UNIVERSITY OF GHANA

COLLEGE OF HUMANITIES

SCHOOL OF SOCIAL SCIENCES

ANTECEDENTS OF OCCUPATIONAL HEALTH, SAFETY BEHAVIOUR AND SAFETY PERFORMANCE: A CASE STUDY OF SELECTED RICE FARMERS IN GHANA

BY

LEBBAEUS ASAMANI

(10191610)

A THESIS SUBMITTED TO THE UNIVERSITY OF GHANA IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF DOCTOR OF PHILOSOPHY IN PSYCHOLOGY

DEPARTMENT OF PSYCHOLOGY

JULY 2017

DECLARATIONS

I, **Lebbaeus Asamani,** hereby declare that this thesis is the result of my own original research produced in the Department of Psychology, University of Ghana, under the supervision of Dr. Maxwell Asumeng, Dr. Adote Anum and Dr. Paul Narh Doku, and that no part has been presented either in part or in whole for the award of a degree in this University or elsewhere. Where views and ideas of others have been used, they have been duly acknowledged.

...

LEBBAEUS ASAMANI
(Student)

This thesis has been submitted for examination with the approval of

Principal Thesis Supervisor: ....

DR. MAXWELL ASUMENG

Date: ....

Second Thesis Supervisor: ....

DR. ADOTE ANUM

Date: ....

Third Thesis Supervisor: ....

DR. PAUL NARH DOKU

Date: ....

ACKNOWLEDGEMENT AND APPRECIATIONS

My sincere thanks go to my resourceful supervisory committee members, Dr. Maxwell Asumeng, Dr. Adote Anum and Dr. Paul N. Doku, and also to the entire faculty members of the Department of Psychology, University of Ghana, especially, Prof. C. C. Mate-Kole and Dr. Oppong Asante, for their immense contributions to the successful completion of this thesis. I am also grateful to the University of Cape Coast for sponsoring me to pursue this PhD programme.

I wish to also express my profound gratitude to my wife, Evelyn Asamani (Mrs) for her unwavering support throughout the period of this programme. I also acknowledge the contributions of my PhD colleagues, especially Dickson Alfred Dai-Kosi, in shaping the thesis, not forgetting Maame Afua Boatemaa, Dr. Ivy Nkrumah, Emilyn Ofosu-Amaah and Ruth Annan-Brew for their assistance in diverse ways. The scheme managers and their staff, the executives of the rice farmers' cooperatives, and the rice farmers of Ashaiman, Kpong and Okyereko irrigation schemes who provided data for the thesis are also greatly appreciated.

DEDICATION

To my wife, Evelyn Asamani

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

Health and safety at work is not only a sound economic policy, but also a fundamental human right that must be protected and ensured at all times. A number of studies in the formal sector have established that personal, organisational and work context factors, including safety behaviour and safety culture, have immense implications for employees' health and safety. However, the informal sector, especially production agriculture, has been neglected in terms of occupational safety research in the social sciences. This study investigated antecedent of health and safety behaviour and safety performance of Ghanaian rice farmers. The study employed the exploratory sequential mixed methods design, comprising qualitative study (study one) and quantitative study (study two). The data for the study were collected from Kpong, Ashaiman and Okyereko rice irrigation schemes.The qualitative study explored occupational health and safety hazards and the major health and safety incidents that rice farmers in Ghana experienced. The qualitative data was obtained through ten (N = 10) semi-structured interviews with key informant. The theoretical thematic analysis was the analytical procedure for the qualitative data, using Braun and Clarke's six-step approach. Results of the qualitative study showed that rice farmers in Ghana were exposed to a myriad of health and safety hazards and also experienced several incidents that resulted in health challenges, physical injuries and disabilities. These findings were used to develop a rice farm hazards exposure scale and to adapt the rate of incident reporting scale for the study two. Study two tested the extent to which religiosity, hazards exposure and safety culture predicted safety performance in a cross-sectional survey with 469 the rice farmers comprising 122 female and 347 males.The data were analyzed using the Partial Least Square Structural Equation Modelling (PLS-SEM) with the SmartPLS 3.6.2. It was concluded that religiosity is an important antecedent of both positive safety behaviour and safety culture, while safety culture is an important predictor of safety behaviour and safety performance. Safety behaviour also partially mediated the effect of safety culture, but not the effect of religiosity on safety performance. Furthermore, both safety culture and safety behaviour were found to be significant moderating variables of the effect of hazards exposure on safety performance. The findings underscore the need to distinguish safety behaviour and safety performance in safety science research. Also, the hazards exposure scale and an integrative safety performance model developed in this study could be used and tested in future studies.The implications of the findings were discussed within certain theoretical frameworks. Recommendations were also made for safety management policy directions, organisational practitioners and directions for future research.

LIST OF ABBREVIATIONS

ACC	–	Accidents
AVE	-	Average Variance Extracted
BIO	–	Biological Hazards
BIO_HZ	-	Biological hazards
CB-SEM	-	Covariance-Based Structural Equation Modelling
CHEM	–	Chemical hazards
CHEM_HZ	-	Chemical hazards
CRS	-	Centrality of Religion Scale
ERGO	–	Ergonomic hazards
ERGO_HZ	-	Ergonomic hazards
EXPER	-	Religious experience
GRPN	–	Group safety norms
HAZ_X	-	Hazards exposure
HAZ_X	–	Hazards exposure
HND	-	Higher National Diploma
IDEOL	–	Ideology
ILO	-	International Labour Office/Organisation
INTL	–	Intellect
JSS	-	Junior Secondary School
MGTC	–	Management commitment to safety
MGTPR	–	Management safety priority
MICOM	-	Measurement Invariance of Composite Model

OCB	-	Organisational Citizenship Behaviour
OHS	-	Occupational Health and Safety
PHY	–	Physical symptoms of safety performance
PHY_HZ	-	Physical hazards
PLS-SEM	-	Partial Least Square Structural Equation Modelling
PPE	-	Personal Protective Equipment
PRIV	-	Private Practice
PSYC	–	Psychological symptoms of safety performance
PUBL	-	Public practice
RP	-	Respondents
SBVR	–	Safety behaviour
SCB	–	Safety compliance
SCOM	–	Safety communication
SCTR	–	Safety culture
SFTPT	–	Safety participation and involvement
SFTRN	–	Safety training
SFTRPT	–	Safety reporting
SPB	–	Safety participation
SPF	–	Safety performance
SSSCE	-	Senior Secondary School Certificate Examination
UN	-	United Nations
US	-	United States
VAF	-	Variance Accounted For

VIF	-	Variance Inflation Factor
WASSE	-	West African Senior Secondary Examination
WHO	-	World Health Organisation

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Workplace safety had been side-stepped or neglected in favour of enhanced productivity for years (Cole, Stevens-Adams & Wenner, 2013), but concerns for safety practices gained the attention of organisations and safety practitioners when series of disasters in a number of industries caused devastating damages and deaths in more recent years (Cole et al., 2013; Neal, Griffin & Hart, 2000). The scientific study of safety to identify antecedents of occupational accidents started at the beginning of the twentieth century (Nielsen & Mikkelsen, 2007). The focus of safety research, prevention and management efforts then were on how to identify antecedents of occupational accidents to help in designing preventive interventions. The main focus was on technical measures to safeguard machinery (Nielsen & Mikkelsen, 2007) which was based on the assumption that faulty machines and technical errors were responsible for workplace accidents.

Research and safety management focus later changed to how to identify workers who were prone to accident when practitioners realized that the emphasis on technical measures was not yielding the desired results (Neal, Griffin & Hart, 2000). The emphasis had been on selecting people who were thought to be less prone to accidents and train them on safety and technical issues (Hale & Hovden, 1998). The foundation of the accident proneness personality theory was that certain characteristics of individuals predict accidents at the workplace (Clarke & Robertson, 2005; Wallace & Vodanovich, 2003). This approach which was based on the accident proneness personality theory was also found not very effective (Guastello, 1993). Organisational factors subsequently became the focus of research efforts to identify causal factors of occupational accidents (Hofmann & Stetzer, 1996). This means that research, accident analysis and safety prevention and management efforts have been focused on technical measures, accident proneness personality and organisational.

Researchers indicated that various occupational safety analysis perspectives in literature could be categorized into *old view* and *new view* (Wallace, 2016). The old view captures the traditional human error approach of accident research and analysis which has not been effective in dealing with occupational safety issues. The new view, however, sees human error as a symptom of a combination of certain antecedents such as personality dimensions, work context and work design (Wallace, 2016). The new view again posits that occupational safety is not inherent, but has to be created because work systems demands sometimes conflict and do not align with the various roles that employees undertake simultaneously. In concert with the new view, managers and safety practitioners need to combine different approaches to create a safer workplace. The implication of this is that occupational safety research needs to focus on factors that have been neglected in occupational science and human error studies. In this regard, the people, tools, tasks, and operating environments which constitute the new view could be integrated in safety science research and management of safety outcomes (Wallace, 2016).

In consonance with the *new view* of occupational safety which takes an integrative perspective of the person, contextual and organisational factors into account in safety analysis, this study explored the extent to which the religiosity (person variable), hazards exposure (contextual variable) and safety culture (organisational variable) of rice farmers predict their safety performance through their safety behaviour in rice farming in Ghana. Thus, the study explored the extent to which individual, situational and organisational variables interact to influence how workers in the rice farms behave with regard to their safety, and further investigated how those behaviours affect safety outcomes among the rice farmers. In the rice farms, technical measures, human (person variables) and management systems (organisational variables) were expected to interact to determine the safety performance of the workforce. This situation is similar to what happens in the transport, oil and gas, industrial manufacturing and constructions which are said to be high risked industries. Identification of what makes people engage in safety behaviour would be invaluable in designing safety interventions and systems to promote safety at the workplace to provide safe and healthy work for Ghanaian employees.

Based on Cooper's reciprocal safety culture model (Cooper, 2000), religiosity was conceptualized as a person variable that has great potential to influence safety behaviour of rice farm workers. Religiosity has been found to have enormous influence on behaviour of individual in various setting, including workplace behaviour. Safety culture and hazards exposure are the other antecedents investigated in this study. These constitute the organisational contextual or situational variables that have implications for the safety behaviour of the rice farmers.

The International Labour Organisation (ILO), the World Health Organisation (WHO), the 1992 Constitution of Ghana, as well as the Labour Act of Ghana, all underscore the fact that protection of workers against harm and sicknesses is a fundamental human right, irrespective of where the individual works. For instance, the International Labour Organisation (ILO) constitution indicates in the preamble that: "The protection of the worker against sickness, diseases and injury arising out of employment is fundamental element of social justice." This is supported by the World Health Organisation which indicated that: "Occupational safety and health is human right and decent work eventually is safe work (WHO, 2010: p. 1). The UN also emphasized this point when the former Secretary General stated that "*Safety and health at work is not only a sound economic policy - it is a basic human right"* (Kofi Annan)*;* and theLabour

Act of Ghana(2003),(Act 651 Article 118:1) also stipulates that it is obligatory for the employer to *"ensure that every worker employed in Ghana works under satisfactory, safe and healthy conditions"* at their workplace, whether in the farm, office or in the factory or shop.The Labour Act of Ghana (Act 651, 2003) defines a workplace as "any place where a worker needs to be or to go by reason of his or her work which is under the direct or indirect control of the worker" (p.52).

The "health and safety" of all workers in all sectors of the economy is essential to ensure healthy workforce, as emphasized above, in order to ensuring safe work environment and conditions for employees to ensure healthy workforce and progressive society. The working environment and the nature of work itself have great influence on physical and psychological health of individuals (Marmot & Wilkinson, 2006). This suggests that the work environment should be devoid of hazard as much as possible to provide healthy and decent work for the workforce. Industrial or occupational accidents have great effect on the mental health of victims as well as others who witnessed the incident. Health and safety of employees at the workplace are costly to the individual employees and their families, employers and the nation as a whole.

Not only is preventing work-related illness and injury important to individuals and their families, but it is also of immense importance for good business, industry and society. There are financial implications for the victim, as well as the employer and even productivity of a whole industry. The cost of workplace injuries and ill-health on individual, organisational and national levels is incalculable. Healthy workforce is essential for the survival and good business of any organisation. There are a number of benefits that accrue to any human organisation that ensures that its workforce work under conducive, safe and healthy work environment. The workforce in those organisations is ensured of fundamental human right to life, and their wellbeing as well as quality of work life and general life is enhanced. The organisation also benefits immensely because providing safe work to employees helps to avoid financial loss through payment of compensations and loss of working man hours. It also helps organisations to maintain their corporate image.

1.2 Occupational health and Safety Hazards

Employees are exposed to various health and safety hazards which lead to serious health consequences and deaths on daily basis (Concha-Barrientos, Nelson, Driscoll, Steenland, Punnett, Fingerhut, & Corvalan, 2004). Occupational hazards are features of the workplace that are likely to cause harm or damage to persons or properties (Asumeng, Asamani, Afful & Agyemang, 2015). Hazards only present potential to cause harm and whether the harm actually occurs or not depends on circumstances such as the amount of hazards exposure, the extent of the risk factors present and how long one has been exposed to the risk factors (Asumeng et al., 2015).

Risk on the other hand represents the likelihood that exposure to a given hazard would lead to harm or damage to a person, health or the environment (Ministry of Health, Ghana, 2010). The likelihood of injury or ill health resulting from a hazard is a function of the nature of the hazard and the control measures put in place to control or manage the hazards (Asumeng et al., 2015). Thus, the control measures put in place act as intervening variables in the link between hazards exposure and safety performance. These measures include safety management systems, safety compliance enforcement, safety participation etc. The prevailing safety culture and safety behaviour at a workplace could determine level of hazards and whether exposure to hazards to could result in harm or not.

Kumphon (2009) indicated that rice farmers are exposed to physical, chemical, biological, and ergonomic hazards. *Biological hazards* are encountered when the work requires that people come into contact with insects, animals, dangerous plants or people. Working in the rice farm may expose the farmers to a variety of biological hazards. *Physical hazards*on the other hand are things at the workplace that can cause harm to the worker when he or she has not even touched or come into contact with them. Examples are exposure to sun and other extreme weather conditions, continuous loud noise etc. Other situations and conditions that can cause harm, health related problems and even death are also referred to as safety hazards. For instance slippery bonds, sharp work tools or objects are safety hazards. Rice farming involves a lot of these hazards.

Another form of hazard is e*rgonomic hazard*which represents conditions or situations that occur when the type of work and body positions put strain on the body parts of the worker. Ergonomic Hazards in rice farming may include, frequent lifting of bag of rice or fertilizer, awkward sustained work posture, awkward movements, especially if they are repetitive, as in weeding or transplanting of seedlings. These have the potential of causing health challenges to the farmers. *Chemical hazards* involve exposure to any chemical at the workplace in any form, solid, liquid or gas. Some agrochemicals can cause illness, skin irritation, or breathing problems. Rice farmers use a variety of agrochemicals to control weed and pests; and also fertilizers to fertilize the soil. Some farmers also burn the field during land preparation and the fumes that come from such could pose health problems.

1.3 Occupational Health and Safety incidents in Agriculture

The ILO estimates indicate that about 160 million people suffer from occupational diseases and 2 million people die every year as a result of occupational accidents and work-related diseases and injuries. The agricultural sector constitutes one of the most hazardous workplaces. Studies in the US regarding injuries to farm workers in 1979, 1980, and 1981 which used national statistics (Reesal, Hagel, Pahwa, Domoney, Dosman, & McDuffie, 1992), indicated that about 300 youth die each year from farm injuries and 23,500 suffer nonfatal injuries. Also, more than 50% of victims of fatal farm injuries die because of the distance of the farm, nearly 20% die on their way to a hospital, and only about 10% survive and get treated.

About 167 agricultural workers suffer a lost-work-time injury, and about 5% result in irreparable deformity of workers everyday (US Labour Statistics, 2012). Exposure to agrochemicals also poses high risk for farm workers, because they may cause poisoning, work-related health problems or even death (ILO, 2010). In Ghana, McNeill and O’Neill (1998), in a study with Ghanaian farmers found that 76% of the respondents suffered musculoskeletal disorders, 77% suffered lower back pains, and 50% burns, among others. Bosompem and Mensah (2012) and Muilerman (2013) also found that Ghanaian Cocoa farmers experience various forms of injuries and disabilities from their farming activities. As Ghana seeks to increase rice production and reduce the quantity of rice imported into the country, there is the need to ensure that farmers are healthy and safe.

To achieve success of health and safety management at the work place requires proper appreciation and identification of risk factors, strong management commitment, and collaboration among safety and health professionals, employees and their associations/ organisations, and management. The nature of hazards at any workplace determines what constitutes safe work behaviour and when or what safety measures workers need to put in place (Weinstein, 2000).This study investigated how a person related variable (religiosity), external or contextual variable (hazards exposure) and organizational variable (safety culture) affect safety outcomes of ice farmers. This is hoped to provide a more comprehensive appreciation of the safety situation to facilitate proactive and objective problem-solving perspective in preventing near-misses or injuries, specifically in the rice farms, and generally at any workplace. Understanding of what makes employees behave in safe manner or otherwise would inform appropriate design of interventions to promote safe work.

Overviews of the concepts investigated in the study are presented below to help in understanding of how they were used and related in the study. Religiosity of the Ghanaian is considered part of our cultural values. Again, the safety culture of an organization takes its root from the broader prevailing culture in the society which the farmers live. Culture therefore is an important pivot for this study, and was discussed in relation to safety. Culture can be defined as the values, norms, rituals, beliefs and symbols shared by members of a group or society, and it includes patterns of behaviour, learned responses, basic assumptions, habits and traditional ways of thinking, feeling and reacting (Shweder, 1991). The culture of a society has been found to be essential for the productivity, work ethics and other aspects of the economy (Nukunya, 2013). This study considers the religious aspect of culture and how it influences the behaviour of the farmers regarding their work safety behaviour. Religiosity is an important cultural factor that needs to be studied because it is one of the most universal and influential social institutions that can influence behaviour and attitudes through institutionalised norms (Mokhlis, 2009).

1.4 Conceptualisation of Safety Behaviour and Safety Performance

Traditional measures of safety performance rely mainly on outcome data such as accident or injury data (Chhokar & Wallin, 1984). Glendon and McKenna (1995) however, indicated that outcome measures are generally inaccurate, retrospective and ignore risk exposure. Confirming this, Cooper (2000) asserted that outcomes of safety measures are affected by social desirability biases because people may respond as they *should* rather than as they actually would have responded which may lead to inaccurate data. To overcome these challenges, the behaviour sampling approach, which is considered to be a more proactive way to manage safety than the outcome measures, was recommended (Tarrants, 1980). The behaviour sampling approach is based on randomly sampled observable behaviours of the worker (e.g. use of personal protective equipment) on the job to determine whether such behaviours are safe work behaviours or otherwise. The consequence of the introduction of the behaviour sample in addition to the outcome data in measuring safety performance is a situation where conceptualizations of safety performance becomes inconsistent in the literature of workplace safety (Christian, Bradley, Wallace & Burke, 2009).

The inconsistencies in the literature involve situations where the terms *safety performance* and *safety behaviour* are used interchangeably in some studies, while others treat the two terms as separate constructs. Christian et al. (2009) in their meta-analysis of workplace safety indicated that safety performance connotes two different concepts in the literature. The first is the use of the term to represent organizational measures of safety outcomes, such as number of injuries and near misses, and the second is to use it to refer to a measure of safety-related behaviours of individuals (e.g. Burke, Sarpy, Tesluk, & Smith-Crowe, 2002; Curcuruto, Conchie, Mariani & Violante, 2015; Ismail, Asumeng & Nyarko, 2015; Neal & Griffin, 2004).

Christian and his colleagues (2009) suggested that safety related behaviours should be distinguished from the outcomes of such behaviours, because they might have different relationships with antecedents. This study concurs with the view to separate safety related behaviours from the outcomes as proposed by Christian et al and considers safety performance behaviours and safety outcomes to be distinct. In that regard, the acts or behaviours of individuals that promote safety outcomes or otherwise, are referred to simply as safety behaviour in this study, while safety outcomes involving tangible events or results, such as near misses, accidents, injuries, or fatalities are referred to as safety performance. Safety behaviour has consistently been found to be the closest cause of safety performance. For instance, Curcuruto, Conchie, Mariani and Violante (2015) and Neal and Griffin (2004) found that when employees actively engage in safety related initiatives, safety performance is improved (i.e. reduced rate of accidents and injuries). The two concepts therefore could not be appropriately conceptualized as alternative ways of measuring safety performance.

In this study, a distinction is also made between *safety compliance* and *safety participation* as components of safety behaviour (Neal & Griffin, 2000; 2004). Literature indicates (e.g. Clarke, 2006, 2013) that both components are associated with work-related accidents and injuries (safety performance as used in this study). Safety participation involves certain specific acts and discretionary extra-role behaviours that indirectly contribute to developing a safe work environment. These include acts such as voluntary participation in safety activities and programmes, helping others, voicing concerns about safety, helping co-workers with safety problems, promoting the safety programmes and policies, attending safety meetings and looking out for the welfare of others (Mullen, Kelloway & Teed, 2017; Neal & Griffin, 2000; Tucker & Turner, 2015). Safety compliance on the other hand denotes adherence to organizational safety rules and practices and engaging in behaviours that maintain workplace safety such as wearing protective safety equipment. The distinctive feature between the two forms of safety behaviour is that compliance involves mandatory in-role safety behaviour, whereas safety participation is a discretionary extra-role behaviour initiated by the individual (Clarke & Ward, 2006).

Safety participation has several features in common with organizational citizenship behaviour (Organ, 1988; van Dyne & LePine, 1998). Organizational citizenship behaviours (OCBs) are voluntary work behaviours that beneficial to the organization, but are not formally recognized and formal rewarded, or promoted therefore non-performance of such behaviours are not punishable (Podsakoff, Mackenzie, Paine & Bachrach, 2000) and they are difficult to promote through formal routes. Safety participation is referred to as safety citizenship behaviour (SCB) by some authors (Hofmann et al., 2003; Didla, Mearns, & Flin, 2009) in line with its conceptual similarity with the general organizational citizenship behaviour.

1.5 Conceptualisation of Safety Culture

The culture of an organization is made up of several sub-cultures and safety culture is one of the sub-cultures of the entire organizational culture and so it helps to explain safety culture within the general context of organizational culture (Cole, Stevens-Adams, & Wenner, 2013; The Health Foundation, 2011). Safety culture has been conceptualized variously in the literature, and attempts were also made to draw distinctions between safety culture and safety climate. Helmreich and Merritt (2001) indicated that the conceptualization of organizational safety culture depends on the area of research and academic discipline. This also led to different safety culture conceptualizations evolving in different areas. According to Wiegmann et al. (2002), the perspectives utilized in conceptualizing safety culture in organizations have been broadly categorized into two. These are the socio-anthropological and organizational psychology perspectives.

The socio-anthropological perspective emphasized the use of ethnographic approaches to the study of culture which involves indepth observations and interviews (Wiegmann et al., 2002). This perspective stressed that culture of an organization is shown in the attitude and behaviour of its members and the foundation of a culture is therefore not obvious for people outside the organisation to see but could be most easily sensed by members. In this regard, using subcomponents to study culture may not result in proper appreciation of the issues of concern. The socio-anthropological perspective further views organizational culture as one that is still evolving but collectively held, and resistant to change and direct manipulation (Wiegmann et al., 2002).

The organizational psychology perspective also conceives organizational culture as the shared values and beliefs of members, myths, stories, legends, rituals, and exceptional language, similar to the socio-anthropological perspective. This perspective emphasized the important role of exploring the potential of organizational cultural dynamics to increase productivity rather than just exploring what the content and structure of culture is (Wiegmann et al., 2002). In that regard, the organizational psychology perspective stressed the need for organizational members to derive a sense of identity from the organization.

The organizational psychology perspective is considered more useful than the socio-anthropological perspective in safety culture research (Uryan, 2010) because it provides a means of modifying organizational culture and demonstrating the relation between culture and desired outcomes in research (Uryan, 2010). Thus, organisational culture is linked to productivity rather than just exploring what culture should be and what its components are. This study therefore utilized the organizational psychology perspective to conceptualize safety culture construct and was measured as a multidimensional construct.

1.5.1 Safety culture and Safety Climate

The concept of safety culture was first used after the analysis of the 1986 Chernobyl nuclear power plant accident (Taylor, 1989). Investigators of the accident went beyond engineering and operational failures to standard industrial practice because of the severity of the accident. The findings brought to the fore the importance of *the person* aspect in managing, designing, constructing or operating hazardous facilities. This approach takes into account the psychology of why people behave as they do in the workplace and how they interact with their work environment (Taylor, 1989).

Review of the safety culture literature indicates that the concept does not have common definition and assessment tools or methodology and components (Antonsen, 2009; Cole et al, 2013). The lack of common definition and component pose a lot of challenge for research and measuring of safety culture. This challenge is further compounded by research on safety climate. The two terms are sometimes used interchangeably and in other situations they are differentiated.

Researchers and practitioners have made attempts to distinguish safety culture and safety climate in terms of conceptualization and measurement. Various definitions have been offered by different authors (e.g. Cooper, 2001; Fernandez-Muniz, Montes-Peon & Vazquez-Ordas, 2007; Griffin & Neal, 2000; Kwon & Kim, 2013; Sinclair, Martin, & Sears, 2010; Vinodkumar & Bhasi, 2010; Zohar, 1980). Havold (2005) noted that the multiplicity of definitions of the concept is due to the fact that both organisational culture and safety culture are abstract concepts, and this gives researchers a large degree of freedom on how they understand the concepts and put them into practice.

Wiegmann et al. (2002) defined safety culture as the shared values among members of an organization that relate to formal safety concerns and the willingness of the organisation to learn from mistakes and have the ability to integrate contributions from members at every level of the hierarchy, power to influence individuals' behaviour, and status as relatively stable, enduring, and resistant to change. Zohar (1980) also points out that safety culture has an informative function regarding the relative importance or priority of safety versus productivity at the workplace. Thus, to Zohar, safety culture provides information to members of organization as to how to behave regarding safety while on the job. The culture gives clues as to what is considered acceptable and where priorities are placed in the productive venture. Meanwhile, Choudry, Fang and Mohamed (2007) indicated that there is a consensus among safety scientists that safety culture is about the employees' shared attitudes, values and beliefs about safety and managements' priority of safety in the organization.

In a number of review by Wiegmann et al. (2002) of definitions of safety culture and climate, it was concluded that safety culture seems to lay emphasis on relatively permanent features of the organization and to be aligned with traditional theories of organizational culture as a social-anthropological construct (e.g., Deal & Kennedy, 1983; Schein, 1991). Safety climate on the other hand, emphasizes the *perceptions* of employees, not the *actual* objective measurable feature, and also stress that those perceptions could change based on prevailing situations. This attempt to differentiate safety culture and safety climate is similar to the distinction that has been made between psychological states and traits (Spielberger, 1966). Neal, Griffin and Hart (2000) however indicated that the distinction between the two concepts in research does not seem to exist in practice. Neal et *al* further stressed most researchers in safety culture and safety climate use similar operational definitions and survey procedure to measure. Safety culture seems to be the preferred term in high-risk industries, such as nuclear power or health care, but safety climate is more frequently used in construction, manufacturing, and other similar industries (von Thaden & Gibbons, 2008).

From the foregoing reviews, it could be concluded that the distinction between the two constructs is not clear cut, and the measures used by researchers in safety culture and safety climate are highly similar. Safety climate is considered to be the measurable facet and a snapshot of the actual culture (Hall, 2006) in an organisation because of the measurement difficulty involved in assessing safety culture (Cooper & Phillips, 2004). Cooper and Phillips suggest that psychometrically, measures used for safety climate could also measure the safety culture construct at a particular point in time because "climate is a measurable facet of organizational culture".

Safety culture in this study refers to the values, attitudes and behaviours of individuals and collectively by members of a given rice irrigation scheme with regard to farm health and safety. This study used information from both the safety culture and safety climate literatures and views the the two constructs basically similar, given that several studies have identified similarities among safety culture and climate measures. In the agriculture sector, the safety behaviours could include wearing of protective clothing, proper use of farm tools and equipment, using lifting equipment or adhering to regulations for pushing and pulling. The actual behaviours of the rice farmers in their daily activities were the focus of the study and so it is appropriate to use the term of safety culture, instead of climate in this study.

1.6 The Concept of Religiosity at the Workplace

Religion is said to be universally valid and every human society appears to have some form of religion (Voland, 2009; Peterson, 2001)). Interest in religiosity and spirituality in the workplace is a relatively new area of scientific investigation that has attracted both scholars and practitioners. Existing literature indicate that more employers are encouraging religiosity and spirituality at work in order to enhance employee morale, commitment and productivity **(**Fry & Nisiewicz, 2013). A myriad of roles and practices have been linked with spirituality and religion at the workplace.

The concept of religion as subculture has become increasingly central to the work environment and workplace behaviour literature in recent years. Africans, and by extension, Ghanaians are generally considered to be very religious and religiosity is considered as part of the African personality and as a subcomponent of the cultural identity of the African (Leonard, 1966; Mbiti, 1969*;* Tembo (1980)). For instance, Tembo (1980) stated that the African personality represents a *"...manifestations of cultural uniqueness exhibited in bebaviour, social norms, customs, values, beliefs, religious zeal, attitude, explanations of the cosmos and supernatural, social and political systems historically or in contemporary times*" (p. 1). The following quotes also depict the value of religiosity and the extent to which the African is perceived to be religious:

> *"Africans are in the natural sense of the word truly and deeply religious of whom it can be said that they eat religiously, drink religiously, bathe religiously, dress religiously and sin religiously" (Leonard,1966, p. 1), and "Africans are notoriously religious" (Mbiti, 1969: p. 1).*

One can logically argue that if the African virtually does everything religiously, including sinning, then the general work behaviour and safety behaviour of the African would also be greatly influenced by his or her religiosity.

The term religiosity is difficult to define in scientific literature (Hackney & Sanders, 2003) and this resulted in multiplicity of definitions and models of religiosity in the literature. Aside the lack of common definition, some researchers also maintained that there is a distinction between religiosity and spirituality. According to Moore and Casper (2006), spirituality relates to intrinsic characteristics that underlie human behaviour. Olowookere (2014) also presents spirituality as the intrinsic religiosity, the selfless acceptance and commitment to the tenets of one's religion. He notes further that spirituality, like intrinsic religiosity denotes *living* one's religion; making religion a lifestyle. Neck and Milliman (1994) posits that spirituality is a process of living out one's set of deeply held personal values stimulated by the desire to find meaning and purpose in life. McCormick (1994) also defined spirituality a behavioural demonstration of individuals' subjective inner experiences. These authors therefore seem to have agreed that spirituality and religiosity are distinct but strongly related. Whereas spirituality is more of individualized inner value and belief driven, religiosity seems to be more of public and group based activities related to one's faith or worship.

Hill, Szewczyk, Woo, Hollar, Culler, and Pister (2000) also support the relatedness of religiosity and spirituality and stressed that the two concepts are kindred rather than independent. They posit that spirituality can be understood as a quest of the sacred, a process through which people want to discover, encompass and bring the sacred into their lives and this process broadly takes place in a religious context, either traditional or non-traditional. Hill et al. (2000) argued that spirituality is an inherent part of a person's religiosity and that a person could be both spiritual and religious, or spiritual without being religious, or being religious without being spiritual. Spirituality suggests having a transcendental relation with a deity or Supreme Being, whereas religiosity means adopting a certain religious creed or church. Meanwhile, Zinnbauer et al. (cited in Rusu & Turliuc, 2011) contends that a number of individuals consider themselves to be spiritual without being religious, and increasingly, spirituality is used to describe religious spiritual experiences, while the religiosity is used for institutionalized religiosity. Contemporary conceptions support a distinction between the two concepts (Hill et al., 2000).

A careful analysis of these definitions clearly shows the inconsistency in the delineation of the concept of religion among researchers. Clarke and Byrne (1993) identified three sources of why producing a satisfactory and shared definition of religion in the literature would not be realized. The sources identified relate to: *"(1) conflicts and lack of clarity in the ordinary use of the term; (2) the confused meaning left to the term from its history; and (3) the obvious divergence in scholarly purposes and approaches to the definition of religion. Thus, because religion may not be definable in general terms, "it must be defined for each research setting*" (Wilkes, Burnett & Howell, 1986, p. 48).

In this study, religiosity represents a belief system that associates the spiritual aspect of humans to the supernatural and extent of adherence to the practices and beliefs of an organized religious institution. This definition recognizes that religiosity represents transcendental experience as well as ritualistic observance and practices of the traditions and beliefs of a given religion.

Since it is possible for one to be religious without being spiritual and vice versa, it would be appropriate for measures of religiosity or spirituality to cover both domains. Ivy (2014) appropriately indicates that religiosity encapsulates both religious belief and religious behaviour.

In Ivy's conceptualization, religious belief is considered to be internal religiosity, or faith, and is defined as "belief in God and a trusting acceptance of God's will" (Steiner, Leinert & Frey, 2010, p. 16), whereas religious behaviour is considered to be external religiosity, and includes "all observable activities, which are undertaken in a religious context, in particular, going to church" (Steiner, et al., 2010, p. 16) and participating in religious activities. This conceptualization was adopted for this study. In this study, the measurement of religiosity has elements of private individualized transcendental experiences which could be described as spirituality. In other words, the measurement covers what some authors described as internal religiosity (spirituality) as well as public practice of the beliefs of one's religion.

1.6.1 Significance of Religiosity at Work

Religion is an important cultural value (Mokhlis, 2009) and the core phenomena of what religion is exist in various forms in all human cultures (Voland, 2009). It is considered one of the most universal and influential social institutions that has significant influence on people's attitudes, values and behaviours at both the individual and societal levels. Religion therefore represents the local and culturally based symbolic niche of a society (Voland, 2009). Any organization or workplace is a miniature society that forms part of the larger society. In that regard, as social beings, the behaviours and attitudes of employees in any work environment are directly influenced to some point by religion-rooted cultural aspects of their living environments (Mokhlis, 2009).

A number of recent studies suggest that individuals' personal attributes, beliefs, attitude and dispositions have enormous influence on employees' organizational behaviour (e.g. Olowookere, 2014; Neal & Griffin, 2006; Roundy, 2009). Religious belief has also been found to be a powerful force in every society (e.g., Abdel-Khalek, 2010) and individuals often activate and bring their religious beliefs to the workplace (Kutcher, et al., 2010). Given this background and the fact that the Ghanaian is very religious and does everything religiously, this study investigated how religiosity of the rice farmers influences their safety behaviour and, indirectly, their safety performance.

1.7 Statement of the Problem

The 1992 constitution of Ghana states that *"every person has the right to work under safe and healthy conditions" (section 24: 1).* However, there seems to be a notion that health and safety at work is an issue of the *industrial and formal* sector only. This is supported by the fact that most of the research work in the occupational health and safety literature is focused in the formal sector, in areas like construction, mining, oil and gas etc. Review of the literature suggests that not much empirical work has been done in the area of health and safety of Agriculture workers in Ghana. The few research work cited in the literature were in areas such as vehicle repair artisans (Monney, Dwumfour-Asare, Owusu-Mensah & Kuffour, 2014), wood industry (Kwankye, 2012; Effah, Antwi, Adu & Boampong, 2013, Mitchual, Donkoh & Bih, 2015), industrial firms (Gyekye & Haybatollahi, 2012; Gyekye, 2001, 2003, Gyekye & Salminen, 2004, 2006), mining (Amponsah-Tawiah & Dartey-Baah, 2011; Amponsah-Tawiah & Mensah, 2016; Amponsah-Tawiah, Jain, Leka, Hollis, cox, 2013), market and street traders (Alfers, 2009), household survey of occupational injuries (Mock et. al, 2005), female work-related ill-health (Avotri & Walters, 1999; Hill, Darko, Seffah, Adanu, Anarfi, & Duda, 2007), crop production (McNeill & O'Neill, 1998). Another research conducted in Ghana among Cocoa farmers also indicated that farming activities pose enormous health and safety hazards to farm workers (Bosompem & Mensah, 2012; Muilerman, 2013).

Meanwhile, statistics show that the informal sector employs about 91.3% of the total workforce worldwide (Heintz, 2005), with that of Ghana constituting 86.1% (GSS, 2012). Heintz further indicated that 53.9% of the world's workforce is engaged in the informal agriculture sector. The International Labour Office (2010) report also suggests that about half (50%) of the world's workforce is engaged in agricultural production, with 60% of this in the developing countries. Production agriculture and other areas in the informal sector have not been much researched, especially in Africa, and Ghana in particular. What this means is that very little is known or done about the health and safety of the chunk of the workforce. This is the first gap this study addressed.

Secondly, agriculture has been cited among the most hazardous occupations in the world (ILO, 2010). The US Janklow Law Firm (2015) observed that farm accidents are a source of worry to many families of farms workers and that similar to working in an office or at a store; agricultural workers have the same right to safety and peace of mind while on the job.Fatal accident rates in a number of countries indicate that the rate in agriculture is twice the average for all other sectors. The International Labour Office (2000) estimates indicate that out of a total of 335,000 fatal workplace accidents worldwide, there are about 170,000 deaths among agriculture workers. The US Department of Labour (2012) statistics also indicate that agriculture ranks among the most hazardous industries and farmers are at very high risk for fatal and nonfatal injuries. The US Department of Labour statistics shows that 374 farmers and farm workers died from a work-related injury, resulting in a fatality rate of 20.2 deaths per 100,000 workers in the US. According to the U.S. Bureau of Labour Statistics (2012), farming and ranching jobs ranked in the top ten of the most dangerous occupations in the United States. Indeed, the US Labour Statistics (2011) indicates that there were 25.4 deaths per 100,000 workers in agriculture, while mining, construction and transportation recorded 12.8, 9.3 and 11.0 deaths respectively. Bennett (2013) also reports that agriculture was ranked number 8 in Bankrate's ratings of "*The 10 of the most dangerous jobs"* in the US.

Again, the agricultural sector is the mainstay of the Ghanaian economy and provides employment to over 64% of Ghanaians **(**Sharife, 2011). This means that research efforts should be directed at the sector that is the pivot of the economy. The lack of research regarding health and safety issues of farmers, especially social science research suggests lack of interest in production agriculture workers' safety issues.

Furthermore, there has been no study cited in the literature in relation to health and safety of rice farm workers in Ghana. Even though safety behaviour and safety culture studies abound in the formal sector, there is paucity in the informal sector and particularly, production agriculture. It would be erroneous to assume that safety behaviour is the same across jobs and occupations. Critical safety behaviours for oil and gas, mining or construction are likely to be quite different from those expected in the agricultural sector because they present different hazards and risk factors. Even with the agricultural sector, there are different dynamics in the various forms of crop production. For instance, there is intensive use of agrochemicals and heavy equipment and machinery in mechanized rice farming activities, right from pre-planting to bagging the rice for sale. This may not entirely be the case of cocoa farming or pineapple farming. As Ghana seeks to increase rice production to become the highest producer in West Africa (Ministry of Agriculture, Ghana, 2012) and reduce the quantity of imported rice, it is imperative that the safety issues of rice farmer are taken care of.

Research into potential relationship of religiosity and safety behaviour and outcomes are also limited. Empirical evidence suggests that religiosity has a great link with employees' organizational and workplace behaviour. For instance, religiosity of workers has been found to be strongly related with organisational citizenship behaviour (Asamani & Opoku Mensah, 2016), their job attitudes (Kutcher et al., 2010; Sikorsa-Simmons, 2005), ethical decision-making in organizations (Fernando & Jackson, 2006; Weaver & Agle, 2002) and higher job satisfaction (Sikorsa-Simmons, 2005). However, no study has been cited in the literature investigating the role of religiosity in safety behaviour and safety performance, especially in Ghana. Given that Ghanaians are very religious with 95.4% affiliated to one religion or the other (Ghana Statistical Service, 2012), the religious beliefs and values could have safety implications. Gyekye (2004) investigated the role of religious affiliation with workplace accident. But it can be argued that just indicating one's religious affiliation does not measure their level of religiosity and religious values or commitments; hence this study measured the level of religiosity of the respondents with a multidimensional scale comprising internal and external practice of religiosity as well as religious experience.

Safety culture has also been cited as a major contributory factor of accidents by many industrial accident investigations, and generally organisations with a strong positive safety culture are more effective at ensuring safety and having better safety performance (e.g. Nielsen & Mikkelson, 2007, Smith & Wadsworth, 2009). Meanwhile, there has not been any study cited in the literature that investigated the safety culture of rice farmers in Ghana. There was also no evidence of hazards exposure scale to assess the extent of exposure in production agriculture and rice farms in particular. This study used a qualitative study to obtain relevant information from the rice farmers to develop hazards exposure scale for use in the quantitative study.

1.8 Objectives of the Study

The general objectives of the study were to explore the prevalence of occupational health and safety hazards, injuries and work-related health problems in rice farming in Ghana, and investigate antecedents of safety behaviour and safety performance. The antecedents considered in this study are safety culture, hazards exposure and religiosity of the respondents.

The specific objectives were to:

1. explore health and safety hazards in rice farming in Ghana and develop a hazards exposure scale to be used in assessing the level of exposure in farming.
2. find out the major health and safety incidents that Ghanaian rice farmers experience.
3. find out rice farmers' attitude toward personal protective equipment usage
4. ascertain the extent to which each of the antecedents (hazards exposure, religiosity and safety culture) predict safety performance (accidents) through safety behaviour.
5. test the moderation effects of safety behaviour and safety culture on the effect of hazards exposure on safety performance.
6. ascertain which component of safety behaviour (safety participation or safety compliance) predicts safety performance more.
7. find out if the age and years of rice farming experience influenced the safety behaviour and safety performance of rice farmers.

1.9 Significance of the Study

The search for causal variables of injuries and health related problems among rice farmers involves determining what reasons the farm workers proffer for accidents or injuries that occurred during their farming activities. Knowing the farmers' explanation of what causes farm accidents and health problems would be very significant in ensuring safe and healthy work among the farmers. This can help in appreciating their work experiences and possibly, put appropriate and informed interventions in place to prevent future occurrence of the incidences.

The study also brought to the fore the need to assess farm hazards the right way and to find out risk levels in order to put in place appropriate intervention measures to prevent adverse consequences. The findings are also relevant in putting policies in place to ensure that unnecessary injuries and deaths as a result of farm injuries and improper handling of injuries are prevented. Again, it can help to avoid loss of labour hours following farm injuries and health related problems. The consequences of this would be enormous in increased productivity and well-being of the farm workers. The findings can also be invaluable in designing safety training programmes aimed at ensuring safe work in the agricultural sector and other related fields.

Another significance of the study is the hazards exposure scale taht was developed from the findings from study one which could be used to assess extent of exposure to hazards in rice farming and other farming situations in Ghana and other similar settings. In addition, the incident reporting scale was also adapted and validated for use in the Ghanaian setting. This adapted and contextualized scale would also be of significant benefit to safety researchers in the agricultural sector.

1.10 Structure of Thesis

The general design employed in the thesis is the sequential exploratory mixed methods, which means that the thesis consists of two studies. Study one was qualitative study which explored the hazards that rice farmers are exposed to at various stages of their farming activities. The findings were used to develop a rice farm hazard exposure scale. The study one was also used to adapt appropriate safety performance scale for the study two. In study two, the hypothesized model was tested quantitatively, using the scales developed and adapted from study one.

The thesis consists of six chapters as following:

Chapter One: This chapter presents the background to the study and overview of the whole thesis. The problem statement and the objectives of the study are also presented in this chapter. Finally, the significance and operational definitions of the main variable used in the study can be found in this chapter.

Chapter Two: the second chapter presents the theoretical framework that underpins the study, detailed review of the concepts in the study and review of relevant literature. The conceptual framework (hypothesized model) and the hypotheses tested in the quantitative study (study two) are presented in this chapter.

Chapter Three: The third chapter highlights the general methodology of the thesis. Accordingly, the general design employed for the study and the justifications for studies one and two are presented in this chapter. The philosophical foundation of the thesis which guided the methodology and the ethical considerations are also captured.

Chapter Four: Chapter four presents the methods, analytical procedure and results of the qualitative of study one. The results of the analysis are presented and used to develop and adapt survey instrument for the study two of the thesis (quantitative study).

Chapter Five: Study two (quantitative study) is presented in the fifth chapter. The quantitative methodology, analysis and results are presented in this chapter. The quantitative study tested hazards exposure, religiosity and safety culture as antecedents of safety performance, with safety behaviour as a mediator of the links between the antecedents and safety performance. The moderation roles of safety behaviour and safety culture were also tested study two and presented in this chapter. The chapter closes with a summary and brief discussion of the major findings of the quantitative study

Chapter six: The final chapter discusses the results of the two studies and conclusions from the findings are presented. Practical and theoretical implications of the findings, as well as recommendations for policy and further research are also presented in this chapter.

CHAPTER TWO

LITERATURE REVIEW

This chapter presents the theoretical underpinning of the study, together with review of related literature pertinent to the study. The literature review is structured under various headings to facilitate reading. A summary of the review is also present at the end of the chapter. The proposed conceptual model and the hypotheses tested in the study are presented thereafter.

2.1 Theoretical Framework

This study utilized the socio-cultural subsystem model and Cooper's reciprocal safety culture model to explain the theoretical relationships between the variables in the study. Safety science researchers have employed various theories in their studies. These theories were considered appropriate for this study because of their theoretical relatedness to the variables under consideration in the study. A good appreciation of the complex relationship and interrelatedness of the work environment, organizational variables and the individual characteristics, as well as socio-cultural and technical factors at the workplace can help to promote high workplace safety and healthy work for Ghanaian workers. A framework of theoretical underpinnings that would help in the understanding of the complexities is presents here.

2.1.1 Cooper's reciprocal safety culture model

The reciprocal safety culture model (Cooper, 2000) is relevant and conceptually appropriate for the explanation of the antecedents of safety behaviour. Cooper's model is based on Bandura's (1978) model and assertion that the behaviour of individuals and their environments influence each other. Based on this premise, Cooper posits that how one behaves on the job is influenced by his or her work environment and organizational variables. The key components of the reciprocal safety culture model are: the *Person*, the job and the situation (see figure 1).

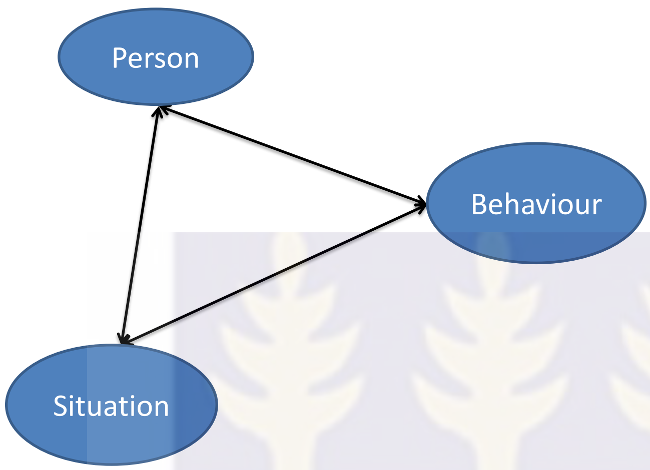

Figure 1: Cooper's Reciprocal Safety culture Model (Cooper, 2000)

These components perpetually influence each other at the workplace, and the quality of the interactions among them determines safety at the workplace. The *person* aspect of the model comprises individual and group beliefs, attitudes, perceptions and values about safety.

Religiosity is conceptualized as a personal variable in this study. The religious beliefs and values of the rice farmers have the potential for influencing their safety related behaviour. The *Job* component of the reciprocal safety culture model depicts individual employees' observable safety-related behaviours (safety behaviours) on the job. Finally, the *Situation* represents the objective situational factors such as organisation policies, management systems, operating procedures and communication styles about safety. The hazards exposure and the prevailing safety culture of the rice farmers constitute the situation aspect of the reciprocal safety culture model as well. These three aspects constantly interact and the quality of the safety culture and behaviour would depend on the nature of the interaction that exits among the three components. The qualities of the safety culture and safety behaviour are expected to have implications for safety performance of the rice farmers.

Work place accident investigations indicated that organizational and cultural factors are underlying causal factors of accidents (Seo, 2005). Safety culture was used here to explain some of the organizational factors (MacDonald, Ingersoll & Berger, 2000) that affect the behaviour and safety outcomes of employees. Religiosity represents a personal and cultural factor that has enormous influence on what employees do at the workplace. Investigations of organizational and individual cultural factors in the explanation of the antecedents of healthy safety behaviour and safety performance are crucial in the effort of promoting healthy work for employees. The focus of the investigation of study was on how these variables interact to shape the safety behaviour of the farmers, which in turn influences their safety performance. Cooper (2000) proposes that the reciprocal safety culture model may be used for benchmarking purposes, and the model is deemed conceptually appropriate for the current investigation.

Cooper (2000) indicated the possibility of measuring *safety culture* through the measurement of each of the components independently or in combination. In this study, safety related behaviour was measured using questionnaire and observation. Actions of rice farmers that have implications for their health and safety represent safety behaviour, whereas safety outcome measures, such as accidents, injuries, health challenges represent safety performance in this study. In Cooper's model, situational factors may be assessed using audits of safety management systems, weekly inspections and environmental surveys. This was done in this study by examining the specific hazards prevalent in rice farming and the levels of exposure. The main or common safety and health challenges experienced by the farmers were also examined.

The irrigation schemes used in the study are well organized with Scheme Managers and administrative staff. In addition, the farmers have cooperatives with their executives who help to run the affairs of each of the schemes. The irrigation schemes are structured with the scheme manger being the health, the extension officers and the cooperative leaders. Finally, the processes are the actual primary and supporting activities or actions that go on in the entire organization. For instance, how an extension officer or scheme manager ensures that the farmers are committed to ensuring safety in their activities.

The reciprocal safety culture model, though does not include a lagging indicator, Cooper indicated that the nature of the interaction the person, situation and behaviour would determine safety at the workplace. This model is therefore appropriate to be used to explain the potential effects among the variables investigated in this study.

2.1.2 Socio-cultural subsystem model

The second theoretical framework for this study is the socio-cultural subsystem model which stems from the social system theory (Luhmann, 1982). The socio-cultural subsystems model considers the kind of relationship that exists between an organization's culture and that of the society in which workers live. Nobles and Schiff (2004), building on Luhmann's work, assert that modern society exists as a complex differentiated sub-systems, with communications linking the systems together. This study holds that religiosity is a part of the Ghanaian cultural system, and safety culture is also a sub of the entire organisational culture. Then again, any organisation or workplace is a miniature social system where the cultural norms and values of the society within which the organisation operates have implications for the behaviour of the workers.

Religiosity has generally been identified as an aspect of cultural value that is important in determining the behaviour of individuals at work, and has substantial influence on the attitudes, values and behaviours of individuals at both the individual and societal levels (Mokhlis, 2009). Religion is considered in this study mainly as a sub-system of culture and a belief that connects the spiritual nature of man to a supernatural being. It is expected that, religiosity, which is a significant aspect of the Ghanaian cultural system, would have a significant influence on their workplace behaviour, including their safety behaviour at work.

This study examined the safety culture that exists in the rice farms as well as the extent of adherence to religious values, norms and beliefs of the farms, and relates them to their safety behaviour. Organisational safety culture is said to be a sub of the overall culture that exists in an organisation (Taylor, 1989). According to Apekey (2001), culture explains the bases for an individual's behaviour and attitude at work. The role of religion, as an element of culture has not received much attention in the safety science literature, regarding the safety behaviour at work. The religious values are part of the Ghanaian cultural values which have been found to be relevant in predicting the attitudes and behaviour of individuals of our society (Apekey, 2001; Saari & Erez, 2002; Saari & Judge, 2004). Employees maintain their religious values and beliefs in the discharge of their work in most cases.

The sub-system theory, in relation to this study, suggests that religiosity, being a part of the Ghanaian cultural system and a crucial influential factor in human behaviour, would be significant in explaining safety behaviour of the rice farmers. Again, safety culture is a sub-culture of the entire organisational culture which is also an essential antecedent of the behaviour of employees regarding their health and safety at work. The proposition here is that each farm worker would (un)consciously transfer the religious values and norms they uphold to the workplace, which would influence their safety behaviour, and ultimately, their safety performance. Indeed, a number of researcher have indicated that there are safety subcultures and these subcultures influence the perception of risk and, ultimately, safety behaviour of individuals (Fleming, Flin, Mearns & Gordon, 1998; Perez- Floriano & Gonzalez, 2007; Pidgeon, 1991). Given that numerous subgroup differences in risk perceptions exist within the same culture, work setting and occupation, it is safe to say that social construction of risk beliefs are context bound (Burke, Salvador, Smith-Crowe, Chan-Serafin, Smith & Sonesh, 2011) and influenced by cultural systems.

Research demonstrated variations in sub-groups within the same organiasation in terms of risk perceptions. These include differences between supervisors and line workers (Weyman & Clarke, 2003), sex difference (Barke, Jenkins-Smith & Slovic, 1997; Greenberg & Schneider, 1995), and difference among national or different cultural groups of workers in the same occupation (Perez-Floriano, 2001). These subgroup differences in risk perceptions and even within the same culture, work setting, and occupation, suggest that the risk perceptions are socially constructed and related to context (Perez- Floriano & Gonzalez, 2007). The sub-systems theory and the reciprocal safety culture model together constitute the underpinning framework for this study. Together, they help explain how antecedents in this study influenced safety behaviour of rice farmers and how the safety behaviour in turn affected their safety performance.

2.2 Hazards Exposure and Health and Safety Incidents in Agriculture

Work in agriculture presents threat to the health and safety of farm workers and their families. Agricultural workers experience the broadest and most extensive exposure to injuries and diseases more than any occupation worldwide (ILO, 2012). Agricultural work also involves doing several things (working) at different place on the farm and around the farm everyday.

There are several aspects of agricultural work that present health and safety threats to farm worker. These include exposure to extreme weather conditions, exposure to animals, reptiles and plants, the use of chemical, awkward working postures, prolong working hours, sharp implement use etc (Hardke & Sadaka, 2013).

Hardke and Sadaka's observation supports Joshi's (2002) position that farming activities require the intensive use of muscles, bones, joints and sustained awkward positions on daily basis. Aside the awkward long sustained bending posture, rice farming involves muddy passageways, the use of unsafe bridges in transportation to and from the farm and the usage of heavy hand tools etc. These have the potential of causing muscular-skeletal disorders such as aches and pains in the limbs, joints or back, physical fatigue, injuries and accidents.

Rice production starts with the land preparation, then cropping, crop management, harvesting and post harvesting activities. The study therefore explored hazards associated with equipment use, agro-chemical use, ergonomic and physical hazards involved in these stages of rice farming. Santaweesuk, Chapman and Siriwong (2013) in a study that investigated health risk perception of occupational hazards among rice farmers in Nakhon Nayok Provice, Thailand observed that paddy fields with holes, flooded areas and mud make rice farming more prone to accidents and injuries.Joshi noted that water-rice fields are suitable places for the growth of several types of bacteria, viruses, fungi, mosquitoes and other parasites. These may result in diseases like malaria, hookworm, skin diseases, etc. There are also respiratory diseases attributable to dust and fumes from field preparation and harvesting, molds and other organic antigens, smoke from burning rice stubbles and agrochemicals.

The use of chemical agents and other substances in crop management such as fertilizers, herbicides, and pesticides also present enormous hazards to the farm workers. It has been found that human occupational exposure to pesticides is a significant cause of death worldwide (Joshi, 2002). Josh again suspected exposure to pesticides to have contributed to serious long-term and chronic health hazards (Joshi, 2002). World Health Organisation (2000) estimates indicate that there are at least three million acute, severe cases of pesticide poisonings, and 20,000 unintentional deaths each year related to pesticide use in agriculture worldwide. Rice farmers in Ghana also use a wide variety of agro-chemicals in their crop management processes.

2.3 Safety Behaviour and Safety Performance

Safety behaviour in the workplace was first developed in the 1930s after accident reports revealed that 95% of workplace accidents were caused by unsafe employee acts (Geller, 2001). Evidence in the literature indicates that safety behaviour is influenced by organisational safety climate and safety culture (Clark, 2006; Neal & Griffin, 2006), organisational safety commitment (Zohar, 2002), and personality factors (Hinsz et al., 2007). Indeed, Maurino, Reason, Johnston and Lee (1995) emphasized the importance of organizational influence on individual behaviour in high-risk industries because human-related accidents take place in an organizational context. The rice farm workers in this study all belonged to cooperatives and public irrigation schemes and work as individuals as well as cooperative. For that matter, the safety cultures that prevail at the various irrigation schemes have implications regarding their safety behaviour and safety performance.

Griffin and Neal intimated that work performance theories could provide a useful basis for conceptualizing the link between safety climate and safety behaviour. They therefore differentiated two types of safety behaviour based on Borman and Motowidlo’s (1993) distinction between task and contextual performance. The two-component safety behaviour

(Griffin & Neal, 2000) which was used in this study consists of safety compliance and safety participation.

In high risk industries, safety compliance is a high priority (Neal & Griffin, 2000). This represents or requires that workers follow laid down rules and regulations, wear protective clothing and equipment, avoid risky acts, etc. A number of studies in safety science research observed that safety compliance is generally higher among workers than safety participation (Neal & Griffin, 2006; Neal, Griffin & Hart, 2000; Zacharatos, Berson & Iverson, 2005). Safety compliance requires that workers adhere to safety rules, while safety participation is more of discretionary acts by employees regarding safety. Safety participation has the propensity to boost the safety consciousness of the workforce. Clarke (2006) argued that the two dimensions of safety behaviour important for good safety performance, and this has been demonstrated in the literature.

Wiegmann and Shappell (2003) also classified safety behaviours into two: safety violation and safety error. *Safety violation* refers to wilfully and consciously disregarding approved safety regulations and procedures (Shappell, Detwiler, Holcomb, Hackworth, Boquet & Wiegmann, 2007; Wiegmann & Shappell, 2001; Wiegmann & Shappell, 2003). S*afety error* refers to situations in which an individual‘s activities accidentally failed to accomplish intended outcome (Shappell & Wiegmann, 2000; Wiegmann & Shappell, 2003).

A number of studies explored the role of organisational factors on safety behaviour in various settings and concluded that organisational factors have great influence on workplace safety behaviour. Safety-related behaviour has been found to be a key element in accident prevention because it has direct relationship with safety performance and so deserves close attention (Didla, Mearns & Flin, 2009). It has been noted that organizations function within various cultural beliefs and norms with respect to hazards and their management. Pidgeon (2001) asserts that accident is nearly always associated with disturbance or a breakdown in existing cultural convictions and norms related to risk. This suggests that the nature of safety related values, norms and attitudes would have implications for safety behaviour on the job, which in turn would affect safety outcomes.

Specht, Chevreau and Denis-Remiet (2006) found that a behaviour-oriented approach is important because employee attitudes and behaviours have been found to predict how they identify risks in the workplace. DeJoy, Bryan, Wilson, Vandenberg and Butts (2004) indicated increasing focus on improving compliance behaviour in terms of following safety rules and regulations. However, other safety researchers realized that compliance alone was not enough to prevent accidents and other negative work outcomes; workers need to be proactive and involved in the management of workplace safety. These proactive safety behaviours became known as safety participation which includes acts such as helping co-workers, promoting safety programmes, demonstrating initiative, suggesting changes for improving safety. Safety participation is also referred to in the literature as safety citizenship behaviours (SCBs) (Hofmann, Morgeson & Gerras, 2003). Safety behaviour has consistently been found to be the immediate antecedent of safety performance. For instance, Neal and Griffin (2000; 2006) and (Curcuruto, Conchie, Mariani & Violante, 2015) found that when workers actively engage in safety participation and compliance, safety performance is improved (reduced rate of accidents and injuries).

2.4 Relationships between Safety Culture, Safety Behaviour and Safety Performance

The health, both physical and psychological, of employees is of crucial importance and it is imperative that organizational and individual factors that have bearing on the rate of accidents and injuries or the health of employees are rigorously investigated and brought to the fore. Conclusions of the Chernobyl investigation and subsequent research findings brought to the fore that the quality of safety culture at a work place has a causal relationship with the safety-related behaviour of employees (Mearns, Whitaker & Flin, 2003; Zohar, 2010).

Extant literature suggests that there is a link between safety culture and safety behaviour/performance (Griffin & Neal, 2000; Guldenmund, 2000; Nahrgang, Morgeson & Hofmann, 2011; Silva et al., 2004). Helmreich and Merritt (2001) assert that the safety culture of an organization shapes the beliefs, values, and behaviours of the workforce regarding safety because “it creates advantages or disadvantages based on the message it gives to group members” (p. 27). Safety culture, as a sub-facet of organisational culture, is said to have influence on the attitudes and behaviours of workers an organization in relation to their health and behaviour or safety performance. Hay (n.d.) observes that the prevailing health and safety culture within an organization has great effect on the health and safety related behaviour of the workforce. He noted further that the development of a positive safety culture is very important if high standards of health and safety are to be achieved and maintained.

As afore-mentioned, some researchers use safety related behaviour sample to measure safety performance, whereas other researchers use safety outcome measures (such as number of injuries, near-misses etc). This is as a result of conceptual ambiguity regarding the two concepts. This study clearly distinguished between the two as safety behaviour is a leading indicator, and safety performance is a lagging indicator. The distinction is necessary because results of investigations involving relationships between safety behaviour or safety culture and safety performance may show variability depending on how the antecedents were measured, the specific safety performance measures used, and whether antecedents were compared to concurrent or future safety performance. For instance, Morrow et al's (2014) did not find significant correlated relationship between safety culture and safety performance when performance was measured using industrial safety accident rate. However, the relationships between safety culture and safety performance were more consistent and stronger when safety performance was measured at the same time than when it was measured one year after the measurement of safety culture. Mearns et al. (2003) also had similar results in their study that investigated the relationship between safety climate and safety performance in offshore environments. The difference in results was attributed to the fact that accident rates may be few and do not capture the frequency of minor or micro incidents, such as near misses or minor incidents that do not meet accident reporting requirements (Zohar, 2000). Notwithstanding this, the rate of accident tends to be the most commonly used independent measures of safety performance.

Safety related behaviour sample is referred to as safety behaviour in many studies and considered to be the immediate antecedent of safety performance (as used in this study). Consistent with the conceptualization employed in this study, Jiang, Yu, Li and Li (2010) separated safety behaviour and safety performance and examined safety climate as an antecedent of safety behaviour (safety compliance and safety participation), as well as safety performance (injuries and near misses). The results indicated that there is a positive relationship between safety climate and safety behaviour. It was also found that both safety compliance and participation were positively related to safety performance. Reason (1997; 2000) asserts that organizations with poor safety culture encourage non-compliance to safe work procedures and practices which results safety violations because the unspoken attitudes and beliefs mean that production and commercial goals are perceived to have priority over safety.

Lu and Tsai (2011) examined the perceptions of seafarers in a container shipping context regarding safety climate and its effects on safety behaviours and found a positive association between safety climate and their safety behaviour. Lu and Tsai's findings support that of Clarke (2006) who found a positive safety climate has a positive effect on both components of safety behaviour of employee (safety compliance and participation). Thus, consistently, safety culture or climate has been found to be very important in the safety behaviour of workers. The nature of safety climate determines what employees do regarding health and safety. In support of the positive effect of safety culture on safety behaviour, Curcuruto, Guglielmi and Mariani (2013) indicated that team safety climate influenced proactive behaviours by increasing proactive orientation, but influenced prosocial behaviours by increasing affective commitment. In a cross-sectional survey among multinational gold mining companies in Ghana investigating the influence of safety climate on safety performance, Ismail, Asumeng and Nyarko (2015) found that safety climate had a positive relationship with safety performance. In Ismail et al's study, safety performance was conceptualized and measured using the two component safety behaviour measure of safety compliance and safety participation (which is termed safety behaviour in this study). In other words, their study actually examined the relationship between safety climate and safety behaviour.

Griffin and Neal (2000) argued that perceived safety climate is an antecedent of safety behaviour and safety culture has been found to have a significant and positive influence on organizational safety performance (Cooper, 2000; Williams, 2003). Neal and Griffin's (2004) again found safety culture to have positively influenced safety behaviour of workers because safety culture acts as a frame of reference that provides clues about the ultimate importance of safety at their workplace. In a study of railway workers in the US, Little (2011) also had a result supporting that safety culture is positively and significantly related to safety performance, such that with a mature safety culture, safety performance was improved. Zohar (2010) also agrees with this and adds that it is within the frame of reference that employees receive, interpret and make sense of signals from a complex net of different sources (e.g. colleagues, policies, rules, practices) about expected behaviours that are supported and rewarded. According to Zohar, safety culture is important for employees' *motivation* to act in accordance with safety rules and procedures. It is also important for workers' *knowledge* about risk and safety, and in combination *safety motivation* and *safety knowledge* is believed to constitute the causal mechanism between safety climate and safety compliance (Neal & Griffin, 2004).

The way employees perceive safety at work is influenced by the preveailing safety culture of the organization. The safety culture in turn influences the attitudes of the workers toward safety, perceived norms for working safely, and perceptions of control over safe working behaviours (Morrow, Koves, Valerie & Barnes, 2014). Consistently working without following safety protocol brings about negative organizational safety culture which leads to poor safety performance (Agnew & Daniels, 2010; Arboleda, Morrow, Crum & Shelley, 2003; Cole, Stevens-Adams & Wenner, 2013; Harvey, Bolam, Gregrory & Erdos, 2001). The negative safety culture created then becomes the norm at the workplace and workers feel comfortable or see nothing wrong with those negative behaviours.

On the other hand, working in strong positive safety culture settings makes workers more likely to have positive attitudes toward safety procedures. The workers ultimately accept that working in a safe manner is the accepted norm and that safe work practices are prioritizes over other job demands (Zohar, 2011). Thus, the quality of the prevailing safety culture is an important determinant of how employees behave regarding their safety at the workplace. The organizational safety culture provides the contextual cues that the employee uses to determine whether to behave in a safe or unsafe manner while performing work.

A higher rating of safety climate has been found to be related to better safety performance (lower accident rate) in a cross-sectional study by Gadd (2002). The literature thus, suggests that safety climate has direct relationship with both safety behaviour and safety performance, as well as an indirect relation with safety performance through safety behaviour. Sawacha, Naoum and Fong (1999) categorized respondents into high, moderate and low performing groups based on the number of injuries they had experienced as a measure of safety performance and found higher level of safety performance to be linked to top management's attitudes to safety, individual concerns for personal safety and a tidy , well planned workplace.

In summary, the literature indicates that safety culture has both direct and indirect link with safety performance, and a positive safety culture has been found to have promoted safety performance in all forms of organizations.

2.5 Effects of Dimensions of Safety Culture on Safety Behaviour/Safety Performance

The various dimensions or components of safety culture have been found to have different effects on the components of safety behaviour and safety performance. In view of that, the components considered in this study were looked at in relation to their effect on safety behaviour and safety performance. There are some components of safety culture that emerge in most safety science research. Some of them are considered below, in relation to their effect or relationship with safety behaviour and safety performance.

Management safety priority is one of the themes that emerged in most safety science research and considered very essential predictor of safety behaviour and safety performance. Management priority for safety depicts the priority management give to safety and health of employees (Bronkhorst, 2015; Idris et. al, 2012). Another important component is management commitment to safety at the workplace which involves quick and decisive action by managers to correct problems or issues that affect employees' health and safety (Dollard & Bakker, 2010; Dollard, 2011). Management support and commitment are demonstrated though how employees are involved and the importance and how quickly they deal with safety concerns workers raise. Management's commitment to safety has been found to be very essential component of safety culture that helps to promote safety performance and healthy work environment (Cooper, 2000; Rundmo & Hale, 2003; Yule, Flin & Murdy, 2007; Zohar, 2000). Employees' perception of the attitude and commitment of their management toward safety has been found to be the most important component of organizations safety climate (Fogarty & Shaw, 2009; Hall, 2006; Seo et al., 2004; Zohar, 1980) that predicts safety behaviour and safety performance. The behaviour of supervisors can also show their commitment to safety through the prioritization of safety over other organizational goals (Flin & Yule, 2004; Rundmo & Hale, 2003). Supervisors' commitment to safety is important in promoting safety performance (Mearns et al., 2003) because supervisors are those who are in direct contact with the workers (Barling, Loughlin & Kelloway, 2002; Zohar & Luria, 2003).

Safety communication is another crucial element of safety culture that has been found to predict safety behaviour and safety performance. This dimension consists of the extent to which management communicates with employees regarding health and safety issues, and brings these to their attention. It also bothers on how contributions employees make in relation to health and safety concerns are treated. This reflects the policies, practices, and procedures that enable a two-way communication process to occur to discuss, resolve and prevent workplace health and safety issues (Jordan, Arden, Doherty, Bannwarth, Bijlsma, Dieppe & Lohmander, 2003). Vinodkumar and Bhasi (2010) indicated that the quality of the communication and interactions that ensues between employees and their supervisors has immense contribution in ensuring that safety performance is not compromised at the workplace. It is imperative that there is regular open communication concerning safety issues between managers, supervisors and employees is an effective practice for improving safety in the workplace. For organizations to foster a climate where employees are alert to hazards, they must provide and communicate risk and safety information freely without fear (Fernandez-Muniz, Montes-Peon & Vazquez-Ordas, 2007). Open communication gives employees a sense of psychological safety which enables them to discuss safety issues with their supervisors (Cigularov, Chen & Rosecrance, 2010) which leads to improved safety behaviour and safety performance. Several study demonstrated that safety communication is an important predictor of safety behaviour (Ishmail, Asumeng & Nyarko, 2015; Griffin & Neal, 2000; Parker, Axtell & Turner, 2001), safety knowledge (Griffin & Neal, 2000).

Safety training is another common and widely used dimension of safety culture in the literature and used in this study. This involves providing knowledge of safety to the workforce to enable carryout their work safely and ensure their wellbeing (Law, Chan & Pun, 2006). When workers are given the relevant safety information they become competent in the discharge of their work and dealing with safety issues at their workplace (Law et al., 2006). Huang, Ho, Smith and Chen (2006) found a positive relationship between safety training and safety performance. While Lin and Mills (2001) are of the view that safety training clear policy declaration has enormous implications for safety performance. Lu and Yang (2011) and Zohar (2010) also hold that effective safety training for all categories of workers leads to improved safety performance at workplace.

In the formal system, safety reporting systems that are effective are very crucial in the management of safety at the workplace. According to Adjekum, Keller, Walala, Young, Christensen, DeMik and Northam (2015) the quality of the safety reporting system is essential for ensuring safety at the workplace. A reporting system that is confidential and non-antagonistic is essential to encourage safety reporting behaviour of employees, which would enable remedial measures to be taken to promote safety. Although this study was conducted in the informal sector, all the rice irrigation schemes used in the study have Scheme Managers and extension officers, in addition to their Cooperative leaders who help in the management and operation of the schemes. In this regard, the safety reporting dimension was deemed important in this study.

The safety norms, safety rules, policies and procedures put in place by an organisation to ensure safe work environment have also been found to be important predictors of safety behaviour and safety performance (Bronkhorst, 2015; Idris et. al, 2012; Hall, Dollard, Winefield, Dormann & Bakker, 2013). The safety norms dimension was included in this study. Safety norms represent perceived social pressures in the workplace (Helmreich & Merritt, 2001; Hall, 2006) and generally acknowledged ways of performing particular tasks (Baron, 2008; Fogarty & Shaw, 2009). Extant literature has shown that established safety systems significantly influence safety behaviours or workers (Barling et al., 2002; Bronkhorst, 2015; Hall et. al., 2013; Idris et. al., 2012; Ismail et. al., 2015; Lu & Tsai 2011; Lu & Yang, 2010). The way work colleagues go about their duties and their beliefs have the propensity to influence the attitude and behaviour of individuals in the work group (Fogarty & Shaw, 2009). The understanding that individuals have regarding organisational processes and procedures are influenced by theinteractions they have with other work group members (Uryan, 2010).

2.6 Relationship between Safety Behaviour and Safety Performance

An organization's safety performance can be measured by tangible events, such as the frequency of injuries, accidents or near-misses. As indicated above, these outcomes are entirely different from individual safety behaviours, which are acts that precede performance outcomes in time and may contribute to their occurrence (Christian et al., 2009).

Literature indicates that employee involvement in safety management, employee responses and behaviour can help improve safety performance at the workplace (Erickson, 2000; Grindle, Dickinson & Boettcher, 2000; Little, 2011). Improved safety behaviour has been found to have reduced the frequency of work related accident and injuries, and also often lead to quality of actual job performance (Vredenburgh, 2002). Safety behaviour was found to have a positive effect on self-reported safety performance in a research involving railway workers (Little, 2011). Little observed that when railway workers complied with laid down safety measure and actively involved themselves in the safety management systems, the incidences of accidents and injuries were reduced. Neal and Griffin (2006) in a study of the lagged relationships among safety climate, safety motivation, safety behaviour, and accidents at the individual and group levels in which measures were taken at two points in time and linked results to prior and subsequent levels of accidents over a 5-year period found that changes in self-reported safety behaviour were associated with a subsequent reduction in accidents. Garavan and Obrien (2001) also found unsafe acts or behaviours to be a major causal factor in workplace accident/injures. In Little's study with rail workers, the results showed a significant and positive relationship between safety behaviour and safety performance. In addition, both safety compliance and participation had significant positive effects on safety performance.

There is a direct relationship between employees' engagement in unsafe behaviours and the probability of an adverse consequence occurring. The reason is that every unsafe act creates weakens the defense and barriers of the organisation as in Reason's (1997) Swiss Cheese Model. The aggregated behaviours of the workers then determine the overall performance of the organization. When an organisation creates a weak or negative safety culture, the workers come to believe that it is acceptable to violate safety procedures and this invariably affects the safety behaviour safety performance of the organisation over time (Morrow, Koves & Barnes, 2014). Thus, a weak or strong safety culture could emerge in an organization, depending on the behaviours that are accepted and directly or indirectly promoted in the organization.

Evidence suggests that specific safety behaviours have a differential influence on safety performance outcomes. Researchers and practitioners alike intimated that, even though compliance with safety rules and regulations at the workplace helps to reduce the risk of accidents, in order to achieve high safety levels, mere compliance is not sufficient (Neal & Griffin, 2000; Little, 2011). Organizations need individuals who are also proactive in participating and initiating improvements in safety. When employees fail to comply with safety procedures or to participate in activities that enhance safety at the workplace, the person who was negligent in these behaviours may not be directly affected but can create the conditions that make it more likely that someone else would be injured later on (Neal & Griffin, 2006).

2.7 Safety behaviour as a mediator of the relationship between safety culture and safety performance

Safety climate has been found to be a predictor of accidents in several studies as indicated above (e.g. Zohar, 2000). However, Neal and Griffin (2004) postulates that the relationship between safety culture and safety performance (e.g. accidents) is mediated by safety behaviour. Thus, safety culture directly determines how people behave regarding safety, and those behaviours have consequences on safety performance. Neal and Griffin argued that if both safety culture and safety behaviour are in the model the effect of safety behaviour should be expected to be stronger than the effects of safety culture on safety performance. In their 2006 study that spans over a five-year period, focusing on the causal chain linking safety climate to safety performance, through safety behaviour, Neal and Griffin found both safety culture and safety behaviours to be significant predictors of safety performance in one year, but safety climate did not predict accident rates in the following year. They explained that this is due to the fact that safety climate is a distal predictor of safety performance, whereas safety behaviour is a more proximal predictor. Thus, safety culture has a stronger link with safety behaviour than with safety performance, and safety behaviour tends to be the immediate determinant of safety performance. In this study, safety behaviour has accordingly been postulated to mediate the relationship between safety culture and safety performance.

2.8 Religiosity and safety behaviour/safety performance

There is dearth of Social Science research on the influence of religiosity in the business environment, organizational condition as well as the economic performance (Manaf, Osman, Abdullah, & Latif, 2014). The situation is not different in Ghana. Not much has been done regarding religiosity and workplace behaviour in the Ghanaian context. Meanwhile, studies conducted in other jurisdictions suggest that religiosity has enormous influence on individual's behaviour in general and also at work.

Literature indicates that religious belief is a powerful force in society (Abdel-Khalek, 2010; McCullough & Willoughboy, 2009) and that religious values and beliefs influence the behaviour of individuals through its influence on culture and society (Mokhlis, 2009). People take their religious beliefs with them to their work place (Kutcher, et al., 2010), and religiosity has been found to be influential in the workplace attitudes and behaviour of employees.

Kutcher et al. (2010) stated employers cannot realistically expect employees to '*leave religion at the door*' when they come to work, because religious belief is an important aspect of the lives of many people, especially, the African. A number of studies have explored the effects that religiosity has on the lives and behaviour of people, both at work and in their daily lives. Strong positive correlations have been discovered between employees' religiosity and organisational citizenship behaviour (Asamani & Opoku Mensah, 2016; Ivy, 2014; McGhee & Grant, 2008), their job attitudes such as commitment, intrinsic satisfaction and involvement (Kutcher et al., 2010; Milliman, Czaplewski & Ferguson, 2003; Sikorsa-Simmons, 2005), ethical decision-making in organizations (Fernando & Jackson, 2006; Weaver & Agle, 2002), reduction in absenteeism and turnover (Fry, 2003, 2005). Workplace religiosity was also found to have made individuals to be more honest, courageous and compassionate (Bento, 1994) which have implications for their work behaviour and attitudes. Krishnakumar and Neck (2002) also indicated that when religiosity or spirituality is encouraged at work, it could engender creativity, honesty, personal fulfilment and commitment and a climate of trust.

Smith, Organ and Near (1983) conceptualized organizational citizenship behaviours into generalized compliance such as engaging in discretionary acts that are expected of a good employee, and altruism such as being helpful and kind to work colleagues. Smith et al.'s two components of OCB are similar to the two component safety behaviour dimensions explored in this study. Thus, if religiosity has been found to be a significant predictor of employees' OCB, it makes logical sense to explore how it predicts safety behaviour of the rice farmers in Ghana.

Religion regulate human behaviour through institutionalized norms and principles (Roundy, 2009), and various religious affiliations have rules that determine how those who ascribe to that religion should act in given situations (Othman & Hariri, 2012). This definitely has implications for workplace behaviour of employees in various settings. For instance, religiosity predicted the behaviour of individuals at the workplace regarding enhanced teamwork, greater kindness and fairness (McGhee & Grant, 2008) and sensitivity to corporate social performance, and improved performance (Moore & Casper, 2006; Rego & Cunha, 2007).

There is consensus among psychological theorists suggesting that beliefs and behaviours are strongly related (Majohed, 2014), therefore investigations into how religiosity or religious beliefs and safety behaviour are related would be very important in predicting and preventing risky behaviour and accidents. The specific means through which religiosity and spirituality influence the work behaviour and outcomes of employees are still being explored. Spirituality and religiosity at work has been suggested as a belief system that enhances employees' well-being and quality of life, provides employees with a sense of purpose and meaning at work and also a sense of interconnectedness and community (Karakas, 2010).

Some researchers are of the view that there may be ethical challenges and moral issues regarding incorporating spirituality and work attitude and behaviour (Brown, 2003; Cavanagh & Bandsuch, 2002; Fernado, 2005). Those who support this stance are of the view that religiosity at work should be viewed as an end in itself, but not to be used as a managerial tool for enhancing organisational outcomes (e.g. Cavanagh & Bandsuch, 2002; Fernado, 2005). Other researchers also cautioned on the potential abuse or misuse of spirituality and religiosity at work (Brown, 2003; Cavanagh & Bandsuch, 2002; Fernado, 2005).Contrary view is held by researcher like Ashmos and Duchon (2000), Garcia-Zamor (2003) and Fry, 2005) who are of the view that spirituality at work could be used to improve workplace behaviour and organisational outcomes. Research suggests that organisations that encourage spirituality or religious experiences at work improve their performance and profitability (Bierly, Kessler & Christensen, 2000; Korac-Kakabadse, Kouzmin & Kakabadse, 2000; Thompson, 2000). The foregoing discussion suggests that a positive relationship between religiosity and safety behaviour is expected, since safety behaviour is an aspect of the overall workplace behaviour.

2.9 Demographic Variables, Safety Behaviour and Safety Performance

A number of researches observed subgroup differences in risk perceptions and safety outcomes, such as differences between males and females, between supervisors and line workers (e.g., Weyman & Clarke, 2003) and in same occupation (Perez-Floriano, 2001). Every work group has many subcultures which are shaped by the status, work experience, age, educational level, and other demographic factors of employees (Helmreich & Merritt, 2001). The safety culture and safety behaviour literature suggests that, generally accepted personal and occupational attributes influence these variables and are frequently used as control variables. Socio-demographic factors of employees and their potential effects on safety performance have been investigated by a number of researchers (Cooper & Phillips, 2004; Dejoy, Schaffer, Wilson, Vandenbert & Butts, 2004; Hadjimanolis, Boustras, Economides, Yiannaki & Nicolaides, 2015; Nahrgang, Morgeson & Hofmann, 2011).

The present study investigated the effects of four demographic variables on the main variables in the study: sex, age, educational levels and years of experience in rice farming. There have been mixed results regarding effects of demographic variable in the health and safety literature. For instance, while some studies found significant relationship between age and safety outcomes, others reported non-significant relationships. Age of employees has been found to have an indirect effect on safety outcomes (Hansen, 1989) and negatively associated with safety performance. Dejoy et al. (2004) also concluded that a positive association between age and safety climate exits, and also between age and safety perception at work, while Hadjimanolis et al. (2015) found a non-significant negative relationship between age and safety conditionsperception in the workplace. Siu, Phillips and Leung (2003) also reported a non-significant relationship between accident rates and age, while a curvilinear relationship was observed safety performanceand age. Given that the relationships observed between age and safety outcomes have not been consistent, a non-directional proposition has been mad in this study.

The direction regarding sex and work-related accidents and illness is not consistent in the literature. Leigh (1986) reported a significant relationship between gender and accidents, with males having a higher likelihood than females. Taiwo, Cantley, Slade, Pollack, Vegso, Fiellin and Cullen (2009) howver found a sex difference in occupational injury with female workers at higher risk compared with their male counterparts in a heavy manufacturing environment. Health and Safety Authority (HSA: 2015) also indicated that Women experienced a higher illness rate than men in 2013, with the rate of females being 34 per 1,000 female workers, compared to 25 per 1,000 male workers. This trend was observed in 2011 as well and trend analysis for the period 2008 to 2012 saw more women to be more likely to experience work-related illness than men. However, there was no significant difference between males and females for the period 2001 to 2007. Sex was therefore postulated in this study to relate with safety behaviour and safety performance, but the direction was not clear.

2.10 Summary and Critique of Literature Review

The chapter presents the theoretical framework that underpins the study. Two main theories: the socio-cultural subsystem and cooper's reciprocal safety culture models were utilized in this study. Review of pertinent literature regarding the variables in the study is also presented. The study investigated religiosity, hazards exposure and safety culture as predictors of safety behaviour and safety performance of rice farmers in Ghana.

The review suggests that there is no common definition and assessment methodology of safety culture. This lack of shared conceptualization is compounded given that safety culture construct is confounded by research on safety climate. The safety climate concept is used interchangeably with safety culture in some cases and in other cases is conceptualized as a distinct construct. Safety climate reflects the prevailing surface features of safety culture which can be observed from the employees' attitudes and perceptions (Flin et al., 2000). Definitions of safety culture in the literature tend to reflect the view that safety culture is something that an organization *is* rather than something that an organization *has*.

Despite the lack of consensus on the conceptualization and the lack of theoretical underpinnings for the construct, there is generally agreement that a positive safety culture is something to which every organization should aspire, and that a negative safety culture may be associated with undesirable safety outcomes.Again, regarding the measurement of safety culture, there is no consistency among the measures used in researches of the two concepts, safety climate or safety culture. Given that researchers conceptualize the terms differently there are also varied measures and dimensions of these concepts. Survey instruments that claim to be measuring safety culture or safety climate are very similar in terms of what dimensions they choose to focus on, and safety climate scales have been used extensively to measure safety culture.

Just like safety culture and safety climate, the safety behaviour and safety performance constructs have also been defined differently in the literature because of the variations involved in their measurement. Behaviour samples are used in by some researchers to measure safety performance, while other researchers used reported accidents and incidents to measure performance. Safety behaviour is also conceptualized by some researchers as a component of safety performance. This study clearly distinguished between safety behaviour and safety performance. Safety behaviour is defined in this study as behaviour that supports safety practices and activities according to occupational, safety and health requirements to avoid workplace accidents. It is conceptualized as a two component construct consisting of safety compliance and safety participation. Safety performance, however, has been operationalized as the number of reported health and safety incidents/accidents that occur within a given period of time. It was argued in this study that safety performance is an outcome measure of safety incidents at the workplace within a given period, and must be clearly distinguished from behaviours that precede those incidents.

The literature also indicated that the quality of the safety behaviour subsequently influences the rate of accidents and work-related health problems (safety performance). However, the conceptual inconsistencies in the delineation of the two concepts make it difficult to have any firm conclusion. Furthermore, safety culture has a stronger link with safety behaviour than with safety performance, and safety behaviour tends to be the immediate determinant of safety performance, which underscores the need to clearly distinguish safety behaviour and safety performance. Consequently, safety behaviour has been conceptualized as a moderator of the link between safety culture and safety performance.

Religiosity conceptualisation and measurement also have challenges in the scientific literature. A number of researchers maintained that there is a distinction between religiosity and spirituality, while others are of the view that the two could be used interchangeably. Another group of researchers also feels religiosity is a subset of spirituality. It is possible that spirituality may or may not involve religion, and spirituality could be exhibited within or without a religious context. However, the literature indicates that contemporary views favour distinguishing the two concepts, yet acknowledged that they are closely related. In this study, it was argued that religiosity and spirituality cannot be separated in the Ghanaian context as indicated by (Gyekye, 1996). Religiosity was therefore measured with a multidimensional scale with spiritual dimensions (religious experience and private practice of religion).

Meanwhile, literature indicates that religious belief is a powerful force in society, and strong positive correlations have been discovered between employees' religiosity and organisational citizenship behaviour. This study therefore explored the link between religiosity and safety behaviour, since safety behaviour is part of the general organizational behaviour.

2.10.1 Gaps identified and implications for this Study

The review revealed four main gaps in the literature which were the focus of this study. The first is that safety science research in the informal sector, especially, production agriculture, was lacking as there were limited studies in the literature. Most of the researches on safety behaviour, safety culture and safety performance focused on the formal sectors, such as mining, construction, aviation etc. Farm workers health and safety is lacking or non-existent in the organisational psychology and safety science literature.

There was also inappropriate measurement of religiosity and also a dearth of relationship of religiosity and safety outcomes in safety science research. Considering that the African or the Ghanaian is deeply religious and does virtually everything religiously, and also having established that religiosity influences the work behaviour of individuals, it is important that its influence on the safety behaviour of workers be investigated. One study seen in the literature that attempted to investigate religiosity and mines workers health and safety in Ghana by Gyekye (2004) merely measured religious affiliations, rather than religiosity. This study therefore incorporated religiosity into the study model as a person variable.

It was also observed that there was no evidence of appropriate measurement scale for assessing the extent of hazards exposure and safety performance in production agriculture, and specifically, rice farming. This study developed a hazards exposure scale with the qualitative study findings and validated in the quantitative study. The incident rate reporting scale (Barling, Loughlin & Kolloway, 2002) which has been used widely was also adapted for use in this study because it was not appropriate for the rice farm research.

Methodologically and conceptually, investigations of the mediation and moderation roles of safety behaviour in the effect of personal, contextual and organisation variables on safety performance were limited, largely because of the conceptual and measurement confusion in the literature regarding safety behaviour and safety performance. This study emphasized the need to distinguish the two concepts in safety science research and tested the mediation and moderation roles of safety behaviour and safety culture, using structural equation modelling. Also, most studies in safety science used only quantitative surveys in their investigations. Data analytical limitation could also account for limited researches that tested intervening effects in most of the researches. Largely, first generation statistical analytical tool such as correlations and regressions were used in the analyses to just test direct relationships. Such analytical tools are limited in testing comprehensively simultaneous direct and indirect effects. This study employed the sequential exploratory mixed methods approach which strengthened the findings of the study and used Partial Least Squares Structural Equation Modelling (PLS-SEM) in the quantitative analysis. The rationale of the study therefore was to address these gaps and provide informed information to improve health and safety of rice and other farm workers in Ghana and other places.

2.11 Conceptual Framework of the Study

Based on the theoretical framework, the objectives of the study and the review of related literature, the following conceptual framework was developed to be explored in this study. The rate of occupational accident, incidents and work related health concerns (safety performance) is predicted by a number of variables, key among them is safety behaviour. This study involved three multidimensional exogenous (independent variables), one endogenous variable, and a mediating variable. Religiosity, hazards exposure and safety culture were the exogenous variables explored as direct predictors of rice farmers' safety behaviour. Religiosity in this study was postulated to have direct relationship with safety behaviour, but indirect relationship with safety performance through safety behaviour. Hazards exposure was postulated to have only direct effect on safety performance, but this effect was proposed to be moderated by safety behaviour and safety culture. Safety culture was also postulated to have both direct and indirect relationship with safety performance.

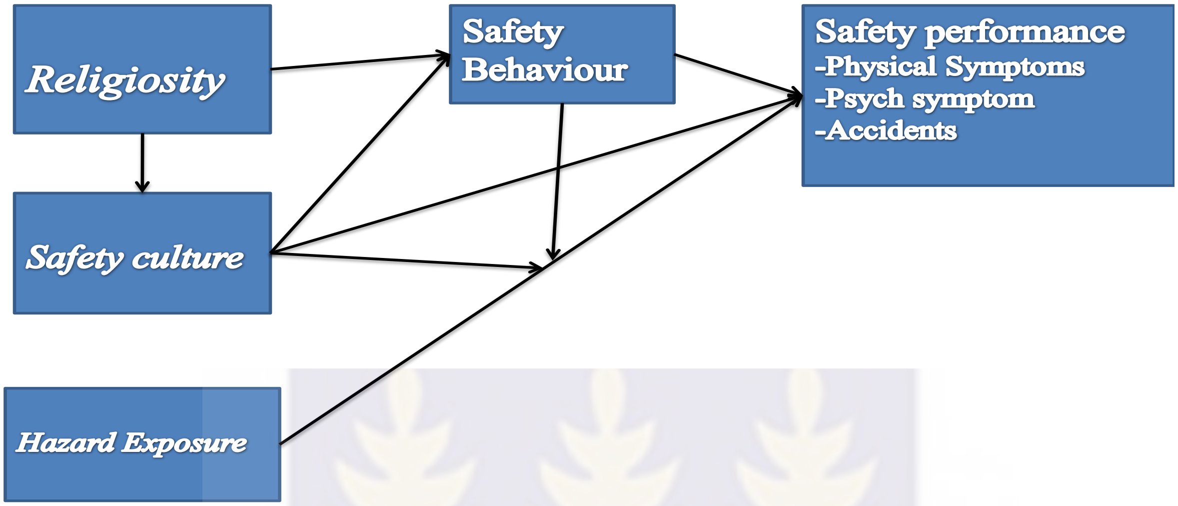

Figure 2: Conceptual Model of the Study

The two component model of safety behaviour (safety compliance and safety participation) by Neal and Griffin (2000) was used in this study. Safety behaviour, just like general organisational behaviour, is influenced by certain antecedents, and safety behaviour in turn directly relate to safety performance. Safety performance is a multidimensional variable consisting of physical symptoms, psychological symptoms and accidents. The effects of the antecedents and the moderating variables as well as the mediating variables on each of the dimensions were explored simultaneously using the structural equation modelling.

2.12 Hypotheses of the Quantitative Study

1. Safety culture will predict (a) safety behaviour and (b) safety performance of rice farmers.
2. Religiosity will predict (a) safety behaviour, and (b) safety culture of rice farmers
3. Hazards exposure will predict safety performance of the rice farmers

4. Safety behaviour will predict safety performance of rice farmer
5. Safety behaviour will mediate the effect of: (a) safety culture, and (b) religiosity on safety performance.
6. The effect of hazards exposure on safety performance will be moderated by (a) Safety behaviour, and (b) Safety culture
7. Safety participation of rice farmers will predict their safety performance more than their safety compliance.
8. The age of rice farmers will directly predict their (a) safety culture, (b) religiosity (c) safety behaviour and (d) safety performance
9. The years of rice farming experience of the rice farmers will directly predict their (a) safety culture (b) safety behaviour and (c) safety performance.

2.13Operational Definition of Terms

1. ***Safety culture****:* Safety culture in this study refers to the values, attitudes and behaviours of individual rice farmers and those collectively held by members of a given rice irrigation scheme with regard to rice farming health and safety.
2. ***Safety performance*** is conceptualized in this study as the rate of health and safety incidents/ accidents that rice farmers suffered in their farming activities. This is an outcome measure of health and safety incidents, including farm accidents, injuries, near misses, work-related ill-health and psychological health symptoms that the farmers suffered.
3. ***Safety behaviour*** represents actions of rice farmers that support or help to promote their safety and health and to avoid farm accidents and health challenges arising out of their

work, such as wearing of personal protective equipment or getting involved in promoting safe working practices in the farms.

4. ***Hazards*** represent features, agents, plant, animals or aspects of the rice farming environment, processes and activities that have the potential to cause harm or discomfort to the farmers.

CHAPTER THREE

GENERAL RESEARCH METHODOLOGY

Chapter Overview

Research methodology has to do with *how* the research is conducted. This may be conceived of in terms of the research philosophy ascribed to, the research strategy employed and the research instruments utilized, and/or developed for the study. The purpose of scientific research process is to transform things *believed* into things *known* (Galliers, 1991). This chapter presents the methodological approach for both the qualitative and the quantitative phases of the thesis. The research philosophical foundation for the mixed methods design employed in the study, detailed description of the research design, the research instruments and their psychometric properties, the population, sample and sampling procedure adopted, and the data collection and analysis procedures utilized in the study in pursuit of the research objectives are also presented. Finally, the rationale for any methodological approach was provided at the appropriate stages.

3.1 Philosophical Basis of the Study

The research approach that is adopted by a researcher is driven largely by philosophical assumptions of the researcher (Brannen, 2005). This study adopted the Pragmatists philosophy of Science because of the nature of the study. Investigation of hazards exposure, religiosity and safety culture and their influence on safety behaviour and performance requires a blend of approaches. The sequential exploratory mixed methods design was used for the study. This involves first conducting qualitative study to help shape the quantitative phase of the thesis. The pragmatist philosophy of science indicates that "...the mandate of science is not to find truth or reality; the existence of which are perpetually in dispute, but to facilitate human problem-solving" (Powell, 2001, p. 884). The pragmatist approach is considered to be the appropriate philosophy for this study because the pragmatic perspective emphasized on researchers employing *what works*, using diverse approaches, giving primacy to the importance of the research problem and question, and valuing both objective and subjective knowledge (Morgan, 2007). This made it convenient for the mixed methods design to be used in the study.

According to Brannen, the paradigmatic position asserts that research questions should be guided by epistemological stance of the researcher. In determining the approach for the study of antecedents of occupational health and safety behaviour of rice farmers, the philosophical assumptions and their ontological and epistemological positions guided the decision. Smith, as cited in Yaro (2001) explained the ontology of science right from the Baconian objective scientific approaches to the subjective and post-modernist era. Smith argued that scientific knowledge largely emerged from sense data which constitutes people's experience followed by the establishment of causal relationships.

The philosophical assumptions that social science research rely on stand on four main assumptions (Hewege & Perera, 2013). These are the ontology, epistemology, human nature and methodology. Thus, the researcher's view of ontology affects his/her epistemological persuasion which, in turn, affects his/her view of human nature, and consequently, the choice of methodology logically follows from the assumptions the researcher has already made (Holden & Lynch, 2004). Ontology relates to the researcher's basic assumption about the nature of reality in the world, and this determines other assumptions. Researchers might have different assumptions about the form and nature of reality (Arbnor & Bjerke, in Hewege & Perera, 2013). It was my view that the issues of hazards exposure and safety incidents among the rice farmers really exist and that choosing the right research approaches would help to find out the antecedents of those incidents.

The second assumption, epistemology, concerns the study of the nature of knowledge. That is, *how is it possible*, if it is, for us to gain knowledge of the world? Epistemology (*what is known to be true*), as opposed to doxology (*what is believed to be true*) encompasses the various philosophies of research approaches and it is concerned with the nature, validity, and limits of inquiry (Rosenau, 1992). The third assumption, concerning human nature, involves whether or not the researcher perceives "man" as the controller or as the controlled (Burrell & Morgan, 1979). And finally, methodology represents the approaches a researcher employs to investigate phenomena of interest.

There are two important contrasting philosophical views that are applied to varying extents by social scientists. These are the philosophies of positivism and subjectivism (Evely, Fazey, Pinard & Lambin, 2008) with varying philosophical positions between them. The objectivist approach to social science research was developed from the natural sciences and forms the basis for quantitative research. Social science researchers decided to employ the generally successful methods of the natural sciences to investigate social science phenomena (Holden & Lynch, 2004). However, subjectivism emerged as a result of critiques of positivists methodological approaches. The philosophies of subjectivism and positivism differ in their perspective of what constitutes social reality (Dyson & Brown 2006; Morgan & Smircich, 1980).

The philosophical view points between the two extremes seem to have a blend of the positivism-subjectivism stances in varied degrees. This made it possible for the subjective views of the rice farmers from the qualitative study to be blended with the cross-sectional survey in this study. Considering the positions and assumptions of the various philosophies of science, the pragmatic philosophy was the most appropriate for this study.

3.2 Research Design

Research designs are procedures for collecting, analyzing, interpreting, and reporting data in research studies which guide the methods decision that researchers must make during their studies and set the logic by which they make interpretations at the end of their studies (Morse & Niehaus, 2009). The design refers to the overall structure or plan of the study (Singleton & Straits, 2010). Szapkiw (2012) also indicated that research design guides decisions that the researcher needs to make about how to go about research.

The sequential exploratory mixed methods design was used in this study. A mixed methods research design is a procedure for collecting, analyzing, and *mixing* both quantitative and qualitative research methods in a single study to understand a research problem (Creswell, 2012). Creswell and Plano Clark (2007) define mixed methods as follows:

> *Mixed methods research is a research design with philosophical assumptions as well as methods of inquiry. As a methodology, it involves philosophical assumptions that guide the direction of the collection and analysis of data and the mixture of qualitative and quantitative data in a single study or series of studies. Its central premise is that the use of quantitative and qualitative approaches in combination provides a better understanding of research problems than either approach alone* (p.5).

Mixed methods designs may be fixed and/or emergent (Morse & Niehaus, 2009). The researcher predetermines and plans at the start of the research process the use of quantitative and qualitative methods and the procedures are implemented as planned in the fixed mixed methods designs. On the other hand, the emergent mixed methods designs occur when the use of mixed methods is adopted or emerges as a result of issues that come out during the process of an ongoing research. According to Morse and Niehaus (2009) the emergent mixed methods designs generally occur when a second approach (quantitative or qualitative) is deemed necessary and added after the study is underway because one method is found to be inadequate.

Thus, the fixed exploratory sequential mixed methods design was the approach employed in this study. This was deemed appropriate because the researcher had predetermined and planned to use the qualitative study to explore the hazards in rice farming and use the findings to adapt the research instruments to be used in the quantitative study.

3.2.1 Justification for the mixed methods design

The objectives of the entire study were such that one methodological approach would not yield adequate and comprehensive outcome. The study investigated the hazards that rice farmers in Ghana are exposed to and used that findings to develop hazards exposure scale that was used in the quantitative study. The effects of religiosity, hazards exposure and safety culture on safety behaviour and safety performance were also tested. The mixed methods design was used in this study becomes necessary because the researcher was of the view that the use of both quantitative and qualitative data together would provide a better understanding of the research problem than only one approach as indicated by Creswell (2008). The use of only one approach could not have adequately addressed the research problem or answer the research questions of interest in this study.

The quantitative and qualitative researches answered different research questions and this made it imperative to employ the mixed methods design. In this study, the exploration of the common hazards and major health and safety incidents in rice farming in Ghana were done with the qualitative, whereas the testing of the influence of hazards exposure, safety culture and religiosity on the safety behaviour and safety performance of the rice farmers was achieved through the use of the quantitative approach. This makes the use of the mixed methods design beneficial in bringing about a complete and comprehensive appreciation of the health and safety situation of the rice farmers. The use of the mixed methods design also provided contextual understanding and externally valid findings and also enhanced the credibility or integrity of the findings (Bryman, 2006). While the quantitative study focused on the specific antecedents and their operationalisation, the qualitative study provided more emphasis on interpretation and provided more comprehensive views of the health and safety situation in the rice farms, taking the contexts into consideration (Tewksbury, 2009).

3.2.2 Justification for the qualitative study

Qualitative study is exploratory research that is used when it is not clear as to what to expect, how to conceptualize issues or there is lack of understanding of *why* and *how* theaffected populations are impacted by the phenomenon under investigation (ACAPS, 2012). Qualitative research explores a phenomenon from multiple perspectives, including groups and individuals, and generates themes in summaries of narratives rather than numerically.

The prime objective of the qualitative study was used to explore the specific hazards that the rice farmers in Ghana are exposed. This objective could not have been adequately and appropriately achieved with the quantitative method alone. The qualitative study enabled semi-structured interviews to be conducted with the rice farmers to get first hand information from them about their farm experiences. The identified hazards were used to develop hazards exposure scale which was used to assess the extent to which the rice farmers were exposed to various forms of hazards in their farming activities in the quantitative study. According to Creswell (2008) and Bryman (2006), a researcher may employ mixed methods when there is the need to incorporate a qualitative component into an otherwise quantitative study, build from one phase of a study to another and explore qualitatively then develop an instrument to be used in the quantitative phase.Again, the qualitative study was used to explore the major health and safety incidents that the rice farmers experienced. In consonance with Bryman's (2006) suggestion the results of the major hazards obtained from the qualitative study were used to adapt the incident reporting scale that was used to measure safety performance in the quantitative study so that better wording and more comprehensive answers were generated.

3.2.3 Justification for the quantitative study

Quantitative research involves the collection of data that can be analysed numerically and the results presented using statistics, tables and graphs. *The aim of the quantitative research method is to test pre-determined hypotheses and produce generalizable results (*Marshall, 1996). The results of quantitative study can confirm or refute hypotheses about the effects of proposed predictor on a criterion (ACAPS, 2012) using statistical tools. Quantitative research has the advantage of having numerical data that has been collected rigorously, using the standardized research instrument and methods. However, quantitative data does not provide an in depth description of the experience of the respondents (ACAPS, 2012).

The study two, which was a quantitative study, was conducted after the qualitative study to test the extent to which the level of hazards exposure, religiosity and safety culture of rice farmer in Ghana predict their safety performance. This required that a cross-sectional survey be conducted with a representative sample of farmers drawn from three rice irrigation schemes. The hazards exposure scale developed in study one was used in the quantitative study together with other adapted scales. The data for study two was numerically coded and scored which fall within the remit of quantitative study. The testing of extent of prediction requires the use of quantitative statistical analysis and testing of hypotheses. The Partial least squares structural equation modelling was used to test the hypothesized model in the quantitative study.

The qualitative study helped to shape the survey instrument for the quantitative study and the findings from the qualitative and quantitative methods were triangulated to mutually corroborate the findings (Creswell, 2012). The two studies were connected by using the qualitative results to shape the quantitative study through development and adapting, shaping of research variables and/or generating a typology of rice farm hazards (Creswell, 2008; 2012).

3.3 Ethical Considerations

There was an informational sheet that presents the objectives of the study and also assured all participants that there were no risks associated with participating in the study. The level or limits of confidentiality and privacy were also presented and explained in detailed to the participants. In addition, participants were made aware that the results of this study remained confidential and their privacy would be protected at all time including any identifying information and that they had the right to remain anonymous. There was identification with codes only to aid in follow-ups in the qualitative study. The participants in the study were also made aware that the data collected in the study would not be released to anybody beyond those helping (research assistants and supervisors) in the study. And that any information about the study released would be in aggregate without individual identification.

To ensure confidentiality of participants, each was given the questionnaire to be completed on his/her own (with the help of the researcher, if necessary) without being required to write down their names, initials or any sign that could be used for any identification purposes. The participants were also be made to understand that even though the researcher wished that all questions would be answered, they had the right to withdraw from the study at any time without consequence, and they could also refrain from answering any questions or group of questions that they do not want to answer without any consequence.

CHAPTER FOUR

STUDY ONE: QUALITATIVE STUDY

4.1 Chapter Overview

This chapter presents the methodology and results of the qualitative study. The qualitative study explored health and safety hazards that were prevalent and major health and safety incidents in rice farming in Ghana. The hazards identified were used to develop a safety hazards scale that was used in the quantitative study. The safety incidents identified were also used to adapt the safety performance measure (incident reporting rate, Barling, Loughlin, Kelloway, 2002) which was also used in the quantitative study. The incident reporting rate scale is a general health and safety incident reporting scale that is widely used in various setting. However, considering the nature of rice farming, it was deemed inappropriate for the specific context under study.

The prime aim of this study was to identify rice farming hazards and health and safety challenges the farmers encounter in their activities through qualitative approach. There is dearth of information regarding safety hazards and health and safety incidents that rice farmers are exposed to in their activities in Ghana. There was some information in the literature about hazards and injuries in cocoa farming (e.g. Bosompem & Mensah, 2012), but little is known about rice farming health and safety challenges in Ghana. Indeed, Bosompem and Mensah indicated that very little research attention has been given to occupational hazards among cocoa and other farm workers. They noted further that only a few studies investigated hazards associated with the use of agrochemicals, but ignored the hazards associated with other farming activities. I have also observed that rice farming in particular has been neglected, yet rice is one of the most consumed cereals in Ghana. The study therefore explored this to find out the hazards and safety challenges that the rice farmers face.

4.2 Specific objectives

The specific objectives of the qualitative study were to:

1. Identify health and safety hazards to which rice farmers in Ghana are exposed, and use the findings to develop rice farm hazards exposure scale to be used in study two
2. Find out common health and safety incidents that the rice farmers encounter to adapt the incident rate reporting scale (Barling, Loughlin, Kelloway, 2002) for use in the quantitative study.
3. Explore the extent of personal protective equipment/wears usage among the rice farmers

4.3 Qualitative Study Methodological Approach

The line of inquiry in study one involved an exploratory (qualitative) research approach. Robson (2002) indicates that an exploratory study investigates or explores what is happening and seeks new insights through asking questions and assessing phenomena in a new light. Creswell (2007) defines qualitative research as "*a means for exploring and understanding the meaning individuals and groups ascribe to social or human problems*" (p. 5). According to Patton (1990), qualitative research approach enables researchers to get close to the problems throughout the field work and brings their personal understandings and experiences into any recommendations that may emerge from the data collected. The use of qualitative approach made it possible for observations and interviews to be conducted and responses recorded directly without any obstacles from the participants (Hair, Bush & Ortinau, 2000).

4.4 Qualitative Study Sample and Sampling Procedure

The sample for study one consisted of key informants from the selected rice irrigation schemes. Given that different levels of an organisational hierarchy have different influences on the safety perception and behaviour, the sample for this study included scheme managers, supervisors (or extension officers) and experienced rice farmers. The theoretical sampling procedure was employed. Accordingly, the researcher did not seek a perfect representation of the respondents under study, and the sample was made purposefully, focusing on key informants to the needed information rather than randomly (Ezzy, 2002). This is because there was the need to get respondents who would provide relevant information about the processes involved in rice farming and the potential health and safety hazards to which the rice farmers are exposed. Sampling and interview therefore continued until the researcher recognizes that no new data was forthcoming, a point of data redundancy or data saturation (Lincoln & Guba, 1985). The characteristics of the respondents are presented in the Table 1. These respondents provided the needed information to help achieve the research objectives.

There is no consensus on the number of respondents that is adequate for a qualitative study. Notwithstanding this, there are several guidelines that could be used to justify the sample size adequacy for qualitative studies. Creswell (2002) recommended sample size between 3-5 for case study research, while for phenomenological investigations, recommended sample sizes range from 6 (Morse & Chung, 2003) to 10 (Creswell, 2002). Recommendaions for grounded theory studies range from 15 to 20 (Creswell, 2002), and 20 to 30 respondents (Morse & Chung, 2003), while for ethnography, Morse and Chung (2003) suggest 30-50 responses for a sound and credible findings.

Simon and Goes (2012) on the other hand, emphasized data saturation, arguing that the researcher may end the study when it is determined that sufficient data have been collected to obtain the themes or categories, and the addition of participants' experiences are captured by the existing themes or categories. When this happens, there is no need further data collection. Thus, the focus is not necessarily the sample size, but adequacy of data is the important consideration. In this study, the saturation was reached when ten respondents were interviewed and the information obtained was deemed adequate for the objective of the study.

Table 1: Characteristics of Interview Respondents

Participant (RP)	Gender	Age	Status	Educational level
1	Male	62	Ex-scheme Manager/ Farmer	First degree
2	Male	61	Ex scheme Manager/ Farmer	First degree
3	Female	39	Extension Officer	First degree
4	Male	41	Scheme Manager	First degree
5	Male	43	Rice Farmer	Middle School
6	Male	54	Rice farmer	Middle School
7	Male	34	Rice Farmer	SHS
8	Male	68	Chief Farmer	Middle School
9	Male	65	Rice Farmer	Middle School
10	Female	N/A	Rice Farmer	Middle School

4.5 Qualitative Study Data Collection Instrument

The aims of the qualitative study were to identify hazards and common health and safety incidents that the rice farmers are exposed to in their farming activities. Accordingly, primary data was collected through the use of semi-structured interview guide and observation guide. The guide sought to identify the hazards that rice farmers are exposed to at various stages of rice production.

The Semi-structured interviews with an interview guide were considered most appropriate for obtaining relevant information regarding rice farm hazards and incidents because it allowed the interview to be focused on the relevant and key issues under consideration. The interview schedules were designed to ensure that the same questions were asked to obtain related information from each participant. The interview guide consists of 10 open ended questions that focused on indentifying hazards associated with rice farming activities, and follow-up and probing questions were asked where necessary to get further (Burnell, 2007; Creswell, 2007; Warren, 2001) . There were no predetermined responses. The interview guide sought to find out the hazards at the pre-planting stage (land preparation and nursing), planting stage, crop management stage, harvesting and post-harvesting stages (see appendix).

In designing the interview guide, pertinent literature on rice farming was reviewed. A number of search engines were used, including google Scholar, Ebscohost, Jstor, etc. Experienced rice farmers were also consuted to obtain relevant information to generate the items. The information obtained was used to shape the questions for the study.

4.6 Pilot Testing of Semi-Structured Interview Guide

The interview protocol was pilot-tested at the Kpong irrigation scheme with three respondents from one lateral (division) of the scheme, and any challenges encountered were addressed before the main study. This consisted of one extension officer and two rice farmers. The pilot testing was done to shape the interview questions and to ascertain their relevance, and also the estimate duration of the interview. After the pilot testing, the questions were reviewed for the main study. No major changes were made, but other relevant questions were added to ensure adequate coverage of the domain of the research interest.

4.7 Qualitative Study Data Collection Procedure

The data was collected through interviews to identify hazards specifically prevalent in Ghanaian rice farming. Different work categories at the irrigation schemes were involved as key informants. These include former and current Scheme Managers, Supervisors (extension officers), and experienced rice farmers. The interviews were conducted mainly in the English Language and audio recorded since all the respondents obtained at least a basic level of education and could speak the English Language. During the interviews and visits to the farm sites, observations were also made to see how the farmers carried out their farming activities and these were recorded in a note book. The interviews were recorded and observation and interaction notes were also taken since recording equipment can fail or may not play as proposed by Creswell (2007).

Follow-up questions were used to probe and clarify interviewee's responses as suggested by Warren, (2001) and Burnell (2007). Each interview lasted between 35 to 45 minutes. At the end of the entire interview, random portions of the tapes were played back for participants to verify the authenticity and also ensure the validity or trustworthiness of the data. All the participants confirmed what was played was a true reflection of what they intended to say. In a few cases, the respondents added new information they felt were relevant. The tapes were then switched off with the consent of all the interviewees after which the participants were thanked for their valuable time spent.

4.8 Qualitative Study Data analysis Procedure

Attride-Stirling (2001) emphasized the importance of qualitative Psychologists including how they analysed their data in the final report of their study. Given that there were specific research objectives for this study, the theoretical (deductive) thematic analysis (Patton, 1990) was used to analyse the data. Thematic analysis involves analyzing and reporting patterns within data, and minimally organizing and describing the data set in rich detail (Braun & Clarke, 2008). According to Braun and Clarke, thematic analysis is not linked to any pre-existing theoretical framework and so could be used within different theoretical frameworks.

In theoretical thematic analysis, the analysis process is driven explicitly by the researcher (analyst), in that it is guided by the researcher's theoretical or analytical interest (Braun & Clarke, 2008). Thus, there are specific research questions or objectives that the researcher intends to answer. The researcher then collects and analyses data in line with the research objectives and interest. Coding of the data is therefore done for specific research questions or objectives, as was done in this study.

In the analysis of the data for this study, themes were organized mainly at the semantic or explicit level. The semantic approach of analysis involves identifying themes within the explicit surface meaning of the data, focusing mainly on what the participants had said (Braun & Clarke, 2008). The analysis thus, started from organizing the data to show patterns in semantic content and then summarized (description), to interpretation, where attempts were made to indicate the significance of the patterns and their broader meanings as well as implications in relation to previous literature (Braun & Clarke, 2008). The audio recorded interviews were transcribed verbatim and Braun and Clarke's (2008) six step thematic analysis was used for the qualitative data.

The six steps are briefly described below:

1. ***Becoming familiar with the data:***

The transcribed data was read and re-read so as to become very conversant with the content. At this stage, notes of initial ideas obtained from the transcripts were written for further consideration.

2. ***Generating initial codes:***

This stage involved coding the unique features of the data in a systematic fashion across the entire data set and the collation of data relevant to each code.

3. ***Searching for themes:***

At the third stage, the codes generated at the previous stage were collated into potential themes. Themes represent important elements of the issue under investigation, and not dependent on quantifiable measures. Boyatzis (as cited in Braun & Clarke, 2008) indicated that themes could be identified at either the theoretical (deductive) or inductive (bottom up) way. The deductive approach was used in this study. Thus, the themes were driven by the research objectives of interest in the study. Then, data relevant to each theme were gathered and presented under the appropriate themes. Each transcript was thoroughly examined and systematically read and re-read, highlighting important statements and grouping recurrent themes, patterns, and ideas as they emerge from the data (Gillham, 2000).

4. ***Reviewing themes:***

The themes were checked in relation to the coded extracts (stage one) and the entire data set (stage two), still guided by the research objectives of the study.

5. ***Defining and naming themes:***

The themes were refined based on the specifics of each theme and the overall story the analysis tells. Precise definitions and names for each theme were done at this stage (e.g. biological hazards).

6. ***Producing the report:***

The final stage of the analysis involved the selection of vivid, compelling extracts and examples from the data set for presentation in relation to the research objectives. The analysis was then related to the research question and literature (implication and significance of the themes). The summarized report of the analysis was then presented.

According to Braun and Clarke (2008) this is a widely used qualitative analytical tool in Psychology. Braun and Clarke indicate that thematic analysis has the strength to organize and describe data in detail as well as interprets various aspects of a research topic. This approach is said to be theoretically flexible in the sense that it can be used within different frameworks to answer different types of research questions.

4.10 Trustworthiness of the Qualitative Study

Validity and reliability are important in any research and must be taken into consideration from the conceptualisation of the study to evaluation of findings (Patton, 2001). This means that a researcher needs to convince the consumers of the findings that the research findings are worth considering (Lincoln & Guba, 1985). The evaluation criteria and terms of the quality of a study should be paradigm based (Healy & Perry, 2000; Lincoln & Guba, 1985). Seale (1999) indicated that "trustworthiness of a research report lies at the heart of issues conventionally discussed as validity and reliability" (p. 266). Having considered the conventional criteria for reliability and validity to be inappropriate for qualitative research, Lincoln and Guba (1985) suggested the criteria of credibility, neutrality or confirmability, consistency or dependability and applicability or transferability to replace the conventional internal validity, external validity, reliability and objectivity respectively. These trustworthiness evaluation criteria have been widely accepted and applied in qualitative research (Koch, 2006; Sandelowski, 1986), and so were utilized in this study for the qualitative study.

4.10.1 Credibility of the study

The objectives of the qualitative study were to explore the major hazards and the extent to which the rice farmers were exposed to these hazards. The major health and safety incidents among the rice farmers were also explored. In ensuring credibility of the study, several measures were adopted, including reflectivity, triangulation, member checking, prolonged-engagement and peer-debriefing.

Reflexivity

Dahlberg, Drew and Nystrom (2002) emphasized the importance of reflection in qualitative research as a crucial cognitive practice in the research field. Reflexivity is a process that is used to validate research procedures in qualitative studies that enables the researcher to reflect on experiences to identify unexpected critical situations and to deal with these in an appropriate ethical way (Guillemin & Gillam, 2004; Mortari, 2015). The researcher needs to reflect on his or her own cultural or professional background throughout the research process, including interpretation of the experiences of the respondents. Having lived in the rural setting and been vegetable and maize farmer in the past made it easy for me to familiarize myself with the experiences of the rice farmers. Again, in the transcribing process, constructions or expressions that were not clear or those that were deeply rooted in the local dialect and items that I could not readily get the English names were double checked for meaning from experienced colleagues, elders from the localities and supervisors. The Twi Medical Glossary (Medical Education Partnership Initiative, MEPI, 2016) was also consulted in some cases.

Triangulation

Triangulation is a process of combining methods through the use of different methods or data or combining both quantitative and qualitative approaches in study (Golafshani, 2003; Patton, 2001). It involvesthe combination of two or more theories, data sources, methods, or investigators in one study of a single phenomenon to confirm the accuracy of data in order to minimize any threat to validity (Denzin, 1998; Shih, 1998).

Three forms of triangulation were employed in this study: The first was data source triangulation which involved obtaining data through semi-structured interviews with scheme managers, extension officers and experienced rice farmers. Again, the data was obtained from three different rice irrigation schemes from two different regions in Ghana. The second was a method triangulation where the interview information was validated or supported by personal observation of the activities in the farms. The third was the use of two other independent data analysts in deriving of the themes and sub-themes, and the themes from the two analysts were merged or synchronized into one report.

Member checks

Member checking requires the researcher contacting the research participants and asking them to read and discuss the expressions used in the themes and reports that emerged from the analysis (Koch, 2006). Member checking was done in this study by giving first, the transcripts, and later, the preliminary report of the study to two Ex-scheme managers who also engage in rice farming and one experienced rice farmer to read through and check if the expressions used reflect their experiences in the rice farms. A third process involved the use of one senior colleague in the data collection and analysis to verify the themes and the analytical processes.

Prolonged engagement

Prolonged engagement suggests spending enough time to become familiar with the research setting and situation (Lincoln & Guba, 1985). I started by contacting the scheme managers on phone and fixed days to meet each of them to inform them and get their consent for the study. Subsequent meetings with the cooperative leaders and also with the farmers at their monthly meetings were arranged to brief them about the study and get their consent as a cooperative. With the permission from the scheme managers and cooperative leaders, as well as the farmers as a group, one-on-one interactions followed with individual farmers to familiarize ourselves (the research team- my research assistants and I) with the environment and the farmers. At least, one month was spent at each irrigation scheme interacting with the rice farmers from the initial contact to the final data collection. The research team established rapport with the farmers and had fruitful interaction with them to get familiarize with the context of the study. Even after the data collection was over, I was still in touch with a number of rice farmers.

Peers debriefing

Lincoln and Guba (1985) defined peers debriefing as a process of exposing oneself to a disinterested peer in a manner that is parallel to the analytical session to enable aspects of the research that might otherwise remain only explicit to the researcher to be examined. Peer debriefing serves as a check to help keep the researcher honest in the research process to ensure credibility. In this study, the research team (two research assistants and I) constantly discuss the progress of the research and information obtained among ourselves. In addition, I regularly give report to the supervisory team on developments regarding the progress of the research at least once a month and discussions were done on the way forward. I also made a poster of preliminary findings of the study at the 39th International Congress of the Association for Psychological Science Convention in Boston, MA, USA and feedbacks were given regarding the processes. Three progress report presentations were also made to the faculty and graduate students of the Department of Psychology, University of Ghana. Finally, an aspect of the study findings was presented to colleagues, faculty members and the University community at the regular Departmental Colloquium of the Department of Psychology, University of Ghana.

4.10.2Transferability of findings

Transferability is about the extent of similarities between different contexts that allow the possibility for a transfer of finding (Koch, 2006).This study was conducted in conventional rice irrigation farms in the Central and Greater Accra Regions. The data was obtained from three different rice farms of different sizes from different localities, making it have broad applicability to all rice farming contexts in Ghana. These irrigation schemes have similar characteristics with other rice schemes in Ghana. Also, the findings from this study can be transferred onto other farming activities contexts in Ghana.

4.10.3 Dependability of the study

Dependability represents consistency or reliability in quantitative research which is based on the extent to which the research process is auditable (Lincoln & Guba, 1985; Sandelowski, 1986). In this study, all methodological and analytical processes and the rationale for using those processes are made explicitly clear to allow other investigators to follow the lines of reasoning (Koch, 2006). The explanaions are provided to justify any decisions or interventions. Also, the direct responses from the respondents were reported in support of the emerged themes.

Confirmability of findings

Confirmability of findings requires that the sequence and rationale for the entire study are logically presented. Koch (2006) asserts that when credibility, transferability and dependability have been established, confirmability is also achieved. In this study the entire process of study from introduction to conclusions are clearly presented and could easily be followed by any researcher who wish to audit the study.

4.11 Findings of the Qualitative Study

The first objective of this study was to i*dentify health and safety hazards that rice farmers in Ghana are exposed to develop hazards exposure scale for study two.* The hazards associated with rice farming activities regarding the following thematic areas of farming operations were explored:

1. Pre-planting: land preparation
2. Planting
3. Crop management
4. Harvesting, and
5. Post-harvesting

To identify the hazards, there was the need to explore the farming activities that are carried out at each stage of the farming process and to observe anything or actions that are likely to cause harm. In this regard, the interview explored the specific activities that are involved at each of the stages afore-mentioned and the tools that are used. Features of the rice fields that were likely to cause harm or health challenges were also observed and noted. The themes and sub-themes that emerged are organised at each stage and presented. Finally, the types of hazards identified have been summarized in a table at the end of the analysis.

4.11.1 Hazards associated with Pre-planting activities

The pre-planting activities involved in rice farming include: clearing of land manually with cutlass, application of weedicides or occasional burning of field to kill the grass to clear the field, watering of the field to soften it for tilling, tilling and crossing, levelling of field and nursing of seedlings.

Clearing of field

Analysis of the transcripts indicate that when the rice field is bushy, the main mode the farmers use in clearing it is spraying the grass with weedicides to kill the grass before tilling (ploughing). Occasionally, cutlasses are used to clear the grass and burnt before the ploughing is done.

A 54 year old male rice farmer said in an interview:

> *Now that I have harvested over a month ago, if I go back there, it would be bushy. So first of all, I have to buy chemical to spray and kill all the grass. Then use cutlass to weed all the edges that the chemical couldn't kill to make it clear* (Respondent, RP 6).

An Extension Officer also explained the field preparation process in these words:

> *You start preparing the land by weeding the grass with cutlass, or killing the grass with chemical. After that you spill water on the field, and then the power tiller comes to till the land for you* (Female, 39 years old, RP 3).

Another male farmer had this to say:

> *You first buy weedicide and spray to kill the grass. Then you call the "Agriman" (*Agric man, ie, the operator of the power tiller), *to come and till the field for you* (34 years old, RP 7).

The main modes of field clearing are the use of weedicide and cutlasses. These activities expose the farmers to all forms of hazards: chemical hazards, ergonomic hazards, biological as well as physical hazards. Spraying with the weedicide exposes them to chemical hazards, and this has been one of the greatest hazards that farm workers are exposed to. Also, using the cutlass to clear the bush exposes the farmers to ergonomic hazards (awkward sustained posture) as they bend to weed. There may also be reptiles (e.g. snakes) and other harmful creatures in the bushy rice field. The use of the cutlass itself is a hazardous activity, not forgetting the scorching sun and the grass being cleared which could also cause some health challenges to the farmers. In addition, they occasionally burn the field and are exposed to fumes and other gaseous particles.

Watering and Tilling

After the field is cleared, it is watered to soften it for tilling. This is normally done by a hired operator, so it is an activity that is not done by all the farmers. There is a set time for the opening of the water for every farmer to water his or her field. This is done by the management of the Cooperatives. This activity therefore does not pose major risk to the individual rice farmers. This is what a respondent had said about the watering of the field:

> *...Opening of the water is a cooperative activity, or joint activity. The cooperative leaders open the water for everybody to get some unto his/her field. It is done at a particular time determined by the cooperative. Everybody is informed at a meeting about the agreed date. You as an individual cannot get up and open the water onto your field on your own. Everyone must be ready at a given time, for us to do it together. Then the power tiller goes to do the tilling (*62 year old male, Ex-scheme Manager, RP 1*).*

Tilling, crossing and levelling

Tilling is the process of ploughing the rice field to make it cultivatable. This is done by a hired operator who uses the power tiller machine. Tilling tends to be an activity for special people, because of that the operators were not involved in the study. Thus, the tilling process does not also pose any major challenge to the rice farmer; though hazardous to the operator of the machine.

A 68 year old respondent (the Chief Farmer) described the rice production process in these words:

> *You start by weeding the grasses with cutlass, or killing the grass with chemical. After that you spill water on the field, and then the power tiller comes to till the land for you. After the tilling, if you want to do transplanting (instead of broadcasting or dibbling), they (extension officers) will come and make or help you to make nursery beds for you to nurse the seedlings. After the nursing, in two weeks time the machine will come and do the crossing for you. After crossing, if you want to plant in line, you go in for marker to mark the lines for you before you plant. Then those who don't want to do the planting because of monetary issues, they do broadcasting.*
>
> *Then broadcast too, you have to do scaring of the birds not to come and eat the seed. Especially, sparrows or doves would eat everything on the field. You have to do away, away (i.e. creaming to scare birds) on it for two weeks* (RP 8).

There are generally, three planting methods which determine the sequence of the tilling and crossing and other related activities. The three methods are: transplanting, broadcasting and dibbling. Transplanting requires that the seeds are nursed to germinate and grow to a certain level when they can be uprooted and re-planted in the rice field. Transplanting is the preferred method among the farmers in all the irrigation schemes used for the study. The second method, broadcasting involves spreading the rice seeds on the surface of the rice field. This method is not a preferred method because birds are likely to eat all the seeds before they even germinate. The third method is dibbling. This involves using an implement to sow the seed directly into the soil and cover it with the soil. This method presents situations where birds might consume all the seeds before they germinate as in the case of broadcasting. This is also not a preferred method as it is time consuming and takes days to complete a large rice field. This situation makes some areas of the farm mature earlier than other portions of the same farm.

Figure 3: Nursing of rice seedlings: **Source: https://www.google.com.gh/search**

Those who want to do transplanting may have to nurse their seeds before tilling the field. They would have to make seedling bed and nurse the seeds. This also involves the use of hoe, shovels and other farm implements. The second tilling (crossing) and levelling of the field is done when the seedlings are ready for transplanting. The levelling is sometimes done manually, where a board is dragged over the field by a number of men to make it level. This could also be done by the tiller towing the levelling board over the field.

Figure 4: Tilling and Crossing of rice field: Source: https://www.google.com.gh/search

Figure 5: Levelling of Rice field: Source: https://www.google.com.gh/search

The most prevalent hazards identified at this stage have to do with exposure to sharp farm implements (e.g. hoe), the sun, and awkward posture. When levelling the field manually, the farmers may also over exert themselves which may cause harm to the people involved. Table 2 presents a summary of the hazards associated with pre-planting activities.

Table 2: Summary of Pre-planting Activities and Hazards

Activity	Processes	Hazards
Clearing of rice field	Weedicide spraying, clearing with cutlass	Agro-chemical, cutlass, awkward sustained posture, sun rays, insects, reptiles etc
Watering of field to soften for tilling	Cooperative opens water from dam and farmers direct onto their fields	Sun rays, objects in soil, slippery bonds
Tilling and crossing	Tiller machine operator hired to till and later cross the rice field	No major hazards to farmers
Levelling	Use of flat board: manually or tow by tiller to level the field	Sun rays, awkward posture, lifting, objects in the soil

4.11.2 Planting related hazards and injuries/health challenges

Rice planting is normally done in three ways: broadcasting, dibbling and transplanting. The broadcasting method involves spreading the rice seed over the field with the hand. This is not a preferred planting method as birds may eat all the seeds before they germinate. The second method is dibbling. This involves digging and sowing the seed directly into the soil as is done in growing of maize. This process is also not common among the farmers. The preferred planting method is the transplanting.

Transplanting

Figure 6: Rice seedlings ready for transplanting: Source: https://www.google.com.gh/search

The farmers have to bend down and use the hands (fingers) to push the seedling into the soil. At this stage, the major hazards include awkward sustained posture for long hours, walking in the marshy rice field bare-footed, and using the fingers to push the seedling into the soil. There are sometimes snail shells and other objects in the soil that may cause harm to the feet or the fingers. Some farmers use ordinary socks to hold their pair of trousers in place while walking in the rice field. The socks get wet on their feet, which has the potential of causing foot rot. There is a paddy boot which is appropriate for the rice field, but the farmers indicated that it is not available for them to use. The Wellington boot was said to be too heavy for the rice field and may get stacked in the soil if used. A summary of the planting activities related hazards are presented in table 3.

Figure 7: Farmers transplanting rice seedlings: Source: https://www.google.com.gh/search

Table 3: Summary of Planting related activities and hazards

Activity	Processes	Hazards
Nursing of seeds	Preparation of nursery bed manually with different implements	Use of implements, awkward posture, sun rays, objects in soil
Marking of line/Transplanting	Marking is done for row manual transplanting. Support is obtained from fellow farmers or hired transplanters	Awkward posture, sun rays, objects in soil, long work hours
Filling in	Manually filling in spaces where transplanted seedlings are dead	Sun rays, objects in soil, implement use

4.11.3 Crop management related hazards and injuries

There are several activities that are involved at this stage. There is constant monitoring of the water level to enable the rice grow well. Water level management is critical, especially when the rice starts booting until the rice starts hedging.

Agro-chemical applications

Two weeks after the transplanting, there is application of selective weedicide (e.g. condax, codbos etc.) to kill any weed among the rice. There is also application of fertilizer (NPK or ammonia, about twice).

A 41 year old Scheme Manager indicated that:

> *...After that you spray your weeds killer. That is a selective herbicide for control of the weed.*
> *After that, you broadcast the fertilizer inside the field. Thereafter, you have to be watching if there are some places that are not filled; you do the filling of any gaps. That is about broadcasting!*
> *But we plant in lines. That one too, after two weeks if you see that the rice is doing well, then you spray the selective herbicide before you apply the fertilizer. After that you open the water onto the field. If you see there is enough water for the rice to grow up, you wait for it to grow up.*
> *There is a time that you will realize that the fertilizer is finished in the soil. That is another two or three weeks, then you do the second application.*
> *After that you keep visiting the field and be irrigating. Where there is no water, you let water go there* (RP 4).

Figure 8: Fertilizer application: **Source:** **https://www.google.com.gh/search**

The application of the fertilizer is done manually with the hand by broadcasting. In response to a question about how the agrochemicals are applied, this was the response from a male respondent:

> *With the fertilizer, you use your hand. For the chemical, we use the machine. The machine has a handle which we use. But for the application of the fertilizer, you must use your hand to broadcast it. After that you find some soap and wash yourself because there is no machine to broadcast fertilizer. Water lets the fertilizer wet; so when it is wet it causes burns* (43 year old Farmer, RP 5).

Thus, the fertilizer application and the spraying of weedicides expose the farmers to various chemical hazards. These are likely to cause respiratory and skin challenges, as well as long term lasting effects on the health of the farmers.

Bird Management (Scaring of birds)

Bird management was a prominent theme that came out as a critical activity of the rice production process. At the hedging stage (i.e. when the rice starts fruiting), the birds are attracted and they start eating the rice. This means the farmer must be on the farm everyday to *scare* birds. Bird management is a crucial event in the life of a rice farmer. This is done to prevent the birds from consuming all the rice on the field. This is done continuously for about 30 days when the rice is ready for harvesting and harvesting is done. The man with the catapult in hand watches and drives away any bird found on the rice field with dry clay balls thrown by the catapult.

Figure 9: Rice at the hedging stage being eating by birds
Source: https://www.google.com.gh/search

Figure 10: Net covering and use of catapult methods of bird control: Source: https://www.google.com.gh/search

A respondent had this to say: "... *if it is hedging then we have to do scaring (drive away birds)"* (Female farmer, RP 10).

A 54 year old male farmer explained what scaring involved in these words:

> *"... Scaring? Yeah, you sack birds. But now there is a method which we are using. We cover it with a net. We use catapult also; we make balls from clay, dry them and then put into the catapult and throw them to drive away the bird. This is done continuously for thirty days"* (RP 6).

Another male farmer said:

> *After the second application of fertilizer, you will realize that the rice has started booting and the birds are attracted and they start eating it. Scaring starts from that time. ... You make a temporary shed on the field and stay there to monitor the*

rice. When you see the birds come around, you use the catapult to drive them away or you shout, hey hey hey, away!!!

If you won't do it that way, then you have to get a silver bowl and hit it with stick and scream: away! Away!! Away!!!, to drive them away. If the birds come around then you scream and beat the bowl: away! Away!! (65 years old, RP, 9).

In response to a question as to whether they do get sore throat as a result of the screaming to scare birds, a respondent responded this way:

"Ooh! Yes. (He laughed). The moment you get home, you have to go and get some medicine to treat it. It is very serious. It's one major problem for us (43 years old male farmer, RP 5).

Another farmer (a female) asserts:

"Scaring of birds is done through shouting and use of catapult. You keep running on the bonds from one place to the other. You get here and the birds are at the other side, so you have to run back to chase them" (RP 10).

It was observed that bird management or bird scaring is one major activity in rice production. Several methods are used in scaring the birds in Ghana. These include the use of scarecrows, covering the rice with nets, use of cymbals, catapults, shouting etc. The methods that are most commonly used in the farms used in this study are the use of net, catapults and use of cymbals, accompanied with shouting. These, especially the catapult, have been described by the farmers as very hazardous.

"...The catapult can get torn and hit your chest or any other place. We even get injured sometimes" (RP 10).

Another 34 years old farmer had this to say:

> "*...Sometimes the catapult gets torn and hits our chest, head, eye etc. Someone even had the eye damaged by the catapult"* (RP 7).

Running on the bonds have also been described as hazardous by the farmers. The bonds are narrow and may be slippery at times.

A 43 year old male farmer mentioned that: "*When running on the bond to scare birds you can slip and fall, or stumble in a hole on the ground and fall. We fall all the time. It's normal"* (RP 5).

The scaring of birds continues till the rice is ready for harvesting. The hazardous nature of the catapult, slippery bonds, screaming exposure to the scorching sun and the rice grass were some of the hazards identified. The farmers indicated that they frequently fall into the growing rice while running on the bonds to scare the birds. This causes a lot of discomfort to the skin if one does not wear clothing to cover it.

Table 4: Summary of crop management activities and hazards

Activity	Processes	Hazards
Fertilizer application	Hand broadcasting on the field	Agro-chemicals, sun rays, objects in soil
Weedicide spraying	Mixing of chemical with water and spraying with machine	Agro-chemicals, sun rays, objects in soil, lifting of weight
Water level monitoring	Constantly monitoring the water levels and supplying (if needed) on the field	Sun rays, slippery bonds
Bird management	Use of catapult and cymbals, creaming, netting	Use of catapult, creaming, sun rays, narrow slippery bonds, rice grass

4.11.4 Harvesting related hazards and injuries

The harvesting of rice in Ghana is done both manually and with the combined harvester. The manual harvesting is done using cutlass and sickle to cut the rice. They are then gathered at a place for threshing.

Manual Harvesting

Figure 11: Farmers harvesting rice manually with cutlasses. (Insert: Images of combined harvesters)

Source: https://www.google.com.gh/search

A 65 year old male rice Farmer had this to say in response to how the harvesting of the rice is done.

> *Sometimes, you don't get combined harvester so you use the cutlass or sickle. After harvesting then you pack it and thresh. After threshing you have to bring it to the platform for drying. After drying, winnowing and then weighing* (RP 9).

Another respondent from another irrigation scheme said:

> *We were doing the manual harvesting. It is only this farming season that someone brought the combined harvester. But it does not go to mushy (swampy) areas so we use the cutlass to cut the rice from those areas. ...When you harvest, you thresh, then put them in sacks and bring to the space here for drying. After drying, then you winnow. After winnowing, to the mill, then it is ready for weighing and marketing* (Ex-Scheme Manager, RP 2).

Threshing of rice

Manual threshing involved the use of to stick (bumper) to hit the rice till all the rice fall off from the grass. This requires a lot of physical energy. The rice grass could also cause skin irritation if the farmers are not properly dressed to cover the skin.

Figure 12: Manual threshing of rice

Source: https://www.google.com.gh/search

Figure 13: Another manual threshing of rice process: Source: https://www.google.com.gh/search

Drying of paddy rice

The next stage after the threshing is drying. The threshed rice (paddy rice) is carried from the farm to the drying platform either with the help of a tractor trailer or individuals carry them on their heads. The rice is spread on canopies on the platform for weeks or few days, depending on the weather condition. When they are well dried, the rice is then taken to the next stage, which is the winnowing stage. The hazards at the dry stage mainly include lifting and carrying of bags of rice to the platform. Another health hazard was that when the unshelled rice touches the skin, it causes skin irritation and itching.

A woman drying rice cautioned my research assistant and I when we wanted to help with the drying. She was not part of the interviewees, but her response provided very valuable information*:*

"Eeei"! You will get skin irritation; your skin will itch badly. You can see we are in long sleeve dresses. If you don't do it that way, by the time you finish, you will have rashes all over your hand.

Meanwhile, it was observed that a few of them were not wearing long sleeve dresses. When I enquired why they were not wearing, they told me they were not comfortable in the long sleeve dresses and that they were not going to let the rice touch their skin: "We will be very careful", they said. Thus, carrying of the rice, exposure to the paddy rice, and exposure to the direct sunshine were the main health and safety hazards involved in the drying process.

Figure 14: Rice drying platform: Source: https://www.google.com.gh/search

Manual winnowing

This is done to remove stone and other particles from the rice. The manual operated machine removes other particles (and dust) from the rice by winding a lever. The paddy rice is also raised high and poured down for the wind to blow foreign materials from the rice (see picture 15).

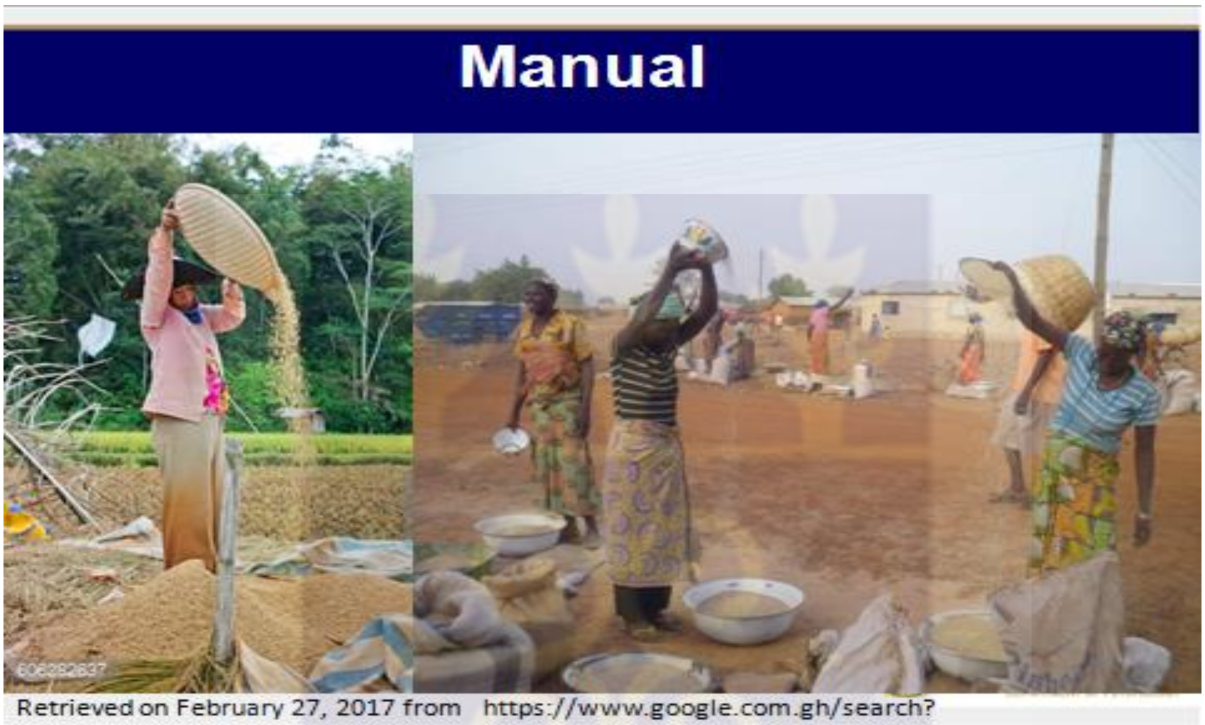

Figure 15: Manual winnowing: Air blows particles and dust from the rice: Source: https://www.google.com.gh/search

A 54 year old rice farmer *(RP 6)* who was using the manual winnowing machine said in response to a question as to whether dust and particles from the rice enter their eyes said:

> *It's serious! Dust enters our eyes very much. I would very much love to use goggles, but I don't have any. You need to use your own money to buy it. This together with gloves, and long sleeves if I get I would use. You need to use protective clothes and glove, those ones too I don't have.There are some who dress nicely before coming to do this. They wear long sleeves and glove to prevent rashes*

He also talked about the itchy nature of the paddy rice: "*The rice itches very badly. What I am doing now, by the time I finished, you would see rashes all over my hands."*

This farmer was in bathroom slippers (*charlley wotey*), so I asked if he wears wellington boots when going to the farm which he responded in the affirmative. Then I asked why he was not wearing it while doing the mowing.

He responded: "*This place is not very hazardous like the farm that is why."*

Meanwhile, when further probing questions were asked, the farmer indicated that they do not normally use appropriate protective safety wears.

He said: "*...We wear socks. But we don't use it; true... If I tell you the truth, we don't use these things most of the time."*

Milling of rice

This is the final stage of the rice production process before it goes to the market or is ready for consumption. The milling is the "shelling" of the rice to get the "pure rice". This process gets the rice ready for final bagging for sale or consumption. There is a de-stoner in the mill that also removes stones and other particles from the rice. The hazard involved here mainly has to do with the lifting and carrying of the bags of rice to the mill and from the mill. The weight might be too heavy that may cause physical strain.

Figure 16: Rice mill: Source: https://www.google.com.gh/search

The milling process ends the production phase of rice. The milling process gives the wholesome rice which is bagged, weighed and sealed for sale. The rice is therefore ready at this stage for consumption and sale.

Table 5: Summary of Harvesting and Post-harvesting Related Activities and Hazards

Activity	Processes	Hazards
Manual or machine	Mostly use of cutlass or sickle to cut the rice; occasionally use the combined harvester	Use of sharp implements, awkward posture, sun rays, rice grass, insects, reptiles, objects in soil, lifting of weight
Threshing	When manual harvesting is done, threshing is done manually	Repetitive movement, awkward posture, rice grass and paddy rice, sun rays, lifting of weight
Bagging and conveying	After threshing, the paddy rice is put in rice bags and conveyed to the drying platform	Paddy rice, lifting of weight, sun rays
Drying	The paddy rice is dried on a platform for days	Paddy rice, lifting of weight, sun rays, awkward posture
Winnowing	Winnowing is done to remove unwanted particles	Paddy rice, particles from rice, sun rays, repetitive hand movement
Milling	The dried paddy rice is milled to get the final consumable wholesome rice.	Lifting of weight
Bagging and weighing	The wholesome rice is bagged and weighed	Lifting of weight, awkward posture

4.12 Summary of Hazards in the Rice farm Operations

As the focus of the study was on the prevailing hazards in rice farming, the various forms of hazards identified at the different stages of rice farming have been summarised and put under the categories of hazards (Kumphon, 2009) in the Table 6 below. The objective of this phase was to develop hazards exposure scale to be used in the study two. Accordingly, the identified hazards were used to develop rice farm exposure scale and pilot-tested with the other scales for ultimate use in the quantitative study.

Table 6: Summary of Rice Farm Hazards

Chemical Hazards	
	Application of agro-chemicals (e.g. fertilizers, pesticides, weedicides)
	Exposure to fumes from burning of farm land
Physical/Safety hazards	
	Dust or particles from winnowing of rice
	Exposure to sun rays
	Prolong working hours
	Working in marshy rice fields, narrow and slippery bonds
	Screaming to scare birds
	Presence of snail shells, tree stumps and thorns in the rice field
	Lifting of weight (bags of fertilizer, rice etc)
Biological Hazards	
	Exposure to animals, insect, snakes etc
	Rice grass or paddy rice exposure
Ergonomic Hazards	
	Use of catapults to scare birds
	Bending or awkward posture at work
	Use of sharp farm implements, tools and equipment
	Use of farm machines (threshers etc)

4.13 Development of Hazards Exposure Scale

The next stage of the scale development process after the identification of the hazards was the generation of the items. There was no evidence of any rice farm hazards exposure scale in the literature. Consequently, the qualitative study was used to explore the rice farming processes to identify the hazards that are prevalent in the rice farming activities. The activities were explored from pre-planting to harvesting and milling of the rice to help identify the hazards. Interviews and observations were used in this process. The summarized results presented in table 6 above were the main sources of the items generated.

Twenty items were generated altogether from the identified hazards. These were rated on a seven point Likert-type of scale from 1 (never) to 7 (several times a day). The response format for the incident reporting scale (Barling, Loughlin & Kelloway, 2002) was adapted the hazards exposure scale. Respondents were asked to indicate how often they engaged in, were exposed or experienced any of the hazards indicated on the seven-point scale. Since there were other adapted scales to be piloted and used in the quantitative study, the hazards exposure items were also added to those scale and used in a pilot testing of the measures. One item (*application of fertilizer*) was deleted after the pilot testing because it was duplicating the first item (application of agro-chemicals), leaving 19 items for the analysis of the scale and subsequent analyses. The items were theoretically grouped into four sub-scales of physical, chemical, biological and ergonomic hazards exposure. The reliability coefficients of the hazards exposure scale from the pilot testing analysis, together with the indicator weights and collinearity analysis (VIF) are presented in table 7. The results show that the scale had an overall Cronbach's alpha of .733, with that of subscales ranging from .507 to .76. These were considered adequate and so the scale was adopted for use in the quantitative study with a larger sample size.

The rice farm hazards exposure scale was modelled as a formative construct. This means that each of the items represents a unique domain of hazards exposure and not replaceable by another item (Nitzl et al, 2016). The assumption for formative latent variables is that the indicators represent, and are "*reality"* of dimensions of the latent variable. Therefore, dropping an indicator means dropping a dimension of the definition of the latent variable and could result in a misleading result (Nitzl et al, 2016). Henseler, Ringle and Sarstedt (2012) also indicated that because the indicators represent different dimensions of the latent variable, there is the possibility that items may relate to each other in opposite directions. Consequently, the correlation of the indicators with their latent variable may be suppressed due to push-pull effects of the co-occurrence of the positive-negative weights.

In view of this, items were not deleted or retained based on their loadings or contribution (or otherwise) to the internal consistency of the overall scale but their uniqueness to the definition of the construct. The multicollinearity analysis of the indicator was therefore performed to ensure that each item is making a unique contribution or measuring a unique domain of hazards exposure. The variance inflation factors (VIFs) statistics indicate that all were within acceptable range (VIF less than 5.0) (Hair, Hult et al, 2014; Hock & Ringle, 2006), an indication that each item is unique. The items were all maintained and used in the quantitative study to measure the degree or level of hazards exposure experienced by the rice farmers. The Cronbach's alpha coefficient was computed to ascertain the internal consistency of the items. The items showed an overall acceptable internal consistency of Cronbach's alpha of .733, with the scale mean of 74.84, standard deviation of 9.41.

Table 8 also presents the correlations among the dimensions of the hazards exposure scale. The results show moderate correlations among the dimensions, suggesting there is no problem of multicollinearity, and that each dimension is unique. Given the good psychometric properties obtained in the pilot testing of the hazards exposure scale, it was deemed acceptable for use in the study two to assess the extent of hazards exposure. Accordingly, the extent of exposure to hazards by the rice farmers was assessed in study two with a large sample and used for further analysis.

Table 7: Hazard Exposure items and their Weight and Variance Inflation Factors

Items	Indicator Weights	VIF
Chemical Hazards ***(Cronbach's alpha = .604)***		
Application of agro-chemicals (e.g. Fertilizer)	0.662**	1.950
Fumes (smoke) from burning of farm land	0.888**	3.747
Physical Hazards ***(Cronbach's alpha = .516)***		
Dust from winnowing of rice	0.181	1.973
Exposure to sun	0.222*	2.729
Prolong working hours (more than 8 hours a day)	0.206*	2.228
Working in water-logged areas	0.347**	2.891
Screaming to scare birds	0.308**	2.549
Presence of snail shells in the soil	0.168*	2.286
Presence of tree stumps and thorns	0.275**	2.482
Running on bonds to scare bird	0.248**	2.899
Walking on slippery bonds	0.268**	3.272
Lifting of weight (bags of fertilizer, rice etc)	0.355**	2.259
Ergonomic Hazards ***(Cronbach's alpha = .507)***		
Bending or awkward posture at work	0.459**	1.847
Use of sharp farm implements, tools and equipment	0.348**	3.266
Use of farm machines (Winnower, threshers etc)	0.373**	3.438
Use of catapults to scare birds	0.138	2.702
Biological Hazards ***(Cronbach's alpha = .758)***		
Exposure to animals, insect, snakes etc	0.452**	3.342
Mosquito and other insect bites	0.333**	2.436
Rice grass exposure	0.424**	3.321

*Indicator weight significant at: * p < .05; ** p < .01*

Table 8: Correlations among Hazards Exposure Dimensions

Dimensions	CHEM	BIO	ERGO	PHY
Chemical hazards	1			
Biological hazards	.365*	1		
Ergonomic hazards	.468**	.661**	1	
Physical hazards	.353*	.390*	.236*	1

**p <.05; ** p < .01*

4.14 Major Forms of Health and Safety Incidents Experienced by the Rice Farmers

The second objective of the qualitative study was to: *Find out common health and safety incidents that the rice farmers encounter and use the findings to adapt the incident rate reporting scale for use in study two***.** The adapted incident rate reporting scale (Barling, Loughlin & Kelloway, 2002) was used to measure safety performance in the quantitative study. The analysis of the interview transcripts revealed a number of them which are presented below. The adapted incident rate reporting scale (safety performance measure) is presented in the appendix.

The major health and safety incidents experienced by the rice farmers have been presented below with excerpts from the data set:

1. ***Injury by objects in the soil***: In response to a question as to whether they wear Wellington boots when doing transplanting on the field, the following were some of the responses:

   No. It is heavy and cannot be used in the mud; water may enter it. We go bare footed. ...Sometimes you step on something and get hurt. We have some snail shells at some places (RP 2).

Another respondent: "*Sometimes you see these snails? Ahaaa! the dead ones; their shells cut the sole of the feet, but not often*" (RP 1).

Another respondent said*: "Sometimes, you step on something in the soil and get injured. Sometimes there are snail shells or other objects that injured some of the farmers"* (RP 4).

2. ***Foot rot***: *"I wear ordinary socks to hold the pair of trousers in place. That is what many of the farmers do. ... It gets wet, but you wash it after work. Some people get foot rot and we are bitten by tick in the water. There are also snail shells in the soil that cuts the sole of the foot. So the socks help to prevent some of those, though it is not appropriate* (RP 9).
3. ***Fertilizer burns***: *Water lets the fertilizer wet; so when it is wet it causes burns* (RP 8).
4. ***Chemical blown into eyes and nose***: In a response to a question: "Does the wind blow the chemical into your eyes or nose sometimes?"This is what a respondent has to say: "*It's serious ooo. So some people use goggles and there is something... nose pad. But most of us don't use it. We check the direction of the wind*" (RP 8).
5. ***Sore throat***: Since you scream to scare the bird, I guess, you would be having sore throat through the screaming? "*Oh yea. It has become normal*" (RP 2). Another respondent said: *Yea! A lot of the times* (RP 10). Another respondent responded: "*The moment you get home, you have to go get some medicine to treat it. It is very serious. It's one major problem for us"* (RP 6).
6. ***Dust or particles falling on the eye***: "*Dust from winnowing enters our eyes very much"* (RP 9).
7. ***Skin rashes***: "*... The rice itches very badly. By the time we finish, if I don't take care I would have rashes all over my hand. That is why you can see some people wearing long sleeve dresses and shirt"* (RP 7).
8. ***Injuries from catapult***: *It can get torn and hit your chest or any other place. We even get injured sometimes* (RP 10)*. "Sometimes the catapult gets torn and hits our chest, head, eye*

etc. Someone even had the eye damaged by the catapult" (RP 5). Another respondent had this to say: "*We use the catapult. ... it got torn and hit me several times. We get injured in some cases*" (RP 6). (*He showed me a scar on his forehead that resulted from catapult wound).*

I met the farmer whose eye was damaged by the catapult. He happened to be one of the experienced rice farmers and so was one of the selected respondents. He explained to me how the eye got damaged in these words:

> *"...As I stretched the catapult, it slipped from my hands and the stick came to hit my eye. The eye was injured and blood started flow. Some of my people helped me and gave me first aid. I later went to the clinic in Ashaiman and was asked to report another time. But I did not have money to continue the treatment. Meanwhile, I was coming to the farm, hoping when I harvest I could get some money and go to the hospital. By the time I harvested and went back to the hospital, I was told the eye was permanently damaged. Now I don't feel the pain, but the eye is spoilt. I use the other one to see"* (RP 9).

9. ***Slip and falls***: "*When running on the bond to scare birds you can slip and fall, or stumble in a whole on the ground and fall. We fall all time"* (RP 5).
10. ***Cutlass injuries***: *When we use the cutlasses to weed, sometimes it cuts you; you also get blisters* (RP 2). Another respondent: *"Sometimes, the cutlass cuts you when harvesting the rice manually." ... "Especially, when they are harvesting the rice manually with cutlass, the frequently cut their hands or legs"* (RP 7).
11. ***Body pains and extreme fatigue***: *"For me, I can work for even the whole day. ... No rest. We farmers do not have rest, especially during scaring time. You continue working; when you are tired then you come and rest for a while; you take a little rest then you go and continue*

the work. But during scaring time, no rest, else the birds would eat all the rice. By the time you close, you get very tired and feel pains all over your body" (RP 5).

12. ***Headache and fever from exposure to direct sun***: In response to the question: "Do you cover your head to protect you from the sun?", a 54 year old male farmer had this to say: "*No. Nothing. I don't use anything, but some people wear cap. ...Because we stay on the sun for a many hours, we sometimes get headache and fever"* (RP 6).

13. ***Lower back (waist) pain:*** "*We do get back pains because of bending when clearing the land or harvesting with cutlass"* (RP 1).

14. ***Malaria****: "There are more mosquitoes here than any other town. Everywhere rice is grown, there are a lot of mosquitoes there and they give us malaria. So we have a clinic here. Because of the mosquitoes, the community made a request to the government and they provided us with a clinic. So the moment anyone gets injured or falls sick, or suffers any other problem, we take the person to the clinic"* (RP 8).

A summary of all the incidents and injuries described above is presented in table 9, together with samples of the excerpts of the interviews cited above.

Table 9: Summary of Major Farm Incidents

Major accidents and injuries	**Examples of Extracts from interview**
Injury by objects in the soil	*We go bare footed. Sometimes you step on something and get hurt. We have snail shells at some places.*
Foot rot	*Some people get foot rot and we are bitten by tick in the water. There are also snail shells in the soil that cuts the sole of the foot. So the socks help to prevent some of those, though it is not appropriate.*
Fertilizer burns	*Water makes the fertilizer wet; so when it is wet it causes burns.*
Chemical blown into eyes and nose	*It's serious ooo. So some people use goggles and there is something... nose pad. But most of us don't use it. We check the direction of the wind.*
Sore throat	*Oh yea. It* (sore throat) has *become normal. The moment you get home, you have to go get some medicine to treat it. It is very serious. It's one major problem for us.*
Dust or particles falling on the eye	*Dust from winnowing enters our eyes very much.*
Skin irritation and rashes	*The rice itches very badly. By the time we finish, if I don't take care I would have rashes all over my hand. That is why you can see some people wearing long sleeve dresses and shirt.*
Injuries from catapult	*It* (catapult) *can get torn and hit your chest or any other part of the body. We even get injured sometimes. Sometimes the catapult gets torn and hits our chest, head, eye etc. Someone even had the eye damaged by the catapult.*
Slip and falls	*When running on the bonds to scare birds you can slip and fall, or stumble in a whole on the ground and fall. We fall all time.*
Cutlass injuries	*When you use the cutlasses to weed, sometimes it cuts you; you also get blisters. Sometimes, the cutlass cuts you when harvesting the rice manually.*
Body pains and extreme fatigue	*For me, I can work for even the whole day. ... No rest. We farmers do not have rest, especially during scaring time. You continue working; when you are tired then you come and rest for a while; you take a little rest then you go and continue the work. But during scaring time, no rest, else the birds would eat all the rice. By the time you close, you get very tired and feel pains all over your body*
Headache and fever from exposure to direct sun	*...Because we stay on the sun for a many hours, we sometimes get headache and fever.*
Lower back (waist) pain	*We do get back pains because of bending when clearing the land or harvesting with cutlass.*
Malaria	*There are more mosquitoes here than any other town. Everywhere rice is grown, there are a lot of mosquitoes there and they give us malaria. So we have a clinic here. Because of the mosquitoes, the community made a request to the government and they provided us with a clinic. So the moment anyone gets injured or falls sick, or suffers any other problem, we take the person to the clinic.*

4.15 Use of Protective Equipment or wears

The third objective of the qualitative study was to find out if the farmers use personal protective equipment or protective wears, and if so, do they use the appropriate ones. In a hazardous work environment such as rice farming, since the most of the hazards cannot be completely eliminated, the use of *Personal Protective Equipment or* PPE is important to reduce or prevent any harm from occurring. The presence of a hazard does not mean harm will occur if measures are put in place to prevent the hazard from causing harm.

The findings indicated that a number of them either do not use any protective equipment or wears or do not wear the right ones. When inappropriate safety wears are used, they rather result in unintended consequences. For instance, the use of socks to hold pair of trousers in a paddy field has resulted in foot rots, as indicated aboveamong the rice farmers.

In response to a question as to whether they wear Wellington boots to the farms and during other farming activities, these were some of their responses: "*We wear normal socks. But we don't use it* (Wellington boots) *true...if I tell you the truth"* (RP 1).The practice observed among the rice farmers was that most of the wear socks in bathroom slippers, instead of the Wellington boots. When they are in the paddy field, the slippers are removed, because they would get stacked in the field. The socks have therefore been the substitute for the paddy boot, which gets wet and cause other problems for the farmers.

Another respondent said:

> *Here we normally do it barefooted. The Wellington boot is too heavy for the mud. The Japanese gave us paddy boot which we used some time ago but they are spoilt now. It is very light and comfortable in the field. There is none around to buy here* (RP 2).

Another respondent said:

> *I wear ordinary socks to hold the pair of trousers in place. That is what many of the farmers do. It gets wet, but you wash it after work*" (RP 9).

In another development I asked a farmer winnowing rice where a lot of particles and dust were flying all over the place from the winnowing machine why he was not using the goggles to protect his eyes. He responded that he did not have any. So I asked if he would use it if they were available, and this was his response:

> *Yes, but I don't have. You need to use your own money to buy it. This together with gloves, and long sleeves if I get I would use. You need to use protective clothes and glove, those ones too we don't have* (RP 6).

Thus, it appears that majority of the rice farmers do not use appropriate protective wears even though they were aware of the health and safety implications. Some also do not use anything at all to protect themselves because the PPEs were either not available for them to buy, or they did not want to spend on those items.

When spraying the weedicides, the chemical could be blown by the wind into the eyes and nostrils of the farmers, but they hardly wear any protective wears. Meanwhile, some of them indicated that the chemicals sometimes are blown into their eyes and they inhale same. In response to a question as to whether they inhale the chemical or the chemical get blown into their eyes and nostrils, a respondent said: *"It's serious ooo. So some people use goggles and there is something... nose pad. But most of us don't use it. We check the direction of the wind* (RP 8).

4.16 Chapter Summary, Discussion of Findings and Conclusion

This chapter presents the results of the qualitative study. The hazards that are prevalent at the various stages of rice farming are presented as gleaned from the interview transcripts from key informants. The hazards identified were used to generate a hazard exposure scale which was used in the quantitative study. Again, common forms of safety incidents suffered by the rice farmers were explored and used to adapt the safety performance scale used in the quantitative study. The use of personal protective equipment (PPEs) was also explored. Figure 17 below depicts the summary of the main findings of the qualitative study.

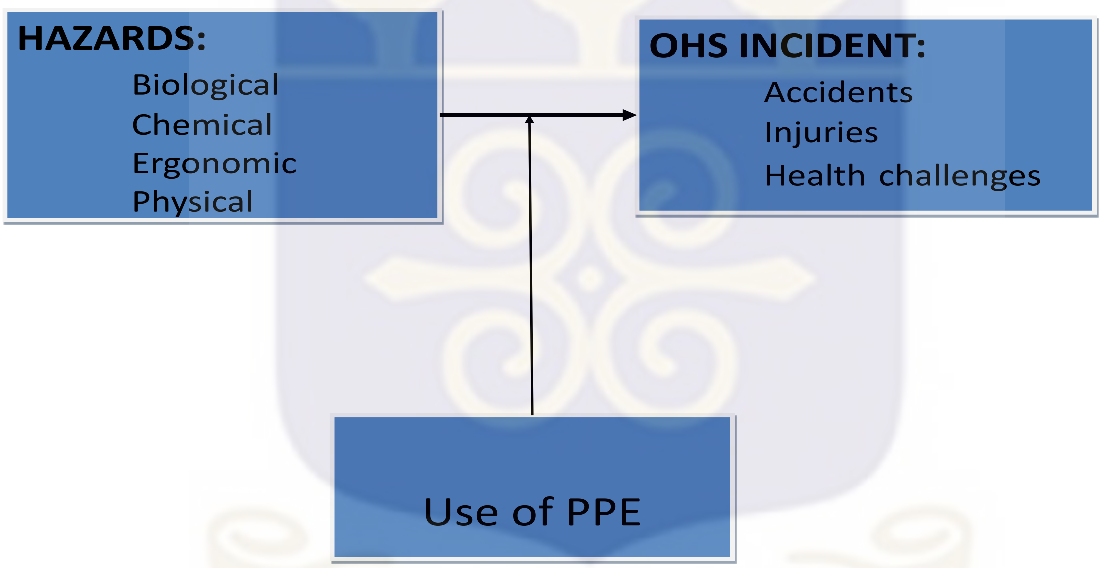

Figure 17: Observed qualitative study model

Source: (*Analysis of Field data, 2017*)

The figure shows that the rice farmers were exposed to biological, chemical, ergonomic and physical hazards in their farming activities. This model was incorporated into and tested as part of the quantitative model in study two. The hazards could lead to occupational health and safety (OHS) challenge, but the harm could be minimised or moderated if PPEs are used. These hazards only present likelihood of harm or health challenge, and most of them cannot be eliminated because they are inherent part of the farming operations. Therefore, appropriate use of PPEs is very necessary to reduce the possibility of harm.

The findings show that rice farmers in Ghana are exposed to various forms of occupational health and safety hazards. The health incidents that emerged include injuries by objects in the soil, foot rot, eye injury, sore throat, cutlass wounds, etc. The rice farming activities that posed most health and safety challenge to the farmers were the scaring of birds, using the catapult and the manual harvesting and threshing of rice. The use of catapult resulted in the lost of an eye of a respondent, with others having various forms and degrees of injuries from the use of the catapult.

The findings indicate clearly that farming activities pose a lot of problems to farmer workers because of the tedious and muscular nature of the work (Joshi, 2002). There are other features or aspects of farming that are inherently hazardous to the health and safety of the farm worker, such as long working hours, weather conditions etc. Joshi indicated that farming has the potential to cause muscular-skeletal disorder, aches, pains etc. As far back as 1989, McNeill and O'Neill investigated the health and safety of farmers engaged incrop production and observed a number of disabilities among the farmers, including lower back pain, chest pain, cutlass injuries etc. Other research conducted in Ghana among Cocoa farmers reported similar safety concerns (Bosompem & Mensah, 2012; Muilerman, 2013).

Long working hour has been found to be prevalent among the rice farmers in this study. As respondent by some of the respondent, it is not possible to rest during the bird management period (scaring of birds). This is because if one leaves the farm to rest, the birds would consume all the rice. The ILO (2010) observed that long working hours has been found to be one of the main causes of health challenges in farming. The Jacklow law firm (2015) also indicated that the common types of farm injuries result from equipment and implement use, pesticides and chemical poisoning, fertilizer burns etc. These were corroborated in the current study with the rice farmers.

Despite the prevalence of various forms of hazards, it was observed that a great number of the farmers do not wear appropriate PPEs. Consequently, they experience many safety and health challenges. Meanwhile, it seems that the farmers were used to, and had become accustomed to the unsafe ways of working. This observation corroborates Pyykkönen and Aherin's (n.d) observation that risk management principles are not widely used in agriculture. It was observed in the current study that many of the rice farmers acted in an unsafe manner, even though they are or were aware of the health and safety implications. Workplace inspection, accident investigation and social science research in the US indicate that there is a deep-seated culture of unwise risk-taking among farm workers. Farmers also often are resistant to officialdom and perceive safety regulations and procedures as great burden (Pyykkönen & Aherin, n.d).

Regarding why they were not using the PPEs and other safety measures, some of the rice farmers indicated that the appropriate PPEs and protective wears were not available for them to buy and use. Other farmers found the protective wears uncomfortable and inconveniencing for their productive activities. This suggests that they placed productivity above safety and engaged in convenient safety violations.

To sum up, the findings emphasized the need for intensive education and awareness creation about the importance of the use of appropriate PPEs since most of the hazards are inherent in the farming processes and cannot be completely eliminated. Suutarinen (2003) indicated that scientific contributions on the application of formal safety management theories or practices in farming are not commonly available. This suggests that more empirical research and attention should be given to the agriculture and the informal sector as Ghana desires to ensure food security and create employment avenues for the youth in the agricultural sector. Literature indicates that occupational health and safety has not been generally regarded as integral issue of good farm management yet (HSE, 2007). But Ghana can take the lead and make good farm safety management a major concern, more so because agriculture is the backbone of our economy.

CHAPTER FIVE

STUDY TWO: QUANTITATIVE STUDY

5.1 Chapter Overview

The quantitative study tested the extent to which the antecedents (hazards exposure, safety culture and religiosity) predicted the safety performance of the rice farmers through their safety behaviour. It also tested the moderation effects of safety behaviour and safety culture on the effect of hazards exposure on safety performance. The design employed for the study, the sample and sampling procedure and the justification of the sample size for the quantitative study are presented here. Also presented are detailed description of the data collection instrument, the procedures for the data collection and data analyses. The results of the analyses are presented and organized based on the hypotheses tested. The chapter closes with a summary of the results and the final observed model of the study.

5.2 Quantitative Research Design

The design used for the quantitative study was the cross-sectional survey using structured questionnaires to collect the data. According to Scheuren (2004) the term survey mostly represents a process of collecting information from a section of individuals. The basic idea of a survey is to measure variables by asking questions and examining the relationships among the measures (Singleton & Straits, 2010). Singleton and Straits indicated that generally, surveys involve a large number of respondents chosen to represent a population of interest, who respond to systematic questionnaire or interviews and the answers are coded numerically. They observed that the most commonly used survey design is the cross-sectional design. A cross-sectional survey involves data collection at a particular point in time from a sample drawn from a specific population (Singleton & Straits, 2010). Hall (2011) also indicates that across-sectional survey is a snapshots of the populations about which data is collected to make inferences about the population of interest at one point in time. Data is collected essentially at one point in time from a sample or *cross section* of respondents chosen to represent the target population in a cross-sectional survey (Singleton & Straits, 2010), and it examines the relationship between variables of interest as they exist in a defined population at a single point in time or over a short period of time.

The cross-sectional surveys have been used to investigate several issues in Social Science with great success and have been the most used research design in Social Science investigation. This study employed the cross-sectional survey because questionnaire was used to elicit responses from a cross section of rice farmers of diverse demographic background, drawn from three different rice irrigation schemes. The responses from the respondents were coded numerically and used to describe the extent to which religiosity and quality of safety culture of the rice farmers predict their safety performance. Again, this study obtained data from a large representative sample of rice farmers at one point in time to obtain a snapshot of the health and safety situation of rice farmers in Ghana. Cognizance of the time limitation of the PhD thesis and the amount of resources available for the study, coupled with the objectives of the study, the cross-sectional survey was deemed the most appropriate.

5.3 Quantitative Study Population

The target (or theoretical) population for the study was all rice farmers in Ghana. Rice is produced in all the ten regions of Ghana, and there are 22 public or conventional irrigation schemes across the ten regions that grow rice (Ministry of Food and Agriculture, 2015). However, the accessible or study population consisted of rice farmers and scheme managers of 3 rice irrigation schemes: 2 in the Greater Accra Region, and 1 in the Central Region. The

Irrigation Schemes used are the Kpong Irrigation Scheme, Ashaiman Irrigation Scheme and the Okyereko Irrigation Scheme. These farms were conveniently chosen because of proximity and easy accessibility; and the dynamics in these rice farms were representative of rice schemes farms in Ghana. Also, the Kpong irrigation scheme is one of the biggest and well organized schemes in Ghana, with Ashaiman and Okyereko being medium size schemes. Table 10 shows the total population of interest of the study areas. The number of workers was obtained from the scheme managers, and this formed the basis for the sampling. The total workforce for the three schemes was 2938, made up of 1973 females and 965 females.

Table 10: Distribution of Accessible Population

Irrigation scheme	**Number of farmer**		**Total**
	Males	***Females***	
Kpong	1800	900	2700
Ashaiman	85	22	107
Okyereko	88	43	131
Total	**1973**	**965**	**2938**

***Source**: Personal communications with scheme manager (February, 2016)*

5.4 Quantitative Study Sample and Sampling Procedure

The sample for the quantitative phase included only individuals who are engaged in rice farming in the chosen irrigation schemes. Rice production is labour intensive and so more than 70% of all rice farmers are men (Addison, Edusah & Sarfo-Mensah, 2014). Responses from a total of 469 rice farmers sampled from the three irrigation schemes meet the quality criteria for the main study.

Table 11: Sex and Educational Level Distributions of Respondents

Gender	**Freq**	**Percent**
Male	347	74.0
Female	122	26.0
Total	**469**	**100.0**
Educational Levels	Freq	Percent
No formal education	113	24.1
Basic (Primary/ JSS/ Middle) School	242	51.6
Secondary (SSSCE/ WASSE)	88	18.8
Tertiary (HND/First Degree equivalent)	26	5.5
Total	**469**	**100.0**

The total number of respondents was 469, made up of 347 male (74%) and 122 females (26%). The males dominated in the sample because of the nature of rice farming. Most of the farmers attained basic level of education, with only 55% having attained tertiary level of education. Thus, about 75.9% of the rice farmers obtained at least basic level of education.

The age and years of rice farming experience of the respondents were measured on a continuous scale to enable quantitative analysis to be performed with other variables. The minimum age of the rice farmers in the study was 23 years and the maximum was 80 years, with their mean age being 45.96 years. The minimum and maximum years of rice farming experience by the respondents were 1 year and 45 years respectively, with the average being 13.65 years.

The sampling procedures adopted were simple random and census. At the Kpong Scheme, there were eight Laterals (divisions) of the farming area. One of the laterals was used for pilot-testing, and the remaing seven were used for the main study. Thus, those who were involved in the pilot-testing of the instruments were not part of the main study. Thirty-seven or thirty-eight respondents were randomly sampled from each lateral depending on the number of farmers in a given lateral, making a total of 263 respondents from the Kpong Scheme. The Schemes were well organized and the number of individuals working in every lateral which formed the sampling frame was obtained from the scheme manager for the sampling. At Ashaiman and Okyereko farms however, the entire population was targeted with the aim of capturing as many as possible. Ninety-eight and one hundred and eight farmers were obtained from Ashaiman and from Okyereko schemes respectively.

The power estimates a-priori sample size determination procedure was used to established the adequacy of the sample used. Given the number of observed and latent variables in the model, the anticipated effect size, and the desired probability and statistical power level, the appropriate sample size was detemined. For this study, there are 5 latent variables and 20 observed variables. Given the probability (alpha) level of .05, anticipated effect size of .3 and the desired statistical power level of .8, the recommended sample size for this study which used the structural equation model is 137, with minimum sample size for model structure and to detect effect 100 and 137 respectively (Soper, 2016). The sample of 469 used in this study was deemed more than adequate to yield representative sample and statistical power.

5.5 Inclusion and Exclusion Criteria

There were different categories of farm workers in the irrigation schemes used for the study. These include the farmers, operators of tractors, tillers and other farm equipment, occasional hired labourers to help with some aspects (e.g. transplanting, tilling) of the rice production, and also the administrative staff and extension officers assigned to the schemes. For this study, the interest was on those who are active rice farmers and engage in the farming activity continuously. Therefore, the respondents included in the study were those who own rice fields and actively engage in rice farming for at least one year. Those who farmed less than a year were dropped from the analysis.

Tractor operators who only plough or till the rice fields but do not engage in rice farming were also not included in the study. Also people who were hired to just help at one stage of the farming process (e.g. transplanting) were also not involved. The scheme managers, extension officers and other administrative staff at the irrigation schemes were also not included in the quantitative study.

5.6 Quantitative Study Research Instrument

Structured questionnaires were the main instrument for the quantitative study. Given that some of the rice farmers could not read or understand the English Language, two versions of the set of questionnaires were used: English version and a translated Twi version. The Questionnaire was translated from English to Twi by the Department of Linguistics and Ghanaian Languages at the University of Cape Coast, following the procedure suggested by Beaton, Bombardier, Guillemin and Ferraz (2002). This is because, at the research areas a sizable percentage of the respondents were not educated and wished to respond in Twi Language. Though a few of the non-educated respondents were of different ethnic background, everyone could understand and speak the Twi Language.

Behling and Law (2000) indicated that a well-translated questionnaire should have semantic equivalence across languages, conceptual equivalence across cultures and normative equivalence to the source survey. The issue of semantic equivalence requires that the words and sentence structure in the translated questionnaire express the same meaning as those in the translated one. Conceptual equivalence also means that the concepts being measured are the same across groups, in this case Twi and English respondents. Normative equivalence represents the degree to which the translated version considers and addresses social issues norms that may differ across the group. This (normative equivalence is not an issues of concern in this study as both groups live in the same areas.

As suggested by Beaton, Bombardier, Guillemin and Ferraz (2002), the semantic equivalence was achieved through the use of two independent forward translators who were professional translators of English to Twi documents at the Department of Ghanaian Languages at the University of Cape Coast. The two translators then compared their versions and any discrepancies identified were addressed, and then the two versions were merged into one document (with my involvement). Another translator later did a back translation from Twi to English to check the validity of the translation. The two versions of the survey instrument (Twi and English versions) were then presented to the thesis supervisory committee (all three committee members speak Twi) to provide expert opinions, and they also scrutinized the two versions and confirmed the semantic equivalence.

Given that all the respondents were Ghanaians working in the same rice irrigation schemes, the issues of normative and conceptual equivalence were not challenges. In addition to semantic, normative and conceptual equivalence, the measurement invariance of composite model (MICOM) procedure proposed by Henseler, Ringle and Sarstedt (2016) was used to assess the compositional equivalence and equality of mean composite score and variances of the measures between the two language respondents. The results showed that there was full measurement invariance between the Twi and the English language respondents. Consequently, the two were put together for all subsequent analyses. Detailed presentation of the MICOM analysis is presented in chapter five. The measures for the variables are described below.

5.6.1 Safety behaviour measures

Safety behaviour of the rice farmers was measured with a 12-item Likert type of scale by Salleh (2010). There are six items each for the two components of safety behaviour: safety participation and safety compliance. The instrument was adapted to suit the rice farms conditions and pilot-tested before use. It is scored on a five point agree (5) – disagree (1) scale. This means that the score range for each subcomponent is from 6 to 30, and the overall composite score for safety behaviour ranges from 12 to 60. Higher score indicates better safety behaviour.

Reported reliabilities range from .76 and above and from the pilot testing reliability coefficients of .87, .74 and .80 for the composite, safety participation and safety compliance respectively were obtained. These were considered acceptable (George & Mallery, 2003) for use in studying rice farmers in Ghana.

5.6.2 Safety performance measure

Safety performance is often measured in research using self-report methods, and was measured in this study with adapted form of the *incident reporting rate questionnaire (*Barling, Loughlin, Kelloway, 2002) which consists of three components, namely, physical symptoms, psychological symptoms and accident rates of respondents. The original scale is made up of 27 incidents, but the adapted version for this study has 39 incidents and respondents are asked: "*In the last month, how frequently did you experience these on the job?"*The scale is scored on a 5-point Likert scale from 1 (never) to 5 (more than 5 times). The adaptation was done base on the findings from study one (the qualitative study) of this thesis.

This questionnaire has been used widely and has reported high internal reliability alpha ranging from .70 to .80, and also found to have good validity (Munteanu, 2005; Kiani, Samavatyan, Pourabdian & Jafari, 2011). In the pilot test, the internal reliability coefficients for the questionnaire and its components (physical symptoms, psychological symptoms and accident) were respectively calculated .64, .76 and .60, with the overall scale alpha coefficient of .83. This suggests that the safety performance scale and its subscales have acceptable internal consistency.

5.6.3 Religiosity measure

The 15-items version of the Centrality of Religiosity Scale (CRS) (Huber & Huber, 2012) was adapted for the study. The scale has 5 additional items for interreligious settings which were included, making a total of 20 items for this study. It measures the general intensities of five theoretically defined core dimensions of religiosity. The five dimensions are: public practice, private practice, religious experience, ideology and the intellectual dimensions. These can together be considered as representative of the religious life of an individual. The scale has been validated in over 20 countries, including a number of African countries (e.g. Nigeria) and found to be very reliable and valid. It is a Likert type of scale measured on 7 points, interpreted as 1 for *Never*, 2 for *A few times a year*, 3 for *1 to 3 times a month*, 4 for *once a week*, 5 for *More than once a week*, 6 for *Once a day*, and 7 for *several times a day*. Individuals with higher scores on the CRS are deemed to have a more central religious construct system. The scale has reported reliability coefficient of .83 and above. The reliability coefficients obtained from the pilot testing are .96, .60, .90, .56, .92, and .92 for the overall scale, intellectual, ideology, public practice, private practice and religious experience subscales respectively.

5.6.4 Safety culture measure

The safety culture scale used by Idris, Dollard, Coward, and Dormann (2012) Bronkhorst (2015) was adapted. This scale was based on Dollard and Kang (2007) and Hall et al. (2010)'s psychosocial safety culture scale. The original scale is made up of five dimensions with three items for each: Management priority for physical health and safety, management commitment to physical health and safety, group norms and behaviour related to physical health and safety, safety Communication, and participation and involvement. Two other components considered to be very relevant for this study and found to be common dimensions used in literature, safety training and safety reporting systems were added because of their relevance to the current study. The two components consist of 9 items. The total items for the safety culture scales used for this study therefore is 24. The items are scored on a five-point likert scale, ranging from *never* (1), *rarely* (2), *sometimes* (3), *mostly* (4), and *always* (5). Scores are added across items to obtain scale and subscale measures of safety culture. The overall quality of safety culture score ranges from 24 to 120, with higher scores representing better safety culture.

The scale has good reported psychometric properties. For instance, Bronkhorst (2015) reported Cronbach's alphas for the five factors in their study as: .87 (top management priority), .89 (direct management commitment), .90 (group norms and behaviour), .91 (safety communication), and 0.86 (involvement and participation). The alpha coefficient obtained in the pilot testing are .78, .65, .57, .82, .51, .64 and .74 for the combined scale, top management priority, direct management commitment, group norms and behaviour, involvement and participation, safety training, and safety reporting respectively. The coefficient for safety communication however, was not good enough, but the scale was included in the study. This might be due to the relatively small sample size. The reliability of the main study with a large sample size is reported in chapter five which is good.

5.6.5 Hazards exposure measure

The hazards exposure scale was developed from study one of the current study and pilot-tested together with the other adapted scale. The scale is made up of 19 items asking respondents to indicate the frequency or the extent of exposure to various rice farming hazards. The hazards were identified through a semi-structured interview and field observation in the three rice irrigation schemes used for this study. The items are scored on a 5-point Likert type of scale from 1 *(never)* to 5 *(more than 5 times)*. Higher score denotes higher exposure to hazards. The validation process of the scale is described in study one. The hazards exposure scale has four subscales: physical, chemical, biological and ergonomic hazards exposure. The reliability of the entire scale when pilot-tested was .73 with subscale reliability coefficients ranging from .51 to .76. Given that this scale is a newly developed scale, the reliability coefficients were deemed to be reasobly good at this stage of the study. Nunnally (1994) suggests that at the early stage of a study involving new measures of a construct, moderate reliability coefficients between .50 and .60 are acceptable because there may be sampling error in the standardization sample.

5.7 Pilot Testing of Quantitative Study Instruments

A pilot testing of the scales was done at the Kpong irrigation scheme to ascertain the validity, reliability and appropriateness of the items before the main study was conducted. Literature suggests that there is no agreed upon sample size that is considered adequate for pilot testing of study protocol. Hertog (2008) for instance indicated that there is simple or strait forward rule for determining the appropriate sample size because other factor must be taken into consideration. Meanwhile, some authors recommend using 10% of the sample projected for the main study (e.g. Connelly, 2008; Treece & Treece, 1982), while other suggest between 10 and 30 respondents (Hill, 1998), or 12 respondents (Julious, 2005; van Belle, 2002). It could therefore be concluded that a sample size of between 10 and 30 would be adequate for pilot testing the instrument for this study.

The study protocol was accordingly pilot tested at the Kpong irrigation scheme with a sample of 32 drawn from one of the laterals, and necessary reviews were done before the main study. The sample is made up of three extension officers, who also engaged in rice farming, and 29 local rice farmers. In all, 26 of the respondents for the pilot testing were males and 6 were females (see Table 13). The respondents used in the pilot-testing were not involved in the main study. The farmers in the remaining seven laterals were the accessible population for the main study.

Table 12: Educational Levels Distribution of Pilot-test Respondents

Educational levels	Frequency	Percentage
No formal education	2	6.3
Basic (Primary/ JSS/ Middle) School	17	53.1
Secondary (SSSCE/ WASSE)	10	31.3
Tertiary (HND/First Degree equivalent)	3	9.4
Total	32	100.0

5.7.1 Reliability analysis of quantitative study measures

The reliability of the instrument, which simply refers to the *consistency of a measure*, was estimated using the cronbach's alpha to ascertain the internal consistency of the items.The psychometric properties of the scales obtained in the pilot test are presented in table 14 below. The reliability coefficients obtained for all the main variables were within acceptable and satisfactory range for all the scales. Some of the subscales however, had Cronbach's alpha below .60. These however were acceptable considering the fact that such subscales were newly adapted and developed (hazards exposure scale) for this study, based on Nunnally's (1994) argument that modest reliabilities of .50 to .60 are adequate. This suggests that there were no challenges with any of the scales regarding meaning of the statements or any other measurement problem. For this reason, the scales were considered appropriate for the main study. The reliability coefficients and the number of items for all the scales and their subscales are presented in table 14 below.

Table 13: Summary of Psychometric Properties of Research Instruments

Scale	Number of items	Reliability
Safety behaviour	**12**	**.86**
-Safety participation	6	.74
-Safety Compliance	6	.80
Religiosity	**19**	**.96**
-Intellectual	3	.60
-Ideology	3	.90
-Public Practice	3	.65
-Private Practice	6	.92
-Experience	4	.92
Safety culture	**24**	**.78**
-Management Safety Priority	3	.74
-Management Commitment	3	.67
-Group safety Norms	3	.82
-Safety Communication	3	.54
-Safety participation	3	.51
-Safety Training	4	.64
-Safety Reporting	5	.74
Safety performance	**38**	**.83**
-Physical Symptoms	22	.64
-Psychological Symptoms	6	.76
-Accidents	10	.60
Hazards exposure	**19**	**.73**
-Chemical hazards	2	.60
-Physical hazards	10	.52
-Ergonomic hazards	4	.51
-Biological hazards	3	.76

A commonly accepted rule of thumb for describing internal consistency (Klin, 2000; George & Mallery, 2003) indicates that $\alpha \geq 0.9$ is excellent, $0.9 > \alpha \geq 0.8$ is good, $0.8 > \alpha \geq 0.7$ is considered acceptable, $0.7 > \alpha \geq 0.6$ is questionable, $0.6 > \alpha \geq 0.5$ poor, and $0.5 > \alpha$ is very poor.

Streiner (2003) indicated that very high reliabilities (0.95 or higher) are not necessarily desirable, because they indicate that the items may be entirely redundant. Adding that the goal in designing a reliable instrument is for scores on similar items to be related (internally consistent), but for each to contribute some unique information as well.

5.8 Quantitative Study Data Collection Procedure

The data for the study were collected within three months, using the set of questionnaires. Two research assistants (MPhil students) were trained by the researcher, together with a PhD candidate, to help in the collection of the data. There were trained Extension Officers who also helped with the data collection after they were given training and briefing on the purpose and nature of the current study. The researcher, together with the research assistants administered the questionnaire to the sampled respondents, whose informed consents were obtained. The completion and collection of the questionnaire were done on the farm sites, or at home, whichever was convenient for the respondents. This boosted the return rate.

At the Kpong Irrigation Scheme, there were five Extension Officers there who had the experience of collecting data from the rice farmers because several NGOs (e.g. JICA, DANIDA etc) employed and trained them for that purpose. These Officers were further *trained* purposely for this study and briefed about the objectives of the study, and together with the Research Assistants were utilized in the data collection in this study as well. Two Extension Officers also help with the data collection at the Okyereko Scheme. The data collection at the Ashaiman Scheme however was done by the research team (Researcher and 2 research assistants). The data were collected through a one-on-one self administration to the farmers.

The Twi version of the questionnaire was used for the farmers who could not read or understand the English Language, and their responses were recorded immediately. Those who could read were however made to complete the questionnaire on their own, and where they had challenges, these were addressed.

The Managements of the Schemes were first contacted on phone to seek their consent for the study to be conducted. This was followed by meeting the Scheme Managers in person and giving them introduction letter, ethical clearance and a copy of the research instrument. The Scheme managers later informed the leaders of the Farmers' Cooperatives about the research. The Cooperative leaders then disseminated the information to the farmers and the research team was informed about their intended general meetings. The research team was invited to explain the aims and objectives of the research to all the farmers present at the meeting. The first data collection started after the meetings and the rest were followed to their homes or farm for the completion of the data. Each farmer was giving either refreshment or a token of GHC 5.00 for participating in the study.

5.9 Quantitative Study Data Analyses Procedure

Several considerations went into the choosing of the statistical technique for the analyses. Lowry and Gaskin suggested that the statistical techniques must be carefully chosen cognizance of the nature of the data to be analyzed and the variables involved. The hypothesized structural and the measurement models of the study were tested to ascertain the extent to which the antecedents predict the safety performance of the rice farmers through their safety behaviour. The main analytical tool employed was the Partial Least Square Structural Equation Modelling (PLS-SEM). The PLS-SEM, also known as PLS-Path Modelling, Component-based SEM, or Variance-based SEM (Garson, 2016) was used to establish the causal relationships among multiple latent variables measured. This was done mainly to estimate the probability that the pattern of the results could have occurred by chance rather than the proposed theoretical causes being tested (Lowry & Gaskin, 2014). According to Lowry and Gaskin, Structural Equation Modelling (SEM) involves estimation of causal relationships based on a theoretical model. The analysis was done with the SmartPLS 3.2.6 software, developed by Ringle, Wende and Will (2005) and deemed to be one of the principal and most developed software applications for PLS-SEM.

Generally, SEM consists of testing of measurement model and structural model. The two sub-models are referred to as *the inner model and the outer model*. The inner model (structural model) tests the relationships between the independent and dependent latent variables. The outer (measurement) model on the other hand tests the relationships between the latent variables and their indicators (Wong, 2013). These were evaluated accordingly.

Assessment of measurement invariance, using the three-step MICOM approach (Henseler, Hubona & Ray, 2016) was done, which suggested that the two versions of the questionnaire used (Twi and English) could meaningfully be pooled together for the measurement and structural model evaluations. The first step involves establishing configural invariance, which was done qualitatively. After that has been established, further measurement invariance assessments focus primarily on the systematic error of the measures. This is to ensure that the constructs do not have different meanings in Twi and English groups. The second, scalar invariance also requires that measurement intercepts do not differ across the groups. Scalar invariance implies that group differences in the mean values of the observed items are due to differences in those of the underlying construct (Steenkamp & Baumgartner, 1998). These were also done through the establishment compositional invariance and equality of composite mean score values and variances. The permutation algorithm was used to evaluate the measurement invariance and also perform multi-group analysis of males and females on the latent variables.

The descriptive statistics of the variables and Multivariate analysis of variance (MANOVA) tests were done using the SPSS version 21.0 and summaries of the results are presented in tables.

5.9.1 Measurement invariance evaluation procedure

The meanings that respondents of different groups in a research give to the issue under investigations could lead to difference in the structural relationship between the latent variables, rather than actual differences in the structural relations. Two versions of questionnaires were used in this study which requires the assessment of measurement in variance between the two versions (Twi and English versions). Also, males and females were compared on the latent variables in the study. Henseler, Ringle and Sarstedt (2016) stressed that assessment of measurement invariance is a critical consideration in multi-group SEM analyses. Measurement invariance refers to "whether or not, under different conditions of observing and studying phenomena, measurement operations yield measures of the same attribute" (Horn & McArdle, 1992, p. 117). This study adopted the three-step MICOM procedure for establishing measurement invariance suggested by Henseler et al. (2016). Henseler et al. indicate that the MICOM procedure is based on non-parametric tests because the variance-based SEM techniques typically do not make distributional assumptions (Hair, Hult, Ringle & Sarstedt, 2017; Lohmöller, 1989; Wold, 1982). This involves the assessment of (1) configural invariance (i.e. equal parameterization and way of estimation), (2) compositional invariance (i.e. equal indicator weights), and (3) the equality of mean value and variance of a composite across groups. The three steps are hierarchically interrelated, which means that one could proceed to the next step only if the previous step's analyses support measurement invariance. Thus, configural invariance is a precondition for compositional invariance, which in turn is a precondition for meaningfully assessing the equality of composite mean values and variances in the final stage.

5.9.2 Evaluation of measurement model procedure

The measurement model shows the goodness of fit and reliability of the measures and the larger the loadings, the stronger and more reliable the measurement model. The focus therefore is to establish the relationship between the latent variable and their manifest (observed) indicators). The measurement model ensures that errors are taken care of before the structural model is done (Albrs, 2010; Hair, Black, Babin, Anderson & Tatham, 2006). This ensures accurate estimations of the hypothesized relationships in the structural model.

There are two types of measurement models: reflective and formative measurement models. In a reflective measurement model, the manifest indicators of a latent variable are presumed to measure a unique underlying concept. Reflective indicators are seen as an effect of their corresponding latent variable and their covariances with the measures reflect their latent construct. The manifest indicators in a reflective model play the role of endogenous variable in the measurement model. The indicators of a construct must covary and they are assumed be a block of homogenous or unidimensional and so the internal consistency of the indicators of a latent variables must be established. This is because the reflective indicators reflect the unique latent construct. The measurement model in a reflective model produces the factor analysis model (Garson, 2016).

Reflective measurement models depend on the assumption that a latent variable equals the common factor underlying a set of observed variables or indicators where the indicators are expected to be correlated (Henseler, Ringle & Sarstedt, 2016). The common factor in this case represents the shared variance of the indicators. Javis, MacKenzie and Podsakoff (2003) indicate that when an indicator or indicators are dropped in a reflective measurement model the meaning of the common factor is not affected.

Formative model represents situations in which the indicators cause the construct. Thus, the phenomenon does not occur naturally, but rather *formed* by the presence of the underlying measures (Javis et al., 2003). Formative measurement models do not require correlated indicators. If indicators are dropped from a formative measurement model, important content or domain of the construct would be removed which would change the meaning of the construct. Formative indicators operate as contributors to a composite variable and so, form the composite fully by means of linear combinations making the composite not having error term (Henseler, Ringle & Sarstedt, 2016). Psychometric literature typically refers to composite rather than formative indicators (Bollen, 2011). Sarstedt et al. (2014) indicated that constructs are not inherently formative or reflective in nature, but rather depends on the construct conceptualization, the aim of the research, and the role of the construct in the model. Gotz, Lechr-Gobbers and Krafft (2010) and Boorshboom, Mellenbergh and van Heerden (2004) also indicated that theoretical foundation determines whether a variable should be modelled as reflective or formative.

5.9.3 Reflective model fit evaluation procedure

The fit of reflective model is established by assessing the outer loadings which represent the absolute contributions of the indicators to the definition of their latent reflective variable and may be considered a form of reliability coefficient for reflective model. According to Henseler, Ringle and Sartedt (2012), a well-fitted reflective model should have indicator path loadings above .70. Hair, Sarstedt, Hopkins and Kuppelwieser (2014) also indicated that as a rule of thumb, indicator loadings within the range from .40 to .70 should be dropped if that would improve the composite reliability. However, indicator loading greater than .60 is deemed adequate for exploratory purpose (Shin, 1998; Hock & Ringle, 2006), and loadings greater than

.70 (Henseler, Ringle & Sarstedt, 2012) and greater than .80 (Daskalakis & Mantas, 2008) are deemed adequate for confirmatory purpose. Yoo and Alavi (2001) also suggest that factor loadings for reflective indicators must be greater than or equal to .60 to be included in the model (Yoo & Alavi, 2001).

5.9.4 Reliability and validity analyses procedures

Henseler, Dijkstra, Sarstedt, Ringle, Diamantopoulos, Straub, and Calantone (2014) suggest that measures of internal consistency reliability only make sense if the composite approximates a reflective construct. The internal consistency reliability of the reflective scales was therefore determined, using the Cronbach's alpha as lower bound and the composite reliability as the upper bound. Both of these must be above .70 (Hair et al., 2014; Henseler, Ringle & Sartedt, 2012). The Fornell-Larcker Discriminant criterion was used to assess the discriminant validity of the variables. This computes the square root of the AVE and is placed in the diagonals cells in a table of matrix and the correlations of other factors are shown below it. The Fornell-Larcker Discriminant criterion of a factor must be greater than its correlation with other latent variables for discriminant validity to be established (Garson, 2016; Nitzl et al., 2016).

The average variance extracted (AVE) demonstrates both convergent and divergent validity (Garson, 2016). This reflects the average communality for each latent variable in a reflective model. AVE of .50 is considered adequate (Chin, 1998; Hock & Ringle, 2006) and should be greater than the cross loadings of the other constructs. Thus, a factor should explain at least 50% of the variance of its indicators. AVE less than .50 means the error variance is more than the explained variance.

5.9.5 Formative model fit evaluation procedure

Formative constructs are psychometrically referred to as composite model (Bollen, 2011). This type of model does not impose any restrictions on the covariances between the same construct indicators. Linear combinations of indicators serve as proxies for the scientific concept under investigation (Henseler et al., 2014). Consequently, dropping an indicator from the measurement model usually alters the meaning of the composite. Formative model fit is therefore established by assessing the relative contributions of each indicator to the construct using the indicator weight (i.e. outer weights). Model fit of formative constructs is determined by the significance of the indicator weights. Since the indicators represent unique domain of the construct, caution and practical judgement must be exercised as to whether a non-significant indicator must be deleted or not (Ringle, Sarstedt & Straub, 2012). Deleting an item may mean sacrificing content validity. This calls for making a choice between theoretical and statistical considerations. Therefore, in the evaluation of the formative indicators in this study, items that were deemed important for the dimensions being measured were not deleted even though they were not statistically significant.

The variance inflation factors (VIF) were also used in determining the relevance of formative indicators and whether multiple indicators were measuring a specific domain of the construct being measured (Hair, Hult et al., 2014). The results show that all the VIFs were below 5.0 which is an indication that there was no issue of multicollinearity of the indicators, and that each was measuring a unique domain of the constructs in question (see appendix).

5.9.6 Evaluation of the structural model Procedure

The structural model tests the causal relationships between the exogenous latent variables and the endogenous latent variables (Garson, 2016). The significance of the path coefficients is determined through the PLS bootstrapping approach. The goodness of fit of the structural model is established by the coefficient of determination (R^2) which explains the variance in the endogenous variable that is explained by the endogenous variable (Garson, 2016). This represents the overall fit of the structural model (Hair, Sarstedt et al., 2014; Henseler et al., 2012). The predictive relevance (Q^2) and the effect size (f^2) are also used to establish the fitness of the analytical model.

Predictive relevance is established by the value of Stone-Geisser Q^2. Stone-Geisser Q^2 greater zero (0) is indicative of predictive relevance of the model. According to Cohen (1988), a Q^2 of .02 is considered to be a small effect size, .15, medium and .35 considered high effect size. Zero or negative effect size indicates that the model is not relevant to prediction of the given endogenous variable. This rule of thumb is widely applied by researchers in Social Science and so, adopted in this study as well.

5.9.7 Global fit indices of PLS-SEM

The meaning of the term *fit* in CB-SEM is different in PLS-SEM (Hair et al., 2012, Hair, Sarstedt et al., 2014; Henseler et al., 2014; Nitzl et al., 2016). Model fit indices for CB-SEM are obtained from the discrepancy between the empirical and the model-implied (theoretical) covariance matrix, whereas PLS-SEM focuses on the discrepancy between the observed values of manifest variables or approximated values of latent variables of the dependent variables and the values predicted by the model in question (Hair et al., 2012a).

Global Fit indices are not strictly required in PLS-SEM as compared to the CB-SEM methods (e.g AMOS and LISREL) because PLS-SEM is not for confirmation of a model, but prediction. Thus, indices such as RMSEA, CFI, IFI or NFI are not required for PLS-SEM assessments (Hair et al, 2012; Henseler et al., 2014; Nitzl et al., 2016; Tenenhaus, Vinzi, Chatelin & Lauro, 2005). The predictive relevance ($Q^{2)}$ or capability of a model is therefore used to evaluate the quality or fit of the model (Henseler et al., 2014). Thus, Q^2 was therefore used as the estimate of the quality of the predictive relevance of in this study.

5.9.8 Mediation analysis Procedure

Mediation process is one way that researchers can explain the process of, or mechanism by which one variable affects another (MacKinnon et al., 2007). When researchers focus only on direct relationships and ignore mediating effects the interpretation of results could be greatly biased. This is because a variable may have no direct effect as a result of its effect being mediated by another variable (Nitzl et al., 2016). In this case, the researcher may assume that the variable in question is not relevant in answering the research question.

The bootstrapping approach by Preacher and Hayes (2004, 2008) was used to test the significance of the mediation effects in this study. This approach is a non-parametric inferential technique that randomly draws several samples with replacement from the original data set. This approach does not require assumptions about the shape of the variable distribution and is considered the best approach to test mediation effect since the distribution of the indirect effect has been found to be asymmetrical (Nitzl et al., 2016). Bootstrapping helps to determine the significance of the mediation effect (Hadi et al., 2016). Mediation effect always exists when the indirect effect is significant, and there is no mediation if the indirect effect is not significant (Garson, 2016; Hair et al., 2014; Wong, 2015).

To evaluate the strength, one approach is to partition the total, direct and indirect effects and to calculate the VAF which involves the estimation of the indirect-to-direct effect ratio. This ratio explains the extent to which the mediation process explains the variance in the endogenous variable. Thus, the indirect effect of the exogenous variable on the endogenous variable must be tested and the strength of the indirect effect would determine the size of the mediation. The bootstrapping was again used to determine the significance of the indirect effect before the VAF ratio is computed. The VAF is computed with the simple formula:

$$\text{VAF} = \frac{Indirect\ effect}{Total\ effect}$$

As a rule of thumb, if the VAF is less than .20, there is nearly zero mediation, VAF between .20 and .80 indicates a typical partial mediation (Hair et. al., 2016), and VAF greater than .80 indicates full mediation.

5.9.9 Test of moderation effects procedure

The two stage moderation analysis procedure (Henseler & Fassott, 2010) in the SmartPLS algorithm was used. The first stage involves running the main effects of the PLS paths to obtain construct scores for the exogenous and the moderator variables and saved for further analysis. Interaction term is generated at the second stage as the element-wise product of the construct scores of the exogenous and the moderator variables obtained at stage one. The interaction term and the independent variable scores are used in a regression on the endogenous variable.

5.9.10 Effects of demographic variables analysis prcedure

The effects of age, gender, level of education and years of farming experience were also explored. The Multi-group analysis (MGA) in SmartPLS and two-way MANOVA in SPSS were used to analyse these effects of the demographic variables on the latent variables. Detailed presentations of the analysis and the results are presented in chapter five.

5.10 Justification for the Use of Structural Equation Modelling (SEM)

Structural equation model is a second generation multivariate data analytical tool that tests theoretically supported linear and additive causal model (Statsoft, 2013, Wong, 2013) and links two or more latent complex variables or concepts that have been measured by a number of manifest indicators (Sarstedt et. al., 2014). It enables the testing of causal relationships among latent variables measured by a number of observed or manifest indicators (items).

The many multi-dimensional latent variables tested in this study made it imperative for the use of SEM. SEM enables multiple latent variables to be included in causal models in which constructs have many indicators that represent dimensions of the latent variable (Garson, 2016, Lowry & Gaskin, 2014). It enabled connecting all the exogenous variable paths to the dependent variables in the same model and analyze all the paths simultaneously rather than one at a time (Gefen, Straub & Boudreau, 2000). This study involved five latent variables: three exogenous, one mediating and one endogenous. The exogenous variables are the religiosity, hazards exposure and safety culture of the rice farmers. The religiosity latent variable consists of five dimensions with19 indicators, and safety culture latent variable consists of seven dimensions with 24 indicators. Hazards exposure is also a four-dimensional construct with 19 indicators. The endogenous variable, also a three dimensional latent variable made up of 39 indicators. There was also a mediating latent variable, the safety behaviour, which was a two dimensional variable with 12 indicators. Finally, four demographic variables were also included in the model. Thus, the study involved five multidimensional latent variables, 21 subscales and 113 indicators, and four demographic variables.

Researchers generally use two main approaches to estimate structural equation models (Sarstedt, Hair, Ringle, Thiele & Gudergan, 2016). The two approaches are the covariance-based SEM (CB-SEM) and the variance or composite based SEM (PLS-SEM). Sarstedt, et al. (2016) observed that the CB-SEM (Bollen, 1989; Diamantopoulos, 1994; Joreskog, 1978) is a more widely applied approach than the PLS-SEM (Hair, Hult, Ringle, & Sarstedt, 2017; Lohmoller, 1989; Wold, 1982).

Covariance-based SEM approach seeks to obtain a theoretical covariance matrix without focusing on explained variance, but calculates the covariances of a set of variables (the common variance) and only that variance is used in any solutions derived (Sarstedt et al, 2016). This approach therefore follows a common factor modeling in estimating construct measure. The common factor model approach assumes that the variance of a set of indicators can be perfectly explained by the existence of one unobserved variable (i.e. the common factor) and individual random errors (Spearman, 1927; Thurstone, 1942; Sarstedt et al, 2016).

Variance-based SEM techniques on the other hand model latent variables as composites and generate proxies from linear combinations of the indicators of a variable. PLS-SEM therefore aims at maximizing the explained variance of the dependent variable (Hair, Ringle et al., 2012) and so seeks to account for the total variance in the observed indicators rather than to explain only the correlation between the indicators (Tenenhaus, Esposito Vinzi, Chatelin & Lauro, 2005; Sarstedt et al., 2016). In this case, the total variance (common, unique and error) that the exogenous variables have in common with the endogenous is included in the estimation of the relationships in the model (Sarstedt et al., 2016). The indicators therefore could be meaningfully combined linearly to form composite variables that comprehensively represent their latent variable and become valid proxies of the conceptual variables being investigated (Henseler, Hubona et al., 2016).

5.10.1 Justification for the Use of PLS-SEM

PLS-SEM was deemed the most appropriate and chosen over the CB-SEM for this study for several reasons. First of all, the CB-SEM approach has been found to produce improper solution in 99% of the cases when the composite model holds (Sarstedt et al., 2016). Meanwhile, when PLS is used to estimate common factor models the error it produces is comparably smaller than when CB-SEM is used to estimate composite models (Barroso, Cepeda Carrion & Roldan, 2010; Hwang, Malhotra, Kim, Tomiuk & Hong, 2010; Marcoulides, Chin & Saunders, 2012; Reinartz et al., 2009; Sarstedt et al., 2016). Rigdon (2012) and Sarstedt, Ringle, Henseler et al (2014) also observed that in practical applications, improper solutions often occur in the use of CB-SEM, and that more often than not, the common factor model assumptions could not be supported in practice (Atinc et al., 2012). Sarstedt et al. (2016) aptly holds that PLS-SEM is the safer option when estimating data from an unknown population, stating that the parameter bias resulting from the use of SEM methods on discrepant populations is much more severe for CB-SEM than for PLS-SEM.

Again, both approaches have been found to have produced comparable results when the models have good measurement properties in several simulation conditions (Amaro, Seabra & Abrantes, 2015; Marcoulides, Chin & Saunders, 2012; Reinartz, Haenlein & Henseler, 2009; Sarstedt et al., 2016; Rigdon, 2012; Sarstedt, Ringle, Henseler et al., 2014). This suggests that PLS-SEM is as equally good as the CB-SEM when appropriately applied, and in situation where

PLS-SEM is inappropriately applied to estimate common factor model, it provides relatively better estimates than when CB-SEM is inappropriately used to estimate composite-based model. PLS-SEM is therefore more robust in the face of inappropriate modelling and in situations where it is unclear as to whether the nature of the data is composite-based of common factor-based.

Furthermore, the variables measured in this study consists of both reflective and formative constructs and the nature of the data is also unknown (whether composite-based or common factor-based), making the PLS-SEM the better option for this study. In addition, PLS-SEM is a soft modeling technique that does not make assumptions about data distribution (Lowry & Gaskin, 2014; Vinzi et. al, cited in Wong, 2013) and is considered a better alternative to the Covariance-Based (CB-SEM) when predictive accuracy is important and correct model specification cannot be ensured (Sarstedt et al., 2016; Rigdon, 2012; Sarstedt, Ringle, Henseler et al, 2014).

The prediction focus of the study also made the PLS-SEM more suitable than the CB-SEM. This study predicted the safety performance of rice farmers through their safety culture and religiosity. Predictive accuracy is of importance in this study and PLS-SEM is a better option in that regard (Amaro, Seabra & Abrantes, 2015; Garson, 2016; Hair, Ringle et al, 2014; Rigdon, 2012; Sarstedt, Ringle, Henseler et al., 2014; Sarstedt et al., 2016). CB-SEM is preferred when the purpose of the research is confirmatory and global fit index is required and so was not deemed to be the appropriate approach for this study.

The PLS-SEM also has the ability to handle multicollinearity among the independent variables (Garson, 2016). This study tested the predictive value or relevance of the dimensions of safety culture and religiosity, a situation in which the dimensions were likely to be collinearly related, hence the PLS-SEM was considered superior over the CB-SEM. Furthermore, the PLS-

SEM is robust in the face of data noise and creating independent latent variables directly on the basis of cross-products involving the response variables and making stronger predictions (Sarstedt et al, 2016; Hair, Ringle et al, 2014).

5.11 Results of Preliminary Analyses

5.11.1 Evaluation of measurement invariance

This study adopted the three-step hierarchical MICOM procedure for establishing measurement invariance suggested by Henseler et al. (2016):

Step 1: Configural invariance

Establishing configural invariance requires that the same basic factor structure exists in all the groups, in terms of number of constructs and items associated with each construct (Henseler et al., 2016). Identical data treatment was also applied to the two sets in terms of the way the coding, reverse coding, and other forms of re-coding, missing value, outliers handling. Finally, the algorithm settings or optimization criteria (Hair et al., 2012b; Henseler et al., 2009) were also the same. For instance, 5000 bootstrapping was used for all constructs.

Step 2: Compositional Invariance

The second step of the MICOM procedure is compositional invariance which focuses on that the way the indicator variables are combined into composites is the same for all groups. This ensures that differences in structural coefficients do not result from differences in the way the composite is formed. The compositional invariance is established when the scores of a composite are created the same way and the scores of the composites are the similar across groups. The permutation test of the correlation between the composite means of the Twi and English groups was used (Henseler et al., 2016). The permutation p-value must show non-significant correlation foe compositional invariance to be established. The results showed that the permutation p-values of all the constructs were greater than .05, hence compositional invariance was established.

Table 14: Original and Permutation Correlations of Mean Composite Values

	Original Correlation	Correlation Perm Mean	5.0%	Perm p-Values
Hazards exposure	0.969	0.984	0.951	0.121
Religiosity	0.998	0.994	0.982	0.873
Safety behaviour	0.999	0.999	0.997	0.391
Safety culture	0.999	0.999	0.997	0.268
Safety performance	0.998	0.997	0.989	0.133

Step 3: Equality of composite mean values and variances

Having established computational invariance at the second step, the final MICOM step was assessed. This involved testing if the there were equality of composite mean values and variances across the groups. Again, the results show that the composite mean values and variances for all the groups were not significantly different between those who responded to the items in Twi and those who responded in the English Language. This suggests that full measurement invariance was established and so the groups were pooled together for the subsequent analyses of the assessment of measurement and structural models. Table 16 presents the equality of composite mean values and variances.

Table 15: Equality of Composite Mean Values and Variances

Equality of composite mean values

Latent Variable	Orig Mean - Diff (Twi - Eng)	Perm Mean Diff (Twi - Eng)	2.5%	97.5%	Perm p-Values
Hazards exposure	-0.100	0.002	-0.207	0.219	0.349
Religiosity	-0.181	-0.001	-0.213	0.211	0.096
Safety behaviour	-0.130	0.000	-0.209	0.216	0.218
Safety culture	0.142	-0.001	-0.217	0.205	
Safety performance	-0.140	-0.000	-0.210	0.218	

Equality of composite variances

Latent Variable	Var - Orig Diff (Twi -Eng)	Var - Perm Diff (Twi-Eng)	2.5%	97.5%	Perm p-Values
Hazards exposure	-0.037	-0.021	-0.514	0.428	0.927
Religiosity	-0.044	-0.015	-0.355	0.376	0.957
Safety behaviour	-0.136	-0.011	-0.321	0.275	0.396
Safety culture	-0.191	-0.019	-0.291	0.249	0.302
Safety performance	-0.236	-0.017	-0.347	0.304	0.182

5.12 Results of Measurement Model of the study

The study involved five main latent variables: three exogenous, one endogenous and one mediating latent variables. The quality criteria for reflective measure include adequate indicator loadings; construct reliability and validity, convergent and discriminant validities. Reliability of the scales was measured with the Cronbach's alpha and composite reliability. The construct and convergent validities were tested with the average variance extracted (AVE). Average variance extracted greater than .50 shows good construct validity because it indicates that the indicators accounted for more than 50% of the variance in the definition the construct. The Fornell-Larcker Discriminant criterion was used to establish discriminant validity of the measures. The Fornell-Larcker Discriminant criterion of a factor must be greater than its correlation with other latent variables.

5.12.1 Evaluation of safety behaviour

The two component safety behaviour scale used in the study is made up of 12 items (indicators), 6 each for safety participation and safety compliance. This scale was modelled as a reflective construct. At the initial stage, some of the indicators in both safety participation and safety compliance had loadings below the .70 cut-off point and were deleted. The final model consists of three safety compliance indicators and four safety participation indicators for the structural model testing. The composite reliability for safety compliance was .903 with an AVE of .757, and composite and AVE for safety participation were .918 and .738 respectively. The Fornell-Larcker criterion (Table 17) also shows that the two dimensions are distinct and could be treated as separate dimensions of the safety behaviour construct, thus, discriminant validity measure was established.

Table 16: Fornell-Larcker Discriminant Criterion table for Safety Behaviour Dimensions

	Safety Compliance	Safety Participation
Safety Compliance	0.870	
Safety Participation	0.653	0.859

5.12.2 Evaluation of religiosity measures

The religiosity construct consists of five dimensions, intellectual, religious ideology, public practice, private practice and religious experience. The first modelling of the construct showed that some of the indicator loadings were below the acceptable estimates and were deleted. The final model used for the analysis consisted of 17 indicators, all loading adequately on their dimensions, except the two items for intellectual and public practice dimensions that did not load adequately and a decision was taken to retain them on theoretical and practical bases. The reliability estimates as well as the AVE for all construct were within acceptable ranges which is an indication that the measurement model for religiosity was adequately good. The dimensions also demonstrated adequate discriminant validity which confirms the five component measure of the religiosity construct.

Table 17: Fornell-Larcker Discriminant Criterion Table for Dimensions of Religiosity

	Experience	Ideology	Intellect	Private	Public
Experience	**0.889**				
Ideology	0.542	**0.835**			
Intellect	0.554	0.508	**0.699**		
Private	0.796	0.593	0.587	**0.780**	
Public	0.489	0.389	0.560	0.530	**0.768**

5.12.3 Evaluation of safety culture measures

A 24-item safety culture scale used in this study consists of seven dimensions. All of the indicators, except the item "*I was given induction training when I started working here*" in the safety training dimension which and was deleted, loaded adequately. The composite reliability and Cronbach's alpha of all the dimensions were all above the .70 cut-off point, except the Cronbach's alpha of .674 for safety communication. However, for exploratory purpose, the alpha of .674 is deemed adequate. Again, the AVE for safety communication of .607 was above the .50 cut-off point, which means that the safety communication dimension accounted for 60.7% of the variance in the indicators. Thus, all the dimensions demonstrated adequate construct reliability and convergent validity which is an indication of good model fit for the safety culture construct.

The Cronbach's alpha, composite reliability and the AVEs of all the dimensions of safety culture demonstrate very good reliability and construct validity. The Cronbach's alpha ranges from .674 (safety communication) to .899 (safety reporting). In fact, it was only safety reporting that has alpha coefficient below .70. Meanwhile, the .674 meets the criterion for exploratory purposes. The composite reliability which is the preferred measure of construct reliability in

SEM analysis ranges from .822 to .932 which is an indication that all the dimensions demonstrate good construct reliability. The safety culture components also demonstrated discriminant validity which is an indication of the acceptability of the seven component construct.

Table 18: Fornell-Larcker Discriminant criterion table for Dimensions of Safety Culture

Variables	1	2	3	4	5	6	7
Grp safety Norms	**0.905**						
Mgt safety Commitment	0.601	**0.862**					
Mgt safety Priority	0.535	0.769	**0.833**				
Safety Communication	0.735	0.648	0.564	**0.779**			
Safety Participation	0.598	0.632	0.562	0.682	**0.828**		
Safety Reporting	0.671	0.566	0.517	0.714	0.686	**0.845**	
Safety Training	0.614	0.638	0.616	0.657	0.554	0.661	**0.843**

5.12.4 Evaluation of safety performance measures

The safety performance construct consists of three dimensions: Physical symptoms, Psychological symptoms and accidents/injuries. The physical symptoms and accident dimensions were modelled as formative variables, while the psychological symptoms dimension was modelled as a variable. To assess model fitness of formative variables, the outer weights, instead of the outer loading in the case of reflective model are used. Thus, for the physical symptoms and the accidents dimensions, the outer weights were used and their significance was assessed through the SmartPLS bootstrapping with 500 re-sampling.

Psychological symptoms dimension of safety performance

The psychological symptoms dimension had six indicators from the beginning. All the indicator loadings were above the acceptable level, except, F23 "*Lost much sleep due to work related worries*" (.550). The Cronbach's alpha and the composite reliability for the final model were .875, and .910 respectively, with an AVE of .668, which indicates a good fit of the psychological symptoms measurement model.

Physical symptoms and accident dimensions of safety performance

The physical symptoms and the accidents dimensions were modelled as formative variables because each indicator represents a unique aspect of their dimensions and so not replaceable by another indicator. For this reason, indicator weights, instead of loadings were used. The SmartPLS bootstrapping algorithm with 500 re-sampling was used to test the significance of the indicator. Three items were deleted because of cross loading after and the final measures are presented in the appendix.

5.12.5 Evaluation of hazards exposure measures

The rice farm hazard exposure variable was measured with a 19-item scale which consists of common and major hazards that the farmers are exposed to. This construct was modelled as a formative construct, with four dimensions. Though some of the item weights were not significant, they were not deleted because they were deemed to be relevant to the study, and analysis of VIFs show that they were measuring unique dimension of hazard exposure in the rice farms. The measures and indicators used in the analysis are presented in table (see appendix).

5.13 Evaluation of Higher Order Measures (Dimension-construct loadings)

After ascertaining the fitness of the indicators in defining each of the dimensions of a construct, the next level in the measurement model was to assess how well the dimensions also fit the definition of the construct as suggested by Ringle, Sarstedt, Schlittgen and Taylor (2013). This study used the reflective-reflective repeated indicator approach for the reflectively modelled variables and reflective-formative for the formatively modelled construct. The higher order constructs were therefore appropriately evaluated. All the dimensions of the constructs adequately loaded or contributed adequately and significantly to the definition of their latent construct as presented in table 20. The average variance extracted (AVE) for each of the latent variables was above the .50 cut-off point which is a demonstration of adequate construct and convergent validity of all the constructs. Thus, all the measures had adequate psychometric properties and so reliability, construct and discriminant validities were established.

Table 19: Evaluation of the Loadings of Sub-scales on their Latent Constructs

Paths	O	M	Sd	t-stats	p-value
Safety Culture	**CA =.952**	**CR= .956**	**AVE=.676**		
SCTR -> GRPN	0.832	0.832	0.019	43.788	0.000
SCTR -> MGTC	0.823	0.823	0.015	55.405	0.000
SCTR -> MGTPR	0.770	0.768	0.023	33.396	0.000
SCTR -> SFTCOM	0.862	0.862	0.012	72.716	0.000
SCTR -> SFTPT	0.810	0.811	0.017	48.149	0.000
SCTR -> SFTRPT	0.865	0.866	0.012	73.527	0.000
SCTR -> SFTTRN	0.813	0.815	0.021	39.242	0.000
Religiosity	**CA =.910**	**CR= .924**	**AVE= .589**		
REL -> EXPER	0.881	0.883	0.010	84.610	0.000
REL -> IDEOL	0.736	0.739	0.026	28.516	0.000
REL -> INTL	0.776	0.794	0.032	24.005	0.000
REL -> PRIV	0.920	0.919	0.007	131.508	0.000
REL -> PUBL	0.688	0.705	0.043	15.875	0.000
Safety Behaviour	**CA =.897**	**CR= .919**	**AVE= .842**		
SBVR -> SCB	0.938	0.938	0.007	125.595	0.000
SBVR -> SPB	0.922	0.922	0.009	105.810	0.000
Safety Performance	**CA =.907**	**CR= .917**	**AVE= .708**		
SPF -> ACC	0.883	0.886	0.012	74.938	0.000
SPF -> PHY	0.933	0.937	0.008	115.626	0.000
SPF -> PSYC	0.756	0.759	0.019	39.773	0.000
HAZ_X	**CA =.780**	**CR =.814**	**AVE=.243**		
HAZ_X -> BIO_HZ	0.681	0.688	0.033	20.694	0.000
HAZ_X -> CHEM_HZ	0.804	0.802	0.035	23.068	0.000
HAZ_X -> ERGO_HZ	0.827	0.829	0.020	41.204	0.000
HAZ_X -> PHY_HZ	0.875	0.880	0.012	73.324	0.000

**EXPER = Religious experience; IDEOL = Ideology; INTL = Intellect; PRIV = Private Practice; PUBL = Public practice; HAZ_X=Hazards exposure; BIO_HZ=Biological hazards; CHEM_HZ =Chemical hazards; ERGO_HZ= Ergonomic hazards, PHY_HZ= Physical hazards; *PHY = Physical symptoms; PSYC = Psychological Symptoms; ACC = Accidents*

5.14 Descriptive Statistics

The mean scores, the number of items on each scale, the scoring, as well as the minimum and maximum possible scores on the scales are presented in Table 21.

Table 20: Descriptive statistics of subscales and composite scores of latent variables
(*Composite scores of sub-scales are in **Bold** print**)

Variables	Mean	No of Items	Rating	Min	Max	Stdv.	Skewness	SE	Kurtosis	SE
Safety participation	13.99	4	5-Point	4	20	3.88	-.659	.113	.064	.225
Safety compliance	11.49	3	5-Point	3	15	2.49	-.250	.113	-.715	.225
Safety behaviour*	**25.48**	**7**	5-Point	**7**	**35**	**5.82**	**-.582**	**.113**	**-.029**	**.225**
Intellectual	16.16	3	7-Point	3	21	5.10	6.489	.113	9.94	.225
Ideological	18.22	3	7-Point	3	21	3.76	-1.345	.113	.931	.225
Public practice	15.46	3	7-Point	3	21	5.24	6.233	.113	7.39	.225
Private practice	27.51	5	7-Point	5	35	6.34	-.634	.113	-.592	.225
Rel experience	15.62	3	7-Point	3	21	4.81	-.452	.113	-1.005	.225
Religiosity*	**92.98**	**17**	7-Point	**17**	**119**	**19.64**	**-.058**	**.113**	**1.761**	**.225**
Mgt safety priority	10.63	3	5-Point	3	15	2.98	-.591	.113	-.619	.225
Mgt commit to safety	10.11	3	5-Point	3	15	2.87	-.191	.113	-.581	.225
Group safety norms	10.08	3	5-Point	3	15	3.29	-.641	.113	-.072	.225
Safety communication	9.94	3	5-Point	3	15	2.51	-.706	.113	.362	.225
Safety participation	10.03	3	5-Point	3	15	2.75	-.686	.113	.222	.225
Safety reporting	10.00	3	5-Point	3	15	2.97	-.295	.113	-.586	.225
Safety training	15.88	5	5-Point	5	25	5.83	-.288	.113	-.867	.225
Safety culture*	**76.68**	**23**	5-Point	**23**	**115**	**19.19**	**-.456**	**.113**	**-.509**	**.225**
Physical symptoms	40.76	20	5-Point	20	100	9.89	.599	.113	.234	.225
Psych symptoms	10.19	5	5-Point	5	25	4.58	1.214	.113	1.475	.225
Accidents	14.76	9	5-Point	9	45	4.60	1.327	.113	2.660	.225
Safety performance*	**65.70**	**34**	5-Point	**34**	**170**	**16.34**	**.582**	**.113**	**.148**	**.225**
Chemical Hazard	5.19	**2**	7-point	**2**	**14**	2.54	1.989	.113	3.937	.225
Physical Hazard	43.54	**10**	7-point	**10**	**70**	10.30	-.115	.113	.211	.225
Ergonomic Hazard	16.07	**4**	7-point	**4**	**28**	4.29	.678	.113	.725	.225
Biological Hazard	14.66	**3**	7-point	**3**	**21**	3.36	.222	.113	-.670	.225
Hazard exposure*	**79.46**	**19**	**7-point**	**19**	**133**	**15.67**	**.852**	**.113**	**1.595**	**.225**

**Represents composite (overall) scores*

The results indicated that the overall safety behaviour of the rice farmers was quite good, which reflected in the subscales as well. Thus, generally, the safety behaviour of the rice farmers seems to be quite good, but there is more room for improvement. Considering the level of religiosity of the rice farmers, the results indicated that the overall level of religiosity was quite high. The overall safety culture score of the rice farmers was also quite satisfactory, and this reflected in all the dimensions as well. The hazards exposure scores for the composite as well as the subscales were high as well, indicating that the rice farmers were exposed to high level of hazards of various kinds. Finally, safety performance scores were also quite high indicating poor safety performance. Higher scores represent more health and safety incidents and low score means low levels of health and safety incidents and issues. The overall safety performance score quite high, considering the health and safety of workers must not be compromised at any point.

Considering the normality of the distribution of the scores, the skewness and kurtosis statistics indicate that the distributions of all composite latent variables were largely normal. The skewness statistics of the intellectual subscale (6.49) and public practice (6.23) of the religiosity scale were however positively skewed as they were above 2.0. Skewness and kurtosis values between -2 to +2 (Tabachnick & Fidell, 1996) are considered acceptanle. The remaining of the variables did not have any problem with skewness and kurtosis as their values were between -2 to +2, suggesting that they were normally distributed. The normality or otherwise of the data was not a challenge because PLS-SEM is a non-parametric analytical approach which does not have strong requirements regarding normality of the data.

Table 21: Correlations among the Main Variables and their Means

Latent variables	Mean	SD	1	2	3	4	5
Safety behaviour	25.48	5.82	1				
Religiosity	92.98	19.64	.338**	1			
Safety culture	76.68	19.19	.517**	.158**	1		
Safety performance	65.70	16.34	-.023	-.007	-.232**	1	
Hazard exposure	79.46	15.67	.109*	.176**	.165**	.369**	1

**p< .05; **p < .01*

5.14.1 Extent of hazards exposure

The table 23 presents the types of hazards and the percentage of farmers who reported being exposed to each of them at least once within the previous year prior to the study.

Table 22: Types of Hazards and Percentage of Rice Farmers Exposed

Hazards	Never (%)	Exposed (%)
Chemical Hazards		
Application of agro-chemicals (e.g. pesticides, weedicides)	8.3	91.7
Fumes from burning of farm land	20.0	80.0
Physical/Safety hazards		
Dust from winnowing of rice	12.6	87.4
Exposure to sun	0.4	99.6
Prolong working hours (more than 8 hours a day)	1.1	98.9
Working in water-logged areas	20.6	79.4
Screaming to scare birds	5.8	94.2
Presence of snail shells in the soil	40.1	59.9
Presence of tree stumps and thorns	31.3	68.7
Running on narrow bonds to scare bird	1.9	98.1
Walking on slippery bonds	1.1	98.9
Lifting of weight (bags of fertilizer, rice etc)	5.5	94.5
Biological Hazards		
Exposure to animals, insect, snakes etc	7.5	92.5
Mosquito and other insect bites	1.1	98.9
Rice grass exposure	4.1	95.9
Ergonomic Hazards		
Use of catapults to scare birds	3.0	97.0
Bending or awkward posture at work	2.1	97.9
Use of sharp farm implements, tools and equipment	2.3	97.7
Use of farm machines (winnower, threshers etc)	61.2	38.8

The types of hazards investigated include chemical, physical or safety hazards, biological and ergonomic hazards. The results indicate that a great number of the farmers were exposed to various forms of hazards in their farming activities, right from preparation of rice fields to harvesting and milling of paddy rice to get the wholesome rice. Among others, about 92% of the farmers are directly exposed to agro-chemical through spraying of weedicides and application of fertilizers. Some farmers also burn the field before ploughing and are exposed to smoke or fumes from the burning and other gaseous substances. The use of catapult (97.0%), mosquitoes and other insects bites (98.9%) and screaming to scare birds (94.2%) were other prevalent hazards to pose great risk to the farmers. Most of the farmers get injured from the use of the catapult and sore throats from screaming. A great number of the farmers also use various forms of sharp farm implements and tools, such as cutlasses, sickles, hoes, etc. These also present enormous hazards to the rice farmer. The awkward sustained working postures on the farms are other major hazards that the farmer encounter.

5.15 Results of Evaluation of Structural Model

The structural model indicates the causal relationships between the latent variables. The study tested the model presented below (Figure 1), using the *PLS* algorithm was used to test the hypotheses. PLS-SEM test of significance is achieved through the use bootstrapping of the endogenous latent variables. The structural model tested in this study involved the direct and indirect effects of religiosity, safety culture and hazard exposure on safety behaviour and safety performance. The moderation role of safety behaviour in the effect of hazard exposure, and the mediation role of safety behaviour in the effects of safety culture and religiosity on safety performance were also explored.

The reflective-reflective higher order was used for the reflective constructs, and the reflective-formative was used for the formatively modelled latent variables. The quality criteria of the structural models were the coefficient of determination, R^2 and the predictive relevance, $Q^{2.}$ The effect sizes, f^2 of the paths are also presented, together with the confidence intervals. The results are presented below in tables and also graphic paths from the SmartPLS output.

5.15.1 Effects of hazards exposure, religiosity and safety culture on safety behaviour and safety performance

The effects of hazards exposure, religiosity and safety culture (antecedent/exogenous variables), on safety behaviour and safety performance were explored in the models presented below to test hypotheses 1, 2, 3 and 4:

1. *Safety culture of the rice farmers will directly predict their (a) safety behaviour and (b) safety performance.*
2. *Religiosity will predict (a) safety behaviour, and (b) safety culture of rice farmers*
3. *Hazards exposure will predict safety performance of the rice farmers*
4. *Safety behaviour will predict safety performance of rice farmer*

There was the need to first test the collinearity among the exogenous variables, because the path coefficients (β) of the exogenous (independent) variables might be biased due to high level of collinearity among the predictor (exogenous/independent) variables (Hair et. al, 2012, 2014). The results indicate that there were no issues of multicollinearity as all the Variance Inflation Factors (VIF) were below the cut-off point of 4.0.

Table 23: VIF of the Main Exogenous Variables and the Endogenous Variables

Latent variables	Safety performance (SPF)	Safety behaviour (SBVR)
Religiosity (REL)	1.215	1.014
Safety behaviour (SBVR)	1.676	-
Safety culture (SCTR)	1.421	1.014
Hazards exposure (HAZ_X)	1.285	-

Figure 17 presents the graphical outlook of the analytical model. From the model, the results showed that the direct effect of religiosity (REL) on safety performance (SPF) was just .025, while religiosity's effect on safety behaviour (SBVR) as .282, and the direct effect of religiosity on safety culture (SCTR) as .155. The direct effect of safety culture on safety behaviour, and safety performance were .487 and -.466 respectively. Hazards exposure (HAZ_X) had the highest effect on safety performance (.537), with the effect of safety behaviour on safety performance being .161. It could be inferred from the result that positive safety culture could improve the safety behaviour of the rice farmer and reduce the incidence of health and safety challenges. The figure also shows that the moderation effect of safety behaviour on the effect of hazards exposure (SBVR*HAZ_X) on safety performance was -.460, while that of safety culture on the effect of hazards exposure (SCTR*HAZ_X) on safety performance was 0.252

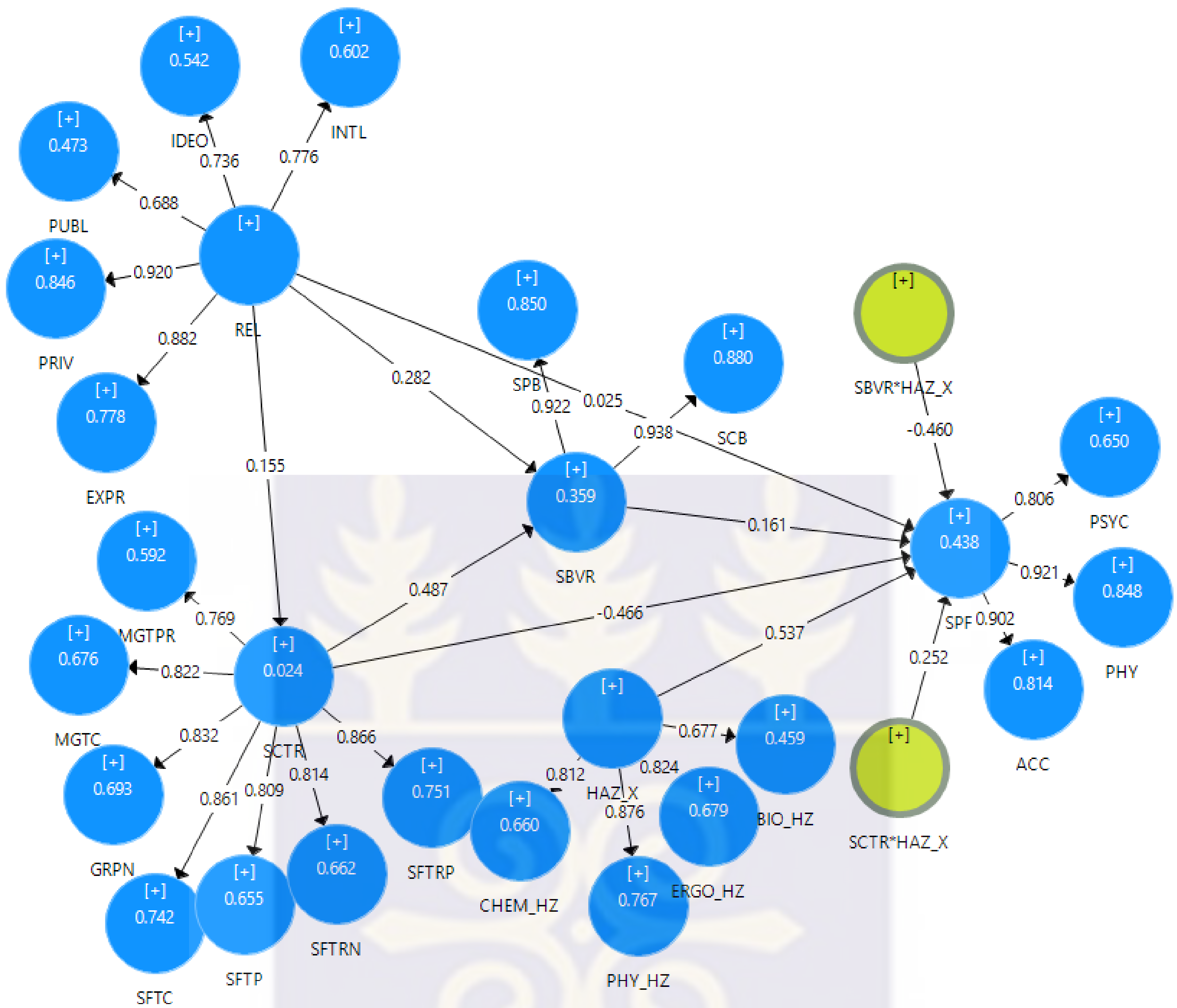

Figure 18: Graphical Presentation of the test of Structural Model

**EXPER = Religious experience; IDEOL = Ideology; INTL = Intellect; PRIV = Private Practice; PUBL = Public practice; HAZ_X=Hazards exposure; BIO_HZ=Biological hazards; CHEM_HZ =Chemical hazards; ERGO_HZ= Ergonomic hazards, PHY_HZ= Physical hazards; *PHY = Physical symptoms; PSYC = Psychological Symptoms; ACC = Accidents*

The analysis involved simultaneous estimation of direct effects of exogenous variables on the main endogenous variable, as well as mediation and moderation analysis. Three sub-models were captured in the analysis and present in the table below.

Table 24: Results of Structural Model

	Standardized coefficients (β)			VAF	Effect Size	Quality Criteria	
Paths	***Direct***	***Indirect***	***Total***		f^2	R^2	Q^2
HAZ_X -> SPF	.537****		.537****		0.334***	.438****	.084
REL -> SPF	.025	-0.015	.010		0.001		
SBVR -> SPF	.161**		.161**		0.029		
SCTR -> SPF	-.466****	0.078**	-.388****	-.201	0.248****		
SBVR*HAZ_X -> SPF	-.460****		-.460****		0.128****		
SCTR*HAZ_X -> SPF	.252****		.252****		0.053*		
REL -> SBVR	.282****	.075****	.357****	.210	0.121****	.359****	.210
SCTR -> SBVR	.487****		.487****		0.362****		
REL -> SCTR	.155****		.155****		0.025	.024*	.011

**p*< .05; ***p* < .01; ****p* < .005; *****p* < .001
PHY = Physical symptoms; PSYC = Psychological Symptoms; ACC = Accidents, HAZ_X = Hazards exposure

The first model presented in the table (Table 25) tested the direct effects of hazards exposure, safety behaviour, safety culture and religiosity on safety performance. The mediation role of safety behaviour in the effects of safety culture and religiosity on safety performance was also explored. In addition, the moderation effects of safety behaviour and safety culture on the effects of hazards exposure on safety performance were tested. The resulted indicated that the model was significant and the exogenous variable together accounted for 43.8% of the variance in safety performance with predictive relevance (Q^2) of .084.

The second model also tested the effects of religiosity and safety culture on safety behaviour. The model was significant and the two exogenous variables accounted for 35.9% of the variance in safety behaviour with predictive relevance of .210. The third model tested the effect of religiosity on safety culture and this as significant, accounting for 2.4% of the variance with predictive relevance of .011. The results established that all the three models were relevant in the prediction of the endogenous variables.

The first hypothesis postulated that: *Safety culture of will predict the (a) safety behaviour and (b) safety performance of rice farmers.* The result showed that the effects of safety culture (SCTR) on both safety behaviour ($\beta = .487$, $p < .001$) and safety performance ($\beta = -.466$, $p < .001$) were both significant. This means that hypotheses 1(a) and 1(b) were both supported. The results show that positive safety culture could improve the safety behaviour of the rice farmers and reduce their health and safety concerns.

The second hypothesis was: *Religiosity will predict (a) safety behaviour and (b) safety culture of rice farmers*. The results indicated that religiosity had a significant effect on safety behaviour ($\beta = .282$, $p <.001$) and safety culture ($\beta = .155$, $p < .001$), accounting for 2.4% of variance in safety culture with predictive relevance of .011. This result confirmed the proposition of hypotheses 2(a) and (b). Religiosity seemed to have had a greater effect on safety behaviour than safety culture.

The third hypothesis postulated that *hazards exposure will predict safety performance of rice farmers.* The result as shown in the first model of table 25 supported the hypothesis. Hazard exposure ($\beta = .537$, $p < .001$) had a significant effect on safety performance with effect size of .334.

Hypothesis 4 also tested the effect of *safety behaviour on safety performance of rice farmer.* The result indicated that religiosity ($\beta = .025$, $p > .05$) did not have significant effect ($\beta = .017$, $p > .05$) on safety performance. This means that religiosity does not predict the safety performance of rice farmers. Thus, hypothesis 4 was not supported.

5.15.2 Mediation effects of safety behaviour

Hypothesis 5 tested *the mediation effects of safety behaviour on the effects of (a) safety culture and (b) religiosity on safety performance*.

The results (Table 25, first model) indicated that the indirect effect of safety culture on safety performance ($\beta = .078$, $p < .01$) was significant, but that of religiosity on safety behaviour was not significant ($\beta = -.015$, $p > .05$). This means both the direct and indirect effects of safety culture on safety performance were significant, but in opposite directions, meaning that there was a partial (competitive) mediating effect of safety behaviour (VAF = - .403). Thus, hypothesis 5(a) was supported by the results, while 5(b) was not supported. Religiosity also had both direct and indirect effects ($\beta = .075$, $p < .001$) on safety behaviour through safety culture. The VAF was .210, which indicates a complimentary partial mediation effect of safety culture. Thus, religiosity directly and indirectly predicted safety behaviour of rice farmers.

5.15.3 Moderation effects of safety behaviour and safety culture

To test hypothesis 6, the moderation effects of safety culture and safety behaviour on the effect of hazards exposure on safety performance were tested. The results are presented in Table 25 in the first model. The results indicate that safety behaviour significantly moderated the effect of hazard exposure (SBVR*HAZ_X) on safety performance ($\beta = -.460$, $p < .001$). The moderation effect of safety culture (SCTR*HAXZ_X) was also significant ($\beta = .252$, $p < .001$). The moderation effects plots of the two moderations are presented. The graph gives a pictorial view of the nature of the interaction. Hypotheses 6 (a) and (b) were both supported by the results.

Given that hazards exposure had a positive effect on safety performance, the negative moderation effect of safety behaviour suggests that as safety behaviour improves, the positive effect of hazards exposure on safety performance reduces. In other words, at a higher level of safety behaviour, the effect of hazards exposure on safety performance will reduce. Again, thus, hypothesis 6 was supported.

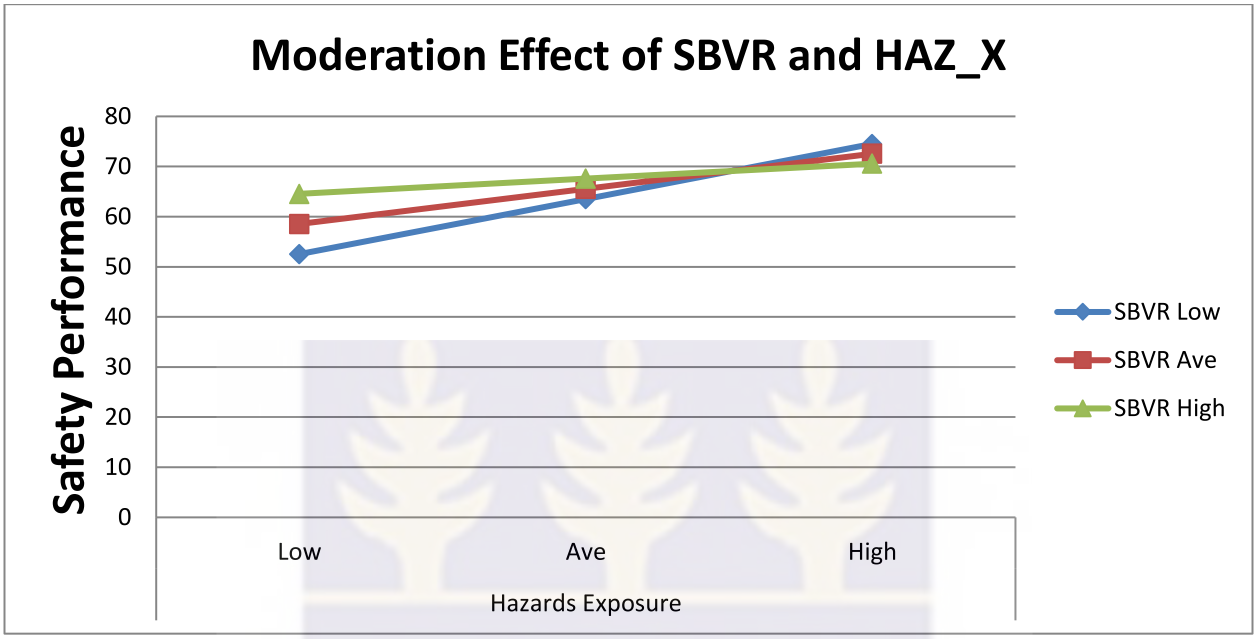

Figure 19: Interaction effects of safety behaviour and hazards exposure

Figure 19 depicts that at the low level of hazards exposure, safety performance increases with increase in safety behaviour. However, at the high level of hazards exposure, the trend has reversed with high safety behaviour having the lowest safety performance score. This explains the negative moderations effect coefficient. The positive moderation effect of safety culture on the relationship between hazards exposure and safety performance also suggests that, at a higher level of safety culture, the effect positive effect between hazards exposure and safety performance would increase. The plot shows that safety performance was highest with lo safety culture and lowest with high safety culture at all levels of hazards exposure. The negative effect of safety culture however gradually reduces as hazards exposure increases with the difference closing up drastically at the high level of hazards exposure.

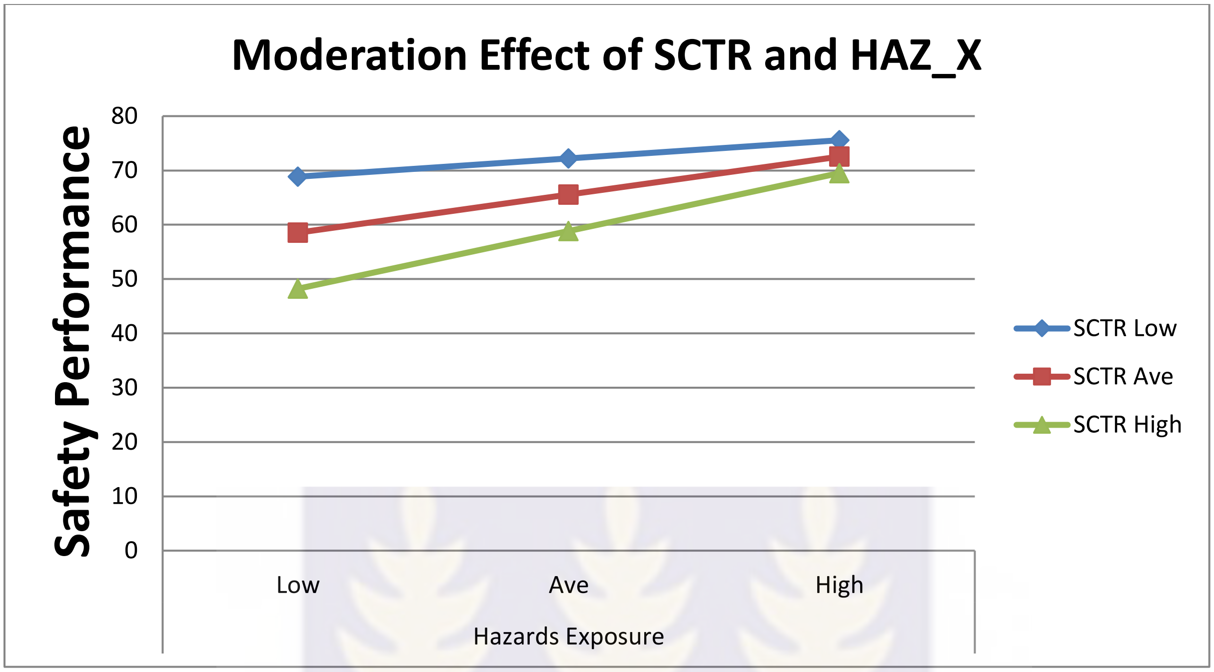

Figure 20: Interaction effects of safety culture and hazards exposure

In sum, the results of the analyses show that religiosity did not have any effect on safety performance. However, it did have direct effect on safety culture and safety behaviour. Safety behaviour and safety culture on the other hand, had direct effects on safety performance, with safety culture having negative relationship, but the effect of safety behaviour being positive. This means that safety culture helps to reduce the incidence of health and safety issues, whereas safety behaviour rather increases health and safety challenges. Further analyses were conducted to find out how come safety behaviour could have positive relationship with safety performance, by partitioning the dimensions of the latent variables.

5.15.4 Effects of religiosity, hazards exposure and safety culture on the three dimensions of safety performance

In the next model (figure 21), the effects of exogenous variables: religiosity (REL), hazards exposure (HAZ_X) and safety culture (SCTR) on the three dimensions of safety performance (SPF) were tested, still maintaining safety behaviour as an intervening (moderating) variable. This was to explore how the exogenous variables predict these dimensions to give a more comprehensive picture of the issue under discussion. The three dimension of safety performance presented in the model are psychological symptoms (PSYC), physical symptoms (PHY) and accidents (ACC). The inner models in the graphical presentation show the standardized paths coefficients of the effects of the exogenous variables on the endogenous variables. For instance, the effects of hazards exposure (HAZ_X) on ACC, PHY and PSYC were .383, .680 and .295 respectively. The table below shows the three models that depict the effects of the exogenous variables on the psychological, physical and accident dimensions of safety performance.

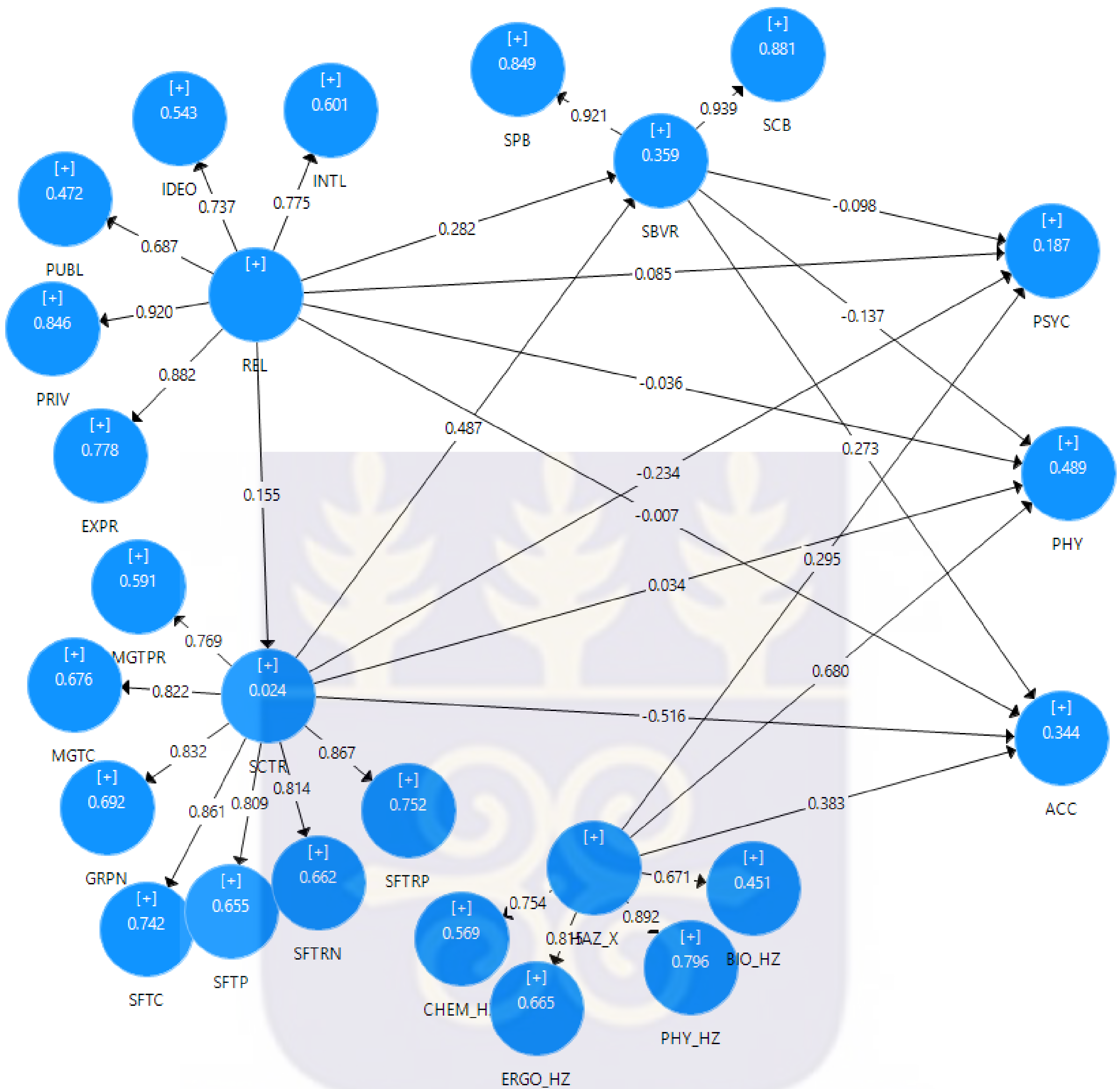

Figure 21: Effects of exogenous variables on dimensions of safety performance

**EXPER = Religious experience; IDEOL = Ideology; INTL = Intellect; PRIV = Private Practice; PUBL = Public practice; HAZ_X=Hazards exposure; BIO_HZ=Biological hazards; CHEM_HZ =Chemical hazards; ERGO_HZ= Ergonomic hazards, PHY_HZ= Physical hazards; *PHY = Physical symptoms; PSYC = Psychological Symptoms; ACC = Accidents*

The first model indicated that the three exogenous variables, together with the mediating variable accounted for 34.4% of the variance in accidents with predictive relevance of .072. The second model had physical symptoms as the endogenous variable. The exogenous variables explained 48.9% of the variance, with predictive relevance of .058. Finally, in the third model, variance of 18.7% was accounted for in psychological symptoms by the exogenous variables with predictive relevance of .107.

Table 25: Effects of Exogenous Variables on Dimensions of Safety Performance

	Standardized coefficients (β)			Effect Size	Quality Criteria	
Paths	**Direct**	**Indirect**	**Total**	**f^2**	**R^2**	**Q^2**
HAZ_X -> ACC	0.383***		0.383***	0.220*	0.344****	.072
REL -> ACC	-0.007	0.018	0.010	0.000		
SCTR -> ACC	-0.516****	0.133****	-0.383****	0.291***		
SBVR -> ACC	0.273****		0.273****	0.072*		
HAZ_X -> PHY	0.680****		0.680****	0.888***	0.489****	.058
REL -> PHY	-0.036	-0.044	-0.079	0.002		
SCTR -> PHY	0.034	-0.067	-0.033	0.002		
SBVR -> PHY	-0.137		-0.137	0.023		
HAZ_X -> PSYC	0.295****		0.295****	0.105*	0.187****	.107
REL -> PSYC	0.085*	-0.071**	0.013	0.008		
SCTR -> PSYC	-0.234****	-0.048*	-0.282****	0.048***		
SBVR -> PSYC	-0.098*		-0.098*	0.008		

**p< .05; **p < .01; ***p < .005; ****p < .001*

**REL = Religiosity; SBVR = Safety Behaviour; SCTR = Safety Culture; HAZ_X = Hazards Exposure*

The extent to which the rice farmers were exposed to various forms of hazards in their farming activities was found to have had significant positive relationships with all the three dimensions of safety performance (Table 26). Hazards exposure had the strongest effect on physical symptoms (β= .680, p < .001), than accidents (β= .383, p < .001) and psychological symptoms (β= .295, p < .001). Thus, the extent of hazards exposure in rice farming is most likely to lead to physical health and safety symptoms than to injuries and psychological symptoms among the rice farmers.

The results also indicate that Safety culture had significant direct inverse relationships with accidents (β = -.516, p < .001) and psychological symptoms (β = -.234, p < .001), but not with physical symptoms (β = 0.034, $p > .05$). It was observed that safety culture predicted accidents/injuries more than it predicted psychological symptoms. Thus, safety culture had great implications for rice farming accidents and injuries with moderate effect size and psychological distress symptom.

Religiosity on the other hand did not have significant effects with accidents (β = -.007, $p > .05$) and physical symptoms (β = -.036, $p > .05$). However, there was a weak significant positive effect on psychological symptoms (β = .085, $p < .05$). This result suggests that, overall, religiosity did not affect safety performance, but when the safety performance was partitioned, religiosity had effect only on the psychological distress symptoms of the rice farmers. Thus, religiosity has implications for the improvement of the psychological health of the rice farmers.

5.15.5 Safety Behaviour dimensions and safety performance

Hypothesis 7: Safety participation of rice farmers will predict their safety performance more than their safety compliance.

Hypothesis 7 postulated safety participation would be a stronger predictor of the rice farmers' safety performance than their safety compliance. The results, as presented in table 27 indicate that safety compliance had negative associations with all the dimensions of safety performance but safety participation had positive association with all the dimensions of safety performance. The VIFs of safety compliance and safety participation indicate that there was no issue of multicollinearity between the two dimensions. Figure 22 shows the graphical presentation of the effects of dimensions of safety behaviour on safety performance dimensions.

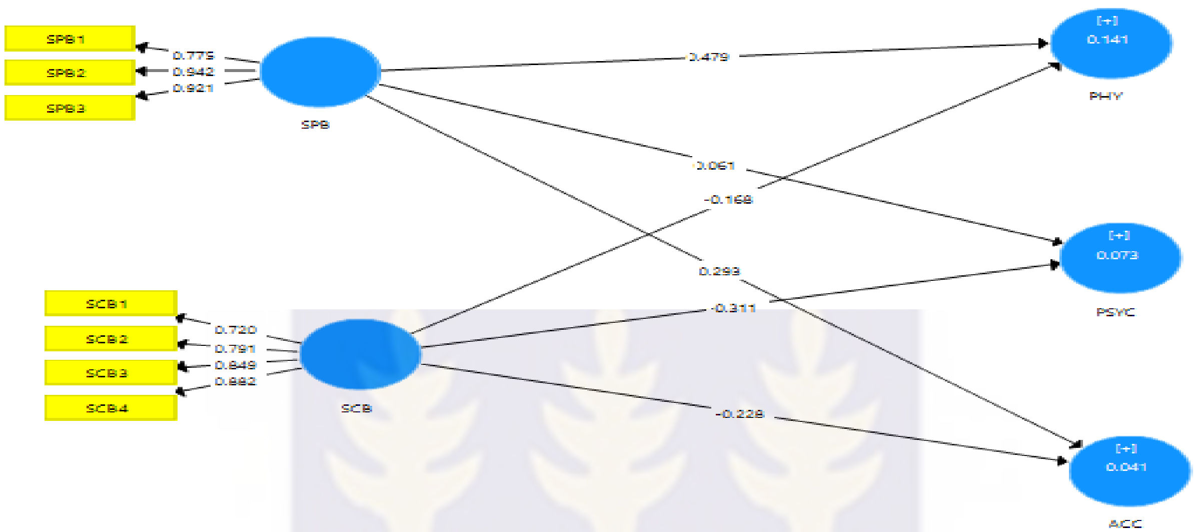

Figure 22: Dimensions of safety behaviour and safety performance

SCB = Safety compliance behaviour; SPB = Safety participation behaviour, ACC = Accidents; PSYC = Psychological symptoms; PHY = Physical symptoms

Table 26: Path Coefficients of Safety Behaviour Dimensions on Safety Performance

Model	(O)	(M)	STD	T Stats	P Values	f-Sq	R^2	Q^2
SCB -> ACC	-0.228	-0.231	0.144	1.587	0.056	.026	.041	.009
SPB -> ACC	0.293	0.261	0.217	1.349	0.089	.042		
SCB -> PHY	-0.168	-0.144	0.185	0.911	0.181	.016	.141	.013
SPB -> PHY	0.479****	0.469	0.118	4.069	0.000	.126		
SCB -> PSYC	-0.311****	-0.314	0.067	4.617	0.000	.049	.073	.038
SPB -> PSYC	0.061	0.059	0.078	0.780	0.218	.002		

**p< .05; **p < .01; ***p < .005; ****p < .001*

SCB = Safety compliance behaviour; SPB = Safety participation behaviour, ACC = Accidents; PSYC = Psychological symptoms; PHY = Physical symptoms

The coefficients of determination (R^2) for the three models indicated that the dimensions of safety behaviour accounted for 14.1%, 7.3% and 4.1% of the variances in physical symptoms, psychological symptoms and accidents respectively. The predictive relevance values (Q^2) of all the three models were positive, an indication that the models were relevant in predicting the three dimensions of safety performance.

The results indicated that safety compliance significantly predicted psychological symptoms of safety performance ($\beta = -.314$, $p < .001$) of rice farmers, whereas safety participation behaviour significantly predicted physical symptoms ($\beta = .469$, $p < .001$; $f^2 = .126$). The results suggest that compliance to laid down safety rules and procedures of work helps to reduce psychological health and safety challenges, but not significant in predicting physical and accidents of the rice farmers. This is a surprising result.

5.15.6 Decomposition of Safety Culture, Safety Behaviour and Safety Performance

Having observed significant negative effect of overall safety culture on the overall safety performance latent variable and its dimensions, there was the need to decompose the dimensions of safety culture to find out how each relates to the dimensions of safety behaviour and safety performance. The results (Table 28) show that there was no problem with multicollinearity among the dimensions.

Table 27: VIFs of Safety Culture Dimensions, Safety Behaviour with regards to Dimensions of Safety Performance

`Exogenous variables	PHY	PSYC	ACC	SCB	SPB
Group Safety Norm (GRPN)	3.702	3.702	3.702	2.710	2.710
Management Commitment (MGTC)	3.030	3.030	3.030	3.009	3.009
Management Safety Priority (MGTPR)	2.592	2.592	2.592	2.583	2.583
Safety Communications (SFTCOM)	3.476	3.476	3.476	3.381	3.381
Safety participation (SFTPT)	2.431	2.431	2.431	2.426	2.426
Safety Reporting (SRPT)	2.890	2.890	2.890	2.800	2.800
Safety Training (STRN)	2.433	2.433	2.433	2.376	2.376
Safety participation Behaviour (SPB)	2.625	2.625	2.625		
Safety Compliance Behaviour (SCB)	2.471	2.471	2.471		

**PHY = Physical symptoms; PSYC = Psychological Symptoms; ACC = Accidents*

GRPN =Group safety norm; MGTC = Management commitment to safety; SFTCOM = Safety communication; MGTPR = Management safety priority; SFTPT = Safety participation; SRPT Safety reporting; STRN = Safety training; SPB = Safety participation behaviour; SCB = Safety compliance behaviour

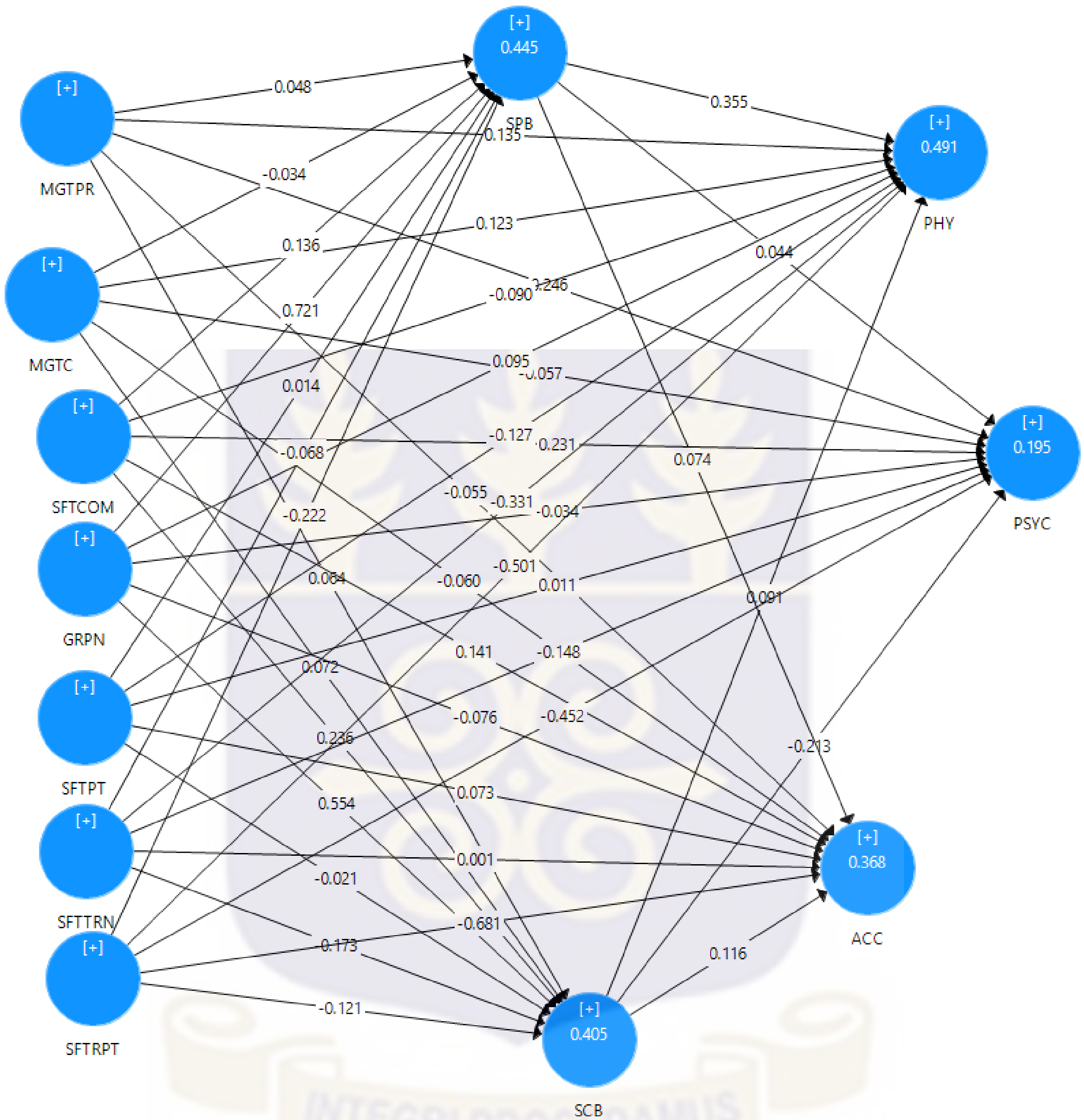

Figure 23: Effects of safety culture dimensions on safety performance dimensions

**PHY = Physical symptoms; PSYC = Psychological Symptoms; ACC = Accidents*
GRPN =Group safety norm; MGTC = Management commitment to safety; SFTCOM = Safety communication; MGTPR = Management safety priority; SFTPT = Safety participation; SRPT Safety reporting; STRN = Safety training; SPB = Safety participation behaviour; SCB = Safety compliance behaviour

5.15.7 Safety culture dimensions and psychological symptoms

The effects of the dimensions of safety culture on psychological symptoms of safety performance were explored in this model (Table 29).

Table 28: Effects of Dimensions of Safety Culture on Psychological Distress Symptoms

Path	Direct	Indirect	Total	VAF	F sq	R^2	Q^2
GRPN -> PSYC	-0.034	-0.086*	-0.121	.711	0.000	.195****	0.117
MGTC -> PSYC	-0.057	-0.017	-0.074		0.001		
MGTPR -> PSYC	0.246***	-0.012	0.235**		0.029		
SCOM -> PSYC	0.231*	-0.044*	0.187*	-.235	0.019		
SFTPT -> PSYC	0.011	0.005	0.016		0.000		
SFTRPT -> PSYC	-.452****	0.016	-0.436****		0.087****		
SFTRN -> PSYC	-0.148*	0.034*	-0.115****	-.296	0.011		
SCB -> PSYC	-0.213***		-0.213***		0.023		
SPB -> PSYC	0.044		0.044		0.001		

**p< .05; **p < .01; ***p < .005; ****p < .001*

**PHY = Physical symptoms; PSYC = Psychological Symptoms; ACC = Accidents*
GRPN =Group safety norm; MGTC = Management commitment to safety; SFTCOM = Safety communication; MGTPR = Management safety priority; SFTPT = Safety participation; SRPT Safety reporting; STRN = Safety training; SPB = Safety participation behaviour; SCB = Safety compliance behaviour

The results showed that all the dimensions of safety culture and the two safety behaviour dimensions accounted for 19.5% of the variance in psychological symptoms. These dimensions were relevant in predicting psychological symptoms ($Q^2 = .117$). Safety reporting was found to be the most significant ($\beta = -.452$, $p < .001$) dimension of safety culture in predicting psychological symptoms, with effect size ($f^2 = .100$). Management safety priority ($\beta = .246$, $p < .001$), safety communication ($\beta = .231$, $p < .05$) had significant positive effects, whereas safety training ($\beta = -.148$, $p < .05$) had negative effect on psychological symptoms. Thus, the results indicate that safety reporting and safety training tend to reduce experiences of psychological health and safety challenges among the rice farmers.

The results also show that the indirect effects of group safety norms ($\beta = -.086$, $p < .05$), safety communications ($\beta = -.044$, $p < .05$) and safety training ($\beta = .034$, $p < .05$) were statistically significant. This is an indication of mediation effect of safety behaviour. The direct effect of group safety norm was not significant, but the indirect effect was significant. This means only the indirect effect was present, which means there was full mediation effect (VAF = .711) of safety behaviour on psychological symptoms.

The direct effects as well as the indirect effects of safety communications and safety training were significant; indications of partial mediation effects of safety behaviour. The VAF of safety communication (-.235) indicate that there was a competitive partial mediation of safety behaviour on the effect of safety communication on psychological symptoms. There was also a competitive partial mediation of safety behaviour on the effect of safety reporting (VAF = -.296) on psychological symptoms.

5.15.8 Safety culture dimensions, safety behaviour and accidents

The model presented in Table 30 tested the effects of the dimensions of safety culture on accidents, and also the mediation effect of the dimensions of safety behaviour in the path between safety culture dimensions and accidents. All the safety culture dimensions, together with the dimensions of safety behaviour accounted for 36.8% of the variance in accidents, with predictive relevance of .050. The results indicate that, among the dimensions of safety culture, only safety reporting ($\beta = -.681$, $p < .001$) significantly predicted accidents directly, with quite high significant effect size ($f^2 = .268$). Thus, safety reporting helps to reduce occurrence of accidents among the rice farmers.

Table 29: Effects of Dimensions of Safety Culture on Psychological Distress Symptoms

Path	Direct	Indirect	Total	VAF	F sq	R^2	Q^2
GRPN -> ACC	-0.076	0.118**	0.042	2.81	0.002	.368****	0.050
MGTC -> ACC	-0.060	0.006	-0.054		0.002		
MGTPR -> ACC	-0.055	0.011	-0.044		0.002		
SCOM -> ACC	0.141	0.038*	0.178*	.213	0.009		
SFTPT -> ACC	0.073	-0.001	0.071		0.003		
SFTRN -> ACC	0.001	-0.025*	-0.024		0.000		
SFTRPT -> ACC	-.681****	-0.031	-0.712****	1.04	0.253****		
SCB -> ACC	0.116		0.116		0.009		
SPB -> ACC	0.074		0.074		0.003		

**p< .05; **p < .01; ***p < .005; ****p < .001*

**PHY = Physical symptoms; PSYC = Psychological Symptoms; ACC = Accidents*
GRPN =Group safety norm; MGTC = Management commitment to safety; SFTCOM = Safety communication; MGTPR = Management safety priority; SFTPT = Safety participation; SRPT Safety reporting; STRN = Safety training; SPB = Safety participation behaviour; SCB = Safety compliance behaviour

The indirect effects of group norms, safety communication and safety training were significant, but their direct effects were not. This suggests that these paths were mediated by safety behaviour. In the case of safety training, only the indirect effect was significant, with a VAF = 1.04. This is a situation of full mediation effect (Hair et al, 2016; Nitzl et al, 2016). There seemed to be a suppressor effect in the case of the relation between group norms and accidents (VAF = 2.81). In this case also, the direct path was not significant (negative non-significant direct, but significant indirect positive path). This has led to drastic suppression of the total effect. There was a complementary partial mediation of safety behaviour on the effect of safety communication on accidents (VAF = .213).

Table 30: Safety Culture Dimensions and Safety Behaviour

Path	Direct	Total	F sq	R^2	Q^2
GRPN -> SCB	0.554****	0.554****	0.191****	.405****	0.245
MGTC -> SCB	0.072	0.072	0.003		
MGTPR -> SCB	0.064	0.064	0.003		
SCOM -> SCB	0.236****	0.236****	0.028		
SFTPT -> SCB	-0.021	-0.021	0.000		
SFTRPT -> SCB	-0.121*	-0.121*	0.009		
SFTRN -> SCB	-0.173***	-0.173***	0.021		
GRPN -> SPB	0.721****	0.721****	0.348****	.445****	0.331
MGTC -> SPB	-0.034	-0.034	0.001		
MGTPR -> SPB	0.048	0.048	0.002		
SCOM -> SPB	0.136***	0.136*	0.010		
SFTPT -> SPB	0.014	0.014	0.000		
SFTRPT -> SPB	-.222****	-0.222****	0.032*		
SFTRN -> SPB	-0.068	-0.068	0.003		

**p< .05; **p < .01; ***p < .005; ****p < .001*

**PHY = Physical symptoms; PSYC = Psychological Symptoms; ACC = Accidents GRPN =Group safety norm; MGTC = Management commitment to safety; SFTCOM = Safety communication; MGTPR = Management safety priority; SFTPT = Safety participation; SRPT Safety reporting; STRN = Safety training; SPB = Safety participation behaviour; SCB = Safety compliance behaviour*

The first model table 31 examined the effects of the dimensions of safety culture on safety compliance. All the dimensions together accounted for 40.5% of the variance in safety compliance, with predictive relevance of .245. Group norms ($\beta = .554$, $p < .001$) and safety communication ($\beta = .236$, $p < .001$) had significant positive effects, whereas safety reporting (-.121, $p < .05$) and safety training ($\beta = -.173$, $p < .001$) had significant negative effects on safety compliance. Thus, group norms and safety communications help to improve the safety behaviour of the rice farmers, whereas training and safety reporting worsens safety compliance.

In the second model, all the dimensions accounted for 44.5% of the variance in safety participation, with high predictive relevance of .331. Group norm again was the most significant predictor of safety participation ($\beta = .721$, $p < .001$) with high effect size of .335. Safety communication also had a weak significant positive effect (β = .136, p < .05), whereas safety training again had a negative effect (β = -.222, p < .001).

Table 31: Safety Culture Dimensions, Safety Behaviour and Physical Symptoms

Path	Direct	Indirect	Total	VAF	F sq	R^2	Q^2
GRPN -> PHY	0.095	0.307****	0.402*	.764	0.005	491****	0.039
MGTC -> PHY	0.123	-0.005	0.118		0.010		
MGTPR -> PHY	0.135	0.023	0.157		0.013		
SCOM -> PHY	-0.090	0.070*	-0.020	3.5	0.005		
SFTPT -> PHY	-0.127	0.003	-0.124		0.013		
SFTRPT -> PHY	-0.501***	-0.090**	-0.591****	.152	0.170		
SFTRN -> PHY	-0.331*	-0.040	-0.371**		0.088		
SCB -> PHY	0.091		0.091		0.007		
SPB -> PHY	0.355***		0.355***		0.095		

**p< .05; **p < .01; ***p < .005; ****p < .001*

**PHY = Physical symptoms; PSYC = Psychological Symptoms; ACC = Accidents*
GRPN =Group safety norm; MGTC = Management commitment to safety; SFTCOM = Safety communication; MGTPR = Management safety priority; SFTPT = Safety participation; SRPT Safety reporting; STRN = Safety training; SPB = Safety participation behaviour; SCB = Safety compliance behaviour

The direct and indirect paths of the dimensions of safety culture on physical symptoms and the direct effects of the dimensions of safety behaviour are presented table 32. The results indicate that all the dimensions of safety culture together with the safety behaviour dimensions accounted for 49.1% of the variance in physical symptoms with predictive relevance on .039. Safety reporting (β = -.501, p < .001) and safety training (β = -.331, p < .001) were the only two dimensions of safety culture that had significant direct effects on the physical symptoms, and both were negative effects. This means that improvements in these dimensions tend to decrease incidence of physical health and safety symptoms. Safety reporting had the most significant effect (f^2 =.170) on physical symptoms of the rice farmers.

Group norms had significant indirect effect (β = .307, p < .001) while the direct effect was not significant. This is an indication of full mediation effect of safety behaviour on physical symptoms. The VAF is .764 which is an indication that safety behaviour account for as much as

76.4% of the variance in physical symptoms. Safety reporting (β = -.090, p < .01) also had indirect significant effects on physical symptoms of safety performance. In the case of safety reporting, both the direct and indirect paths were significant and negative, which is an indication of complementary partial mediation. However, the VAF (.152) was less than .20 for a typical partial mediation to be established. Thus, the mediation effect of 15.2% was very small, which suggests that the total effect was largely due to the direct effect of safety reporting.

Safety participation (β = .355, p < .005) also had significant direct positive effect, but safety compliance did not have a significant effect on physical symptoms.

5.15.9 Effects of Age and Years of rice Farming Experience

Hypothesis 8 tested the whether the age of the rice farmers and their years of rice farming experience were related to their safety behaviour and safety performance. The age and years of rice farming experience of the respondents were measured on a continuous scale to enable quantitative analysis to be performed with other variables. The minimum age of the rice farmers in the study was 23 years and the maximum was 80 years, with their mean age being 45.96 years. The minimum and maximum years of rice farming experience by the respondents were 1 year and 45 years respectively, with the average being 13.65 years.

Table 32: Effects of Age and Years of Rice Farming Experience on Religiosity, Safety Behaviour, Safety Culture, and Safety Performance

Paths	Coeff. (β)	f^2	t-stats	P value	R^2	Q^2
AGE -> REL	0.099*	0.010	2.036	0.022	.010	.004
AGE -> SBVR	0.075	0.004	1.253	0.106	.019	.010
EXP -> SBVR	-0.166**	0.019	2.471	0.007		
AGE -> SCTR	0.081	0.004	1.638	0.051	.004	.002
EXP -> SCTR	-0.051	0.002	0.843	0.200		
EXP -> SPF	0.037	0.001	0.462	0.322	.001	.000
AGE -> SPF	-0.005	0.000	0.066	0.474		

EXP =Farming experience; SPF =Safety performance, SBVR = Safety behaviour; SCTR = Safety culture; REL = Religiosity

The relationships of the age of the farmers and their religiosity, safety behaviour, safety culture and safety performance were tested (Table 33). The results indicated that the age of the farmers significantly predicted only their level of religiosity (β = .099, $p < .05$). Thus only hypothesis 8(b) was supported.

The results of hypothesis 9, testing the effects of years of rice farming experience on the safety behaviour and safety performance of the rice farmers, are also presented in table 33. Rice farming experience significantly predicted safety behaviour (β = -.166, $p < .01$), but not safety performance of the rice farmers. This means that, the more experienced the farmers were, the poorer their safety behaviour.

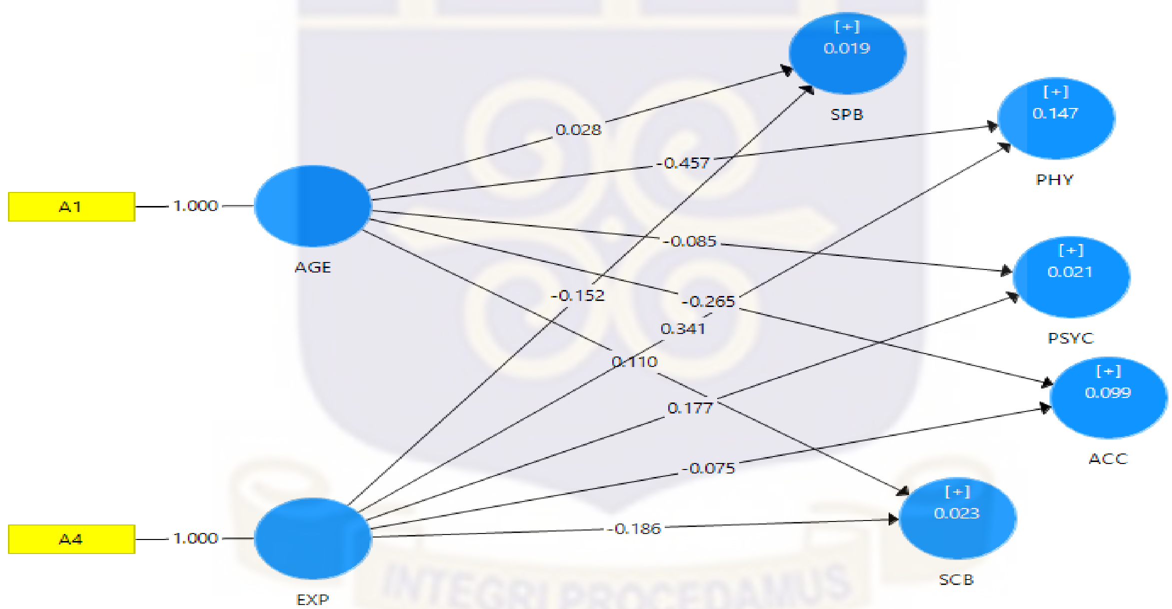

Figure 24: Effects of Age and Experience on safety behaviour safety performance dimensions

EXP =Farming experience; PHY = Physical symptoms; PSYC = Psychological symptoms; ACC = Accidents; SPB = Safety participation behaviour; SCB = Safety compliance behaviour

Table 33: Effects of Age and Years of Rice Farming Experience on the Dimensions of Safety Performance

Model	Path Coeff (β)	STD	t-Stats	p-value	R^2	Q^2
AGE -> ACC	-.265****	0.051	5.210	0.000	.099****	.017
EXP -> ACC	-0.075	0.052	1.458	0.072		
AGE -> PHY	-0.457	0.307	1.486	0.069	.147****	.000
EXP -> PHY	0.341	0.385	0.885	0.188		
AGE-> PSYC	-0.085	0.077	1.099	0.136	.021	.004
EXP -> PSYC	0.177	0.117	1.509	0.066		
AGE -> SCB	0.110*	0.066	1.666	0.048	.023	.011
EXP -> SCB	-0.186***	0.064	2.894	0.002		
AGE -> SPB	0.028	0.062	0.454	0.325	.019	.011
EXP -> SPB	-0.152**	0.064	2.378	0.009		

**p< .05; **p < .01; ***p < .005; ****p < .001*

The effects of age of the rice farmers and their rice farming years of experience on the dimensions of their safety behaviour and safety performance were analyzed (Table 34 and figure 24). These variables were measured on a continuous scale, recording the actual ages and number of years of rice farming experience. Age significantly predicted accidents inversely (β = -.275, p < .001) and positively predicted safety compliance behaviour (β = .114, p < .05). The years of rice farming experience also significantly predicted both dimensions of safety behaviour but did not predict any of the safety performance dimensions. There were negative relationships between farming experience and safety compliance behaviour (β = -.186, p = .002) and safety participation behaviour (β = -.152, p = .009).

The age of the rice farmers and their numbers years in rice farming together accounted for 11.1% and 20.6% of the variance in the accident (β = .111, p < .001) and physical (β = .206, p < .001) dimensions of safety performance. The joint variance on the rest of the dimensions were however not significant. The predictive relevance (Q^2) values were all positive, except that for physical symptoms. This means that age and rice farming experience were relevant in predicting all the endogenous variables in the models, except physical symptoms with Q^2 = 0.000.

The moderation effects of the age of the rice farmers on the relationships between their years of experience and the dimensions of safety behaviour and safety performance were further explored.

5.16. Additional Findings

5.16.1 Test of moderation effect of the sex of respondents

The permutation algorithm in the SmartPLS was used to assess the PLS-SEM measurement invariance (Henseler, Ringle, & Sarstedt, 2015) and to compare males and females on the hypothesized structural model. This was done using the MGA. To perform the MGA, the test of *measurement invariance* was first done as recommended by Henseler, Ringle and Sarstedt (2015). The three-step measurement invariance for composite models (MICOM) procedure for establishing measurement invariance (Henseler et al., 2016) was used the measurements of the constructs were equivalent before any comparison is done.

5.16.2 Test of measurement invariance for sex of respondents

The MICOM procedure is used to show if significant inter-group differences are due to inter-group differences in the measured construct (Henseler et al., 2016). Thus, to show if the constructs measured meant the same thing for the different groups being compared. Test of measurement invariance is a necessary precondition for multi-group analysis to ensure that the groups did not differ on the measured variable before comparing them. Configural invariance was not a problem here as both males and females were from the same cultural background and the constructs were conceptualized and measure the same. Thus, the same basic factor structure exists between males and females in terms of number of constructs and items associated with each construct (Henseler et al., 2016). The compositional invariance and test of equality of composite mean values and variances were done in the PLS permutation algorithm. The measurement invariance analysis indicated that there was full measurement invariance with all the variables. Thus, multi-group analysis could be meaningfully done with all the variables to compare males and females.

Table 34: Test of Compositional Measurement Invariance for Males and Females

Latent variables	Original correlation	Corr Perm. Mean	5.0%	Perm p- value
Hazards exposure	0.952	0.966	0.912	0.194
Religiosity	0.998	0.998	0.997	0.265
Safety behaviour	1.000	1.000	0.999	0.331
Safety culture	1.000	1.000	0.999	0.242
Safety performance	0.982	0.983	0.967	0.206

Table 35: Equality of Composite Mean Values and Variances

Equality of composite mean values					
Latent Variable	**Orig Mean - Diff (Male -Female)**	**Perm Mean Diff (Male -Female)**	**2.5%**	**97.5%**	**Perm p-Values**
Hazards exposure	0.116	-0.001	-0.204	0.206	0.144
Religiosity	0.011	-0.001	-0.206	0.205	0.917
Safety behaviour	0.072	-0.000	-0.205	0.208	0.494
Safety culture	-0.087	0.000	-0.198	0.208	0.405
Safety performance	0.149	0.001	-0.205	0.201	0.150
Equality of composite variances					
Latent Variable	**Var - Orig Diff (Male -Female)**	**Var - Perm Diff (Male -Female)**	**2.5%**	**97.5%**	**Perm p-Values**
Hazards exposure	-0.325	0.019	-0.431	0.520	0.142
Religiosity	-0.144	0.016	-0.355	0.346	0.402
Safety behaviour	-0.032	0.012	-0.265	0.306	0.778
Safety culture	-0.180	0.011	-0.252	0.284	0.150
Safety performance	0.083	0.011	-0.298	0.325	0.652

Having established that there was measurement invariance between males and females, the test of whether the structural model differs between males and females was analyzed. The results indicated that the effects of hazards exposure on safety performance (coefficient difference = -0.317, p < .001), safety behaviour on safety performance (coefficient difference = -0.255, p < .05), and religiosity and safety culture (coefficient difference = -0.262, p < .05) were significantly different between males and females. In all the three difference, the effects were stronger on females than males. Thus, for instance, the effect of hazards exposure on safety performance was stronger on females than on males. These differences reflected in the direct as well as the total effects.

Table 36: Path Coefficient Differences between Males and Females

Direct Effects

	Path coefficients		**Male- Female diff**		**t-Statistics**		
Paths	***Males***	***Females***	***Coef Diff***	***Perm mean diff***	***2.5%***	***97.5%***	***P value***
HAZ_X -> SPF	0.364	0.681	-0.317	-0.011	-0.193	0.173	0.000
REL -> SBVR	0.300	0.192	0.108	-0.007	-0.145	0.145	0.134
REL -> SCTR	0.160	0.422	-0.262	-0.004	-0.208	0.218	0.014
SBVR -> SPF	0.031	0.286	-0.255	-0.004	-0.224	0.226	0.025
SCTR -> SBVR	0.474	0.560	-0.087	-0.002	-0.155	0.154	0.283
SCTR -> SPF	-0.342	-0.498	0.156	0.006	-0.206	0.217	0.153

Indirect Effects

	Path coefficients		**Male- Female diff**		**t-Statistics**		
Paths	***Males***	***Females***	***Coef Diff***	***Perm mean diff***	***2.5%***	***97.5%***	***P value***
REL -> SBVR*	0.076	0.236	-0.160	-0.003	-0.119	0.111	0.009
REL -> SPF**	-0.043	-0.087	0.044	0.002	-0.100	0.111	0.431
SCTR -> SPF**	0.015	0.160	-0.146	-0.002	-0.113	0.109	0.013

*Mediators: * Safety culture; **Safety behaviour*

Total effects

	Path coefficients		**Male- Female diff**		**t-Statistics**		
Paths	***Males***	***Females***	***Coef Diff***	***Perm mean diff***	***2.5%***	***97.5%***	***P value***
HAZ_X -> SPF	0.364	0.681	-0.317	-0.011	-0.193	0.173	0.000
REL -> SBVR	0.376	0.428	-0.053	-0.010	-0.146	0.130	0.560
REL -> SCTR	0.160	0.422	-0.262	-0.004	-0.208	0.218	0.014
REL -> SPF	-0.043	-0.087	0.044	0.002	-0.100	0.111	0.431
SBVR -> SPF	0.031	0.286	-0.255	-0.004	-0.224	0.226	0.025
SCTR -> SBVR	0.474	0.560	-0.087	-0.002	-0.155	0.154	0.283

Regarding the indirect effects, the results suggest that the effect was again stronger on females that males. Safety culture significantly mediated the effect between religiosity and safety behaviour and the effect was stronger for female than males (coefficient difference = -.160, p <. 01). Safety behaviour also mediated the effect of safety culture on safety performance with coefficient difference of -.146 (p < .05).

5.16.3 Effects of sex and educational level differences on the latent variables

The two-way between-group MANOVA was used to test whether there were differences between males and females, and also among the different levels of education in their scores on the four latent variables: religiosity, safety culture, safety behaviour and safety performance. The mean scores of male and female farmers are presented in table below.

Table 37: Means Scores for Males and Females on the Latent Variables

Dependent Variable	Sex	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Safety performance	Male	66.545	1.092	64.400	68.690
	Female	60.422	3.333	53.873	66.972
Safety culture	Male	74.364	1.270	71.869	76.860
	Female	79.887	3.877	72.268	87.506
Religiosity	Male	93.602	1.325	90.998	96.207
	Female	99.250	4.046	91.299	107.200
Safety behaviour	Male	25.724	.400	24.938	26.510
	Female	26.653	1.221	24.253	29.053

Examination of the covariance matrices test (Box's M) shows that there were significant differences among the covariance matrices of the dependent variables across groups. This would however not pose any problem for the analysis, given that the power to detect effects was very high.

Table 38: Box's Test of Equality of Covariance Matrices[a]

Box's M	230.399
F	3.495
df1	60
df2	3886.079
Sig.	.000

Tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups.
*a. Design: Intercept + Sex + Educ + Sex * Educ*

The result showed overall main effect for educational level (Pillai's Trace = .133, $F_{(12, 1380)} = 5.314$, $p < .001$; partial eta square = .044, power to detect effect = 1.0), and overall interaction effect was also not significant (see table appendix G). The Pillai's Trace criterion was used because it is more robust than Wilks' lambda when the cell sizes are unequal and there is lack of homogeneity of covariances (Tabachnick, 1989, 2001; Carey, 1998).

There were no significant sex differences on any of the latent variables. In other words, males and females did not differ significantly in their levels of religiosity, safety behaviour, safety culture and safety performance. For instance, the mean score for males on safety performance was 66.55, while that for females was 60.42. On safety culture, females (79.89) had a slightly better safety culture than males (74.36), and females (99.25) also tend to be more religious than males (93.60). These differences in the overall means scores were not statistically significant for any sex difference inferences to be made.

The table presenting the between subject effects is presented in the appendix. Given the overall significant main effect for educational level, the univariate main effects on the dependent variables were examined. The results showed significant effects for safety culture [$F_{(3, 342.46)} = 8.587$, $p < .001$, partial eta square = .053, and power to detect effect = .994], and safety performance [$F_{(3, 253.08)} = 7.538$, $p < .001$, partial eta square = .047, power to detect effect =

.987]. There was also a significant univariate interaction main effect for religiosity ($F_{(3, 372.92)}$ = 4.288, p = .005, partial eta square = .027, power to detect effect = .864) (see table in appendix G).

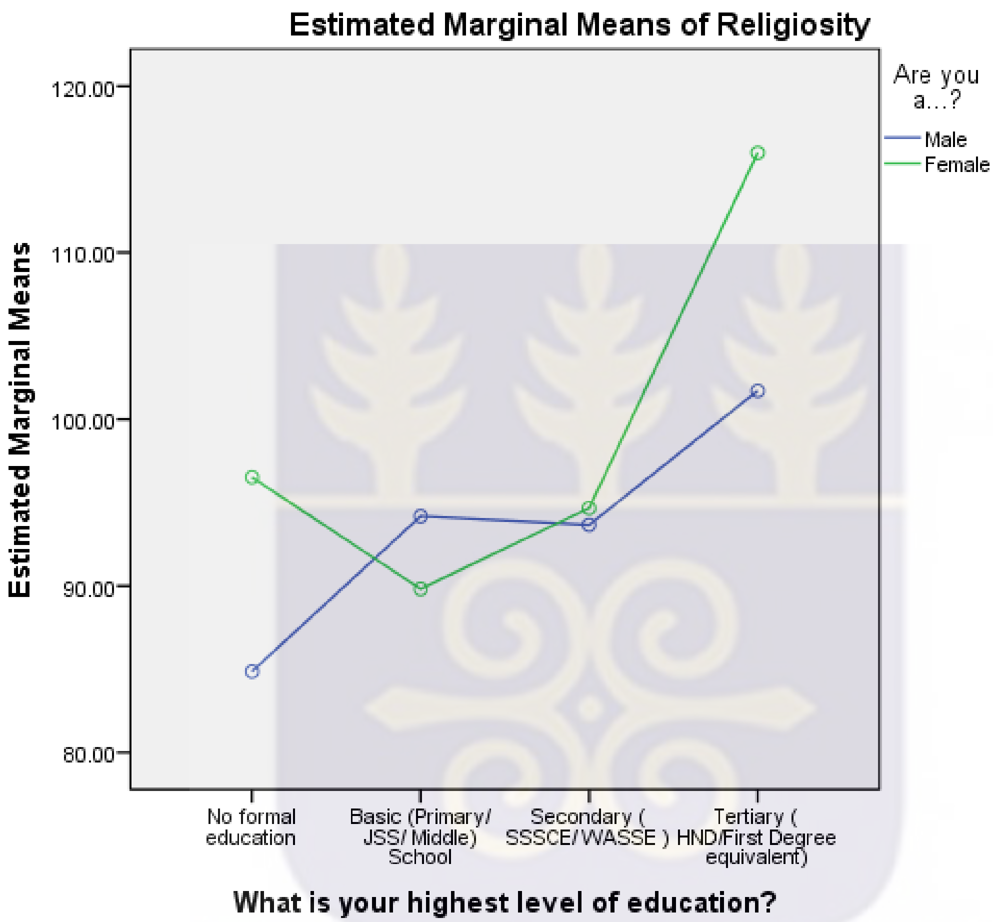

Figure 25: Interaction effect of sex and educational levels on religiosity

The Levene's tests for all the dependent variables (interested in safety culture and safety performance, and religiosity) were significant, which means that the error variances were unequal across group. For this reason the Dunnett T3 post hoc analysis was done to find out which of the means differed significantly.

Table 39: Levene's Test of Equality of Error Variances[a]

Variable	F	df1	df2	Sig.
Safety performance	2.660	7	461	.010
Safety culture	3.645	7	461	.001
Religiosity	2.754	7	461	.008
Safety behaviour	6.792	7	461	.000

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + Sex + Educ + Sex * Educ

The analysis showed that the safety performance mean score of farmers with no formal education was significantly different from all the other levels of education, but the other levels did not significantly differ from each other. The mean difference between those with no formal education and basic level of education on safety performance was 9.04, significant at .001. Thus, the safety performance of those with no formal education was significantly lower than those with basic level of education. The differences between no formal education and secondary level (mean difference = 7.04, $p = .009$) and tertiary level (mean difference = 12.51, $p = .011$) were also significantly different regarding their safety performance.

The trend was the same for safety culture. The safety culture of farmers with no formal education was significantly better quality than those with basic level of education (mean difference = 10.12, $p < .001$), secondary level of education (mean difference = 11.40, $p < .001$), and tertiary level of education (mean difference = 20.19, $p < .001$). The post hoc results are presented in appendix H.

Table 40: Mean Score on Latent Variables by Educational Level

Dependent Variable	Highest level of education	Mean	Std. Error	95% Confidence Interval LB	UB
Safety performance	No formal education	59.084	1.507	56.123	62.044
	Basic	68.077	1.159	65.799	70.355
	Secondary	64.878	3.364	58.267	71.489
	Tertiary	61.896	5.854	50.392	73.400
Safety culture	No formal education	85.234	1.753	81.790	88.678
	Basic	74.225	1.349	71.575	76.875
	Secondary	77.419	3.913	69.729	85.109
	Tertiary	71.625	6.810	58.243	85.007
Religiosity	No formal education	90.689	1.829	87.095	94.282
	Basic	91.999	1.407	89.233	94.764
	Secondary	94.163	4.084	86.138	102.187
	Tertiary	108.85	7.106	94.889	122.819
Safety behaviour	No formal education	24.907	.552	23.823	25.992
	Basic	25.282	.425	24.447	26.116
	Secondary	26.815	1.233	24.393	29.237
	Tertiary	27.750	2.145	23.535	31.965

Safety culture of rice farmers with no formal education was found to be highest, leading to lowest level of safety performance. Religiosity and safety behaviour levels tend to increase as educational level increases, with rice farmers having tertiary level of education being the most religious with best safety behaviour, and those with no formal education being the least. Meanwhile, these differences in religiosity and safety behaviour were not statistically significant.

5.17 Summary of Quantitative Results

This chapter presents the analytical procedures and the results from the analyses. The main data analysis procedure was the PLS-SEM, using the SmartPLS software. The measurement and structural models were tested with the reflective-reflective (reflective constructs) and reflective-formative (formative constructs) higher order modelling and the results were presented in tables and graphically. The SPSS was also used to estimate the descriptive statistics and perform MANOVA analysis. Table 42 presents the summary of the results of the hypothesis testing.

Table 41: Summary of Hypotheses Testing Results

Hypotheses	Results
1. Safety culture of the rice farmers will directly predict their	
(a) safety behaviour and	Supported
(b) safety performance.	Supported
2. ***Safety behaviour will mediate the effect of***:	
(a) safety culture on safety performance	Supported
(b) religiosity on safety performance.	Not Supported
3. Religiosity will positively predict	
(a) safety behavior , and	Supported
(b) safety culture of rice farmers	Supported
4. Hazards exposure will positively predict safety performance of the rice farmers	Supported
5. Safety behaviour will moderate the effect of hazards exposure on safety performance	Supported
6. Safety behaviour will negatively predict safety performance of rice farmer	Not supported had positive relationship
7. Safety participation of rice farmers will predict their safety performance more than their safety compliance.	Not supported
8. The age of rice farmers will directly predict their	
(a) safety culture	Not supported
(b) religiosity	Supported
(c) safety behaviour and	Not supported
(d) safety performance	Not supported
9. The years of rice farming experience of the rice farmers will directly predict	
(a) safety culture	Not supported
(b) safety behaviour and	Supported
(c) safety performance of rice farmers.	Not supported

The final observed model is basically the same as the hypothesized model, except that the expected direction of the path between safety behaviour and safety performance was the reverse. Safety behaviour was expected to moderate to strong negative effect on safety performance, but the results turned out to be rather weak positive relationship. All in all, the hypothesized model has been largely supported by the results. The discussion of the results and implications of the major findings for safety science research and health and safety management practices in rice farming and agriculture, as well as the application of the findings to other sectors were discussed in the ensuing chapter.

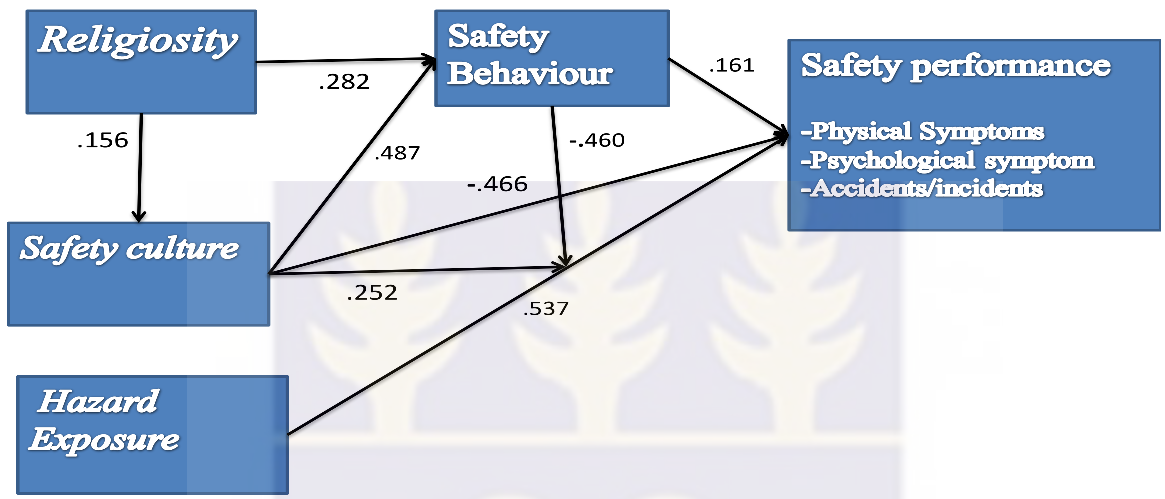

Figure 26: Final observed model with standardized coefficients

CHAPTER SIX

DISCUSSION OF RESULTS AND CONCLUSIONS

6.1 Chapter Overview

Rice farming involves a great deal of hazards right from land preparation to harvesting and post harvesting. At every stage of the rice farming process, various forms of hazards are encountered: physical, ergonomic, chemical, and biological hazards. Exposure to these hazards poses great risks to the rice farmers. There has been limited research attention in the informal sector in general, and in production agriculture in particular. This study used the sequential exploratory mixed methods to explore hazards in Ghanaian rice farming and investigate the extent to which religiosity, hazards exposure and safety culture of the rice farmers predicted their safety performance. In safety management practice, the first step, and probably the most important stage, is the appropriate identification of the hazards prevalent at the work environment. The specific and major hazards that Ghanaian rice farmers are exposed to were explored in the qualitative study. The qualitative results were used to adapt the safety performance scale and also used to develop a hazards exposure inventory. These two scales were used in the quantitative study together with other scales adapted. Greater appreciation of the health and safety issues of Ghanaian rice farmers emerged from the use of the mixed methods design.This would help to put appropriate measures in place to manage and ensure that the health and safety of the rice farmers are not compromised.

The quantitative study tested the extent to which hazards exposure, safety culture and religiosity of the rice farmers predict their safety performance. Investigations into possible personal, organisational and contextual antecedents of safety behaviour to improve health and safety at the workplace are of immense importance. Distinction is made between safety behaviour and safety performance in this study. Safety behaviour constitutes actions of individuals that promote safety at the workplace. The two component safety behaviour model of Neal and Griffin (2000): safety participation and safety compliance was used in the study. Safety performance on the other hand has to do with tangible and observable health and safety outcomes, such as accidents, injuries, work-related health challenges, as well as psychological outcomes of safety breaches at the workplace. These were measured with self-report measures.

Safety behaviour was modelled as an intervening or mediating variable in the relationships between two antecedents (religiosity and safety culture) and safety performance. Thus, the direct effects of the antecedents on safety behaviour and safety performance, as well as their indirect effects on safety performance through safety behaviour were explored. The moderation roles of safety culture and safety behaviour on the effect of hazards exposure on safety performance were also explored. Finally, the effects of four demographic variables on the main latent variables were examined as well.

Data for the qualitative study was obtained through semi-structured interviews from key informants and observations. The semantic deductive (theoretical) thematic analysis was used to analyze the transcribed data. The results from this were used to develop a rice farm hazard exposure measurement scale as well as adapt the safety performance instrument. These were used together with other adapted instruments in the quantitative study.

The quantitative study, which followed the qualitative, employed cross-sectional survey design. Data was obtained through administration of survey questionnaires adapted for this purpose from 469 rice farmers sampled from three major rice irrigation schemes in the Greater Accra and Central Regions of Ghana. The main analytical procedure was the PLS-SEM, using the SmartPLS software. Mediation analyses were done using the bootstrapping approach with 5000 re-sampling, while moderation effects were tested with the two-stage approach.

6.2 Summary of Main Findings

The findings from the qualitative study indicated that the rice farmers were exposed to several health and safety hazards, as indicated in the previous chapter. It was also observed that, despite the prevalence of hazards in their farming activities, most of them did not use personal protective wears, and those who attempted to use any at all, used inappropriate ones. The use of inappropriate safety wears, such as wearing of socks to hold the pair of trousers in place without any footwear when working in the paddy fields resulted in foot rots to some farmers. This is because the socks got wet and remained on the feet for long hours of work. A number of safety incidents were also reported and observed. These include, falls, cutlass or other farm implement wounds, wounds from catapults used for bird scaring, lower back pain, fever, malaria, headache among others.

In the quantitative study, the results show that religiosity and safety culture both had significant positive relationships with safety behaviour. This means that increased level of religiosity and positive safety culture enhanced positive safety behaviour. Religiosity of the rice farmers again had significant direct effects on safety culture, and indirect effect on safety behaviour through safety culture. This means that rice farmers who scored high on religiosity were found to have had better safety culture than the less religious farmers. Thus, religiosity was found to be important in positive safety behaviour and safety culture of the rice farmers.

Regarding the effect of religiosity on safety performance, the results indicate that religiosity did not relate to the safety performance of rice farmers. Thus, safety performance measured in this study was not affected by or dependent on the level of religiosity of the farmers.

This was a surprising finding, given that religiosity had a positive relationship with safety behaviour and safety culture, which in turn related significantly with safety performance. However, when safety performance was partitioned into its three dimensions, religiosity had a significant positive direct effect on psychological symptoms which suggest that religiosity plays a significant role in the mental health of individuals.

Another significant finding was that hazards exposure had a strong significant positive effect on safety performance. Thus, the more the farmers were exposed to hazards on their farms, the more health and safety incidents they suffered. *It must be noted that high score on the safety performance scale represents more health and safety challenges.*

Safety culture was also found to have had a significant direct positive effect on safety behaviour and significant direct negative effect on safety performance. Thus, positive safety culture improves safety behaviour, and reduces health and safety incidents (improves safety performance).

Considering the effect of safety behaviour on safety performance, I expected safety behaviour to have had a negative effect on safety performance. But contrary to expectation, was found to have rather had a significant positive effect on safety performance. This means that positive safety behaviour led to more health and safety challenges.

The test of the mediation effect of safety behaviour shows that safety behaviour partially mediated the effect of safety culture on safety performance, but not the effect of religiosity on safety performance.

The results also show that safety culture and safety behaviour both moderated the effect of safety hazards exposure on safety performance. Safety behaviour had a negative moderation effect, whereas safety culture had a positive moderation effect.

Finally, the test of the effects of four demographic variables indicate that years of rice farming experience significantly predicted the safety behaviour of the farmers, but not their safety performance. Educational levels of the farmers also influenced their safety culture and safety performance, such that those with higher level of education had lower safety culture. Male and female rice farmers did not differ significantly on any of the variables measured in this study. However, in terms of the effect that the predictors had on safety behaviour and safety performance, it was found that males and females differ significantly only on the effect of religiosity on safety culture. Religiosity had a greater effect on safety culture for females than for male.

Figure 27 depicts the final observed model of the study, showing the supported effects of the antecedents on the dependent variable (safety performance). The path in red presents the surprising significant positive effect of safety behaviour on safety performance. The model is discussed further in the ensuing section.

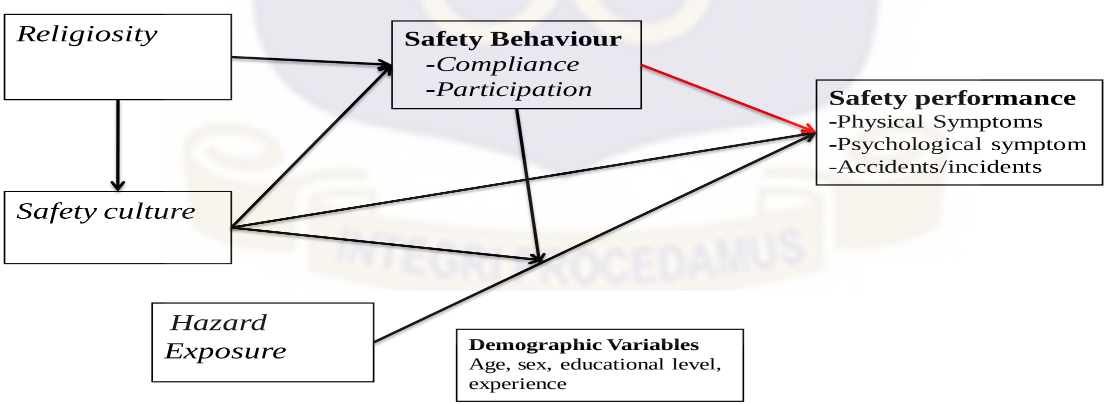

Figure 27: Final observed model of the study

6.3 Discussion of Main Findings

This section presents detailed discussion of the main findings in the study and related them to existing literature which comes mainly from the formal industrial sector. The theoretical framework and relevant theories were utilized to explain the findings and the practical, as well as theoretical implications of the findings were offered.

6.3.1 Effects of safety behaviour on safety performance

The study tested the hypothesis that: *Safety behaviour will negatively predict safety performance of rice farmer*. The results however show that safety behaviour rather had a positive relationship with safety performance. This result contradicts expectation and most of the empirical data, suggesting that positive safety behaviour leads to increased health and safety challenges (poor safety performance), such as accidents, physical health and psychological health symptoms.

Safety behaviour has been reported in the literature to be the immediate or most proximal antecedent of safety performance (e.g. Curcuruto, Conchie, Mariani & Violante, 2015; Neal & Griffin; 2004), having negative relationship with accidents, injuries and near misses. Also, Morrow, Koves, & Barnes (2014), Vredenburgh (2002), Little (2011), Erickson (2000), Grindle, Dickinson, and Boettcher (2000) as well as Neal and Griffin (2006) all reported negative relationships between safety behaviour and safety performance, such as accidents, injuries etc.

Logically, one would also expect positive safety behaviour to reduce health and safety challenges, but that was not the case in this study. Unsafe acts or behaviours logically and empirically ought to be of concern regarding causal factor in workplace accident/injures (Garavan & Obrien, 2001).

A number of studies (e.g. Clarke, 2006, 2013) indicate that the two components of safety behaviour are associated with work-related accidents and injuries (safety performance). Given the surprising result in this study among the rice farmers, safety behaviour and safety performance constructs were partitioned into their sub components to find out what might have accounted for the positive relationship. The results of the partitioning indicate that safety compliance had negative associations with all the dimensions of safety performance with accidents, physical symptoms and psychological symptoms respectively, but safety participation had positive association with all the dimensions of safety performance in that order. The positive effects of safety participation were stronger than the negative effects of safety compliance and this led to the overall weak positive relationship of safety behaviour and safety performance.

The implication of the results here is that safety compliance could lead to a reduction in the health and safety incidents among the rice farmers, whereas safety participation would rather increase their physical symptoms of safety performance. Though the partitioning of the dimensions helped to a large extent, there is still a puzzle regarding why safety participation would result in increased psychological symptoms specifically, and safety performance in general. Earlier studies indicate that mere compliance with safety procedures is not sufficient (Neal & Griffin, 2000; Little, 2011) but safety participation is important in reducing overall safety incidents. It seems that the farmers who engage in safety participation behaviour had to go the extra mile to put things right. This might have accounted for the increased physical symptoms in their case. Neal and Griffin (2006) indicated that when workers do not participate in activities that enhance safety at the workplace, the person who was negligent in those behaviours may not be directly affected but can create the conditions that make it more likely that someone else would be injured later on. In this regard, it is possible that the negligence of other farms workers could result in negative effects on those who might have been involved in safety participation behaviour.

The conclusion from the findings of the present study is that safety compliance is essential in the management of safety among the rice farmers. However, the findings regarding safety participation behaviour require further investigation. Further studies might be needed in this area to find out why safety participation related positively with safety performance.

6.3.2 Effects of Safety culture on safety behaviour and safety performance

Occupational culture of safety is very essential for the wellbeing and productivity of any organisation, irrespective of the sector of the economy that it operates. Prioritising the beliefs, assumptions, values and actions that ensure safe and healthy work make an organisation have a culture of safety which has enormous implications for safety behaviour and outcomes.

The present study hypothesised that: *Safety culture of the rice farmers will directly predict their (a) safety behaviour and (b) safety performance***.** This hypothesis was supported by the results of the study. Safety culture had a significant direct positive effect on safety behaviour, and significant direct negative effect on safety performance. This means that having a positive safety culture at the workplace would make employees engage in behaviours that would enhance safety at the workplace. This result is in line with findings in the industrial settings which have established that safety culture and safety behaviour are strongly related (Griffin & Neal, 2000; Guldenmund, 2000; Nahrgang et al., 2011; Silva et al., 2004). The reason for this positive relationship is that safety behaviour serves as a frame of reference that guides employees regarding acceptable behaviours at the workplace in various contexts (Griffin, 2004; Zohar, 2010).

A number of meta-analysis (Beus et al., 2010; Christian et al., 2009; Clarke, 2006) found evidence that supports the direct relationships between safety culture and safety behaviour, as well as safety performance. The results of these meta-analysis indicate that the relationship between safety culture and accidents/injuries range from a -.22 to -.39, and that between safety culture and safety behaviours, range from .43 to .61. Thus, the relationship between safety culture and safety performance appears to be a medium effect and the relationship between safety culture and safety behaviours appears to be a large effect. The relationship between safety culture and safety performance (accidents/ injuries/physical and psychological health symptoms) was -.466, whereas .487 was observed between safety culture and safety behaviour of the rice farmers. This is largely similar to the results in the meta-analysis and other studies in the literature.

The prevailing safety culture of an organization provides contextual cues that the employee uses to decide whether to behave in a safe or unsafe manner at work. Thus, the positive relationship between safety culture and safety behaviour among the rice farmers was in consonance with the literature in the industrial setting. Zohar (2000) holds that positive safety climate enhances safety behaviour among employees, consequently improving safety performance because the prevailing culture primes employees concerning what they should do when faced with safety challenges. What this means is that, workers develop an understanding of behaviours and actions that are considered acceptable according to the prevailing safety culture. Among the rice farmers in this study, it was observed that largely, the use of nose pad when spraying weedicides was not a practice. Instead, they decided to observe the direction of the wind so that the chemical would not be blown into their eyes and nostrils. Meanwhile, a number of them reported that the wind occasionally blows the chemicals into their eyes and nostrils.

Research in safety culture is of great importance to contemporary researchers because organisational accidents occur within a cultural and social context (Clarke, 2015). The relationship between safety culture or climate and safety related behaviours and outcomes have been researched widely in the formal sector but not in the informal sector. In line with Cole, Stevens-Adams and Wenner (2013), the results of this study confirmed that a positive safety culture is an important predictor of both safety behaviour and safety performance. Thus, a positive safety culture would promote safety and a negative safety culture may also result in poor safety performance. When workers continuously discharge their duties without following safety regulations and procedures it results in the creation of a negative safety culture (Agnew & Daniels, 2010; Arboleda, Morrow, Crum & Shelley, 2003).

An important observation in safety culture research is that the dimensions or components used in a given study have different effects on safety behaviour and safety performance. In that regard, the components used in this study were also explored regarding their individual effects on safety behaviour and safety performance. Management safety priority is one component that is commonly used in most researches. In this study, management priority had a significant direct positive effect on psychological symptoms of safety performance. This is contrary to findings in other researches in the literature. Management commitment to safety has been found to be a very essential component of safety culture that helps to promote safety performance (Yule, Flin & Murdy, 2007; Zohar, 2000). Yet, in this present study, management safety priority did not have a significant effect on safety performance.The non-significant effect might bethat the rice farmers are individual farmers who are directly responsible for what happens on their farms. They are not under the direct supervision of the scheme managers and the leaders of their cooperatives. The scheme managers and the cooperative leaders only provide technical advice regarding the farming activities and productivity. Even if any safety breach by a particular farmer is observed, the scheme manager could only offer an advice, which may not be adhered to by the farmer in question. From interaction with the farmers and the scheme managers, it came to light that, unlike the formal sector where the management of the organisations are responsible for the safety management and well-being of the workers, the scheme managers and cooperative leaders do not have such vicarious liability. Safety compliance cannot be enforced among the rice farmers by the scheme manager and cooperative leaders. This therefore might have accounted for the non-significance of management commitment to safety and also the direct positive relationship of management safety priority on psychological symptoms.

Group norms concerning safety had a significant positive effect on physical symptoms in this study. This means that as the farmers' group safety norms increased, their physical symptoms also increases. This was unexpected as previous studies suggest that group safety norms improve safety performance. However, it seems that the safety culture or group norms of the rice farmers regarding physical safety were not a positive one which might have led to the strong positive association. As indicated earlier, continuous non-compliance to safety regulations leads to a negative safety culture. This was evident from the findings of the qualitative study that most of the farmers did not comply with safe work procedures and this has become the norm.

The Social Control Theory (Hirschi, as cited in Clarke, 2015) posits that connectedness to a group engenders behaviour conformity of group members. This tendency to conform may have positive as well as negative consequences for safety behaviour and safety performance. Repeated engagement in risky behaviour without an adverse consequence results in decreased risk perception as posited by the Habituated action theory (Kasperson et al., 1988; Weyman & Kelly, 1999, cited in Clarke, 2015). Interactions with the rice farmers in study one indicated that most of them conveniently violated safety procedures and the practice has become the norm. This might have led to a situation where risk perception had decreased and risk tolerance increasing, resulting in negative health and safety culture and safety consequences. This is supported by Weller, Daeschel, Durham and Morrissey (2013) who found that risk taking can lead to repeating the behaviour and engaging in more dangerous behaviour if negative consequences do not occur. This leads to the creation of negative safety culture which would later have negative and devastating effects.

Another plausible explanation for this positive relationship might rest in the Social action theory. Individuals take risks because of peer pressure or a general community perception that an activity is low risk (Coleman, 1986). It is instructive to note that group safety norms had strong positive effects on both safety compliance and participation behaviours. A person could be persuaded to engage in unsafe behaviour if "*everyone else is doing it*" or the community at large does not perceive an action to be unsafe (Coleman, 1986). In this regard, there might be certain unsafe behaviours that were pervasive among the rice farmer which had negative physical consequence on their health. This view is supported by (Cooper, 2003) who argued that the tendency to act in an unsafe manner could be influenced by what co-workers expect from individuals. This calls for an intervention at both individual and group levels too improve adherace to safety norms and work procedure. Scheme managers and leaders of the cooperatives have roles to play to encourage the farmers to adopt positive and safe work procedures and discourage violations of safety procedures. This can be done through regular education and reminders on the need to adopt appropriate safe farming procedures at all times.

Among the dimensions of safety culture used in this study, safety reporting and safety training had significant negative effectson all the dimensions of safety performance. It was indicated in the first study that the scheme managers and some NGOs organized safety training programmes for the rice farmers from time to time. The strong negative relationship observed in this study is in line with findings in the formal sector (Huang, Ho, Smith & Chen, 2006; Lin & Mills, 2001). Along with safety training, a good safety reporting system that promotes safety reporting behaviour of employees facilitates the adoption of remedial measures in order to promote safety. The conclusion from the findings of this current study is that safety reporting is animportant predictor of safety behaviour and safety performance. This result agrees with findings in the formal sector studies (e.g. Adjekum et al., 2015). The rice farmers indicated that although there was no formal or mandatory reporting system in their schemes, when there is an incident, it is reported to their cooperative leaders and the scheme mangers. In some case, remedial measures and safety advice are proffered.

An important conclusion from the findings of the present study is that safety culture is an important predictor of rice farmers' safety behaviour and safety performance. This is because the safety culture of an organization is a subculture of the entire organizational culture and these have tremendous influence on what workers see as appropriate behaviour in given situations. As indicated by Cooper's reciprocal safety culture theory, the culture of the organization influences the behaviour of the workers, and vice versa. Thus, the reciprocal safety culture theory was supported in this study. Quality safety culture engenders positive safety behaviour and consequently, safety performance.

6.3.3 Effects of religiosity on safety behaviour, safety culture and safety performance

One of the propositions tested in this study was that "*religiosity would relate positively with safety behaviour, and indirectly with safety performance through safety behaviour.*" Several studies indicated that religiosity has positive influence on employees' workplace behaviour and negative relationship was consistently observed between safety behaviour and safety performance. Safety behaviour has also been found severally to be the most proximal antecedent of safety performance (accidents, injuries and health challenges). It was therefore expected that religiosity would influence the safety behaviour of the rice farmer, which in turn would influence their safety performance.

The results from the present study support the positive relationship between religiosity and safety behaviour of the rice farmers. However, contrary to expectation, the results did not support the proposition that religiosity would relate to safety performance through safety behaviour. Thus, the expected direct relationship between religiosity and safety behaviour was supported, whereas the indirect relationship between religiosity and safety performance through safety behaviour of the farmers was not supported. What this means is that the incidence of health and safety challenges among the rice farmers was not related to their level of religiosity, though religiosity is significant for safety behaviour.

Religiosity was also found to have had a positive relationship with mental health (Ronneberg, Miller, Dugan & Poprell, 2014) and mediated the relationship between certain antecedents and risky behaviour (Greening & Stoppelbein, 2002). The expectation in the present study was that religiosity would reduce psychological symptoms when safety performance was partitioned. This was confirmed with religiosity having direct relationship with only the psychological distress symptoms dimension of safety performance. This supports the proposition that religiosity provides a sense of purpose and meaning in life, as well as community and connectedness to individuals. The results suggest that religiosity helps individuals to cope with both work related stress and stress from other sources of their lives. Dutton and Heaphy (2003) suggested that trust and sense of community among individuals have eroded in current times, and the sense of self-centeredness, greed and egoism, instead of caring for others has rather increased (Gull & Doh, 2004; Schroth & Elliot, 2002; Neal, 2000). These situations, they argued is making individuals search for a sense of community, quality connectedness and compassion at work.These situations make religion an apt alternative for individuals to achieve their sense of purpose and meaning, as well as the sense of community and social connectedness that would make them complete as humans. Therefore, individuals who are more religious tend to have a more satisfying work life and better psychological health than less religious individuals.

The present findings indicate that religiosity improved safety behaviour of the rice farmers. This finding confirms the study of Kutcher et al (2010) who observed that employees do not leave their religiosity behind but carry their religious beliefs with them to their work place.This has implications for their workplace attitudes and behaviour as demonstrated in several studies (e.g. Asamani, 2016; Ivy, 2014; McGhee & Grant, 2008; Kutcher et al., 2010).

Consistent with the socio-cultural subsystems theory, the work environment is a miniature society and as social beings, our actions and attitudes in any environment, whether work or home, are directly influenced to some point by religion-rooted cultural beliefs (Mokhlis, 2009). Religious beliefs and values are part of the overall cultural value system of the Ghanaian and the tenets of various religions admonish individuals to engage in appropriate behaviours. These values might have been deeply rooted in the belief systems of the farmers and directly influencing their safety related behaviours. This notion was expressed in Mokhlis (2009), positing that religion represents important cultural aspect of individual and it is one of the most universal and influential social institutions that has significant influence on people's attitudes, values and behaviours at both the individual and societal levels. In this regard, whether the individuals are in their farms or home, their actions are guided by the deeply rooted and culturally relevant religious beliefs.

Considering how entrenched religious values are in the context of the African, and for that matter, the Ghanaian, it was not surprising that religiosity was positively related with safety related behaviour and safety culture of the rice farmers. As forcefully expressed by Mbiti (1969) and Leonard (1966), religious beliefs and values are aspects of the African Personality. This suggests that the African does basically, everything religiously, including working on the farmer. It is not uncommon to hear workers remind each other of the values of their religion when deciding on the cause of action to take. We hear of statements such as *"... the Bible or the Quran tells us that..."* or ..."*As a Moslem or a Christian, I will not do this or that..."* which are indications that religious beliefs and values are always activated in different settings and these prime employees as to what is expected of them. Religion being a cultural subsystem (Arnould, Price & Zikhan, 2004) makes workers to activate and take their religious beliefs to the workplace (Kutcher, et al., 2010), hence, the positive relationship with safety behaviour.

Religiosity also had significant positive relationship with safety culture. There is some evidence of decline in traditional support systems (Leigh, 1994) and decline in local communities and social groups that provide a sense of connectedness in the past (Conger, 1994). The workplace has therefore replaced these vital ingredients as primary sources for many people and religiosity has been found to be one crucial institution that provides individuals with a sense of community and connectedness. This increases their sense of attachment to the organization;

loyalty and sense of belonging to the organization (Dutton & Heaphy, 2003) which makes them accept and imbibe the prevailing culture at the workplace. This is very essential in today's work environment given that employees spend most of their waking lives at the workplace.

In concluding, the present study argues that religiosity is very essential in the work life of individuals in today's world because of the decline in the traditional support system. Religion therefore provides people with a sense of purpose, community and connectedness and influences their behaviour at work, including safety behaviour. The sense of connectedness and community that religion provides, it makes individuals become committed to the prevailing norms and values at the workplace, thereby making them accept the (safety) culture at the workplace.

6.3.4 Effects of hazards exposure on safety performance

Hazards are features of the work environment that have the potential to cause harm or discomfort or health challenge to people exposed to it, or damage to property. Since hazards only present the potential or likelihood to cause harm or damage, the study investigated *whether the extent to which the rice farmers were exposed to hazards translated to accidents, injuries, or health challenges*.

The current study found that hazards exposurehad a positive effect on safety performance of the rice farmers. This means that, the more hazards the rice farmers were exposed to, the worse their safety performance. In other words, the farmers experienced more health and safety challenges (such as accidents, injuries, psychological distress symptoms). The result of this study was expected and it confirms the observation by Hadjimanolis, et al. (2015) that situational factors such as perceived risks and hazards on the job, priority of production over safety etc have significant influence on safety performance. Hazards present probability of harm of health challenge, and so once that probability increase through high level of exposure, the risk of harm becomes greater and that leads to increased health and safety challenges and incidents.

The results from both study one and study two indicate that the rice farmers were exposed to high levels of hazards which led to several forms of injuries and other forms of health challenges. Exposure to physical and psychosocial hazards may affect both psychological and physical health (Laka & Jain, 2010). Hazards exposure had significant positive relationships with all the dimensions of safety performance as well as the global safety performance. Psychological effects of physical hazards were found to have had direct effects on the brain of the affected persons (Laka & Jain, 2010). Physical hazards also had indirect effects on the awareness, suspicion or fear of the fact that they are being exposed to harm (Laka & Jain, 2010). Chemical hazards were also found to have had psychological effects on the brain of individual directly through the unpleasantness of their smell, andindirectlythrough the fear that such exposure might be harmful (Cox, Griffiths &Rial-González, 2000).

The findings from study one of the present study (qualitative study) also indicate that most of the rice farmers work for long hour under various difficult conditions. Prolong sustained awkward work posture, screaming to scare birds amidst running, among others were also observed among the rice farmers which could lead to serious fatigue. Some studies indicated that fatigue could have a dual effect and predispose a worker to stress and increase the extent of any pre-existing condition. Long working hours have also been found to have negative effects on sleep patterns in terms of duration and quality (Virtanen et al., 2009; Cox, Griffiths & Rial-González, 2000). This, in turn, could have ripple effects on the behaviour and performance of the individual subsequently, which could lead to physical harm or accident at work.

The findings from the present study emphasize the need for more investigations into the hazards associated with rice farming. Empirical research would facilitate the understanding of patterns of exposure in production agriculture to help in designing safety systems and policies for preventing any adverse consequences. It must be stressed that farms are also workplaces, and like all other workplaces, workplace health and safety policies must apply.

6.3.5 Mediating effect of safety behaviour on the effect of safety culture on safety performance

It was postulated that *safety behaviour would mediate the effect of safety culture on safety performance.*The results indicated that safety behaviour had a competitive partial mediation effect on the effect of safety culture on safety performance. Complementary mediation effect was expected rather than the competitive effect obtained in the current study. Neal, Griffin, and Hart (2000) argued that the relationship between safety culture and occupational accidents is mediated by safety behaviour. Given that safety culture has been found consistently to relate positively with safety behaviour and positive safety behaviour in turn reduces health and safety incidents, a mediation relationship between safety culture and safety performance was postulated and tested in this study. Thus, safety culture directly determines how people behave regarding safety, and those behaviours have consequences on safety performance. Neal and Griffin stressed their argument further by suggesting that if both safety culture and safety behaviour are in the model, the effect of safety behaviour would be expected to be stronger than the effects of safety culture on safety performance. The results of this present studydid not support Neal and Griffin's stance. The direct effect of safety culture in this study was stronger than that of safety behaviour. In addition, the effect of safety behaviour was positive, contrary to expectation.

The reason for the contrary finding in this study might be the competitive effects of the two dimensions of safety behaviour among the rice farmers. The rice farming population is a discrepant population which makes the data unique in some way. The rice irrigation schemes are semi-structured informal work environment. For this reason, certain features of the formalized work environment were not present. For instance, there were no formal safety management policies and structured management systems in the farms. The farmers are individual farmers operating the farms with technical assistance from the scheme managers and extension officers. In a nutshell, though safety behaviour mediated the relationship between safety culture and safety performance, this effect was contrary to expectation due to the positive effect of safety behaviour on safety performance.

6.3.6 Mediating effect of safety behaviour on the effect of religiosity on safety performance

The findings of this study, contrary to expectation, indicate that safety behaviour did not mediate the effect of religiosity on safety performance. Safety behaviour was expected to be enhanced when religiosity increases, given that religiosity has been found to be very important in the workplace behaviour in various settings. In turn, safety behaviour was expected to have a negative effect with safety performance. However, as indicated earlier, safety behaviour rather had a positive effect on safety performance, with a small effect size. The weak positive effect of safety behaviour on safety performance could be attributed to "pull-push effect" of positive-negative effects of the two dimensions of safety behaviour. As indicated earlier safety compliance had a negative effect on safety performance, while safety participation had a positive effect on safety performance. The positive effect of safety participation was greater than the negative effect of safety compliance, resulting in a combined (overall) weak positive effect of safety behaviour.

The lack of significant mediating effect of safety behaviour might be due to the weak effect of safety behaviour on safety performance. The indirect effect (mediating effect) is actually the product of the effect of the predictor on the mediator, and the effect of the mediator on the dependent variable. Therefore, given the weak effect of the mediator (safety behaviour) on safety performance, it was not surprising that the mediation effect was not significant.

In sum, the mediating effect of safety behaviour on the relationship between religiosity and safety performance is likely to hold if the effect of safety behaviour on safety performance is large enough. This study recommends that the study model be tested in other contexts to ascertain the relevance of safety behaviour in the religiosity-safety performance relationship.

6.3.7 Moderation effect of safety culture and safety behaviour on the effect of hazards exposure on safety performance

The evidence in the literature suggests that the effects of hazards exposures on health and safety of workers may be intervened (Laka & Jain, 2010). Considering that appropriate safety behaviour and positive safety culture at the workplace could reduce the probability of hazards exposure resulting in accidents and injuries, the moderation roles of safety culture and safety behaviour were tested in this study. Hadjimanolis et al. (2015) noted that situational variables such as perceived risks and hazards on the job, perceived safety conditions, involvement in accidents, priority of production over safety, information available to employees, and safety training. The technical aspects of safety such as the availability of personal and general protection equipment were also found to be significant predictors of safety performance.

Hazards per their nature only present the potential to cause harm, but whether any harm actually occurs depends on several factors. There are several measures that could and should be put in place to prevent hazards from causing harm to employees. Most hazards on the rice farms cannot be eliminated. For this reason other safety management approaches need to be applied to prevent harm. This includes the use of protective safety equipment and protective wears, as well as management systems and processes put in place. In this regard, the quality of safety culture and safety behaviour is likely to have implications for the effect of hazards exposure on safety performance. Concluding, the findings of this study indicate that when the farmers comply with safety measure and promote positive safety culture, the probability of the hazards exposure leading to harm reduces drastically.

6.3.8 Effects of demographic variables on the main variables

Zohar and Luria (2005) indicated that diverse work groups within an organisation could influence the relationship between overall organisational safety culture and behaviour because different organisational subgroups might have different experiences and perceptions of their health and safety at the workplace. The effects of age, sex, level of education and years of rice farming experiences on the main variables were explored. Results from previous studies show mixed findings. The results of this study indicate that the sex and age of the rice farmers did not have significant relationship with any of the variable. However, years of rice farming experience significantly related positively with safety behaviour of the rice farmers, but not with the other variables. Educational level of the rice farmers also had a significant positive effect on safety culture and safety performance.

It appears therefore that experienced rice farmers were more negligent in their farming activities, but did not have significantly higher safety performance (injuries and health challenges) than the younger farmers. Hadjimanolis, et al. (2015), Cooper and Phillips (2004), Nahrgang et al. (2011) and Dejoy et al. (2004) all indicate that these demographic factors are potential predictors of work-related safety outcomes. Dejoy et al. (2004) for instance observed a positive relationship between age and safety climate. The findings of the present study however were contrary to Dejoy et al's findings. Possible reasons might be work context difference in which the studies were conducted. The current study was conducted among rice farmers in Ghana whereas Dejoy et al. conducted their study in the industrial and formal work setting. The results of this study regarding age and safety behaviour and safety performance were consistent with Hadjimanolis et al. (2015) results which found a non-significant negative relationship of age with health and safety situation in the workplace, and Siu et al. (2003) who also found that accident rates were not related to age.

Safety culture among the rice farmers was better with those with no formal education than with those with higher educational level. That is, there was a negative relationship between level of education and safety culture of the rice farmers. It appears that the farmers with higher level of education were not adopting good safety culture. This is a bit surprising because I expected those with higher education level to be more aware of the safety implications of their actions.

Safety performance was also lowest among the farmers with no formal education and highest among those with secondary and basic levels of education. There seem to be a curve linear relationship between safety performance and educational level, such that it was lowest among no formal education, increased among the basic and secondary level farmer, and dropped again among the farmers with tertiary level of education.

6.4 Empirical Contribution of the Study

The current study has enormous theoretical, methodological and practical significance, and also implications for the field of Industrial and Organisational Psychology, safety science research literature and methodologically in several ways. The first contribution of the study concerns the application of psychological and industrial and organizational principles in the investigation of the health and safety of rice farmers in Ghana. There was no evidence in the literature that suggests that any I/O psychology study has been conducted to investigate the health and safety issues of rice farmers in Ghana. This study contributed to the literature of safety science research in the informal sector, and especially, rice farming. The focus of most I/O Psychological research has been the formal sector which constitutes less than 20% of the Ghanaian economy, and less than 10% of the world's labour force. Again, the production agriculture sector has not seen any psychological science research, especially rice farming. As Ghana seeks to increase rice production and reduce the import volume of rice, this study provides significant findings to help provide safe and healthy work for the rice farmers.*The present study is therefore novel and groundbreaking in the field of I/O Psychological research*.

Secondly, there is also no evidence in the literature regarding investigations of the extent to which rice farmers level of religiosity affect their safety behaviour and safety performance in Ghana. This study incorporated religiosity as a person or individual variable that has implications for safety outcomes among the rice farmers. Literature established that religiosity influences the work behaviour and attitudes of employees and has implications for their performance and productivity. Also, Gyekye and Salminin (2004, 2006) attempted investigating the effect of religiosity on the rate of accidents in the mining industry in Ghana. However, they only used church attendance as a measure of religiosity. This is likely to result in erroneous conclusions, as church attendance alone cannot be synonymous with one's religiosity. The current study, however, measured religiosity with a multi-dimensional scale, covering intellectual, public practice, private practice, ideological and transcendental experiences. Thus, this study provided a more comprehensive assessment of the religiosity construct that could provide a more accurate result in scientific research.

The safety culture of production agriculture workers in Ghana has never been investigated. This study contributed to the literature by investigating the safety culture of rice farmers and how this affects their safety performance. This study also brought to the fore and emphasized the need to distinguish safety behaviour from safety performance in safety science research.

Another significant contribution of this study is the development of the rice farm hazards exposure scale. There was no evidence of the existence of any scale that could be used to assess the extent to which rice farmers and other agricultural workers are exposed to hazards in Ghana. The development of this scale therefore would facilitate the assessment of extent of hazards exposure in rice farms and other farming activities. Again, the adapted incident reporting scale in the Ghanaian context could be used in production agriculture to assess the safety performance of workers in those sectors.

The findings from the present study informed the formulation of an *integrative safety performance model* (figure 28) to be used in investigations of antecedents of health and safety performance at the workplace. The findings emphasised the roles of *person* variable and *organisational*, contextual or *situational* variables in determining the safety behaviour of individuals, and safety behaviour in turn on safety performance. The contextual variables also directly have implications for safety performance at the workplace.

The integrative safety model consists of four components: the person, context, and behaviour and safety performance. The model posits that safety outcomes are products of multiple constituencies or factors at the workplace. As such, safety performance is a product of the nature or quality of actions (behaviour) of individuals and situational variables prevailing in the work environment. The safety performance variable constitutes the safety outcomes such as accidents, injuries and work-related health problems, whereas the behaviour represents the safety related behaviours of individuals on the job. The context component represents the management systems, policies, group norms and perceptions, hazardous nature of the work environment, etc including the prevailing safety culture/climate of the organization. The person component also represents the beliefs, values, attitudes, perceptions regarding safety and other personal traits of the individual.

The behaviour of the individual on the job is determined by the prevailing contextual factors and the person variables. There is a reciprocal influence between the person and contextual factors; because the prevailing policies and management systems have the potential of influencing the values and personal attitudes of the individual workers and the values, beliefs and attitudes of the individual could also shape the policies and situational factors at the workplace. The integrative safety performance model posits that occupational safety is multifaceted and that all the components should be analyzed together in investigations regarding causal factors of safety performance. The model is a product of the current study and other findings in the literature.

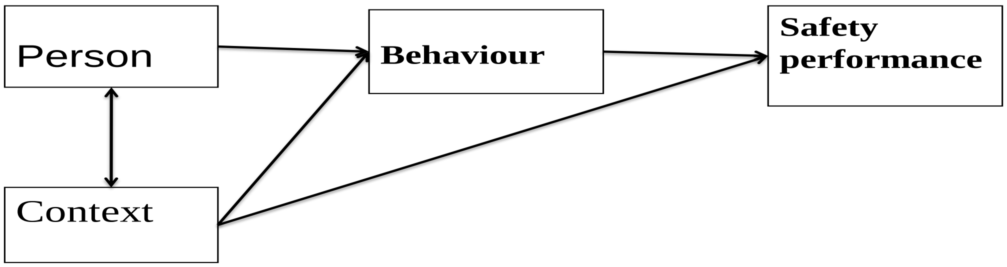

Figure 28: Integrative Safety Performance Model *(Dceveloped from findings of the current study, 2017)*

6.6 Implications of Findings for I/O Psychologists and Occupational Health and Safety Practitioner

The findings of the study have a number of implications for practicing I/O Psychologists and occupational health and safety practitioners. The findings underscore the need for safety science practitioners to encourage and nurture positive safety culture and safety behaviour as either positive or negative safety culture has immense implications for safety. When employees work without complying with safety regulations and are not reprimanded for safety violations, a negative safety culture is created (Agnew & Daniels, 2010; Harvey, Bolam, Gregrory & Erdo, 2001). For this reason, positive safety compliance must be encouraged and enforced to promote safe work for all workers, irrespective of the sector. Employees must be made to follow safety protocols in the discharge of their duties, and not to prioritize production over safety. In addition to this, proactive participation and initiatives to improve safety must be encouraged among workers, as compliance alone is not sufficient (Dilda, Mearns & Flin, 2009).

The findings also indicate that religiosity is important in promoting positive safety behaviour and safety culture. This confirms the importance of religiosity in workplace behaviour in general and safety science in particular. This calls for cautious encouragement of religiosity at the workplace. Krishnakumar and Neck (2002) suggested optional organisation of morning prayers or meditation sessions, multi-faith prayer space, corporate chaplaincy, spiritual wellness and balance programmes as means for encouraging religiosity at the workplace. These could be applied together with efforts to promote accommodation and encouragement of free expression of religious beliefs and spiritual requests from employees (Cash & Gary, 2000).

Industrial and Organisational Psychologists should also promote the acknowledgement and respect for religious diversity (Krishnakumar & Neck, 2002) and foster a culture of diversity of beliefs. It is important for I/O psychologists and manager to accept that employees are made up of body, soul and spirit and integrating these together makes employees feel as whole persons. The whole person must be engaged, not only the physical by taking into account people's spiritual lives. When the religious and spiritual aspects of employees are blocked it may result in poor psychological health.

Industrial and Organisational Psychologists need to be interested and get involved in the informal sector to promote wellbeing and productivity. There is the need for training of farm workers on the importance and appropriate usage of personal protective equipment, empowerment and development of scheme managers and supervisors of farms to help in the promotion of safe work practices. There are also the need to design safety management intervention programmes and manuals onhow to identify hazards and assess risk level in farms and other work settings.

Industrial and Organisational Psychologists can also help to promoe psychological wellbeing of farm workers and other categories of workers. Occupational incidents have substantial effect on the psychological health of workers, as found in this study.

6.7 Implications for Policy makers

The results of the study suggest that safety compliance is important for reduction of health and safety incidents and challenges. In view of this, it is important that the health and safety provisions in the labour act be universally applied to all workers and employers, irrespective of the sector. It was observed that all the conventional irrigation farms have scheme managers and extension officers who help them with technical advice. These extension officers could be equipped to offer health and safety training and advice to the farmers. The extension officers and scheme managers should be concerned more about the health and safety of the farmers, instead of only being concerned with production. They should conduct regular safety audits of the rice farms and offer appropriate advice and ensure that the farmers comply with safe working procedures.

Farmers' cooperatives should not only be concerned with increased yields, but pay critical attention to health and safety of farm workers, as productivity is pursued. This means that there is the need for capacity building for irrigation scheme managers and extension officers in safety management so that they would be in a position to educate and promote safe work practices.

Personal protective equipment or wears for farmers should be made available and affordable by the Ministry of Agriculture, and championed by farmers' Cooperatives. The government needs to provide comprehensive health care to farming communities, psychological care and medical as Ghana seeks to revump the agricultural sector and ensure food security.

There is also the urgent need for a comprehensive national policy on health and safety for workers, including the Agricultural sector. Finally, insurance policy for farm workers would be of great benefit.

6.8 Limitations of the Study

This study has several strengths that make the findings largely meaningful forpractitioners, policy makers and researchers. However, some limitations of the study are worth mentioning to be taken note of. First, given that questionnaires were used in the collection of the quantitative data, it is likely that some respondents would not have provided true responses that reflect the true states of the variable measure. However, given the relatively large sample size and the use of the bootstrapping approach in the analysis, any biases in responses might have been minimized. Again, all the scales were well validated with very good reliability coefficients which would provide accurate results. Notwithstanding, future studies could utilized concurrent mixed methods design instead of only the quantitative method.

The study was conducted at the Southern part of Ghana, and with only organised rice irrigation scheme farmers. This may limit the generalizability of the findings to rice farmers at the other parts of Ghana, given the relevance of contextual variables in influencing safety behaviour and safety outcomes. Agaian, the health and safety situation of non-organised rice farmers may be different from those in the organised farms. The findings therefore must be generalized to other rice farmers with caution.

Another limitation is in relation to the fact that this study was conducted among rice farmers which suggest that the findings have limited applicability to rice farmers, and to some extent to other production agricultural ventures. The findings must be applied to the industrial, service and formal sectors with caution as safety dynamics are context driven. Again, tractor, power tiller and other agricultural machine operators were not included in the study. This limits the findings of the study to only actual farmers. Future studies may include the operators in their sample to have more comprehensive findings of the rice production activities.

This study did not test how safety culture relates to hazards exposure and how hazards exposure and risk perception also affect safety behaviour at work. Future studies would explore these relationships and how other African collectivist values also relate to safety behaviour.

6.9 Recommendations for Further Research

The findings of the current study call for further investigation into the role of religiosity in safety performance in different settings and why safety behaviour had a positive relationship with safety performance among the rice farmers would be of great benefit in safety science research. The fact that safety compliance and safety participation had different and opposite effects on safety performance suggest that the two component of safety behaviour must be partitioned in research in order to arrive at valid conclusions. It the two components are combined as it may lead to erroneous results. Future studies may also explore how other Arican values, for instance, collectivist values and respect for authority relate to safety behaviour and safety culture.

I also suggest that future studies may explore the nature of relationships between safety culture and hazards exposure, as well as how hazards exposure relates to safety behaviour and also risk perception. It would be interesting to find out the dynamics among these variables.

As was proposed by Christian et al.(2009) and other researchers, it is imperative that safety behaviour and safety performance must be distinguished in occupational safety research so that consistent results could be arrived at to help in dealing with occupational health and safety. The practice of conceptualizing safety performance sometimes as an umbrella term and at other times as safety related behaviours or tangible safety outcomes must be avoided. Behaviours and acts that promote safe work should be delineated as safety behaviour, and the safety outcomes (accidents, injuries, near misses and work-related health challenges) which are consequences of the behaviours and actions should be conceptualized as safety performance.

The findings from this study confirmed the relevance of person and contextual or situational factors in safety behaviour and safety performance. In view of this, an integrative safety performance model (figure 28) has been proposed for further research into investigations into occupational safety issues. It is therefore recommended that this model be tested in varied work setting.

6.10 Summary and Conclusions of the Study

The informal sector, especially, production agriculture has seen very little research about the health and safety of farm workers. Meanwhile, the informal sector constitutes majority of the labour force and contributes greater proportion to the Ghana economy than the formal sector. This study investigated the hazards that rice farmers are exposed to, and the major health and safety incidents that the farmers experienced in a qualitative study. The results from the qualitative study were used to develop rice farm hazards exposure scale and also to adapt the rate of incident reporting scale and used in the quantitative study. The quantitative study tested the extent to which rice farmers' religiosity, hazards exposure and safety culture predicted their safety performance. The mediation role of safety behaviour was tested in these relationships. Safety behaviour and safety culture were tested as moderator in the relationship between hazards exposure and safety performance. The effects of age, sex, level of education and years of rice farming experience on the main variables were also tested.

The sequential exploratory mixed methods design was employed for the study. The philosophical foundation for the study was the pragmatism philosophy, with the socio-cultural subsystems and Cooper's reciprocal safety culture being the theoretical underpinnings of the study. The qualitative data was analysed with the theoretical thematic analysis while the cross-sectional survey was the design for the quantitative study. The respondents were rice farmers sampled from the Ashaiman, Kpong and Okyereko rice irrigation schemes. The main data analysis technique for the quantitative study was the PLS-SEM with the SmartPLS software.

Generally, the findings support both the socio-cultural sub-systems theory and Cooper's reciprocal safety culture model, and it was argued that the two models were crucial in the explanation of antecedents of safety behaviour and safety performance. However, Cooper's model does not indicate how the personal, contextual and behavioural variables affect safety outcomes. Based on the findings in this study, an *integrative safety performance model,* as described above has been proposed.

The findings also stressed the importance of religious beliefs and safety culture in promoting safety behaviour and safety performance. The findings do not provide support that religiosity has a direct effect on safety performance. The findings also led to the conclusion that both safety behaviour and positive safety culture are significant in reducing the possibility of hazards exposure causing harm.

To sum up, Ghana has great potential to increase rice production to help reduce the level of rice importation. To achieve this goal, the health and safety of the rice farmers is crucial. The present study further confirm that individuals' engagement in safety behaviour is influenced by both external and internal factors, or person related andsituation related variablesas indicated by Geller (2005) and Christian et al (2009). In view of this, it is imperative for organizational and safety practitioners to take into account both person and contextual variables in their efforts to provide safe work to their workers. The health and safety of rice farmers and other production agriculture workers need to be taken seriously if Ghana seeks to ensure productive workforce and healthy nation because the agriculture sector provides employment for over 60% of Ghanaians. Just like working in a factory, office or a store, agricultural workers have the same right to safety and peace of mind while on the job. For this reason, it is important for the Directorate of Occupational Health and Safety to extent their education and inspections to the informal and production agricultural work settings.

Individuals spend most of their waking lives at work or in work-related activities. Given that the traditional social support system is eroding, it is important that the workplace is made safe from physical and psychological harms. People derive not only financial benefits from work, but also psychological and social benefit. The workplace must therefore be made to provide people with meaning, purpose and safe community in life as recommended above. This would go a long way to ensure healthy work for Ghanaians to meet one of their fundamental human rights: *the right to safe working conditions* for "occupational safety and health is human right and decent work eventually is safe work" (WHO, 2010: p. 1). Finally, it is important to end by reiterating Kofi Annan's apt statement that: "*Safety and health at work is not only a sound economic policy - it is a basic human right",* irrespective of where one works.

REFERENCES

Abdel-Khalek, A. M. (2010). Quality of life, subjective well-being, and religiosity in Muslim college students. *Quality of Life Research, 19*(8), 1133-1143.

ACAPS (2012). *Qualitative and Quantitative Research Techniques for Humanitarian Needs Assessment: An Introductory Brief*. Retrieved on July 5, 2017 from http://www.acaps.org/img/documents

ACSNI (1993). Study group on human factors. Third report: organising for safety. Advisory committee on the safety of nuclear installations, *Health and Safety Commission*.

Addison, M., Edusah, S. E., & Sarfo-Mensah, P. (2014). Gender constraints and rice varietalcharacteristics preferences in lowland rice ecosystem in Ghana. *Developing Country Studies*, *4*(150), 92- 98

Adjekum, D. K., Keller, J., Walala, M., Young, J. P., Christensen, C., DeMik, R. J., & Northam, G. (2015). Cross-sectional assessment of safety culture perceptions and safety behaviour in collegiate aviation programmes in the United States. *International Journal of Aviation, Aeronautics, and Aerospace, 2*(4). Retrieved June 9, 2016 fromhttps://doi.org/10.15394/ijaaa.2015.1074

Affeldt, D. L., & MacDonald, D. A. (2010). The relationship of spirituality to work and organizational attitudes and behaviours in a sample of employees from a health care system. *The Journal of Transpersonal Psychology, 42*(2),192-208.

Agnew, J. L. & Daniels, A.C (2010). *Safe by accident? Take the luck out of safety: Leadership practices that build a sustainable safety culture*. Atlanta, GA: Performance Management Publications.

Albers, S. (2010). PLS and success factor studies in marketing. In *Handbook of partial least squares* (pp. 409-425). Berlin Heidelberg: Springer.

Alfers, L. (2009). *Occupational Health and Safety for Market and Street Traders in Accra and Takoradi, Ghana*. Retrieved on March 9, 2015 from www.wiego.org

Allport, G. & Ross, J. (1967). Personal religious orientation and prejudice. *Journal of Personality and Social Psychology*, *2*, 423-443.

Allport, G. W. (1953). The trend in motivational theory. *American Journal of Orthopsychiatry*, *23*(1), 107-119.

Amaro, S., Abrantes, J. L., & Seabra, C. (2015). *Comparing CB-SEM and PLS-SEM results: An empirical example*. 2nd international symposium on partial least squares path modelling, Spain, Seville.

Amponsah-Tawiah, K. & Dartey-Baah, K. (2011) Occupational Health and Safety: Key Issues and Concerns in Ghana. *International Journal of Business and Social Science*, *2(14)*,119-126

Amponsah-Tawiah, K. (2013). Occupational health and safety and sustainable development in Ghana. *International Journal of Business Administration*, *4*(2), 74-78.

Amponsah-Tawiah, K., & Mensah, J. (2016). Occupational health and safety and organizational commitment: Evidence from the Ghanaian mining industry. *Safety Health Work*, *7*(3), 225-230.

Antonakis, J., Bendahan, S., Jacquart, P.& Lalive, R. (2010). On making causal claims: A review andrecommendations. *Leadership Quarterly*,*21*, 1086-1120.

Antonsen, S. (2009). Safety culture and the issue of power. *Safety Science, 47*(2): 183-191.

Apekey, A. K. (2001). *Traditional values and management in Ghana*(PhD thesis),University of Ghana, Legon, Ghana.

Arboleda, A., Morrow, P.C., Crum, M.R., Shelley, I., Mack, C., (2003). Management practices as antecedents of safety culture within the trucking industry: Similarities and differences by hierarchical level. *Journal of Safety Research, 34*, 189–197

Arnould, E., Price, L. & Zikhan, G. (2004). *Consumers* (2nd ed.). New York: McGraw-Hill.

Asamani, L. & Opoku Mensah, A. (2016). Religiosity as an antecedent of Employees' Organizational Citizenship Behaviour. *Advances in Social Sciences Research Journal*, 3*(7)* 34-45.

Ashmos, D. P. & Duchon, D. (2000), Spirituality at work: A conceptualization and measure. *Journal of Management Inquiry*, *9*(2), 134-145.

Asumeng, M., Asamani, L., Afful, J., Agyemang, C.B., (2015). Occupational safety and healthissues in Ghana: Strategies for improving employee safety and health at workplace. *International Journal of Business and Management Review 3*(9), 60-79.

Atinc, G., Simmering, M. J., & Kroll, M. J. (2012). Control variable use and reporting in macro and micro management research. *Organizational Research Methods*, *15*(1), 57-74.

Attride-Stirling, J. (2001). Thematic networks: An analytic tool for qualitative research. *Qualitative research,1*(3), 385-405.

Avotri, J. Y., & Walters, V. (1999). You just look at our work and see if you have any freedom on earth: Ghanaian women's accounts of their work and their health. *Social Science and Medicine*, *48*(9), 1123-1133.

Baider, L., Holland, J. C., Russak, S. M. & De-Nour, A. K. (2001). The system of belief inventory (SBI-15): A validation study in Israel, *Journal of Psychological, Social and Behavioural Dimensions of Cancer,* 10(6), 534–540.

Bandura A. (1978). The self system in reciprocal determinism, *American Psychologist, 33*(4):343-358.

Barling, J. Loughlin, C., & Kelloway, E. K. (2002). Development and test of a model linking safety-specific transformational leadership and occupational safety. *Journal of Applied Psychology, 87,* 488–96.

Baron, R. A. (2008). The role of affect in the entrepreneurial process. Academy of management *Review, 33*(2), 328-340.

Baron, R. M., Kenny, D. A., (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51*, 1173-1182.

Barroso, C., Carrión, G. C., & Roldán, J. L. (2010). *Applying maximum likelihood and PLS on different sample sizes: Studies on SERVQUAL model and employee behavior model*. In Handbook of partial least squares (pp. 427-447). Berlin Heidelberg: Springer.

Beaton, D., Bombardier, C., Guillemin, F. & Marcos Bosi Ferraz, M. B. (2007). *Recommendations for the cross-cultural adaptation of the DASH and Quick DASH outcome Measures.* Spine: Institute for Work & Health.

Behling, O., & Law, K. (2000). Translating questionnaires and other research instruments: Problems and solutions. *Sage University papers series on quantitative applications in the Social Sciences.* 07-131. Thousand Oaks, CA: Sage.

Benefiel, A. C., Dong, W. K., & Greenough, W. T. (2005). Mandatory "Enriched" Housing of Laboratory Animals: The Need for Evidence-based Evaluation.*Institute for Laboratory Animal Research Journal 46*,95 -105.

Bennett, C. (2013). *Death on the farm a grim reality of agriculture*, retrieved May 27, 2015 from http://westernfarmpress.com/blog/death-farm-grim-reality-agriculture

Bentler, P. M., & Chou, C. P. (1987). Practical issues in structural modeling. *Sociological Methods and Research*, *16*(1), 78-117.

Bentley, T. A. & Haslam, R. A. (2001). Identification of risk factors and countermeasures for slip, trip and fall accidents during delivery of mail. *Applied Ergonomics*, *32*, 127-134.

Bento, R. (1994). When the show must go on. *Journal of Managerial Psychology*, *9*(6), 35-44.

Berends, J. J. (1995a). *Organisatie, cultuur en veiligheid: Een literatuurstudie naar organisatiecultuur en veiligheidscultuur* (Interim report). Eindhoven University of Technology, Eindhoven.

Berends, J. J. (1996). *On the measurement of safety culture* (Graduation report). Eindhoven University of Technology, Eindhoven.

Bergan, A. & McConatha J. T. (2012). Religiosity and life Satisfaction. *Activities Adaptation and Aging 24*(3):23-34 · October 2012

Bergan, A. (2001). Religiosity and life satisfaction. *Activities, Adaptation and Aging*, *24*(3), 23-34.

Bergan, A., & McConatha, J. T. (2001). Religiosity and life satisfaction. *Activities, Adaptation and Aging*,*24*(3), 23–34.

Bierly, P., Kessler, E. & Christensen, E. (2000). Organizational learning, knowledge and wisdom. *Journal of Organizational Change Management*, *13*(6), 595–618.

Blegen, M. A., Pepper, G. A., Rosse J. (n. d). *Safety climate on hospital units: A new measure. advances in patient safety*. Retrieved from http://www. ahrq.gov/downloads/pub/ advances/vol4/blegen.pdf

Bollen, K. (2011). Evaluating effect, composite, and causal indicators in structural equation models. *MIS Quarterly*, *35*(2), 359-372.

Bollen, K. A. (1989). A new incremental fit index for general structural equation models. *Sociological Methods and Research*, *17*(3), 303-316.

Bollen, K. A., & Stine, R. (1990). Direct and indirect effects: Classical and bootstrap estimates of variability. *Sociological Methodology*, 115-140.

Boomsma, A., & Hoogland, J. J. (2001). *The robustness of LISREL modeling revisited.* In R. Cudeck, S. du Toit, & D. Sörbom (Eds.), Structural equation modeling: Present and future: A Festschrift in honor of Karl Jöreskog (pp. 139–168). Chicago: Scientific Software International.

Borman, W. C., & Motowidlo, S. J. (1993). *Expanding the criterion domain to include elements of contextual performance.* In N. Schmitt & W. C. Borman (Eds.), Personnel selection in organizations (pp. 71–98). San Francisco: Jossey-Bass.

Borsboom, D. Mellenberg, G. J., & Heerden, J. V. (2004). The concept of validity. *Psychological Review, 111*(4), 1061- 1071.

Bosompem, M., & Mensah, E. (2006). Occupational hazards among Cocoa Farmers in the Birim South District in the Eastern Region of Ghana. *ARPN Journal of Agricultural and Biological Science*, *7*(12).

Boyatzis, R. E. (1998). *Transforming qualitative information: Thematic analysis and code development*. sage.

Brannen, J. (2005). Mixing methods: The entry of qualitative and quantitative approaches into the research process. *International Journal of Social Research Methodology, 8*(3), 173-184.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77-101.

Braun, V., & Clarke, V. (2008). *Successful qualitative research: A practical guide for beginners*. London: Sage Publications.

Bronkhorst, A. W. (2015). The cocktail-party problem revisited: Early processing and selection of multi-talker speech. *Attention, Perception, & Psychophysics*, *77*(5), 1465-1487.

Brown, R. B. (2003). Organizational spirituality: the sceptic's version. *Organization, 10*(2), 393-400.

Brown, R. L., Holmes, H. (1986). The use of a factor-analytic procedure for assessing the validity of an employee safety climate model. *Accident Analysis and Prevention 18* (6), 455–470.

Bryman, A. (2006). Integrating quantitative and qualitative research: How is it done? *Qualitative research, 6*(1), 97-113.

Burack, E. H. (1999). Spirituality in the workplace. *Journal of Organizational Change Management*, *12*(4), 280-291.

Bureau of Labor Statistics, (2012). *Workplace injuries and illnesses – 2011*. U.S. Department of Labour

Burke, M. J., Borucki, C. C. & Kaufman, J. D. (2002). Contemporary perspectives on the study of psychological climate: A commentary. *European Journal of Work and Organizational Psychology*, *11*(3), 325-40.

Burke, M. J., Salvador, R. O., Smith-Crowe, K., Chan-Serafin, S., Smith, A. & Sonesh, S. (2011). The dread factor: How hazards and safety training influence learning and performance. *Journal of Applied Psychology, 96*(1), 46–70

Burke, M. J., Sarpy, S. A. Tesluk, P. E, & Smith-Crowe, K. (2002). General safety performance: A test of a grounded theoretical model, *Personnel Psychology, 55*, 429—457.

Burrell, G., & Morgan, G. (1979). *Social paradigms and organizational analysis*. Aldershop: Gower.

Burnell, B. (2003). The real world aspirations of work-bound rural students. *Journal of Research in Rural Education, 18*(2), 104-113.

Burton, S. (2009). The Oversight and Review of Cases in the Light of Changing Circumstances and New Information: How Do People Respond to New (and Challenging) Information? London: C4EO [online]. Retrieved on 23 July, 2016 from http://www.c4eo.org.uk/themes/safeguarding/files/ safeguarding_briefing_3.pdf

Cabrera, D.D., Isla, R., & Vilela, L.D. (1997). An evaluation of safety climate in ground handling activities. In Soekkha, H.M. (Ed.), *Aviation Safety, Proceedings of the IASC-97 International Aviation Safety Conference*, Netherlands, 27-29 August, 255-268.

Carey, G. (1998). *Multivariate analysis of variance (MANOVA): I.Theory*. Retrieved on April 12, 2017 from www.colorado.edu

Cavanagh, G. F. & Bandsuch, M. R. (2002). Virtue as a benchmark for spirituality in business. *Journal of Business Ethics*, *38*(1-2), 109-117.

Cheung, G. W., & Lau, R. S. (2008). Testing mediation and suppression effects of latent variables: Bootstrapping with structural equation models. *Organizational researchmethods, 11*(2), 296-325.

Chhokar, J. S., & Wallin, J. A. (1984). A field study of the effect of feedback frequency on performance. *Journal of Applied Psychology*, *69*(3), 524.

Chin, W. W. (1998). The partial least squares approach to structural equation modeling. *Modern methods for business research, 295*(2), 295-336.

Choudry, R., Fang, D. & Mohamed, S. (2007). The nature of safety culture: A survey of thestate-of-the-art. *Safety Science*, *45*, 993-1012.

Christian, M.S., Bradley, J.C., Wallace, J.C., Burke, M. J. (2009). Workplace safety: Ameta-analysis of the roles of person and situation factors. *Journal of Applied Psychology,94*, 1103 - 1127.

Cigularov, K. P., Chen, P. Y., & Rosecrance, J. (2010). The effects of error management climate and safety communication on safety: A multi-level study. *Accident Analysis and Prevention*, *42*(5), 1498-1506.

Clarke, P. B. & Byrne, P. (1993). *Religion defined and explained*. London: MacMillan Press Ltd.

Clarke, S. (2006). Contrasting perceptual, attitudinal and dispositional approaches to accidentinvolvement in the workplace, *Safety Science, 44*, 537–550.

Clarke, S. (2013). Safety leadership: A meta-analytic review of transformational and transactional leadership styles as antecedents of safety behaviours, *Journal of Occupational and Organisational Psychology*, *86*(1), 22-49.

Clarke, S. G. (2000). Safety culture: Under-specified and overrated? *International Journal of Management Reviews*, *2*, 65–90.

Clarke, S., & Robertson, I. (2005). A meta-analytic review of the Big Five personality factorsand accident involvement in occupational and non-occupational settings. *Journal of Occupational and Organizational Psychology*, *78*(3), 355-376.

Clarke, S., & Ward, K. (2006). The role of leader influence tactics and safety climate in engaging employees' safety participation. *Risk Analysis*, *26* (5), 1175-1185

Clarke, S., & Ward, K., (2006). The role of leader influence tactics and safety climate in engaging employees’ safety participation. *Risk Analysis, 26*, 1175 - 1185.

Cohen, J. (1988). *Statistical power analysis for the Behavioral Sciences*. (2nd ed.). Mahwah, NJ: Erlbaum.

Cole, M. (2006) Using a motivational paradigm to improve hand-washing compliance. *Nurse Education in Practice 6*, 156-162.

Cole, K. S., Stevens-Adams, S. M., & Wenner, C. A. (2013). *A Literature Review of Safety Culture*. Sandia report, Retrieved on July 6, 2017 from www.osti.gove/bridge

Collins, F. S., Brooks, L. D., & Chakravarti, A. (1998). A DNA polymorphism discovery resource for research on human genetic variation. *Genome research*, *8*(12), 1229-1231.

Concha-Barrientos, M., Nelson, D. I., Driscoll, T., Steenland, N. K., Punnett, L., Fingerhut, M. A., & Corvalan, C. (2004). *Selected occupational risk factors. Comparative quantification of health risks: global and regional burden of disease attributable to selected major risk factors*. Geneva: World Health Organization, 1651-1801.

Connelly, L. M. (2008). Pilot studies. *Medsurg Nursing*, *17*(6), 411-2.

Cooper, M. D. (2000). Towards a model for safety culture. *Safety Science*, *36* (2), 111–136.

Cooper, M.D., &Phillips, R.A. (2004). Exploratory analysis of the safety climate and safety behavior relationship. *Journal of Safety Research*, 497-512.

Cooper, R., (2001). The role of object-oriented concepts in cognitive models. *Trends in Cognitive Sciences, 5* (8) 333, http://eprints.bbk.ac.uk.

Cox, S., Cox, T., 1991. The structure of employee attitudes to safety: An European example. *Work and Stress*, *5* (2), 93–106.

Cox, S., Flin, R., 1998. Safety culture. Philosophers' stone or man of straw? *Work & Stress*, *12*(3), 189–201.

Coyle, I.R., Sleeman, S.D., &Adams, N. (1995). Safety climate. *Journal of Safety Research*, *26* (4), 247–254.

Creswell, J. W. (2002). *Educational research: Planning, conducting, and evaluating quantitative*(pp. 146-166). Upper Saddle River, NJ: Prentice Hall.

Creswell, J. W. (2007). *Qualitative enquiry and research design: Choosing among five approaches.*US: Sage publications Ltd.

Creswell, J. W. (2008).*Educational research: Planning, conducting, and evaluating quantitative and qualitative research* (3rd ed.).Upper Saddle River, NJ: Pearson Education.

Creswell, J. W. (2012).*Educational research: Planning, conducting, and evaluating quantitative and qualitative research* (4thed.).Upper Saddle River, NJ: Pearson Education

Creswell, J. W. and Plano Clark, V. L. (2007) *Designing and Conducting Mixed Methods Research*, Sage, Thousand Oaks, California.

Curcuruto M., Conchie, S. M., Mariani, M. G. & Violante F.S. (2015). The role of prosocial andproactive safety behaviors in predicting safety performance. *Safety Science*, *80,*317–323

Curcuruto, M., Guglielmi, D., & Mariani, M. G. (2013). Organizational citizenship for safety: Psycho-social processes of mediation. *Psicologia sociale*, *8*(2), 229-248.

Dahlberg, K., Drew, N., & Nystrom, M. (2002). *Reflective life world research*. Lund, Sweden: Studentlitteratur.

Daskalakis, S., & Mantas, J. (2008). Evaluating the impact of a service-oriented framework for healthcare interoperability. *Studies in health technology and informatics*, 136, 285.

Deal, T. E., & Kennedy, A. A. (1983). Culture and school performance. *Educational leadership, 40*(5), 14-15.

DeDobbeleer, N., Be´ land, F.(1991). A safety climate measure for construction sites, *Journal of Safety Research*, *22*, 97–103.

DeJoy, D.M., Bryan,S.S., Wilson, M. G., Vandenberg, R.J., &Butts, M. M. (2004). Creating safer workplaces: Assessing determinants and role of safety climate. *Journal of Safety Research 35*, 81–90.

Denis, J. E., (1988). Inventory, taxonomy and assessment of methods for international market selection, *International Marketing Review,5*(3), 38-51.

Denzin, N. K., & Lincoln, Y. S. (Eds.) (1998). *The landscape of qualitative research: Theories and issues.* Thousand Oaks: Sage Publications.

Diamantopoulos, A. (1994). Modelling with LISREL: A Guide for the Uninitiated. *Journal of Marketing Management, 10*(1-3), 105-136.

Didla, Shama, Mearns, Kathryn and Flin, Rhona (2009). Safety citizenship behaviour: proactive approach to risk management, *Journal of Risk Research,12* (3), 475 — 483

Dollard, M. F. (2011). Psychosocial safety climate, work conditions, and emotions in the workplace: A Malaysian population-based work stress study. *International Journal of Stress Management*, *18*(4), 324.

Dollard, M. F., & Bakker, A. B. (2010). Psychosocial safety climate as a precursor to conducive work environments, psychological health problems, and employee engagement. *Journal of Occupational and Organizational Psychology, 83*(3), 579-599.

Dollard, M. F., & Kang, S. (2007). *Psychosocial safety climate measure*. Adelaide: Work and StressResearch Group, University of South Australia.

Donald, I., & Canter, D. (1994). Employee attitudes and safety in the chemical industry. *Journal of Loss Prevention in the Process Industries, 7*, 203–208.

Dyson, S., & Brown, B. (2006). Social theory and applied health research. Glasgow, Scotland, Open University Press.

Easterby-Smith, M. Thorpe, R. & Lowe, A.(1991). *Management research: An introduction*. London; Sage Publications.

Easterby-Smith, M. Thorpe, R. & Lowe, A. (2002). *Management research: An introduction* (2nded.). London; Sage Publications.

Eeckelaert, L., Starren, A., van Scheppingen, A., Fox, D., & Brück, C. (2011). Occupationalsafety and health culture assessment: A review of main approaches and selected tools (European Agency for Safety and Health at Work). *Luxembourg, Luxembourg: Publications Office of the European Union*. Retrieved on May 23, 2016 fromhttp://osha.europa.eu/en/publications/reports/culture_assessment_soar_TEWE11005ENN

Effah, B., Antwi, K., Adu, G., & Boampong, E. (2013). The safety culture of artisans at the Sokoban wood village enclave, Ghana. *American International Journal of Contemporary Research, 3*(12), 121-128.

Ek, A., Akselsson, R., Arvidsson, M. &Johansson, C. R. (2007). Safety culture in Swedish air traffic control. *Safety Science, 45*, 791–811.

Ek, Å.,& Akselsson, R., (2007). Aviation on the ground: Safety culture in a ground handling company. *International Journal of Aviation Psychology, 17* (1), 57-74.

Ellison, C. G. (1983). Religious involvement and subjective well-being. *Journal of health and social behaviour*, 80-99.

Erickson, J.A. (2000). Corporate culture: The key to safety performance. *Occupational Hazards, 62* (4), 45–50.

Evely, A., Fazey, I., Pinard, M., & Lambin, X. (2008). The influence of philosophicalperspectives in integrative research: a conservation case study in the Cairngorms National Park. *Ecology and Society*, *13*(2) ….

Ezzy, D. (2002). *Qualitative analysis: Practice and innovation.* Crows Nest, NSW: Allen & Unwin

Fang, D., Chen, Y., & Wong, L. 2006. Safety climate in construction industry: A case study in Hong Kong. J. Constr. Eng. Manage., 132(6): 573–584.

Fernandez-Muniz, B., Montes-Peon, J. M., Vazquez-Ordas, C. J. (2009).Relation between occupational safety management and firm performance. *Safety Science, 47*, 980–991

Fernandez-Muniz, B., Montes-Peon, J.M., Vazquez-Ordas, C. J. (2007). Safety management system: Development and validation of a multidimensional scale. *Journal of Loss Prevention in the Process Industries 20* (1), 52–68.

Fernando, M. & Jackson, B. (2006). The influence of religion-based workplace spirituality on business leaders' decision-making: An inter-faith study. *Journal of Management and Organisation, 12,* 23-39.

Fernando, M., & Jackson, B. (2006). The Influence of religion-based workplace spirituality on business leaders' decision making: An inter faith study, *Journal of Management and Organization*, *12*, 23-39.

Fetzer, J. (1999). *Multidimensional measurement of religiousness/spirituality for use in health research.*A report of a national working group. Supported by the Fetzer Institute in collaboration with the National Institute on Aging, Kalamazoo, MI: Fetzer Institute.

Fleming, M., Flin, R., Mearns, K., & Gordon, R. (1998). Risk perception of offshore workers on U.K. oil and gas platforms. *Risk Analysis, 18,*103–110. doi:10.1111/j.1539-6924.1998.tb00920.x

Flin, R. & Yule, S. (2004). Leadership and safety in healthcare. Lessons from industry. *Qualityand Safety in Health Care, 13* (Suppl. II), 45-51.

Flin, R., Mearns, K., O'Connor, P., & Bryden, R. (2000). Measuring safety climate: Identifying the common features. *Safety Science, 34*(1–3), 177–192.

Fogarty, G. J., & Shaw, A. (2009). Safety climate and the theory of planned behavior: Towards the prediction of unsafe behavior. *Accident Analysis and Prevention*, *42*(5), 1455-1459.

Frone, M.R. (1998). Predictors of work injuries among employed adolescents. *Journal of Applied Psychology 83*, 565 – 576.

Fry, L. W. (2003). Toward a theory of spiritual leadership. *The Leadership Quarterly, 14*(6), 693-727.

Fry, L. W. (2005). Toward a theory of ethical and spiritual well-beingand corporate social responsibility through spiritual leadership. In: C. Dunne, R.A. Giacolone and C.L. Jurkiewicz (eds). *Positive psychology and corporate responsibility*. Information Age Publishing: Greenwich, CT.

Fry, L., & Nisiewicz, M. (2013). *Maximizing the triple bottom line through spiritual leadership*. Palo Alto, CA: Stanford University Press.

Gadamer, H. G. (1993). Hermeneutik: Wahrheit und Methode. Ergänzungen, *Register, 2*(2), Mohr Siebeck.

Gadd, S. (2002). Safety Culture: A review of the literature, Health and safety laboratory, *Human Factors Group*, 1-40.

Galliers, R. D. (1991). Strategic information systems planning: myths, reality and guidelines for successful implementation. *European Journal of Information Systems, 1*(1), 55-64.

Garavan, T. N., & O'Brien, F. (2001). An investigation into the relationship between safety climate and safety behaviors in Irish organizations. *Irish Journal of Management, 22*, 141–170.

Garcia-Zamor, J. (2003). Workplace Spirituality and Organizational Performance. *Public Administration Review*, *63*(3), 355–363.

Garson, G. D. (2016). *Partial least squares (PLS-SEM) (2016 ed.*). Asheboro, USA: Statistical Publishing Associates. Retrieved 17 February, 2016 from www.statisticalassociates.com

Gay, L. R. (1996). *Educational research: Competencies for analysis and application* (5th ed.). New York: Macmillan.

Gefen, D., Straub, D., & Boudreau, M. C. (2000). Structural Equation Modelling and Regression: Guidelines for Research Practice, *Communications of the Association for Information Systems*, *4*(7), 1-77.

Geller, E. S. (1994). Ten Principles for achieving a total safety culture. *Safety Management*, *39*(9), 18-24.

Geller, E. S. (2001). *Actively caring for occupational safety: Extending the performance management paradigm.* In C. M. Johnson & W. K. Redmon & T. C. Mawhinney

(Eds.),Handbook of Organizational Performance: Behavior Analysis and Management: 303-326. Binghamton, New York Haworth Press Inc.

Geller, E. S. (2005). Behavior-based safety and occupational risk management, *Behaviour modification, 29* (3), 539-561

George, D., & Mallery, P. (2003). SPSS for Windows step by step: A simple guide and reference. 11.0 update (4th ed.). Boston: Allyn & Bacon

Ghana Labour Act (Act 651) (2003). Accra: Assembly Press

Ghana Statistical Service (2012). 2010 *Population and housing census: Summary report of final results*. Accra: Ghana Statistical Service.

Glendon, A. I. & Stanton, N. A. (2000). Perspectives on safety culture. *Safety Science*, *34*(1–3): 193-214, https://doi.org/10.1016/S0925-7535 (00)00013-8 [SD-008]

Glendon, A.I., Litherland, D. K. (2001). Safety climate factors, group differences and safety behavior in road construction. *Safety Science, 39* (3), 157–188.

Glendon, A.I., McKenna, E. F. (1995). *Human Safety and Risk Management*. London: Chapman and Hall.

Glennon, D. P. (1982a). Measuring organizational safety climate. *Australian Safety News* January/February, 23-28.

Glennon, D.P. (1982b). *Safety climate in organisations.* Proceedings of the 19th Annual Conference of the Ergonomics Society of Australia and New Zealand, 17-31.

Glick, W. H. (1985). Conceptualizing and measuring organizational and psychological climate:Pitfalls in multilevel research. *Academy of Management Review 10* (3), 601–616.

Golafshani, N. (2003). Understanding reliability and validity in qualitative research. *The Qualitative Report*, *8*(4), 597-606.

Gorsuch, R. (1984). Measurement: The boon and bane of investigating religion. *American Psychologist*, *39*, 228–236.

Götvall, J. (2014). *A Framework for Assessing Safety Culture* (Master's thesis). Chalmers University of Technology, Gothenburg, Sweden.

Götz, O., Liehr -Gobbers, K., & Krafft, M., (2010). Evaluation of structural equation models using the partial least squares (PLS) approach. Pp. 691 - 711 in Esposito, Vinzi V., Chin, W. W., Henseler, J., & Wang, H., eds., Handbook of partial least squares: Concepts, methods, and applications. NY: Springer. Series: Springer

Griffin, M. A. & Neal, A. (2000). Perceptions of safety at work: a framework for linking safetyclimate to safety performance, knowledge, and motivation. *Journal of Occupational Health Psychology*, *5*(3), 347-358.

Grindle, A. C., Dickinson, A. M., &Boettcher, W. (2000). Behavioural safety researching manufacturing settings: A review of the literature. *Journal of Organizational Behaviour Management*, *20*(1), 29–68.

Guastello S.J. (1993). Do we really know how well our occupational accident preventionprograms work? *Safety Science*, *16*, 445-463.

Guillemin, M., & Gillam, L. (2004). Ethics, reflexivity, and ''ethically important moments'' in research. *Qualitative Inquiry*, *10*, 261–280.

Guillory, W. A. (2000). *The Living Organization: Spirituality in the Workplace.* Innovations International Inc., Salt Lake City: UT.

Guldenmund, F. W. (2000). The nature of safety culture: A review of theory and research. *Safety Science*, *34* (1–3), 215–257.

Guldenmund, F. W. (2007). The use of questionnaires in safety culture research – an evaluation. *Safety Science*, *45*, 723–743.

Guldenmund, F.W. (2010). (Mis)understanding safety culture and its relationship to safetymanagement. *Risk Analysis*, *30* (10), 1466–1480.

Gyekye, A. S. (2001). *The Self-Defensive Attribution Theory Revisited: A Culture- Comparative Analysis between Finland and Ghana in the Work Environment*. Helsinki: Yliopistopaino.

Gyekye, A. S., & Salminen, S. (2004). Causal attributions of Ghanaian industrial workers for accident occurrence. *Journal of Applied Social Psychology, 34*(11), 2324-2342

Gyekye, A.S., & Salminen, S. (2006). The self-defensive attribution hypothesis in the work environment: Co-workers' perspectives. *Safety Science, 44* (82), 157 - 168.

Gyekye, K. (1996). *African Cultural Values: An Introduction*. Accra: Sankofa Publishing Company.

Gyekye, K. (2004). *Beyond cultures: Perceiving a common humanity* (Vol. 9). Washington, DC: Council for Research in Values and Philosophy.

Gyekye, S. A. (2003). Causal attributions of Ghanaian industrial workers for accident occurrence: Miners and non-miners' perspective. *Journal of Safety Research*, *34*, 533-538.

Gyekye, S. A. (2006). Workers' perceptions of workplace safety: An African perspective. *International journal of occupational safety and ergonomics*, *12*(1), 31-42.

Gyekye, S. A., & Haybatollahi, M. (2012). Workers' religious affiliations and organizational behaviour: An exploratory study. *International Journal of Organisational Behaviour, 17*(4), 1-18.

Hackney, C. H., & Sanders, G. S. (2003). Religiosity and mental health: A meta–analysis of recent studies. *Journal for the scientific study of religion*, *42*(1), 43-55.

Hadi, N. U., Abdullah, N., & Sentosa, I. (2016). An Easy Approach to Exploratory Factor Analysis: Marketing Perspective. *Journal of Educational and Social Research, 6*(1), 215.

Hair, J. F., Black, W., Babin, B., Anderson, R., Tatham, R., (2006). *Multivariate Data Analysis(6th ed.)*. Upper Saddle River, NJ: Pearson Prentice Hall.

Hair, J. F., Bush, R. P., & Ortinau, D. J. (2000). *Marketing research: A practical approach for the new millennium*. Irwin Professional Publishing.

Hair, J. F., Jr., Hult, G. T. M., Ringle, C. M., &Sarstedt, M. (2014). *A primer on Partial Least Squares Structural Equation Modeling (PLS-SEM).* Thousand Oaks, CA: SAGE Publications Ltd.

Hair, J. F., Sarstedt, M. J., Hopkins, L., & Kuppelwieser, V. G. (2014). Partial least squares structural equation modeling (PLS-SEM) An emerging tool in business research. *European Business Review*, *26*(2), 106-121.

Hair, J. F., Sarstedt, M., Ringle, C.M., & Mena, J.A. (2012a). An Assessment of the Use of Partial Least Squares Structural Equation Modelling in Marketing Research.*Journal of the Academy of Marketing Science*, *40* (1),414-433.

Hair, J. F.,Hult, G. T. M., Ringle, C. M., &Sarstedt, M. (2017). *A primer on partial least squares structural equation modeling (PLS-SEM)* (2nd Ed.). Thousands Oak, CA: Sage Publications.

Hale, A. R. & Hovden, J. (1998). *Management and culture: the third age of safety. A review of approaches to organizational aspects of safety, health and environment*. In A. M. Feyer &A. Williamson (Eds.), Occupational Injury: Risk, Prevention and Intervention (pp. 129-165). London: Taylor & Francis Ltd.

Hale, A. R. (2000). Culture's confusions. *Safety Science, 34*(1–3): 1-14.

Hall, G. B., Dollard, M. F. & Coward, J. (2010). Psychosocial Safety Climate: Development of the PSC-12. *International Journal of Stress Management*, *17*(4), 353–383

Hall, G. B., Dollard, M.F., Winefield, A. H., Dormann, C., Bakker, A. B. (2013). Psychosocial safety climate buffers effects of job demands on depression and positive organizationalbehaviours. *Anxiety Stress Coping, 26,* 355-377. doi: 10.1080/10615806.2012.700477.

Hall, J. (2006). Spirituality at the beginning of life. *Journal of Clinical Nursing, 15*(7), 804-810.

Hall, J. (2011). *Cross-Sectional Survey Design*. In: Encyclopedia of Survey Research Methods, Sage Publications, Inc., pp. 173. DOI: http://dx.doi.org/10.4135/9781412963947

Hall, L., Johansson, P., Tärning, B., Sikström, S., & Deutgen, T., (2010). Magic at the marketplace: Choice blindness for the taste of jam and the smell of tea. *Cognition*, *117* (1), 54–61. doi:10.1016/j.cognition.2010.06.010

Hansen, C.P. (1989). A causal model of the relationship among accidents, biodata, personality and cognitive factors. *Journal of Applied Psychology, 74,* 81–90.

Harper, A. C., Cordery, J. L., de Klerk, N. H., Sevastos, P., Geelhoed, E., Gunson, C., &Colquhoun, J. (1997). Curtin industrial safety trial: Managerial behavior and programeffectiveness. *Safety science, 24*(3), 173-179.

Harvey, J., Bolam, H., Gregory, D., & Erdos, G. (2001). The effectiveness of training to change safety culture and attitudes within a highly regulated environment. *Personnel Review*, *30*, 615-636.

Havold, J. (2005). Safety-culture in a Norwegian shipping company. *Journal of Safety Research, 36* (5),441–458.

Hay, D. (n.d). *Workplace Safety culture assessment tool: An overview*. Retrieved February 19, 2015 from www.dmhay.co.nz.

Health and Safety Authority (2015). *Summary of Workplace Injury, Illness and Fatality Statistics 2014-2014*. Dublin: HSA.

Health and Safety Commission (HSC, 1993). *Third report: organizing for safety*. ACSNI Study Group on Human Factors. London: HMSO.

Health and Safety Executive, (2009). Self-reported work-related illness and workplace injuries in 2007/08: *Results from the labour force survey*. Retrieved on January 20, 2017 from http://www.hse.gov.uk/statistics/lfs/lfs0708.pdf

Health and Safety Executive (2000). *Safety Culture Maturity Model. Offshore Technology Report*. Author.

Healy, M., & Perry, C. (2000). Comprehensive criteria to judge validity and reliability ofqualitative research within the realism paradigm. *Qualitative Market Research*, *3*(3), 118 -126.

Heintz, J. (2005). *Employment*, *Poverty*, *and Gender in Ghana*. Working Paper Series No 92. University of Massachusetts Amherst: Political Economy Research Institute.

Helmreich, R. L., & Merritt, A. R. (2001). *Culture at work in aviation and medicine: National, organizational and professional influences.*Aldershot, UK: Ashgate.

Henseler, J., Hubona, G., &Ray, P. A., (2016). Using pls path modeling in newtechnology research: updated guidelines.*Industrial Management and Data Systems*, *116* (1): 2–20.

Henseler, J., & Sarstedt, M. (2012). Goodness-of-fit indices for partial least squares path modeling. *Computational Statistics*, 1-16.

Henseler, J., Dijkstra, T. K., Sarstedt, M., Ringle, C. M., Diamantopoulos, A., Straub, D. W., & Calantone, R. J. (2014). Common beliefs and reality about PLS: Comments on Rönkkö and Evermann (2013). *Organisational Research Methods*, *17*(2), 182-209.

Henseler, J., Hubona, G., & Ray, P. A. (2016). Using PLS path modelling in new technology research: Updated guidelines. *Industrial management & data systems*, *116*(1), 2-20.

Henseler, J., Ringle, C. M., & Sarstedt, M., (2015). A new criterion for assessing discriminant validity in variance-based structural equation modelling. *Journal of the Academy of Marketing Science, 43*(1). 115 - 135.

Henseler, J., Ringle, C. M., & Sarstedt, M. (2012). Using partial least squares path modelling in advertising research: Basic concepts and recent issues. *Handbook of research on international advertising*, 252.

Henseler, J., Ringle, C. M., & Sinkovics, R. R. (2009). *The use of partial least squares path modeling in international marketing.* In: New challenges to international marketing (pp.277-319). Emerald Group Publishing Limited.

Henseler, J., Ringle, C. M., Sarstedt, M. (2016). Testing measurement invariance of composites using partial least squares, *International Marketing Review*, *33*(3), 405-431

Hertzog, M. A. (2008). Considerations in determining sample size for pilot studies. *Research in Nursing and Health*, *31*, 180-191.

Hewege, C. R., & Perera, L. C. R. (2013). In search of alternative research methods in marketing: Insights from Layder's adaptive theory methodology. *Contemporary Management Research, 9*(3), 343.

Hill, A., Darko, R., Seffah, J., Adanu, R., Anarfi, J. & Duda, R. (2007).Health of urban Ghanaian women as identified by the Women's Health Study of Accra. *InternationalJournal of Gynaecology and Obstetrics, 99,* 150-156.

Hill, J., Szewczyk, R., Woo, A., Hollar, S., Culler, D., & Pister, K. (2000). System architecture directions for networked sensors. *ACM SIGOPS operating systems review, 34*(5), 93-104.

Hill, P. C. & Maltby, L. E. (2009). Measuring religiousness and spirituality: Issues, existing measures, and the implications for education and well-being In M. de Souza et al. (Eds.), *International handbook of education for spirituality, care and wellbeing* (pp. 33-50). New York: Springer.

Hill, P. C., & Hood, R. W., Jr. (Eds.). (1999). *Measures of religiosity*. Birmingham, AL: Religious Education Press.

Hill, R. (1998). What sample size is “enough” in internet survey research? Interpersonal Computing and Technology: *An Electronic Journal for the 21st Century, 6*(3-4).

Hinsz, V. B., Nickell, G. S., & Park, E. S. (2007). The role of work habits in the motivation of food safety behaviours. *Journal of Experimental Psychology: Applied, 13*(2), 105.

Hirschi, T. (1969). *Causes of delinquency*. Berkeley: University of California Press.

Höck, M., & Ringle, C. M. (2006). *Strategic networks in the software industry: An empirical analysis of the value continuum*. In IFSAM VIIIth World Congress, (28, p. 2010).

Hofmann, D., & Stetzer, A. (1996). A cross-level investigation of factors influencing unsafe behaviours and accidents. *Personnel Psychology, 49,* 307-339

Hofmann, D.A., Morgeson, F.P., & Gerras, S. (2003). Climate as a moderator of the relationship between LMX and content specific citizenship: Safety climate as an exemplar. *Journal of Applied Psychology, 88*, 170-178.

Hofstede, G.R., (1986). Werken aan de organisatiecultuur. *Bedrijfskunde, 58* (2), 102–106

Holden, M. T., & Lynch, P. (2004). Choosing the appropriate methodology: Understanding research philosophy. *The marketing review, 4*(4), 397-409.

Horn, J. L. & McArdle, J. J. (1992). A practical and theoretical guide to measurement invariance in aging research. *Experimental Aging Research 18*(3-4), 117-44.

Hox, J. J., & Bechger,T. M. (1998). An introduction to structural equation modelling. *Family Science Review, 11*: 354-373.

Huang, Y. H., Huang, Ho, M., Smith, G.S., Chen, P. Y. (2006). Safety climate and self-reported injury: Assessing the mediating role of employee safety control Accident.*Analysis and Prevention, 38* (3) (2006), pp. 425–433 https://doi.org/10.1016/j.aap.2005.07.002 [SD 008].

Huber, S., & Huber O. W., (2012). The centrality of religiosity scale (CRS). *Religion, 3*, 710–724.doi: 10.3390/rel3030710.

Hughes, J. A., & Sharrock, W. W. (1997). *The philosophy of social research* (3rded). London and New York: Longman

Hwang, H., Malhotra, N. K., Kim, Y., Tomiuk, M. A.,&Hong, S., (2010). A Comparative Study on Parameter Recovery of Three Approaches to Structural Equation Modeling. *Journal of Marketing Research, 47*(4), 699-712.

Idris, M. A., Dollard, M. F., Coward, J., & Dormann, C. (2012). Psychosocial safety climate: Conceptual distinctiveness and effect on job demands and worker psychological health. *Safety Science, 50*(1), 19-28.

International Safety Advisory Group (1991). *Safety Culture*(Safety Series No. 75-INSAG-4). Vienna, International Atomic Energy Agency.

International Labour Office (2010).*Global Employment Trends for Youth. Special issue on the impact of global economic crises on the youth*. Geneva: Author

International Labour Office (2001b). *ILO guidelines on occupational safety and health management systems (ILO-OSH 2001)*. Geneva: Author.

International Atomic Energy Agency (1988). *Principles for the Exemption of Radiation Sources and Practices from Regulatory control*. Nuclear.

Isaac, S., & Michael, W. B. (1995). *Handbook in research and evaluation*. San Diego, CA: Educational and Industrial Testing Services.

Ismail, U. F. F., Asumeng, M. & Nyarko, K. (2015). The impact of safety climate on safetyperformance in a gold mining company in Ghana.*International Journal of Management Excellence, 5*(1), 556-566.

Ivy, J. S. (2014). *The effects of religion on organizational citizenship behaviour*. Honours theses, Paper 272.

Janklow Law Firm (US) (n.d). *Pain and suffering calculator.* Retrieved July 8, 2015 from www.janklowabdallah.com

Jiang, L., Yu, G., Li, Y., & Li, F. (2010). Perceived colleagues' safety knowledge / behaviour and safety performance: Safety climate as a moderator in a multilevel study. *Accident Analysis and Prevention, 42,* 1468 – 1476.

Jordan, K. M., Arden, N. K., Doherty, M., Bannwarth, B., Bijlsma, J. W. J., Dieppe, P., &Lohmander, S. (2003). EULAR Recommendations 2003: an evidence based approach to the management of knee osteoarthritis: Report of a Task Force of the Standing Committee for International Clinical Studies Including Therapeutic Trials (ESCISIT). *Annals of the rheumatic diseases*, *62*(12), 1145-1155.

Jöreskog, K. G. (1978). Structural analysis of covariance and correlation matrices. *Psychometrika*, *43*(4), 443-477.

Jöreskog, K. G., &Wold, H. O. A. (1982). *The ML and PLS techniques for modeling with latent variables: Historical and comparative aspects*. In H. O. A. Wold, & K. G. Jöreskog (Eds.), Systems under indirect observation, part I (pp. 263–270). Amsterdam: North-Holland.

Judd, C. M., & Kenny, D. A. (2010). *Data analysis in social psychology: Recent and recurring issues.* John Wiley & Sons, Inc..

Julious, S. A. (2005). Sample size of 12 per group rule of thumb for a pilot study. *Pharmaceutical Statistics*, *4,* 287-291.

Karakas, F (2010). Spirituality and performance in organisations: A literature review. *Journal of Business Ethics*, *94*(1), 89-106.

Kennedy, R. & Kirwan, B. (1998). Development of a hazard and operability-based method for identifying safety management vulnerabilities in high risk systems. *Safety Science*, *30*(3): 249-274

King, J.E., Jr., Stewart, M.M., & McKay, P.F. (2010). Religiosity, religious identity, and bias towards workplace others. *Academy of Management Annual Meeting Proceedings*, 1-6. DOI:10.5465/ambpp.2010.54492059.

Klin, A. (2000). Attributing social meaning to ambiguous visual stimuli in higher-functioning autism and Asperger syndrome: the Social Attribution Task. *Journal of Child psychology and Psychiatry, 41*(7), 831-846.

Kline, B. R. (2005). *Principles and practice of structural equation modelling* (2nd ed). New York: The Guilford Press.

Koenig, H. G., & Büssing, A. (2010). The Duke University religion index (DUREL): A Five-item measure for use in epidemiological studies. *Religions, 1*, 78-85.

Korac-Kakabadse, N., Kouzmin, A. & Kakabadse, A. (2002). Spirituality and leadership praxis. *Journal of Managerial Psychology*, *17*(3), 165–182.

Kouabenan, D. R. (1998). Beliefs and the perception of risks and accidents. *Risk Analysis, 18*(3), 243-252.

Krishnakumar, S., & Neck, C. (2002). The "what", "why" and "how" of spirituality in the workplace. *Journal of Managerial Psychology*, *17*, 153–164.

Kumphon, P. (2009). Pesticide poisoning 2009. Bureau of Epidemiology, Department of Disease Control, Ministry of Public Health. *Weekly Epidemiological Surveillance Report, Thailand, 42*(17), 257-259.

Kutcher, J. E., Bragger, J. D., Srednicki, R. O., & Masco, L. L. (2010). The role of religiosity instress, job attitudes, and organizational citizenship behaviour. *Journal of Business Ethics, 95*, 319 - 337.

Kwankye, E. A. (2012). *Worker characteristics and compliance to occupational health and safety. A study of Naja David wood industry limited in Kumasi Metropolis* (Doctoral dissertation, Department Sociology and Social Work, Kwame Nkrumah University of Science and Technology).

Law, W. K., Chan, A. H. S., & Pun, K. F. (2006). Prioritising the safety management elements: Ahierarchical analysis for manufacturing enterprises. *Industrial Management and Data Systems, 106*(6), 778-792.

Lee, R. T. (1996). A meta-analytic examination of the correlates of the three dimensions of jobburnout.*Journal of applied Psychology, 81*, 123-133.

Lee, T., Harrison, K. (2000). Assessing safety culture in nuclear power stations. *Safety Science. 34*,61–97.

Leigh, J. P. (1986). Individual and job characteristics as predictors of industrial accidents.*Accident Analysis and Prevention, 18*(3), 209-216.

Leka, S. (2003). Psychosocial hazards and seafarer health: priorities for research and practice. *International maritime health*, *55*(1-4), 137-153.

Leonard, A. G. (1966). *The lower Niger and its peoples*. London: Frank Cass.

Lin, J. & Mills, A. (2001). Measuring the occupational health and safety performance. *Facilities, 19*(3/4), 131-138.

Lin, S. H., Tang, W. J., Miao, J. Y., Wang, Z. M., Wang, P. X. (2008). Safety climate measurement at workplace in China: A validity and reliability assessment. *Safety Science. 46*, 1037-1046

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Beverly Hills, CA: Sage.

Little, A. D. (2011). *Safety culture, safety behaviour and safety performance in Railway companies*, 9th World Congress Rail Research, May 22 – 26, 2011.

Lohmoeller, J. B. (1989). *Latent variable path analysis with partial least squares*. Heidelberg: Physica.

Lowry, P. B., & Gaskin, J. (2014). Partial least squares (PLS) structural equation modelling (SEM) for building and testing behavioral causal theory: When to choose it and how to use it. *IEEE Transactions on Professional Communication, 57*(2), 123-146.

Lu, C. S., & Tsai, C. (2010). The effect of safety climate on seafarers' safety behaviours in container shipping. *Accident Analysis and Prevention, 42(6),* 1999 – 2006.

Lu, C. S., & Yang, C. S. (2010). Safety leadership and safety behaviour in container terminal operations. *Safety Science 48(2),* 123 – 134

Lu, C. S., & Yang, C. S. (2011). Safety climate and safety behavior in the passenger ferry Context. .*Accident Analysis and Prevention*, *43*, 329 – 341

Luhmann, N. (1982). The world society as a social system, *International Journal of General Systems*, *8* (3), 131-138.

Lundberg, S. (1985). The added worker effect. *Journal of Labour Economics, 3*(1, Part 1), 11-37.

Lynn, M.L., Naughton, M.J. & Vander Veen, S. (2011). Connecting religion and work: Patterns and influences of work-faith integration. *Human Relations*, *64* (5), 675-701.

MacDonald, D. D., Ingersoll, C. G., & Berger, T. A. (2000). Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems. *Archives of environmental contamination and toxicology*, *39*(1), 20-31.

MacKinnon, D. P., Lockwood, C. M., Hoffman, J. M. West, S. G. &Sheets, V. (2002). Acomparison of methods to test mediation and other intervening variable effects, *Psychological Methods*, *7*(1), 83–104.

Manaf, H, A., Osman, Abdullah, A., Muhammad S. & Latif, L. A. (2014). Analysis of religious affiliation and workplace attitude as predictors on employees' job commitment: a perspective from a public university in Malaysia, *Asian Journal of Business and Management, 2*(5), 414-421

Marcoulides, G. A., Chin, W. W., & Saunders, C. (2012). When imprecise statistical statements become problematic: a response to Goodhue, Lewis, and Thompson. *MIS Quarterly, 36*(3), 717-728.

Markow, F. Klenke, K. (2005). The effects of personal meaning and calling on organizational commitment: An empirical investigation of spiritual leadership. *InternationalJournal of Organizational Analysis, 13*(1), 8-27.

Marmot, M., & Wilkinson, R. G. (2006). *Social determinants of health*. NY: Oxford University Press New York, 366.

Marshall, M. N. (1996). *Sampling for Qualitative Research*. Oxford University Press,522.

Maurino, D. E., Reason, J., Johnston, N., & Lee, R. B. (1995). *Beyond aviation human factors-safety in high technology systems*. Aldershot, UK: Avebury Aviation.

Mbiti, J. S. (1969). *African Religions and Philosophy*, London, Heinemann.

McCormick, D. (1994). Spirituality and management. *Journal of Managerial Psychology, 9*, 5–8. doi:10.1108/02683949410070142

McCullough, M.E., &Willoughby, B.L.B. (2009). Religion, self-regulation and self-control: Association, explanationsand implications. *Psychological' Bulletin, 135*(1), 69 - 93.

McDaniel, S.W. & Burnett, J.J. (1990). Consumer religiosity and retail store evaluative criteria. *Journal of the Academy of Marketing Science, 18* (2), 102-112.

McGhee, P., & Grant, P. (2008). Spirituality and ethical behaviour in the workplace: Wishful thinking or authentic reality. *Electronic Journal of Business Ethics and Organisational Studies, 13*(2), 61-69.

McNeill, M., & O'Neill, D. (1998, April). Occupational disorders in Ghanaian subsistence farmers. In Proceedings of the annual conference of the Ergonomics Society. Chartered Institute of Ergonomics and Human factors, Loughborough, UK (1-3).

Mearns, K., Hope, L., Ford, M. T., & Tetrick, L. E. (2010). Investment in workforce health:Exploring the implications for workforce safety climate and commitment. *Accident Analysis and Prevention*, *42*(5), 1445-1454.

Mearns, K., Whitaker, S.M., & Flin, R. (2003). Safety climate, safety management practice and safety performance in offshore environments. *Safety Science*, *41*(8), 641–680

Milliman, J., Czaplewski, A. J., & Ferguson, J. (2003). Workplace spirituality and employee work attitudes: An exploratory empirical assessment. *Journal of Organizational Change Management, 16*, 426–447. doi:10.1108/09534810310484172

Ministry of Food and Agriculture (2015). *Irrigation scheme in Ghana.* Republic of Ghana.Ghana Irrigation Development Authority. Retrieved May 15, 2015 from http://mofa.gov.gh/site/?page_id=2987

Ministry of Health/Ghana Health Service (GHS, 2010). *Occupational Health and Safety policy and guidelines for the health sector*. Ghana: Ghana Health Service

Mock, V., Frangakis, C., Davidson, N. E., Ropka, M. E., Pickett, M., Poniatowski, B., & Cohen, G. (2005). Exercise manages fatigue during breast cancer treatment: A randomized controlled trial. *Psycho-Oncology, 14*(6), 464-477.

Mohamed, S. (2003). Scorecard approach to benchmarking organizational safety culture in construction. *Journal of Construction Engineering and Management, 129*(1): 80-88.

Mokhlis, S. (2009). Relevancy and measurement of religiosity in consumer behaviour research, *International Business Research, 2*(3): 75 – 84.

Monney, I., Bismark, D. A., Isaac, O. M., & Kuffour, R. A. (2014). Practices among vehicle repair artisans in an urban area in Ghana. *Journal of Environment and Occupational Science, 3*(3), 147.

Moore, T. W., & Casper, W. J. (2006). An examination of proxy measures of workplace spirituality: A predictors of organizational citizenship behaviors. *Journal of Business Ethics, 93*(2), 215-235.

Moore, T. W., & Casper, W. J. (2006). An examination of proxy measures of workplace spirituality: A profile model of multidimensional constructs. *Journal of Leadership and Organizational Studies, 12*(4), 109-118.

Morgan, G., & Smircich, L. (1980). The case for qualitative research. *Academy of management review, 5*(4), 491-500.

Morgan, K. (2007). The learning region: institutions, innovation and regional renewal. *Regional studies, 41*(1), 147-159.

Morrow, S. L., Kenneth Koves, G. & Barnes, V. E. (2014). Exploring the relationship between safety culture and safety performance in U.S. nuclear power operations. *Safety Science, 69*, 37–47 ·

Morse, J. M., & Chung, S. E. (2003). Toward holism: The significance of methodological pluralism. *International Journal of Qualitative Methods, 2*(3), 13-20.

Morse, J. M., & Niehaus, L. (2009). Principles and procedures of mixed methods design.

Mortari, L. (2015). Reflectivity in research practice: An overview of different perspectives, *International Journal of Qualitative Methods*, 1–9

Muilerman, S. (2013). *Occupational safety and health on Ghanaian cocoa farms.* Baseline report of sustainable tree crops programme,Accra, Ghana, International Institute of Tropical Agriculture (IITA),

Mullen, J., Kelloway, E. K., & Teed, M. (2017). Employer safety obligations, transformational leadership and their interactive effects on employee safety performance. *Safety science, 91*, 405-412.

Munteanu, D. S., (2005). Improving machine translation performance by exploiting non-parallel corpora. *Computational Linguistics, 31*(4), 477-504.

Nahrgang, J.D., Morgeson, F.P.&Hofmann,D.A. (2011). Safety at work: A meta-analytic investigation of the link between job demands, job resources, burnout, engagement, and safety outcomes. *Journal of Applied Psychology, 96*, 71.

National Alliance for the Mentally Ill (NAMI, 1999). *Fact sheet. Facts about mental illness and work*. Retrieved on February 20, 2015 from www.nami.org

Neal, A. &Griffin, M. A. (2004). *Safety climate and safety at work*. In: Barling, J., Frone, M. (Eds.), thePsychology of Workplace Safety. Washington DC, American Psychological Association, 15–34.

Neal, A. &Griffin, M. A. (2006). A study of the lagged relationships among safety climate, safety motivation, safety behaviour, and accidents at the individual and group levels. *Journal of Applied Psychology, 91*, 946-953.

Neal, A., Griffin, M.A. &Hart, P. M. (2000). The impact of organizational climate on safety climate and individual behaviour. *Safety Science, 34*, 99-109.

Neck, C. P. & Milliman, J. F. (1994). Thought self-leadership: Finding spiritual fulfillment in organizational life. *Journal of Managerial Psychology, l9*(6), 9-16.

Nielsen, K. J. & Mikkelsen K.L. (2007). Predictive factors for self-reported occupational injuries at 3 manufacturing Plants.*Safety Science Monitor*, 11, 1-9

Niskanen, T. (1994). Safety climate in the road administration. *Safety Science 17*, 237–255.

Ntalianis, F., & Darr, W. (2005). The influence of religiosity and work status on psychological contracts. *International Journal of Organizational Analysis*, *13*(1), 89-102.

Nuclear Regulatory Commission (2011). Final safety culture policy statement. *Federal Register*, 76 (114).

Nukunya, K. (2013). *The spread of the global financial crisis to Eastern Europe: Evidence from leading indicators and the impact of exchange rate regimes* (Doctoral dissertation, TheClaremont Graduate University).

Nunnally, J. (1967). *Psychometric methods.* New York: McGraw-Hill Book Co.

Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric theory* (3rded.). New York: McGraw-Hill

Olowookere, E. I. (2014). The influence of religiosity and organizational commitment onorganizational citizenship behaviours: A Critical Review of Literature, Advances in Social *Sciences Research Journal*, *1*(3), 48-63.

Organ, D. W. (1988). *Organizational citizenship behaviour: The good soldier syndrome*. Lexington, MA: Heath.

Ostrom, L., Wilhelmsen, C. &Kaplan, B. (1993). Assessing safety culture. *Nuclear Safety, 34* (2), 163–172.

Othman, R., & Hariri, H. (2012). Conceptualizing religiosity influence on whistle blowing intentions.*British Journal of Economics, Finance and Management Sciences*, *6*(1),629

Paloutzian, R. F., Emmons, R. A. & Keortge, S. G. (2003). Spiritual well-being, spiritual intelligence, and healthy workplace policy. In: R. A. Giacolone and C. L. Jurkiewicz (eds.) *Handbook of workplace spirituality and organizational performance.* M.E. Sharpe: New York, 123-137.

Pargament, K. I., Koenig, H. G. & Perez, L. M. (2000). The many methods of religious coping: development and initial validation of the RCOPE. *Journal of Clinical Psychology*, *56*, 519-543.

Parker, S. K., Axtell, C. M., & Turner, N. (2001). Designing a safer workplace: Importance of job autonomy, communication quality and supportive supervisors. *Journal of Occupational Health Psychology*, *6*, 211–28.

Patton, M. Q. (1990). *Qualitative evaluation and research methods*. SAGE Publications, Inc.

Patton, M. Q. (2002). *Qualitative evaluation and research methods* (3rd ed.). Thousand Oaks,CA: Sage Publications, Inc.

Perez-Floriano, L. R. (2001). *Hazard information, risk perception, cultural values, and safety compliance: A comparison of Canada, Mexico, and the United States* (Doctoral dissertation). California School of Professional Psychology, San Diego, CA.

Perez-Floriano, L. R. (2001). *Hazard information, risk perception, cultural values, and safety compliance: A comparison of Canada, Mexico, and the United States* (Doctoral dissertation). California School of Professional Psychology, San Diego, CA.

Perez-Floriano, L. R., & Gonzalez, J. A. (2007). Risk, safety and culture in Brazil and Argentina: The case of TransInc Corporation. *International Journal of Manpower*, *28*, 403–417.

Peterson, G. R. (2001). Religion as orienting worldview. *Zygon, 36*(1), 5-19.

Pidgeon, N. (2001). *Safety culture: Transferring theory and evidence from the major hazards industries*. Paper presented at the Behavioural Research in Road Safety 10th Seminar

Pidgeon, N.F. (1991). Safety culture and risk management in organizations. *Journal of Cross Cultural Psychology, 22* (1), 129–140.

Podsakoff, P. M., Mackenzie, S. B., Paine, J. B., & Bachrach, D. G. (2000). Organizational citizenship behaviours: A critical review of the theoretical and empirical literature andsuggestions for future research. *Journal of Management*, *26*(3), 513–563.

Powell, T. C. (2001). Competitive advantage: Logical and philosophical considerations. *Strategic Management Journal, 22*(9), 875-888.

Preacher, K. J., & Hayes, A. F. (2004). SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behaviour Research Methods, Instruments, and Computers, 36*,717-731. doi:10.3758/BF03206553

Preacher, K.J., Hayes, A.F., 2008. Asymptotic and resampling strategies for assessing comparing indirect effects in multiple mediator models. *Behavioural Research Methods 40*,879-891.

Pyykkönen, M. & Aherin, B. (n. d). *Occupational health and safety in agriculture*,Helsinki, Finland: Ministry of Social Affairs and Health,

Reason, J. (1997). *Managing the risks of organizational accidents.* Aldershot, Hants, England: Ashgate Publishing.

Reason, J. (2000). Human error: Models and management. *British Medical Journal,* 320, 768-770.

Reason, J. T. (1997). *Managing the risks of organizational accidents*. Ashgate, Aldershot.

Reave, L. (2005). Spiritual values and practices related to leadership effectiveness. *The Leadership Quarterly*, 16(5), 655-687.

Reesal, M. R., Hagel, L., Pahwa, P., Domoney, D., Dosman, J. A., & McDuffie H. H. (1992). *Hearing Loss in Farmers in Rural Saskatchewan*, Abstracts. Third International Symposium: Issues in health, safety and agriculture, Saskatoon, Saskatchewan, May 10-15, 92.

Rego, A. & Cunha, M. (2007). Workplace spirituality, commitment, and self-reported individual performance: An empirical study. *Management ResearchJournal of the Iberoamerican Academy of Management*, *5*(3), 163-183.

Rego, A., Ribeiro, N., & Cunha, M. P. (2010). Perceptions of organizational virtuousness and happiness as profile model of multidimensional constructs. *Journal of Leadership and Organizational Studies*, *12*(4), 109-118

Reinartz, W., Haenlein, M., & Henseler, J. (2009). An empirical comparison of the efficacy ofcovariance-based and variance-based SEM. *International Journal of Research in Marketing*, *26*(4), 332-344.

Richards, P. S., & Bergin, A. E. (1997). *A spiritual strategy for counseling and psychotherapy*. Washington, DC: American Psychological Association.

Richter, A. & Koch, C. (2004). Integration, differentiation and ambiguity in safety cultures. *Safety Science*, *42*(8): 703-722.

Rigdon, E. E., (1998). *Structural equation modeling*. In modern methods for business research, G. A. Marcoulides (editor). Mahwah, NJ: Lawrence Erlbaum Associates, Publishers, 251-294.

Rigdon, E. E., 2012. Rethinking partial least squares path modeling: In praise of simple methods. *Long Range Planning, 45* (5 – 6), 341 – 358.

Rigdon, P. (2016) Yakima basin integrated water resource management plan. Tribal fishing platform and wapato irrigation project dam. Retrieved on January 12, 2017 from http://www.critfc.org/wp-content/uploads/2016/10/2_5-Rigdon-Yakima-Basin.pdf

Ringle, C. M., Sarstedt, M., & Schlittgen, R. (2014). Genetic algorithm segmentation in partial least squares structural equation modeling. *OR Spectrum, 36*(1), 251–276.

Ringle, C. M., Sarstedt, M., & Straub, D. W. (2012). Editor's comments: A critical look at the use of PLS-SEM in MIS quarterly. *MIS quarterly, 36*(1), iii-xiv.

Ringle, C. M., Sarstedt, M., Schlittgen, R., & Taylor, C. R. (2013). PLS path modeling and evolutionary segmentation. *Journal of Business Research, 66*(9), 1318–1324.

Ringle, C. M., Wende, S., & Will, A. (2005). *Customer segmentation with FIMIX-PLS*. In Proceedings of PLS-05 International Symposium, SPAD Test&go, Paris (pp. 507-514).

Robson, C. (2002). Real world research: A resource for social scientists and practitioner. Adapting open innovation in ICT ecosystem dynamics references real world research:*A Resource for Social Scientists and Practitioner,* 270.

Rönkkö, M., & Evermann, J. (2013). A critical examination of common beliefs about partial least squares path modeling. *Organizational Research Methods, 16*(3), 425-448.

Rönkkö, M., McIntosh, C. N., & Antonakis, J. (2015). On the adoption of partial least squares in psychological research: Caveat emptor. *Personality and Individual Differences, 87*, 76-84.

Rönkkö, M., McIntosh, C. N., Antonakis, J., & Edwards, J. R. (2016). Partial least squares path modeling: Time for some serious second thoughts. *Journal of Operations Management, 47*, 9-27.

Rosenau, P. M. (1992), *Post-modernism and the social sciences. Insights, inroads, and intrusions*. Princeton, N.J: Princeton University Press

Roundy, P.T. (2009). Work and religion: Artificial dichotomy or competing interests? *International Journal of'Human and Social Sciences, 4*(5), 311-317.

Rundmo, T., & Hale, A. R. (2003). Managers' attitudes towards safety and accident prevention. *Safety science*, *41*(7), 557-574.

Rusu, P. P., & Turliuc, M. N. (2011). Ways of approaching religiosity in psychological research. *The Journal of International Social Research, 4*(18), 354-362.

Saari, L. M., & Judge, T. A. (2004). Employee attitudes and job satisfaction. *Human resource management*, *43*(4), 395-407.

Safety Research Unit (1993). *The contribution of attitudinal and management factors to risk in the chemical industry* (Final Report to the Health and Safety Executive). PsychologyDepartment, University of Surrey, Guilford.

Salleh, A. (2010). *Safety behaviour in the Malaysian petrochemical industry* (PhD thesis). Universiti Utara, Malaysia.

Sarstedt, M., Hair, J. F., Ringle, C. M., Thiele, K. O., & Gudergan, S. P. (2016). Estimation issues with PLS and CBSEM: Where the bias lies! *Journal of Business Research, 69*(10), 3998 - 4010.

Sarstedt, M., Ringle, C. M., Henseler, J., & Hair, J. F. (2014). On the emancipation of PLS-SEM: A commentary on Rigdon (2012). *Long range planning*, *47*(3), 154-160.

Sawacha, E., Naoum, S., Fong, D. (1999). Factors affecting safety performconstruction sites. *International Journal of Project Management, 17* (5), 309–315.

Schein, E. H. (1992). *Organizational culture and leadership* (2nded.). San Francisco, Jossey-Bass.

Schein, E., 2004. *Organizational culture and leadership* (third ed.). San Francisco, Jossey Bass.

Scheuren, F. (2004). *What is a Survey?* American Statistical Association.

Schwartz, S. H. & Huismans, S. (1995). Value priorities and religiosity in four western religions. *Social Psychology Quarterly, 58*, 88-107.

Seale, C. (1999). Quality in qualitative research. *Qualitative Inquiry*, *5*(4), 465-478.

Seo, D. (2005). An explicative model of unsafe work behaviour. *Safety Science, 43* (3), 187–211.

Shafranske, E., & Maloney, H. (1990). Clinical psychologists' religious and spiritual orientations and their practice of psychotherapy. *Psychotherapy, 27*, 72-78.

Shafranske, E., & Sperry, L. (2005). Addressing the Spiritual Dimension in Psychotherapy: Introduction and Overview. In L. Sperry & E. Shafranske (Eds.), *Spirituallyoriented psychotherapy*. Washington, DC: American Psychological Association.

Shappel, S. A., & Wiegmann, D. A. (2000). *The human factors analysis and classification system-HFACS* (No. DOT/FAA/AM-00/7). US Federal Aviation Administration, Office of Aviation Medicine.

Shappell, S., Detwiler, C., Holcomb, K., Hackworth, C., Boquet, A., & Wiegmann, D. A. (2007). Human error and commercial aviation accidents: An analysis using the human factorsanalysis and classification system. *Journal of the Human Factors and Ergonomics Society*, *49*(2), 227-242.

Sharife, K. (2011). *Ghana: Over 64% work in agriculture sector*, retrieved on 26th May, 2015 fromhttp://www.theafricareport.com/West-Africa/over-64-of-employed-ghananians-work-in-the-agricultural-sector.html

Shweder, R. A. (1991). *Thinking through cultures: Expeditions in cultural psychology*. Harvard University Press.

Sikorska-Simmons, E. (2005). Predictors of organizational commitment among staff in assisted living. *The Gerontologist, 45* (2), 196-205.

Silva, S., Lima, M. L., & Baptista, C. (2004). OSCI: An organisational and safety climate inventory. *Safety Science, 42*, 205–220.

Simon, M. & Goes (2012). *Dissertation and scholarly research: Recipes for dissertation*. Retrieved August 21, 2016 from *www.dissertationrecipes.com*

Sinclair, R. R., Martin, J. E. &Sears, L. E. (2010). Labour unions and safety climate perceived union safety values and retail employee safety outcomes. *Accident Analysis and Prevention, 42*, 1477-1487.

Singleton, R. &Straits, B. C.(2010). *Approaches to social research*. New York: Oxford University Press.

Siu, O. L., Phillips, D. R. & Leung, T. W. (2003). Age differences in safety attitudes and safety performance in Hong Kong construction workers. *Journal of Safety Research, 34*(2), 199-205.

Smith, C. A., Organ, D. W. & Near, J. P. (1983). Organizational citizenship behavior: Its nature and antecedents. *Journal of Applied Psychology, 68*, 653-663.

Sobel, M. E. (1982). Asymptotic confidence intervals for indirect effects in structural equation models. In S. Leinhardt(Ed.), *Sociological methodology 1982* (pp. 290–312). Washington, DC: American Sociological Association.

Soper, D. (2016). *A-priori sample size calculator for multiple regression*. Available: www.danielsoper.com

Spearman, C. (1927). *The abilities of man*. London: MacMillan.

Specht, M., Chevreau, F. R. & Denis-Remis, C. (2006). Dedicating management to culturalprocesses: Toward a human risk management system. *Journal of Risk Research, 9*, 525 - 542.

Spielberger, C. D. (1966). *Theory and research on anxiety. Anxiety and behaviour.* New York, Academic press.

Statsoft (2013). *Structural equation modelling*, Statsoft electronic statistics textbook. Retrieved July 9, 2016 from http://www.statsoft.com/textbook/structural-equation-modeling/

Steiner, L., Leinert, L., & Frey, B.S. (2010). Economics, religionand happiness. *Zeitschrift Fuer Wirtschafts- Und Unternehmensethik, 11*(1), 9-24.

Stenbacka, C. (2001). Qualitative research requires quality concepts of its own. *ManagementDecision, 39*(7), 551-555

Stone, C. A., & Sobel, M. E. (1990). The robustness of estimates of total indirect effects incovariance structure models estimated by maximum. Psychometrika, 55(2), 337-352.

Streiner, D. L. (2003). Starting at the beginning: An introduction to coefficient alpha and internal consistency. *Journal of Personality Assessment*, *80* (1), 99-103

Szapkiw, A. (2012). *Statistics guide.* Lynchburg, VA: Liberty University. Retrieved from http://amandaszapkiw. com/eLearning/statistics-guide/downloads/Statistics-Guide. pdf.

Tabachnick, B. G., & Fidell, L. S. (1989). *Using multivariate statistics*. New York: Harper & Row.

Tabachnick, B. G., & Fidell, L. S. (2001). *Using multivariate statistics* (4th ed.). Boston: Allyn & Bacon.

Taiwo, O. A., Cantley, L. F., Slade, M. D., Pollack, K. M., Vegso, S., Fiellin, M. G., & Cullen, M. R. (2009). Sex differences in injury patterns among workers in heavy manufacturing. *American Journal of Epidemiology, 169*(2), 161-166.

Tarrants, W. E. (1980). *The measurement of safety performance*. New York, Garland STPM.

Taylor, C. (1989). *Sources of the self: The making of the modern identity*. Harvard University Press.

Tembo, M. S. (1980). *A sociological analysis of the African personality among Zambian students* (MA thesis). East Lansing, Michigan State University.

Tenenhaus, M., Amato, S., & Esposito Vinzi, V. (2004, June*). A global goodness-of-fit index for PLS structural equation modelling*. In Proceedings of theXLII SIS scientific meeting, 1, 739-742.

Tenenhaus, M., Esposito Vinzi, V., Chatelin, Y. -M., & Lauro, C. (2005). PLS path modeling. *Computational Statistics and Data Analysis, 48*(1), 159–205.

Tewksbury, R. (2009). Qualitative versus Quantitative Methods: Understanding Why Qualitative Methods are Superior for Criminology and Criminal Justice. *Journal of Theoretical and Philosophical Criminology*, *1*(1), 38-58

The Health Foundation (2011). *Measuring safety culture.Theevidence scan*. London, the Evidence Centre. Retrieved on February 10, 2015 from www.health.org.uk.

The US Department of Labour, (2012).The Latino labour force at a glance. *US Bureau of Labour Statistics*, Current Population Survey: Author.

Thompson, W.D. (2000). Can you train people to be spiritual? *Training and Development*, *54*(12), 18-19.

Thurstone, L. L., (1942). Psychological Examination for College Freshmen (No. 8).

Treece, E. W., & Treece, J. W. (1982). *Elements of research in nursing* (3rd ed.). St. Louis, MO:Mosby.

Tsang, J., & McCullough, M. E. (2003). Measuring religious constructs: A hierarchical approachto construct organization and scale selection. Positive psychological assessment: *A handbook of models and measures*, 345-360.

Tucker, S., & Turner, N. (2015). Sometimes it hurts when supervisors don't listen: Antecedents and consequences of safety voice among young workers. *Journal of Occupational Health Psychology, 20*, 72-81.

Turner, J. (1999). Spirituality in the workplace. *caMagazine, 132*(10), 41-42.

Turner, N., & Gray, G. C. (2009). Socially constructing safety. *Human Relations, 62*, 1259–1266. doi:10.1177/0018726709339863

Uryan, Y. (2010). *Organizational safety culture and individual safety behavior: A case study of the Turkish national police aviation department* (Doctoral dissertation, University of Central Florida Orlando, Florida).

van Belle, G. (2002). *Statistical rules of thumb. How to figure out an appropriate sample for the pilot study?* New York: John Wiley

Van Dyne, L., & LePine, J. A. (1998). Helping and voice extra-role behaviours: Evidence of construct and predictive validity. *Academy of Management journal, 41*(1), 108-119.

Varonen, U., and Mattila, M. (2000). The safety climate and its relationship to safety practices, safety of the workenvironment and occupational accidents in eight wood-processing companies. *Accident Analysis and Prevention, 32*, 761–9.

Vinodkumar, M.N., & Bhasi, M. (2010). Safety management practices and safety behaviour: Assessing the mediating role of safety knowledge and motivation. *Accident Analysis and Prevention, 42* (6), 2082–2093, http://dx.doi.org/10.1016/j.aap.2010.06.021.

Voland, E. (2009). *The biological evolution of religious mind and behaviour*, W. Schiefenhövel (eds.),The Frontiers Collection, Berlin, Heidelberg: Springer-Verlag,.

von Thaden, T. L., & Gibbons, A. M. (2008). The safety culture indicator scale measurementsystem (SCISMS). *National Technical Information Service Final Report*, 1-57.

Vredenburgh, A. G. (2002). Organizational safety: Which management practices are most effective in reducing employee injury rates? *Journal of Safety Research. 33* (2), 259-276

Wallace, C. (2016). Creating a safety conscious organization and workforce. *Organizational Dynamics, 45* (4), 1-312.

Wallace, J. C., & Vodanovich, S. J. (2003). Workplace safety performance: Conscientiousness, cognitive failure, and their interaction. *Journal of Occupational Health Psychology, 8*, 316 - 327.

Warr, P. (1987). *Work, Unemployment, and Mental Health*, Clarendon Press, Oxford.

Warren, N. (2001). Work stress and musculoskeletal disorder etiology: The relative roles of psychosocial and physical risk factors. *Work*, *17*, 221-234.

Weaver, G.R. & Agle, B.R. (2002). Religiosity and ethical behavior in organizations: Asymbolic interactionist perspective.*Academy of Management Review, 27* (1), 77-97.

Weinstein, N. D. (2000). Perceived probability, perceived severity, and health-protective behaviour. *Health Psychology*, *19,* 65–74. doi:10.1037/0278-6133.19.1.65

Weller, L. D., Daeschel, M. A., Durham, C. A. & Morrissey, M. T. (2013). Effects of water, sodium hypochlorite, peroxyacetic acid, and acidified sodium chlorite on in-shell hazelnuts inoculated with Salmonella Enterica serovar Panama. *Journal of Food Science, 78*(12), 1885–1891.

Westrum, R., (2004). A typology of organisational cultures. *Quality Safety and Health Care, 13*, 22--27.

Weyman, A. & Kelly, C. (1999). Risk perception and communication: A review of the literature, *Health and Safety Executive,Research Report*, 248-299

Weyman, A. K., & Clarke, D. D. (2003). Investigating the influence of organizational role on perceptions of risk in deep coal mines. *Journal of Applied Psychology, 88*, 404–412. doi:10.1037/0021-9010.88.3.404

Weyman, A. K., & Clarke, D. D. (2003). Investigating the influence of organizational role on perceptions of risk in deep coal mines. *Journal of Applied Psychology, 88*, 404–412.

WHO (2003). Authored by S. Leka, A. Griffiths, & T. Cox, *Work organization and stress*. Study group on human factors. London: HMSO.

Wiegmann, D. A. & Shappell, S. A. (2003). *A human error approach to aviation accidentanalysis: The human factors analysis and classification system*. Burlington, VT: Ashgate.

Wiegmann, D. A., & Shappell, S. A. (2001). Human error analysis of commercial aviationaccidents: Application of the human factors analysis and classification system (HFACS). *Aviation Space and Environmental Medicine, 72* (11), 1006-1016

Wiegmann, D. A., Zhang, H., & von Thaden, T. (2001). *Defining and assessing safety culture in high reliability systems: An annotated bibliography.* University of Illinois Institute of Aviation Technical Report (ARL-01-12/FAA-01-4). Savoy, IL: Aviation Res. Lab.

Wiegmann, D. A., Zhang, H., von Thaden, T., Sharma, G., & Mitchell, A. (2002). A synthesis of safety culture and safety climate research. Savoy: *Aviation Research Laboratory*, Institute of Aviation.

Wiegmann, D., Zhang, H., von Thaden, T., Gibbons, A. and Sharma, G. (2004). Safety culture:An integrative review. *International Journal of Aviation Psychology, 14* (2): 117-134.

Wilkes, R. E., Burnett, J. J., & Howell R. D., (1986). On the meaning and measurement of religiosity in consumer research. *Journal of the Academy of Marketing Science*, *14* (1), 47-56.

Williams, R. (2003). The technology and the society. Television. *Critical Concepts and Cultural Studies*, *2*, 42 – 57.

Williamson, A. M., Feyer, A. M., Cairns, D., Biancotti, D. (1997). The development of a measure of safety climate: the role of safety perceptions and attitudes. *Safety Science 25*, 15–27.

Wold, H. O. A. (1982). *Soft modelling: the basic design and some extensions*, in J¨oreskog, K. G., Wold, H. O. A. (eds). *Systems under indirect observation, Part II*,1-55.

Wong, E. S., Stotka, J. L., Chinchilli, V. M., Williams, D. S., Stuart, G., & Markowitz, S. M. (1991). Are universal precautions effective in reducing the number of occupational exposures among health care workers? *JAMA, 265,* 1123–1128. doi:10.1001/jama.265.9.1123

Wong, K. K. K. (2013). Partial Least Squares Structural Equation Modeling (PLS-SEM) Techniques Using SmartPLS. *Marketting Bulletin*, *24*, 1-32.

Workman's Compensation Law (1987). *PNDC (187).* Ghana

World Health Organization. (2010). GAP intervention guide - For mental, neurologicaland substance abuse disorders in non-specialized health settings. Mental Health Gap Action Programme, 1–121. Retrieved on March 21, 2016 from http://scholar.google.com/scholar?hl=en&btnG=Search&q=intitle:mhGAP+InterventioGuide#1\nhttp://scholar.google.com/scholar?hl=en&btnG=Search&q=intitle:mhGAP+inervention+guide#1

Worthington, E. L., Jr., Wade, N. G., Hight, T. L., Ripley, J. S., McCullough, M. E., Berry, J. W., Schmitt, M. M., Berry, J. T., Bursley, K. H., & O'Conner, L. (2012) . The Religious Commitment Inventory-10 (RCI-10). *Measurement Instrument Database for the Social Science.* Retrieved from www.midss.ie

Worthington, E. L., Jr., Wade, N. G., Hight, T. L., Ripley, J. S., McCullough, M. E., Berry, J. W., Schmitt, M. M., Berry, J. T., Bursley, K. H., & O'Conner, L. (2003). The religious commitment inventory-10: Development, refinement, and validation of a brief scale for research and counseling. *Journal of Counseling Psychology*, *50*, 84-96.

Worthington, E. L., Wade, N. G., Hight, T. L., McCullough, M. E., Berry, J. T., Ripley, J. S. et al. (2003). The religious commitment inventory-10: Development, refinement and validation of a brief scale for research and counseling. *Journal of Counseling Psychology, 50,* 84-96.

Wulff, D. M. (1997). *Psychology of religion: Classic and contemporary* (2nd ed.). New York: Wiley and Sons.

Yaro, I. (2001). *Feasibility of adopting rice-cum-fish culture system to enhance the development of conventional aquaculture participation in Niger State*. In Eyo, A.A. and Ajao, E.A. (Eds) pp.31- 36. Proceedings of Fisheries Society of Nigeria held in Maiduguri, 4th- 9th Nov. 201.317p

Yoo, Y. Alavi, M., (2001), Media and group cohesion: Relative influences on social presence, task participation, and group consensus. *MIS Quarterly, 25* (3), 371-390.

Yule, S., Flin, R., Murdy, A. (2007). The role of management and safety climate in preventing risk taking at work. *International Journal of Risk Assessment and Management, 7* (2), 137–151.

Zacharatos, A., Barling, J., & Iverson, R. D. (2005). High-performance work systems and occupational safety. *Journal of Applied Psychology, 90*(1), 77-93.

Zhang, H., Wiegmann, D. A., von Thaden, T. L., Sharma, G., & Mitchell, A. A. (2002). *Safety culture: A concept in chaos?* Proceedings of the 46th Annual Meeting os the Human Factors and Ergonomics society. Santa Monica: Human Factors and Ergonomics Society

Zhao, Y., Wang, S. X., Nielsen, C. P., Li, X. H. & Hao, J. M. (2010). Establishment of a database of emission factors for atmospheric pollutants from Chinese coal-fired powerplants. *Atmospheric Environment, 44*, 1515–1523.

Zin, S. M., & Ismail, F. (2012). Employers' behavioural safety compliance factors toward occupational, safety and health improvement in the construction industry. Paper presented at the ASEAN Conference on Environment-Behaviour Studies, Savoy Homann Bidakara. *Procedia-Social and Behavioural Sciences, 36,* 742 –751

Zohar, D. (1980). Safety climate in industrial organizations: Theoretical and applied implications. *Journal of Applied Psychology, 65*, 96 -102

Zohar, D. (2000). A group-level model of safety climate: testing the effect of group climate onmicroaccidents in manufacturing jobs. *Journal of Applied Psychology, 85*(4): 587-596.

Zohar, D. (2002). The effects of leadership dimensions, safety climate, and assigned priorities on minor injuries in work groups. *Journal of Organizational Behaviour 23*, 75–92.

Zohar, D. (2010). Thirty years of safety climate research: Reflections and future directions. *Accident Analysis and Prevention, 42*(5): 1517-1522.

Zohar, D. (2011). *Safety climate: Conceptual and measurement issues.*In J. C. Quick, & L. E. Tetrick (eds.), Handbook of occupational health psychology (2nded.) (pp. 141–164). Washington, DC: American Psychological Association.

Zohar, D., Luria, G. (2003). The use of supervisory practices as leverage to improve safety behaviour: A cross-level intervention model. *Journal of Safety Research, 34* (5), 567–577

Zohar, D., Luria, G. (2005). A multilevel model of safety climate: Cross-level relationships between organization and group-level climates. *Journal of Applied Psychology, 90* (4), 616–628.

APPENDICES

Appendix A: Letter of Introduction

UNIVERSITY OF GHANA
DEPARTMENT OF PSYCHOLOGY

Tel.: (233-0302) 500381 Ext. 3754/3310 028 955 04 63 P. O. Box LG 84, Legon - Ghana E-mail: psychology@ug.edu.gh

Our Ref. No...

PSYC 2/33/01

March 18, 2016

Kpong Irrigation Scheme Manager
Kpong

Dear Sir/Madam,

LETTER OF INTRODUCTION
MR. LEBBAEUS ASAMANI

The above-named is a PhD student at the Department of Psychology, University of Ghana, Legon.

In partial fulfillment of the requirement for the awards of the PhD degree, **Mr. Lebbaeus Asamani** has to write and submit an original thesis.

He has selected the topic: **"Antecedents of Occupational Health and Behaviour and Safety Performance: A Study of Rice Farmers in Ghana".**

To enable him collect data for his work, he would need to administer questionnaires and conduct interviews. He has selected your Institution as suitable for his data collection.

Your assistance is appreciated.

Yours sincerely,

Prof. C.C. Mate-Kole
(Head of Department)

KIS
RECEIVED 11 MAY 2016
073/16

see
Pls. inform Raphael to stand by to offer any needed assistance.
ATS
11/05/16

Appendix B: Ethical Clearance

UNIVERSITY OF GHANA
ETHICS COMMITTEE FOR THE HUMANITIES (ECH)

P. O. Box LG 74, Legon, Accra, Ghana

My Ref. No.................

27th January, 2016

Mr. Lebbaeus Asamani
Department of Psychology
University of Ghana
Legon

Dear Mr. Asamani,

ECH 072/15-16: ANTECEDENTS OF OCCUPATIONAL HEALTH AND BEHAVIOUR AND SAFETY PERFORMANCE: A STUDY OF RICE FARMERS IN GHANA

This is to advise you that the above reference study has been presented to the Ethics Committee for the Humanities for a full board review and the following actions taken subject to the conditions and explanation provided below:

Expiry Date:	25/01/17
On Agenda for:	Initial Submission
Date of Submission:	3/12/15
ECH Action:	Approved
Reporting:	Bi-Annually

U.G./ISSER/ECH
VALID UNTIL
25 JAN 2017
APPROVED DOCUMENT

Please accept my congratulations.

Yours Sincerely,

Rev. Prof. J. O. Y. Mante
ECH Chair

CC: Prof. C. C Mate- Kole, Department of Psychology, University of Ghana

Tel: +233-303933866 Email: ech@ug.edu.gh | ech@isser.edu.gh

Appendix C: Protocol Consent Form

UNIVERSITY OF GHANA

Official Use only
Protocol number

Ethics Committee for Humanities (ECH)

PROTOCOL CONSENT FORM

Section A- BACKGROUND INFORMATION

Title of Study:	***Antecedents of occupational health and safety behaviour and safety performance: a study of rice farmers in Ghana***
Principal Investigator:	ASAMANI LEBBAEUS
Certified Protocol Number	

Section B– CONSENT TO PARTICIPATE IN RESEARCH

General Information about Research

The Purpose of this research is to attempt to understand why people behave in ways that promote safety at the workplace. The study is being conducted in about 9 rice irrigation schemes and also a number of individual small-holder rice farms in three regions in Ghana. It is in a form of cross-sectional, mixed method survey, involving semi-structured interviews and completion of quantitative questionnaireby management, supervisor and all employees and individual rice farmers in the research areas. The completion of the questionnaire is expected to take about 40 minutes to 1 hour, whiles the interview would take about 30 minutes.

Benefits/Risk of the study

There are no known risks to you if you decide to participate in this research study, nor are there any costs for participating in the study. The information you would provide will help design appropriate safety interventions to promote safety in farming and other workplaces. The information collected may not benefit you directly, but what I learn from this study should provide general benefits to employees, companies, and researchers.

Confidentiality

Data or information obtained would remain confidential and your privacy would be protected at all time including any identifying information. Note that it is your right to remain anonymous. I understand that to facilitate the interviewer's job, the interview will be recorded. However, the recording will be destroyed as soon as it has been transcribed. There would be identification with codes only to aid in follow-ups, where necessary. At no period will the data collected in the study be released to anybody beyond those working on the research project (The researcher, two research assistants, and the thesis supervisors). And any information about the study released would be in aggregate without individual identification. Each participant would be given the questionnaire to be completed on their own (with the help of the researcher or his assistants, if necessary) without being required to write down names, initials or any sign that could be used for any identification purposes.

Compensation

I understand that there would be no compensation for participating in this study, and that participation is voluntary.

Withdrawal from Study:

I also understand that I have the freedom to withdraw from the study at any time without consequence or prejudice to me, and I can refrain from answering any questions or group of questions that I do not want to without penalty.

Contact for Additional Information

For any information about the project, I can contact the principal investigator, **Mr. Lebbaeus Asamani**, of the Department of Psychology, University of Ghana, Legon, on 0242122281 or email- lasamani@st.ug.edu.gh

If you have any questions about your rights as a research participant in this study you may contact the Administrator of the Ethics Committee for Humanities, ISSER, University of Ghana at ech@isser.edu.gh / ech@ug.edu.gh or 00233- 303-933-866.

Section C-VOLUNTEER AGREEMENT

"I have read or have had someone read all of the above, asked questions, received answersregarding participation in this study, and am willing to give consent for me, mychild/ward to participate in this study. I will not have waived any of my rights by signingthis consent form. Upon signing this consent form, I will receive a copy for my personal records."

____

Name of Volunteer

_______________________________ _______________

Signature or mark of volunteer Date

If volunteers cannot read the form themselves, a witness must sign here:

I was present while the benefits, risks and procedures were read to the volunteer. All questions were answered and the volunteer has agreed to take part in the research.

____

Name of witness

_______________________________ _______________

Signature of witness Date

I certify that the nature and purpose, the potential benefits, and possible risks associated with participating in this research have been explained to the above individual.

____

Name of Person who Obtained Consent

_________________________________ _________________

Signature of Person Who Obtained Consent Date

Appendix D: Semi-Structured Interview Guide for Qualitative Study

Interview Guide

Introduction of Interview

Dear Respondent, my name is ***Lebbaeus Asamani***, a PhD candidate of the Department of Psychology, University of Ghana, Legon. The interview is designed to gain general information from you about hazardous aspects of rice farming. During the interview, I would like to discuss the follow topic: Common health and safety hazard in rice farming, health and safety incidents and how you deal with any harm or injury experience in the farm, among others.

The interview is intended to apply to scheme manager, extension officers and farmers alike. It would take the form of a general discussion and generally about 40 minutes.

1. What is your age? ………………..years
2. What is your highest level of education? ………………………………………………
3. What is your current job description? ……………………………………………………………
4. How long have been working with this irrigation scheme? ……………………………………

Identification of Hazards

1. Can you tell me what your main work as a rice farmer involves? Tell me about the rice farming activities?
2. Generally, what are the things you come into contact with during your work?
3. What safety implications do they have? What are potential harmful aspects of your job?
4. What are the tools and machines that you use in your work?
5. What precautionary measure and preventive measures do you put in place to prevent injuries?
6. How long do you work on a typical day?
7. Do you come into contact with animals, insects etc in your work?
8. How would you describe the nature of your road to the farm?
9. I guess you make use of a lot of chemicals? What are some of the things you use chemicals to do?
10. What are some of the chemicals (pesticides, herbicides, weedicides etc)?

Major health and safety incidents and preventive measures

11. What aspect of your work do you consider to be hazardous or risky that poses health challenges to you?
12. What forms of health and safety incidents have you ever experienced in your rice farming process?
13. When accidents occur, what remedial actions are taken to prevent the same thing happening again?
14. How are accidents or incidents handled here?

Appendix E: Quantitative Survey Instrument (English)

Dear Respondent,
The purpose of this questionnaire is to get your view on safety at this workplace. Your answers will be processed on a computer and will be dealt with confidentially. No individual results will be presented in any way. Although I want you to answer each and every question, you have the right to refrain from answering any one particular question, a group of questions, or the entire questionnaire

Informed Consent
I have read the above introduction to the questionnaire and agree to complete the questionnaire under the stated conditions. Please tick, if you agree to participate in the study [ ]

SECTION A: Background information

1. What is your age? ………………..years
2. Are you a…. [ ] Male [ ] Female
3. What is your highest level of education?
   [ ] No formal education [ ] Basic (Primary/JSS/Middle) School
   [ ] Secondary (SSSCE/WASSE/Diploma) [ ] Tertiary (HND/First Degree equivalent)
   [ ] Master's degree [ ] PhD
4. How long have been doing rice farming? …………………………..
5. What is your position? [ ] Manager [ ] Supervisor [ ] Operator
   [ ] Farm worker [ ] Extension Officer [ ] Other: (Specify) ....

SECTION B: Hazards

Please indicate **how often you do**, exposed to or experience the things indicated in each statement, using the 7-point scale below:
1 (Never) 2 (A few times a year) 3 (1 – 3 times a month) 4 (Once a week) 5 (More than once a week) 6 (once a day) 7 (Several times a day)

1. Application of agro-chemicals (e.g. Fertilizer)	1	2	3	4	5	6	7
2. Use of catapults to scare birds	1	2	3	4	5	6	7
3. Dust from winnowing of rice	1	2	3	4	5	6	7
4. Exposure to sun	1	2	3	4	5	6	7
5. Prolong working hours (more than 8 hours a day)	1	2	3	4	5	6	7
6. Working in water-logged areas	1	2	3	4	5	6	7
7. Exposure to animals, insect, snakes etc	1	2	3	4	5	6	7
8. Screaming to scare birds	1	2	3	4	5	6	7
9. Presence of snail shells in the soil	1	2	3	4	5	6	7
10. Presence of tree stumps and thorns	1	2	3	4	5	6	7
11. Running on narrow bonds to scare bird	1	2	3	4	5	6	7
12. Bending or awkward posture at work	1	2	3	4	5	6	7
13. Use of sharp farm implements, tools and equipment	1	2	3	4	5	6	7
14. Use of farm machines (tillers, harvesters, threshers etc)	1	2	3	4	5	6	7
15. Exposure to fumes (smoke) from burning of farm land	1	2	3	4	5	6	7
16. Exposure to mosquito and other insect bites	1	2	3	4	5	6	7
17. Walking on slippery bonds*	1	2	3	4	5	6	7
18. Exposure to rice grass exposure	1	2	3	4	5	6	7
19. Lifting of weight (bags of fertilizer, rice etc)	1	2	3	4	5	6	7

SECTION C: Safety Behaviour

In the following section, please indicate how frequently you engage in the behaviour indicated in each statement regarding safety in your workplace (farm), using the scale:
1 (never) 2 (rarely) 3 (a few times) 4 (very often) 5 (always)

Items	**Rating**				
1. I voluntarily carry out tasks or activities that help to improve workplace safety (e.g. correcting things that could lead to accident).	1	2	3	4	5
2. I help my colleague when they are working under risky or hazardous conditions.*	1	2	3	4	5
3. I often make suggestions to improve how safety is handled around here	1	2	3	4	5
4. If I see something unsafe, I go out of my way to address it.	1	2	3	4	5
5. I am directly and or indirectly involved in improving safety policy and practices.	1	2	3	4	5
6. I initiate steps to improve work procedures, if I think it will make work safer *	1	2	3	4	5
7. I ensure the highest levels of safety when I carry out my job. *	1	2	3	4	5
8. I put in extra effort to improve the safety of the workplace. *	1	2	3	4	5
9. I carry out my work in a safe manner.*	1	2	3	4	5
10. I use the correct safety procedures for carrying out my job.	1	2	3	4	5
11. I often try to solve problems in ways that reduce safety risks.	1	2	3	4	5
12. I use all the necessary safety equipment to do my job.	1	2	3	4	5

SECTION D: Religiosity

Below are statements about our relationship with a divine being. Please indicate how often you do the things indicated in each statement, using the 7-point scale below:
1 (Never) 2 (A few times a year) 3 (1 – 3 times a month) 4 (Once a week) 5 (More than once a week) 6 (once a day) 7(Several times a day)

Statements	**Ratings**						
1. How often do you think about religious issues?	1	2	3	4	5	6	7
2. To what extent do you believe that God or something divine exists?	1	2	3	4	5	6	7
3. How often do you take part in religious services?	1	2	3	4	5	6	7
4. How often do you pray?	1	2	3	4	5	6	7
5. How often do you experience situations in which you have the feeling that God or something divine intervenes in your life?*	1	2	3	4	5	6	7
6. How interested are you in learning more about religious	1	2	3	4	5	6	7

topics?							
7. To what extent do you believe in an afterlife (e.g. immortality of the soul, resurrection of the dead or reincarnation)?	1	2	3	4	5	6	7
8. How important is it for you to take part in religious services?	1	2	3	4	5	6	7
9. How important is personal prayer for you?	1	2	3	4	5	6	7
10. How often do you experience situations in which you have the feeling that God or something divine wants to communicate or to reveal something to you?	1	2	3	4	5	6	7
11. How often do you keep yourself informed about religious questions through radio, television, internet, newspapers, or books?	1	2	3	4	5	6	7
12. In your opinion, how probable is it that a higher power really exists	1	2	3	4	5	6	7
13. How important is it for you to be connected to a religious community?	1	2	3	4	5	6	7
14. How often do you pray spontaneously when inspired by daily situations?	1	2	3	4	5	6	7
15. How often do you experience situations in which you have the feeling that God or something divine is present?	1	2	3	4	5	6	7
16. How often do you meditate?*	1	2	3	4	5	6	7
17. How important is meditation for you?	1	2	3	4	5	6	7
18. How often do you experience situations in which you have the feeling that you are touched by a divine power?	1	2	3	4	5	6	7
19. How often do you try to connect to the divine spontaneously when inspired by daily situations?	1	2	3	4	5	6	7

SECTION E: Safety climate

In the following section, please indicate how often each statement about how safety issues at your workplace are dealt with, using the scale:
1 (Never) 2 (rarely) 3 (sometimes) 4 (mostly) 5 (always)

Tick only one option for each question. Although some questions may appear very similar, please answer each one of them.

1. Health and safety of workers is a priority here	1	2	3	4	5
2. Management (Executives) considers workers physical health to be as important as productivity	1	2	3	4	5
3. Management shows support for physical injury prevention through involvement and commitment to deal with safety issues	1	2	3	4	5
4. My extension officers acts quickly to correct problems/issues that affect workers' safety or physical health	1	2	3	4	5
5. My extension officers clearly considers the safety of workers to be of great importance	1	2	3	4	5

6. My extension officers acts decisively when a concern of workers' safety or physical health status is raised	1	2	3	4	5
7. We discuss physical safety hazards and incident prevention here	1	2	3	4	5
8. In our farm, we care about the physical safety awareness of other workers	1	2	3	4	5
9. We remind each other of the rules and regulations regarding physical safety	1	2	3	4	5
10. There is good communication here about physical safety issues which affect me	1	2	3	4	5
11. Information about workplace physical well-being is always brought to my attention here	1	2	3	4	5
12. My complaints, remarks and contributions to resolving safety concerns here are listened to	1	2	3	4	5
13. Participation and consultation in health and safety issues occur with workers, cooperatives executives, scheme managers and health and safety coordinators	1	2	3	4	5
14. Farmers are encouraged to become involved in health and safety matters here	1	2	3	4	5
15. The prevention of physical injury involves all levels of the workers here	1	2	3	4	5
16. I was given induction training when I started working here*	1	2	3	4	5
17. I was trained in safe work procedures for my work	1	2	3	4	5
18. Our scheme manager/supervisor makes sure we do the work safely	1	2	3	4	5
19. We are always made aware of safety issues	1	2	3	4	5
20. We have safety reporting procedures (for incidents and issues)	1	2	3	4	5
21. We are always encouraged to report safety incidents	1	2	3	4	5
22. I know who to ask about what to do, if I get injured at work*	1	2	3	4	5
23. We all have to report all injuries at work straight away	1	2	3	4	5
24. We are given necessary information and training about injury management	1	2	3	4	5

SECTION F: Safety performance

In the last 12 months, how frequently have you experienced these on the job?

1 (Never) 2 (rarely) 3 (sometimes) 4 (mostly) 5 (always)

1. Headache or dizziness or fever	1	2	3	4	5
2. Persistent fatigue	1	2	3	4	5
3. Skin rash/burn	1	2	3	4	5
4. Pesticide or chemical suffocation or poisonings	1	2	3	4	5
5. Blisters	1	2	3	4	5
6. Muscle strain or sprain (e.g. back pain)	1	2	3	4	5
7. Chest pain	1	2	3	4	5
8. Cut or puncture (e.g. cutlass or sickle wound)	1	2	3	4	5
9. Thorns or stump injury	1	2	3	4	5
10. Snake bite	1	2	3	4	5
11. Scorpion sting	1	2	3	4	5
12. Temporary Loss of hearing	1	2	3	4	5
13. Foot rot	1	2	3	4	5

14. Fallen object on eye	1	2	3	4	5
15. Eye injury	1	2	3	4	5
16. Sore throat	1	2	3	4	5
17. Injuries resulting from animals*	1	2	3	4	5
18. Health problems resulting from grain, dust, or mold	1	2	3	4	5
19. Electrical shock*	1	2	3	4	5
20. Respiratory injuries (e.g. difficulty breathing)	1	2	3	4	5
21. Dislocation/fracture bone	1	2	3	4	5
22. Malaria	1	2	3	4	5
23. Lost much sleeps due to work related worries.*	1	2	3	4	5
24. Been unable to concentrate on work related tasks.	1	2	3	4	5
25. Felt constantly under strain	1	2	3	4	5
26. Felt incapable of making decisions.	1	2	3	4	5
27. Been losing confidence in myself	1	2	3	4	5
28. Been unable to enjoy my normal day-to-day activities.	1	2	3	4	5
29. Was exposed to chemicals such as gases and fumes.	1	2	3	4	5
30. Over exerted myself while handling, lifting or carrying.	1	2	3	4	5
31. Slipped, tripped or fell on the same level.	1	2	3	4	5
32. Fell from height (from top of something)	1	2	3	4	5
33. Was struck by a moving vehicle (e.g. bicycle, motor, car, tiller etc) on my way to or from the farm	1	2	3	4	5
34. Chemical blown into eye or nose	1	2	3	4	5
35. Was struck by flying/falling object(s)	1	2	3	4	5
36. Struck against something fixed or stationary	1	2	3	4	5
37. Was trapped by something collapsing, caving in or overturning	1	2	3	4	5
38. Got in touch with a moving machinery	1	2	3	4	5
39. Had clothes caught in something (e.g. winnower, milling machine)*	1	2	3	4	5
40. Other incidents not mentioned (Please specify)					

....

NB: * *Asterisked items were not used in final analysis because of low loadings*

AppendixF: Quantitative Questionnaire (Twi version)

NHWEHW{MU HO AKADE{

Nyianofo] pa,

Nhwehw[mu ho ns[mmisa yi botae ne s[menya w'adwenkyer[[fa bamm] ho w] adwuma yi mu. M[kora wo mmuae[no so w] k]mputa so a y[nti ho nkyer[obiara. Ankorankor[mmuae[no de[menna nadi w] kwan biara so. {wom s[m[p[s[wob[yi ns[mmisa no nyina ara ano de[nanso wow] ho kwan s[wogyae [mu biara to h], s[[y[baako, akuakuo anaa ns[mmisa no nyina ara mpo.

Megye tom

Nnianim a [di nhwehw[mu ho ns[mmisa yi anim no, makan na megye tom s[m[yi ns[mmisa no ano s[nea [ho nhyehy[e[te[no ara. Mesr[, san h], s[wop[s[woboa w] nhwehw[mu yi mu a [ ]

}FA A: Nyianofo] no ho ns[m

1. Woadi mfe[s[n? Mfe[...............
2. Woy[.........[ ]Barima [ ]}baa
3. Woak] sukuu aduru s[n?

   [ ]Menk]] sukuu [ ]Ahyease[sukuu
   [ ]Ntoaso] sukuu [ ]Suap]n (HND/Abodin krataa a edi kan, first degree equivalent)
   [ ]Abodin krataa a [t] so mmienu (Masters degree) [ ]PhD
4. Mfe[s[n ni na woadua [mo? Mfe [...........
5. Wo dibea be s[n? [ ]Panin pa ara [ ]}hw[sofo] [ ]Mfidie dwumay[ni [ ]Afuom adwumay[ni [ ]Panin a mek] mm]nten so k]hw[mfuom no so. [ ]Nea [keka ho (Kyer[mu) ....

}FA B: Akwanhyia:

Mesr[s[gyina mma 1-7 no so na kyer[**mp[n dodo]** a woy[anaa wohyia anaa wofa nne[ma a y[atoto din w] nnaka a [didi so yi mu no:

1 (Koraa) 2 (Mp[n kakraa bi w] afe mu) 3 (Bere koro de k]si mpr[nsa w] bosome biara mu) 4 (Bere koro w] nnaw]twe biara mu) 5 ({boro baako w] nnaw]twe biara mu) 6 (Bere koro w] da biara mu) 7 (Mp[n dodo] w] da biara mu)

1. Afuom nnuro a wode y[adwuma. (S[ebia f[tiliza)	1	2	3	4	5	6	7
2. Tae a y[de hunahuna nnomaa	1	2	3	4	5	6	7
3. Mfuturo a [firi [mo no a y[boro no mu ba	1	2	3	4	5	6	7
4. Awia a y[gyina so	1	2	3	4	5	6	7
5. Adwuma a y[y[no mmer[tenten ({boro d]nhwere nw]twe da koro)	1	2	3	4	5	6	7
6. Woy[adwuma w] mmeae[a nsuo w] asaase no mu bebree	1	2	3	4	5	6	7
7. Mmoa a wohyia; nt]teboa,]w], nea [keka ho	1	2	3	4	5	6	7
8. Woteam de b] nnomaa hu	1	2	3	4	5	6	7
9. Wotia nwa ntonturowa so w] nwea mu	1	2	3	4	5	6	7
10. Wotia dunsin anaa nkas[e so	1	2	3	4	5	6	7
11. Woredi nnomaa nt[nt[s[wob[hunahuna w]n	1	2	3	4	5	6	7
12. Wokuntunu wo mu anaa wogyina h] na woy[adwuma	1	2	3	4	5	6	7
13. Wode nne[ma ne nnade[a ano y[nam na[y[adwuma	1	2	3	4	5	6	7
14. Mfidie ay[de y[afuo (nea y[de funtum asaase, nea y[de twa nn]bae, nea y[de boro eyuo ne nea [keka ho)	1	2	3	4	5	6	7
15. Wohye w'afuo no	1	2	3	4	5	6	7
16. Ntontom ne ntommoa we wo	1	2	3	4	5	6	7
17. Wonante mmeae[a [h] y[toro	1	2	3	4	5	6	7
18. Wode nnuro a y[de gu asaase mu y[dwuma	1	2	3	4	5	6	7
19. {moho sr[no y[wo biribi	1	2	3	4	5	6	7
20. Wopagya nne[ma a [mu y[duru (Asaase no mu nnuro [w] b]t] mu, [mo no ne nea [keka ho.)	1	2	3	4	5	6	7

}FA C: Nney[e[a [si pira ano kwan:

}fa yi de[, mesr[s[kyer[mp[n dodo] a woy[nne[ma a [didi so a mabob] so w] nnaka no mu no. Fa mma 1-7 no kyer[: **1 (Koraa)** **2 ({ntaa nsi)** **3 (Mmer[kakraa bi ntam)** **4 ({taa si)** **5 (Abere biara)**

	Nne[ma a y[reka ho as[m no	Susudua				
1.	Mehy[da y[nne[ma bia [de bamm] b[ba adwuma mu h] (S[ebia mereyiyi nne[ma bi a [b[tumi de akwanhyia aba adwuma mu h])	1	2	3	4	5
2.	S[m'af[fo] y[adwuma w] tebea bi a [mu y[hu a, meboa w]n.	1	2	3	4	5
3.	Metaa kyer[kyer[kwan a y[b[fa so na bamm] ho ns[m atu mp]n	1	2	3	4	5
4.	S[mehunu biribi a [ntumi mfa bamm] ho ns[m mma a mehw[ho as[m ka	1	2	3	4	5
5.	Mpontuo a [w] bamm] ho nhyehy[e[anaas[y[de redi dwuma mu no, meka ho p]tee anaa kwan bi so	1	2	3	4	5
6.	Kwan ahodo] a y[fa so y[adwuma no, mefa ho tu anam]n de tu ho mp]n, s[medwene s[[b[ma bamm] aba adwuma no mu a	1	2	3	4	5
7.	S[meredi dwuma a, mehw[s[bamm] mu w] soro	1	2	3	4	5
8.	Meb] me ho mm]den biara s[m[tu bamm] mu mp]n w] adwuma no mu	1	2	3	4	5
9.	Mey[adwuma w] bamm] mu	1	2	3	4	5
10.	Merey[m'adwuma a mede bamm] kwan sononko so na [y[	1	2	3	4	5
11.	Metaa p[ ]haw ahodo] anoyie w] kwan a [boa te akwanhyia ahodo] ano	1	2	3	4	5
12.	Mede mfidie ne nne[ma a [hia na [di me dwuma	1	2	3	4	5

}FA D: Gyedie:

Nea [didi so] yi y[ns[m a [fa nkitahodie a [da y[n ne Nyame bi ntam. Mesr[, kyer[**mp[n dodo]** a woy[nne[ma a y[abob] so w] ha nona fa mma 1-7 susu.

1 (Koraa) *2 (Mmer[kakraa bi w] afe mu)* *3 (1-3, bosome biara mu)* *4 (Bere koro w] nnaw]twe biara mu)* *5 (Boro baako w] nnaw]twe mu)* *6 (Da biara baako)* *7 (Mp[n bebree da biara)*

Ns[mmisa no	Susudua						
1. Mp[n dodo] s[n na wodwene nne[ma a [fa gyedie ho?	1	2	3	4	5	6	7
2. S[n na wogye tom s[Nyame anaa honhom bi w] h]?	1	2	3	4	5	6	7
3. Mp[n dodo] s[n na [y[a woka [som a [fa gyedie ho ho?	1	2	3	4	5	6	7
4. Mp[n dodo] s[n na wob] mpae[?	1	2	3	4	5	6	7
5. Mp[n dodo] s[n na [y[a wonya atenka bi s[Nyame anaa honhom bi adi wo akagyinam?	1	2	3	4	5	6	7
6. S[n na wo k]n d] s[wob[sua nne[ma a [fa gyedie ho?	1	2	3	4	5	6	7
7. S[n na wogye nkwa a [w] owuo akyi no di? (S[[bia sunsum no wu a]nwu, nyane a awufo] b[nyane anaas[w]b[wu na w]asan aba nkwa mu mu bio.)	1	2	3	4	5	6	7
8. Mfaso] b[n na [w] so] s[y[de y[n ho b[ka gyedie mu somho?	1	2	3	4	5	6	7
9. S[n na ankorankor[ho hia ma wo?	1	2	3	4	5	6	7
10. Mp[n dodo] s[n na wonya atenka bi s[Nyame anaa honhom bi p[s[ ]ka anaas[ ]da biribi adi kyer[wo?	1	2	3	4	5	6	7
11. Mp[n dodo] s[n na wofa kasafidie, t[l[fihyen, intan[t, dawurub] nkrataa anaa nwoma so nya ns[m anaa anoyie a [fa gyedie mu ns[mmisa ho?	1	2	3	4	5	6	7
12. Wo nsusuii[mu no, wogye di s[[bia na tumi bi a [ky[n so bi w] h]?	1	2	3	4	5	6	7
13. Mfaso] b[n na [w] so s[wo ne nnipakuo bi a [w] gyedie bi mu b[nya nsaw]so]?	1	2	3	4	5	6	7
14. Mp[n dodo] s[n na nne[ma a [sisi da biara mu a [hy[nkuran no tumi ma wo b] mpae[a w'ani nna?	1	2	3	4	5	6	7
15. Mp[n dodo] s[n na wotumi nya atenka bi s[Nyame anaas[honhom bi b[n wo?	1	2	3	4	5	6	7
16. Mp[n dodo] s[n na wotumi gye ber[de y[dinn dwendwen?	1	2	3	4	5	6	7
17. Ber[a biribiara ay[dinn na wode dwendwen no, mfaso] b[n na [w] so?	1	2	3	4	5	6	7
18. Mp[n dodo] s[n na wonya atenka bi s[Nyame anaas[honhom bi de ne nsa aka wo?	1	2	3	4	5	6	7
19. Mp[n dodo] s[n na s[da biara mu nne[ma a [hy[nkuran no ba w'akwan mu a, wotumi wura honhom mu?	1	2	3	4	5	6	7

}FA E: Nsakyer[e[ahodo] a [de bamm] ba.

W]]fa yi mu no, mesr[s[kyer[mp[n dodo] a nne[ma a y[abob] so a [fa kwan a y[fa so kora bamm] ho ns[m w] adwuma mu h] no te[fa. Fa mma 1-5 susu.

1 (Koraa) 2 ({ntaa nsi) 3 ({t] da bi a) 4 (Mp[n pii) 5(Bere biara)

San nea y[de resusu yi mu baako p[ma as[mmisa biara. {wom s[ns[mmisa no bi b[sesa de[nanso mesr[wo yi [mu biara ano.

1. Adwumay[fo] apomden ne w]n bamm] y[y[n as[nhia w] ha	1	2	3	4	5
2. Mpanimfo] (Adwuma no nnaanofo] no) hunu adwumay[fo] no honam fam apomden s[[ho hiate s[adwuma no a w]y[no ankasa	1	2	3	4	5
3. Mpanimfo] tu w]n ho ky[de w]n ho gye nne[ma a [boa si nea [b[tumi de pira biara aba no kwan mu.	1	2	3	4	5
4. Nipa p]tee a]hw[me dwumadie so no tu anam]n nt[nt[m de si]haw biara a [ha adwumay[fo] bamm] anaa w]n apomden ho kwan.	1	2	3	4	5
5. Nipa p]tee a]hw[me dwumadie so no hunu adwumay[fo] no ho bamm] s[[ho hia pa ara.	1	2	3	4	5
6. S[biribi a [fa adwumay[fo] bamm] anaa w]n honam fam apomden ho ba a, nipa p]tee a]hw[me dwumadie so no tu ho anam]n papa.	1	2	3	4	5
7. Y[susu akwan a y[fa so si honam fam akwanhyia ne nea [de ba ho.	1	2	3	4	5
8. Y[n afuom no, afofor] honam fam bamm] ho k]k]b] y[y[n ahiade[.	1	2	3	4	5
9. Y[kaekae y[n ho de fa mmara ne nhyehy[e[a [fa honam fam bamm] ho.	1	2	3	4	5
10. Nkitahodie papa w] ha de fa honam fam bamm] ns[m ho a [nya me so nsunsuanso].	1	2	3	4	5
11. Y[ma menya ns[m a [fa adwuma no nkank] ho abere biara.	1	2	3	4	5
12. Y[tie me haw, me nsusui[ne m'adwenkyer[a [fa bamm] ho ns[m ho no.	1	2	3	4	5
13. Adwumay[fo], akuakuo nnaanofo], mpanimfo] a [y[nhyehy[e[ne bamm] ne apomden so hw[fo] nya kwan k] dwumadie a y[de p[nimde[.	1	2	3	4	5
14. Y[hy[adwumay[fo] nkuran s[w]n mfa w]n ho nhy[apomden ne bamm] ns[m mu w] ha.	1	2	3	4	5
15. Kwan a y[de si honam fam pira ano no fa adwumay[fo] ahodo] a [w] ha no nyina ara ho.	1	2	3	4	5

16. Mehy[[adwuma no ase no, y[maa me adwuma no mu ntetee[	1	2	3	4	5
17. Y[maa me ntetee[w] kwan a m[fa so ay[m'adwuma no a bamm] w] mu	1	2	3	4	5
18. Y[n panin pa ara ne nea]hw[y[n adwuma so no hw[s[y[b[y[y[n adwuma no bamm] mu.	1	2	3	4	5
19. Abere biara y[ma y[hunu bamm] ho ns[ns[m.	1	2	3	4	5
20. Y[w] kwan a y[fa so b] bamm] ho amanne[(nne[ma a [sisi ne ns[ns[m ho)	1	2	3	4	5
21. Bere biara y[hy[y[n nkuran s[y[mm] bamm] ho ns[m ho amanne[	1	2	3	4	5
22. S[mepira w] adwuma mu a, menim nipa a [w] s[mebisa ne nky[n biribi.	1	2	3	4	5
23. {s[s[y[n nyina ara b] pira biara a y[b[pira ho amanne[nt[m pa ara	1	2	3	4	5
24. Y[kyer[kyer[y[n nne[ma a [fata ne ntetee[a [fata s[nea y[b[si ab] pira ho bra	1	2	3	4	5
25. Nnwuma a [s[s[y[y[no d]]so na [mu y[den a, y[ma y[n kwan ma y[tu anam]n a [b[tumi de nsuansuanso] biara aba.	1	2	3	4	5
26. S[mpaninfo] a w]hw[y[ntotoe[no reb] apr] na w]hunu bamm] ho sint] biara a w]hw[de nne[ma toto yie.	1	2	3	4	5
27. S[mpaninfo] a w]hw[y[ntotoe[no hunu biribi a [b[tumi de akwanhyia aba a w]nnyi w]n ani.	1	2	3	4	5
28. Adwumay[fo] a [w] ha no hunu nne[ma a [b[tumi de akwanhyia aba no s[[y[ade[a y[ntumi nsi ano kwan.	1	2	3	4	5
29. Adwumay[fo] a [w] ha no hunu pira nketenkete s[[y[ade[a [ka w]n daadaa adwuma ho nti [ny[hwee.	1	2	3	4	5
30. S[anam]ntuo bi w] h] a [y[hu nanso [mfa pira mma a adwumay[fo] a [w] ha no mmu no hwee.	1	2	3	4	5
31. S[[b[y[na adwumay[fo] a [w] ha no b[tumi awie w]n adwuma nt[m no ntiw]bu w]n ani gu nhyehy[e[a [b[tumi de bamm] abr[w]n no so.	1	2	3	4	5
32. S[nnwuma a [s[s[y[y[no d]]so na [mu y[den a, adwuamy[fo] no ntu anam]n biara a [b[tumi de akwanhyia aba.	1	2	3	4	5
33. Adwuamy[fo] a [w] ha no hunu no s[y[n adwuma yin y[ahufo] adwuma.	1	2	3	4	5
34. Adwumay[fo] a [w] ha gye tom tu anam]n a[b[tumi de akwanhyia aba w] adwuma mu.	1	2	3	4	5

}FA F: Nney[e[a bamm] w] mu.

W] bosome du-mmienu a atwam ntam mu no, mp[n dod] s[n na nea [didi so yi ato wo w] adwuma mu?

1 (Koraa)   2 ({ntaa nsi)   3 ({t] da bi a)   4 (Mp[n pii)   5(Bere biara)

1. Tipae[anaa anisobiri anaa horae[	1	2	3	4	5
2. Bere biara na wabr[	1	2	3	4	5
3. Honam ani nsawa/ahohyehye[	1	2	3	4	5
4. Nnuro a y[de kum mmoa anaa nnuru b]ne anaa awuduro hini wo	1	2	3	4	5
5. Honam no hy[nsuo	1	2	3	4	5
6. Wo honam no twetwe wo anaa [tutu wo (S[[bia w'akyi y[wo ya)	1	2	3	4	5
7. Wo bo y[wo ya	1	2	3	4	5
8. Ade[twa wo anaa [pira wo (S[[bia krant[anaa langalanga)	1	2	3	4	5
9. Nkas[e ne dunsin pira wo	1	2	3	4	5
10. }w] ka wo	1	2	3	4	5
11. Nyanyankyer[w] wo	1	2	3	4	5
12. {y[a bere tiawa bi mu no wonted as[m	1	2	3	4	5
13. Apor]por]	1	2	3	4	5
14. Nne[ma tot] w'ani so	1	2	3	4	5
15. Wopira w'ani	1	2	3	4	5
16. Menem kuro	1	2	3	4	5
17. Mmoa pirapira wo	1	2	3	4	5
18. Nwea, mfuturo ne at[ky[a [tumi de apomden ho haw ba	1	2	3	4	5
19. Anyinam tumi fa wo mu	1	2	3	4	5
20. Home[ho haw (S[[bia wobr[ansa na woahome)	1	2	3	4	5
21. W'ap] so baabi ahwan/dompe abu	1	2	3	4	5
22. Atiridii	1	2	3	4	5
23. Adwuma no ho adwendwen nti wontumi nna	1	2	3	4	5
24. W'adwen ntumi nk] nea [s[s[woy[w] adwuma no ho so	1	2	3	4	5
25. Wonya atenka s[wobr[wo ho	1	2	3	4	5
26. Wohunu no s[wontumi nsi agyinae[biara	1	2	3	4	5
27. {y[a menya me mu awer[hy[mu	1	2	3	4	5
28. M'ani ntumi nnye me daadaa dwumadie no ho	1	2	3	4	5
29. Nne[ma bi a ano y[den bi te s[mframa b]ne ne ntutuo baa m'akwan mu	1	2	3	4	5
30. Merekita na merepagya na meresoa nne[ma no, mebr[[me ho dodo	1	2	3	4	5
31. {paa me anaa mepatrii[w] faako h] ara	1	2	3	4	5

32. Mefiri sorosoro b[hwee ase	1	2	3	4	5
33. Afidie bi a [rek] b]] me	1	2	3	4	5
34. Nnuro bi a ano y[den b] guu m'ani so anaa me hwenem	1	2	3	4	5
35. Nne[ma bi a [nam wiem anaa [firi soro reb[b] fam b]] me	1	2	3	4	5
36. Biribi a [gyina h] anaa [tim h] b]] me	1	2	3	4	5
37. Biribi a na [rehwe ase, na [rebu agum anaa na [redane sum me afidie	1	2	3	4	5
38. Me ne afidie bi a [rek] dii ahyiamu	1	2	3	4	5
39. Me ntaade[kaae[w] biribi mu (S[[bia afidie a y[de gye anyinam mu tumi)	1	2	3	4	5
40. Nne[ma ahodo] a [keka ho a y[mm]] so (Mesr[wo kyer[m)					

APPENDIX G: Final Measurement Models used to Test the Structural Model

Appendix G (i) Religiosity final model

	Items	**Loadings**	**CA**	**CR**	**AVE**
	Intellectual dimension		**.479**	**.733**	**.489**
C1	How often do you think about religious issues	0.834			
C6	How interested are you in learning more about religious topics?	0.726			
C11	How often do you keep yourself informed about religious questions through radio, television, internet, newspapers or books?	0..494			
	Ideological dimension		**.783**	**.873**	**.698**
C2	To what extent do you believe that God or something divine exists?	0.883			
C7	To what extent do you believe in an afterlife (e.g. immortality of the soul, resurrection of the dead or reincarnation)?	0.781			
C12	In your opinion, how probable is it that a higher power really exists?	0.839			
	Public practice		**.641**	**.806**	**.590**
C3	How often do you take part in religious services?	0.833			
C8	How important is to take part in religious services?	0.891			
C13	How important is it for you to be connected to a	0.533			

	religious community?				
	Private practice		**.840**	**.885**	**.608**
C4	How often do you pray?	0.731			
C9	How important is personal prayer for you?	0.741			
C14	How often do you pray spontaneously when inspired by daily situations?	0.801			
C17	How important is meditation to you?	0.848			
C19	How often do you try to connect to the divine spontaneously when inspired by daily situations?	0.771			
	Religious Experience		**.867**	**.919**	**.790**
C10	How often do you experience situations in which you have the feeling that God or something divine wants to communicate or reveal something to you?	0.869			
C18	How often do you experience situations in which you have the feeling that you are touched by a divine power?	0.902			
C15	How often do you experience situations in which you have the feeling that God or something divine is present?	0.896			

Appendix G (ii) Safety behaviour final model

Safety participation: CA = .880 CR = .918 AVE = .757	
B1	I voluntarily carry out tasks or activities that help to improve safety in this farm 0.784
B3	I often make suggestions to improve how safety is handled around here 0.911
B4	If I see something unsafe, I go out of my way to address it 0.906
B5	I am directly and indirectly involved in improving safety policy and practices 0.830
Safety compliance: CA = .839 CR = .903 AVE = .757	
B10	I use the correct safety procedures for carrying out my job 0.858
B11	I often try to solve problems in ways that reduce safety risks 0.884
B12	I use all the necessary safety equipment to do my job 0.868

Appendix G (iii) Safety culture final model

Management safety priority CA = .778 CR = .871 AVE = .693	
1. Health and safety of workers is a priority here	0.791
2. Management (Executives) considers workers physical health to be as important as productivity	0.888
3. Management shows support for physical injury prevention through involvement and commitment to deal with safety issues	0.816
Management Safety Commitment CA = .826 CR = .896 AVE = .742	
4. My direct supervisor acts quickly to correct problems/issues that affect workers' safety or physical health	0.864
5. My direct supervisor clearly considers the safety of workers to be of great importance	0.889
6. My direct supervisor acts decisively when a concern of workers' safety or physical health status is raised	0.830
Group safety Norms CA = .891 CR = .932 AVE = .820	
7. We discuss physical safety hazards and incident prevention here	0.915
8. In our farm, we care about the physical safety awareness of other workers	0.894
9. We remind each other of the rules and regulations regarding physical safety	0.906
Safety communication CA = .674 CR = .822 AVE = .608	
10. There is good communication here about physical safety issues which affect me	0.812
11. Information about workplace physical well-being is always brought to my attention here	0.806
12. My complaints, remarks and contributions to resolving safety concerns here are listened to	0.716
Safety participation and involvement CA = .771 CR = .867 AVE = .685	
13. Participation and consultation in health and safety issues occur with workers, cooperatives executives, scheme managers and health and safety coordinators	0.839
14. Workers are encouraged to become involved in health and safety matters here	0.807
15. The prevention of physical injury involves all levels of the workers here	0.837
Safety reporting CA = .899 CR = .925 AVE = .714	
16. I was given induction training when I started working here	0.813
17. Our manager/supervisor makes sure we do the work safely	0.876
18. We are always made aware of safety issues	0.841
Safety training CA = .797 CR = .881 AVE = .711	
19 We have safety reporting procedures (for incidents and issues)	0.746
20. We are always encouraged to report safety incidents	0.850
21. I know who to ask about what to do, if I get injured at work	0.869
22. We all have to report all injuries at work straight away	0.885
23. We are given necessary information and training about injury management	0.867

Appendix G (iv) Psychological symptoms final model

Psychological symptoms	Loadings	CA	CR	AVE

F24 Been unable to concentrate on work related tasks.	0.814	.875	.910	.668
F25 Felt constantly under strain	0.787			
F26 Felt incapable of making decisions.	0.799			
F27 Been losing confidence in myself	0.779			
F28 Been unable to enjoy my normal day-to-day activities.	0.767			

Formative models evaluations

Appendix G (v) Physical symptoms dimension of Safety performance

Path	**Items**	**Weights**	**Std dev**	**t-Stats**	**p-value**	**VIF**
F1 -> Physical	Headache or dizziness or fever	-0.077	0.065	1.184	0.237	1.635
F2 -> Physical	Persistent fatigue	0.389	0.080	4.871	0.000	2.059
F3 -> Physical	Skin rash/burn	0.083	0.073	1.137	0.256	1.698
F4 -> Physical	Pesticide or chemical suffocation or poisonings	0.195	0.083	2.342	0.020	1.893
F5 -> Physical	Blisters	0.060	0.067	0.896	0.371	1.638
F6 -> Physical	Muscle strain or sprain (e.g. back pain)	-0.111	0.053	2.079	0.038	1.286
F7 -> Physical	Chest pain	-0.018	0.066	0.277	0.782	1.577

F8 -> Physical	Cut or puncture (e.g. cutlass or sickle wound)	-0.220	0.070	3.148	0.002	1.809
F9 -> Physical	Thorns or stump injury	0.514	0.061	8.485	0.000	1.791
F10 -> Physical	Snake bite	-0.068	0.073	0.927	0.354	2.127
F11 -> Physical	Scorpion sting	-0.016	0.070	0.227	0.821	2.190
F12 -> Physical	Temporary Loss of hearing	0.095	0.063	1.511	0.131	1.425
F13 -> Physical	Foot rot	0.162	0.061	2.674	0.008	1.385
F14 -> Physical	Fallen object on eye	0.199	0.066	3.023	0.003	1.812
F15 -> Physical	Eye injury	-0.039	0.071	0.546	0.586	1.831
F16 -> Physical	Sore throat	0.021	0.067	0.309	0.757	1.473
F18 -> Physical	Health problems resulting from grain, dust, or mould	0.012	0.067	0.174	0.862	1.736
F20 -> Physical	Respiratory injuries (e.g. difficulty breathing)	-0.273	0.061	4.484	0.000	1.420
F21 -> Physical	Dislocation/fracture bone	0.225	0.066	3.394	0.001	1.528
F22 -> Physical	Malaria	0.133	0.062	2.155	0.032	1.235

Appendix G (vi) Accidents dimension of safety performance

Path	Items	Weights	Std	t-stats	p-value	VIF
F29 -> Accident	Was exposed to chemicals such as gases and fumes.	0.188	0.070	2.673	0.008	1.464
F30 -> Accident	Over exerted myself while handling, lifting or carrying.	0.387	0.063	6.137	0.000	1.547
F31 -> Accident	Slipped, tripped or fell on the same level.	0.151	0.069	2.190	0.029	1.354
F32 -> Accident	Fell from height	0.047	0.063	0.755	0.451	1.597
F33 -> Accident	Was struck by a moving vehicle	0.093	0.063	1.474	0.141	1.558
F34 -> Accident	Chemical blown into eye or nose	0.586	0.069	8.439	0.000	1.512
F35 -> Accident	Was struck by flying/falling object(s)	-0.086	0.085	1.012	0.312	1.539

F36 -> Accident	Struck against something fixed or stationary	0.023	0.076	0.309	0.757	1.733
F37 -> Accident	Was trapped by something collapsing, caving in or overturning	-0.013	0.080	0.168	0.867	1.673

Appendix G (vii) Hazards exposure model

Paths	**Indicators**	**Weight**	**Sdv**	**t-stats**	**p-val**	**VIF**
Chemical hazards						
HZ1 ->Chem	Application of agro-chemicals	-0.318	0.293	1.083	0.279	1.582
HZ15 ->Chem	Burning of farm land	0.727	0.370	1.969	0.050	2.142
Physical hazards						
HZ2 ->Phys	Use of catapults to scare birds	0.650	0.075	8.669	0.000	1.887
HZ3 ->Phys	Dust from winnowing of rice	0.483	0.103	4.668	0.000	1.892
HZ4 ->Phys	Exposure to sun	0.120	0.076	1.564	0.119	2.261
HZ5 ->Phys	Prolong working hours	-0.140	0.099	1.408	0.160	2.238

HZ6 ->Phys	Working in water-logged areas	-0.149	0.100	1.479	0.140	1.446
HZ8 ->Phys	Screaming to scare birds	0.472	0.089	5.319	0.000	2.479
HZ9 ->Phys	Presence of snail shells in the soil	-0.103	0.093	1.108	0.268	2.103
HZ10 ->Phys	Presence of tree stumps and thorns	0.208	0.096	2.169	0.031	2.079
HZ11 ->Phys	Narrow bonds to scare bird	0.297	0.125	2.367	0.018	1.973
HZ17 ->Phys	Walking on slippery bonds	0.465	0.097	4.781	0.000	2.006
Ergonomic hazards						
HZ12 -> Ergo	Bending or awkward posture	0.027	0.198	0.137	0.891	1.319
HZ13 -> Ergo	Use of sharp farm implements, tools	-0.301	0.184	1.642	0.101	1.580
HZ14 -> Ergo	Use of farm machines (e.g. threshers)	0.309	0.167	1.852	0.065	2.228
HZ19 -> Ergo	Lifting of weight (e.g. bags of rice)	0.987	0.095	10.398	0.000	1.698
Biological hazards						
HZ16 -> Bio	Mosquito and other insect bites	0.023	0.119	0.196	0.845	1.462
HZ7 -> Bio	Exposure to animals, insect, snakes	-0.704	0.691	1.019	0.309	1.759
HZ18 -> Bio	Rice grass exposure	0.710	0.684	1.038	0.300	1.657

Appendix H: MANOVA Results

Appendix H (i): Sex by level of education mean score of latent variables

Dependent Variable	Sex	Level of education	Mean	Std. Error	95% Confidence Interval	
					Lower Bound	Upper Bound
Safety performance	Male	No formal education	58.587	2.004	54.649	62.526
		Basic	68.045	1.192	65.702	70.388
		Secondary	66.256	1.757	62.804	69.708
		Tertiary	73.292	3.247	66.910	79.673
	Female	No formal education	59.580	2.250	55.159	64.001
		Basic	68.109	1.989	64.202	72.017
		Secondary	63.500	6.495	50.737	76.263
		Tertiary	50.500	11.249	28.395	72.605
Safety culture	Male	No formal education	84.587	2.332	80.006	89.169
		Basic	75.949	1.387	73.224	78.675

		Secondary	73.171	2.044	69.155	77.187
		Tertiary	63.750 7		56.327	71.173
	Female	No formal education	85.880	2.617	80.737	91.023
		Basic	72.500	2.313	67.954	77.046
		Secondary	81.667	7.555	66.820	96.513
		Tertiary	79.500	13.086	53.785	105.215
Religiosity	Male	No formal education	84.857	2.433	80.076	89.638
		Basic	94.185	1.447	91.341	97.030
		Secondary	93.659	2.133	89.468	97.849
		Tertiary	101.708	3.942	93.962	109.455
	Female	No formal education	96.520	2.731	91.153	101.887
		Basic	89.813	2.414	85.069	94.556
		Secondary	94.667	7.884	79.174	110.159
		Tertiary	116.000	13.655	89.166	142.834
Safety behaviour	Male	No formal education	24.635	.734	23.192	26.078
		Basic	25.798	.437	24.939	26.656
		Secondary	25.463	.644	24.199	26.728
		Tertiary	27.000	1.190	24.662	29.338
	Female	No formal education	25.180	.824	23.560	26.800
		Basic	24.766	.729	23.334	26.197
		Secondary	28.167	2.380	23.491	32.843
		Tertiary	28.500	4.122	20.401	36.599

Appendix H (ii) Multivariate test results

Effect		Value	F	Hypo. Df	Error df	Sig.	Partial Eta Squared	Obs. Power[d]
Intercept	Pillai's Trace	.914	1222.332[b]	4.000	458.000	.000	.914	1.000
	Wilks' Lambda	.086	1222.332[b]	4.000	458.000	.000	.914	1.000
	Hotelling's Trace	10.675	1222.332[b]	4.000	458.000	.000	.914	1.000
	Roy's Largest Root	10.675	1222.332[b]	4.000	458.000	.000	.914	1.000
Sex	Pillai's Trace	.012	1.343[b]	4.000	458.000	.253	.012	.420
	Wilks' Lambda	.988	1.343[b]	4.000	458.000	.253	.012	.420
	Hotelling's Trace	.012	1.343[b]	4.000	458.000	.253	.012	.420
	Roy's Largest Root	.012	1.343[b]	4.000	458.000	.253	.012	.420
Educ	Pillai's Trace	.133	5.314	12.000	1380.000	.000	.044	1.000
	Wilks' Lambda	.870	5.469	12.000	1212.046	.000	.045	1.000
	Hotelling's Trace	.147	5.597	12.000	1370.000	.000	.047	1.000

	Roy's Largest Root	.127	14.563[c]	4.000	460.000	.000	.112	1.000
Sex * Educ	Pillai's Trace	.042	1.649	12.000	1380.000	.073	.014	.858
	Wilks' Lambda	.958	1.650	12.000	1212.046	.072	.014	.799
	Hotelling's Trace	.043	1.650	12.000	1370.000	.072	.014	.858
	Roy's Largest Root	.029	3.369[c]	4.000	460.000	.010	.028	.847

Appendix H(iii) Test of between-subjects effects

Source	Dependent Variable	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared	Obs Power[e]
Corrected Model	Safety performance	8309.899[a]	7	1187.128	4.691	.000	.066	.995
	Safety culture	14571.70[b]	7	2081.671	6.079	.000	.084	1.000
	Religiosity	8627.185[c]	7	1232.455	3.305	.002	.048	.959
	Safety behaviour	217.147[d]	7	31.021	.913	.496	.014	.397
Intercept	Safety performance	331682.8	1	331682.83	1310.61	.000	.740	1.000
	Safety culture	489547.7	1	489547.77	1429.49	.000	.756	1.000
	Religiosity	765222.7	1	765222.70	2051.98	.000	.817	1.000
	Safety behaviour	56444.51	1	56444.51	1661.41	.000	.783	1.000

Sex	Safety performance	771.292	1	771.29	3.048	.082	.007	.414
	Safety culture	627.449	1	627.44	1.832	.177	.004	.272
	Religiosity	656.209	1	656.20	1.760	.185	.004	.263
	Safety behaviour	17.759	1	17.75	.523	.470	.001	.111
Educ	Safety performance	5723.424	3	1907.80	7.538	.000	.047	.987
	Safety culture	8822.124	3	2940.70	8.587	.000	.053	.994
	Religiosity	2391.943	3	797.31	2.138	.095	.014	.545
	Safety behaviour	112.834	3	37.61	1.107	.346	.007	.299
Sex * Educ	Safety performance	1020.433	3	340.14	1.344	.259	.009	.358
	Safety culture	1438.158	3	479.38	1.400	.242	.009	.372
	Religiosity	4796.900	3	1598.96	4.288	.005	.027	.864
	Safety behaviour	100.520	3	33.50	.986	.399	.006	.269
Error	Safety performance	116667.905	461	253.07				
	Safety culture	157875.038	461	342.46				
	Religiosity	171915.557	461	372.91				
	Safety behaviour	15661.910	461	33.97				
Total	Safety performance	2149635.000	469					
	Safety culture	2929789.000	469					
	Religiosity	4234878.000	469					
	Safety behaviour	320362.000	469					
Corrected Total	Safety performance	124977.804	468					
	Safety culture	172446.738	468					
	Religiosity	180542.742	468					
	Safety behaviour	15879.058	468					

Appendix H (iv): Multiple comparisons table of educational level effects

Dunnett T3						
Dependent Variable	(I) What is your highest level of	(J) What is your highest level of	Mean Difference	Std. Error	Sig.	95% Confidence Interval

	education?	education?	(I-J)			Lower Bound	Upper Bound
Safety performance	No formal education	Basic (Primary/ JSS/ Middle) School	-9.0354*	1.74033	.000	-13.6510	-4.4199
		Secondary (SSSCE/ WASSE)	-7.0416*	2.18437	.009	-12.8495	-1.2338
		Tertiary (HND/First Degree equivalent)	-12.5119*	3.77726	.013	-23.0389	-1.9850
	Basic (Primary/ JSS/ Middle) School	No formal education	9.0354*	1.74033	.000	4.4199	13.6510
		Secondary (SSSCE/ WASSE)	1.9938	1.97954	.895	-3.2774	7.2650
		Tertiary (HND/First Degree equivalent)	-3.4765	3.66262	.914	-13.7590	6.8060
	Secondary (SSSCE/ WASSE)	No formal education	7.0416*	2.18437	.009	1.2338	12.8495
		Basic (Primary/ JSS/ Middle) School	-1.9938	1.97954	.895	-7.2650	3.2774
		Tertiary (HND/First Degree equivalent)	-5.4703	3.89327	.652	-16.2543	5.3137
	Tertiary (HND/First Degree equivalent)	No formal education	12.5119*	3.77726	.013	1.9850	23.0389
		Basic (Primary/ JSS/ Middle) School	3.4765	3.66262	.914	-6.8060	13.7590
		Secondary (SSSCE/ WASSE)	5.4703	3.89327	.652	-5.3137	16.2543
Safety culture	No formal education	Basic (Primary/ JSS/ Middle) School	10.1221*	1.94170	.000	4.9786	15.2656
		Secondary (SSSCE/ WASSE)	11.4093*	2.33947	.000	5.1872	17.6314
		Tertiary (HND/First Degree equivalent)	20.1978*	4.06525	.000	8.8547	31.5408
	Basic (Primary/ JSS/ Middle) School	No formal education	-10.1221*	1.94170	.000	-15.2656	-4.9786
		Secondary (SSSCE/ WASSE)	1.2872	2.24701	.993	-4.6880	7.2624
		Tertiary (HND/First Degree equivalent)	10.0757	4.01276	.097	-1.1541	21.3054
	Secondary (SSSCE/ WASSE)	No formal education	-11.4093*	2.33947	.000	-17.6314	-5.1872
		Basic (Primary/ JSS/ Middle) School	-1.2872	2.24701	.993	-7.2624	4.6880
		Tertiary (HND/First Degree equivalent)	8.7885	4.21962	.230	-2.8956	20.4725

	Tertiary (HND/First Degree equivalent)	No formal education	-20.1978*	4.06525	.000	-31.5408	-8.8547
		Basic (Primary/ JSS/ Middle) School	-10.0757	4.01276	.097	-21.3054	1.1541
		Secondary (SSSCE/ WASSE)	-8.7885	4.21962	.230	-20.4725	2.8956

Based on observed means.
The error term is Mean Square (Error) = 342.674.

*. The mean difference is significant at the .05 level.