THE INFLUENCE OF SAFETY CULTURE FACTORS ON SAFETY BEHAVIOR OF HEALTHCARE PROFESSIONALS IN THE UAE HEALTHCARE SECTOR: THE MODERATING ROLE OF SAFETY STRESSORS

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Abstract

Safety culture is a subset of organizational culture. Organizations clarify their values about the safety and health of their workforce through policies, procedures, and practices, and they are also shown in the norms and values of the organization as a whole. Safety culture is related to the behavior of employees on safety issues. The aim of this study was to determine the influence of safety culture factors (safety climate, safety management practices, safety attitude, safety knowledge and safety motivation) on safety behavior and how this relationship is moderated by safety stressors. The unit of analysis was individual and the study involved healthcare professionals in Abu Dhabi, including physicians, nurses and allied health professionals. In total, 1,000 questionnaires were distributed online and 800 were returned. Only 770 questionnaires were used for further analysis with structural equation modeling. The results suggest that safety culture factors significantly influenced safety behavior. However, no moderating role was found for safety stressors. The multi-sample analysis using invariant measurement confirmed that higher and lower levels of safety stressors did not affect the relations between safety culture factors and safety behavior of healthcare professionals in the UAE healthcare sector. This result provides some interesting implications for healthcare professionals. The study suggests that safety attitudes may regulate the impact on safety behavior of perceptions of management values about safety, and policies and procedures relating to safety in multicultural environments. It is likely that healthcare professionals who experience a positive workplace safety climate will develop positive attitudes to safety that encourage safety behavior. The homogeneous characteristics of categories of healthcare professionals in the UAE may also offer a positive coping strategy for stress, and this may have caused the insignificant moderating effect of safety stressors on the relationship between safety climates, safety attitudes, and safety behaviors.

Keywords: *Safety culture, safety behavior, safety management practices, safety stressors, healthcare professional, United Arab Emirates*

List of Abbreviations

AMOS	:	Analysis of Moment Structure software package
CFA	:	Confirmatory factor analysis
CFI	:	Comparative Fit Index
Df	:	degree of freedom
EFA	:	Exploratory factor analysis
GFI	:	Goodness-of-Fit Index
RMSEA	:	Root Mean Square Error of Approximation
SA	:	Safety attitude
SB	:	Safety behavior
SC	:	Safety climate
SEM	:	Structural equation modeling
SK	:	Safety knowledge
SM	:	Safety motivation
UAE	:	United Arab Emirates

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CHAPTER 1: **INTRODUCTION**

1.1 Background

Safety culture is a part of the overall culture of an organization. However, the systems and processes used vary widely between organizations, and there is scope to improve the quality, consistency, and safety of the healthcare sector. In recent years, there has been a growing focus in the UAE and internationally on approaches to improve safety. This has led to greater recognition of the importance of the culture of organizations in this process. In the 1980s, there were catastrophic events in the nuclear power, offshore oil, and commercial aviation industries, and since then, safety culture has become an integral part of the occupational safety and health business lexicon (Elisabetta et al., 2019; Mecit Can Emre Simsekler, 2019; Cox & Flin, 1998; Fang & Wu, 2013).

Developing a strong safety culture in the healthcare sector is considered a way to improve safety behavior and prevent medical errors (Gheed Al Salem et al., 2019; Yiannis et al., 2019; Ammouri, Tailakh, Muliira, Geethakrishnan & Al Kindi, 2015; Jafree, Zakar, Zakar & Fiscker, 2017; Sammer, Lykens, Singh, Mains & Lackan, 2010). Recent research in healthcare sector has linked safety culture with improving patient safety and reducing any side effect. (van Nunen, Li, Reniers & Ponnet, 2018). The terms “safety culture” and “safety climate” are often used used interchangeably in the healthcare safety-related literature (Haji Omid et al., 2019; Mohr et al., 2018; Nævestad, 2017; Şimşekoğlu & Nordfjærn, 2017; Vinodkumar & Bhasi, 2009). Guldenmund (2007) described safety culture as a subset of organizational culture and noted that organizations clarify their values about safety and health of their workforce through their policies, procedures, and practices. Safety culture is a global phenomenon and encompasses the norms, values, and basic assumptions of whole organizations (Blegen, Pepper & Rosse, 2005). In healthcare, therefore, safety culture describes the way patient safety is thought about and implemented within the organization, and how this is supported by structures and processes (Dorata, et al., 2019; Gutberg & Berta, 2017; Nieva & Sorra, 2003). In healthcare, senior management faces huge problem with the cost of employees’ non-compliance to safety culture, which results in increasing patients’ morbidity and mortality (Trinchero, Farr-Wharton & Brunetto, 2019). Although patient safety is the utmost outcome for healthcare sector, however studies revealed that high chances exist of adverse events occuring in general healthcare environments. Establishment of a supportive safety culture in healthcare organziations is widely accepted to be among the highest priorities for reducing adverse events and improving patient safety as well as quality of care (AlFaqeeh et al., 2019). Further, safety culture can be used to proactively assess a healthcare organization’s effectiveness in identifying and remediating work-related hazards, and therefore reducing or preventing work-related ill-health and injury (Stephanie et al., 2019; Neal & Griffin, 2006; Tucker, Diekrager, Turner & Kelloway, 2014; Zadow, Dollard, Mclinton, Lawrence & Tuckey, 2017). Literature on safety culture in healthcare organizations main focusing on safety climate, teamwork climate, job satisfaction, perception of managemet and working conditions (Stephanie et al., 2019; Dollard et al., 2017). Yet key indicator of work safety, such as safety attitudes, safety behavior, and safety management system and practices are often overlooked in the literature. Since indicators of safety climate, teamwork climate, job satisfaction, perception of managemet and working conditions focus largely on staff perceptions about how safety is managed in their organization, researchers have claimed that it is easier to measure because it focuses on current staff perceptions of safety (Hong et al., 2019; Mohr et al., 2018; Bhattacharya, 2015; Colla, Bracken, Kinney & Weeks, 2005; El-Hosany & Sleem, 2015; Schwatka, Hecker & Goldenhar, 2016). An integrated safety culture model is therefore largely neglected in the literature in healthcare sector. As a result, safety culture cannot act objectively as an effective tool for risk management and have limited functions in safety measurement, diagnosis, intervention and improvement of safety performance in healthcare sector (Beus, Payne, Bergman & Arthur, 2010; Gutberg & Berta, 2017; Probst & Estrada, 2010). Thus, safety culture studies in healthcare organizations are still fragmented. As a result, safety culture cannot act objectively as an effective tool for risk management and have limited functions in safety measurement, diagnosis, intervention and improvement of safety performance.

1.2 Statement of the Problem

Safety culture have received attention and was widely discussed in various safety management studies and incident. Research argued that the concept of safety culture has been under developed for more than two decades (Singh & Verma, 2019; Kalteh et al., 2019; Nadhim, et al., 2018). Experts have developed a number of model frameworks associated with safety culture theory and relevant literature presents a widely-varying range of opinion regarding safety culture (e.g., Cooper, 2000; Flin et al., 2006; Mearns et al., 2003; Vinodkumar & Bhasi, 2011), however, these are mainly conducted and related to other high-risk indusries such as oil and gas, and construction. Dunstan, Cook, and Coyer (2019) argue while there is clear evidence that the assessment of safety culture in healthcare is available, the application of safety culture measures by healthcare professionals has so far been rather limited. Consistent with Flin, Burns, Yule and Robertson (2006) and Guo, Yiu and Gonzalez (2016) suggestion that safety culture factors in healthcare are limited. Jafree et al. (2017) noted that there had been scant research on safety culture in the health sector that reflected on employees' safety behaviour. Safety culture measures in healthcare sector are mainly on safety climate, teamwork climate, job satisfaction, perception of managemet and working conditions. As a result, there remains a need for further efforts to identify and investigate the important factor of safety culture model in healthcare sector (Alshammari et al., 2019; Cheng, Yen, & Lee, 2019). Research in other sectors such as oil and gas, construction and hospitality and tourism found that safety climate, safety motivation, safety knowledge, and safety behavior shaped the safety culture in these sectors (Hassan et al., 2019; Joan et al., 2019; Muchiri et al., 2019Murray et al., 2019; Sawhney & Cigularov 2019). Recent research by found safety management practices, and safety attitudes are among the important factors of safety culture (Durgun & Kaya 2019; Jin-Dong & Gwang-Hee, 2019). Recent study suggest the importance of safety stressors in the interaction between intention to behave and observable safety outcomes, especially in the context of high-risk industry such as healthcare sector (AlFaqeeh, Khalid, & Osman, 2019; Sampson et al., 2014; Wang et al., 2018).

Williamson, Feyer, Cairns and Biancotti (1997) suggested that it was important to consider the concept of safety climate because it cannot be defined as a simple summary of the perceptions of workers about their work environments. There are safety stereotypes shared by most workers, and these contribute little to distinguishing the particular safety culture in an organization (Hofmann & Mark, 2006; Marquardt, Gades & Robelski, 2012). As far as worker attitudes influence, or are influenced by, the prevailing climate in an organization, only some aspects of safety attitude and perception vary across individuals and organizations (Conchie & Donald, 2008; Nævestad, 2017). The existence of these apparently consistent that safety attitudes deserves further research attention.

In general, factors of safety knowledge and safety motivation have been extensively researched as part of the relationship between safety climate and safety behavior in other sector such as oil and gas industry and construction (Almazrouei et al., 2019; Rino et al., 2019; Guo et al., 2016; Neal & Griffin, 2006; Vinodkumar & Bhasi, 2010). However, there has been limited research on the relationships between safety knowledge and safety motivation on the relationship on safety management practices and safety attitude (Vinodkumar & Bhasi, 2009). There is very little literature on the role of safety stressors in the relationship between safety attitudes and safety behavior (AlFaqeeh, Khalid, & Osman, 2019; Sampson et al., 2014; Wang et al., 2018). Studies have tended to conclude that the influence of occupational stressors on the relationship between personal attributes and safety behavior is unclear and further research is still needed especially among healthcare professionals (Gilboa, Shirom, Fried & Cooper, 2008). There have been several suggestions to explain the mixed findings on the relationships between occupational stressors and job performance in other sectors but limited in healthcare sector. The relationships between safety uncertainty, safety obstacles and safety performance have yet to be examined, but empirical research on occupational stressors suggests connections are plausible. (Alzahrani, Jones, Rizwan & Abdel-Latif, 2019)

A better understanding of healthcare professional attitudes linked to safety climate and safety management practices is therefore important to measure how motivation and perceptions can be affected by working conditions that may induce healthcare professional stress reactions. The main purpose of measuring safety culture is to provide opportunities to improve safety behavior and enhance the safety performance of healthcare sector rather than focusing on patient safety culture. This empirical study therefore developed and validated an integrative model of safety culture in healthcare sector. This study investigated and explored the effects of healthcare sectors' safety climate and safety management practices, safety knowledge, safety attitude, safety motivation and safety stressors on safety behavior, as an integrated safety culture model in healthcare sector in Abu Dhabi.

1.3 Research Questions

In this study, safety culture dimensions include safety climate, safety management practices, safety knowledge, safety attitude, and safety motivation. The research background and problem statement suggested the following research questions should be considered:

(a) What are the safety culture factors that influence the safety behavior of healthcare professionals in the UAE healthcare sector?

(b) To what extent do safety culture factors affect the safety behavior of healthcare professionals in the UAE healthcare sector?

(c) Do high or low levels of safety stressors moderate the relationship between safety culture factors and safety behavior of heathcare professionals in the UAE healthcare sector?

1.4 Research Objective

The general objective of this study was to determine the influence of safety culture dimensions (safety climate, safety management practices, safety knowledge, safety attitude, and safety motivation) towards safety behavior among healthcare professionals in Abu Dhabi. The precise research objectives were:

(a) To investigate the effect of safety culture factors on safety behavior of heathcare professionals in the UAE healthcare sector;

(b) To determine the contribution of safety culture factors to safety behavior of heathcare professionals in the UAE healthcare sector; and

(c) To examine the moderating effect of low or high levels of safety stressors in the relationship between safety culture factors and safety behavior of healthcare professionals in the UAE healthcare sector.

Research Question	Research Objective
What are the safety culture factors that influence the safety behavior of healthcare professionals in the UAE healthcare sector?	To investigate the effect of safety culture factors on safety behavior of healthcare professionals in the UAE healthcare sector
To what extend do safety culture factors affect the safety behavior of healthcare professionals in the UAE healthcare sector?	To determine the contribution of safety culture factors on safety behavior of healthcare professionals in the UAE healthcare sector
Do high or low levels of safety stressors moderate the relationship between safety culture factors behavior of	To examine the moderating effect of low or high levels of safety stressors in the relationship between safety culture factors and safety behavior of

healthcare professionals in the UAE healthcare sector?	healthcare professionals in the UAE healthcare sector

1.5 Significance of the Study

1.5.1 Theoretical Contribution

This study offers a new perspective on the theoretical model of safety culture. Earlier studies have argued that it is not possible to predict safety behavior because of cultural and language differences across countries and industries (Saedi et al., 2019; Singh & Verma, 2018; Flin et al., 2006; Vinodkumar & Bhasi, 2009). This model will add value to the safety culture and safety climate literature because of limitations in the models built around safety culture and safety climate (Nævestad et al., 2018; Nævestad, 2017; Şimşekoğlu & Nordfjærn, 2017; Vinodkumar & Bhasi, 2009). This study fills a gap on the lack of consensus about safety culture factors in the healthcare sector (Greenwood, 2018; Bronkhorst, 2015; Flin et al., 2006; Guldenmund, 2007). This study provide a framework for the affect of safety cutlure factors on safety behavior on healthcare sector on arab countries. It higlights how safety culture of healtcare sector can be improved within the model.

1.5.2 Practical Contribution

The study offers an assessment of healthcare safety culture and safety performance, and how safety climate influences staff safety behavior. The study also clarifies the issue of the role of safety stressors in the relationship between safety attitudes and safety behavior. This study is relevant because it explores safety performance in the healthcare industry, helping to deliver patient safety. It also serves as a basis for further research on the factors defining safety culture rather than safety climate (Seung et al., 2019; Kuosmanen, et al., 2019; Gutberg & Berta, 2017; Nieva & Sorra, 2003). The findings of this study will contribute to knowledge about the current factors of safety culture in the healthcare sector. It is likely to inform administrators about the range of strategies available to improve patient safety while focusing of safety behavoior of healthcare professional and how safety stressors might aftect safety behaivor and resulted in affect on patient safety. This study will demonstrate the importance for senior management in healthcare sector in UAE in taking into consideration different safety cutlure factors when developing different policies and procedures for health and safety, or making any decisions either rewarding healthcare professionals who comply or punishing those who don’t comply.

1.6 Definitions of Key Terms

1.6.1 Safety Culture

Guldenmund (2007) described safety culture as a subset of organizational culture. Safety culture is broadly defined as a global phenomenon covering the norms, values, and assumptions across whole organizations (Blegen et al., 2005). The term describes the way safety aspects are considered and implemented within an organization, including the supporting structures and processes (Gutberg & Berta, 2017; Nieva & Sorra, 2003).

1.6.2 Safety Climate

Neal and Griffin (2006) desribed safety climate as the perceived value placed on safety in an organization at a particular point in time. These perceptions and beliefs may influence attitudes, values, opinions and actions of individuals within the organization and can change over time (Beus et al., 2010).

1.6.3 Safety Management Practices

Safety management practices are broadly the practical system developed in response to statutory requirements, and mainly focus on mandatory information related to workplace safety (Vinodkumar & Bhasi, 2010). Flin et al. (2006) suggested that developing and conceptualizing safety activities requires management commitment, communication about safety issues and, most importantly, employee involvement.

1.6.4 Safety Attitudes

Vinodkumar and Bhasi (2009) described safety attitudes as personal attributes that provide or affect individual responses towards safety situations.

Safey attitudes may influence individual choices of actions and response to safety circumstances in the workplace (Steyrer et al., 2012).

1.6.5 Safety Knowledge

Safety knowledge is facts and information available to individuals or organizations that help them to develop safety competences. Knowledge is acquired through experience or formal and informal education. Safety knowledge is vital for an organization to ensure safety decisions and tasks can be undertaken effectively, and with an understanding of the consequences (Neal & Griffin, 2006; Vinodkumar & Bhasi, 2010).

1.6.6 Safety Motivation

Safety motivation describes an individual's willingness to make an effort to enact safety behaviors and demonstrate the values associated with those behaviors (Neal & Griffin, 2006). Individuals are more likely to be motivated to comply with safe working practices and participate in safety activities if they perceive that there is a positive safety climate in the workplace (Neal & Griffin, 2006). Ajzen, Czasch and Flood (2009, p. 1358) defined safety motivation as "the individual factors which awaken, channelize and maintain behavior to attain a curtain goal".

1.6.7 Safety Behavior

Safety behavior is associated with safety participation and safety compliance in the workplace (Neal & Griffin, 2006; Vinodkumar & Bhasi, 2010). It may require encouragement and enrichment to internalize the safety values that are explicitly exhibited in safety behavior as an outcome (Sinclair, Martin & Sears, 2010).

1.6.8 Safety Stressors

Safety stressors are obstacles and uncertainty related to safety in the workplace, which may cause stress in employees (Zapf, Vogt, Siefert, Mertini & Isic, 1999). These factors will disrupt information processing and require mental effort because they are perceived as beyond the control of employees (Sampson et al., 2014).

1.7 Summary

Exploring and determining the safety culture factors that affect safety behavior of healthcare professionals will raise awareness among healthcare managers of the importance of safety issues. It should help to increase the priority given to patient safety, and to ensure that managers and clinicians have a range of strategies to address this issue. Competent healthcare professionals are vital to improving the delivery of healthcare services by reducing the probability of medical errors and improving service quality. However, developing a safety culture takes both professionals and managers.

1.8 The Structure of the Dissertation

This thesis is in five chapters. Chapter one provides a brief introduction to the background of the study, research problem, research aim and objectives and the study's contribution. Chapter Two reviews the literature on safety culture dimensions, safety behavior and safety stressors. It also discusses the safety culture dimensions of safety climate, safety management practices, safety knowledge, safety motivation and safety attitudes. It describes safety behavior and safety stressors and provides relevant models. This chapter also examines the literature on the relation between safety culture factors and safety behavior to provide hypotheses, and therefore acts as a foundation to develop the research framework for the study. Chapter Three describes the research approach. It explains the quantitative approach, the process of measurement development, data collection procedures and the tools and steps taken to analyze the results.

Chapter Four provides the data analysis and findings. It describes the pilot study and main study including the measurement model and structural model, and the invariance measurement. This chapter also describes the primary findings of the hypothesized causal path between safety culture factors and safety behavior. Lastly, the final chapter provides a discussion that addresses all the research objectives, highlighting the hypotheses and relating them to the empirical findings in Chapter Four. Chapter five highligts the discussion of the findings. The final chapter also summarizes the principal conclusions and explains the study's research contributions and limitations and makes suggestions for future research.

CHAPTER 2: **LITERATURE REVIEW**

2.1 Introduction

This chapter discusses the key concepts and literature associated with the major components of the framework that serves as the foundation for this study. It considers leading theories on the underlying dimensions of safety culture, including safety climate, safety management practices, safety knowledge, safety motivation, and safety attitudes, all of which have a significant effect on safety behavior. This chapter reviews the literature on these issues to identify relationships between possible study variables.

2.2 Safety Culture

In last two decades, Safety culture was highlighted as a serious issue after the Chernobyl accident in 1986 (Gao et al. 2019; Khairlida et al., 2019; Spurgeon et al., 2019; Wachter & Yorio, 2014), and stems from the organizational culture (Heckemann et al., 2019; Dikens et al., 2019; Khan et al., 2018; Lawati et al., 2018; Clarke, 1999). To fully understand the concept of safety culture, it is therefore necessary to understand organizational culture. The concept of organizational culture has been discussed for many years, but interest in it increased significantly during the early 1980s (Guldenmund, 2007). According to Pidgeon (1991), safety culture is a set of roles, norms, technical issues, social attitudes, and belief practices intended to minimize the exposure of the public, managers, employees, and customers to injurious or dangerous conditions. Guldenmund (2007) described safety culture as an aspect of organizational culture that influences behavior and attitudes related to decreasing or increasing risk. Cooper (2000) defined safety culture as the shared organizational beliefs, attitudes, values, and norms associated with the proper conduct, danger, and risk of hazardous operations. Zohar (1980) defined it as employee perceptions about environmental safety characteristics and organizational traits that influence safety performance. These employee perceptions are influenced by attitude, personality, and organizational policy (Zohar, 1980). This implies that safety culture is not a standalone concept. In recent studies, many organization in different industries are measuring safety culture as they believe that it reflects on organization activities and forecasts organization safety behavior. The operational definition is therefore that safety culture is the reflection of shared values, beliefs, attitudes, and perceptions manifested in employee perceptions of environmental safety and organizational characteristics that influence safety behavior (Yorio et al., 2019; Lee et al., 2019; Cooper, 2000; Cox & Flin, 1998; Guldenmund, 2000; Pidgeon, 1991; Zohar, 1980).

2.3 Safety Climate

Recent study describes the relationship between safety culture and safety climate as "personality and mood" where safety culture refers to norms, values and believes as discussed previously and safety climate is management perception to safety. The same study highlighted that those two concepts are overlapping with each other. Previous study defined Safety climate as "shared employee perceptions about the relative importance of safe conduct in their occupational behavior" (Zohar, 1980, p. 96). This definition identifies safety climate as consensual or shared social cognition about the relative importance or priority of safety versus productivity at the workplace. These shared perceptions inform employees about management commitment to their safety and health, guiding appropriate task behaviors during work involving physical risks (Twafik et al., 2019); Jiang et al., 2019). According to Zohar (1980), safety climate perceptions emerge by sharing personal experiences that show the extent to which management invests in their protection as opposed to productivity. This leads them to develop congruent behavior–outcome expectations and act accordingly. Safety climate therefore informs employees about the priority given to safety during production processes involving physical or health risks, resulting in adjusted behavior (Zadow et al., 2019; Mohr et al., 2018). A positive safety climate will increase the frequency of safety behavior among employees working in hazardous environments, and vice versa. This definition follows the conceptual framework of organizational climate research, where perceptions of climate describe the meaning employees attach to policies, procedures, and practices, and the behaviors that are expected and rewarded (Reichers & Schneider, 1990). According to Hofmann, Michael and Zohar (2017), climate perceptions differ from other organizational perceptions in that their objective is to uncover the (implicit) order in the organizational environment as a means to adapt or adjust to that environment. Policies, procedures, and practices form the building blocks of the organizational environment, and climate perceptions as order-seeking interpretations of the environment describe the nature of relationships or the relative priorities among these elements, rather than the interpretation of individual elements in isolation. Safety climate therefore relates to shared perceptions about the priority of safety policies, procedures, and practices and the extent to which safety-compliant or enhancing behavior is supported and rewarded in the workplace (Taylor et al., 2019; McLinton et al., 2018; Zohar & Luria, 2010). When safety policies are more coherent and comprehensive and communicated and implemented more frequently during production processes, management commitment to employee protection is perceived as greater. Flin (2007) proposed a conceptual model of safety climate in healthcare settings that covers both worker and patient injury. Flin's model describes safety climate as a multilevel construct covering practices of senior managers and workgroup supervisors. Flin hypothesized that motivation was a product of safety climate and a proximal antecedent of workers' unsafe behaviors. The model shows errors as a consequence of unsafe behaviors and as a predisposing factor for both worker and patient injury. Flin's conceptualization of safety climate as a multilevel construct is consistent with Zohar and Luria's (2005) safety climate model, which is operationalized at organizational and group levels. Flin's inclusion of individual motivation in the safety climate–injury pathway reflects previous findings by Neal, Griffin and Hart (2000), suggesting that worker safety knowledge and motivation partially mediated the relationship between safety climate and safety performance. The incorporation of human error as a separate component reflects the healthcare context of the model and recognizes that both individual and system factors are involved in patient and worker injury (Flin, 2007; Joan et al., 2019). Flin hypothesized that safety climate is similar for both worker and patient injury. She acknowledged, however, that different motivating factors may influence worker behaviors linked to patient adverse events than those associated with worker injury.

2.4 Safety Management Practices

Kirwan (1998) described safety management as the practices, roles and functions associated with remaining safe. It is usually regarded as a sub-system of overall organizational management and is carried out via the organization's safety management system with the help of safety management practices (Kirwan, 1998). Safety management includes any practices that could be perceived by employees as shaping the safety environment (Vivoda et al., 2019; Hassan et al., 2019; Vinodkumar & Bhasi, 2011). There have been numerous attempts to identify specific safety management practices that predict safety performance in the healthcare sector. Suggestions have included management commitment to safety activities and safety rules and procedures (Zhang et al., 2019; Trinchero, Farr-Wharton & Brunetti, 2017; Vredenburgh, 2002; Yorio & Wachter, 2014), safety training (Flin, 2017; Lin, Lin & Lou, 2017; Vredenburgh, 2002), safety communication and feedback (Vredenburgh, 2002), and safety promotion and policies (Linnan et al., 2019;

Brunetto et al., 2016; Kapp & Han, 2017). Workers' involvement in safety management practices has also been found, but only in a study of small and medium-sized enterprises (Subramaniam, Shamsudin, Ramalu & Hassan, 2016).

2.4.1 Safety Management Practices factors

There are different dimention of safety management factors. In recent study highlghted those factors are management and colleague commitment to safety, incident reporting, communicaiton, collaborating. For the purpose of this study, the following factors will be addressed.

2.4.1.1 Management Commitment

In one of the first investigations of safety climate, Zohar (1980) found that management commitment to safety is a major factor affecting the success of organizational safety programs. The safety commitment of the management must result in observable management activity and be demonstrated in behavior as well as words (Hopkins, 2014). Employees' perceptions will reflect how far they believe that safety is valued in the organization (Griffin & Neal, 2000). In high-risk environments like chemical industries (Gao, et al., 2019; Cox & Flin, 1998; Şimşekoğlu & Nordfjærn, 2017; Vinodkumar & Bhasi, 2010), and the healthcare sector (Alingh et al., 2018; Trinchero et al., 2017; Vredenburgh, 2002; Yorio & Wachter, 2014), management commitment has been repeatedly highlighted as an important issue in safety. Following

Vredenburgh (2002), this study includes management commitment as a safety management practice.

2.4.1.2 Training

Fernandez-Muniz, Montres-Peon and Vazquez-Ordas (2007) explained that employees need occupational safety training to be active participants in a safety program. Safety training provides workers with the knowledge, capabilities and skills needed to carry out their tasks safely. It also helps them to identify the risks in the workplace, and the procedures available to prevent, correct or minimize these. To improve the level of safety and health for all employees, organizations should institute a systematic comprehensive safety and health training program for new employees, and ensure that all new employees are introduced to the safety, health and quality systems (Gao et al., 2019; Vredenburgh, 2002). Studies have found that organizations with lower accident rates were characterized by good safety training for employees (Reiman et al., 2019; Anderson, 2005; Probst & Estrada, 2010; Sinclair et al., 2010; Tucker et al., 2014; Vredenburgh, 2002; Yorio & Wachter, 2014). Safety training is therefore considered a safety management practice and measured using items related to training for new employees, discussion of safety issues in training sessions, training on emergency situations, encouragement to attend training programs, and hazard assessment training.

2.4.1.3 Employee Involvement

Employee involvement is a behavioral technique that involves individuals or groups in the upward communication flow and decision-making processes within the organization. The amount of participation can range from none, where the supervisor makes all decisions, to full, where everyone connected with, or affected by the decision, is involved. Employees close to the work are usually best qualified to make suggestions for improvements, and can be consulted before making final decisions, especially where decisions affect them (Almklova et al., 2018; Vredenburgh, 2002). This empowerment of workers provides them with authority, responsibility and accountability for decisions and ensures that both employees and management are involved in setting goals and objectives (Li et al., 2019; Subramaniam et al., 2016). Worker involvement has been reported to be a critical factor in safety management (Boukas & Kontogiannis 2019; Boughaba, Hassane & Roukia, 2014; Demirkesen & Arditi, 2015; Rundmo, 2000; Yu, Ding, Zhou & Luo, 2014). It is ttherefore considered a safety management practice in this study, and measured using items about whether the safety committee includes workers' representatives, involvement of workers in safety-related decision-making, and identifying safety problems, and consultation with workers about safety matters.

2.4.1.4 Communication

Regular communication about safety issues between management, supervisors and workforce is an effective management practice to improve safety in the workplace (Manapragada et al., 2019; Cigularov, Chen & Rosecrance, 2010; Demirkesen & Arditi, 2015; Kouabenan, Ngueutsa & Mbaye, 2015; Yorio & Wachter, 2014). Earlier studies also suggested that safety communication and feedback as a management practice are useful tools to support safety behavior in healthcare, particularly hazard reporting systems, an open door policy on safety issues, communication about safety goals and opportunities to discuss safety issues (Steel et al., 2019; DeFrank et al., 2019; Brunetto et al., 2016; Pousette, Larsman, Eklöf & Törner, 2017; Sujan et al., 2015).

2.4.1.5 Safety rules and procedures

Well-documented safety rules and procedures and their enforcement by supervisors and managers can improve safety behavior of workers (Vinodkumar & Bhasi, 2010, 2011). Safety rules and procedures were examined in safety studies in high-risk industries, and found to have a significant correlation with safety behavior (Gao et al., 2019; Chu et al., 2019; Vinodkumar & Bhasi, 2010, 2011). The level of enforcement of safety rules and procedures is therefore considered to be a safety management practice because it is related to effective rules and procedures to prevent accidents, and regular safety inspections (Rocha et al., 2019; Hale, Borys & Adams, 2015; Pinto, 2014; Taylor & Snyder, 2017).

2.4.1.6 Reward system

Vredenburgh (2002) contended that a well-designed reward system should be characterized by a high level of visibility in the organization, and that this will help to modify behavior. Safety promotion policy is therefore an important safety management practice. Research suggests that consideration of safety performance in the employee selection process is a significant predictor of injury rates (Guo et al., 2018; Mohammadi et al., 2018; Wang et al., 2019; Eckhardt, 1996; Guldenmund, 2007; Nævestad, 2017; Şimşekoğlu & Nordfjærn, 2017). Recently, health and safety whistleblowing in the healthcare sector has become an important factor in safety management because of the increase in public expectation of transparency and openness (Hyde, 2016; Waring, 2016). Mannion and Davies (2015) suggested that staff in healthcare organizations should be encouraged to raise concerns about safety and health. They also argued that whistleblowing should be embedded in organizational practice as a normal activity related to care quality. As a result, policies on whistleblowing are considered a very important safety management practice. The perceptions of employees on the level of the selected six safety management practices implemented in their organizations are considered to be organizational factors that may influence safety behavior.

These six safety management practices are therefore considered antecedents of safety behavior in this study. The following hypothesis was therefore proposed:

H1: Safety climate is significantly related to safety management practices

2.5 Safety Knowledge

Brasaite, Kuononen and Suominen (2015) suggested that further investigation should be conducted into healthcare professionals' knowledge, because of their attitudes to self-reporting accidents. Neal and Griffin (2006) also suggested that safety climate and safety knowledge can have important and lasting effects on employees in guiding their safety behavior.

According to theories of job performance (Campbell, McCloy, Oppler & Sager, 1993; Gilboa et al., 2008), behavior is determined by interactions between motivation and knowledge. Campbell et al. (1993) considered job performance as an individual-level variable. They described performance as a function of three determinants: (1) declarative knowledge, (2) procedural knowledge and skills, and (3) motivation. Researchers (Neal et al., 2000; Vinodkumar & Bhasi, 2010) have often combined the first two into a single construct, safety knowledge (Murray et al., 2019; Thaivalappilet al., 2020), when explaining safety behavior. Christian, Bradley, Wallace and Burke (2009) reported that safety behavior was strongly related to safety knowledge. Neal et al. (2000) also found that safety knowledge can predict safety attitudes. Safety training, safety communication, and safety rules and procedures are also significantly related to safety knowledge (Vinodkumar & Bhasi, 2010). This study therefore hypothesized:

H2: Safety management practices are significantly related to safety knowledge

2.6 Safety Motivation

Motivation is a crucial factor that can directly and indirectly affect safety behavior and the success of safety programs in general (Sawhney & Cigularov 2019; Ajzen et al., 2009; Lund & Aaro, 2004). It has been used as a construct in several well-known models of accident prevention (Jin-Dong & Gwang-Hee 2019; Christian et al., 2009; Vinodkumar & Bhasi, 2010). Safety motivation is related to individual desire to attain particular goals (Muchiri et al., 2019; Ajzen et al., 2009). Neal and Griffin (2006) considered safety motivation to be a function of individual willingness to enact safety behaviors. Individuals are likely to be motivated to comply with safe working practices and participate in safety activities if they perceive that there is a positive safety climate in the workplace. Sinclair et al. (2010) argued that encouragement and enrichment must be interwoven to internalize the importance of safety.

The literature on safety motivation is, however, limited. Most research has focused on how to motivate workers to work safely. Theoretical studies have treated safety motivation as part of safety compliance and safety participation. They have therefore ignored the divergence between the theoretical and epistemological, especially about knowledge, attitudes and actions related to intention for safety (Goh, Love, Stagbouer & Annesley, 2012; Lund & Aaro, 2004). Studies by Griffin and Neal (2000), Hofmann and Mark (2006), and Zohar and Luria (2005) showed that safety management practices influenced individual motivation about work safety behavior. Previous studies have consistently reported that a higher level of safety motivation has a positive relationship with effective organizational safety management practices (Muchiri et al., 2019; Jin-Dong & Gwang-Hee 2019;

Christian et al., 2009; Sinclair et al., 2010). Safety motivation has also been found to be positively related to safety performance (Neal & Griffin, 2006; Vinodkumar & Bhasi, 2010). Christian et al. (2009) reported that safety behavior was strongly related to safety motivation. Neal et al. (2000) found that safety motivation can predict safety attitudes. Safety training, safety communication, and safety rules and procedures are also significantly related to safety motivation (Vinodkumar & Bhasi, 2010).

Variations on safety strategies that have been proposed as measures (e.g., safety performance, safety compliance, safety participation), but there is evidence to support the effectiveness of this approach in behavioral-based safety measures (Kaila 2019; Guldenmund, 2000; Griffin & Neal, 2000). Ajzen et al., 2009 and Christian et al., 2009 have contended that safety motivation is incomplete without the justification of physiological and psychological factors. Employees are influenced by personal and social motives (Ajzen et al., 2009; Christian et al., 2009). Christian et al. (2009), and Neal and Griffin (2006) showed that safety motivation is influenced by safety management practices, but the relationship with performance is unclear (Pedersen & Kines, 2011). The study therefore proposed:

H3: Safety management practices are significantly related to safety motivation

2.7 Safety Attitudes

To prevent errors, injuries, and accidents, both unsafe acts and unsafe conditions should be eliminated. Attention has tended to focus on patient safety in healthcare (Bondevik et al., 2019), because physical evidence can easily be gathered to account for incidents (Braithwaite, Wears & Hollnagel, 2015; Okuyama, Wagner & Bijnen, 2014). This means that changes can be made to prevent similar incidents in the future (Rajaram, Barnard & Bilimoria, 2015). Brown, Willis and Prussia (2000) found that workers' safety attitude was significantly related to safety behavior. Relatively little effort has been devoted to examining the effect of safety management factors in reducing or eliminating unsafe acts (Sawhney & Cigularov, 2019). Safety attitudes therefore need to be closely examined to ensure patient safety.

However, it is challenging to measure the safety attitudes of employees, and therefore the impact of safe behaviors (Sawhney & Cigularov, 2019; Vinodkumar & Bhasi, 2009). Employees' mental processes can affect how they perceive accident risk, adjust their safety attitudes and behave. To understand how safety attitudes lead to safe behaviors, the mental processes of employees need to be closely investigated Attitudes to safety also depend on how people perceive risks (Durgun & Kaya 2019; Shin, Lee, Park, Moon & Han, 2014). Earlier studies argued that workers' attitudes towards safety affected self-reported accident rates, but Vinodkumar and Bhasi (2009) found these factors were not significantly correlated. This suggests that safety climate is the antecedent, and safety management factors the predictors of safety attitudes that then affect safety behavior. The following hypothesis was therefore proposed:

H4: Safety knowledge is significantly related to safety attitudes

H5: Safety motivation is significantly related to safety attitudes

H6: Safety attitudes are significantly related to safety behavior

2.8 Safety Behavior

Good safety behavior, almost by definition, leads to safety compliance in the workplace (Muchiri et al., 2019; Zohar, 1980). In most cases, researchers have measured safe (Griffin & Neal, 2000) and unsafe behavior (Sharon et al., 2019; Rundmo, 1998) and found that these are influenced by organizational and cultural factors (Brown et al., 2000; Cui et al., 2013; Clarke, 1999; Hofmann et al., 2017). A classical theory on accident causation is the Domino Model, proposed by Henrich (1931). Henrich suggested that injuries (the fifth domino) were caused by accidents (the fourth domino) because of unsafe acts or unsafe conditions in the workplace (the third domino) and preceded by an individual fault (the second domino) and issues in the social environment (the first domino). Henrich (1931) suggested that removing the third domino is the most effective way to reduce workplace injuries. Findings on 75,000 accidents showed that around 88% were caused by unsafe individual acts, only 10% because of unsafe conditions and 2% were 'acts of God' (Henrich, 1931). Subsequent findings have also showed that workplace accidents and injuries tend to result from unsafe behavior rather than an unsafe environment (Hammera et al., 2019; Mullen, 2004), and that unsafe acts contributed to almost all workplace injuries (Layne et al., 2019; Guo et al., 2016; Mearns et al., 2003; Mearns et al., 2010; Pidgeon, 1991).

Neal and Griffin (2006) proposed a model based on theories of job performance (Borman & Motowidlo, 1993; Campbell et al., 1993). This distinguishes between various components of performance. Safety compliance and safety participation can be treated as safety behavior or components of safety performance (Neal et al., 2000). Pousette et al. (2017) measured self-rated safety behavior across several constructs. They considered structural safety behavior (participation in organized safety activities), interactional safety behavior (safety activities in everyday interactions with co-workers and management) and personal safety behavior (behavior promoting personal protection).

Safety-related behaviors such as safety compliance and safety participation can therefore probably be considered components of safety performance. Safety compliance describes employee behavior that increases personal safety and health. Safety participation is behavior that increases the safety and health of co-workers, and therefore supports the organization's stated goals and objectives (Boughaba et al., 2014; Nielsen, 2014). Safety behavior is probably the most important predictor of healthcare work hazard and risk (Sorensen et al., 2019; Eklöf, Törner & Pousette, 2014). Research also shows that good safety behavior is associated with adequate resources and routines, workplace learning, supportive managers and colleagues, and that these factors together form a safety culture (Flin et al., 2006; Vincent, Burnett & Carthey, 2014; Yorio, Willmer & Moore, 2015; Vandenberg et al., 2019). Insufficient resources, and lack of communication and collaboration on safety and health will contribute to acceptance of working conditions that could lead to stressors.

2.9 Safety Stressors

Working conditions induce a stress reaction if they disrupt information processing and require mental effort (Zapf et al., 1999). Action theory suggests that where health and safety are concerned, stressful working conditions include uncertainty about safety, and obstacles to safety that may influence action (AlFaqeeh et al., 2019; Noor Dalia et al., 2019; Wang et al., 2018; Sampson et al., 2014). Safety uncertainty describes safety-related events where individuals do not know how to achieve goals, what actions would be beneficial, and what feedback is trustworthy. Safety role ambiguity (when role information is unclear or inadequate) and safety role conflict (when role information from different sources conflicts) would both fall under safety uncertainty (Rizzo, House & Lirtzman, 1970). Safety obstacles are safety-related job conditions that interfere with or prevent goal pursuit or the regulation of activities (Kim et al., 2019; Tucker et al., 2018; Casey, Griffin, Flatau Harrison & Neal, 2017). These include issues that require workers to expend more effort on a task or engage in more risky actions.

There is some research to support action theory's suggestions about the connections between occupational stressors and job performance, but the results are inconsistent on specific stressors (Park, Hinsz & Nickell, 2015; Petrou, Demerouti & Schaufeli, 2015; Wang et al., 2015; Zhang, LePine, Buckman & Wei, 2014). These inconsistencies have led to the increasing recognition that safety stressors do not all have the same relationship with safety behavior (Kim et al., 2019; Casey et al. 2017; Sampson et al., 2014; Wang, Wang & Xia, 2018). Other researchers have explained the differences by categorizing safety stressors based on the level of perceived individual control (Ang, Zhang, Hwa & Lim, 2016; Magnavita, 2014; Ruotsalainen, Verbeek, Mariné & Serra, 2014).

Based on action theory, safety stressors should be detrimental to both safety compliance and participation (AlFaqeeh et al., 2019; Sampson et al., 2014). When faced with safety obstacles and uncertainty, workers' resources, effort, and attention will be challenged. They will therefore have to decide where to devote their limited energy. Logically, workers' limited resources will first be devoted to completing the required components of their job. As a result, they will have fewer resources left for discretionary behaviors. Discretionary performance will therefore be reduced more than required performance. Some studies have explored the relationships between stressors and discretionary and required components of general job performance. These support the idea that stressors influence discretionary performance more than required behaviors. Wang et al. (2018), for example, found that high safety-related stressors impaired safety participation but not safety compliance, and safety uncertainty had a negative effect on safety compliance. Sampson et al. (2014) found that safety uncertainty and safety obstacles were negatively related to safety performance.

This study extends previous research on safety stressors and safety performance by focusing on how safety-specific forms of uncertainty and obstacles moderate the relationship between safety attitudes and safety behavior. Some researchers have suggested that safety stressors should be viewed as outside the control of workers, but others have seen them as under the control of employees. This study therefore follows the suggestion of AlFaqeeh et al. (2019) and Sampson et al. (2014) and Wang et al. (2018) to examine the moderating effect of safety stressors to expand understanding of safety culture in high-risk sectors. This is important because more general support seems to influence safety behavior, but general support alone may not be sufficient to assess the sophisticated causes of safety performance. The hypothesis proposed was therefore:

H7: The effect of safety climate, safety management practices, safety knowledge, safety motivation and safety attitudes on safety behavior will be strengthened in healthcare professionals if the levels of safety stressors are low.

Table 1.1 Summary of Literature Review and contribution of the study

Measurement domains in safety culture from cross-sectional studies	Sources
Safety climate	Flin (2007); Hofmann et al. (2017); Jiang et al. (2019); Joan et al. (2019); McLinton et al. (2018); Mohr et al. (2018); Neal et al. (2000); Reichers and Schneider (1990); Taylor et al. (2019); Twafik et al. (2019); Zadow et al. (2019); Zohar (1980); Zohar and Luria (2010);
Safety management practices	Hassan et al. (2019); Kirwan (1998); Vivoda et al. (2019); Vinodkumar and Bhasi (2011);
Management commitment	Alingh et al. (2018); Cox and Flin (1998); Hopkins (2014); Gao et al. (2019); Griffin and Neal (2000); Şimşekoğlu and Nordfjærn (2017); Trinchero et al., (2017); Vinodkumar & Bhasi (2010); Vredenburgh (2002); Yorio and

	Wachter (2014); Zhang et al. (2019); Zohar (1980)
Safety rules and procedures	Chu et al. (2019); Gao et al. (2019); Hale et al. (2015); Pinto (2014); Rocha et al. (2019); Taylor and Snyder (2017); Trinchero et al., (2017); Vinodkumar & Bhasi (2010; 2011); Vredenburgh (2002); Yorio and Wachter (2014); Zhang et al. (2019);
Safey training	Anderson (2005); Fernandez-Muniz et al. (2007); Flin (2017); Gao et al. (2019); Lin et al. (2017); Probst and Estrada (2010); Reiman et al. (2019); Sinclair et al. (2010); Tucker et al. (2014); Vredenburgh (2002); Yorio and Wachter (2014)
Safety communication and feedback	Brunetto et al. (2016); Cigularov et al. (2010); DeFrank et al. (2019); Demirkesen and Arditi (2015); Kouabenan et al. (2015); Manapragada et al. (2019); Pousette et al. (2017); Sujan et al.

	(2015); Steel et al. (2019); Vredenburgh (2002); Yorio and Wachter (2014)
Safety promotion and policies	Brunetto et al. (2016); Linnan et al. (2019); Kapp and Han (2017); Vinodkumar & Bhasi (2010; 2011)
Workers' involvement	Almklova et al. (2018); Boukas and Kontogiannis (2019); Boughaba et al. (2014); Demirkesen and Arditi (2015); Li et al. (2019); Rundmo (2000); Subramaniam et al. (2016); Vredenburgh (2002); Yu et al. (2014)
Reward system	Eckhardt (1996); Gao et al. (2019); Guldenmund (2007); Hyde (2016); Mannion and Davies (2015); Mohammadi et al. (2018); Nævestad (2017); Şimşekoğlu & Nordfjærn (2017); Wang et al. (2019); Waring (2016); Vredenburgh (2002);

Safety knowledge	Brasaite et al. (2015); Campbell et al. (1993); Christian et al. (2009); Gilboa et al. (2008); Murray et al. (2019); Neal et al. (2000); Neal and Griffin (2006); Thaivalappilet et al. (2020); Vinodkumar & Bhasi (2010)
Safety motivation	Ajzen et al. (2009); Goh et al. (2012); Guldenmund (2000); Griffin and Neal (2000); Hofmann and Mark (2006); Jin-Dong and Gwang-Hee (2019); Kaila (2019); Muchiri et al. (2019); Neal et al. (2000); Neal and Griffin (2006); Lund and Aaro (2004); Sawhney and Cigularov (2019); Sinclair et al. (2010); Vinodkumar & Bhasi (2010); Zohar and Luria (2005)
Safety attitudes	Bondevik et al. (2019); Braithwaite et al. (2015); Brown et al. (2000); Durgun and Kaya (2019); Okuyama et al. (2014); Rajaram et al. (2015); Sawhney and Cigularov

	(2019); Shin et al. (2014); Vinodkumar and Bhasi (2009);
Safety behavior	Boughaba et al. (2014); Borman and Motowidlo (1993); Brown et al. (2000); Campbell et al. (1993); Clarke (1999); Cui et al. (2013); Guo et al. (2016); Flin et al. (2006); Griffin and Neal (2000); Hammera et al. (2019); Henrich (1931); Hofmann et al. (2017); Layne et al. (2019); Mearns et al. (2003); Mearns et al. (2010); Muchiri et al. (2019); Mullen (2004); Neal et al. (2000); Neal and Griffin (2006); Nielsen (2014); Sharon et al. (2019); Rundmo (1998); Pidgeon (1991); Pousette et al. (2017); Vandenberg et al. (2019); Vincent et al. (2014); Yorio et al. (2015); Zohar (1980)
Safety stressors	AlFaqeeh et al. (2019); Ang et al. (2016); Casey et al. (2017); Kim et al. (2019); Magnavita (2014); Noor

	Dalia et al. (2019); Rizzo et al. (1970); Sampson et al. (2014); Park et al. (2015); Petrou et al. (2015); Ruotsalainen et al. (2014); Tucker et al. (2018); Wang et al. (2015); Wang et al. (2018); Zapf et al. (1999); Zhang et al. (2014)

2.10 Safety Culture Models

2.10.1 Cooper's Reciprocal Safety Culture Model

Cooper (1993, 1997, 2000) developed the reciprocal safety culture model based on Bandura's (1978) model of reciprocal determinism, a social cognitive theory. Bandura (1978) theorized that behavior and environment are reciprocal determinants of each other. Individuals could respond to their environment and correct their behavior based upon what they observe. The key components of Cooper's safety culture model are:

1. **Person (safety climate)**: Individual and group beliefs, attitudes, perceptions and values about safety, i.e., the safety climate of an organization.

2. **Job**: Observable safety-related behaviors, i.e., safety behaviors on the job.

3. **Situation**: This may include objective situational factors such as organization policies, management systems, operating procedures and communication styles, i.e., the safety management system in an organization.

The job and situation components in Cooper's model are equivalent to the behavior and external environment components in Bandura's model. According to Cooper (2000), all three components interact reciprocally with each other in a perpetual dynamic interplay. Cooper (2000) suggested that it is possible to quantify safety culture by measuring each of these components independently or in combination.

Cooper's reciprocal safety culture model is broadly similar to Geller's

Total Safety Culture model, with the term situation used instead of environment. These models are considered to be holistic because they incorporate both psychological and environmental factors (Cui, Fan, Fu, & Zhu, 2013). Cooper (2000) asserted that his model was capable of identifying where best to focus resources and efforts to pursue safety goals.

Criticisms of Cooper's model have centered on practical issues related to behavioral observations. Firstly, the level of resources required to observe safety-related behaviors may be substantial and come at the expense of other areas, such as process safety (Anderson, 2005). Secondly, it has been suggested that behavioral observations may replace root cause analysis leading to the development of quick fix and simplistic solutions. Finally, observers of unsafe behaviors may be reluctant to report those seen violating safety rules, resulting in underreporting (Hopkins, 2014).

2.10.2 Kennedy and Kirwan's Safety Culture Model

Safety culture is an enduring feature of organizations and forms an integral part of organizational culture (Kennedy & Kirwan, 1998). Kennedy and Kirwan (1998) conceptualized a four-layer model with organizational culture as the innermost layer, safety culture and safety climate as the middle layers, and safety management practices as the outermost layer. This conceptualization suggests that organizational culture and safety culture are hidden from view. Safety climate is closer to the surface, and safety management practices are observable. The model does not depict the dynamics between layers, but these are important for clarifying the construct of safety culture. The model may appear to be counter-intuitive when viewed graphically, because organizational culture is enclosed in safety culture. This may give the impression that organizational culture is a sub-component of safety culture rather than the other way around.

Kennedy and Kirwan (1998) suggested that safety culture failures will manifest themselves in safety management failures. They argued that safety culture is intangible and abstract, and it is therefore better to focus on safety management practices when trying to predict and prevent incidents, because these are observable and measurable.

These models are well intentioned, but there is clearly confusion around the concepts. This confusion appears to emanate from fragmented and unsystematic efforts to develop theoretical concepts (Kennedy & Kirwan, 1995). Flin et al. (2006) argued that the literature lacks of an understanding of an integrative framework to guide examination of safety culture factors in a wide range of contexts. This contributes to the lack of consensus about safety culture factors in the healthcare sector (Bronkhorst, 2015; Flin et al., 2006; Guldenmund, 2007). The wide range of constructs and conceptual themes are assembled from literature on the industry (Zhu et al., 2014).

Critically, safety culture is hypothesized as being a function of enduring organizational and professional practices (Guldenmund, 2000). Organizational, safety and health policies and systems have an impact on behavior that in turn affects workplace safety (Yorio et al., 2015). In trying to understand safety culture, it is essential to reflect on its relationship with safety climate (O'Connor, O'Dea, Kennedy & Buttrey, 2011). Despite the solid evidence that safety climate is strongly and positively related to safety performance, it may still be hard to identify the factors that influence safety behaviors (Neal & Griffin, 2006; Noort, Reader, Shorrock & Kirwan, 2016).

2.10.3 Griffin and Neal's Model of Safety Climate

Griffin and Neal's (2000) conceptualization of safety climate was based on the literature on organizational climate (James & James, 1989; James & McIntyre, 1996), and work performance (Borman & Motowidlo, 1993; Campbell et al., 1993). The model emphasizes the role of senior managers in the promotion of safety. It hypothesized that employees' perceptions of management values, and policies and procedures relating to safety, would positively influence safety performance. Griffin and Neal (2000) argued that these relationships may be mediated by employee knowledge, skill, and motivation. In their model, the concept of safety performance was considered to include both safety compliance (active practices) and safety participation (proactive practices).

A major limitation of their model is that it does not clearly separate the roles of supervisors and managers in the promotion of safety (Flin, 2007). It also fails to address the influence of group practices on safety compliance and safety participation (Toppazzini & Wiener, 2017), or the effects of safety climate on safety attitudes. These omissions, on the surface, appear to disregard the multilevel nature of workplaces and obscure the collective aspect of safety climate. However, Griffin and Neal's model of safety climate has been used in multilevel safety climate studies (Bhattacharya, 2015; Nævestad, 2017; Vinodkumar & Bhasi, 2010; Zhu et al., 2014).

2.11 Summary

This chapter has provided an overview of the key concepts and literature associated with the major components of the framework that serves as the foundation for this study. Three of the leading theories used to explain and predict the underlying safety culture factors of safety climate, safety management practices, safety knowledge, safety motivation, and safety attitudes, which have a significant effect on safety behavior, have been discussed. The possible effect of safety stressors on healthcare professionals has also been reviewed. These factors have been used to define variables as the basis of a research framework. Studies have established that there are relationships between safety climate, safety management practices, safety knowledge, safety motivation, and safety attitudes that have a significant effect on safety behavior. They have also shown that safety stressors affect the level of safety behavior. The next chapter sets out the methodology used in this study.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

The previous chapter reviewed the literature on the underlying theories of safety culture and safety climate in predicting safety behavior in the healthcare sector. It identified a research gap related to the extent to which safety culture dimensions influence safety behavior. There is also a gap on how safety stressors intervene in the relationship between safety culture factors and safety behavior. This chapter attempts to form a link between theory and the study variables. Identifying cause and effect between safety culture dimensions and safety behavior, and how safety stressors moderate these relationships, will provide opportunities for improving safety behavior and safety performance of healthcare professionals in healthcare organizations.

3.2 Development of Research Framework

The research framework is designed to form the link between theory and the study variables. It uses new ideas and dimensions to fill the gap in the literature by identifying safety culture factors that influence safety behavior in the healthcare sector. It is believed that when these factors are clearly identified and understood, the gap between safety cultures, individual safety behavior and safety stressors can be fully understood. Strategies can be identified to address these gaps to enhance awareness of the importance of safety culture factors in shaping human behavior.

3.2.1 Issues in the Development of the Research Framework

Research on the healthcare sector and healthcare professionals tends to concentrate on patient safety as the ultimate objective. However, patient safety cannot be achieved if healthcare professionals do not embed safety culture dimensions both psychologically and physically, through safety behavior (Cooper, 2000; Cui et al., 2013). Earlier studies imply that safety culture is not a standalone concept. The operational definition is that safety culture is the reflection of shared values, beliefs, attitudes, and perceptions manifested in employee perceptions of environmental safety and organizational characteristics that influence safety performance (Cox & Flin, 1998; Guldenmund, 2000; Pidgeon, 1991; Zohar, 1980). Safety culture dimensions are considered important because heathcare professionals have discreation and are likely to deal with many safety issues that can sometimes be ambiguous and/or that require immediate action.

Safety climate, safety management practices, safety knowledge, safety motivation, and safety attitudes are all expected to have a significant effect on safety behavior. It is therefore important to be able to assess healthcare professionals' organizational beliefs, attitudes, values, and norms, including attitudes associated with the proper conduct, danger, and risk of hazardous operations (Cooper, 2000). These beliefs and norms shape perceptions about environmental safety characteristics and organizational traits that influence safety behavior (Zohar, 1980).

Previous studies have suggested that psychological stressors are a predictor variable. No studies have addressed safety stressors as a moderating factor that may affect the extent of the relationship between safety climate, safety management practices, safety knowledge, safety motivation, and safety attitudes on safety behavior in the healthcare sector or among healthcare professionals.

These factors are influenced by attitude and organizational policies that may affect psychological stress in healthcare professionals. The integration of safety stressors into the relationship between safety culture factors and safety behavior is important because it goes beyond organizational beliefs, attitudes, values, and norms, and may therefore better explain the precise relationship.

Most studies on the effect of safety culture dimensions on safety behavior have been conducted in developed countries (Casey et al., 2017; Petrou et al., 2015). Safety behavior is, however, an important issue in the healthcare sector in emerging countries, especially those like the UAE with people from many nationalities and cultures working in the healthcare sector. Studies have argued that research in developing countries is inadequate and that the cultural differences between developed and developing countries may lead to different results (Wang et al., 2018; Zhang et al., 2014). A study on this topic in an emerging country will therefore shed new light on the issues.

Several studies have considered the effect of safety climate, safety management practices, safety knowledge, safety motivation, and safety attitudes on safety behavior (Griffin & Neal, 2000; Neal & Griffin, 2006; Neal et al., 2000; Vinodkumar & Bhasi, 2010). However, these studies have focused on other high-risk sectors such as nuclear, oil and gas and coal mining. None have examined these issues in the healthcare sector and among healthcare professionals in an integrated and interactive way. Previous studies have therefore overlooked the relationship between the six main constructs in the healthcare sector (Pousette et al., 2017).

There is, therefore, a major gap in the existing safety, organization, and psychological literature, providing an immerse opportunity for future research. This study attempts to fill this gap and examine the relationships of safety climate, safety management practices, safety knowledge, safety motivation, and safety attitudes on safety behavior and the effect of safety stressors on these relationships.

3.2.2 Research Framework

The hypotheses in Chapter Two are grounded in the literature and developed through an understanding of the concepts. However, empirical testing is required of these hypotheses to establish that the model is applicable. A research framework was therefore developed (Figure 1) to show the safety culture factors that may have an impact on safety behavior among healthcare professionals in the healthcare sector in Abu Dhabi.

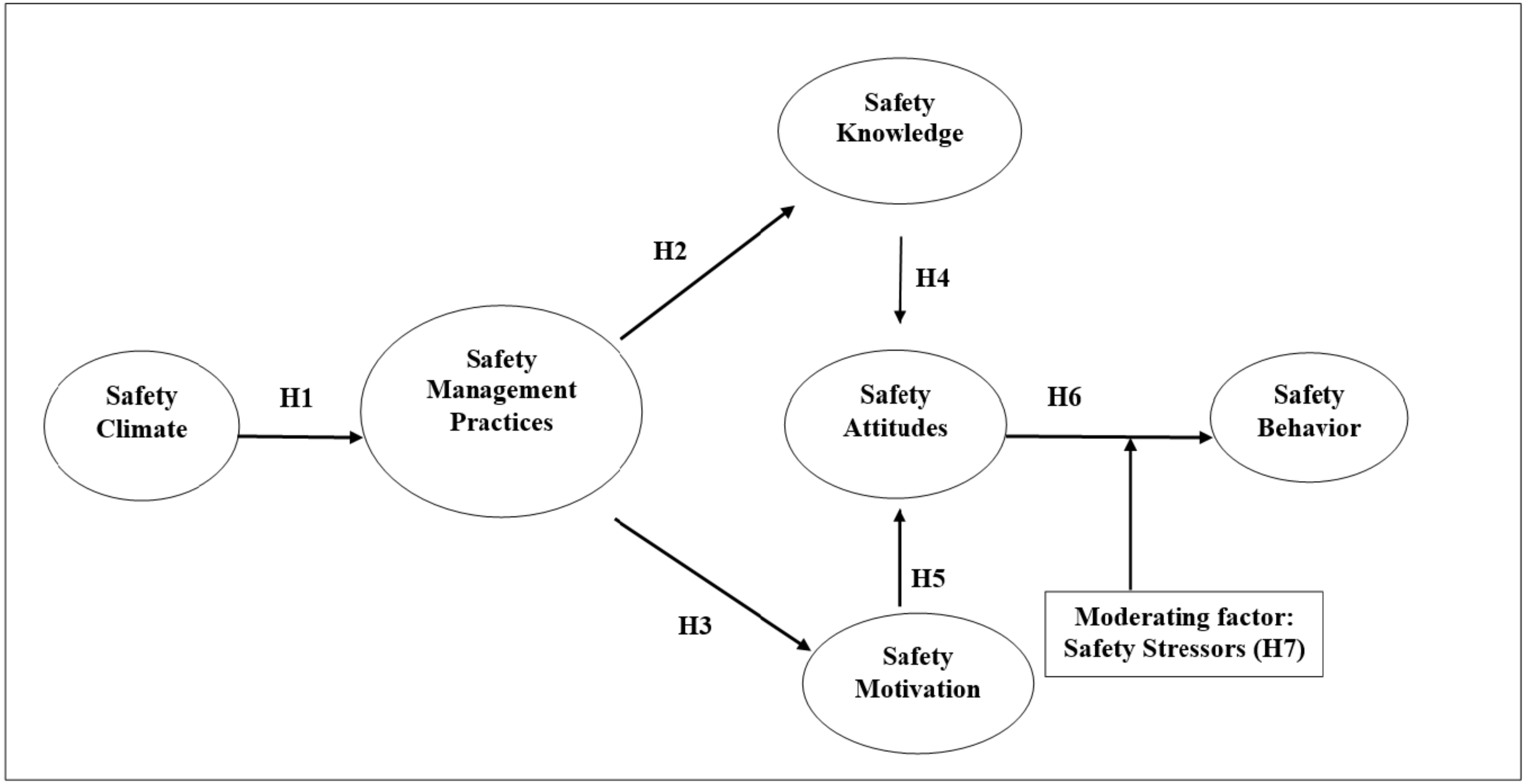

Figure 3.1 Research Framework

3.3 Research Process

Figure 3.2 shows the sequences of a research process (Sekaran & Bougie, 2010; Zikmund, Babin, Carr & Griffin, 2010). The model provides a guideline for the study. It was helpful in research planning and data collection, because it ensured that the research was carried out in a systematic and efficient way.

The research interest was identified to enable preliminary data gathering. This involved reviewing the literature to find a suitable gap then identify and define a research problem. The plan and structure of the investigation was delineated to provide a blueprint for the data collection, measurement, and analysis. The findings from the preliminary tests helped to refine the research framework and revise the instruments.

3.4 Research Design

The research design guides the methods and procedures used to collect and analyze the research information (Zikmund et al., 2010). This ensures that the right data can be gathered and analyzed to arrive at a solution (Sekaran & Bougie, 2010).

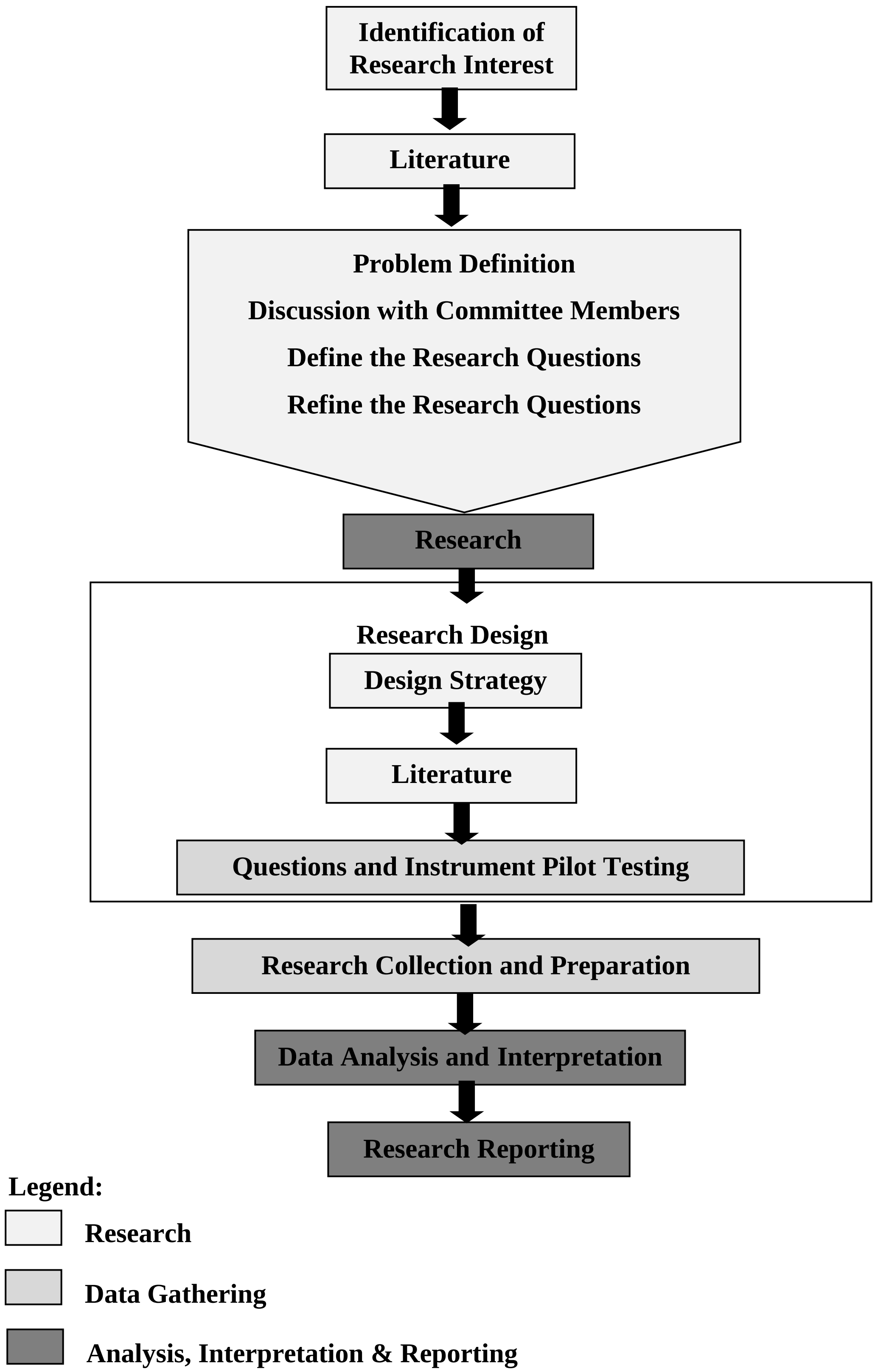

Figure 3.2 Research Process

3.4.1 Population and Sampling

The population of this research consisted of 8,983 physicians, 24,915 nurses and 7,767 allied health professionals (Department of Health, 2017). The sampling frame selected was 12 hospitals; the Abu Dhabi Health Services Company's (SEHA) flagship business entities employed 1,516 physicians (Abu Dhabi Health Services Company, 2014), 7,000 nurses and 3,000 allied health professionals (Zaman, 2017). A stratification process was used to divide members of the population into homogeneous subgroups before sampling (Botev & Ridder, 2017), as shown in Table 3.1.

Table 3.1

Stratified Proportional Sampling

Group of healthcare employees	**Population**	**Sample size**	**Percentage**
Physicians	1,516	49	13.2%
Nurses	7,000	228	60.8%
Allied health professionals	3,000	98	26%
Total	**11,516**	**375**	**100%**

According to Krejcie and Morgan (1970), 375 is a sizeable sample size for a population of 11,516. The sample size was in line with the rule of thumb for determining sample size proposed by Roscoe (1975). He claimed that a sample size of between 30 and 500 is appropriate for most research. Another approach to calculating required sampling size in behavioral science (Cohen, 1992) agrees that a sample size of between 85 and 217 is acceptable for correlation analysis.

This study used unrestricted probability sampling and stratified proportional sampling. This approach can produce highly generalizable findings (Fosnacht, Sarraf, Howe & Peck, 2017; Tipton et al., 2016). It is often desirable to have estimates of population parameters for groups within the population (Shahrokh Esfahani & Daugherty, 2014). This approach enables all known individuals within the population to have an equal chance of being selected as a study subject.

3.4.2 Type of Study

Zikmund et al. (2010) explained that research methods should be chosen to fit the research problem, the study objective, the availability of data sources, the urgency of decisions and the cost of obtaining the data. This study was exploratory in nature, because it is a very early study in this field. Sekaran and Bougie (2010) suggested that exploratory studies are useful in investigating new and vague research subjects. It was also causal, to identify the reasons for actions. This type of study offers the advantage of replicability

(Hair, Black, Babin & Anderson, 2010). A descriptive element was used for the respondents' demographic profiles to support the exploratory approach.

3.4.3 Quantitative Versus Qualitative Research

Quantitative research allows for data measurement and analysis. It can examine associations and causality of the study variables. This is advantageous because the research findings are more objective (Zikmund et al., 2010). Quantitative research can also be used to test hypotheses because of its ability to measure data using statistics (Roscoe, 1975).

Qualitative research is heavily focused on the process. Quantitative research, however, emphasizes structural matters to test hypotheses (Saunders, Lewis & Thornhill, 2007), so offers a more objective view of the study and its participants (Hair et al., 2010). Hypothesis testing in quantitative research enables interpretation of empirical results, normalizing the data.

This study used a quantitative approach because it aimed to investigate the causes of safety culture factors and their effect on safety behavior among healthcare professionals. This was considered best addressed through quantifiable data that can be generalized to the population of interest. Quantitative methods were therefore used for data collection and analyses in the pilot test and the main study.

3.4.4 Data Collection Method

This research involved two phases of data collection:

1. Data collection for pilot testing; and
2. Data collection for the main study.

Pilot testing helps to determine the appropriateness of the data collection plan for the main study. This means that errors resulted from poor design can be minimized (Zikmund et al., 2010). Pilot testing also helps to identify and rectify problems with the data collection instrument (Sekaran & Bougie, 2010), allowing modification. Testing manipulations and measures in advance is important because the original instruments were tested in very different contexts (Brandt et al., 2014).

The pilot test was replicated in the main study. This involved gathering and measuring information on a series of variables in an established and systematic fashion. This process enabled the researcher to answer the research questions and evaluate the outcomes of the study. A formal data collection process is necessary to ensure that data are both defined and accurate, and to ensure that decisions based on the findings are valid (Cooper & Schindler, 2008). The process provides a baseline from which to measure and indicate what to improve. Accurate data collection is essential to maintaining the integrity of research (Zikmund et al., 2010). It requires selection of appropriate data collection techniques and instruments, and clearly defined instructions for their correct use to reduce the likelihood of errors (Sekaran & Bougie, 2010).

3.4.5 Primary Versus Secondary Data

Primary data were used in this study because no suitable secondary data were available. Primary data can be obtained using various techniques such as interviews (personal, telephone or computer-based), questionnaires (mail, electronically or personally-administered), focus groups, observation and experimentation (Sekaran & Bougie, 2010). This study used an online survey. Primary data from this source are considered reliable for replication of procedures and checking the result, because of the familiarity of the data collection procedure and analysis methods (Cooper & Schindler, 2008). The data were expected to provide up-to-date information that would directly address the research questions.

3.4.6 Survey Questionnaire

Online questionnaires are a popular data collection method, but may have a lower response rate than paper-based surveys (Kwak & Radler, 2002). To minimize the non-response bias, the number of online questionnaires distributed was doubled, to ensure that an adequate sample was collected (Dolnicar, Grün & Leisch, 2016). Respondents were guaranteed anonymity, confidentiality, and time to respond, to minimize the non-response rate. Frohlich (2002) considered that a response rate of between 30 and 35% was acceptable for generalization. Bartlett, Kotrlich and Higgins (2001) recommended a minimum returned sample size of just 119 for generalizability.

The online questionnaire was approved by the Institutional Review Board for Human Subjects Research (IRB) of Abu Dhabi University (Appendix A), and Abu Dhabi Health Services Company (SEHA) (Appendix B).

3.4.7 Questionnaire Design and Instrument Development

The online questionnaire was divided into two sections. Section A asked about the demographic characteristics of respondents. Section B was divided into six subsections covering the study variables.

To maximize the content validity of the measures, scales developed by other scholars were used and adapted to the context where necessary. A seven-point Likert-type scale ranging from (1) strongly disagree to (7) strongly agree was used. Symonds (1924) was the first to suggest that reliability is optimized with seven response categories. Other researchers have also suggested that a seven-point scale is suitable for measuring perceptions and opinions (Bearden, Netemeyer & Mobley, 1993; Finstad, 2010).

Safety climate was measured using three items from Neal et al. (2000). These measured management perspective on workplace health and safety. The items were averaged, and the score represented the perceptions of healthcare practioners on their management's views on workplace health and safety.

Safety management practices were measured through six dimensions of management commitment (seven items), safety training (six items), workers' involvement (five items), safety communication and feedback (five items), safety rules and policies (five items), and safety promotion policies (five items) adapted from Vinodkumar and Bhasi (2010). In total, 33 items asked about the practical system developed in the organization in response to statutory requirements. These questions focused mainly on mandatory information on workplace safety. A high score implies that healthcare practioners perceived that there was efficient delegation of safety activities, associated with management commitment, communication about safety issues, and effective involvement of employees.

The safety knowledge variable was measured by averaging out the replies provided to six items first used by Vinodkumar and Bhasi (2010). The items covered the degree of information on safety acquired through experience or formal and informal education. A high score implies a strong level of safety knowledge.

Safety motivation was also measured from six items obtained from Vinodkumar and Bhasi (2010). The scale measured the extent of individual willingness to exert effort to enact safety behaviors and the values associated with those behaviors. The items were averaged out, and a high score shows a stronger tendency to comply with safe working practices and participate in safety activities, linked to a positive safety climate in the workplace.

Safety attitudes was measured by averaging out five items adapted from Vinodkumar and Bhasi (2009). The scale asked about the degree of personal attributes that support a tendency to respond effectively in safety-related situations. A high score shows a stronger safety attitude.

Safety behavior was measured using items derived from Neal et al. (2000) and Vinodkumar and Bhasi (2010). The twelve items were split into two dimensions, safety compliance (seven items) and safety participation (five items). These covered the degree of individual assessment on favorable safety performance associated with safety participation and safety compliance. A high score suggests a higher level of safety behavior.

The 13 items on safety stressors were adapted from Sampson et al. (2014). Four items measured interpersonal safety conflict, four covered safety role ambiguity, and four assessed safety role conflict. The scale measures stress in response to each of these safety stressors encountered during task performance. The items were averaged out, and a high score shows high stress reactions

In line with the work of Alshareef et al. (2018), the questionnaire items were in English, and not translated into Arabic. This is because the main language used in teaching medicine, and the primary medium of instructional communication in the healthcare sector in most Arabic-speaking countries is English. Table 3.2 shows the sources used for the instrument development. The questionnaire is shown in Appendix C.

3.4.8 Data Analysis Technique

The data were analyzed using Statistical Package for Social Sciences (SPSS) version 18.0 (SPSS Inc., 2009). Structural equation modeling (SEM) used AMOS version 18.0 (Arbuckle, 2003). SPSS was used for the pilot study and SEM was used to test the measurement and structural models. Descriptive and frequency analysis was used for the demographic and other general characteristics of respondents. SEM was used for simultaneous estimation of multiple equations in examining the hypothesized model (Hair et al., 2010).

3.5 Pilot Testing

The online questionnaire underwent pilot testing to check its validity and reliability before the main study. Connelly (2008) suggested that pilot study samples should be 10% of the sample projected for the main study but other authors have argued that the sample required for a pilot study does not need to be a proportion of the main study sample (Albers & Lakens, 2018; Lane & Hennes, 2018). It is, however, not a straightforward issue to resolve the pilot sample size (Anderson et al., 2017). Hertzog (2008) argued that multiple factors were relevant, including the type of study. Overall, researchers have suggested that an appropriate pilot study sample size can range from 10 to 30 (Hill, 1998; Julious, 2005; Issac & Michael, 1995).

In this study, a pilot test was used to eradicate potential problems and weaknesses in the initial questionnaire. Confirmatory factor analysis (CFA) was used for the measurement model, with convergent and discriminant validity. Convergent validity specifies the set of items that measure a construct (Kline, 2010). It also tests the dimensionality of items as a representation of a common, latent construct (Ziegler & Hagemann, 2015) that explains a significant proportion of variance in the latent variables (Wang et al., 2015). Discriminant validity specifies the extent to which a construct is truly distinct from other constructs (Byrne, 2010). It therefore tends to indicate a much lower proportion of variance from other latent variables (Wang et al., 2015). This analysis is important to identify critical dimensions that would compromise the structure and criterion variables in subsequent analyses. It also enables understanding of the structure of the variables and determination of correlations among them (Field, 2013). This approach helps to evaluate the validity and reliability of the construct to ensure its replicability for field study

(Brandt et al., 2014; Cohen, Manion & Morrison, 2007; Maniadis, Tufano & List, 2017).

3.6 Data Examination and Preparation

The online survey responses were checked and edited. Editing helps to detect errors and omissions and therefore to achieve a minimum standard of data quality (Cooper & Schindler, 2008). Incomplete responses were identified, withdrawn and not analyzed. Non-response bias may lead to meaningful data being omitted. Yüksel (2017) explained that non-response bias must be treated carefully to ensure the result can be completely validated and mitigate higher variances for the estimates.

3.7 Model Specification

One main component of SEM is a measurement model that shows the relationship between the latent variables and their indicators. Hagel (2014) suggested that a psychometric theory required unidimensionality, and Ziegler and Hagemann (2015) posited that this technique is similar to testing the dimensionality of items. To determine which scale items should represent a common, latent construct, CFA was used. First order and second order model specifications were measured to differentiate between the original variables by extracting factors (Russell, 2002) to take into account factor inter-correlations. This reduces the number of items and builds latent constructs from fewer factors. This analysis is important to identify critical dimensions that could compromise the structure and criterion variables in subsequent analyses.

3.8 Convergent Validity

It is important to test the instrument to ensure that the convergent validity of the construct is acceptable, and to test for the model fit. Validity tests were carried out for first order, second order and third order models to examine the instrument (Cooper & Schindler, 2008). Validity describes the degree to which an instrument actually measures the conceptual and operational definitions (Guion, 1980). Cooper and Schindler (2008) argued that the measurement tool should be sensitive to changed situations and times, to ensure measurement is meaningful. Kline (2010) described convergent validity as assessing the set of items that is presumed to measure a construct.

According to Fornell and Larcker (1981), convergent validity of the order constructs must be validated using average variance extracted (AVE). This measures the amount of variance captured by a construct in relation to the amount of variance from measurement error. Convergent validity is established on the construct level when the AVE of each latent construct is higher than 0.50 (AVE > 0.50). Hair et al. (2010) added that factor loading should also be considered to establish convergent validity at construct level. Higher factor loadings or factor loadings higher than 0.50 ($\lambda > 0.50$) indicate high convergent validity.

3.9 Tests for Model Fit

The measurement adequacy of first order, second order, and third order models was further measured and verified through an assessment of model fit. It is advisable to consider several fit indices to assess the model fit in addition to the chi-square (χ^2) index and degree of freedom (*df*) (Bollen, 1990; Byrne, 2010; Hooper, Coughlan & Mullen, 2008; Miles & Shevlin, 2007). At least four common fit indices are sufficient to test the structural equation models (Byrne, 2010; Hooper et al., 2008).

The common fit indices recommended are Goodness-of-Fit Index (GFI), Normed-fit Index (NFI), Tucker–Lewis Index (TLI), Comparative Fit Index (CFI), and Root Mean Square Error of Approximation (RMSEA) (Byrne, 2010; Hair et al., 2010). In this study, relative χ^2 (χ^2/df), CFI, NFI, TLI and RMSEA were chosen instead of χ^2 and GFI, because they are less sensitive to sample size (Bollen, 1990; Kline, 2010; Miles & Shevlin, 2007). This approach is a basic task in SEM modeling that forms the basis for accepting one model over another. Table 3.3 shows the model fit indices for the study, and the acceptable thresholds.

3.9.1. Model of chi-square (χ^2) and Relative χ^2 (χ^2/df)

χ^2 is the fundamental measure used in SEM to quantify the differences between the observed and estimated covariance matrices (Hair et al., 2010). According to Hu and Bentler (1999), χ^2 value is the conventional measure to assess incongruity between sample and fitted covariance matrices. The probability value associated with χ^2 indicates the likelihood of obtaining a χ^2 value that exceeds the χ^2 value when the null hypothesis is true (Byrne, 2010). The higher the probability associated with χ^2, therefore, the closer the fit with the hypothesized model (under the null hypothesis). An insignificant threshold of 0.05 indicates a good model fit or known either “badness of fit” (Kline,

2010) or “lack of fit” measure (Mulaik et al., 1989) only if the reported sample size is between 100 to 200 (Tabachnick & Fidell, 2007) with cut-off value of less than 5.0 (Tabachnick & Fidell, 2007) or less than 3.0 (Kline, 2010).

Bentler and Bonnet (1980) explained that χ^2 is sensitive to sample sizes and tends to reject the model if very small or very large samples are used (Kenny & McCoach, 2003). Relative χ^2 (χ^2/df), also known as normed χ^2, minimizes the impact of sample size on the model (Wheaton, Muthen, Alwin & Summers, 1977). This is because df measures the amount of mathematical information available to estimate the model parameters and is calculated based on the number of unique covariances and variances in the observed covariance matrix (Hair et al., 2010). The criterion for acceptance value for this statistic varies, ranging from less than 2.0 (Tabachnick & Fidell, 2007, Ullman, 2001) through less than 3.0 (Kline, 2010) to less than 5.0 (Bentler, 1990; Marsh, Hau & Wen, 2004; Schumacker & Lomax, 2004; Wheaton et al., 1977) for sample sizes of more than 200 (Bentler, 1990; Marsh et al., 2004).

3.9.2 Comparative Fit Index (CFI)

The CFI is a revised form of the NFI (Byrne, 2010) and was introduced by Bentler (1990). CFI addresses the tendency to underestimate fit with smaller samples (Bentler, 1990; Tabachnick & Fidell, 2007). Tabachnick and Fidell (2007) argued that CFI is a common index used in SEM programs and has become popular because it is less sensitive to sample sizes (Fan, Thompson & Wang, 1999). Bentler (1990) suggested that CFI should be the index of choice for AMOS reporting.

This statistic assumes that all variables are uncorrelated, and compares the fit of a target model to the fit of an independent model (Bentler, 1990; Kline, 2010). CFI with value of more than 0.90 is commonly considered to represent a well-fitting model (Bentler, 1990; Hatcher, 1994), although Forza and Filippini (1998) suggested that a CFI value greater than 0.80 was sufficient. However, Hu and Bentler (1999) noted that a CFI value close to 0.95 was superior because it indicates a better fit.

3.9.3 Normed-fit Index (NFI)

The NFI was introduced by Bentler and Bonnet (1980) to assess the model by comparing the χ^2 of the null model. This index specifies that all measured variables are uncorrelated. Forza and Filippini (1998) and Greenspoon and Saklofske (1998) suggested that an NFI value of greater than 0.80 was a good fit, although Bentler and Bonnet (1980) recommended values greater than 0.90. Kline (2010) argued that NFI was unreliable for samples smaller than 200, but it has been proven reliable for samples bigger than 200 (Bentler, 1990; Mulaik et al., 1989). This index is often preferred because it is useful in more complex models (Bentler, 1990; Kline, 2010; Tabachnick & Fidell, 2007).

3.9.4 Tucker–Lewis Index (TLI)

The TLI is an incremental fit index, also known as the Non-Normed Fit Index (NNFI). It was developed to address the disadvantages of the

Normed Fit Index (NFI) (Anderson & Gerbing, 1988). A bigger TLI value indicates a better fit for the model. Values as low as 0.80 (Bentler, 1990; Hair et al., 2010) and larger than 0.95 are interpreted as a satisfactory fit (Hu & Bentler, 1999; Tabachnick & Fidell, 2007), but 0.90 is accepted as the cut-off value in many studies (Byrne, 2010). The key advantage of this fit index is that it is not significantly affected by sample size (Byrne, 2010; Hu & Bentler, 1999).

3.9.5 Root Mean Square Error of Approximation (RMSEA)

RMSEA measures the error of approximation in the population and is recognized as an important criteria in covariance structure modeling (Byrne, 2010). Browne and Cudeck (1993) explained that RMSEA is crucial in determining how best to fit population covariance into models with unknown parameter values. RMSEA values range from zero to 1.00. Byrne (2010), MacCallum et al. (1996), and Steiger (1998) recommended that the threshold value for RMSEA should be less than 0.08. Browne and Cudeck (1993), and Hu and Bentler (1999), however, argued that values of less than 0.05 and 0.06 indicated a good fit. This study concurred with Byrne (2010), MacCallum, Browne & Sugawara (1996), and Steiger (1998) that values of less than 0.08 appeared more realistic than the exact fit of less than 0.06.

Table 3.3

Summary of the observed model fit indices and acceptable threshold value for this study

Fit Indices	Recommended Threshold Value	Sources
χ^2	< 0.50	Tabachnick and Fidell (2007)
(reported if sample size between 100 and 200)	< 0.30	Ullman (2001), Kline (2005)
Relative χ^2 (χ^2/d.f)	< 2.0	Tabachnick and Fidell (2007) Ullman (2001)
(reported if sample size more than 200)	< 3.0	Kline (2005)
	< 5.0	Bentler (1990), Marsh et al. (2004), Schumacker and Lomax (2004), Wheaton et al. (1977)
Comparative Fit Index (CFI)	> 0.80	Forza and Filippini (1998)
	> 0.90	Bentler (1990)
	> 0.90	Hatcher (1994)
	> 0.95	Hu and Bentler (1999)
Normed-fit Index (NFI)	> 0.80	Forza and Filippini (1998)
	> 0.80	Greenspoon and Saklofske (1998)

	> 0.90	Bentler and Bonnet (1980)
Tucker–Lewis Index (TLI)	> 0.80	Bentler (1990)
	> 0.80	Hair et al. (2010)
	> 0.90	Byrne (2010)
	> 0.95	Hu and Bentler (1999)
	> 0.95	Tabachnick and Fidell (2007)
Root Mean Square Error of Approximation (RMSEA)	< 0.08	Byrne (2010)
	< 0.08	MacCallum et al. (1996)
	< 0.08	Steiger (1998)
	< 0.06	Hu and Bentler (1999)
	< 0.05	Browne and Cudeck (1993)

3.10 Discriminant Validity

Discriminant validity in the measurement model tests the relationships between latent variables. Studies (Hagel, 2014; Ziegler & Hagemann, 2015) have suggested that a construct should be measured for unidimensionality before a series of model tests for multidimensionality can be conducted. The unidimensionality of a construct is important because the nomological items should be defined and interpreted before results can be obtained and ideally replicated for the structural model. It also enables understanding of the structure of the variables and determination of the correlations among them

(Field, 2013). In this model and dataset, therefore, the dimensions were tested for associations with each other.

The validity test was conducted for all constructs in this study. CFA was used to assess the validity of the instrument, or the extent to which a construct is truly distinct from another. Fornell and Larcker (1981) argued that AVEs of two latent variables or manifest variables must be greater than the square of their correlations (r^2) for discriminant validity to be sufficient.

3.11 Test of Normality and Outliers

Normality can be assessed based on kurtosis and skew (Hair et al., 2010). Arbuckle (2003) explained that critical assumption in SEM analyses of AMOS in particular is that data must be multivariate normal. Kurtosis describes the “peakness” or “flatness” of the distribution compared with a normal distribution, and skew describes the balance of the distribution. If a distribution is unbalanced, it is skewed. A distribution shifted to the left has positive skew, and a shift to the right is a negative skew. Kurtosis and skewness values of ± 1 are acceptable normality (Marcoulides & Hershberger, 1997) and could be assumed at 0.05 significance level with z-statistic value less than 5.0 (Bentler & Satorra, 2010). This study used SEM-AMOS and kurtosis values of ± 7 (Byrne, 2010) and skew values of ± 2 (Gravetter & Wallnau, 2014) were considered normal at 0.05 significance level. This is consistent with Bentler and Satorra (2010), who suggested that these values, with a z-statistic of 3.476 were highly suggestive of normality in the sample.

3.12 Structural Model

There is a growing use of SEM in social science research and it has become very much a dominant multivariate technique (Hair et al., 2010). Three different strategies are often used in its application: (1) confirmatory modeling strategy, (2) competing modeling strategy, and (3) model development strategy. These help researchers to estimate a complex set of relationships.

This study used SEM to examine the causality between the variables outlined in the research framework. Hardy and Bryman (2004, p.35) argued that:

> *"When the phenomena of interest are complex and multidimensional, SEM is the only analysis that allows complete and simultaneous tests of all relationships."*

SEM was therefore considered appropriate for this study because it provides estimates of the strength of all hypothesized relationships between variables in the theoretical model (Byrne, 2010; Schreiber, Nora, Stage, Barlow & King, 2006; Tomarken & Waller, 2005). This allows researchers to develop more sophisticated theories (Williams, Gavin & Hartman, 2004).

A confirmatory modeling strategy was applied to the hypothesized model. Kline (2010) stated that within a confirmatory modeling strategy, the researcher specifies a model and SEM is used to determine whether the model fits the data. Byrne (2010) and Hair et al. (2010) explained that a good fit of the data does not mean that the proposed model is proven but that it is confirmed as one of several possible acceptable models.

To ensure the SEM procedures were performed appropriately, Byrne (2010) provided three fundamental levels of analyses for SEM with AMOS. For this study, the comprehensive "six stages in structural equation modeling" proposed by Hair et al. (2010) were applied to test both measurement theory (how the constructs are represented) and structural theory (how the constructs relate to each other), as shown in Figure 3.3.

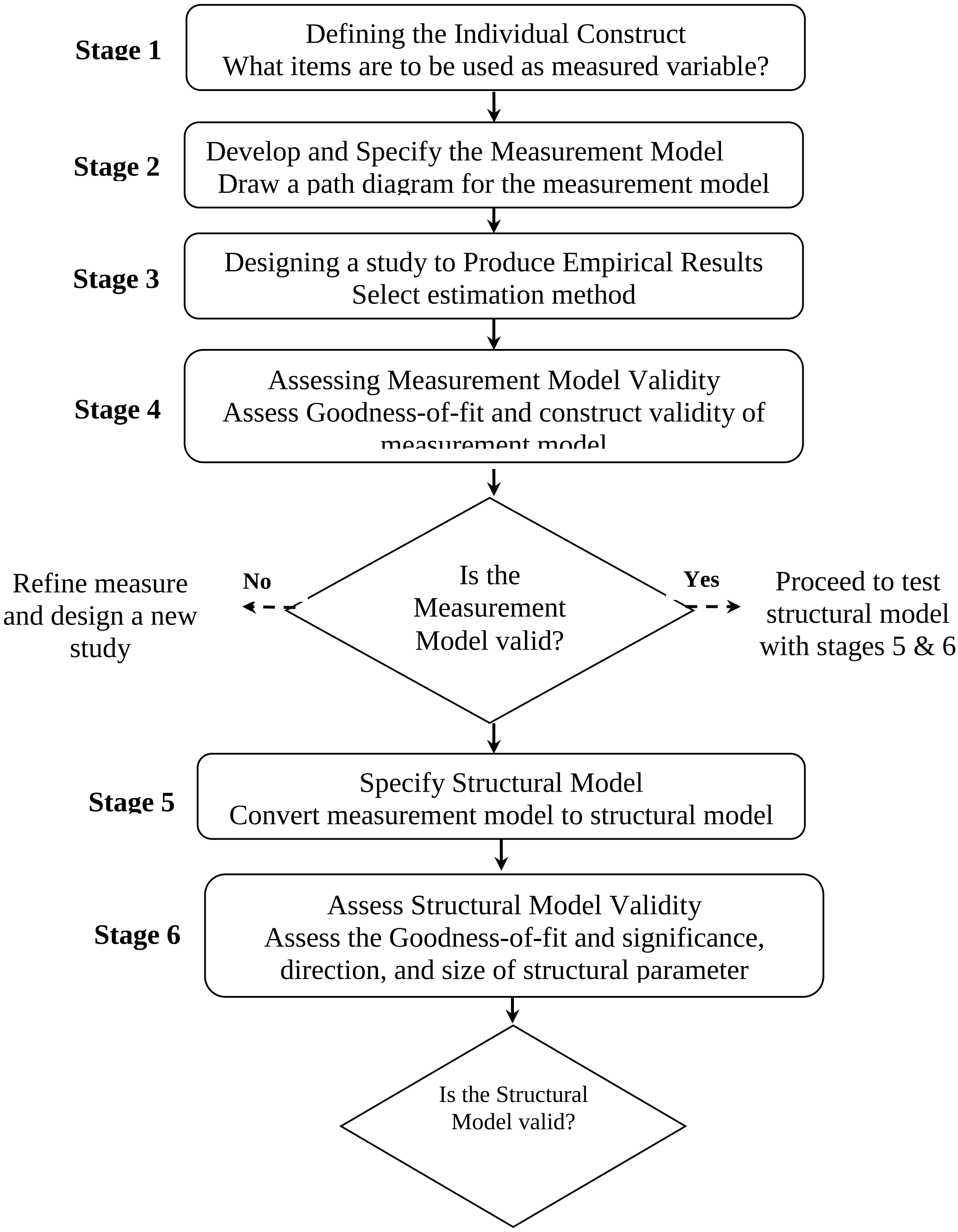

Figure 3.3

Six-stage process for structural equation modeling (Source: Hair et al., 2010)

3.13 Strategies of Measurement Invariance

One of the most common strategies to examine measurement invariance is multi-group confirmatory factor analysis (Kline, 2015).

Confirmatory factory analysis examines whether the hypothesized measurement model fits the data well, but multi-group confirmatory factor analysis can be used to compare the measurement model very precisely across groups. The progressive analytic strategy in multi-group CFA involves three steps, corresponding to the three invariance conditions of configural, metric, and scalar invariance (Kline, 2015; Vandenberg & Lance, 2000).

To examine configural invariance, the same measurement model can be examined separately for each group using CFA. The fit of the models can be evaluated using the common criteria recommended by Hu and Bentler (1999): robust χ^2, Comparative Fit Index (CFI < 0.90), and Root Mean Square Error of Approximation (RMSEA < 0.08). If the same measurement model fits the data well across groups, then configural invariance is supported.

The second step of invariance examination is to examine metric invariance by comparing two nested models, a baseline model and an invariance model. The baseline model allows the factor loadings to be freely estimated across multiple groups. The invariance model constrains the factor loadings to be equivalent across multiple groups. Differences between the two nested models are examined using the χ^2 difference test (Muthén, 1989) and the ΔCFI (Cheung & Rensvold, 2002; Meade & Lautenschlager, 2004). A non-significant result of the χ^2 difference test indicates that the invariance model is a better representation of the data because it fits the data equivalently relative to the baseline model, but has better parsimony (Muthén, 1989). In contrast, a significant result in the χ^2 different test would indicate that the baseline model is a better representation of the data, suggesting that the psychological meanings of the latent constructs vary across groups.

The χ^2 difference test is highly sensitive to sample size and less sensitive to a lack of invariance than ΔCFI (Cheung & Rensvold, 2002; Meade & Lautenschlager, 2004). Simulation studies comparing multiple goodness-of-fit indices (e.g., χ^2, AIC, RMSEA, and CFI) have recommended ΔCFI as it is independent of model complexity and sample size and a ΔCFI less than 0.01 indicates invariance (Cheung & Rensvold, 2002; Meade & Lautenschlager, 2004). Meade, Johnson & Braddy (2008) suggested that if ΔCFI indicates invariance and the sample size is greater than 200, any differences between groups are probably trivial and further analyses could proceed, even if the χ^2 difference test is significant.

Full metric invariance, where all latent constructs have the same meanings across groups, is rare in applied settings. Partial metric invariance, where several of the latent constructs show the same meanings across groups, could warrant further examination of scalar invariance on those latent constructs.

The final step of invariance examination is to examine scalar invariance by comparing the means of the latent constructs. This step can be conducted by using a similar nested-model comparison strategy. In this case, the baseline model would allow the means to be freely estimated across multiple groups. The invariance model would constrain the means to be equivalent across multiple groups.

3.14 Summary

This chapter dicusses the research design and data collection strategy. It also describes how the formulating and pilot-testing of an instrument increases the efficiency of data collection, and covers data analysis techniques. The chapter then describes the research framework. The next chapter outlines the data collection and data analysis procedures used to address the research objectives, and describes the results of this work.

CHAPTER 4: DATA ANALYSIS AND RESULTS

4.1 Introduction

This chapter describes the process of data analysis used to test the hypotheses developed in this study. This chapter is divided into four main sections. The first section reports the pilot test results. The second section describes the respondents' profile and descriptive statistics. The third sets out the measurement models for the variables. Finally, the fourth section shows the structural model used to confirm the hypothesized research framework.

4.2 Pilot Test

4.2.1 Data Examination

For the purpose of pilot testing, 200 online questionnaires were distributed via email and social media such as WhatsApp and Facebook over two weeks between 14th and 30th April 2018. Out of 180 responses received, only 150 respondents provided full responses, and 30 responses were therefore discarded as incomplete. The data were then transferred into SPSS 18.0 for analysis. Out of 150 participants, 52 were male (34.7%) and 98 female (65.3%). Participant ages ranged from 25 to 65 years, and the majority were nurses (59.3%; 89), with the biggest group of respondents having between one and five years of experience (35.3%; 53). The data were considered normal because skewness and kurtosis were within the acceptable limits of ± 2.0 (Gravetter & Wallnau, 2014) and ± 7.0 (Byrne, 2010).

4.2.2 Measurement Model

The measurement model for the pilot study gave adequate convergent validity with factor loadings of more than 0.50 and all first order models and second order model yielded satisfactory goodness-of-fit. These first order models met the cut-off values of less than 5.0 for χ^2/df (Bentler, 1990; Marsh et al., 2004; Schumacker & Lomax, 2004; Wheaton et al., 1977), less than 0.80 for RMSEA (Byrne, 2010; MacCallum et al., 1996; Steiger, 1998), and more than 0.80 for CFI (Forza & Filippini, 1998), NFI (Forza & Filippini, 1998) and TLI (Bentler, 1990; Hair et al., 2010). These indices were selected because of their sensitivity to some variables and insensitivity to sample size (Kline, 2010).

The discriminant validity met the threshold suggested for factor loadings (≥ 0.5) (Hair et al., 2010; Kline, 2010), AVEs (> 0.50) (Kline, 2010), Cronbach's alpha (> 0.60), composite reliability (CR) (≥ 0.60) (Nunnally & Bernstein, 1994; Raykov, 1998), and r-square (r^2) less than AVEs (Byrne, 2010), except for MC4, W15, SCF4, SRP2, SM4 and SK6, which had a factor loading of less than 0.50. These items were therefore dropped from their respective constructs. The tabulation of factor loadings, AVEs, Cronbach's alpha, and composite reliability is shown in Table 4.1.

The correlation (r) values were between 0.398, $p < 0.01$ (Safety participation ↔ Safety climate) and 0.772, $p < 0.01$ (Safety climate ↔ Safety management practices). The correlation values suggested that multicollinearity is not an issue, because r was not more than 0.80 (Cohen, 1992). The result of correlation is shown in Table 4.2.

Similar cut-off value of less than 5.0 for χ^2/df (Bentler, 1990; Marsh et al., 2004; Schumacker & Lomax, 2004; Wheaton et al., 1977), less than 0.08 for RMSEA (Byrne, 2010; MacCallum et al., 1996; Steiger, 1998), and more than 0.80 for CFI (Forza & Filippini, 1998), NFI (Forza & Filippini, 1998) and TLI (Bentler, 1990; Hair et al., 2010) were used to assess discriminant validity. The model had acceptable goodness-of-fit indices (χ^2 = 1142.665; df = 604; CFI = 0.901; NFI = 0.813, TLI = 0.891 and RMSEA = 0.077), and suggested that it could be used in the main study (Brandt et al., 2014; Cohen et al., 2007; Maniadis et al., 2017). The summary of fit indices of first order model, and second order model, and correlated model is shown in Table 4.3.

Table 4.1 The tabulation of factor loadings, AVEs, Cronbach's alpha, and composite reliability

Variables/ dimensions		Factor loadings	N	AVE	CA	CR
First order models						
Safety climate (SC)			3	0.624	0.790	0.833
	SC1	0.753**				
	SC2	0.807**				
	SC3	0.809**				
Safety management commitment (MC)			6	0.572	0.753	0.889
	MC1	0.880**				
	MC2	0.788**				
	MC3	0.747**				
	MC5	0.707**				
	MC6	0.726**				
	MC7	0.672**				
Safety training (ST)			6	0.601	0.771	0.900
	ST1	0.770**				
	ST2	0.785**				
	ST3	0.900**				
	ST4	0.639**				

	ST5	0.814**				
	ST6	0.718**				
Workers involvement in safety matters (WI)			4	0.632	0.788	0.871
	WI1	0.640**				
	WI2	0.759**				
	WI3	0.937**				
	WI4	0.814**				
Safety communication and feedback (SCF)			4	0.586	0.756	0.846
	SCF1	0.552**				
	SCF2	0.807**				
	SCF3	0.871**				
	SCF5	0.792**				
Safety rules and policies (SRP)			5	0.523	0.720	0.740
	SRP1	0.703**				
	SRP3	0.618**				
	SRP4	0.743**				
	SRP5	0.815**				
Safety promotion and policies compliance (SPP)			5	0.510	0.713	0.839
	SPP1	0.758**				

	SPP2	0.718**				
	SPP3	0.721**				
	SPP4	0.723**				
	SPP5	0.646**				
Safety knowledge (SK)			5	0.781	0.883	0.947
	SK1	0.930**				
	SK2	0.905**				
	SK3	0.898**				
	SK4	0.803**				
	SK5	0.877**				
Safety motivation (SM)			5	0.739	0.854	0.933
	SM1	0.928**				
	SM2	0.990**				
	SM3	0.860**				
	SM5	0.799**				
	SM6	0.691**				
Safety attitudes (SA)			5	0.764	0.871	0.941
	SA1	0.797**				
	SA2	0.777**				

	SA3	0.938**				
	SA4	0.938**				
	SA5	0.906**				
Safety compliance (SBC)			7	0.597	0.749	0.907
	SBC1	0.859**				
	SBC2	0.956**				
	SBC3	0.969**				
	SBC4	0.853**				
	SBC5	0.549**				
	SBC6	0.515**				
	SBC7	0.543**				
Safety participation (SBP)			5	0.584	0.751	0.872
	SBP1	0.612**				
	SBP2	0.555**				
	SBP3	0.892**				
	SBP4	0.882**				
	SBP5	0.816**				
Second order models						
Safety management practices (SMP)			6	0.722	0.836	0.938

	MC	0.909**				
	ST	0.966**				
	WI	0.889**				
	SCF	0.798**				
	SRP	0.941**				
	SPP	0.510**				
Safety behavior (SB)			2	0.702	0.825	0.820
	SBC	0.974**				
	SBP	0.675**				

Note: ** Significant at the 0.01 level; AVE = Average Variance Extracted; CR = Composite Reliability; CA = Cronbach's alpha.

Table 4.2 The correlation result of studied variables for the pilot study

	1	2	3	4	5	6	7
1. Safety climate (SC)	1						
2. Safety management practices (SMP)	0.772**	1					
	(0.596)						
3. Safety knowledge (SK)	0.543**	0.628**	1				
	(0.295)	*(0.394)*					
4. Safety motivation (SM)	0.501**	0.481**	0.725**	1			
	(0.251)	*(0.231)*	*(0.526)*				
5. Safety attitudes (SA)	0.556**	0.521**	0.729**	0.618**	1		
	(0.309)	*(0.271)*	*(0.531)*	*(0.382)*			
6. Safety compliance (SBC)	0.574**	0.607**	0.756**	0.725**	0.703**	1	
	(0.329)	*(0.368)*	*(0.572)*	*(0.526)*	*(0.494)*		
7. Safety participation (SBP)	0.397**	0.572**	0.577**	0.491**	0.577**	0.636**	1
	(0.158)	*(0.327)*	*(0.333)*	*(0.241)*	*(0.333)*	*(0.404)*	

Note: ** Correlation is significant at the 0.01 level (2-tailed); r^2 are in parentheses

Table 4.3. The summary of fit indices of first order model, and second order model, and correlated model

Models	χ^2	df	CFI	NFI	TLI	RMSEA
First order: safety climate (SC)	0.000	0	1.000	1.000	\tli	\rmsea
First order: safety management commitment (MC)	10.684	8	0.990	0.964	0.982	0.047
First order: safety training (ST)	5.554	6	1.000	0.990	1.002	0.000
First order: workers involvement in safety matters (WI)	5.148	2	0.990	0.984	0.969	0.031
First order: safety communication and feedback (SCF)	0.770	2	1.000	0.997	1.000	0.000
First order: safety rules and policies (SRP)	2.699	3	1.000	0.987	1.000	0.000
First order: safety promotion and policies compliance (SPP)	4.283	4	0.999	0.985	0.997	0.022
First order: safety knowledge (SK)	1.462	4	1.000	0.998	1.000	0.000
First order: safety motivation (SM)	1.933	2	1.000	0.998	1.000	0.000
First order: safety attitudes (SA)	0.424	3	1.000	0.999	1.000	0.000
First order: safety compliance (SBC)	6.845	8	1.000	0.993	1.000	0.000
First order: safety participation (SBP)	4.159	3	0.997	0.990	0.990	0.051
Second order: safety management practices (SMP)	699.651	370	0.878	0.875	0.866	0.077
Second order: safety behavior (SB)	91.873	48	0.969	0.939	0.958	0.078
Correlated model	1142.665	604	0.901	0.813	0.891	0.077

4.2.3 Summary of Pilot Test

The pilot test showed that the instrument and variables had sufficient convergent and discriminant validity. Construct inter-correlations suggested that there was no discriminant validity problem. These analyses supported the reliability of the measure, and suggested that the instrument had sufficient stability and consistency. The pilot test therefore suggested that the measures and instruments were suitable for use in the main study.

4.3 Main Study

The main study was conducted between 1st May and 31st July 2018. In total, 1,000 anonymous online questionnaires were distributed to all healthcare employees of SEHA, and 800 responses (80%) were received. Only 770 (77%) responses were complete. The 30 incomplete responses (23%) were removed from the analysis to avoid missing data. The response rate of 77% met the acceptable level for generalization of the study suggested by Frohlich (2002). Bartlett et al. (2001) suggested that a minimum returned sample size of as low as 119 is sufficient for generalizability.

The withdrawn responses had similar socio-demographic profiles (males, and higher age group). The valid responses were from 519 women (67.4%) and 251 men (32.6%), ranging in age from 25 to 65 years. Most respondents were nurses (494, 64.2%), 25.3% (195 respondents) were allied health professionals, and 10.5% (81 participants) were physicians. The largest group of respondents had more than 10 years of experience (35.1%, 270).

The data for the main study were considered normal because skewness and kurtosis were between the acceptable limits of ± 2.0 (Gravetter & Wallnau, 2014) and ± 7.0 (Byrne, 2010).

4.3.1 Measurement Model

A CFA was performed on the each of the study variables. The measurement model for all first order models and second order models were confirmed. All first order models and second order modesl yielded satisfactory goodness-of-fit as shown in Figures 4.1 to 4.8. These first order models met the cut-off values of less than 5.0 for χ^2/df (Bentler, 1990; Marsh et al., 2004; Schumacker & Lomax, 2004; Wheaton et al., 1977), less than 0.80 for RMSEA (Byrne, 2010; MacCallum et al., 1996; Steiger, 1998), and more than 0.80 for CFI (Forza & Filippini, 1998), NFI (Forza & Filippini, 1998) and TLI (Bentler, 1990; Hair et al., 2010).

Similar to the pilot study, MC4, W15, SCF4, SRP2, SM4 and SK6 were dropped from their respective constructs because had a factor loading of less than 0.50. The rest of the items rotated into seven constructs with factor loadings and AVEs of greater than 0.50 (Hair et al., 2010; Kline, 2010). The composite reliability and Cronbach's alpha values were well above 0.60 (Nunnally & Bernstein, 1994; Raykov, 1998), suggesting that the variables had good convergent validity (Byrne, 2010). The tabulation of factor loadings, AVEs, Cronbach's alpha, and composite reliability for the main study is shown in Table 4.4.

All seven constructs had correlations of between 0.430 (r^2 = 0.185) and

0.759 ($r^2 = 0.576$) at $p < 0.01$, with AVEs greater than r^2, showing sufficient discriminant validity. The r values for all studied variables were less than 0.80, thus there was no indication of multicollinearity effect (Cohen, 1992). Table 4.5 shows the correlation result for the main study.

Similar cut-off value of less than 5.0 for χ^2/df (Bentler, 1990; Marsh et al., 2004; Schumacker & Lomax, 2004; Wheaton et al., 1977), less than 0.08 for RMSEA (Byrne, 2010; MacCallum et al., 1996; Steiger, 1998), and more than 0.80 for CFI (Forza & Filippini, 1998), NFI (Forza & Filippini, 1998) and TLI (Bentler, 1990; Hair et al., 2010) were used to assess discriminant validity. The model had satisfactory goodness-of-fit indices ($\chi^2 = 1647.773$; df = 460; CFI = 0.955; NFI = 0.938, TLI = 0.948 and RMSEA = 0.058), and suggested that it could be used in the main study (Brandt et al., 2014; Cohen et al., 2007; Maniadis et al., 2017). The summary of fit indices of first order model, and second order model, and correlated model for the main study is shown in Table 4.6.

Table 4.4 The tabulation of factor loadings, AVEs, Cronbach's alpha, and composite reliability

Variables/ dimensions		Factor loadings	N	AVE	CA	CR
First order models						
Safety climate (SC)			3	0.786	0.886	0.917
	SC1	0.857**				
	SC2	0.890**				
	SC3	0.911**				
Safety management commitment (MC)			6	0.519	0.709	0.862
	MC1	0.830**				
	MC2	0.888**				
	MC3	0.778**				
	MC5	0.591**				
	MC6	0.611**				
	MC7	0.553**				
Safety training (ST)			6	0.677	0.822	0.926
	ST1	0.811**				
	ST2	0.866**				
	ST3	0.864**				
	ST4	0.766**				

	ST5	0.850**				
	ST6	0.774**				
Workers involvement in safety matters (WI)			4	0.626	0.789	0.870
	WI1	0.739**				
	WI2	0.748**				
	WI3	0.877**				
	WI4	0.792**				
Safety communication and feedback (SCF)			4	0.589	0.759	0.849
	SCF1	0.568**				
	SCF2	0.810**				
	SCF3	0.857**				
	SCF5	0.801**				
Safety rules and policies (SRP)			5	0.604	0.775	0.859
	SRP1	0.740**				
	SRP3	0.713**				
	SRP4	0.767**				
	SRP5	0.879**				
Safety promotion and policies compliance (SPP)			5	0.510	0.713	0.839
	SPP1	0.662**				

	SPP2	0.713**				
	SPP3	0.686**				
	SPP4	0.765**				
	SPP5	0.714**				
Safety knowledge (SK)			5	0.801	0.894	0.953
	SK1	0.832**				
	SK2	0.886**				
	SK3	0.933**				
	SK4	0.908**				
	SK5	0.912**				
Safety motivation (SM)			5	0.758	0.868	0.940
	SM1	0.901**				
	SM2	0.925**				
	SM3	0.919**				
	SM5	0.791**				
	SM6	0.806**				
Safety attitudes (SA)			5	0.783	0.883	0.947
	SA1	0.842**				
	SA2	0.796**				

	SA3	0.893**				
	SA4	0.958**				
	SA5	0.927**				
Safety compliance (SBC)			7	0.599	0.753	0.908
	SBC1	0.888**				
	SBC2	0.925**				
	SBC3	0.924**				
	SBC4	0.893**				
	SBC5	0.536**				
	SBC6	0.548**				
	SBC7	0.557**				
Safety participation (SBP)			5	0.562	0.740	0.862
	SBP1	0.574**				
	SBP2	0.619**				
	SBP3	0.858**				
	SBP4	0.827**				
	SBP5	0.824**				
Second order models						
Safety management practices (SMP)			6	0.777	0.878	0.954

	MC	0.896**				
	ST	0.907**				
	WI	0.947**				
	SCF	0.915**				
	SRP	0.885**				
	SPP	0.720**				
Safety behavior (SB)			2	0.728	0.840	0.839
	SBC	0.990**				
	SBP	0.690**				

Note: ** Significant at the 0.01 level; AVE = Average Variance Extracted; CR = Composite Reliability; CA = Cronbach's alpha.

Table 4.5 Result of correlation of studied variables of the main study

	1	2	3	4	5	6	7
2. Safety climate (SC)	1						
2. Safety management practices (SMP)	0.784**	1					
	(0.615)						
3. Safety knowledge (SK)	0.541**	0.659**	1				
	(0.293)	*(0.434)*					
4. Safety motivation (SM)	0.472**	0.481**	0.701**	1			
	(0.223)	*(0.231)*	*(0.491)*				
5. Safety attitudes (SA)	0.485**	0.494**	0.690**	0.725**	1		
	(0.235)	*(0.244)*	*(0.476)*	*(0.526)*			
6. Safety compliance (SBC)	0.519**	0.610**	0.740**	0.727**	0.759**	1	
	(0.269)	*(0.372)*	*(0.548)*	*(0.529)*	*(0.576)*		
7. Safety participation (SBP)	0.430**	0.601**	0.683**	0.580**	0.636**	0.695**	1
	(0.185)	*(0.361)*	*(0.466)*	*(0.336)*	*(0.404)*	*(0.483.)*	

Note: ** Correlation is significant at the 0.01 level (2-tailed); r^2 are in parentheses

Table 4.6. The summary of fit indices of first order model, and second order model, and correlated model for the main study

Models	χ^2	df	CFI	NFI	TLI	RMSEA
First order: safety climate (SC)	0.000	0	1.000	1.000	\tli	\rmsea
First order: safety management commitment (MC)	19.025	5	0.994	0.991	0981	0.060
First order: safety training (ST)	8.737	5	0.999	0.997	0.997	0.031
First order: workers involvement in safety matters (WI)	0.304	1	1.000	1.000	1.000	0.000
First order: safety communication and feedback (SCF)	0.712	1	1.000	0.999	1.000	0.000
First order: safety rules and policies (SRP)	2.012	3	1.000	0.999	1.000	0.000
First order: safety promotion and policies compliance (SPP)	3.152	4	1.000	0.998	1.000	0.000
First order: safety knowledge (SK)	15.472	4	0.997	0.996	0.993	0.061
First order: safety motivation (SM)	4.656	3	1.000	0.999	0.998	0.027
First order: safety attitudes (SA)	6.042	3	0.999	0.998	0.997	0.036
First order: safety compliance (SBC)	28.556	11	0.996	0.994	0.992	0.045
First order: safety participation (SBP)	20.683	5	0.988	0.985	0.976	0.075
Second order: safety management practices (SMP)	1359.23	370	0.935	0.913	0.929	0.059
Second order: safety behavior (SB)	199.505	49	0.977	0.970	0.970	0.063
Correlated model	1647.773	460	0.955	0.938	0.948	0.058

4.3.2 Structural Model

Once the measurement models were secured, the structural equation modelling was adaopted using the maximum likehood estimation in AMOS to examine the nomological network by testing the relationships between safety climate, safety management practices, safety knowledge, safety motivation and safety behavior, to confirm theoretically related constructs. Because of conceptualization of safety management practices is a second order factor model, the score of six dimensions were computed by averaging the items under each dimensions.

Figure 4.9 shows that the structural model generated a satisfactory goodness-of-fit (χ^2 = 2592.354; df = 569; CFI = 0.927; NFI = 0.908, TLI = 0.919 and RMSEA = 0.068). The goodness-of-fit indices satisfied the cut-off values of less than 5.0 for χ^2/df (Bentler, 1990; Marsh et al., 2004; Schumacker & Lomax, 2004; Wheaton et al., 1977), less than 0.80 for RMSEA (Byrne, 2010; MacCallum et al., 1996; Steiger, 1998), and more than 0.80 for CFI (Forza & Filippini, 1998), NFI (Forza & Filippini, 1998) and TLI (Bentler, 1990; Hair et al., 2010).

The investigation of causal path parameters showed that all regression coefficient of the hypothesized relationships were significant at $p < 0.01$. Safety climate was significantly related to safety management practices (β = 0.796, $p < 0.01$, R^2 = 63%). Safety management practices were significantly related to safety knowledge (β = 0.705, $p < 0.01$, R^2 = 50%) and safety motivation (β = 0.566, $p < 0.01$, R^2 = 32%). Safety knowledge (β = 0.176, p <

0.01), and safety motivation ($\beta = 0.842$, $p < 0.01$) were significantly related to safety attitudes ($R^2 = 86\%$), and safety attitudes were significantly related to safety behavior ($\beta = 0.888$, $p < 0.01$, $R^2 = 79\%$). Safety climate, safety management practices, safety knowledge, safety motivation and safety attitudes also significantly predicted the dimensions of safety behavior, safety participation ($\beta = 0.714$, $p < 0.01$, $R^2 = 51\%$) and safety compliance ($\beta = 0.974$, $p < 0.01$, $R^2 = 95\%$).

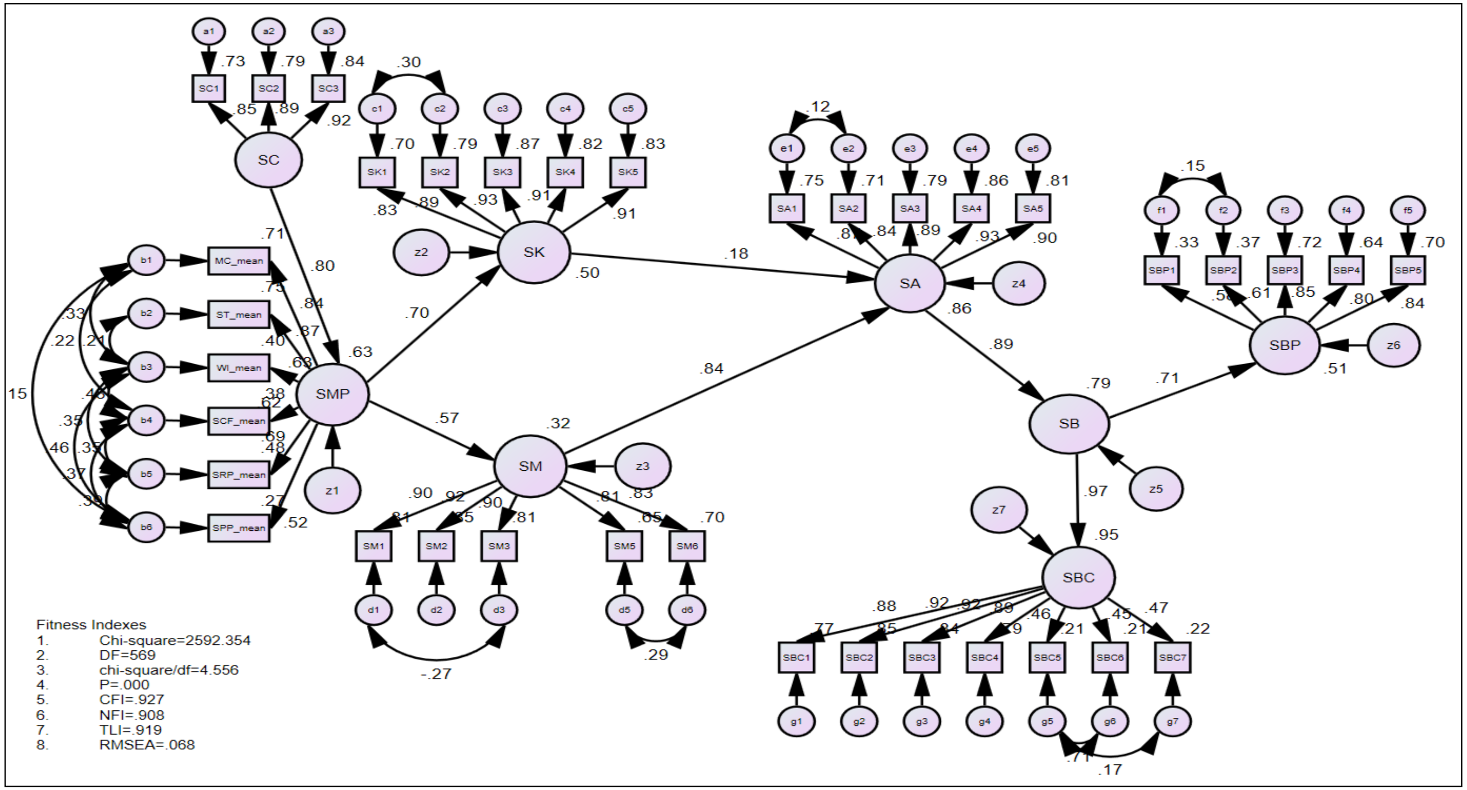

Figure 4.1 Final structural model

Notes: SC = Safety climate; SMP = Safety management practices; SK = Safety knowledge; SM = Safety motivation; SA = Safety attitudes; SBC = Safety behavior – compliance; SBP = Safety behavior – participation; MC = Safety management commitment; ST = Safety training; WI = Worker involvement in safety matters; SCF = Safety communication and feedback; SRP = Safety rules and policies; SPP = Safety promotion policies compliance.

Table 4.5 Structural paths regression weight of structural model

Hypotheses	Structural Paths			C.R.	P	β	R^2	Result
H1	SMP	←	SC	0.796	***	0.796	0.633	Significant
H2	SK	←	SMP	0.705	***	0.705	0.496	Significant
H3	SM	←	SMP	0.566	***	0.566	0.321	Significant
H4	SA	←	SK	0.175	***	0.175	0.859	Significant
H5	SA	←	SM	0.843	***	0.843	0.859	Significant
H6	SB	←	SA	0.894	***	0.894	0.789	Significant

Note: SC = Safety climate; SMP = Safety management practices; SK = Safety knowledge; SM = Safety motivation; SA = Safety attitudes; SBC = Safety behavior – compliance; SBP = Safety behavior – participation; MC = Safety management commitment; ST = Safety training; WI = Worker involvement in safety matters; SCF = Safety communication and feedback; SRP = Safety rules and policies; SPP = Safety promotion policies compliance; *** Regression coefficient is significant at the 0.01 level

4.4 Measurement Invariance

Multi-group confirmatory factor analysis was used to assess the measurement invariance, and whether the final structural model applied to measure the level of safety stressors. The measurement invariance reflects the extent to which the underlying constructs measure across groups through configural invariance, metric invariance, and scalar invariance (Kline, 2015). It checks whether the model is similarly perceived by all healthcare professionals despite the distinctiveness in terms of level of safety stressors.

A multisample analysis was used to assess the moderating role of safety stressors in the relationship between safety behavior and its five direct antecedents: safety climate, safety management practices, safety knowledge, safety motivation and safety attitudes. The safety stressors total sample was divided into two groups by level of safety stressors at work, using the arithmetic mean (García, Sanzo & Trespalacios, 2008). Some cases were very close to the mean (± ½ standard deviation) and were eliminated. The first group contained 551 healthcare professionals (72% of the total of 770), who showed a high level of safety stressors. The second group included 219 healthcare professionals (28% of the 770) with a lower level of safety stressors.

Initially, multisample analysis generates an individual structural solution for each group (healthcare professionals with low or high levels of safety stressors). Afterwards, this form of analysis offers information about the significance of the differences between the coefficients of the two models, using the invariant measurement test. Tables 4.13 and 4.14 show the results of multisample analysis based on the differences between healthcare professionals with low and high level of safety stressors. All causal paths were significantly different ($p < 0.01$) in both variant and invariant groups for higher and lower levels of safety stressors.

The path coefficient for healthcare professionals with a higher level of safety stressors in invariant model shows: safety management practice ← safety climate ($\beta = 0.806$, $p < 0.01$, $R^2 = 65\%$), safety knowledge ← safety management practice ($\beta = 0.701$, $p < 0.01$, $R^2 = 49\%$), safety motivation ← safety management practice ($\beta = 0.586$, $p < 0.01$, $R^2 = 34\%$), safety attitudes ← safety knowledge ($\beta = 0.144$, $p < 0.01$), and safety attitudes ← safety motivation ($\beta = 0.819$, $p < 0.01$) contributing to $R^2 = 79\%$ of safety attitudes. Safety behavior ← safety attitudes ($\beta = 0.888$, $p < 0.01$, $R^2 = 79\%$), with compliance ← safety behavior ($\beta = 0.911$, $p < 0.01$, $R^2 = 83\%$), and participation ← safety behavior ($\beta = 0.801$, $p < 0.01$, $R^2 = 64\%$).

The path coefficient for healthcare professionals with a lower level of safety stressors in invariant model shows: safety management practice ← safety climate ($\beta = 0.880$, $p < 0.01$, $R^2 = 72\%$), safety knowledge ← safety management practice ($\beta = 0.853$, $p < 0.01$, $R^2 = 73\%$), safety motivation ← safety management practice ($\beta = 0.786$, $p < 0.01$, $R^2 = 62\%$), safety attitudes ← safety knowledge ($\beta = 0.530$, $p < 0.01$), and safety attitudes ← safety motivation ($\beta = 0.517$, $p < 0.01$) contributing to $R^2 = 92\%$ of safety attitudes. Safety behavior ← safety attitudes (β

$= 0.980$, $p < 0.01$, $R^2 = 96\%$), with compliance ← safety behavior ($\beta = 0.877$, $p < 0.01$, $R^2 = 94\%$), and participation ← safety behavior ($\beta = 0.971$, $p < 0.01$, $R^2 = 77\%$).

The path coefficient for healthcare professionals with a higher level of safety stressors in variant model shows: safety management practice ← safety climate ($\beta = 0.811$, $p < 0.01$, $R^2 = 66\%$), safety knowledge ← safety management practice ($\beta = 0.702$, $p < 0.01$, $R^2 = 49\%$), safety motivation ← safety management practice ($\beta = 0.587$, $p < 0.01$, $R^2 = 35\%$), safety attitudes ← safety knowledge ($\beta = 0.150$, $p < 0.01$), and safety attitudes ← safety motivation ($\beta = 0.812$, $p < 0.01$) contributing to $R^2 = 78\%$ of safety attitudes. Safety behavior ← safety attitudes ($\beta = 0.893$, $p < 0.01$, $R^2 = 80\%$), with compliance ← safety behavior ($\beta = 0.934$, $p < 0.01$, $R^2 = 87\%$), and participation ← safety behavior ($\beta = 0.801$, $p < 0.01$, $R^2 = 64\%$).

The path coefficient for healthcare professionals with a lower level of safety stressors in variant model shows: safety management practice ← safety climate ($\beta = 0.833$, $p < 0.01$, $R^2 = 69\%$), safety knowledge ← safety management practice ($\beta = 0.809$, $p < 0.01$, $R^2 = 66\%$), safety motivation ← safety management practice ($\beta = 0.713$, $p < 0.01$, $R^2 = 51\%$), safety attitudes ← safety knowledge ($\beta = 0.393$, $p < 0.01$), and safety attitudes ← safety motivation ($\beta = 0.681$, $p < 0.01$) contributing to $R^2 = 73\%$ of safety attitudes. Safety behavior ← safety attitudes ($\beta = 0.953$, $p < 0.01$, $R^2 = 91\%$), with compliance ← safety behavior ($\beta = 0.957$, $p < 0.01$, $R^2 = 92\%$), and participation ← safety behavior ($\beta = 0.780$, $p < 0.01$, $R^2 =$

61%).

The invariant structural model (χ^2/df = 4.102; CFI = 0.887; NFI = 0.856, TLI = 0.878 and RMSEA = 0.064), and the variant structural model (χ^2/df = 4.185; CFI = 0.887; NFI = 0.857, TLI = 0.875 and RMSEA = 0.064) for healthcare professionals with higher levels of safety stressors achieved satisfactory goodness-of-fit. The invariant structural model (χ^2/df = 4.102; CFI = 0.887; NFI = 0.856, TLI = 0.878 and RMSEA = 0.064), and the variant structural model (χ^2/df = 4.185; CFI = 0.887; NFI = 0.857, TLI = 0.875 and RMSEA = 0.064) for healthcare professionals with lower levels of safety stressors also attained satisfactory goodness-of-fit. The goodness-of-fit indices satisfied the cut-off values of less than 5.0 for χ^2/df (Bentler, 1990; Marsh et al., 2004; Schumacker & Lomax, 2004; Wheaton et al., 1977), less than 0.80 for RMSEA (Byrne, 2010; MacCallum et al., 1996; Steiger, 1998), and more than 0.80 for CFI (Forza & Filippini, 1998), NFI (Forza & Filippini, 1998) and TLI (Bentler, 1990; Hair et al., 2010). The additional constraints of these equal factor loadings with respect to the specific constructs between healthcare professionals with low and high levels of safety stressors (ΔCMIN = 27.303; df = 26; p = 0.394) showed no significant difference in the relationship between safety behavior and its five direct antecedents, safety climate, safety management practices, safety knowledge, safety motivation and safety attitudes among healthcare professionals. Figure 4.2, Figure 4.3, and Figure 4.4 show the interaction plot of safety attitudes and its dimensions with safety stressors in predicting safety behavior.

Table 4.7 The results of causal path coefficients of multisample analysis based on the differences between healthcare professionals with low and high levels of safety stressors

			High level of safety stressors		Low level of safety stressors	
			Invariant model β	**Variant model β**	**Invariant model β**	**Variant model β**
SMP	←	SC	0.806***	0.811***	0.850***	0.833***
SK	←	SMP	0.701***	0.702***	0.853***	0.809***
SM	←	SMP	0.586***	0.587***	0.786***	0.713***
SA	←	SK	0.144***	0.150***	0.530***	0.393***
SA	←	SM	0.819***	0.812***	0.517***	0.681***
SB	←	SA	0.888***	0.893***	0.980***	0.953***
SBC	←	SB	0.911***	0.934***	0.877***	0.957***
SBP	←	SB	0.801***	0.801***	0.971***	0.780***

Notes: SC = Safety climate; SMP = Safety management practices; SK = Safety knowledge; SM = Safety motivation; SA = Safety attitudes; SBC = Safety behavior – compliance; SBP = Safety behavior – participation; *** significant at 0.01 level.

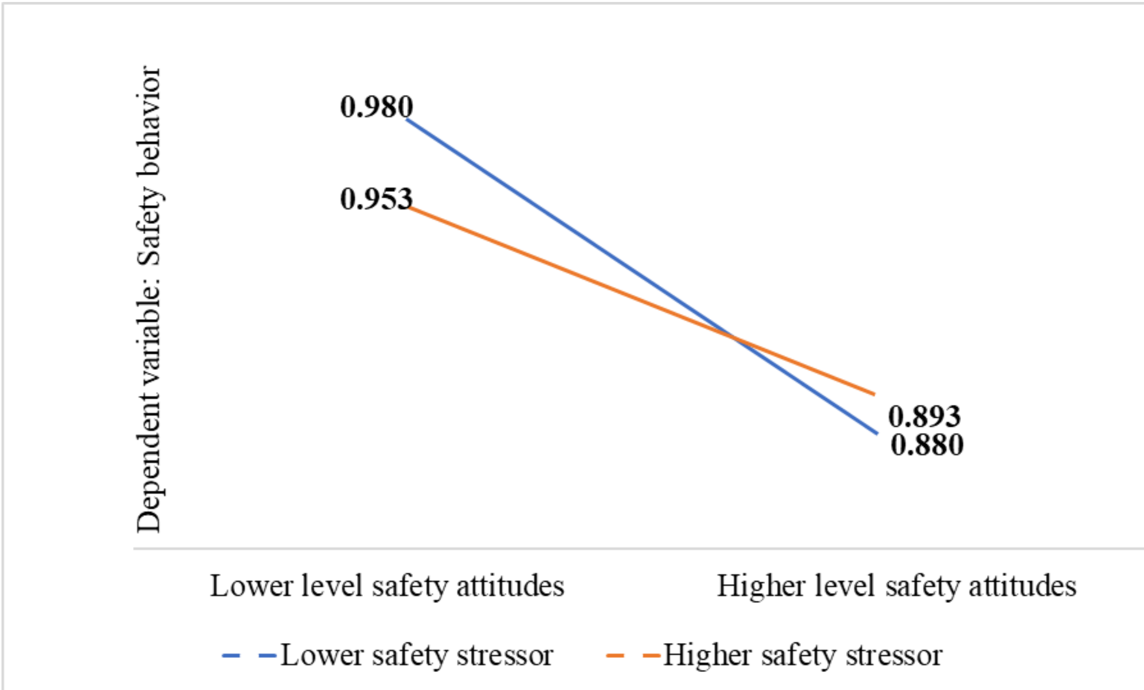

Figure 4.2 The interaction plot of safety attitudes and safety stressors in predicting safety behavior

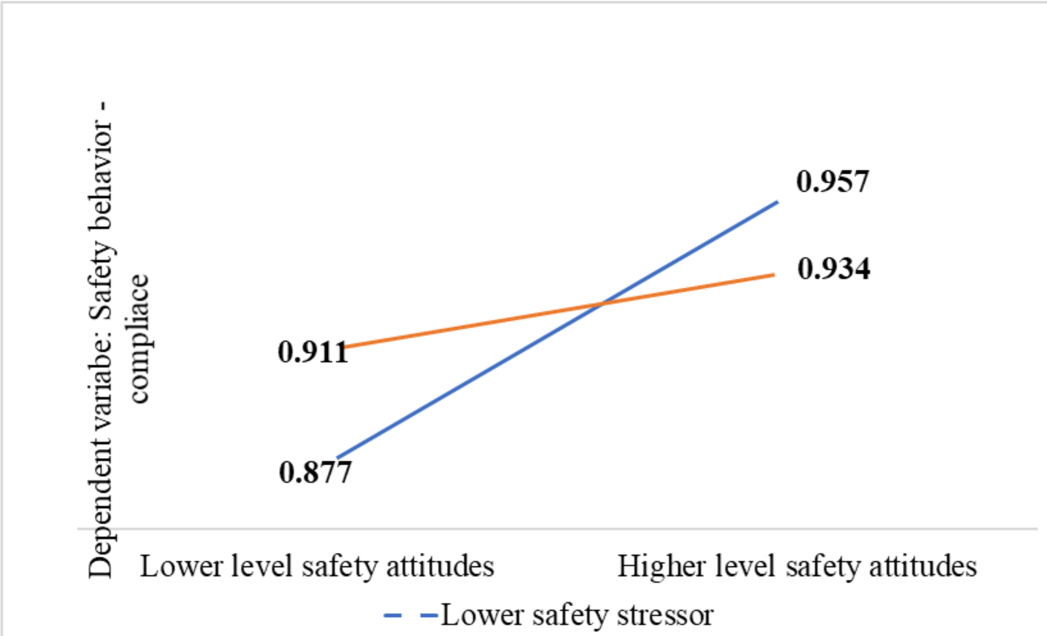

Figure 4.3 The interaction plot of safety attitudes and safety stressors in predicting safety behavior – compliance

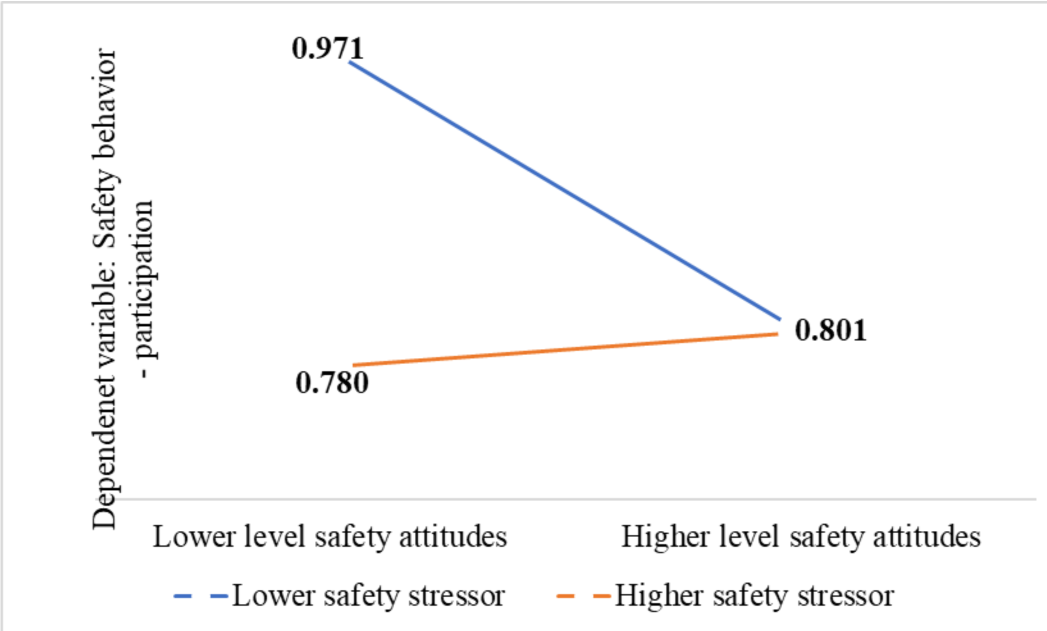

Figure 4.4 The interaction plot of safety attitudes and safety stressors in predicting safety behavior - participation

4.4 Summary

This chapter reports the results from 770 healthcare professionals working in Abu Dhabi. The data were analyzed using different tests and approaches, via SPSS and AMOS-SEM. Tests for normality were used to increase the potential of generating a normal distribution of data. The results suggested that responses were not affected by non-response bias. Kurtosis and skewness were normal and there was no evidence of multivariate outliers.

SPSS was used to examine the demographic descriptive data, and SEM-AMOS for the measurement models of pilot and main studies. Confirmatory factor analysis was used to interpret the measurement model. The model showed that all constructs had satisfactory convergent validity and discriminant validity. There were no issues of multicollinearity.

The final structural model had sufficient goodness-of-fit, and showed that safety climate, safety management practices, safety knowledge, safety motivation and safety attitudes were significant and contributed strongly to safety behavior (R^2 = 79%), and its dimension, safety participation (R^2 = 51%) and safety compliance (R^2 = 95%). The multisample analysis using invariant measurement confirmed that the level of safety stressors did not significantly affect the relationships between the other variables (ΔCMIN = 27.303; df = 26; p = 0.394). The results therefore suggest that healthcare professionals perceived that safety climate, safety management practices, safety knowledge, safety motivation and safety attitudes were important factors of safety culture that significantly affected their safety behavior at work. Table 4.8 shows a summary of the hypothesis-testing results.

Table 4.8 Summary of the hypothesis-testing results

Research Questions	Research Objective	Hypotheses	Remarks
(a) What are the safety culture factors that influence the safety behavior of healthcare professionals in the UAE healthcare sector?	(a) To investigate the effect of safety culture factors on safety behavior of heathcare professionals in the UAE healthcare sector	*H1: Safety climate is significantly related to safety management practices*	Accepted
(b) To what extent do safety culture factors affect the safety behavior of healthcare professionals in the UAE healthcare sector?	(b) To determine the contribution of safety culture factors to safety behavior of heathcare professionals in the UAE healthcare sector	*H2: Safety management practices are significantly related to safety knowledge*	Accepted
		H3: Safety management practices are significantly related to safety motivation	Accepted
		H4: Safety knowledge is significantly related to safety attitudes	Accepted

		H5: Safety motivation is significantly related to safety attitudes	Accepted
		H6: Safety attitudes are significantly related to safety behavior	Accepted
(c) Do high or low levels of safety stressors moderate the relationship between safety culture factors and safety behavior of heathcare professionals in the UAE healthcare sector?	(c) To examine the moderating effect of low or high levels of safety stressors in the relationship between safety culture factors and safety behavior of healthcare professionals in the UAE healthcare sector.	*H7: The effect of safety climate, safety management practices, safety knowledge, safety motivation and safety attitudes on safety behavior will be strengthened if the level of safety stressors is lower*	Rejected

CHAPTER 5: DISCUSSION

5.1 Introduction

This chapter discusses the research findings and sets them in the context of previous studies. It is structured around the principal research aim, divided into three objectives and seven hypotheses. The chapter also discusses the theoretical and practical contribution of this research, sets out the limitations of the research and makes some suggestions for future research.

5.2 Discussion of research findings

The objective of this study was to determine the safety culture factors that influence the safety behavior of healthcare professionals in Abu Dhabi. It investigated:

(a) The effect of safety culture factors on safety behavior;

(b) The extent of the contributions of these safety culture factors on safety behavior;

(b) The effect of low or high levels of safety stressors on the relationship between safety culture factors and safety behavior of healthcare professionals.

There has been an increased awareness of the importance of safety culture factors in shaping human behavior in the healthcare sector in recent years. Researchers have found considerable evidence of a positive relationship between safety climate and safety performance (Neal & Griffin, 2006; Steyrer et al., 2012). However, little was known about the extent to which safety culture factors influence safety behavior. This suggested a need to investigate and better understand the influence of safety culture factors, by exploring their effects on safety behavior. A quantitative approach was used to enhance the generalizability of the results. Data collection was through an anonymous online survey and the 770 complete responses were analyzed using Statistical Package for Social Sciences (SPSS) version 18.0 (SPSS Inc., 2009) and structural equation modeling (SEM) using AMOS version 18.0 (Arbuckle, 1995). The response rate of 77% met the acceptable standard for generalization of the study suggested by Frohlich (2002). In UAE, especially in the Emirates of Abu Dhabi, the safety culture factors have already started getting more attention in the last decade from the local authorities such as the Department of Health and SEHA. The focus on two aspects of employee safety culture and patient safety culture. Authority suggests when the employee works in a safe environment, this will affect positively in improving the patient safety culture. One of the intitiative that Arab Countries started is the Patient Safety Friendly Hospital Initiative (PSFHI) standards that assessed the safety of patients in the Arab countries. PSFHI is one of the WHO initiatives that contribute towards the development of a systematic system of patient protection by institutions in countries, launched in 2007 by the Eastern Mediterranean Regional Office of the WHO to improve the patient safety rate in the region. Ministries of health were evaluated using the PSFHI, covering Egypt, Jordan, Morocco, Pakistan, Sudan, Tunisia and Yemen in seven developing countries. One hospital was evaluated against PSFHI standards in each state. Therefore, leadership and management engagement were found to be some key areas in which all organizations in UAE require. Leadership is important for patient safety because it recognizes the system-related problem of safe care (Elmontsri et al., 2017).

Safety culture factors including safety climate, safety management practices, safety knowledge, safety motivation, and safety attitudes significantly influenced safety behavior (R^2 = 80%) and its dimensions, safety participation (R^2 = 50%) and safety compliance (R^2 = 93%). The multi-sample analysis using invariant measurement confirmed that the relationship between safety behavior and safety culture factors was not influenced by healthcare professionals by higher levels of safety stressors There were no significant differences in the relationship between safety behavior and its five direct antecedents, among healthcare professionals at different levels of safety stressors. Healthcare professionals perceived safety climate, safety management practices, safety knowledge, safety motivation, and safety attitudes as important factors of safety culture that significantly affected their safety behavior at work. Comparing with the rest of the world patient safety culture must be implemented as a tool to enhance patient safety in the Arab world. All stakeholders, such as policymakers, health care providers and medical educators should be involved in improving the culture of patient safety. The various contexts in which the Hospital Survey on Patient Safety Culture (HSPSC) was implemented could have affected the areas of strength and weakness, given the different views of the health workers regarding safety culture (Elmontsri et al., 2017).

5.2.1 Findings Related to Research Questions

5.2.1.1 Research question 1: What are the safety culture factors that influence the safety behavior of healthcare professionals in the UAE healthcare sector?

Flin et al. (2006) argued that the literature lacks an integrative framework to guide examinations of safety culture factors in a wide range of contexts. The absence of such a framework has contributed to the lack of a consensual definition of safety culture factors in the healthcare sector (Bronkhorst, 2015; Flin et al., 2006; Guldenmund, 2007). Safety culture was operationally defined for this study as the shared values, beliefs, attitudes, and perceptions manifested in employee perceptions of environmental safety and organizational characteristics that influence safety behavior (Cooper, 2000; Cox & Flin, 1998; Guldenmund, 2000; Pidgeon, 1991; Zohar, 1980). The results from the study showed that safety climate, safety management practices, safety knowledge, safety motivation, and safety attitudes are safety culture factors that significantly influence safety behavior. These measurable factors, therefore, define safety culture factors in the healthcare sector, filling a gap in the literature (Bronkhorst, 2015; Flin et al., 2006; Guldenmund, 2007). In the UAE, healthcare organizations concentrate on patient safety culture by improving the monitoring of medical errors and enhancing the safety culture. They set up an event-reporting system for all adverse and sentinel accidents using the Patient Safety Net (PSN) of the University Healthcare Consortium (UHC), SEHA, an operator in Abu Dhabi and the largest healthcare network in the UAE, in 2009. In 2011, the Department of Health of Abu Dhabi (DoH) supervised health service in Abu Dhabi. Besides, the DOH and the Dubai Health Authority requires health professionals to monitor and interact with patient-related adverse incidents (Edrees et al., 2017). On the other side, in enhancing a safety culture of employees, The government in Emirate of Abu Dhabi introduces a new system in 2008 called Occupational Safety and Health and Management System (OSHMS) and this system manages employee health and safety and minimize accidents and enhance a safe working environment. OSHSM focuses on improving safety culture and identifying factors that influence a safe working environment.

5.2.1.2 Research question 2: To what extent do the safety culture factors affect safety behavior of healthcare professionals in the UAE healthcare sector?

Safety climate, safety management practices, safety knowledge, safety motivation, and safety attitudes were significant and contributed highly to safety behavior (R^2 = 80%) and both its dimensions (safety participation, R^2 = 50%, and safety compliance, R^2 = 93%). Safety culture is a subset of organizational culture manifest in policies, procedures, and practices (Guldenmund, 2007). It encompasses the norms, values, and basic assumptions of the entire organization (Blegen et al., 2005). In healthcare, therefore, it covers how patient and worker safety are thought about and implemented within an organization, and the structures and processes that support safety (Gutberg & Berta, 2017; Nieva & Sorra, 2003). There is, however, no consensus on an operational definition of safety culture in healthcare. The safety culture factors considered in this study (i.e., safety climate, safety management practices, safety knowledge, safety motivation, and safety attitudes) were significantly related to relevant, observable outcomes. Hence, they may provide an operational definition of safety culture in healthcare. In 2012, one project in Abu Dhabi implemented 18 Intensive Care Units (ICUs) to increase patient safety and to reduce the incidence of central line-associated blood-stream infections (CLABSI). The system had an infant and neonatal ICUs and showed an overall 38% reduction of CLABSI levels. To identify factors that influence voluntary reporting between front line health providers and make recommendations on how to establish and maintain a strong culture of safety in the community, survey data were also collected as part of this reduction effort of the CLABSI (Edress et al., 2017).

5.2.1.3 Research question 3: Do high or low levels of safety stressors moderate the relationship between safety culture factors and safety behavior of healthcare professionals in the UAE healthcare sector?

Occupational stressors negatively impact job performance, but previous results were inconsistent on safety-specific stressors (Park et al., 2015; Petrou et al., 2015; Wang et al., 2015; Zhang et al., 2014). Action theorists had predicted that safety stressors would be detrimental to both safety compliance and participation (Sampson et al., 2014). The results, however, did not fit this prediction. There was no evidence that the influence of safety climate, safety management practices, safety knowledge, safety motivation, and safety attitudes on safety behavior would be changed if healthcare professionals' levels of safety stressors altered. In this context, a study was conducted in three major Dubai-related hospitals and found that stress is more associated with socio-demographics among physicians and UAE doctors are more stressed, with women having more stress, because of women are mostly involved in family roles (Al Mazrouei, et al., 2015).

5.2.2 Findings related to hypotheses

5.2.2.1 H1: Safety climate is significantly related to safety management practices

Flin (2007) proposed a conceptual model of safety climate that included both worker and patient injury, making it specific to healthcare settings. Flin’s inclusion of individual motivation in the safety climate–injury pathway reflected previous findings (Neal et al., 2000), which showed that worker safety knowledge and motivation partially mediated the relationship between safety climate and safety performance. Flin (2007) further hypothesized that safety climate is similar for both worker and patient injury, and this led to the first hypothesis in this study. It was, however, not known whether safety climate was significantly related to safety management practices in the healthcare context. Based on the results, H1 was accepted, confirming that safety climate is significantly related to safety management practices in healthcare settings. Like other countries, it is equally important to the healthcare industries in the UAE to perform safety management by making efforts in generating safety climate. For managing patient’s safety in healthcare both control-based and commitment-based management is useful but commitment-based safety management is more valuable when encouragement comes for speaking.

In UAE healthcare sector, safety management practices hava an essential impact on shaping the safety climate. In different healthcare sectors in the same Emirates who are implementing a similar structure for policies and procedures, those who have emphasized on different safety management practices factors such as senior management commitment, employees involvement, and effective communication, they have solid safety climate.

5.2.2.2 H2: Safety management practices are significantly related to safety knowledge

The hypothesis was also accepted based on the findings. The acceptance of H2 was consistent with previous studies. It suggests that to improve the level of safety and health for all employees, organizations should institute a systematic, comprehensive safety and health training program for new employees, and provide a system to help orient new employees on safety, health and quality systems (Vredenburgh, 2002). Researchers have also found that organizations with lower accident rates provided good safety training for employees (Anderson, 2005; Probst & Estrada, 2010; Sinclair et al., 2010; Tucker et al., 2014; Vredenburgh, 2002; Yorio & Wachter, 2014). One of the elements of OSHSM is training and competency, healthcare settings who are employing OSHSM has an annual training plan that includes annual mandatory training, refresher training, job-specific training. Those training courses include different topics for safety such as fire safety, manual handling, infection control practices. In this study, safety training to increase safety knowledge is considered a management practice, suggesting that there is a relationship between safety knowledge and safety management practices. Acceptance of H2 confirmed this relationship in healthcare settings

5.2.2.3 H3: Safety management practices are significantly related to safety motivation

The level of enforcement of safety rules and procedures had been identified as a safety management practice that can influence safety motivation (Hale et al., 2015; Pinto, 2014; Taylor & Snyder, 2017). An additional association between management practices and motivation was suggested by Vredenburgh (2002), who contended that a well-designed reward system characterized by a high level of organizational visibility and recognition can contribute to motivation and thereby modify the behavior. One of the safety management practices factor in this study is the involvement of employee in any new process. In UAE healthcare sectors who are implementing OSHMS, employee involvement is one of the requirements. Employees are consulted in introducing any new process or procedure, introducing any new change or purchasing any new equipment that would affect employees safety or patient safety. Employees are involved through a risk assessment process as this process helps the hospital in identifying risks with the new change and propses adequate control measures. The involvement of the employee will positively affect safety compliance and participation which is in this study context definition of safety motivation. Therefore, the acceptance of H3 confirmed that safety management practices were significantly related to safety motivation in healthcare, suggesting that findings linking safety motivation and specific safety management practices (e.g. Hale et al., 2015; Pinto, 2014; Taylor & Snyder, 2017; Vredenburgh, 2002) may have practical implications for safety management in healthcare.

5.2.2.4 H4: Safety knowledge is significantly related to safety attitudes

Brasaite et al. (2015) urged further investigation into healthcare professionals' safety knowledge and its relation to their attitudes to self-reporting accidents. This was supported by Neal and Griffin (2006), who suggested that safety climate and safety knowledge can have important and lasting effects on employees' safety behavior. Christian et al. (2009) also reported that safety behavior was strongly related to safety knowledge, and Neal et al. (2000) found that safety knowledge can predict safety attitudes. Safety training, safety communication, and safety rules and procedures were significantly related to safety knowledge (Vinodkumar & Bhasi, 2010). Acceptance of H4 confirmed the relationship between safety knowledge and safety attitudes in healthcare settings. For example, healthcare professionals must report adverse drug reactions (ADRs) globally. For protecting patients, it is essential to know ADRs and the behaviour of health professionals in relation to ADR documents. Nevertheless, medical professionals have primarily little knowledge of ADR, due to a lack of experience in pharmacovigilance, workload and permitted liabilities.

5.2.2.5 H5: Safety motivation is significantly related to safety attitudes

Studies have consistently indicated that higher levels of safety motivation are positively related to effective organizational safety management practices

(Christian et al., 2009; Sinclair et al., 2010). Safety motivation is also positively related to safety performance (Neal & Griffin, 2006; Vinodkumar & Bhasi, 2010). Christian et al. (2009) reported that safety behavior was strongly related to safety motivation. Neal et al. (2000) also found that safety motivation can predict safety attitudes. The effect of safety training, safety communication, and safety rules and procedures are also related to safety motivation (Vinodkumar & Bhasi, 2010). However, many researchers have suggested that safety motivation cannot be fully understood without considering individual physiological and psychological factors, because employees are influenced by personal and social motives (Ajzen et al., 2009; Christian 2009). It was not known whether individual safety attitudes were significantly related to safety motivation (Ajzen et al., 2009; Christian 2009). Acceptance of H5 has confirmed that safety motivation is significantly related to safety attitudes, providing support to the claim that individual employee factors must be considered developing a complete understanding of safety motivation. In UAE healthcare, employees are encouraged to report any unsafe act or condition through PSN or emails to risk and safety team and this report can be anonyms which help in enhancing reporting culture and improving employee and patient safety culture.

5.2.2.6 H6: Safety attitude is significantly related to safety behavior

Brown et al. (2000) found that workers' safety attitude was significantly related to safety behavior. Understanding this requires investigation of workers' mental processes (Shin et al., 2014). Attitudes depend on how people perceive risks.

Previous researchers have argued that workers' attitudes towards safety affect self-reported accident rates, but Vinodkumar and Bhasi (2009) found that these factors were not significantly correlated. This suggests that safety climate is the antecedent factor and that safety management factors predict how safety attitudes affect safety behavior. The results in this study confirmed that safety attitude is significantly related to safety behavior, confirming the finding of Brown et al. (2000) in healthcare. Researchers demonstrated that safety knowledge influences safety attitudes by safety behaviour, and investigated further whether supervisory safety attitudes can influence their strength, and play a role as moderators of the mediated relationship (Kao et al., 2019). In UAE Healthcare sectors, employees involved in incidents are invited to attend the incident investigation process where they are involved in identifying the root cause of the incident, lessons learned and action plans are taken to prevent reoccurrence. Each near miss, incident or accident in healthcare is being investigated, analyzed and monitor trends. Employees safety attitude towards reporting accidents/incidents or unsafe act or unsafe conditions have positively affected individual and organization safety behavior and this was accepted in this study.

5.2.2.7 H7: The effect of safety climate, safety management practices, safety knowledge, safety motivation and safety attitudes on safety behavior will be strengthened if the level of safety stressors is lower

There is some research to support the idea that occupational stressors negatively impact safety behavior, but results have been inconsistent in safety stressors (Park et al., 2015; Petrou et al., 2015; Wang et al., 2015; Zhang et al., 2014). High levels of safety stressors were expected to be detrimental to both safety compliance and participation (Sampson et al., 2014). Safety obstacles and uncertainty require workers' resources, effort, and attention, and may cause in other areas being neglected. The results, however, showed that safety stressors did not have a moderating effect on the relationship between safety culture factors and safety behaviors. This result contradicts an earlier study that found that safety stressors moderated the causality between safety climate, safety attitudes, and safety behavior (Wang et al., 2018), but is consistent with other research that reported inconsistent results on safety stressors (Parsons, 1978). Action theory does not explain the importance of perceived behavioral control, and in particular, coping with safety stressors as a controlling factor. However, it can be extended based on the fundamental assumption of the theory of planned behavior (Ajzen, 1991), which is consistent with the findings of this study. The theory of planned behavior explains the degree to which healthcare professionals perceived barriers to safety attitudes and safety behaviors as affecting their intention to seek coping strategies to deal with stress. Positive coping strategies may come from looking for support from family or friends, or from using others' ways of dealing with similar problems (Li et al., 2017). Groups of healthcare professionals in the UAE may have homogeneous characteristics (the majority are Filipino and Indian) and this may offer a positive coping strategy for dealing with safety stressors because psychological well-being is shared (Freire, Mar Ferradas, Valle, Nunez & Vellejo, 2016; Harzer & Ruch, 2015). This may be one reason for the insignificant impact of safety stressors on the relationship between safety climates, safety attitudes, and safety behaviors. This study has followed the proposal for future research by Sampson et al. (2014) and Wang et al. (2018), by focusing on whether safety-specific forms of uncertainty and obstacles moderate the relation between safety attitudes and safety behavior. The rejection of H7 indicated that safety climate, safety management practices, safety knowledge, safety motivation, and safety attitudes in safety behavior would not be strengthened if healthcare professionals' levels of safety stressors were lowered.

Chapter 6: Conclusion

6.1 Implication

6.1.1 Theoretical Implication

The results of the study have two main implications for theory. The first is that the results addressed the identified need in safety culture theory for a consensual definition of safety culture factors in the healthcare sector in UAE. This study confirmed the relationship between five safety culture factors and safety behavior. The five factors identified were safety climate, safety management practices, safety knowledge, safety motivation, and safety attitudes.

The second implication for theory is the lack of confirmation for the prediction that high levels of safety stressors would be detrimental to safety compliance and participation in healthcare sector in UAE. The results suggest that the level of safety stressors is not a significant influence in the relationship between safety culture and safety behavior.

6.1.2 Practical Contributions

There were significant relationships between the tested safety culture factors. These have some implications for practice. For example, the relationship between safety management practices and safety knowledge suggests that safety management practices that have been found to increase safety knowledge in other contexts may be beneficially applied in healthcare settings. Healthcare organizations in UAE might therefore institute a systematic, comprehensive safety and health training program for new employees, and provide a system to help orient new employees on the safety, health and quality systems. Healthcare organizations in UAE might also be able to reduce accident rates by emphasizing on the need for good safety training for employees and effective implementation and monitoring of the outcome of the training programs. The finding that safety knowledge is significantly related to safety attitudes suggests that these safety management practices might also be used to influence safety attitudes via the relationship with safety knowledge.

The findings that safety management practices are significantly related to safety motivation, and safety motivation to safety attitudes, indicate additional ways by which safety management practices could be used to influence safety attitudes, which in turn were significantly associated with safety behavior. For example, the level of enforcement of safety rules and procedures and well-designed reward systems have been identified as safety management practices that can influence safety motivation. The result of this study will help policy makers in healthcare organization in developing, implementing and monitoring the policy and procedures that focus on safety culture factors such as training and competency, communication and consultation, risk assessment, accident/incident investigations. This study will heighlight for healthcare sector policy maker the importance of improving the safety culture of the hospital which will impact positively in improving patient safety culture.

6.2 Limitations of the Research

Despite its contributions, the study had some limitations. The study used self-reported measurement instruments, all of which had been used in previous studies. However, the results were reliant on the respondents' answers, and the accuracy may have been affected by social desirability bias and the desire to protect privacy (Brenner & DeLamater, 2014; Kim & Kim, 2013). To minimize this limitation, respondents were assured that their responses would be kept anonymous and confidential. The second limitation involved the constructs used to measure the study variables, which were gathered from the literature. These constructs have been previously tested, but not in the UAE, and they may therefore have lacked validity. Confirmatory factor analysis was used to check their convergent and discriminant validity. Thirdly, the study sample included clinical staff from healthcare facilities across the UAE. The safety culture factors therefore did not emerge from a single organizational culture. This may suggest that safety culture is common across organizations, but there may also have been other factors that were limited to one organization and therefore did not emerge. This limitation may be addressed by future research. An additional limitation was the potential cultural homogeneity of participants. Participants came from a range of cultural backgrounds, although they were all working in the UAE. It is not known how this combination might have influenced the outcomes. Future research may be needed to confirm whether the results are generalizable beyond the UAE. It is also not known whether the results are generalizable beyond the healthcare field. There is a need for an integrative framework to guide examination of safety culture factors in a wide range of contexts (Flin et al., 2006), and is hoped that this research may make a contribution to the development of such a framework. However, a study sample drawn exclusively from healthcare settings may limit the generalizability of the findings. It is possible, for example, that healthcare workers are more conscious of safety issues than workers in other fields, and that associations among constructs in this population may not exist in other populations. Future research is needed to see whether the findings apply in other settings and fields.

6.3 Future Research Directions

The potential heterogeneity of safety cultures in this study suggests that future researchers might attempt to verify the importance of the five safety culture factors by measuring their effects and relationships in other, more homogeneous contexts. Studies in contexts outside the UAE might enhance the generalizability of the results, and verification of the safety culture factors in known, homogeneous contexts might contribute to a more robust definition of the constructs.

Qualitative research might be used to examine healthcare workers' perceptions and experiences of safety culture factors and their effects on safety behavior. This might lead to a better understanding of specific means by which safety attitudes, safety knowledge, and other safety culture factors can be modified to enhance safety for healthcare workers and patients.

Future research might also test the generalizability of the safety culture factors included in this study beyond the context of healthcare. Previous researchers have not agreed on a definition of safety culture factors that can be applied in a broad range of contexts. Future researchers might investigate the relationships and effects of the five factors from this study in other industries.

The finding that changing the level of safety stressors among healthcare workers did not affect the relationship between safety culture factors and safety behavior refuted a prediction of action theory. Future researchers might attempt to examine this finding in other contexts, to determine if the result is confined to the healthcare industry or more broadly applicable.

6.4 Conclusion

The general objective of this study was to determine the safety culture factors that influence the safety behavior of healthcare professionals in Abu Dhabi. A quantitative approach was used to enhance generalizing the study result conducted in hospitals in Emirates of Abu Dhabi as sample to the hospital in UAE at larger scale.Data collection was through an anonymous online survey. The results indicated that safety culture factors including safety climate, safety management practices, safety knowledge, safety motivation, and safety attitudes significantly influenced safety behavior across two dimensions, safety participation and safety compliance. However, contrary to expectations (Sampson et al., 2014), the level of safety stressors had no effect on the relationship.

These results may meet an identified need in safety culture theory for a consensual definition of safety culture factors in the healthcare sector (Bronkhorst, 2015; Flin et al., 2006; Guldenmund, 2007). They also have practical implications for enhancing safety culture factors in the healthcare sector. The relationship between safety management practices and safety knowledge suggests that safety management practices that have been found to increase safety knowledge in other contexts may be beneficially applied in healthcare settings. These safety management practices might also be used to influence safety attitudes via the relationship to safety knowledge. This study has therefore made useful contributions both theoretically and practically, as well as providing some useful ideas for future research that will extend the field still further.

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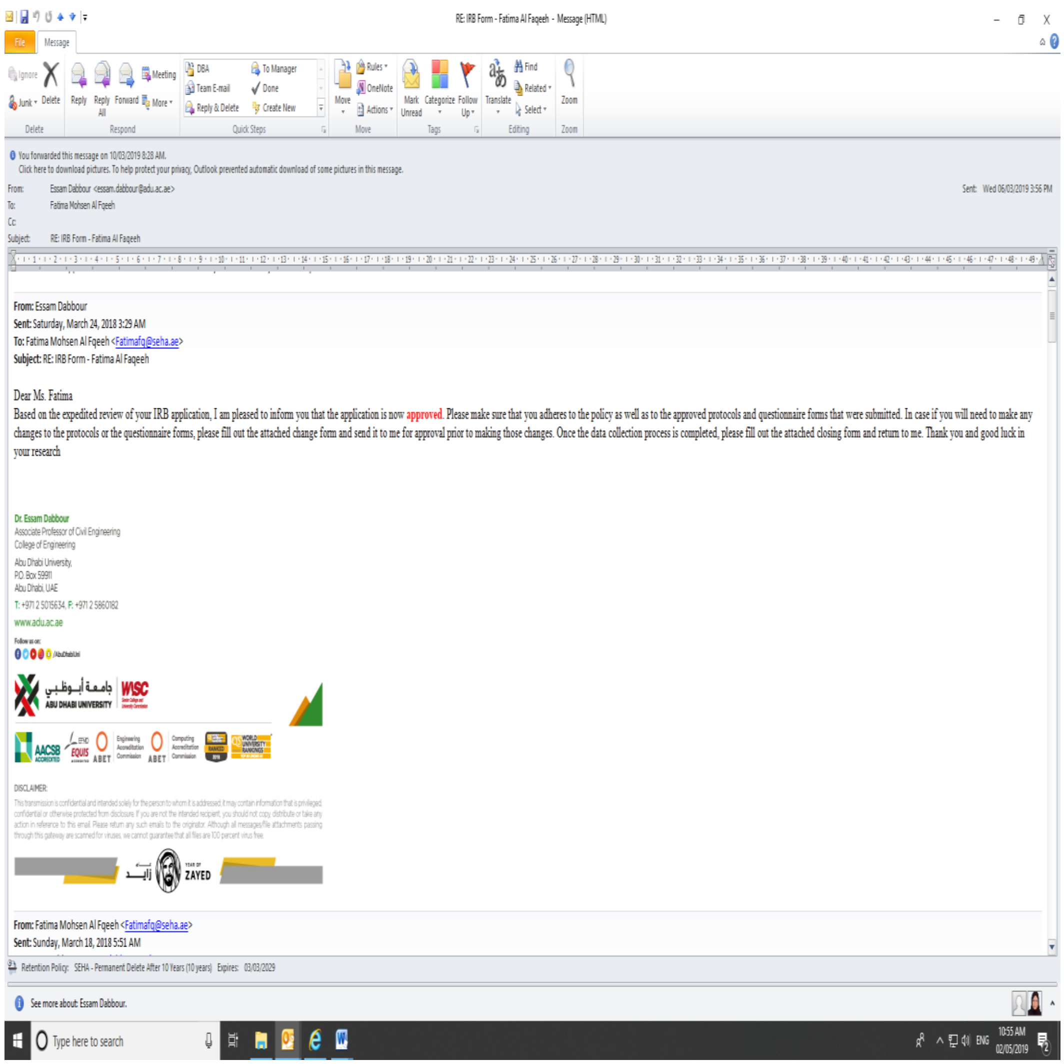
APPENDIX A

Approval from Institutional Review Board for Human Subjects Research (IRB) of Abu Dhabi University



RE: IRB Form - Fatima Al Faqeeh - Message (HTML)

You forwarded this message on 10/03/2019 8:28 AM.
Click here to download pictures. To help protect your privacy, Outlook prevented automatic download of some pictures in this message.

From: Essam Dabbour <essam.dabbour@adu.ac.ae>
To: Fatima Mohsen Al Fqeeh
Cc:
Subject: RE: IRB Form - Fatima Al Faqeeh
Sent: Wed 06/03/2019 3:56 PM

From: Essam Dabbour
Sent: Saturday, March 24, 2018 3:29 AM
To: Fatima Mohsen Al Fqeeh <Fatimafq@seha.ae>
Subject: RE: IRB Form - Fatima Al Faqeeh

Dear Ms. Fatima
Based on the expedited review of your IRB application, I am pleased to inform you that the application is now approved. Please make sure that you adheres to the policy as well as to the approved protocols and questionnaire forms that were submitted. In case if you will need to make any changes to the protocols or the questionnaire forms, please fill out the attached change form and send it to me for approval prior to making those changes. Once the data collection process is completed, please fill out the attached closing form and return to me. Thank you and good luck in your research

Dr. Essam Dabbour
Associate Professor of Civil Engineering
College of Engineering
Abu Dhabi University,
P.O. Box 59911
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From: Fatima Mohsen Al Fqeeh <Fatimafq@seha.ae>
Sent: Sunday, March 18, 2018 5:51 AM

Retention Policy: SEHA - Permanent Delete After 10 Years (10 years) Expires: 03/03/2029

See more about: Essam Dabbour.

APPENDIX B

Approval from Abu Dhabi Health Service Company

(SEHA)

RE: طلب بحث الموظفة -فاطمة محسن الفقيه - Internet Explorer

https://webmail.seha.ae/owa/#viewmodel=ItemAttachment&AttachmentItemID=AAMkADAwNjBmMzUzLTdlODctNGUyYi04ZDNhLThkYzFmMmE3OGY1YgBGAAAAAABn7QCfczoHTqp87Dh%2FEdeOBwDR6E3H%2Fz5zQrDiR05fPQwPAA

From: Waleed Butti Al Zaabi
Sent: 18 April 2018 9:50 AM
To: Fatima Mohsen Al Fqeeh
Cc: Corporate Learning & Development Section (HO); Training and Development Department (SKMC); Training (AGH); Training and Development (RAH); Training Dept Group (AAH); Tawam Training & career development; HR-Training (MFQ); Suaad Mubarak Mubarak
Subject: طلب بحث الموظفة -فاطمة محسن الفقيه

الاخت / فاطمة الفقيه المحترمة

يسرنا اعلامكم بالموافقة على طلب البحث المقدم من طرفكم يمكنكم الان التواصل مع اقسام التدريب بالمنشآت مباشرة لتنسيق لاستكمال البحث المعني .

كل الشكرو التقدير

الاخوة و الاخوات موظفي اقسام التدريب / المنشآت الصحية – المحترمين

يرجى استكمال اجراءات البحث للاخت فاطمة الفقيه حسب المرفق والتواصل معها مباشرة لاي استفسار بخصوص محتوى البحث المقدم رقم التواصل : 0551147490

كل الشكرو التقدير

Waleed Butti Al Zaabi
Corporate Senior Learning & Development Officer
Group CEO Office
Abu Dhabi Health Services Company - SEHA

وليد بطي الزعابي
ضابط أول التعليم والتطوير - المقر الرئيسي
مكتب الرئيس التنفيذي
شركة أبوظبي للخدمات الصحية - صحة

+971 2 410 2000 +971 2 410 2547 +971 2 410 2562 109090, Abu Dhabi, UAE wzaabi@seha.ae [www.seha.ae]www.seha.ae

رسالتنا: تطوير نظام صحي متميز للإرتقاء بالخدمات الصحية المقدمة إلى أعلى المستويات العالمية في الجودة الطبية وخدمة المتعاملين

Our Mission: Transform our healthcare system services to the highest medical quality and customer care international standards.

APPENDIX C

The questionnaire

THE ROLE OF SAFETY CULTURE FACTORS TO PREDICT SAFETY BEHAVIOR IN THE UAE HEALTHCARE SECTOR

Dear Valuable Participants,

Thank you for agreeing to participate in this survey. My name is Fatima Al Faqeeh, I am a student at Abu Dhabi University pursuing my Doctorate Degree in Business Administration. I am also working in SEHA Corporate as Health and Safety Manager. The purpose of this research to understand the role of safety culture factors in shaping safety behavior in healthcare sector.

Please take few minutes to fill out this survey. I truly appreciate valuable feedback and your response will be kept confidential. Thank you for your input.

1. Hospital Name

- ☐ SKMC
- ☐ Mafraq
- ☐ Corniche
- ☐ SSMC
- ☐ Rahba
- ☐ Al Garbia
- ☐ Tawam
- ☐ Al Ain

* 2. Age

- ○ 18-24
- ○ 25-34
- ○ 35-44
- ○ 45-54
- ○ 55-64

- 65+

* 3. Gender
- Male
- Female

* 4. Occupation
- Physician
- Nurse
- Allied Health

* 5. Job title
- Senior Manager
- Middle manager
- supervisor
- others

* 6. Year of experience in hospital industry in UAE
- less than 1 year
- 1-5 years
- 6-10 years
- More than 10 years

* 7. Management places a strong emphasis on workplace health and safety
- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 8. Safety is given a high priority by management
- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 9. Management considers safety to be important
- Strongly agree

- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 10. Safety is given high priority by the management
- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 11. Safety rules and procedures are strictly followed by the management
- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 12. Corrective action is always taken when the management is told about unsafe practices
- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 13. In my hospitals managers/supervisors do not show interest in the safety of workers
- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 14. Members of the management attend safety meetings
- Strongly agree
- Agree
- Neither agree nor disagree

○ Disagree
○ Strongly disagree

* 15. When near-miss accidents are reported, my management acts quickly to solve the problems

○ Strongly agree
○ Agree
○ Neither agree nor disagree
○ Disagree
○ Strongly disagree

* 16. My hospital provides sufficient personal protective equipment's for the workers

○ Strongly agree
○ Agree
○ Neither agree nor disagree
○ Disagree
○ Strongly disagree

* 17. My hospital gives comprehensive training to the employees in workplace health and safety issues

○ Strongly agree
○ Agree
○ Neither agree nor disagree
○ Disagree
○ Strongly disagree

* 18. Newly recruits are trained adequately to learn safety rules and procedures.

○ Strongly agree
○ Agree
○ Neither agree nor disagree
○ Disagree
○ Strongly disagree

* 19. Safety issues are given high priority in training programs.

○ Strongly agree
○ Agree
○ Neither agree nor disagree
○ Disagree
○ Strongly disagree

* 20. I am adequately trained to respond to emergency situations in my

workplace.
- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 21. Management encourages the workers to attend safety training programs
- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 22. Safety training given to me is adequate to enable to me to assess hazards in workplace
- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 23. Management always welcomes opinion from employees before making final decisions on safety-related matters
- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 24. My hospital has safety committees consisting of representatives of management and employees
- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 25. Management promotes employees' involvement in safety related matters
- Strongly agree
- Agree

○ Neither agree nor disagree
○ Disagree
○ Strongly disagree

* 26. Management consults with employees regularly about workplace health and safety issues

○ Strongly agree
○ Agree
○ Neither agree nor disagree
○ Disagree
○ Strongly disagree

* 27. Employees do not sincerely participate in identifying safety problems

○ Strongly agree
○ Agree
○ Neither agree nor disagree
○ Disagree
○ Strongly disagree

* 28. My hospital does have a hazard reporting system where employees can communicate hazard information before incidents occur.

○ Strongly agree
○ Agree
○ Neither agree nor disagree
○ Disagree
○ Strongly disagree

* 29. Management operates an open-door policy on safety issues

○ Strongly agree
○ Agree
○ Neither agree nor disagree
○ Disagree
○ Strongly disagree

* 30. There is sufficient opportunity to discuss and deal with safety issues in meetings

○ Strongly agree
○ Agree
○ Neither agree nor disagree

- Disagree
- Strongly disagree

* 31. The target and goals for safety performance in my hospital are not clear to the employees

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 32. There are open communications about safety issues in this workplace

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 33. The safety rules and procedures followed in my hospital are sufficient to prevent incidents occurring

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 34. The facilities in the safety department are not adequate to meet the needs of my hospital

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 35. My supervisors and managers always try to enforce safe working procedures

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 36. Safety inspections are carried out regularly

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 37. The safety procedures and practices in this hospital are useful and effective

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 38. In my hospital safe conduct is considered as a positive factor for job promotions

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 39. In my hospital, employees are rewarded for reporting safety hazards (thanked, cash or other rewards, recognition in newsletter, etc.)

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 40. In my hospital safety week celebration and other safety promotional activities arranged by the management are very effective in creating safety awareness among the workers.

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 41. There exists very healthy competition among the employees to find out and report unsafe condition and acts.

- Strongly agree
- Agree

Neither agree nor disagree

Disagree

Strongly disagree

* 42. Our supervisor becomes very happy and appreciative when employees find out and report unsafe conditions and acts in our section

Strongly agree

Agree

Neither agree nor disagree

Disagree

Strongly disagree

* 43. I know how to perform my job in a safe manner.

Strongly agree

Agree

Neither agree nor disagree

Disagree

Strongly disagree

* 44. I know how to use safety equipment's and standard work procedures.

Strongly agree

Agree

Neither agree nor disagree

Disagree

Strongly disagree

* 45. I know how to maintain or improve workplace health and safety.

Strongly agree

Agree

Neither agree nor disagree

Disagree

Strongly disagree

* 46. I know how to reduce the risk of accidents and incidents in the workplace

Strongly agree

Agree

Neither agree nor disagree

Disagree

Strongly disagree

* 47. I know what are the hazards associated with my jobs and the necessary precautions to be taken while doing my job.

Strongly agree

Agree

- Neither agree nor disagree
- Disagree
- Strongly disagree

* 48. I do know what to do and whom to report if a potential hazard is noticed in my workplace

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 49. I feel that it is important to maintain safety at all times.

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 50. I believe that safety at workplace is a very important issue

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 51. I feel that it is necessary to put efforts to reduce accidents and incidents at workplace

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 52. I believe that safety that can be compromised to safe patient

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 53. I feel that it is important to encourage others to use safe practices.

- Strongly agree
- Agree

Neither agree nor disagree
Disagree
Strongly disagree

* 54. I feel that it is important to promote safety programs

Strongly agree
Agree
Neither agree nor disagree
Disagree
Strongly disagree

* 55. I feel that it is important to maintain safety at all times

Strongly agree
Agree
Neither agree nor disagree
Disagree
Strongly disagree

* 56. I carry out my work in a safe manner

Strongly agree
Agree
Neither agree nor disagree
Disagree
Strongly disagree

* 57. I feel that it is necessary to put efforts to reduce accidents and incidents at work place

Strongly agree
Agree
Neither agree nor disagree
Disagree
Strongly disagree

* 58. I feel that it is important to encourage others to use safe practices

Strongly agree
Agree
Neither agree nor disagree
Disagree
Strongly disagree

* 59. I feel that it is important to promote safety programs.

Strongly agree
Agree
Neither agree nor disagree

- Disagree
- Strongly disagree

* 60. I use all necessary safety equipment's to do my job

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 61. I carry out my work in a safe manner

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 62. I follow correct safety rules and procedures while carrying out my job

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 63. I ensure the highest levels of safety when I carry out my job

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 64. Occasionally due to lack of time, I deviate from correct and safe work procedures

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 65. Occasionally due to over familiarity with the job, I deviate from correct and safe work procedures

- Strongly agree
- Agree
- Neither agree nor disagree

- Disagree
- Strongly disagree

* 66. It is not always practical to follow all safety rules and procedures while doing a job

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 67. I help my co-workers when they are working under risky or hazardous conditions

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 68. I always point out to the management if any safety related matters are noticed in my hospital

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 69. I put extra effort to improve the safety of the workplace

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 70. I voluntarily carryout tasks or activities that help to improve workplace safety

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 71. I encourage my co-workers to work safely

- Strongly agree

- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 72. You get into arguments about safety with others at work

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 73. Other people yell at you about safety at work

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 74. People are rude to you about safety at work

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 75. Other people do nasty things to you at work

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 76. There are clear, planned safety goals and objectives for my job

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 77. I know that I have divided my time to ensure safety at work

- Strongly agree
- Agree

Neither agree nor disagree
Disagree
Strongly disagree
* 78. I know what my safety responsibilities are at work
Strongly agree
Agree
Neither agree nor disagree
Disagree
Strongly disagree
* 79. know exactly what is expected of me about safety at work
Strongly agree
Agree
Neither agree nor disagree
Disagree
Strongly disagree
* 80. I must ignore a rule or policy to carry out an assignment safely
Strongly agree
Agree
Neither agree nor disagree
Disagree
Strongly disagree
* 81. I work with two or more groups who operate quite differently regarding safety
Strongly agree
Agree
Neither agree nor disagree
Disagree
Strongly disagree
* 82. I receive incompatible safety requests from two or more people
Strongly agree
Agree
Neither agree nor disagree
Disagree
Strongly disagree
* 83. I do things that are apt to be thought of as safe by one person and not by others
Strongly agree
Agree

- Neither agree nor disagree
- Disagree
- Strongly disagree

* 84. I receive an assignment without adequate resources and materials to execute it safely

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree