HIGH PERFORMANCE WORK SYSTEMS AND WORKPLACE SAFETY: A MULTILEVEL APPROACH

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ABSTRACT

Research in workplace safety has focused on either the physical approach that emphasizes ergonomic design of the environment and work-related equipment, an environmental approach that emphasizes potential hazards such as noise, toxins, and temperature, or a behavioural approach that emphasizes changing employee behaviours that are deemed to be responsible for workplace incidents such as accidents, injuries, fatalities, and safety-related events. I built on this research (i) to develop and validate an HPWS for safety scale, and (ii) to propose and test a model of processes through which unit level HPWS for safety influence individual level safety outcomes. This thesis reports the findings of four studies. Three of these studies focused on the development and validation of an HPWS for safety scale while the fourth study used the validated scale to examine the processes through which HR practices influence workplace safety. Data were analyzed using multilevel structural equation modelling (MSEM) with Mplus version 7.3. The findings revealed that (i) experienced HPWS for safety directly relates to safety behaviours and also indirectly through safety knowledge and safety motivation, (ii) experienced HPWS for safety relates to both safety-specific events and workplace injuries through a mediational chain of safety knowledge and safety compliance, (iii) experienced HPWS for safety relates to workplace injuries through a mediational chain of safety knowledge and safety initiative, (iv) experienced HPWS for safety relates to both safety-related events and workplace injuries via safety motivation and safety compliance, (v) the use of HPWS for safety significantly related to unit safety climate, (vi) the use of HPWS for safety significantly related to experienced HPWS for safety while unit-level safety climate moderated the safety knowledge-safety compliance relationship. Lastly, the findings provide support for the psychometric properties of the scale. I also discussed the theoretical and practical implications of the findings, highlighted the study's strengths and limitations, and then mapped out some directions for future research.

Key words: High performance work system for safety, unit safety climate, safety knowledge/safety motivation, safety behaviours, safety outcomes

DEDICATED

To my Lord and Saviour Jesus Christ

And

My Darling Little Daughter, Jesusemen Zoe Okhawere

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1.0. CHAPTER 1: INTRODUCTION

1.1. Background of the Study

Workplace accidents claim millions of lives and cause even more disabilities each year worldwide, including about 5600 work-related fatal injuries each year between 2002 and 2008 (U.S. Bureau of Labour Statistics, 2011), and approximately 3 million work-related injuries and illnesses in 2013 (U.S. Bureau of Labour Statistics, 2014). The International Labour Organization (2011) corroborates the preceding reports by suggesting that at least 2.34 million employees died because of work-related incidents or diseases in 2008 (amounting to 6300 work-related deaths per day) and 317 million work-related injuries. Thus, globally, it has been estimated that the number of work-related fatalities exceeds the number of road fatalities or violent deaths (Howard, 2014). Although official statistics on workplace incidents such as accidents, injuries, safety-related events and, of course, fatalities are unreliable in Nigeria, estimates suggest that on average, 200 industrial accidents occur per day in Nigeria, with between 100 and 200 occupational fatalities per year (Fajana, 2010). Given that a considerable number of work-related injuries and illnesses are not reported for a variety of reasons (U. S. Government Accountability Office, 2009), it is possible that actual workplace injuries and illnesses will be greater than the existing figures suggest. Research into workplace safety has been motivated by not only the high financial costs of accidents and damage to corporate reputation, but also the human costs of pain, sufferings and grief that employees and their families experience (Nahrgang, Morgeson & Hofmann, 2007).

Studies on workplace safety have consistently employed three distinct but conceptually related approaches: (i) the physical approach that emphasizes ergonomic design of the environment and work-related equipment; (ii) an environmental approach that emphasizes potential hazards such as noise, toxins, and temperatures; and (iii) a behavioural approach that emphasizes changing employee behaviour that are deemed to be responsible for injuries, accidents, and fatalities in the workplace (Smith, Karsh, Carayon, & Conway, 2003).

The focus of the current study is on behavioural safety in the workplace because safety problems stem not only from the poor attitudes of management towards workplace safety (Coyle, Sleeman, & Adams, 1995) but also from employees' unsafe behaviours including recklessness, violation of safety rules and regulations and from nonchalant attitudes to hazards (Laurence, 2005; Zohar & Luria, 2003; Hobbs & Williamson, 2002). Margolis (1973) notes that employee attitudes toward safety are directly related to management attitudes toward safety. In support of Margolis (1973), Beck and Feldman (1983) opine that the execution of safe work practices is contingent upon what employees expect. The foregoing arguments suggest that management's and employees' safety-related attitudes and behaviours are equally important in the consideration of employees' workplace safety. Thus, there is need to shift the research spotlight from the other two approaches (i. e. ergonomic and environmental) to a behavioural approach to workplace safety.

Previous behavioural approach to workplace safety has tended to focus on either an individual or organizational level of analysis. At the individual-level of analysis, studies have reported relationships between employees' perceptions of their work environment or other individual factors (e.g. job insecurity, experienced high performance work systems [HPWS], safety attitudes) and safety outcomes such as accidents, injuries (e.g. Neal & Griffin, 2006; Huang, Ho, Smith, & Chen, 2006; Clarke, 2006; DeJoy, Schaffer, Wilson, Vanenberg, & Butts, 2004; Mearns, Whitaker, & Flin, 2003; Barling, Loughlin, & Kelloway, 2002; Probst & Brubaker, 2001), and near misses (e.g. Zacharatos, Barling, & Iverson, 2005). At the organizational or unit-level of analysis, organizational factors or aggregated climate perceptions have been examined as predictors of safety outcomes such as accidents and injuries (e.g. Wallace, Popp, & Mondore, 2006; Zacharatos & colleagues, 2005; Zohar & Luria, 2004; Zohar, 2002). While research from each stream has made significant contributions, Deitz, Carlson, Donavan, Babakus, and Hansen (2011) note that neither a micro- nor macro- approach alone can meaningfully account for differences in, for example, safety outcomes. Although research (e.g. Gerhart, 2005, Bowen & Ostroff, 2004) suggests that Strategic Human Resource Management (SHRM) should move closer to the individual level by emphasizing the impact of human resource practices on employee attitudes, very limited research has to date examined both individual (e.g. employee perceptions of HR practices, behaviours) and organization or unit-level (e.g. use of HR practices; climate) predictors of workplace safety (Wallace & Chen, 2006) in the same study. The dearth of research that has adopted a multilevel approach to examining the influence of high performance work systems (HPWS) on individual safety outcomes limits our understanding of the nested nature of antecedents to employee safety knowledge/safety motivation and behaviours, and ultimately safety outcomes.

A paucity of research has examined the influence of individual human resource practices such as selecting for safety, safety compensation or rewards (Lauver, 2007) and training (Lauver, 2007; Harvey, Bolam, Gregory, & Erdos, 2001) on workplace injuries. However, extant research has shown that HRM practices are more likely to yield positive effects for the organization when they are introduced as part of a coherent system, rather than as single "best practices" (Kling, 1995). In support of Kling (1995), Dyer and Reeves (1995) assert that these systems "seem to be superior to any of the individual HR activities of which they are composed" (p. 668). This resonates with SHRM research that focuses on bundles of HRM practices and their impact on organizational outcomes (Jiang, Lepak, Hu, & Baer, 2012; Buller & McEvoy, 2012; Becker & Huselid, 1998). Unfortunately, our understanding of the role of HPWS in workplace safety is limited. Although some research (e.g. Evans & Davis, 2015; Zacharatos & colleagues, 2005) has begun to link HPWS practices to safety, the extant literature demonstrates only limited insights into the influence of HPWS on employee safety outcomes. Thus, the lack of adequate research attention to HPWS as potential predictors of workplace safety has left us with several unanswered questions. First, do HPWS influence employees' safety outcomes? If so, what are the processes or mechanisms through which HPWS influence workplace safety?

Whereas there is considerable evidence that HPWS are associated with organizational performance (e.g. Aryee, Walumbwa, Seidu, Otaye, 2012; Combs, Liu, Hall, & Ketchen, 2006; Wright, Gardner, Moynihan, & Allen, 2005; Boselie, Dietz, & Boon, 2005; Bartel, 2004; Batt, 2002; Arthur, 1994), research has identified a number of theoretical and methodological limitations (Ferris, Arthur, Berkson, Harrel-Cook, & Fink, 1998). For example, it has been observed that there is a little consensus among researchers concerning the specific practices to be included in the configuration of the HPWS (Collins & Smith, 2006; Datta, Guthrie, & Wright, 2005; Delaney & Huselid, 1996). Thus, there is a call for SHRM researchers to "see the development of reliable and valid measures of HRM systems to be one of the primary challenges for……...advancing…………research" (Delaney & Huselid, 1996, p. 967). Although research seems to have addressed this concern, most of the scales developed in response to this call do not have strategic focus (Lepak, Liao, Chung, & Harden, 2006; Bowen & Ostroff, 2004). Fundamental to SHRM is the construct of HPWS that is defined as a "system of HR practices designed to enhance employees' skills, commitment, and productivity in such a way that employees become a source of sustainable competitive advantage" (Datta & colleagues, 2005, p. 136). Predicated on the assumption that adoption of a specific organizational strategy (e.g. safety) aligned with a system of internally coherent human resource practices rather than individual isolated practices influence organizational performance (Lepak & colleagues, 2006), a few studies have examined the influence of a set of HRM practices on workplace safety (e. g. Evans & Davis, 2015; Zacharatos & colleagues, 2005). However, none of these studies focused on the development and validation of a safety-specific HPWS measure. While Liao, Toya, Lepak, and Hong (2009), for example, reported an HPWS for service quality, to the best of my knowledge and in spite of the relative importance (compared to production) of workplace safety, research has yet to develop and validate an HPWS for safety measure.

Two perspectives have often been assumed on the HRM-performance relationship by SHRM researchers. The first perspective is based on a system approach where current research in this area has now shifted emphasis away from separate or individual HRM practices and employee performance to a more macro focus on the overall set of HRM practices and organizational performance (e.g. Huselid, Jackson, & Schuler, 1997; Huselid & Becker, 1996; Huselid, 1995). In other words, rather than examining the effects of individual HRM practices on organizational (e.g. Delery & Doty, 1996; Delaney & Huselid, 1996) or on individual performance, the present trend in SHRM research focusing on HRM-performance relationship is to consider a system of HRM or a configuration of HRM practices (Ferris & colleagues, 1998).

The second perspective has been the strategic approach (Ferris, Hochwarter, Buckley, Harrell-Cook, & Frink, 1999). In this strategic-based approach, the particular "fit" between various HRM practices and the organization's competitive strategy have been examined (e.g. Miles & Snow, 1994; Wright & Snell, 1991). Embedded in this perspective is the argument or notion that, to be effective, HRM systems should achieve "horizontal fit" in such a way that these practices complement and are aligned with one another and achieve "vertical fit" in such a manner that the HRM system is aligned with the organizational strategy (Becker & Gerhart, 1996; Huselid, 1995; Wright & McMahan, 1992). Consistent with this "fit" notion, Bowen and Ostroff (2004, p. 206) suggest that the content of HRM system "should be largely driven by the strategic goals and values of the organization" and that "the foci of the HRM practices must be designed around a particular strategic focus" such as workplace safety. The importance of this statement is that, for HRM systems to be effective, they must reflect how employees add values, and this can be realized only when the HRM practices are linked within a system toward some strategic focus or anchor. This implies that the HRM systems must be objective-specific in order to achieve maximum effects on organizational performance. In support of this argument, Liao and colleagues (2009) opine that without being objective-specific, HRM systems lack a clear direction for employees. As a result, all dimensions of the HPWS should be selected and designed to achieve specific organizational objectives.

In response to this orientation, SHRM researchers have not only adopted a configurational perspective to conceptualize HPWS, but have also developed HPWS with an objective-specific focus. For example, Liao and colleagues (2009) derived some dimensions of their measures primarily from Zacharatos and colleagues' (2005) general measure of HPWS practices and Delery and Doty's (1996) general measure of HPWS for banking industry and adapted them in their study to have a service-quality focus. Building on this scenario of HPWS differentiation views and prior research on objective-specific HPWS (e.g. Liao & colleagues, 2009), I argue that HPWS should strategically anchor around a specific organizational objective-workplace safety, and that practices within the system (i.e. HPWS for safety practices) should supplement one another in order to create synergistic effects.

Another issue in the safety literature is a lack of clear and consistent construct definitions and conceptualizations (cf. Clarke & Robertson, 2005). Although workplace safety research has safety as its ultimate outcome, it is unclear what constitutes safety outcomes or performance. Thus, it has been noted that research has not always distinguished between safety behaviours and safety outcomes (Christian, Bradley, Wallace, & Burke, 2009). A number of studies have either focused on accident and injury rates while others have focused on employee behaviours. It is here argued that this lack of distinction in the definition and conceptualization of safety constructs retards our understanding of the outcomes of efforts to promote workplace safety. Fishbein (1979) and Fishbein and Azjen (1975) have called for the need to distinguish between outcomes (e.g. safety-related events, workplace injuries) and behaviours (e.g. safety compliance, safety initiative). Consequently, this study considers safety behaviours as distinct from safety outcomes. Safety behaviours are here defined as actions or behaviours individuals demonstrate that promote health and safety in the workplace. In contrast to safety behaviours, safety outcomes are tangible events or results such as workplace injuries, accidents, fatalities (Christian & colleagues, 2009; Barling & colleagues, 2002), and safety-related events.

While research on workplace safety has predominantly focused on safety compliance model (Gomez-Mejia, Backin, Cardy, & Dimick, 1997; Montgomery, 1996; Cooper, Philips, Sutherland, & Makin, 1994), it has been argued that safety compliance alone cannot foster workplace safety. Although enforcement of safety compliance may help address unsafe work-related behaviours, these behaviours cannot be predicted in a growing number of work situations and therefore safety outcomes (e.g. accidents, injuries, etc.) cannot be avoided by ensuring safety compliance. Thus, in addition to relying on management practices that ensure rule enforcement (i.e. safety compliance), it has been acknowledged that workplace safety may involve discretionary behaviours (Hofmann, Morgeson, & Gerras, 2003; Griffin & Neal, 2000). In other words, organizational practices (e.g. HR practices) could also enhance safety through rule development (e.g. safety initiative) as a way of fostering workplace safety.

Research in SHRM has shown that a management strategy emphasizing high-commitment (Wood & de Menezes, 1998; Walton, 1985) and high-involvement (Lawler, 1996, 1986) work practices offers a constructive alternative to a rule enforcement (or safety compliance) approach. Walton (1985) argues that high commitment work practices (HCWP) provide an environment that enhances workers' commitment leading to mutually beneficial outcomes for both employees and organizations. In the same vein, high involvement management practices (HIWP) focuses on the empowerment of the employees through increased dissemination of information and participation in decision making (Zacharatos & colleagues, 2005). Thus, work practices that generate high levels of commitment and involvement (e.g. HPWS) promote employee discretionary behaviours.

Zacharatos and colleagues (2005) argue that HPWS could be applied to improve workplace safety "just as well as firm economic performance" (p. 78). This resonates with the argument that safety should be regarded as a performance variable just like production, profits, sales, customer services and quality control (Kivimaki, Kalimo, & Salminen, 1995; Griffiths, 1985). It is also consistent with Kaminski (2001) who suggests that many of the HR management practices that are frequently utilized to enhance organizational performance might have similar effects on workplace injuries. Building on the preceding arguments, Zacharatos and colleagues (2005) conducted two separate studies that investigated (i) the influence of human resource management practices on safety performance (measured in terms of lost time injuries) at the organizational level and (ii) at the individual level, the mechanisms through which employee perceived HPWS influence safety performance. While Zacharatos and colleagues' (2005) studies extended prior research on HPWS-performance relationships by establishing a link between HPWS and workplace safety, there are some methodological limitations in their study. For example, in their first study, a single organizational representative provided data with regard to the existence or use of high commitment management practices in their respective companies. It has been observed that a single-rater design has questionable reliability status (Bowen & Ostroff, 2004; Gerhart, Wright, McMahan, & Snell, 2000).

In view of the foregoing limitations, and grounded in social exchange theory (SET: Blau, 1964) and social information processing (SIP: Salancik & Pfeffer, 1978) perspective, data obtained from oil and gas industry in Nigeria were used to test a model of the mechanisms (mediation and moderation) through which the use of HPWS for safety influences individual employee safety outcomes. Specifically, the objectives of this study were:

To build on existing research to develop and validate a theoretically informed measure of HPWS for safety; and

To propose and test a multilevel model of the mechanisms through which unit-level HPWS for safety influence safety outcomes.

These objectives are schematically depicted in a multilevel conceptual model shown in Figure 2.1. This study proposes a multilevel model of the relationship between unit-level HPWS for safety and employee safety outcomes. I proposed that the unit level HPWS for safety is directly related to unit level safety climate and employee experienced HPWS for safety. I also proposed that experienced HPWS for safety is indirectly related to safety behaviours of safety compliance and safety initiative through safety knowledge and safety motivation. Furthermore, I proposed that experienced HPWS for safety is related to safety outcomes of safety-related events and workplace injuries through the mediating effects of both safety knowledge and safety motivation, and safety behaviours of safety compliance and safety initiative. Again, I proposed that unit level safety climate moderates the effects of safety knowledge and safety motivation on safety behaviours of safety compliance and safety initiative. Lastly, I proposed that safety knowledge/safety motivation and unit safety climate interact to foster employee safety outcomes of safety-related events and workplace injuries through the mediating effects of safety behaviours of safety compliance and safety initiative.

1.2. Theoretical Contributions of the Study

This study contributes to the literature in several ways.

Whereas research has shown that HPWS can be applied to workplace safety (Evans & Davis, 2015; Zacharatos & colleagues, 2005) as well as firm economic performance (Wright & colleagues, 2005; Bartel, 2004; Batt, 2002), research has yet to develop a safety-specific measure of HPWS. Thus, informed by Bowen and Ostroff's (2004) recommendation that HRM practices should be driven by an organization's strategy focus, the current study developed and validated an HPWS for safety measure. Although the constituent domains of HPWS for safety scale initially built on extant HPWS research, they are driven by a focus on enhancing workplace safety. I utilize a rigorous empirical procedure to establish the construct validity of the new HPWS for safety measure that should extend the psychometric properties and predictive validity of similar scales in this area. It is therefore, expected that this measure of HPWS for safety should address two issues in SHRM literature: (i) Delaney and Huselid's (1996) concerns that the SHRM literature "is distinguished by the fact that virtually no two studies measure HRM practices in the same way" (p. 967), Delery's (1998) concerns with regards to the absence of theoretically informed measure of HPWS practices (Delery, 1998), and (ii) the need for a strategically-focused HPWS (Bowen & Ostroff, 2004) which is related to but goes beyond the motivation for Delaney and Huselid's call. Thus, the development and validation of an HPWS for safety measure centres on the foundation human resource issues (Schneider, White, & Paul, 1998) that must be addressed if the strategic objective of safety performance is to be accomplished (Bowen & Ostroff, 2004).

Second, research (e.g. Wallace & Chen, 2006) has acknowledged that productivity and safety are both important dimensions of overall performance on many jobs. Although prior research in SHRM has linked HPWS to performance outcomes, extant literature indicates that the focus has been on productivity to the neglect of workplace safety. Zacharatos and colleagues (2005) noted this gap and consequently extended prior research on HPWS-performance relationships to include occupational safety. Extending their research, this study examines the intermediate mechanisms through which HPWS for safety influence workplace safety outcomes. In doing so, it demonstrates that performance can be measured in a number of different ways and that HPWS can have positive effects on a variety of outcomes, including safety outcomes, depending on the priorities of the organization (Zacharatos, 2001). It also bridges the research domains of strategic HRM and safety in order to enhance our understanding of the role of safety in SHRM research and to make a subtle distinction in the theoretical refinement of SHRM and safety literatures.

Third, in spite of the recognition of multilevel studies (Wright & Nishii, 2007; Wallace & Chen, 2006; Ostroff & Bowen, 2000), most prior safety research has focused on relationships between variables at either the organizational or individual level of analysis without due cognizance of the interplay between individual behaviours and organizational variables. For example, Zacharatos and colleagues, (2000) conducted two separate studies linking HPWS to workplace safety. Their first study linked the use of HPWS to occupational safety at the organizational level while the second study focused on the influence of employee perceptions of the use of HPWS on occupational safety at the individual level of analysis. Thus, there is a relative dearth of empirical work examining a multilevel approach to explicate HPWS-safety outcomes relationships. By adopting a multilevel approach, this study explicitly recognizes the integrated nature of organizations in such a way that individual and organizational characteristics combine to influence individual outcomes (Kozlowski & Klein, 2000). In other words, it enhances our understanding of how and why organizational and individual factors combine to shape the attitudinal and behavioural effects of the use of HPWS for safety and thereby provide organizations and managers with actionable knowledge about how to use safety-related HR practices effectively to promote workplace safety.

Lastly, Christian and colleagues (2009) note the lack of clear and consistent construct definitions and conceptualizations as a shortcoming in the safety literature. This lack of conceptual distinction constrains our understanding of the impact of workplace safety promotion. Consequently, this study extends the extant safety literature by responding to the recent call (See Christian & colleagues, 2009) to distinguish between safety behaviours and safety outcomes. Clear delineation of the two constructs is a critical step to facilitate not only the organization of accumulated knowledge, but also the development of theory in the safety domain (Christian & colleagues, 2009). Another issue which is often overlooked in safety literature is the final linkage between safety performance as behaviour and safety outcomes (e.g. Neal, Griffin, & Hart, 2000; Griffin & Neal, 2000; Sigmard & Marchand, 1995). Rarely have the two been examined in the same study.

1.3. A Brief Literature Review and Definition of Key Constructs

1.3.1. High-Performance Work Systems (HPWS)

Over the past two decades or so, organizations have become interested in the concept of strategic management and its corollary, strategic HRM. Researchers in business-related disciplines have attempted to tie the methods and tools of their disciplines to the strategy of the firm (Wright & McMahan, 1992). But because of the apparent lack of integration across the various HRM functions, the attempts made to tie each functional area to the firm's strategy independent of the other functions resulted in such phenomenon as "strategic selection," "strategic appraisal," "strategic development," and "strategic rewards" (Fombrum, Trichy, & Devanna, 1984). While the perspective of HRM has been extended by these efforts by admitting the necessity for each individual sub-function to be aligned with organizational goals, the interplay between all of the functions was neglected (Wright & Snell, 1991; Lengnick-Hall & Lengnick-Hall, 1988). However, following the pressure to become a strategic partner in the emergence of SHRM (e. g. Bowen & Ostroff, 2004; Ulrich, 1998; Wright & McMahan, 1992; Fombrum & colleagues, 1984), researchers have begun to approach the field from a more macro perspective, that is, a perspective that could precisely be referred to as strategic human resource management (SHRM) (Butler, Ferris, & Napier, 1991).

According to Wright and McMahan (1992), SHRM is the pattern of planned human resource deployments and activities that are intended to enable an organization to achieve its goals. Wright and McMahan's (1992) definition of SHRM emphasized two fundamental elements that differentiate it from traditional HRM. First, vertically, it involves the linking of HRM practices with the strategic process of the organization (Dyer, 1985). Second, horizontally, it highlights the coordination or synergy among the various HRM practices (Wright & Snell, 1991; Baird & Meshoulam, 1988; Schuler & Jackson, 1987) through a pattern of planned action (Wright & McMahan, 1992).

A fundamental principle of SHRM research is that the impact of HRM practices on individuals as well as organizations can best be understood by examining a bundle (Lepak, Liao, Chung, & Harden, 2006a; Pil & MacDuffie, 1996; MacDuffie, 1995) or configuration (Delery & Doty, 1996) of HR practices. Reflecting this background, studies on HRM have focused on High-Performance Work Systems (HPWS), a term defined as a configuration of HRM practices intended to enhance employee’s skills, commitment, and performance in such a way that employees become a source of sustainable competitive advantage (Kim & Wright, 2010; Becker & Huselid, 2006; Datta, Guthrie, & Wright, 2005; Bowen & Ostroff, 2004; Youndt & Snell, 2004; Godard, 2004; Pfeffer, 1998; Lawler, 1996, 1992; Levine, 1995). Research (e.g. Datta, Guthrie, & Wright, 2005; Levine, 1995; Huselid, 1995; Arthur, 1994; Lawler, 1992) suggests these systems to include practices such as rigorous selection procedures, internal merit-based promotions, grievance procedures, cross-functional and cross-trained teams, extensive training, information sharing, participatory mechanisms, group-based reward, and skill-based pay. Although Macky & Boxall (2007) observe that there is no consensus on an ideal bundle or configuration of these policies and practices, the logic is that HPWS shape and align employees’ attitudes and behaviours (e.g. safety behaviours) with the strategic goals of the organization (e.g. workplace safety) thereby enhancing organizational performance (Schuler & Jackson, 1987). As Macky and Boxall (2007) put it, “while there are a number of theoretical, empirical, and practical dimensions on which these constructs differ, a common theme is the notion that the HR practices involved should form a coherent, integrated ‘bundle’; a system of complementarities whose effect is greater than the sum of parts” (p.537).

Guided by Bowen and Ostroff (2004) who indicate that the content of HR systems “should be largely driven by the strategic goals and values of the organization” and that “the foci of human resource management practices must be designed around a particular strategic focus” (p. 206) such as workplace safety, this study developed a measure of HPWS for safety. HPWS for safety, in this context, is defined as a system of separate but interconnected HR safety practices designed to enhance employee knowledge (i.e. skills or competencies) motivation, and safety-related performance. Thus, HPWS for safety includes such components as safety training, safety rewards, internal opportunity for promotion, safety involvement and participation, performance appraisals, self-managed team, safety information sharing, safety audit, safety campaign, and safety equipment maintenance.

1.3.2. Safety Performance

Safety performance has been looked at from different perspectives. For example, it has been used to refer to two different concepts. First, it has been referred to as a metric for safety-related behaviours of individuals (e.g. Clarke, 2006; Zacharatos & colleagues, 2005; Neal & Griffin, 2004; Burke, Sarpy, Tesluk, & Smith-Crowe, 2002; Marchand, Simard, Carpentier-Roy, & Quellet, 1998). On the other hand, it has also been conceptualized as an organizational metric for safety outcomes, such as number of injuries per year (e.g. Zacharatos & colleagues, 2005). Thus, it is paramount to distinguish safety-related performance/behaviours from safety outcomes of those behaviours because each of them might have differential pattern of relationships with antecedents (Christian & colleagues, 2009).

Christian and colleagues (2009) note that when safety performance is conceptualized as individual behaviours, it provides researchers with a measurable criterion that is more proximally related to psychological factors than safety outcomes such as accidents or injuries. Zohar (2000) observes that safety performance behaviours are better predicted than safety outcomes. In their model of safety performance, Burke and colleagues (2002) conceptualize safety behaviours as “actions or behaviours that individuals exhibit in almost all jobs to promote the health and safety of workers, clients, the public, and the environment” (p. 432). This study conceptualizes safety behaviours as actions or behaviours individuals demonstrate that promote health and safety in the workplace.

Marchand and colleagues (1998) contend that a unidimensional model of safety performance that focuses on employees' compliance with safety rules and procedures is inadequate and therefore propose an expanded model that includes employee safety initiatives. Distinguishing between task and contextual performance, Neal and colleagues (Griffin & Neal, 2000; Neal & colleagues, 2000; Neal & Griffin, 1997) developed a two-dimensional model comprising safety compliance, defined as "adhering to safety procedures and carrying out work in a safe manner", and safety participation, defined as "helping co-workers, promoting the safety programme within the workplace, demonstrating initiative, and putting effort into improving safety in the workplace" (Neal & colleagues, 2000, p.101).

In this study, safety outcomes are defined in terms of accidents, injuries and safety-related events. Accidents have often been assumed to be caused by employee attributes (Laurence, 2005; Zohar & Luria, 2003; Hobbs & Williamson, 2002; Barling & Hutchinson, 2000; Margolis, 1973) or human error (Dekker, 2002). Thus, the extant workplace safety literature frequently suggests relationship between individual-level factors and workplace injury (e.g. Salminen & Tallberg, 1996; Hudson, Reason, Wagenaar, Bentley, Primrose, & Visser, 1994; Sutherland & Cooper, 1991; Feyer & Williamson, 1991; Reason, 1990a; Hansen, 1989; Hale & Glendon, 1987) leading managers to control workplace safety through the selection of particular types of employees and to introduce interventions that are geared toward the modification of employee behaviours (Parker, Axtell, & Turner, 2001).

Research shows that, although there might be evidence that links a small group of personality characteristics to injuries or accidents (See Hansen, 1989; Shaw & Sichel, 1971), this relationship is only indirectly. Wallace, Popp, and Mondore (2006) comment that although human error represents unsafe behaviours and accidents that are attributable to a person, it does not provide much insight into the behavioural mechanisms that lead to unsafe behaviours. Dekker (2002) believes that "human error is not an explanation for failure, but instead demands an explanation" (p.372). His new view of occupational accidents sees human error and unsafe behaviours as symptoms and not direct causes. Thus, it is proposed that effective safety measures should focus not just on the individual employee who is mainly at the receiving end but also on the arrowhead such as the organizational factors (e.g. organizational leadership or HRM).

Therefore, attempting to identify the organizational and managerial factors and the human factors that interact to impact workplace safety is an objective of the current study. Thus, the study examines the influence of a system of separate but interconnected safety-related human resource practices on workplace safety outcomes in terms of workplace injuries and safety-related events through their impacts on employees' safety knowledge/safety motivation, and safety behaviours.

1.4. Research Setting

The data for this study will be collected from oil and gas industry in Nigeria. The choice of Nigeria's oil and gas industry as a target population is motivated by some salient factors. First, research evidence shows that studies investigating HPWS and safety outcomes in 'critical skills occupations' such as the oil and gas industry (See Cantor, 1992) are scant. Smith-Crowe, Burke, and Landis (2003) describe 'critical skills occupations' as occupations requiring high levels of knowledge and skills in order to perform jobs safely. Thus, this study posits that oil and gas industry in Nigeria falls within the purview of Smith-Crowe, Burke, and Landis' (2003) description of critical skills occupations. Second, research indicates that, although similar work in this area has been carried out in Western (e. g. U.S., UK, Australia) and Asian (e.g. China, India) countries, little if any, has been done in less developed but emerging economies such as Nigeria. Third, Nigeria is presently the world's 10th largest producer and 5th largest exporter of crude oil, petroleum and petroleum products forming 95% of her commodity exports. Official statistics on fatalities and accidents are unreliable, largely because organizations are unwilling to expose themselves to compensation claims and a lack of appreciation on the employees' behalf of their rights despite relatively high levels (approximately 60%) of union membership (Fajana, Owoyemi, Elegbede, & Gbajamo-Sheriff, 2011). However, estimates suggest that on average, 200 industrial accidents occur per day in Nigeria, with between 100 and 200 occupational fatalities per year (Fajana, 2010).

HRM practices operate within economic, social, political, and legal settings. In order to gain an insight into the local conditions, processes, philosophies, and problems involved in developing national models of HRM practices, there must be a due consideration of the historical and cultural milieu (Hofstede, 1993) as well as the local values, and customs of the employees (Fajana & colleagues, 2011). Thus, research has begun to realise that HRM practices have to be tailor-made. For example, comparing data from 13 different countries based on HRM practices, Sparrow and Budhwar (1997) found world-wide differences in the use of HRM practices. Their findings suggest that countries are unique in their approach to HRM. What this means is that what works in one country (with regard to HRM practices) might not work well or as much in another country. The implication of their findings therefore, is that organizations will have to focus more on HRM practices designed to meet the needs of local employees. Additionally, research (e.g. Fajana & colleagues, 2011) reports that HRM practices in Nigeria are still much at infancy stage and that lack of indigenous and comprehensive HRM models characterize HRM practices in Nigeria. Thus, there is need for research to explore the indigenous and comprehensive HRM models particularly with regard to health and safety in the Nigerian context (Fajana & colleagues, 2011). Consequently, this study has proposed a conceptual model (See figure 2.1) that may be suitable to HRM practices in Nigeria and has developed a measure of HPWS (for safety) that is culture-free and suitable for use in an emerging economy like Nigeria.

1.5. Structure of the Thesis

Chapter 2 reviews social exchange theory (SET) and social information processing perspective (SIP) as the theoretical perspectives that underpin the conceptual model I proposed and tested in this study. It also suggests the rationale for choosing SET and SIP as the most appropriate theoretical framework as against other possible theories such as regulatory focus theory, self-determination theory, and perceived organizational support theory. Furthermore, this chapter discusses the context of the study and presents AMO theory as the theoretical underpinning for the development and validation of HPWS for safety scale. Specifically, I discussed the tenets of these theories, their appropriateness for this study, and how they informed my choice of variables. Chapter 2 also presents the literature review and hypotheses development.

Chapter 3 presents the development and validation of the HPWS for safety scale. This chapter discusses the scale development process starting with the rationale for a safety-specific HPWS measure, the philosophical perspective adopted by the research, and then the generation of the initial pool of items, followed by three studies to validate the newly developed HPWS for safety scale. The ethical issues core to this research were also discussed.

Chapter 4 describes the methodology of the main study. First,the ethical issues core to the research were clearly acknowledged, followed by the description of the sample and data collection procedure as well as measures of the study variables. Second, the chapter describes and justifies the use of multilevel structural equation modelling (MSEM) with Mplus to test the study’s hypotheses.

Chapter 5 presents the results of the findings of the analyses. First, it reports results of analyses to ascertain the discriminant, convergent, and criterion-related validity of the study constructs. Second, it reports the results of the MSEM analyses adopted to test the hypothesized relationships depicted in figure 2.1. Lastly, it presents a table of the summary of main findings.

Chapter 6 is the discussion and conclusion chapter. It presents a summary of the key findings of the study and discusses the theoretical and practical implications of these findings, the limitations and strength of the study, and maps out directions for future research.

2.0. CHAPTER 2: THEORETICAL FRAMEWORK, CONCEPTUAL MODEL, AND DEVELOPMENT OF HYPOTHESES

2.1 Introduction

This study proposes and examines a multilevel model of why and when HPWS for safety impacts employees' safety outcomes as well as the mechanisms hypothesized to mediate and moderate the relationships. The chapter discusses the context of the study and draws on social exchange theory (SET) and social information processing perspective (SIP) to account for the hypothesized relationships depicted in figure 2.1. It also considered other alternative theories such as regulatory focus theory, self-determination theory, and perceived organizational support theory, and advanced reasons why SET and SIP were found to be more appropriate theoretical frameworks as compared to these other possible alternative theories. It further draws on AMO theoretical framework to develop and validate an HPWS for safety scale. First, it is important to appreciate the context for the research and to this effect, I will first present a brief overview of the state of development of HRM in Nigeria and particularly in the oil and gas industry.

2.2. Research Context

This section presents the circumstances that form the setting for the conduct of this research and in terms of which it can be fully understood. The study was conducted in oil and gas industry in Nigeria. In Nigeria, the oil and gas industry contributes well over 95 percent of its foreign earnings and this suggests the importance of this sector to the overall development of the country. Nigeria, with a population of about 140 million people, has a growth rate of 3.2% (Federal Republic of Nigeria Official Gazette, 2007). It is the 10th largest producer of oil in the world and, until recently when it was overtaken by Algeria, it was also the largest producer of the product in Africa (Oyejide & Adewuyi, 2011). It also ranks the ninth largest gas reserve holder in the world and the largest in Africa (Yakubu, 2013).

Relatively, little research has been conducted on HRM in developing countries in general (Budhwar & Debrah, 2001) and Nigeria in particular. Therefore, as elsewhere in developing countries, HRM practices and policies are not well documented in Nigeria as it is in the developed countries (e.g. Sission & Storey, 2000; Schuler & Jackson, 1999; Poole, 1999; Poole & Warner, 1998). However, due to the privatization and liberalization policies adopted by the federal government in the 2000s, there were more foreign investments. Therefore, as foreign firms increased their involvement in Nigerian economy, there was the need to build capabilities and utilize local competencies. Thus, the knowledge of HRM and more importantly, the knowledge of the factors that affect HRM in Nigeria became more increasingly critical to the way and manner business was done in Nigeria (Ovadje & Ankomah, 2001). Ovadje and Ankomah (2001) noted that Personnel Management was still very much an administrative function concerned with recruitment, payroll, and record keeping. Relatively, few companies, usually medium to large companies and multinational companies, have a formal Personnel or HR department. In addition, in most of these companies, the Personnel Manager typically reports to the head of the Finance and Administration (Ovadje & Ankomah, 2001). However, in very few cases, he or she is a member of the top management.

The HRM is a strategic function in the oil and gas industry in Nigeria (Ovadje & Ankomah, 2001). This is because the HR and HRM policies and practices in the oil and gas industry in Nigeria model those of the developed countries because of the presence of multinational corporations. For example, HRM evolved over time beginning with the transformation of Personnel Management into HRM and moving from there to the incorporation of industrial relations into HRM (Guest, 1991). Then, there was the integration of HRM into business strategies, devolvement of HRM to line managers (Brewster & colleagues, 1997; Budhwar &Sparrow, 1997), and now we look at HR as a source of competitive advantage for organizations (e.g. Wright & colleagues, 1994; Schuler & MacMillan, 1984). Currently, there is a consensus that HRM contributes to firm's performance (See Schuler & Jackson, 1999; MacDuffie, 1995; Huselid, 1995). Based on the foregoing, the present study posits that safety-related HRM practices contribute to employee safety outcomes via their safety behaviours.

The federal government is the largest employer of labour in Nigeria. As a result, its actions and policies concerning HR and HRM go a long way in determining what happens in the entire public and private sectors. For example, when wages and salaries are reviewed in the public sector, the employees in the private sector also get their own wages and salaries reviewed by way of unions' negotiations. Therefore, the HRM policies in Nigeria vis-à-vis oil and gas companies are subject to the whims and caprices of the government policies. To enhance the HR development in the oil and gas industry in Nigeria, therefore, the federal government established the Petroleum Training Institute (PTI) in Effurun in 1972 and Petroleum Technology Development Fund (PTDF) in Abuja in 1990. The PTDF was established with the sole aim to develop the work force capacity (HR) of the country to enable it to actively participate in the development, exploration, and exploitation of the mineral resources in the country. The PTDF was given the responsibility to upgrade the PTI to a Centre of excellence. The PTI was primarily charged with the specific mandate to, among others:

1. Provide courses of instruction, training and research in oil and gas technology and to provide technicians and such skilled personnel that are normally required for oil and gas industry;
2. Organize conferences, seminars, and study group relative to the requirements of oil and gas industry (Olorunsola, 2012).

The Institute therefore provides training in professional HR and safety specifically for the oil and gas industry by serving as an Industrial Training Centre, offering job-oriented training in both regular and part-time programmes in order to meet the specific needs of the industry.

This is in line with Ovadje and Ankomah (2001) who observe that the training and development functions of HRM are regulated by government policies. Thus, in line with the government policy on HR and safety development, oil and gas companies in Nigeria have a set of formal HRM and safety policies and practices embedded in their structure. For example, they operate their HR and safety policies and practices with the aim to increase employees' knowledge, skills, and abilities to perform their job; empower or motivate them to perform their job; and create opportunity for them to perform their job (Delery & Shaw, 2001; Becker & Huselid, 1998). One of the ways they do this is to provide their workers with education subsidies to enable them embark on job-related training. Some of the companies include this allowance in workers' wages while others prefer to maintain educational and training subsidy programmes. In either case, it is expected that the training course be job-related and beneficial to both employees and employers.

All of the organizations surveyed have HR departments headed by HR managers and subordinated by HR line managers who are in charge of the units within the departments. Therefore, the HR functions are well represented on the board and affect, largely, the business strategy development of the organizations. The strategic partnership status enjoyed by the HR functions in oil and gas industry in Nigeria enables us to understand not only the role that HR plays in the organizational development, but also in the effective implementation of organizational strategy and ultimately, safety performance. Therefore, the oil and gas industry in Nigeria provides an appropriate context on which to investigate why and how the use of HPWS for safety facilitates employee safety outcomes in the workplace.

2.3. Theoretical Framework

2.3.1. Social Exchange Theory (SET)

Social exchange theory (SET) is one of the dominant paradigms for understanding workplace behaviour. Its origin can be traced back to the 1920s (See Mauss, 1925; Malinowski, 1922) and its use cuts across several disciplines such as sociology (Blau, 1964), social psychology (e.g. Gouldner, 1960; Thibault & Kelly, 1959), and anthropology (e.g. Sahlins, 1972; Firth, 1967). Despite the fact that there are divergent views of social exchange, theorists have acknowledged that social exchange entails a series of interactions that generate obligations (Emerson, 1976) and has therefore been used to account for the development and maintenance of interpersonal relationships.

Blau (1964) was among the first to distinguish between social exchange and economic exchange. Social exchange involves "favours that create diffuse future obligations, not precisely specified, and the nature of the return cannot be bargained...... but must be left to the discretion of the one who makes it" (Blau, 1964, p.93). Economic exchange, on the other hand, is established based on contractual relationship that requires specific performance of contractual obligations with no expectation of performance beyond the terms of reference specifically provided in the contract (Blau, 1964). It represents short-term economic inducements offered, for example, by employers to employees in exchange for well-specified contributions by the employees (Tsui, Pearce, Porter, & Hite, 1995). The basic difference between economic and social exchange therefore, is that social exchange entails unspecified, broad, and open-ended obligations on the part of both parties (Blau, 1964). Economic exchange is based mainly on transactions whereas social exchange relationships are based on mutual trust that the individual party to the exchange will be fair in discharging their obligations in the long run (Holmes, 1981). Konovsky and Pugh (1994) emphasize that this trust is necessary for maintaining social exchange, especially in the short-run, where some temporary or perceived deviations or differences may exist between an individual's inducements- that is, the benefits received from participation in the social exchange relationship- and contributions, the individual's inputs into the relationship. Again, the expectation of long-term fairness in social exchange differentiates it from the expectation of short-term fairness that generally defines economic exchange. Thus, like economic exchange, social exchange entails a relationship that elicits an expectation of some future return for contributions, whereas, unlike economic exchange, the exact nature of the return is not indicated. In addition, social exchange does not occur on a quid pro quo or calculated basis (Konovsky & Pugh, 1994).

Cropanzano and Mitchell (2005) suggest that one of the principles of SET is that relationships evolve over time into trusting, loyal, and mutual commitments. In order to achieve this, the parties involved must abide by certain “rules” of exchange. According to Emerson (1976), the rules of exchange characterize a “normative definition of the situation that forms among or is adopted by the participants in the exchange relation” (p. 351). In this manner, the rules and norms of exchange are “the guidelines” of exchange processes. Cropanzano and Mitchell (2005) posit that reciprocity is perhaps the best known exchange rule.

Reciprocity entails interdependent exchange that involves mutual and complementary arrangements that define the characteristics of social exchange (Molm, 1994). It emphasizes contingent interpersonal transactions, whereby an action by one party leads to a response by another. For example, if a person supplies a benefit, the receiving party should respond in kind (Gergen, 1969). Gouldner (1960) explains that within SET, positive behaviours are promoted through the norm of reciprocity. Reciprocity is a condition whereby when one party receives a favour from the other party, the party that received the favour is required to provide something in return in a “mutually gratifying pattern of exchanging goods and services” (Gouldner, 1960, p.170).

As earlier noted, although SET was originally developed to account for the development and maintenance of interpersonal relationships, it has since been extended to workplace relationships (Shore, Tetrick, & Barksdale, 1999). The theory posits that if one party in a social interaction acts in a way that benefits the other party, a mutual expectation will arise that this behaviour will be reciprocated at some later stage. In other words, the theory proposes that when individuals provide services that are valuable to others, the beneficiaries of these services respond with a certain level of obligation (Mearns & colleagues, 2010). Beneficiaries experience an obligation to reciprocate the good deeds thereby making reciprocity the axis around which social exchange-based relationships revolve.

Social exchange theorists distinguish between discretionary and mandatory actions which organizations undertake. They posit that discretionary or voluntary aid that the organization gives makes the employees believe that they are genuinely respected and valued by the organization, whereas mandatory or expected actions do not have any positive influence on their beliefs about the organization (Eisenberger & colleagues, 1997; Cotterell, Eisenberger & Speicher, 1992; Gouldner, 1960). This suggests that management behaviour that purports or demonstrates to offer supports to employees in a variety of ways would generate an obligation among employees to reciprocate by contributing to the goals of the organization. For example, it has been observed that where organizations invest in individual training and development programmes, employees reciprocate through desirable work-related behaviours (Moorman, Blakely, & Niehoff, 1998; Wayne, Shore, & Liden, 1997; Haas & Deseran, 1981). In addition to statutory provisions, investing in HPWS for safety practices signals to employees the organization’s care and concern for the safety and well-being of its employees. If employees interpret these activities to suggest appreciation, investment, and recognition of their contributions, they will perceive themselves as being involved in a long-term social exchange (Shore & Shore, 1995) with its inherent reciprocal obligations.

Given the above arguments, SET informs the relationships depicted in model 2.1. HPWS entails the creation of a mutual investment based on employment relationship, where an organization invests in employee skills and opportunities and, in turn, expects them to be qualified and motivated to contribute to work-related investments in the organization (Huselid, 1995). Thus, HPWS not only signal an organization’s interest to maintain a long-term relationship with its employees but also to strengthen the socio-emotional (e.g. employee well-being, safety) aspect of the exchange. When HPWS practices are interpreted by employees as expressing appreciation, investment, and recognition, they begin to perceive themselves in a social exchange relationship (Shore & Shore, 1995). This creates feelings of obligation on the part of employees, and because individuals return favours in the light of positive treatment received from others (Blau, 1964), employees are more likely to reciprocate the organization’s favourable treatment by developing appropriate behaviours that foster its goal attainment.

SET has been utilized by researchers (e.g. Sun & colleagues, 2007; Takeuchi & colleagues, 2007; Allen, Shore, & Griffeth, 2003) to justify the theoretical relationships between HRM practices and attitudinal, behavioural and performance outcomes. For example, Allen and colleagues (2003) found supportive human resource practices such as participation in decision-making, fairness of rewards, and growth opportunities to contribute to employees’ perceived organizational support, which mediated the relationships between HRM practices and organizational commitment, job satisfaction, and employee turnover. According to them, POS represents the strength of the employees’ perceived social exchange relationship with the organization. Sun and colleagues (2007) also contend that the mediating role of service-oriented citizenship behaviour in the relationship between high performance human resource practices and both productivity and turnover represents a relational view of the employment relationship, with employees reciprocating the favourable treatment received from the organization. In a similar vein, Takeuchi and colleagues (2007) found high performance work practices rated by both managers and employees to be highly related to collective human capital, an establishment level social exchange, which mediated the relationship with a subjective measure of establishment performance. In this study, I tested the formulation of SET by examining the mechanisms through which experienced HPWS for safety influence individual safety outcomes.

2.3.2. Social Information Processing Theory (SIP)

Social information processing (SIP) theory (Salancik & Pfeffer, 1978) was developed as an alternative perspective to needs satisfaction theories (e.g. Hackman & Oldham, 1976; Alderfer, 1972; Herzberg, 1968; Vroom, 1964; Argyris, 1957; Maslow, 1943). Models of needs satisfaction posit that individuals possess different sets of needs which have to be met, and that jobs possess distinct objective characteristics that have the potentials to meet these needs and thus increase individuals' levels of satisfaction (Pollock, Whitbred, & Contractor, 2000). Job attitudes and, sometimes, motivation, are assumed to be the outcome of the correspondence between the needs of the individual and the characteristics of the job or the job situation (Salancik & Pfeffer, 1977). The implication, therefore, is that jobs that meet the individual needs are satisfying whereas those that do not are not satisfying. Thus, it is assumed that if an individual is satisfied with his or her job, it is because the job has characteristics compatible with his or her needs and if the individual is not happy with his or her job, it is because the job is not satisfying his or her needs.

Although the need-satisfaction model has been the theoretical framework almost universally applied to understand work-related attitudes (Salancik & Pfeffer, 1977), this approach has met with some criticisms (See Staw & Ross, 1985; Salancik & Pfeffer, 1978; Salancik & Pfeffer, 1977). For example, it has been noted that these models appear to deny individuals' capacity to provide their own satisfaction by cognitively reconstructing situations (Salancik & Pfeffer, 1977). Thus, the repeated failures to find empirical support for models of universal human needs (Hulin & Blood, 1968; Turner & Lawrence, 1965) prompted Salancik and Pfeffer (1978) to come up with SIP theory, suggesting that individual needs and perceptions of job characteristics are not fixed but are instead, influenced by the social environment or the network of social and informational relationships which surround an individual.

The social information processing (SIP) perspective highlights the effects of social context, the individual's past actions and experience with the job, and the individual's perceptions of the job's characteristics to predict job satisfaction, rather than individual predispositions (or needs) and rational decision-making processes (Salancik & Pfeffer, 1978). Thus, this theory is built on the premise that individuals tend to adapt their attitudes, behaviours, and beliefs to the information they obtain from the social context, cognitive evaluation of the dimensions of their work environment, the reality of their past and present behaviours and the situation (Salancik & Pfeffer, 1978). This implies that an individual can learn about behaviour by studying the information and social environment from which that behaviour emanates and to which it adapts.

The SIP perspective posits an individual's immediate social environment as an important source of information, and that this social context is the basic determinant of behaviour (Salancik & Pfeffer, 1978). The social context provides individuals with information both directly (about what an individual attitudes and behaviours should be) and indirectly (by making more or less salient the information about some behaviour: past activities, statements, thoughts). Salancik and Pfeffer (1978) further suggest that 'social context binds people to behaviour through a process of commitment, affects the saliency of information about their past activities, and provides norms and expectations that constrain their rationalization or justification of those activities' (p. 233). Thus, the social context can influence employees' beliefs about the nature of the workplace (e.g. safety), the appropriate employee attitudes, and the needs employees are supposed to possess.

SIP regards a need as an outcome produced by an individual employee instead of a static individual characteristic. Salancik & Pfeffer (1978) argue that these needs and the job characteristics that are assumed to satisfy them are socially constructed realities, rather than fixed. These realities are constructed and shaped through the application of the social information cues that individual employees receive from their work environment. Thus, if employees are exposed to more positive cues with regards to the organization or unit's policy on and practice of individual safety, these employees will be more likely to express positive feelings about safety. SIP has been employed to account for the development of unit values, perceptions, and norms (See Liao & Rupp, 2005; Robinson & O'Leary-Kelly, 1998).

SIP has been criticized because it provides an over socialized view of individual satisfaction and for not articulating the process through which the social environment affects individual attitudes and perceptions (Staw & Ross, 1985; Blau & Katerberg, 1982). In response to this criticism, Pollock, Whitbred, and Contractor (2000) contend that the lack of consistent empirical support for SIP is not because of fundamental theoretical flaws, but because of its inadequate articulation in prior research. Thus, in spite of the criticism, research (e.g. Aryee & colleagues, 2012; Liao & Rupp, 2005; Zalesny & Ford, 1990; Fried & Ferris, 1987; Griffin, 1983) has applied SIP with some success to examine perceptual and behavioural outcomes in addition to attitudinal outcomes. For example, Liao and Rupp (2005) have applied SIP to provide the theoretical underpinning for the emergence of justice climate as group-level property. Aryee and colleagues (2012) have also used SIP to account for the theoretical justification of the relationship between branch-level HPWS and experienced HPWS. According to them, branch-level HPWS provides a contextual cue for employees that enables them to psychologically interpret their work environment. Drawing on Aryee and colleagues (2012), Liao and Rupp (2005), I utilized SIP to account for the theoretical justification of the relationship between the use of HPWS for safety and experienced HPWS for safety, and as a theoretical underpinning for the emergence of safety climate as a unit-level property. I also use SIP to explain the relationship between the use of HPWS for safety and unit-level safety climate. This is based on Bowen and Ostroff (2004) who suggest that the use of HPWS can serve as a signalling function by communicating messages to employees about a particular strategic focus, which in this research, is workplace safety. Thus, applying this perspective to workplace safety suggests that individual employees who work in a shared social environment will receive similar social cues or normative expectations regarding appropriate safety-related behaviours.

2.3.3. Alternative Theoretical Framework Considered for Inclusion

A number of related alternative theoretical constructs were considered in developing the overall theoretical framework of this study. The dominant among these were regulatory focus theory (RFT), perceived organizational support (POS), and self-determination theory (SDT).

2.3.3.1. Regulatory Focus Theory

Regulatory focus theory (RFT) describes the process of self-regulation focus which indicates that people change their behaviours through two coexisting motivational systems (i.e. promotion focus and prevention focus) that cater to different needs during goal pursuit (Kark & colleagues, 2015). This theory suggests that individuals strive to accomplish tasks using a promotion focus strategy that is characterized by an eagerness focus or concern for accomplishing greater quantity of work more quickly, or using a prevention focus strategy, characterized by a vigilance focus or concern for adhering to work-related rules, responsibilities, and regulations. Although "both promotion and prevention involve motivation to approach or attain a new task goals, they differ in their orientations towards how to successfully attain the goals" (Kark & colleagues, 2015; Lanaj, Chang, & Johnson, 2012; Forster, Higgins, & Bianco, 2003; Higgins, Friedman, Harlow, Idson, Ayduk, & Taylor, 2001, p.21). Because of their achievement emphasis on getting work done more quickly, employees adopting promotion focus might behave unsafely in pursuit of their goals. Thus, while it is possible for the adoption of promotion regulatory focus to increase one's accomplishment by increasing the quantity and speed with which the employee completes the task, it is likely that the overall effectiveness may reduce because of the possible increase in safety incidents and errors at work. On the other hand, employees adopting a prevention focus may strive to work in a safe manner to reduce the possibility of being involved in an accident and to ensure task completion. However, this is likely to reduce output because of a vigilant work focus and thus increase the overall effectiveness by reducing the possibility of accidents involvement (Forster & colleagues, 2003).

Research (e.g. Wallace, Chen, & Kanfer, 2005; Forster & colleagues, 2003) seems to indicate that promotion focus increases speed at the expense of accuracy whereas prevention focus increases accuracy at the expense of speed. For example, Wallace and colleagues (2005) found promotion focus to be positively related to productivity performance while prevention focus is positively related to safety performance. However, they found that when production and safety were viewed as competing variables, promotion focus was negatively related to safety while prevention focus was negatively related to production. Therefore, it seems likely that, in a more demanding work context, promotion focus fosters productivity at the expense of safety whereas prevention focus tends to foster safety at the expense of productivity (Wallace & Chen, 2006; Beersma, Hollenbeck, Humphrey, Moon, Conlon, & Ilgen, 2003). However, Wallace and Chen (2006) contend that productivity and safety are both important dimensions of overall performance on many jobs. In addition, a meta-analytic research (e.g. Viswesvaran, Schmidt, & Ones, 2005) indicates an evidence for a general factor in performance ratings, meaning that productivity and safety are positively related dimensions of performance. The above explanations indicate that what RFT speaks to is not what this current research is interested in. Thus, the suitability of the complete theory will be questionable if utilized to facilitate the relationships hypothesized in the study's conceptual model.

2.3.3.2. Perceived Organizational Support

Perceived organizational support (POS) reflects employees' perceptions concerning the degree to which their organization values their contributions and cares about their well-being. The underpinning or framework of POS is derived from SET that was developed to explain the maintenance of interpersonal relationship in the context of work environment. The only important distinction made by social exchange theorists is the issue of discretionary versus mandatory actions that organizations exhibit. Social exchange theorists contend that favours received from others will be highly valued if they are given based on discretionary choice rather than circumstances that are beyond the giver's control. The recipient sees such voluntary favours as a demonstration of the giver's genuine value and respect for the recipient (Cotterell, Eisenberger, & Speicher, 1992; Eisenberger, Cotterell, & Marvel, 1987; Blau, 1964; Gouldner, 1960). However, mandatory actions do not have any positive effect on employees' beliefs of the organization (Cotterell & colleagues, 1992; Gouldner, 1960). Thus, although POS is relevant to extricate the relationships postulated in the study's conceptual model, the theoretical arguments will be similar to those of SET since it is a part of the underpinning SET agenda. Therefore, it is more appropriate to adopt SET as against POS as the theoretical underpinning of this study.

2.3.3.3. Self-Determination Theory

Self-determination theory (SDT) posits that people are intrinsically motivated to actively seek challenges and new experiences to develop and perform at their best (Deci & Ryan, 1985). Although these actions tend to be self-determined to the extent that they are approved or endorsed by one's sense of self (Deci, Vallerand, Pelletier, & Ryan, 1991), certain environmental factors are needed in order to enhance this sense of intrinsic motivation. Thus, SDT is described as organismic-dialectical metatheory that sees people as proactive organisms whose intrinsic functioning can be either facilitated or impeded by social context (Deci & Ryan, 1991, 1985).

SDT is characterized by the relative strength of autonomous versus controlled motivation as opposed to the total motivation that characterizes other work motivation theories (Gagne & Deci, 2005). Research indicates that, whereas autonomous motivation facilitates effective performance and well-being, controlled motivation can detract from those outcomes, particularly if the task requires creativity, cognitive flexibility or deep processing of information (Gagne & Deci, 2005). Thus, the two aspects can be considered to be contradictory in the sense that more time is needed to, for example, engage safety behaviours (safety compliance and safety initiative) which can distract employees from their core duties. This will tend to create in the employees a dissonance behaviour because they will have to think of prioritizing certain behaviours over others. What is relevant in the current study is the concern of the organization for the health and well-being of the individual employees and how employees would reciprocate the good treatment received from the organization if given based on discretion. Thus, SDT does not seem to speak to what the current research is interested in. Therefore, I see the use of SET to be more appropriate in the theoretical underpinning of the relationships depicted in the study's conceptual model.

2.3.4. Ability-Motivation-Opportunity (AMO) Theory

Boxall and Purcell (2011) posit that although the ability-motivation-opportunity (AMO) framework has been around for quite some time, the work of Campbell and colleagues (1993) presents a formal and more explicit version of AMO theory. Prior research has drawn upon the AMO framework (See Bailey, Berg, & Sandy, 2001; Appelbaum, Bailey, Berg, & Kalleberg, 2000) to posit employee performance as a function of three key components: ability, motivation, and opportunity to perform (Jiang & colleagues, 2012). Representing it mathematically, it means:

$$P = f\ (A - M - O)$$

Ability describes the practices that equip employees with the necessary skills needed to undertake their jobs (Cox, Higgins, & Speckesser, 2009). Motivation describes the willingness of employees to exert effort to the achievement of organizational objectives and may arise from extrinsic/financial rewards, intrinsic drive or from mutual trust/employees as stakeholders (Appelbaum & colleagues, 2000). Appelbaum and colleagues (2000) describe opportunity as involvement in the decision-making process of the organization. This framework suggests that organizational interests are best served by an HRM system that attends to employees' interests such as skill requirements, motivations, and the quality of their job (Boselie & colleagues, 2005; Bailey & colleagues, 2001; Appelbaum & colleagues, 2000).

Appelbaum and colleagues (2000), Bailey and colleagues (2001) argue that effective HPWS are characterized by three basic components: First, HPWS help to build the employees' "skills to participate" (i.e. ability) (Appelbaum & colleagues, 2000; Bailey, 1993). It represents the discretionary effort model that suggests that employees in a HPWS need more skills than those in traditional work settings. HPWS expects employees to be familiar with and execute a wider range of tasks to enable them to develop better skills such as interpersonal and behavioural skills. It is also expected that they should be able to take on supervisory and coordination function (Bailey & colleagues, 2001). Thus, it is expected that the employees in HPWS should receive more formal and informal training.

The second component is "motivation to participate" which comprises incentives that encourage employees to participate in decision-making activities. This will include contingent compensation, employment security, and transformational leadership (Mendelson, Turner, & Barling, 2011). HRM policies that motivate employees to provide more effort that is discretionary indicate that firms adopt some type of pay-for-performance such as profit- or gain-sharing, or bonuses for meeting production or quality targets (Bailey & colleagues, 2001). It is believed that when pay is linked to actual performance (e.g. safety performance), it will elicit greater discretionary effort from employees. Thus, given the conducive milieu and the right incentives, Appelbaum and colleagues (2000) argue that employees may be willing to exert additional effort for the organization by being more creative, helpful, giving extra attention to details or taking on more tasks (Cox & colleagues, 2009).

Third, is work organization that provides employees with the "opportunity to participate" which will include information sharing, reduced status distinctions, and self-managed teams. Researchers (e.g. Boxall & Macky, 2009; Wood & Wall, 2007; Appelbaum & colleagues,

2000) see the features of AMO as that which make HPWS stand out from other HRM practices. This indicates that, for employees to perform above the minimum requirements, they must possess the appropriate ability (i.e. the requisite knowledge and skills) to participate; be motivated (i.e. given appropriate incentives) to participate and be given the opportunity to use their skills and appropriate incentives to provide discretionary effort (Purcell, Kinnie, Hutchinson, Rayton, & Swart, 2003; Bailey & colleagues, 2001). They describe discretionary effort (e.g. safety initiative) as that contribution of effort beyond what is called for or required (e.g. safety compliance) in the job description. They suggest that the nucleus of an HPWS is to organize the work process in such a manner that non-managerial employees have the opportunity to contribute discretionary effort through participation in shop floor problem solving and decision-making. In other words, employees can contribute only when they have the autonomy to solve problems and make proposals that can bring about positive changes in organizational routines (Doty & Delery, 1997).

Thus, according to Appelbaum and colleagues (2000), discretionary effort is the key to HPWS and AMO serves as the conceptual tool to elicit this effort. Specifically, it suggests that HPWS increase employee ability to do their job, the motivation to do the job beyond the terms of their job descriptions, and the opportunity to exert discretionary effort (Cox & colleagues, 2009). The idea of discretionary effort means that employees may be in the position to contribute more to the organization than to simply get the job accomplished.

Based on research on AMO framework (e.g. Combs & colleagues, 2006; Wall & Wood, 2005; Boselie & colleagues, 2005), the practices that constitute each of the three components of AMO have been identified. For example, in an overview of 104 studies published in leading academic journals from 1994 to 2003, and relating to HPWS-performance relationship, Boselie and colleagues (2005) identify ten (10) top HRM practices that have been frequently included in HPWS-performance studies. Similarly, Combs and colleagues' (2006) meta-analysis of 92 HPWP-performance studies identify the single HRM practices domains that have been found to be directly related or unrelated to organizational performance outcomes (See Table 3.1). A comparison of the work of Combs and colleagues (2006), Boselie, and colleagues (2005) reveal two fundamental implications: One is that both studies independently identified similar domains of interventions that previous research had included as HRM practices. This is in consonant with the emerging consensus that suggests that HRM practices should be examined in an HPWS framework (Dorenbosch, 2009). Two, Dorenbosch (2009) observes that we can categorize the type of HRM domains among the top 10 of the most frequently included HRM practices in accordance with AMO framework. Consistent with the preceding discussion, Lepak and colleagues (2006) suggest that it might be worthwhile to conceptualize HRM practices as belonging to one of three main AMO components: skill-enhancing HRM practices (i.e. ability), motivation-enhancing HRM practices, and opportunity-enhancing HRM practices (See Table 3.1). According to Jiang and colleagues (2012), the skill-enhancing HRM practices that are designed to ensure appropriate development of employee skills include comprehensive recruitment, rigorous selection, and extensive training. The motivation-enhancing HRM practices that are designed to promote employee motivation include developmental performance management, competitive compensation, incentives and rewards, extensive benefits, promotion and career development, and job security. The opportunity-enhancing HRM practices that are designed to empower employees to utilize their skills and motivation to achieve organizational goals include flexible job design, work teams, employee involvement, and information sharing. These practices together define the AMO components and thereby foster the discretionary behavior central to HPWS

2.4. Conceptual Model

Figure 2.1 represents the mechanisms through which HPWS for safety relates to individual safety outcomes. As shown in that Figure, HPWS for safety is posited to relate directly to unit safety climate but indirectly to individual safety outcomes through a chain of mediating mechanisms. Specifically, HPWS for safety relates directly to unit safety climate and experienced HPWS for safety. It also posits that employees' experienced HPWS for safety indirectly influences safety outcomes (measured in terms of workplace injuries and safety-related events) through the mediating effects of safety knowledge/safety motivation and safety compliance/safety initiatives (safety behaviours). Furthermore, it proposes unit safety climate to have a cross-level moderating influence on the relationship between safety knowledge/safety motivation and safety behaviours (safety compliance and safety initiative).

This multilevel model is characterized by the simultaneous examination of the mechanisms through which HPWS for safety influence individual safety outcomes. Drawing on SET, I examined all the hypothesized relationships between experienced HPWS and safety outcomes: experienced HPWS for safety-safety knowledge/safety motivation relationship, experienced HPWS for safety-safety behaviour relationships, experienced HPWS for safety-safety knowledge/safety motivation-safety behaviours-safety outcomes relationships, and so on. However, underpinned by SIP, I examined the relationship between the use of HPWS for safety and safety climate as well as experienced HPWS for safety. In the same vein, informed by both SET and SIP, I examined the moderation role of unit safety climate on the effects of safety knowledge/safety motivation on safety behaviours on one hand, and on safety outcomes of safety-related events and workplace injuries via the mediating roles of safety behaviours of safety compliance and safety initiative on the other.

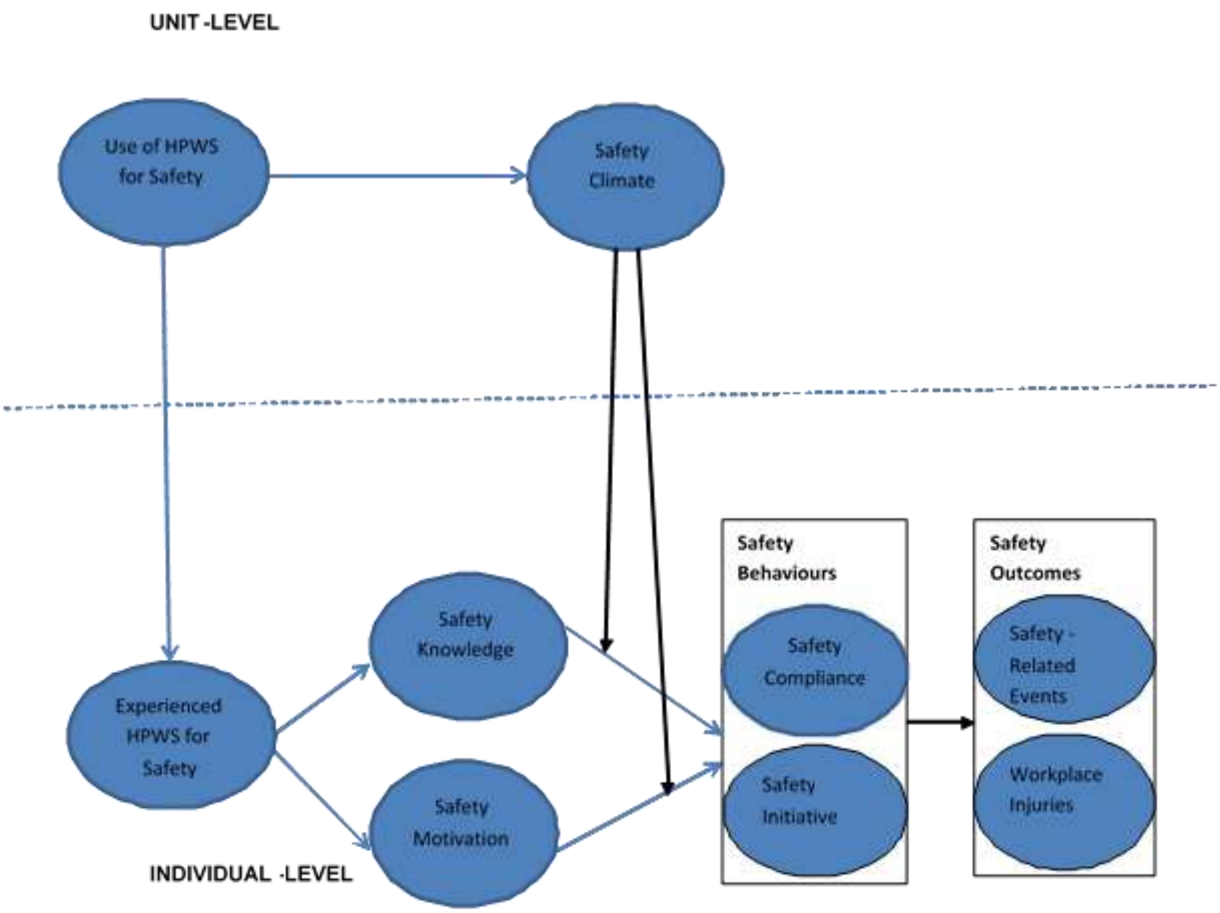

Figure 2.1: A Conceptual Model of HPWS for Safety and Workplace Safety

2.5. Literature Review and Hypothesis Development

2.5.1. Unit-Level Relationships

2.5.1.1. HPWS for Safety and Unit-Level Safety Climate

HRM systems emphasize different objectives and therefore, have been known by different labels such as high commitment work practices (Collins & Smith, 2006; Wood & de Menezes, 1998; Walton, 1985), and high involvement work practices (Lawler, 1996, 1986, 1992) and HPWS (Becker & Huselid, 1998). As earlier noted, HPWS combines elements of both high commitment work practices and high involvement work practices (Zacharatos & colleagues, 2005). Researchers in SHRM consider an HPWS to include coherent practices (Appelbaum & colleagues, 2000) or a bundle of HRM practices (/Lepak & colleagues, 2006a) that are intended to enhance employees' skills, participation in decision making, and motivation to put forth discretionary effort. Although a number of HRM practices thought to constitute an HPWS vary from one study to the other (Posthuma, Campion, Masimova, & Campion, 2013), an HPWS typically includes selective staffing, extensive training, performance appraisals, compensation, job design, and involvement and participation (Sun, Aryee, & Law, 2007; Zacharatos & colleagues, 2005). These practices have been consistently found to have positive relationship with employee outcomes as well as the operational and financial outcomes of firms. This study expects HPWS to relate to safety climate, a type of organizational climate with a specific strategic focus.

Zohar (1980) defines climate as "a summary of molar perceptions that employees share about their work environments…...a frame of reference for guiding appropriate and adaptive behaviours" (p. 96). Employees develop this shared perception by collecting and interpreting information from their work environment (Schneider, Ehrhart, & Macey, 2013). When these perceptions are shared and summarized for individual employees within the unit, they are referred to as unit climate. Unit climate can be operationalized by aggregating individual perceptions to the unit level, using the direct consensus model (Chan, 1998).

It has been argued that different climates can be formed in the same organization as a function of various strategic foci of the organization (Schneider, 1990). In support of the existence of multiple climates, Schneider and Bowen (1992) posit that a positive climate for employees' safety may be different from a positive climate for employees' empowerment. They suggest, inter alia, that an organization might operate HRM policies and practices that promote, for example, employees' safety and this will have little or no bearing on, for example, the empowerment climate except and unless the organization also puts in place HRM policies and practices that foster a shared perception of empowerment. Drawing on the work of Schneider and Bowen (1992), research has linked climate to shared, specific foci such as climate for service or customer service (e.g. Borucki & Burke, 1999; Schneider, White, & Paul, 1998; Burke, Borucki, & Hurley, 1992; Schneider, Wheeler, & Cox, 1992; Schneider, 1990), climate for innovation (e.g. Anderson & West, 1998), climates of concern for employees and customers (Chuang & Liao, 2010), climate for social exchange (Takeuchi, Chen, & Lepak, 2009), and empowerment climate (e.g. Aryee & colleagues, 2012). Based on the foregoing, this study investigated employees' perceptions of the work environment in terms of unit safety climate as the unit's strategic focus and examined the relationship between HPWS for safety and employees' perception of unit safety climate. Unit level safety climate is defined as shared perceptions of work environment characteristics as they relate to safety issues that affect individuals within the unit.

Although much research has examined antecedents of safety climate, research examining the impact of HRM practices on unit safety climate is scant. Consonant with the predictions of the SIP perspective (Salancik & Pfeffer, 1978), Bowen and Ostroff (2004) observed that the use of HPWS can serve as a signalling function by communicating messages to employees about a particular strategic focus, which in this context is workplace safety. When practices of HPWS are targeted to safety, for example, safety-related training, rewards contingent on safety-related performance, safety information sharing, and employee involvement in safety-related decision-making, they provide an opportunity to experience a sense of choice in initiating and regulating one's actions (Aryee & colleagues, 2012). Employees' shared perception of these practices and the ingrained messages as facilitating safety will come to define their work environment.

In support of this argument, prior research has shown HRM practices to relate to service climate (e.g. Jiang, Chuang, & Chiao, 2015; Chuang & Liao, 2010; Salanova, Agut, & Peiró, 2005). Hong, Liao, Hu, and Jiang (2013) found this relationship to be stronger for service-oriented HRM practices than general HRM practices. Similarly, Zacharatos and colleagues

(2005) found HPWS to relate to perceived safety climate, although at the individual level of analysis. Consistent with the preceding theoretical explanations and empirical findings, I propose a positive relationship between HPWS for safety and safety climate:

Hypothesis 1: HPWS for safety will positively relate to unit safety climate

2.5.2. Cross-Level Relationships

2.5.2.1. HPWS for Safety and Experienced HPWS for Safety

Researchers have noted that experience of, rather than implementation of, HPWS is what drives the demonstrated outcomes of HPWS (Kehoe & Wright, 2013; Nishii & Wright, 2007; Nishii, Lepak, & Schneider, 2008). Although empirical studies that link managerial reports of the use of HPWS to employee outcomes are found to be methodologically consistent with the earlier research in SHRM, there is still a need for research to assess the role of employees' perceptions of HRM practices in determining their attitudinal and behavioural outcomes (Kehoe & Wright, 2013; Nishii & Wright, 2007, Nishii, Lepak, & Schneider, 2008). This is because there may be a disconnection between the managerial reports of what the organization actually does as formal policies and practices and employees' experiences of these policies and practices (Liao & colleagues, 2009).

Recent studies indicate that macro-level HRM practices are not uniformly applied across employee groups (Lepak, Taylor, Tekleab, Marrone, & Cohen, 2007; Wright & Boswell, 2002). For example, it has been observed that there is the likelihood that variability could occur in the styles of management, resource availability, and differences in the unit's task (Jensen, Patel, & Messersmith, 2013) and these may invariably bring about variability in HRM practices. Liao and colleagues (2009) note that between-group and within-group differences are potential sources of variability in employees' experiences of HPWS. They suggest that employees in groups of different employment status will have differential experiences in their exposure to HPWS practices. This indicates that employee experiences of HRM practices are germane in understanding the connection between HRM practices and organizational effectiveness. Organizations may also adopt specific HRM practices to match the demand of some employee groups (Miles & Snow, 1984). For instance, Lepak and Snell (2002) reported that core employee groups were more exposed to commitment-oriented HRM practices that entail high investment (Lepak & colleagues, 2007) compared to their noncore counterparts. Thus, based on the preceding arguments, Liao and colleagues (2009) posit that the between-group differences can make a fundamental contribution to the variability that exists in employees' experiences of HPWS.

The preceding discussions resonate with Guzzo and Noonan (1994) who observe that all HRM policies and practices convey messages in unintended manner, and these messages can be differently understood leading to employees interpreting the same HRM practices differently. The lack of uniformity in the application of HRM policies and practices across employee groups (Lepak & colleagues, 2007; Wright & Boswell, 2002) suggests the existence of a potential disconnection between the use of HPWS and employees' actual experiences (Aryee & colleagues, 2012; Liao & colleagues, 2009). Thus, experienced HPWS (for safety) may establish a pathway through which the use of HPWS (for safety) may influence employees' safety knowledge/safety motivation and behavioural variables at the individual level of analysis.

While Liao and colleagues (2009) reported a nonsignificant relationship between the use of HPWS and experienced HPWS, the SIP perspective proffers a theoretical argument suggesting why the two constructs should be related. The use of HPWS (for safety) creates a contextual cue that helps employees who work in a shared social environment to interpret their work environment (Aryee & colleagues, 2012) and generate common perceptions in a way that will convince them that some types of HRM practices are acceptable adaptations to their collective working conditions (Robinson & O'Leary-Kelly, 1998). In view of the preceding arguments, coupled with the argument that most work-related incidents such as injuries and safety-related events result from employees' unsafe behaviours (Margolis, 1973), it is pertinent that particular attention be paid to employees' actual experiences of the use of HPWS for safety. Therefore, it is expected that the use of HPWS for safety will relate to employees' experienced HPWS for safety:

Hypothesis 2: HPWS for safety will relate to employees' experienced HPWS for safety.

2.5.3. Individual-Level Relationships

2.5.3.1. Experienced HPWS for Safety, Safety knowledge/safety motivation, and Safety Behaviours

SHRM researchers such as Bowen & Ostroff (2004) contend that HRM practices are likely to have desired consequences on employees' attitudes and behaviours only to the extent that they are consistently experienced and perceived by employees. Specifically, Bowen and Ostroff (2004) noted that employees' attitudinal and behavioural responses to an HRM system depend on the HRM practices that employees perceive to exist in their work context. Therefore, employees' perceptions of HRM practices are more proximal predictors of their attitudinal and behavioural outcomes than manager rated HRM practices. This study therefore, examines linkages between employees' experienced HPWS and their safety knowledge/safety motivation and safety behaviours.

2.5.3.1.1. Experienced HPWS for Safety and Safety Knowledge

Campbell (1990), Campbell, McCloy, Oppler, and Sager (1993) conceptualize knowledge as comprising declarative and procedural knowledge. Declarative knowledge represents employees' knowledge about their work requirements. In other words, it includes knowledge of the principles, facts, and ideas about one's work. Procedural knowledge, on the other hand, describes knowledge pertaining to how to do the work. Procedural knowledge involves education, experience, training, and interest (Randhawa, 2008). Safety knowledge reflects both declarative and procedural knowledge. In other words, it describes the extent to which an employee feels that he or she knows the safety-related principles, practices and procedures of their job and how to perform their work safely (Griffin & Neal, 2000; Griffin, Neal, & Burley, 2000; Neal & colleagues, 2000).

When employees experience the use of HPWS for safety, their safety knowledge may be enhanced in some ways. First, employees' safety knowledge can be directly developed or improved through safety-related training programmes (Guest, 2002). For example, induction programmes that emphasize safety practices and on-the-job safety-related training programmes may help to facilitate employees' safety knowledge. Second, employees' safety knowledge can also be enhanced through safety information sharing. For example, organizations can share information about new development in safety practices with employees and thus, enhancing their safety-related knowledge. Third, employees' knowledge of safety-related activities and hence, safety knowledge can also be fostered through safety campaigns. For example, organizations that organize health and safety awareness through specific health and safety campaign programmes can also enhance their employees' safety knowledge. These components of HPWS for safety may jointly contribute to employees' safety knowledge.

SET (Blau, 1983) suggests that individuals are drawn to participate and invest in rewarding relationships, after which they become bound to reciprocate the benefits or favours received from their exchange partners. Implementation of HPWS for safety signals an employer's care and concern for employees' health and safety. Grounded in SET, it is proposed here that if employees experience the practices that constitute HPWS for safety, they are likely to perceive that their exchange relationships with the organization is characterized by supportive environment based on investments in employee knowledge and skills development. In return, employees are likely to be obliged to the organization by developing positive attitudes towards the achievement of organizational goals. Thus, this study proposes that treating employees as a valuable resource and ensuring that they have access to extensive safety-related training, safety-related information, and providing them with the opportunity to work in self-managed teams, will have a significant influence on their safety knowledge. Although there is no direct evidence demonstrating the relationship between experienced HPWS for safety and safety knowledge, prior research (e.g. Jiang & colleagues, 2015; Jiang & colleagues, 2012; Takeuchi, Lepak, Wang, & Takeuchi, 2007) has indicated the positive impact of HRM practices on human capital in general. Thus, this study proposes a positive relationship between experienced HPWS for safety and safety knowledge.

Hypothesis 3: Experienced HPWS for safety positively relates to safety knowledge

2.5.3.1.2. Experienced HPWS for Safety and Safety Motivation

Safety motivation describes "an individual's willingness to exert effort to enact safety behaviours and the valence associated with those behaviours" (Neal & Griffin, 2006, p. 947). It is a reflection of an employee's drive to perform safety-related activities and procedures (Griffin & Neal, 2000; Griffin & colleagues, 2000; Neal & colleagues, 2000). Thus, an employee must have the knowledge of how to do his or her work safely and the motivation to do his or her work safely (Neal & colleagues, 2000). While safety knowledge provides employees the capabilities to contribute, safety motivation deals with the extent to which employees are willing to utilize the capabilities resulting from their safety knowledge.

Delery and Shaw (2001) observe that motivation is one of the employees' features that are capable of adding value to the organization. I argue that individual employees could be motivated not only to comply with safe working practices but also to proactively engage in activities that will enhance safety in the workplace. This can be done in several ways. First, employees can be motivated when, for example, the organizations provide them with a favourable working environment through the provision of extensive safety-related training and development. Two, when the organizations deliberately consider the investment of managerial time in appraising the performance and training needs of employees. Three, Liao and colleagues (2009) posit that one of the reasons for employees to be motivated by HPWS is a favourable social exchange with the organization. SET predicts that if employees perceive that the organization is concerned about their safety and well-being, they are likely to develop an implicit obligation to reciprocate. Grounded in SET (Blau, 1983), it is proposed that, in this circumstance, individual employees would reciprocate these benefits or favours with appropriate attitudes. Thus, in the present study, it is expected that employees will add value to the organization (Delery & Shaw, 2001) by exhibiting greater safety motivation.

Based on prior research that linked experienced HPWS to other motivational constructs such as psychological empowerment (e.g. Aryee & colleagues, 2012; Seibert, Wang, & Courtright, 2011; Liao & colleagues, 2009), I expect HPWS for safety to relate to safety motivation. Thus, I hypothesize that:

Hypothesis 4: Experienced HPWS for safety positively relates to safety motivation.

2.5.3.2. Experienced HPWS for Safety and Safety Behaviours: Mediating Roles of Safety Knowledge and Safety Motivation

In the preceding discussion, it was argued that experienced HPWS for safety would be related to safety knowledge and safety motivation. In this section, I posit that experienced HPWS will be related to safety behaviours in terms of safety compliance and safety initiative and that these relationships will be mediated by safety knowledge and safety motivation. Employees' safety is associated with their safety behaviours which Griffin and Neal (2000) and Neal & colleagues (2000) originally differentiated to two types: safety participation, which is described as employees' voluntary safety behaviours, and safety compliance, described as mandated safety activities that are normally part of the formal requirements of employees' work roles and procedures. Thus, previous research mainly examined safety compliance and safety participation as two aspects of safety behaviour. Although obtaining compliance with safety rules and procedures is fundamental for enhancing safety, there is need for organizations to also have individual employees who will proactively participate in safety (Didla, Mearns, & Flin, 2009). Therefore, in line with contemporary theoretical trends (e.g. Kark, Katz-Navon, & Delegach, 2015; Fugas, Silva, & Meliá, 2012; Parker, Williams, & Turner, 2006) that emphasize employee roles that extend beyond normal rule enforcement to include discretionary individual behaviour (Hofmann & colleagues, 2003), the present study focuses on two dimensions of safety behaviours, namely safety compliance and safety initiative.

Safety compliance is defined as describing employees' behaviours in a manner that increases their personal health and safety. It reflects the circumstances in which employees adhere to safety-related rules and procedures, and tend to work in a safe manner (Williams, Turner, & Parker, 2000; Griffin & Neal, 2000; Thompson, Hilton, & Witt, 1998; Simard &

Marchand, 1994). Safety initiative, which is one specific aspect of safety participation behaviours (Kark & colleagues, 2015), describes the circumstances in which employees do not just work within the confines of the safety standards but actually go beyond compliance and act proactively to improve safety in the workplace. It is believed that an employee acts proactively when he or she voluntarily participates in safety activities that add value to the organization. For example, when an employee helps to teach safety procedures to new members of staff or assists co-workers to ensure that they perform their work safely. In addition, an employee is said to be proactive when he or she makes safety-related suggestions about workplace activities and encourages his or her supervisor to engage in actions that promote safety (Griffin & Neal, 2000; Williams & colleagues, 2000; Simard & Marchand, 1994; Andriessen, 1978). In this sense therefore, safety initiative reflects discretionary individual behaviour that is not explicitly recognized by job descriptions or formal rewards systems (Hofmann & colleagues, 2003).

As earlier noted, there are some reasons why it is expected that experienced HPWS should be related to safety behaviours. One, it has been argued that an organization's HRM is instrumental in eliciting high levels of organizational citizenship behaviour (Morrison, 1996; Rousseau & Greller, 1994), and safety initiative can be likened to safety organizational citizenship behaviours (See Podsakoff, MacKenzie, Paine, & Bachrach, 2000). Two, it has been observed that HPWS promotes employees' shared perceptions of a supportive organizational environment that motivates discretionary behaviours (e.g. safety initiative) that contribute to organizational effectiveness (Sun & colleagues, 2007). As a way to manage employment relationship, an organization may provide HPWS practices such as extensive safety training, safety rewards, and internal opportunity for promotion that serve to communicate a positive valuation of employees' contribution and therefore contribute to employees' perceptions of supportive work environment in terms of employee safety and well-being. SET provides that there is a perceived obligation on the part of employees to reciprocate this relationship (Blau, 1964; Gouldner, 1960). One way in which employees can reciprocate this relationship is by enlarging their roles so that they extend beyond normal role of rule enforcement (i.e. safety compliance) to include safety initiative.

Prior research (e.g. Snape & Redman, 2010; Kehoe & Wright, 2013; Sun & colleagues, 2007; Liao & Chuang, 2004) has demonstrated the relationship between HRM (HPWS) practices and employee behaviours. For example, Sun and colleagues (2007) found that high performance HR practices were positively related to service-oriented OCB. Similarly, Liao and Chuang (2004) found employee involvement practices to be positively associated with employee self-rating of specific customer service-related behaviours. Although these studies focused on employee service-oriented behaviours, similar results have been obtained in the context of safety. For example, Zacharatos and colleagues (2005) found HPWS to be related to safety compliance and safety initiative (described in terms of personal safety orientation). Thus, I expect experienced HPWS for safety to be related to safety compliance and safety initiative. I therefore hypothesize that:

Hypothesis 4a: HPWS for safety positively relates to safety compliance

Hypothesis 4b: HPWS for safety positively relates to safety initiative

However, I expect this relationship to be indirect through safety knowledge and safety motivation. I next discuss why safety knowledge and safety motivation relate to safety behaviours of safety compliance and safety initiative.

Before the mediating role of safety knowledge and safety motivation in the relationship between experienced HPWS for safety and safety behaviours is discussed, there is need to explain why safety knowledge and safety motivation are related to these safety behaviours. This study previously suggested that employees who have experienced the use of HPWS for safety practices are likely to demonstrate increased safety knowledge based on a kind of obligatory reciprocation in their exchange relationship (See SET: Blau, 1983). This enhanced safety knowledge is then likely to influence safety behaviours in several ways. First, it is expected that once the capacity for using knowledge is acquired, it is more likely that this knowledge will be transferred to the job in order to affect on-the-job behaviour (Smith-Crowe & colleagues, 2003). Second, as earlier noted, individual employee knowledge has been proposed as one of the only three main factors that directly determine individual differences in performance (Campbell & colleagues, 1993). Third, Griffin and Neal (2000) have argued that safety performance (i.e. safety behaviour) must be determined by knowledge and skills that are required to perform particular behaviours. Fourth, Christian and colleagues (2009) suggest that knowing how to perform safely, for example, proper handling of hazardous chemicals and emergency procedures is a precondition to enacting safe behaviours. Therefore, safety knowledge should be strongly related to safety behaviours.

Several studies have found empirical support for the positive relationships between perceived safety knowledge and safety performance (safety behaviours). For example, Burke, Sarpy, Tesluk, and Smith-Crowe (2002) reported that safety knowledge was positively related to safety performance (safety behaviour). For these reasons and coupled with the support from previous studies suggesting a positive relationship between safety knowledge and safety behaviours (e.g. Christian & colleagues, 2009; Griffin & Neal, 2000), I expect safety knowledge to be related to safety behaviours in terms of safety compliance and safety initiative. However, consistent with Campbell and colleagues (1993), Neal and colleagues (2000) found safety knowledge to be more strongly related to safety compliance than safety participation. Following Neal and colleagues, I anticipate that safety knowledge should be more strongly related to safety compliance than discretionary safety behaviour of safety initiative. Therefore, I hypothesize that:

Hypothesis: 5: The relationship between safety knowledge and safety compliance will be stronger than the relationship between safety knowledge and safety initiative

Hypothesis 5a: Safety knowledge positively relates to safety compliance

Hypothesis 5b: Safety Knowledge positively relates to safety initiative

It was earlier argued that when employees feel that their organization is concerned about their well-being and safety, for example, safety-training needs, they would reciprocate by way of developing appropriate attitudes toward the organizational goals, for example, increased motivation to perform safely. It is here argued that this increased motivation to perform safely will affect safety behaviours in a variety of ways. First, as previously noted, Campbell and colleagues (1993) identified motivation as one of the three factors that determine performance (behaviour). Second, as Griffin and Neal (2000) noted, safety performance (safety behaviour) is influenced by knowledge and skills necessary or required to perform particular behaviours and by the motivation to perform these behaviours. Third, Neal and Griffin (2006) maintain that individual employees who are motivated to engage in safety behaviours should, in turn, be more likely to exhibit those behaviours.

Several studies (e.g. Neal & Griffin, 2006; Probst & Brubaker, 2001; Griffin & Neal, 2000; Andriessen, 1978) have found empirical support for the positive relationship between safety motivation and safety performance (safety behaviour). For example, in their studies conducted across a range of manufacturing and mining organizations, Griffin and Neal (2000) found motivation to perform safely to influence individual reports of safety performance (safety behaviours). Similarly, in their study of the effects of job insecurity on employee safety outcomes, Probst and Brubaker (2001) found safety motivation to be positively related to safety behaviour. The preceding discussions and arguments support the notion that employees' behaviours could be a reaction to their responses to the use of appropriate HRM practices (Tsui & colleagues, 1997), suggesting that their responses (possibly as a result of increased knowledge and enhanced motivation) to the use of HRM practices could predict behaviours (Probst & Brubakar, 2001). However, building on Campbell and colleagues (1993), Neal and colleagues (2000) found safety motivation to be more strongly related to safety participation than safety compliance. In this study, it is expected that safety motivation should play a larger role in discretionary safety behaviour of safety initiative than safety compliance. Consequently, I hypothesize that:

Hypothesis: 6: The relationship between safety motivation and safety initiative will be stronger than the relationship between safety motivation and safety compliance

Hypothesis 6a: Safety motivation positively relates to safety compliance

Hypothesis 6b: Safety motivation positively relates to safety initiative

To explain the mediating roles of safety knowledge and safety motivation in the relationships between experienced HPWS for safety and safety behaviours (i.e. safety compliance and safety initiative), social exchange theory (Blau, 1964, Gouldner, 1960) is used. Social exchange theorists contend that favours received from others are more valued if they are given based on discretionary choice rather than circumstances that are beyond the benefactor's control. The recipient as a demonstration that the benefactor genuinely values and cares for him or her (Cotterrel, Eisenberger, & Speicher, 1992; Blau, 1964; Gouldner, 1960) accepts such discretionary favour. Thus, HPWS practices such as safety-related pay and safety-related appraisals that are linked to employees' internal opportunity for promotion contribute more to safety knowledge and safety motivation and consequently, safety behaviours, if employees believe that they are outcome of organization's voluntary actions instead of the pressure from the external bodies such as the government regulation or labour union pressure. Therefore, a favourable social exchange with the organization can be considered as one of the reasons why employees should be influenced by HPWS. Drawing on SET, it has been contended that "positive, beneficial actions directed at employees by the organization and/or its representatives contribute to the establishment of high quality exchange relationships that create obligations for employees to reciprocate in positive, beneficial ways" (Settoon, Bennett, & Liden, 1996, p. 219).

Consistent with SET, it is here argued that HPWS for safety will promote employees' safety knowledge (e.g. safety training, a shift in the approach to performance management, safety reward packages, effective communication of safety performance expectations, and recognition when these had been met or exceeded: Tregaskis, Daniels, Glover, Butler, &Meyer, 2012) and will signal that the organization is interested in the safety and well-being of the employees. This will be considered by the employees as being in a social exchange relationship (Shore & Shore, 1995). Thus, employees will, in turn, reciprocate the organization's treatment by developing appropriate safety knowledge that is likely to enhance their safety behaviours. Based on the preceding discussion, it is argued that safety knowledge will mediate the relationship between experienced HPWS for safety and safety behaviours in terms of safety compliance and safety initiative. Thus, I hypothesize that:

Hypothesis 7a: Employee safety knowledge will mediate the positive relationship between employees' experienced HPWS for safety and safety compliance

Hypothesis 7b: Employee safety knowledge will mediate the positive relationship between employees' experienced HPWS for safety and safety initiative

Also examined here is safety motivation as a mediator of the experienced HPWS for safety-safety behaviour relationship. The constituent HRM dimensions that define HPWS for safety include extensive safety training, rewards contingent on safety performance, safety information sharing, and performance appraisal system based on safety performance. Collectively, the experience of these practices will motivate employees to perform safely. Therefore, further relying on the SET, safety motivation should give a similar indirect explanation of the relationship between HPWS for safety and safety behaviours in terms of safety compliance and safety initiative. Prior studies (e.g. Probst & Brubaker, 2001; Griffin &

Neal, 2000) provide support for the mediating role of safety motivation. For example, Griffin and Neal (2000) found motivation to perform safely to mediate the link between organizational factor (safety climate) and safety performance (safety behaviours). Based on the preceding argument, the relationships between experienced HPWS for safety and safety behaviours in terms of safety compliance and safety initiative will be mediated by safety motivation.

Hypothesis 8a: Employee safety motivation will mediate the positive relationship between employees' experienced HPWS for safety and safety compliance;

Hypothesis 8b: Employee safety motivation will mediate the positive relationship between employees' experienced HPWS for safety and safety initiative.

2.5.3.3. Safety Behaviours and Safety Outcomes

An issue that is yet to be fully addressed in safety literature is the question of what constitutes safety performance and the need for better conceptualization. Christian and colleagues (2009) therefore called for a distinction between safety behaviours and safety outcomes. Again, another issue is often overlooked in safety literature. This is the final linkage between safety performance as behaviours and safety outcomes and this has rarely been examined in the same study. Safety behaviours focus on the safety-specific actions or behaviours which employees exhibit in the workplace (Burke & colleagues, 2002).

Although prior research (e.g. Christian & colleagues, 2009; Neal & Griffin, 2006; Simard & Marchand, 1994) has examined the relationship between safety behaviours (such as safety compliance, safety initiative, and safety participation) and safety outcomes (such as accidents and injuries), this study builds on and extends these studies to link these safety behaviours (i.e. safety compliance and safety initiative) to two aspects of safety outcomes, namely, workplace injuries and safety-related events. Workplace injuries describe the workplace incidents that lead to employees' personal harm and these range from slips, trips, and some other minor occurrences (Evans, Michael, Wiedenbeck, & Ray, 2005; Oliver &colleagues, 2002) to those that require first aid treatment (Michael, Evans, Jansen, & Haight, 2005; Hofmann & Stetzer, 1996) or time off work (Neal & Griffin, 2006). Although the term safety-related events has been used in prior research about marine vessel accidents (e.g. Talley, 1995), it is here described as human-related incidents (Barling & colleagues, 2002) that occur in the workplace such as exposure to dangerous chemicals or gases. As previously argued, safety outcomes constitute performance variables just as operational and financial outcomes.

Research (e.g. Zohar, 2003; Zohar, 1980) has shown that when management is seen to be conspicuously involved in safety activities such as job training programmes (e.g. relating to safety), participation in safety committees, and putting safety into consideration when designing jobs, they signal an organization's priority of safety. From a SET perspective, when employees perceive these management safety activities as commitment toward safety and concern for employees' health and well-being, they will develop appropriate safety behaviours which, in turn, cause a reduction in safety outcomes. This supports the notion that safety behaviour is a more proximal predictor of safety outcomes (Christian & colleagues, 2009; Neal & Griffin, 2006).

Prior studies (e.g. Simard & Marchand, 1994) have found safety initiative to be positively correlated with lower frequency of lost-time work accidents. Similarly, Neal and Griffin (2006) found improvements in safety behaviours within groups to be associated with a subsequent reduction in accidents and injuries. Therefore, with improved safety compliance and safety initiative as defined in this study, employees would observe unit's safety rules and procedures and take informal initiative to improve safety at work. They will also make suggestions to, as well as put pressures on the supervisor to improve safety in the work environment. Accordingly, I posit safety behaviours of safety compliance and safety initiative to be directly related to the safety outcomes of safety-related events and workplace injuries.

Hypothesis 9a: Safety compliance negatively relates to safety-related events;

Hypothesis 9b: Safety compliance negatively relates to workplace injuries;

Hypothesis 10a: Safety initiative negatively relates to safety-related events;

Hypothesis 10b: Safety initiative negatively relates to workplace injuries.

2.5.3.4. Experienced HPWS for Safety and Safety Outcomes: The Mediating Influence of Safety Knowledge/Safety Motivation, and Safety behaviours

So far, I have argued that employees' experienced HPWS for safety directly influence safety knowledge and safety motivation that, in turn, directly influence safety behaviours such as safety compliance and safety initiative, leading to safety outcomes such as safety-related events and workplace injuries. In this section, it is argued that experienced HPWS for safety can facilitate the safety outcomes of safety-related events and workplace injuries through the mediating influences of safety knowledge/safety motivation, and safety behaviours.

Whereas there is a convergence in the opinion of researchers that HRM practices are associated with organizational outcomes through their influence on employee attitudes and behaviours (e.g. Wright, McCormick, Sherman, & McMahan, 1999; Huselid, 1995; Wright, McMahan, & McWilliams, 1994), Nishii and Wright (2007), Bowen and Ostroff (2004) suggest that this causal chain might be more complex than expected. They note that employees' perceptions of HRM practices are likely to precede the employee attitudes and behaviours links in the causal chain. That is, in order for HRM practices to exert their direct effect on employees' attitudes and behaviours, they must first have to be perceived and subjectively and objectively interpreted by employees in manners that will engender or create such attitudinal and behavioural responses.

Research provides evidence that HRM systems function by influencing employee knowledge and motivation (Delery & Shaw, 2001; Huselid, 1995; Wright & Snell, 1991). Furthermore, Takeuchi and colleagues (2007) indicate that employee behaviours may serve as potential mediators in the HRM practice-outcomes relationship. This study posits that if HRM system can be presumed to work by influencing both employee attitudes (Delery & Shaw, 2001; Huselid, 1995; Wright & Snell, 1991) and employee behaviours (Takeuchi & colleagues, 2007) in such a manner that it affects performance (Zacharatos & colleagues, 2005), it is logical to argue, drawing on and extending this conceptual framework or literature, that the relationships between experienced HPWS for safety and employees' safety outcomes are likely to be mediated by employees' safety knowledge/safety motivation, and safety behaviours.

As previously noted, it has been contended by social theorists that resources received from others are given more value if it is believed by the recipient that the donor gave it based on choice rather than being coerced by circumstances beyond their control. This is because such voluntary action is an implicit demonstration of the fact that the donor values and cares for the recipient (See Blau, 1964; Gouldner, 1960). Therefore, one of the ways by which experienced HPWS for safety can enhance employees' safety knowledge/safety motivation is the creation of favourable social exchange within the organization (Liao & colleagues, 2009). In this scenario, SET will predict that employees reciprocate by getting more involved in safety compliance and initiating steps to improve workplace safety in terms of safety-related events and workplace injuries.

There are several reasons why safety knowledge/safety motivation and the safety behaviours of safety compliance and safety initiative mediate the relationship between experienced HPWS for safety and safety outcomes. First, research has shown that the predictor variable (e.g. experienced HPWS for safety) is related to both mediating variables of safety knowledge (Jiang & colleagues, 2015; Jiang& colleagues, 2012; Takeuchi & colleagues, 2007) and safety motivation (Aryee & colleagues, 2012; Seibert & colleagues, 2011; Liao & colleagues, 2009). Second, research has shown that safety knowledge (e.g. Christian & colleagues, 2009; Smith-Crowe & colleagues, 2003; Burke & colleagues, 2002; Campbell & colleagues, 1993) and safety motivation (e.g. Neal & Griffin, 2006; Griffin & Neal, 2000; Campbell & colleagues, 1993) are related to safety behaviours. In addition, safety behaviours have been shown to be related to safety outcomes such as lost-time accidents, accidents, and injuries (Neal & Griffin, 2006; Simard & Marchand, 1994). Furthermore, the predictor variable (e.g. HPWS) has been found to have a direct effect on safety outcomes such as lost-time injuries (Zacharatos & colleagues, 2005). These are the conditions for the traditional stages of the Baron and Kenny's (1986) mediation process model. Finally, there is a consensus among researchers that HRM practices are associated with organizational outcomes through their influence on employee attitudes and behaviours (e.g. Wright & colleagues, 1999; Huselid, 1995; Wright & colleagues, 1994). Based on the foregoing, I hypothesize that:

Hypothesis 11: Employee safety knowledge and safety compliance will mediate the negative relationship between experienced HPWS for safety and safety-related events;

Hypothesis 12 Employee safety knowledge and safety compliance will mediate the negative relationship between experienced HPWS for safety and workplace injuries;

Hypothesis 13: Employee safety knowledge and safety initiative will mediate the negative relationship between experienced HPWS for safety and safety-related events;

Hypothesis 14: Employee safety knowledge and safety initiative will mediate the negative relationship between experienced HPWS for safety and workplace injuries;

Hypothesis 15: Employee safety motivation and safety compliance will mediate the negative relationship between experienced HPWS for safety and safety-related events;

Hypothesis 16: Employee safety motivation and safety compliance will mediate the negative relationship between experienced HPWS for safety and workplace injuries;

Hypothesis 17: Employee safety motivation and safety initiative will mediate the negative relationship between experienced HPWS for safety and safety-related events;

Hypothesis 18: Employee safety motivation and safety initiative will mediate the negative relationship between experienced HPWS for safety and workplace injuries.

2.5.4. Moderating Effect of Unit-Level Safety Climate

Unit safety climate describes employees' shared perception of the priority management attaches to workplace safety (Zohar & Tenne-Gazit, 2008; Gonzalez-Roma, Peiro, &

Tordera, 2002). Unit safety climate evolves as individual employees attribute meaning to their unit context based on the significance of the environment for individual safety values (James, James, & Ashe, 1990; James & James, 1989). In other words, it represents an aggregate measure of individual employee's responses (Dawson, González-Romá, Davis, & West, 2008). It is conceptualized as a higher order factor that involves employee perceptions of workplace safety-related attributes and the relative priority when compared with other competing goals (e.g. productivity, speed, etc.) (Jiang & colleagues, 2010; Zohar & Luria, 2005; Griffin & Neal, 2000).

A body of safety literature indicates that organizational climate moderates the relationships between individual difference variables to the extent that organizations promote strategically focused climates, that is, climates that are aligned with organizational goals. This body of research is built on the notion that human beings make great efforts to cohere with their environment (Smith-Crowe & colleagues, 2003). For example, one would expect that in a supportive climate for safety, employees would endeavour to be productive by transferring the knowledge and skills that they have learned, for example, during safety training, to their jobs. On the other hand, in an organization that lacks such a climate, a weak relationship between safety knowledge and safety performance (behaviour) would be expected because employees would be neither willing nor able to exhibit acquired safety knowledge and skills (Smith-Crowe & colleagues, 2003). The arguments that have been presented about the link between safety climate and safety knowledge (See Smith-Crowe & colleagues, 2003) are also applicable to the link between safety climate and safety motivation. For example, Zohar (2000) contends that unit safety climate influences safety motivation because it informs employees within the unit of the desired role behaviours and thereby shapes the expectancy and valence associated with safe and unsafe behaviours.

Griffin and Neal (2000) contend that theories of work performance have provided an important foundation for conceptualizing the link between safety climate and safety behaviour. Based on Campbell and colleagues (1993), Griffin & Neal (2000) suggest that perceived safety climate is an antecedent of safety behaviour. However, I propose that although safety climate is an antecedent of safety behaviour, it (unit safety climate) moderates the effect of safety knowledge/safety motivation on safety behaviours of safety compliance and safety initiative. Thus, although much research (e.g. Jiang & colleagues, 2010; Clarke, 2006; Neal & Griffin, 2006; Zohar, 2000; Griffin & Neal, 2000) consistently demonstrates the existence of relationships between safety climate and safety behaviours, to the best of the author's knowledge, only limited research has examined the moderating influence of unit safety climate on the relationships between employees' safety knowledge and safety behaviours (e.g. safety compliance and safety initiative)on one hand, and safety motivation and safety behaviours(e.g. safety compliance and safety initiative), on the other. SIP perspective provides the theoretical underpinnings for the emergence of safety climate as a unit-level property. SIP (Salancik & Pfeffer, 1978) contends that individuals use information gathered from others in their direct social context to form judgements about organizational practices, values, and norms. Because members of the same group are exposed to the same practices, leaders, and other contextual characteristics (Naumann & Bennett, 2000), they are likely to possess shared information and form common perceptions concerning their work environment within the unit. Thus, from a SIP perspective, Salancik and Pfeffer (1978) argued that climate should influence how employees think and feel about aspects of their work environment. Particularly, employees depend on cues from the work environment to interpret organizational events, develop appropriate attitudes, and understand behaviour-outcome expectancies. Drawing on SIP, therefore, it is here posited that, when safety climate is high, the effect of safety knowledge/safety motivation on safety behaviour will be enhanced and, as a result, employees would be more likely to engage in behaviours that are beneficial to both the employees and organization (Jiang & colleagues, 2010). In contrast, in a low safety climate, safety performance would attract less emphasis and as a result, the effects of safety knowledge and safety motivation on employees' safety behaviours would diminish.

Although research examining cross-level safety climate effects is limited, prior studies (e.g. Probst, 2004; Smith-Crowe & colleagues, 2003; Rouiller & Goldstein, 1993; Tracey, Tannenbaum, & Kavanagh, 1995; Brown, 1981) support the fact that safety climate moderates the relationships between individual difference variables. For example, Probst (2004) reported that safety climate moderated the relationship between job insecurity and workplace safety (e.g. safety knowledge, safety compliance, accidents, injuries) such that a high rather than low safety climate reduces or eliminates the adverse effect of job insecurity on safety behaviours such as safety compliance. Prior studies that have examined the relationships between safety climate and safety knowledge/safety motivation found that when safety perceptions (i.e. safety climate) increased, employees' safety knowledge and motivation to comply with safety policies and procedures increased (Neal & Griffin, 2006; Morrison & colleagues, 1997; Brown & Leigh, 1996). As a result, reported safety behaviour was positively affected. However, with decreased safety climate perceptions, employees subsequently reported decreased safety behaviours (Neal & Griffin, 2006; Hofmann & Stetzer, 1996) compared to increased safety climate perceptions. Consequently, unit safety climate will have a cross-level moderation effects on the relationship between safety knowledge/safety motivation and safety behaviours of safety compliance and safety initiative. Therefore, I hypothesize that:

Hypothesis 19a: Unit-level safety climate moderates the effects of safety knowledge on safety compliance such that this relationship will be stronger when safety climate is high rather than low;

Hypothesis 19b: Unit-level safety climate moderates the effects of safety knowledge on safety initiative such that this relationship will be stronger when safety climate is high rather than low;

Hypothesis 20a: Unit-level safety climate moderates the effects of safety motivation on safety compliance such that this relationship will be stronger when safety climate is high rather than low;

Hypothesis 20b: Unit-level safety climate moderates the effects of safety motivation on safety initiative such that this relationship will be stronger when safety climate is high rather than low

This study further posits that the effects of unit safety climate on employees' safety outcomes are moderated by the extent to which the unit is seen as valuing and emphasizing safety. In other words, the unit's priority for or emphasis on safety is likely to play a significant role in determining the extent to which employees' safety outcomes are affected. For example, in units in which safety is a priority, employees' safety knowledge may be emphasized by, for example, providing safety-related training to employees, and this may motivate employees to pay attention to safety in order to enhance their safety behaviours. Conversely, when the unit does not place a strong emphasis on safety, employees may focus more on other job-related activities such as production at the expense of safety (Probst, 2004). Thus, safety behaviours will be adversely affected. From SET perspective, if priority of safety is valued by unit line managers (meaning positive safety climate), they would demonstrate their commitment to safety and concern for employees' health and well-being, and the employees, in response, would behave in a safe manner for an implied obligation (Hofmann & colleagues, 2003; Hofmann & Morgeson, 1999) which, in turn, would affect their safety outcomes. In other words, when employers are perceived to meet their obligations, treat employees fairly, and provide valued services and benefits, employees reciprocate with higher levels of performance (Mearns, Lorrains, Ford, & Tetrick, 2010). Furthermore, a body of research demonstrates that a number of factors considered to be important components or dimensions of safety climate predict workplace safety-related outcomes such as accidents and injuries (Hofmann & Stetzer, 1996; Niskanen, 1994; DeJoy, 1994; Dedobbeleer &

Beland, 1991; Brown & Holmes, 1986; Zohar, 1980). These components or dimensions include management concern for employees' well-being, adequacy of training, provision of safety equipment, quality of safety management system, and employee involvement in workplace health and safety (Neal & colleagues, 2000). Although there is concrete evidence to demonstrate the main effect of safety climate on employee safety outcomes, there is yet a scant empirical evidence to show how unit safety climate might moderate the effects of safety knowledge/safety motivation on safety outcomes through the mediating effects of safety behaviours. As earlier noted in safety literature, it seems likely that unit safety climate will play a significant role in determining whether and to what extent safety knowledge/safety motivation would affect safety outcomes through safety behaviours. For example, Probst (2004) suggests that organizational safety climate provides employees with cues concerning what behaviours and outcomes would be reinforced. Therefore, when employees are concerned about their workplace safety, they are likely to look to the organizational climate for cues as to the best means by which they will retain their jobs. Conversely, organizations that are seen to place less emphasis on safety might be conveying the message that enhanced employee attention to safety may not be important for them to retain their jobs. Janssens, Brett, and Smith (1995) suggest that the more an organization is seen to emphasize more on production, the more employees perceive that safety is subordinated to the demands of production. Thus, high unit safety climate provides opportunities in terms of safety training that enhances employee safety knowledge and motivate employees to increase, for example, their safety compliance (Brown & Holmes, 1986; Neal & colleagues, 2000; Probst, 2004). Thus, it seems likely that safety behaviours of safety compliance and safety initiative may be enhanced when the safety training and the motivational opportunities provided by a high unit safety climate have positive effect on employees' safety knowledge and safety motivation. Consequently, I expect that a high unit safety climate will allow increased employee safety knowledge and safety motivation, leading to higher levels of safety behaviours of safety compliance and safety initiative and, subsequently, improved safety outcomes of safety-related events and workplace injuries. This scenario has been described as the first stage of moderated mediation, but the proposed mediating effect takes place across levels of analysis (See Kenny, 2008; MacKinnon, 2008; Preacher, Rucker, & Hayes, 2007; Edward & Lambert, 2007). Based on the foregoing, I proposed as follows:

Hypothesis 21a: The negative indirect effect of employee safety knowledge on safety-related events via safety compliance is moderated by unit safety climate such that the indirect effect becomes stronger as unit safety climate is higher;

Hypothesis 21b: The negative indirect effect of employee safety knowledge on workplace injuries via safety compliance is moderated by unit safety climate such that the indirect effect becomes stronger as unit safety climate is higher;

Hypothesis 21c: The negative indirect effect of employee safety knowledge on safety-related events via safety initiative is moderated by unit safety climate such that the indirect effect becomes stronger as unit safety climate is higher;

Hypothesis 21d: The negative indirect effect of employee safety knowledge on workplace injuries via safety initiative is moderated by unit safety climate such that the indirect effect becomes stronger as unit safety climate is higher;

Hypothesis 22a: The negative indirect effect of employee safety motivation on safety-related events via safety compliance is moderated by unit safety climate such that the indirect effect becomes stronger as unit safety climate is higher;

Hypothesis 22b: The negative indirect effect of employee safety motivation on workplace injuries via safety compliance is moderated by unit safety climate such that the indirect effect becomes stronger as unit safety climate is higher;

Hypothesis 22c: The negative indirect effect of employee safety motivation on safety-related events via safety initiative is moderated by unit safety climate such that the indirect effect becomes stronger as unit safety climate is higher;

Hypothesis 22d: The negative indirect effect of employee safety motivation on workplace injuries via safety initiative is moderated by unit safety climate such that the indirect effect becomes stronger as unit safety climate is higher;

2.6. Conclusion

This chapter presented an extended discussion of SET and SIP as theoretical underpinnings of the relationships proposed and tested in this study. It also presented and discussed Figure 2.1 that provides a schematic representation of the relationships examined. Specifically, the chapter reviewed the literatures that link the use of HPWS for safety to unit safety climate and the individual level safety outcomes through employees' experienced HPWS for safety, safety knowledge/safety motivation, and safety behaviours. These linkages or relationships hypothesized in the conceptual model were theoretically explained utilizing social exchange theory (SET) and social information processing perspective (SIP). The next chapter discusses the development and validation of the new HPWS for safety scale.

3.0. CHAPTER 3: DEVELOPMENT OF HIGH-PERFORMANCE WORK SYSTEM FOR SAFETY SCALE

3.1. Introduction

Predicated on the assumption that different organizational strategies (foci) are linked to different sets of HRM practices (contingency perspective of SHRM: e.g. Schuler & Jackson, 1995; 1987b), this study developed and validated an HPWS for safety scale. This chapter describes the methodology of this study, starting with the research philosophical perspective. It discusses the method used to develop and validate the scale that consists of three main parts. First, and given the scale's grounding in AMO theory, this chapter reviews the literature inspired by this theory. Second, it presents the three different studies conducted to develop and validate the scale. Study 1 adopts an inductive approach to the generation of the initial pool of items whereas Studies 2 and 3 ascertained the validity of the newly developed HPWS for safety scale.

3.2. Research Philosophical Perspective

One of the issues that permeate the conduct of research in organizational psychology as a field of study concerns the question of what should genuinely be accepted as knowledge. The concern is whether the same principles, procedures, and the distinctive character that underpin the natural sciences should guide the study of social world. The philosophical stance that positively align with the tenets of natural sciences is constantly associated with an epistemological position that is denoted as positivism (Bryman & Bell, 2011, 3rd Ed.) Bryman and Bell (2011) describe positivism as an epistemological position that advocates the application of the methods that are adopted in the study of natural sciences to the study of social reality.

Ponterotto (2005) identifies three major emphasis of the epistemological perspective of positivism. First, the positivists lay emphasis on dualism and objectivism, implying that the researcher, the research participant, and the topic of investigation are assumed to be independent of one another (dualism) (Remenyi, Dan, Williams, Brian, Money, Arthur, Swartz, & Ethne, 1998). And by undertaking rigorous, and standard procedures, the participant and the topic of investigation can be studied by the researcher without bias (objectivism) (Ponterotto, 2005). Second, the positivists assert that the researcher can investigate his research participants without influencing them and vice versa. Finally, the positivists consider replicated findings as “true” and these enhance theory verification evidence.

The exponents of positivism argue that the scientific method provides for the acquisition of knowledge through observation and experiment, irrespective of context and related concepts such as feelings, opinions, values, or cultures (Cibangu, 2010). Thus, the positivists rely on the assumption that there is no place for value in the research process. In other words, one’s values, hopes, expectations, and feelings do not have place in scientific inquiry (Ponterotto, 2005). Ponterotto (2005) suggests that positivism provides the primary foundation and anchor for quantitative research.

In spite of the fact that the quantitative researchers contend that they do not aim to produce a science of laws but just aims to produce a set of cumulative generalizations to enhance the development of the universal knowledge based on critical examination and sifting of data, the philosophical stance of positivism is still subject to criticisms. This is because a true positivism depends on a number of assertions that have often been criticized and ultimately discredited (Lee & Lings, 2008). For example, positivists are criticized on the basis of the fact that they ignore the difference that exists between the natural and social world by failing to take into cognizance the ‘meanings’ that are brought to social life as they are merely refining and possibly extending what is already known (Easterby-Smith, Thorpe, & Lowe, 1991). In their conception of science, positivists only consider things to be in existence if they are directly observable, and any proposition that cannot be directly empirically tested is regarded as a mere nonsense (Lee & Lings, 2008). For example, the positivists' philosophy of science considers variables such as employee's safety motivation and safety knowledge as unobservable constructs (latent variables) and therefore do not actually exist because one cannot directly observe them (Lee & Lings, 2008). However, research (e.g. Lee & Lings, 2008) indicates that although one cannot directly observe some constructs, for instance, employee's motivation to perform his work safely in the workplace, we can however, observe the actual result or outcome of a motivated employee which is improved or enhanced safety performance behaviour. Positivists have also been criticized for being concerned only with the issue of association and neglecting that of causality (Lee & Lings, 2008). Positivists contend that only associations can truly be observed, implying that causality is an irrelevant concept.

Whilst positivism, in one form or the other, has been seen as the most dominant (or standard: Lee & Lings, 2008) view in research linking HRM and performance outcomes (See Boselie & colleagues, 2005), it should be noted that there are other philosophical approaches that have been identified to provide for the acquisition of reliable and 'genuine' knowledge. For example, interpretivism (e.g. Sheppeck & Millitello, 2000; Gratton, Hope-Hailey, Stiles, & Truss, 1999; Boxall & Steeneveld, 1999; Chend & Brown, 1998) and realism (e.g. Bacon & Blyton, 2001; Truss, 2001), among others, are other philosophical positions that have been adopted in research to provide an account of the linkages that exist between HRM and organizational performance outcomes (See Boselie & colleagues, 2005).

As earlier pointed out, Boselie and colleagues (2005) suggest that a few studies (e.g. Sheppeck & Millitello, 2000; Gratton& colleagues, 1999; Boxall & Steeneveld, 1999; Chend & Brown, 1998) have adopted interpretivist's philosophical perspective to provide an account of the linkages between HRM and organizational performance outcomes. The interpretivist's philosophical perspective is often perceived as an alternative to positivist's viewpoint (Bryman & Bell, 2011; Ponterotto, 2005). It was established on the view that there was a need for a strategy that recognizes the differences between people and the objects of the natural sciences and thus requiring the investigator to grasp the subjective meaning of social action (Bryman & Bell, 2011). Interpretivism in social research has developed from the common features of the philosophical viewpoints of hermeneutics, phenomenology and existentialism, ethnographic research, critical research, feminist tradition, Weber's notion of Verstehen, and symbolic interactionism (Lee & Lings, 2008; Blaikie, 2004; Bryman, 2004).

The interpretivists argue that the world is subjective, complex and socially constructed by the inherent elements in a social situation (Lee & Lings, 2008). In other words, they hold that reality is not objective but, instead, a social construction generated within the minds of individuals interacting in a given social context, rather than it being an externally singular entity (Lee & Lings, 2008; Hansen, 2004). Thus, the interpretivist's philosophy espouses a hermeneutical perspective that maintains that meaning is hidden and must be brought to consciousness through deep reflections (See Ponterotto, 2005; Schwandt, 2000; Sciarra, 1999). The interactive dialogue between the investigator, the research participant, and the topic of investigation can engineer this reflection. Because the actor (e.g. research participant) constructs reality, we cannot separate an objective reality from the person (research participant) who is experiencing, processing, and labelling the reality (Sciarra, 1999). Therefore, the distinguishing characteristic of interpretivism is the fact that, principally, there is interaction between the investigator and the object of investigation. It is only through this interaction can deeper meaning be discovered (Ponterotto, 2005). Thus, in this perspective, knowledge is highly context-dependent thereby rejecting the idea of seeking abstract and generalizable knowledge (Lee & Lings, 2008) as suggested by positivism.

Another difference between positivism and interpretivism is that, while the former emphasizes the acquisition of knowledge through observation and experiment, and hence scientific explanation, the later emphasizes the goal of understanding (Verstehen) the "lived experiences" or the "meaning" of social phenomena from the point of view of those who live it day by day (Schwandt, 2000, 1994). Thus, the interpretivists consider knowledge to consist of rich, emic and idiographic description of experiences within their context (Lee & Lings, 2008; Ponterotto, 2005). It is important to note that interpretivism is an empirical concept that is amenable to human science (qualitative) research (Herman, 1997) and hence it provides the primary foundation and anchor for qualitative research (Ponterotto, 2005).

As earlier indicated, positivism has received unequalled condemnation claiming that its approach is not suitable to the study of social science phenomena. Some of the critics are of the opinion that its explanatory success in the natural sciences has not been successfully established and celebrated in the social sciences because of its flaws (Mack, 2010; Holden & Lynch, 2004). These critics suggest interpretivism as an alternative and a more appropriate approach to the study of social sciences because of the complex nature of social science research, that is, human beings. Furthermore, the supporters of interpretivism argue that the researchers who have used nominalistic approach and its attendant epistemology obtained more explanatory success (Holden & Lynch, 2004). This does not, however, rule out the fact that interpretivism also has its own flaws (Mack, 2010; Holden & Lynch, 2004; Hughes & Sharrock, 1997). For example, the critics of interpretive philosophies regard its inability to replace positivism with a better approach as its greatest flaw (Hughes & Sharrock, 1997).

Due to the heated and seemingly unending controversy between the critics of both traditions, many researchers observe that these debates are not likely to end in any philosophical solution as there is no question of right or wrong philosophical stance. For instance, it has been contended that: (i) if reality is external and unknown to humans, then how do we accumulate knowledge about it? Moreover, (ii) if we are accumulating knowledge about it, how do we know that we are doing so? (Connell & Nord, 1996). According to Connell and Nord (1996), philosophical debates do not offer solutions to these queries because we do "…not know how to discover a correct position on the existence of, let alone the nature of, reality" (p.1). This resonates with Hughes and Sharrock (1997) who state that it is difficult to provide any guideline to an appropriate philosophical stance, pointing out that “since the nature of philosophy, and its relationship to other forms of knowledge, is itself a matter of philosophical dispute, there is, of course, no real basis for us to advocate any one view on these matters as the unequivocally correct conception of the relationship between philosophy and social research” (p.13).

This study adopted realism as an alternative philosophical perspective different from both positivist and interpretive philosophies. Two major forms of realism have been identified: empirical realism and critical realism. Empirical realism suggests that reality can be understood through the utilization of appropriate methods (Bryman & Bell, 2011). This description does not take into cognizance the fact that there are enduring structures and generative mechanisms that underpin and produce observable phenomena and events and is therefore, ‘superficial’ (Bhaskar, 1989). Critical realism, on the other hand, is a specific form of realism that takes into cognizance the reality of the natural order and the events and discourses of the social world. It fundamentally holds that “we will only be able to understand-and so change-the social world if we identify the structures at work that generate those events and discourses …...These structures are not spontaneously apparent in the observable pattern of events; they can only be identified through the practical and theoretical work of the social sciences” (Bhaskar, 1989, p.2). Critical realism therefore suggests two things. The first is that, while positivism is of the view that the “scientist’s conceptualization of reality actually directly reflects that reality, realists argue that the scientist’s conceptualization is simply a way of knowing that reality” (Bryman & Bell, 2011, p.17). This resonates with Bhaskar (1975) who describes science as a systematic attempt to express in thought the structures and ways of acting of things that exist and act independently of thought. Thus, critical realists admit that there is difference between the objects of investigation and the terms they use to describe, account for, and understand them. The second is that, unlike positivists, the realists satisfactorily admit into their explanations theoretical concepts that are not directly observable (e.g. safety motivation & safety knowledge) and therefore can use hypothetical entities to account for regularities in the natural or social orders (Bryman & Bell, 2011; Lee & Lings, 2008). Therefore, contrary to the positivist's idea that theoretical terms or concepts are solely defined by their empirical observations, the realists argue that some concepts are almost never defined by their observations and yet refer to entities that are 'real'. Thus, the realists believe that although many concepts the scientists are interested in studying cannot be directly observed, it is possible to usefully measure and study them in the context of theoretical explanations (Lee & Lings, 2008).

Realist philosophies share positivist's beliefs in several ways (Bryman & Bell, 2011; Lee & Lings, 2008; Ponterotto, 2002; Lincoln & Guba, 2000): (i) a belief in an objective world that we can observe and measure (Lee & Lings, 2008). Therefore, the natural and social sciences can and should apply the same kinds of approach to the collection of data and to explanation (Bryman & Bell, 2011). Thus, positivism and realism proffer an objective, detached investigator role (Ponterotto, 2005). (ii) a commitment to the claim that there is an external reality to which scientists direct their attention, suggesting that there exists a reality that is separate from our description of it (Bryman & Bell, 2011). (iii) Both positivism and realism operate from both nomothetic and etic perspective (Ponterotto, 2005).

However, there are essential distinctions that exist between positivism and realism. Whereas the positivists emphasize "theory verification", realists hold that it is possible to measure unobservable entities and hence emphasizing "theory falsification" (Popper, 2002, 1968; Lincoln & Guba, 2000). Guba and Lincoln (1994) highlight Popper's (1968) work by presenting an interesting scenario to demonstrate the verification-falsification difference: "Whereas a million white swans can never establish, with complete confidence, the proposition that all swans are white, one black swan can completely falsify it" (p.107). The positivists are mainly concerned with association whereas the realists are concerned not only with association but also with causality, that is, there exist some independent causes that lead to the observed effects (Lee & Lings, 2008; Remenyi & colleagues, 1998). This is consistent with Easterby-Smith, Thorpe, and Lowe (1991) who contend that the relationship between man and society is deterministic and that we are born into a world in which there are causal laws that explain the patterns to our social behaviour.

In her study of the complexities and controversies in linking HRM with organizational outcomes, Truss (2001) adopted a realist philosophical perspective (See Boselie & colleagues, 2005). This study undertook a longitudinal research to analyze in detail the HR policies and practices of one case study firm (Hewlett-Packard) and how these policies were enacted. She utilized an exploratory approach to data collection "using a variety of methodologies" and drawing on a broad range of HR practices (at the two time points of data collection) and informants (Truss, 2001, p. 1121). In other words, the research adopted four principal methods in collecting data: interview, questionnaires, focus groups, and the collection of documentary evidence, and collected data from employees at all levels of the firm, from 'operating core', middle managers, HR departments, and senior executives. According to her (Truss, 2001, p.1128), this was done in order to "access not only the rhetoric of what the HR group was trying to achieve, but also the 'reality' experienced by employees" (Truss, Gratton, Hope-Hailey, McGovern, & Stiles, 1997; Legge, 1995).

The present study investigated the issue of safety in the context of strategic human resource management (SHRM), adopting a multilevel model of intermediate mechanisms through which HPWS for safety influence individual-level safety outcomes through employee experienced HPWS for safety. In order to carry out this research, multiple methods were employed starting with literature reviewing and hypotheses statements. Both qualitative (i.e. use of interview method) and quantitative surveying (i.e. use of questionnaires) were adopted to collect data. The study obtained data from employees at both unit and individual levels of the organizations (that is, from front-line employees, line managers, including HR and Health and Safety line managers). This is consistent with previous research (e.g. Truss, 2001, p.1128) which suggests that multiple-source data collection is necessary because it gives the opportunity to “access not only the rhetoric of what the HR group was trying to achieve, but also the ‘reality’ experienced by employees” (Truss & colleagues, 1997; Legge, 1995). In other words, the researcher believes that there is an underlying reality that needs to be discovered, and which contains regular and consistent patterns that can ultimately be generalized (Lee & Lings, 2008). Consistent with the realist philosophies (and contrary to the positivist’s view) (See Lee & Lings, 2008), the researcher also believes that unobservable constructs like safety motivation and safety knowledge can be measured in a systematic and reliable manner.

Furthermore, in line with Creswell (2008), the current study presented a conceptual model (See figure 2.I) which clearly shows, at the unit-level, the use of HPWS for safety as the independent variable and unit safety climate as the dependent variable. However, at the individual-level, experienced HPWS for safety has been shown to foster or facilitate safety outcomes of safety-related events and workplace injuries through the mediating influences of safety knowledge/safety motivation and safety behaviours of safety compliance and safety initiative. This study was carried out following a scientific method that involves a systematic survey and description of phenomena contextualized within a model (See figure 2.1) (See Ponterotto, 2005).

All the variables: use of HPWS for safety, employee experienced HPWS for safety, unit safety climate, safety knowledge/safety motivation, safety compliance, safety initiative, safety-related events, and workplace injuries were operationally conceptualized. For example, the HPWS for safety and all its dimensions as developed and validated through inductive and deductive methods were defined to suit Creswell (2008) criterion of operational definition in the concept of realism. In the same vein, the study was carried out to address some gaps in previous research (e.g. Zacharatos & colleagues, 2005).

This study directed its efforts to test several hypotheses which were derived after a systematic review of the literature and presenting theoretical (SET and SIP) and empirical arguments to justify their propositions. Some analytical techniques including Mplus were utilized to express the functional relationships between the variables. And subjecting the priori hypotheses to statistical test analysis indicates that the researchers' inferences can either be confirmed or rejected.

3.3. Background to the Development of an HPWS for Safety Scale

Despite the progress made in our understanding of the performance implications of HPWS (e.g. Aryee & colleagues, 2012; Combs & colleagues, 2006; Wright & colleagues, 2005; Bartel, 2004; Delery & Shaw, 2001), this stream of research has been noted to be plagued with a number of methodological issues. Primary among these issues is the lack of consensus among researchers with regard to the specific HRM practices that should be included in the bundling of HPWS and this makes it difficult to make consistent inferences from empirical findings in HPWS-performance research (Collins & Smith, 2006; Datta & colleagues, 2005; Boselie & colleagues, 2005; Delery & Shaw, 2001; Delaney & Huselid, 1996). The work of Gerhart and colleagues (2000) has identified the items used to measure the HRM practices content as a potential source of measurement error in HPWS-performance research. For example, Gerhart and colleagues (2000) contend that studies in HPWS reflect considerable unreliable measurement because of the items that are used to assess the HPWS. This indicates that the effect size estimates that are found in the relationship between HPWS and performance outcomes so far should be interpreted with caution (Gerhart & colleagues, 2000) because these flaws of HPWS measurement can have substantial implications for the validity and reliability of the conclusions that are reached from HPWS-performance studies (Dorenbosch, 2009). Although Delaney and Huselid (1996) note that, "the relevant literature is distinguished by the fact that virtually no two studies measure HRM practices in the same way… As a result, we see the development of reliable and valid measures of HRM systems to be one of the primary challenges (and opportunities) for……. advancing this line of research" (p. 967), the current study is motivated by the need for a strategically-focused HPWS which is related to but different from the motivation for Delery and Huselid' call. Thus, one of the objectives of this study was to attempt to systematically address the measurement issues such as items generation in a HPWS framework.

Motivated by an aim to develop a system of high performance work practices, Zacharatos and colleagues (2005) conducted two separate studies in which they developed and validated an HPWS scale. While their first study investigated the impact of human resource management practices on safety at the organizational level, the second study focused on the underlying mechanisms through which employees' perceived HPWS related to safety performance. In the first study, they developed 63 items to measure high performance management practices while in their second study, they developed a 51-item HPWS measure. According to the authors, the items used to measure HPWS in Study 2 are different from those used in Study 1 in two ways: First, the items used for Study 2 emphasized employees' perception of the extent to which the organization had adopted the human resource practices. Second, in Study 2, item responses were all on Likert-type scales. Many of the items were similar between the two studies (Zacharatos & colleagues, 2005). Put together, their measurement scales addressed several critical issues. First, in order to address the limitations of previous research, they used multi-measure approach to identify both the existence and extent of each HRM practice. Second, consistent with their conceptualization of HPWS, they used an additive approach to create a unitary index. However, there is one main limitation in their studies, and that is, the utilization of generalized management practices measure to assess the effects of HPWS on occupational safety. In other words, the high performance management practices proposed as part of their organization and employee level models were assessed in general as opposed to safety-specific terms. Thus, this study extended previous research (e.g. Zacharatos & colleagues, 2005) by approaching the understanding of HPWP measures from a different perspective.

First, I developed a system of HRM practices that is safety-specific (HPWS for safety scale). Second, this scale is grounded in the Ability-Motivation-Opportunity (AMO) perspective. Because the existing AMO theory was not formulated specifically for understanding HRM in the context of workplace safety, this study translated and adapted it to suit its requirement

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Table 3.1: Most frequently included HRM practices in HPWS-performance relationship

AMO Category	**Most Frequently included HRM Practices in Research**	**Rank Order**	**Relationship with Organizational Performance**
Ability	Training and development	1	Yes
	Recruitment and selection	4	Yes
Motivation	Contingent pay and rewards	2	Yes
	Performance management/appraisal	3	No
	Good (above market) wages	7	Yes
	Internal opportunities for Promotion	9	Yes
Opportunity	Team working and collaboration	5	No
	Direct participation	6	Yes
	Communication/information sharing	8	No
	Enriched job design	10	Not included

Sources: Combs and colleagues (2006); Boselie and colleagues (2005)

3.4. High Performance Work System Practices Identified Through Deductive Method

Table 3.2 presents the general HRM practices that are often included in generic measures of HPWS and tend to reflect AMO framework. These generic measures of HPWS inform the generation of HRM practices (and items) included in the present HPWS for safety measure. The last column of Table 3.2 represents features of Ability-Motivation-Opportunity framework and these include: Safety training and development, hiring for safety, compensation contingent on safe performance, employment security, internal opportunities for promotion, employee safety involvement/participation, performance appraisals, self-managed team and collaboration, safety information sharing, and job and work design. These reflect the HRM domains that have been most frequently studied and have been tied by previous research to other positive organizational outcomes (See Combs & colleagues, 2006; Boselie & colleagues, 2005). These HR practices are expected to enhance employee ability, motivation, and opportunity to perform or behave safely in the workplace. The next section presents the scale development process.

Table 3.2: Deductive Selection of High Performance Work System for Safety Domains That Were Included in This Study

HPWPs in AMO Research (Boselie & colleagues, 2005)	HPWPs in Research (Posthuma & colleagues, 2013)	Bamberger & Meshoulam, 2000	Combs & colleagues, 2006	Zacharatos & colleagues, 2005	Sun & colleagues, 2007	Chuang & Liao, 2010	AMO Research Based on the Literature Review	Selected Domains in the Current Study (Initial Pool)
Training and Development	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Safety Training
Recruitment and Selection	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Hiring for Safety
Contingent Compensation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Safety Rewards
Good Wages	Yes	No	Yes	No	NI	No	No	Employment Security
Internal Opportunity for Promotion	Yes	Yes	Yes	No	Yes	No	Yes	Internal Opportunity for Promotion
Direct Participation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Safety Involvement and Participation
Performance Appraisals	Yes	Yes	No	No	Yes	Yes	Yes	Performance Appraisals
Team Working and Collaboration	No	No	No	Yes	NI	NI	Yes	Self-Managed Team
Communication and Information Sharing	Yes	No	No	Yes	NI	NI	Yes	Safety Information Sharing
Clear Job Descriptions	Yes	Yes	NI	No	Yes	NI	Yes	Clear Job Description

Source: Posthuma & colleagues (2013); Combs & colleagues (2006); Boselie & colleagues (2005); Bamberger & Meshoulam, 2000; Sun & colleagues (2007)

3.5. Dimensions of Safety-Specific HPWS

3.5.1. Safety Training

The training dimension of HPWS represent practices that foster employee skills and competencies that are required for their present and future jobs (Posthuma & colleagues, 2013). Safety training focuses on safe work procedures and the importance of safety. Lauver (2007) suggests that safety training affects employees by making an improvement on their safety skills and abilities, as well as by communicating, through training, essential safety information. Safety training is important in the sense that an organization that has safety as a strategic focus will depend on frontline employee safety skills and safety initiatives to identify and resolve safety-related problems and to initiate changes in safe work methods (Pfeffer &Veiga, 1999). Training that is based on attitudes and beliefs toward safety has been shown to be very effective (Harvey, Bolam, Gregory, & Erdos, 2001; DeJoy, Searcy, Murpgy, & Gershon, 2000). Barling, Kelloway and Iverson (2003) observed that training enables employees to acquire greater competencies to control their work, leading them to perform their jobs more safely. Thus, increasing investment in safety-related training can enhance an organization's safety performance just as much as it improves economic performance (Zacharatos & colleagues). Safety training is a skill-enhancing component of AMO.

3.5.2. Safety Rewards

Rewards represent practices that deal with the direct and indirect rewards and payments employees receive from their organizations (Posthuma &colleagues, 2013). Posthuma and colleagues (2013) suggest that rewards in the form of compensation and benefits are important in the sense that they help to focus an employee's energy on specific behaviours that are desired by the organizations. It is therefore essential that organizations have employee rewards tied to the strategic focus or foci, which, in the context of the current study, are safety behaviours. Thus, if an organization, for example, considers safety as a main performance indicator, then it follows that the organization will reward employees for their efforts to promote safety. Research shows that when employees are rewarded contingent on their safety performance, they become more effective in reducing workplace injuries. For example, in a study of roofing crews, Austin, Kessler, Riccobono, and Bailey (1996) found safety compliance levels of crews provided with time off as a reinforcer for complying with certain safety behaviours to increase from 55% to 95%. Safety reward has been conceptualized as belonging to motivation-enhancing component of AMO.

3.5.3. Internal Opportunities for Promotion

Internal opportunities for promotion include those practices that enable employees to move up to higher level positions within an organization. The notion of internal labour market is a critical component of internal opportunity for promotion. The principles associated with the traditional internal labour market recognize the offer of a combination of permanent employment contracts, a steady career progression from low skilled to high skilled posts (in this context safety-related skills), transparent and integrated pay structures (e.g. tied to safety), and internal training (e.g. safety training) to employees (Grimshaw, Ward, Rubery, & Beynon, 2001). These principles may be safety-related and targeted to foster employee internal opportunity for promotion. These are introduced not only to meet the internal productive requirements of the organizations such as employee commitment (e.g. to workplace safety) but also to meet certain external conditions such as ensuring strong trade unions, low unemployment and steady national economic growth (See Elbaum, 1984; Jacoby, 1984; Rubery, 1978).

It is here argued that, when these principles are introduced to enhance employees’ internal opportunity for promotion based on their safety skills and safety performance, the employees are motivated to perform safely. Thus, high performance promotion for safety may include using promotions as a reward system for high safe performance such as reduction of accidents and injuries in the workplace. Internal opportunity for promotion has been conceptualized as belonging to motivation-enhancing component of AMO.

3.5.4. Safety Involvement and Participation

Employee involvement and participation dimension of HPWS for safety deals with those practices that provide employees with the opportunity to participate in making safety-related decisions of the organization. Marchington and Kynighou (2013) identify three types of employee involvement and participation: direct, indirect, and informal. Direct EIP is where employees personally get involved in a formal practice such as, for example, team briefing on safety-related issues, upward safety-related problem solving and safety-related suggestion schemes. Indirect EIP concerns a situation where employees are represented by one or more of their co-workers or trade union officials on a formal committee such as health and safety (Hall, Hutchinson, Purcell, Terry, & Parker, 2011, Dobbins & Gunnigle, 2009). Although informal EIP is less well researched (Marchington & Kynighou, 2013), it has been either as a substitute for or a supplement to formal schemes (Marchington & Suter, 2013).

Research (e.g. Wilkinson, Dundon, Marchington, & Ackers, 2004; Freeman & Medoff, 1984) has shown that employee voice through unions can foster organizational performance. For example, Wilkinson and colleagues (2004) suggest that whether through union or non-union channels, EIP can have a positive influence on an organization in three ways. First, employee attitudes and behaviours can be improved and loyalty and commitment to the organizational goals enhanced when management legitimately value employees' opinions. Second, lower absenteeism and greater cooperation can be achieved through employee increased loyalty and commitment. Third, accessing employee input and ideas can bring about improved managerial systems.

It is here argued that, by extension, employee safety involvement and participation (ESIP) will enhance organizational safety through the improvement of employee safety attitudes and safety behaviours. Simard and Marchand (1995) indicate that a participative management style was the only best predictor of the extent to which employees were proactively involved in their own safety. The finding of Shannon, Walters, Lewchuk, Richardson, Moran, Haines, and Verma's (1996) study of 718 Canadian workplaces reveal that those workplaces in which employees participated in decision-making had lower cost-time accident rates than those workplaces where employees were expected to adhere to the instructions of management in doing their jobs. Safety involvement and participation has been conceptualized as belonging to motivation-enhancing component of AMO.

3.5.5. Performance Appraisals

Research (e.g. Kinicki & colleagues, 2013; Aguinis, 2009; Cascio, 2006; DeNisi & Pritchard, 2006) posits performance management as a set of processes and managerial behaviours that define, measure, motivate, and develop the desired employee performance. Performance appraisal, which is a part of performance management (Kinicki & colleagues, 2013) is described as involving the identification, measurement, revision as well as the development of human performance in organizations (Carroll & Schneider, 1982). Although Cleveland, Murphy, and Williams (1989) note that performance appraisals are conducted in organizations for the purpose of documentation, within-person decisions (feedback on strengths and weaknesses), and between-person decisions (who to promote), both they and others (e.g. Ilgen, 1993; Beehr, Ruh, Dawson, McCaa, & Kavanagh, 1978) are of consensus that the ultimate goal of performance appraisal in organizations is to help them to improve employee performance as part of a larger performance management system. Since the purpose of performance appraisal is to improve employee performance in general, I here argue that safety-related high performance appraisal can as well enhance the employee safety performance. Thus, it is essential that we have performance appraisal as a dimension of the HPWS for safety scale. I further argue that frequent safety-related performance appraisals and feedback will help employees to see how well they are improving in safety activities related to their jobs, and this will increase their motivation to perform more safely.

Previous studies show that the factors emphasized by performance appraisals affect the safety behaviours of employees (Lauver, 2007). Cooper (2001) demonstrates that what gets measured and rewarded is what gets done well. Zhang and Li (2009) argue that this is fundamental because it can align individual and team performance with organizational strategies. Performance appraisal is conceptualized as belonging to motivation-enhancing component of AMO.

3.5.6. Self-Managed Team

Self-managed teams are described as groups of interdependent individuals that are capable of regulating their behaviour on relatively whole task (Goodman, Devadas, & Hghson, 1988; Cumming & Griggs, 1977). Pfeffer (1998a) identifies four benefits of team-based work organizations. One, an individual's behaviours are better controlled by his or her peers than someone else from a higher rung of the organizational ladder. Two, teams have the tendency of making their members feel more highly responsible for the success of the organization. Three, hierarchical layers are reduced as a result of teams' work and this, in effect, gives autonomy to those individual employees who best understand the situation. Four, working as a team enables the employees to put their ideas together in a manner that they become more creative.

Self-managed teams are expected to be effective and contribute to employee quality of work life (Cumming, 1978; Susman, 1976), quality improvements (e.g. Kapstein & Hoerr, 1989; Walton, 1972), cost savings and productivity improvements (e.g. Kapstein & Hoerr, 1989; Goodman, 1979; Walton, 1972), decreased absenteeism and turnover (e.g. Beekun, 1989), and safety improvements (Goodman, 1979; Walton, 1972). The study of Geller, Roberts, and Gilmore (1996) is consistent with Goodman's (1979) and Walton's (1972) reports where a sense of belongingness to a group and a sense of personal control were found to predict employees' propensity to actively care for co-worker safety. In their study, Trist, Susman, and Brown (1977) found employees who work in autonomous teams to experience fewer accidents than their counterparts who worked individually. Similarly, Smith (1994) reported an incidence in a Mobil Oil Corporation where it was found that the implementation of joint safety committees in which management and employees met on a regular basis to discuss safety issues had significant impact in fostering workplace safety. While there is paucity of research that has investigated teams and safety, the preceding reports are good reasons to believe that the implementation of teams in organizations is likely to be an effective way to foster workplace safety. Self-managed team is conceptualized as belonging to motivation-enhancing component of AMO.

3.5.7. Safety Information Sharing

Information sharing dimension of HPWS is concerned with HR practices that deal with the channels and methods that are used to exchange information in an organization (Posthuma & colleagues, 2013). Access to information is very important if employees must work effectively. Fitz-Enz (1997) opines that information is one of the company's most valuable resources. According to Pfeffer (1998a) employees' access to information enables them to have a clearer understanding of the organizational operations and its goals and this, in turn, enhances the overall organizational effectiveness.

It will be difficult for employees to work safely if they are not well informed about all aspects of the job they do in particular and about the organization in general. For example, as injuries occur and the organization learns the particular behaviour that should be changed, there is need for these changes to be communicated to all employees. Mendelson and colleagues

(2011) emphasize that when organizations promote a free exchange of information, they tend to demonstrate that they do so in order to enhance participation in organizational decisions.

Prior studies support the importance of information sharing for workplace safety. For example, research (e.g. Smith, Cohen, Cohen, & Cleveland, 1978; Cohen, 1977) suggests that organizations with better safety records are those where there is a greater contact and open discussion between management and frontline employees. Zohar (1980a) found factories rated by trained, independent observers as having better safety programmes to be embodied by open communication between management and employees. Hofmann (1999) reports that employees feel they are a significant part of the organization when there is increased sharing of safety-related information. The preceding findings indicate that there are positive consequences of safety information sharing if included as a dimension of HPWS for safety scale. Safety information sharing is conceptualized as belonging to opportunity-enhancing component of AMO.

3.5.8. Safety Audit

Audit has been defined as "a structured, proactive management tool to assess systematically compliance with defined standards, legislation, policy, or best practice" (Allford & Carson, 2015, p. 7). Safety audits characterize the qualitative approaches used by organizations to identify those areas of the safety management system that affect the level of risk. They also include the analysis framework that help to assess the safety culture of an organization by measuring whether safety performance indicators are present or not (Kennedy & Kirwan, 1998). To determine the extent to which the organization's safety policies and procedures are followed and whether there is need for improvement or not, there is need for safety audits. Process safety audit verifies whether what the business does in reality matches up to both what it says it does in terms of policies and procedures and what it should do in terms of continuous accident or risk reduction (Allford & Carson, 2015).

The objectives of safety audits include the identification of areas for improvement with the overall intent to reduce the chance of an accident or incident with the concomitant consequences such as death, injury, prosecution, financial loss, and so on (cf Allford & Carson, 2015). Safety audits provide organization with feedback that enables it to maintain, reinforce, and develop its ability to manage workplace safety. In a random audit process carried out in a hospital setting, Ursprung, Gray, Edwards, Horbar, Nickerson, Plsek, Shiono, Suresh, and Goldmann (2005) found a total of 338 errors to be detected and these errors represent a broad spectrum of systems problems. Although research linking safety audits to workplace safety is scant, the preceding report suggests that including safety audit as a dimension of HPWS for safety scale is fundamental. Safety audit is conceptualized as belonging to opportunity-enhancing component of AMO.

3.5.9. Safety Campaign

Safety campaigns refer to purposeful attempts to inform, persuade, and motivate employees to change their attitudes and behaviours in order to improve workplace safety. Together with other behavioural measures such as safety training, law enforcement, and perhaps infrastructure, safety campaigns are used as a means of influencing the target population to behave more safely (Hoekstra & Wegman, 2011). For any campaign message seeking to effect a change in behaviour to achieve its purpose, it must be persuasive. However, opinions about what types of message are persuasive are divergent. For example, it is believed that persuasion is usually a rational attempt to present data. However, research (e.g. Elliot, 1993) suggests that the effect can be more if an emotional message is used. Whether a campaign message uses factual or emotional persuasion, the objective of many safety campaigns is to highlight the risks associated with certain behaviour (Lewis, Watson, Tay, & White, 2007; Weber, Martin, & Corrigan, 2006)

Although there seems to be limited research linking safety campaigns to workplace safety, there are a number of related research that has demonstrated the potential effects of safety campaigns. For instance, World Health Organization (WHO) (2004) indicates that road safety campaigns were able to influence behaviour when used in conjunction with legislation and law enforcement. In the same vein, Elvik, Vaa, Hoye, Erke, and Sorensen (2009) report that the effects of safety campaigns combined with other measures are more effective than the effects of mass media alone. Elvik and Vaa (2004) suggest that safety campaign reduce accidents levels by somewhere between 0 and 49% depending on the type of campaign and accident used. However, it was shown that the local, personally directed campaigns (as it is suggested in the current study) demonstrate “by far the biggest effect on road accidents” (Hoekstra & Wegman, 2011, p. 81). Thus, I argue that safety campaign is very important as a dimension of HPWS for safety scale. Safety campaign is conceptualized as belonging to opportunity-enhancing component of AMO.

3.5.10. Safety Equipment Maintenance

Equipment maintenance is a deliberate attempt to prevent system failure as well as to restore the system function when a failure occurs. Ramalhoto (1999) suggests that one main objective of maintenance is to maintain or improve the system reliability, production and operation regularity. Through regular inspections or proper preventive maintenance, failures, which are the most obvious interruptions of operation can, most of the time, be prevented (Ramalhoto, 1999). Swanson (2001) argues that effective equipment maintenance is critical to many operations because it extends equipment life, improves equipment availability and retains equipment in appropriate condition.

Research has identified maintenance management strategies to include reactive, preventive, predictive (Bateman, 1995), total production maintenance (Weil, 1998), and aggressive maintenance (Swanson, 2001). Reactive maintenance strategy has been described as a firefighting approach to maintenance in which equipment is allowed to run until it fails. Then the failed equipment is either repaired or replaced (Paz & Leigh, 1994). Preventive and predictive maintenance are both referred to as proactive maintenance. It describes a maintenance strategy whereby breakdowns are completely avoided through activities that help to monitor equipment deterioration and undertake minor repairs in order to restore equipment to appropriate condition.

Aggressive maintenance strategy seeks to improve overall equipment operation through involvement in efforts to improve the design of new and existing equipment (Swanson, 2001). Maggard and Rhyne (1992) describe total production maintenance as a partnership approach to maintenance where small teams or groups come together to create a cooperative relationship between maintenance and production in order to accomplish maintenance work.

Although research linking equipment maintenance to workplace safety (i.e. safety outcomes) is scant, it has been shown that both proactive and aggressive maintenance strategies have significant positive relationships with the measures of performance (i.e. product quality, equipment availability, and reduction in production costs) while reactive maintenance strategy has a marginally significant negative relationship with the three measures of performance (i.e. product quality, equipment availability, and reduction in production costs) (Swanson, 2001). Drawing on prior research (e.g. Swanson, 2001), I include safety equipment maintenance as an important dimension of the new HPWS for safety scale. Safety equipment maintenance is conceptualized as opportunity-enhancing component of AMO.

3.6. Scale Development Process

3.6.1. Introduction

Several criteria have been suggested to assess the psychometric adequacy of behavioural measures. For example, the American Psychological Association (1985) highlights that measures should have an evidence of the content-related validity, criterion-related validity, construct-related validity, and internal consistency. Hinkin (1995) defines content validity as the adequacy with which a measure assesses the domain of interest, while criterion-related validity relates to the relationship that exists between a particular measure and another independent measure. Construct validity refers to the relationship of the measure to the underlying attributes that the measure attempts to assess whereas internal consistency is the homogeneity of the items within the measure or rather, the extent to which item responses correlate with the total test scores. Schwab (1980) notes three stages in the development of measures: the item development or the generation of individual items stage; the scale development stage (i.e. the manner in which items are combined to form scales); and the scale evaluation stage (i.e. the psychometric examination of the new measure). Thus, in line with Schwab (1980) and others (e.g. Hinkin, 1998), this study developed a new measure of HPWS for safety utilizing the following procedure: (i) item development and content validity assessment; (ii) pilot-testing the items/scale; and (iii) psychometric examination of the scale.

3.6.2. Ethics-1

Before I went to the field for collecting data for the development and validation of HPWS for safety scale, I drafted the research proposals in line with the Aston University's ethical guidelines for research. This was submitted to and subsequently approved by the Aston University Research and Ethics Committee. Because it was initially difficult to gain access into the organizations of interest for the purpose of the qualitative interview, I decided to establish personal and direct contacts with the HR and safety professionals and experts within those organizations. Before I finalized the agreement to participate with these individuals, I arranged a meeting with those who indicated interest to participate in the interview. During these meetings, each of the prospective participants was provided with a sample of the interview schedule upon request. However, I was later able to gain access into NNPC and General Hospitals in Niger State of Nigeria through a letter from the NNPC Group Managing Director (HR) and Director of Hospital Management Services, directing nine of the eleven NNPC subsidiaries and all the General Hospitals in the State, respectively, to participate in the research. The HR managers in the organizations used for this purpose acted as intermediaries between the researcher and the prospective participants and this channel of communication remained open to both the prospective participants and the researcher throughout the research exercise.

In both the interview schedule and the questionnaires distributed to the prospective participants in Studies 1, 2, and 3, I provided a covering statement outlining the issues of informed consent, confidentiality and anonymity procedures involved in this study. The issue of informed consent was my primary ethical concern. In considering this issue, I made the prospective participants to be aware of the purpose and nature of the study, the nature and extent of their participation, and the potential risk and benefits involved. I ensured that they understood the information that were given concerning their participation. Concerning the confidentiality, I assured the participants that all information provided would be protected and that it would not be linked to them as individuals or as a group. The prospective participants were also informed as well that they could withdraw from the interview or the research process (as the case may be) at any time if they so desired. However, they were advised that once they start filling the questionnaires after they have read this message, it would show their informed consent to participate. I gave them my personal contact details directly to interviewees and indirectly through HR managers to other prospective participants in case there was need to get in touch with me. The obtained data were stored in a secure folder and these would be destroyed after the dissemination of the research findings.

3.6.3. Study 1: Item Development

In an attempt to adequately capture the specific content domains of HPWS for safety, this study adopted deductive and inductive approaches to scale development. This is necessary because there is a need to understand the phenomenon to be examined through a thorough review of the literature to develop the theoretical definition of the construct under investigation (Hinkin, 1995). Hinkin's (1995) review of scale development practices suggests that a deductive technique to item generation can be done in two primary ways: (i) a researcher can derive items that are "designed to tap a previously defined theoretical universe" (p.969). In other words, items can be generated through the adoption or adaptation of, for example, previous HPWS scale items that are not safety specific; and (ii) a researcher can also develop a conceptual definition of the construct under investigation grounded in theory, "but then utilizes a sample of respondents who were subject matter experts to provide critical incidents that are subsequently used to develop items" (p.969). The present study adopted Hinkin's (1995) suggestions by:

1. Reviewing literature on similar work to identify ten (10) content domains and some items that underpin HPWS practices;
2. Developing a theoretical foundation by defining HPWS for safety through an extensive review of the literature on the ability, motivation, and opportunity (AMO) theoretical framework; and
3. Using HR and Health and Safety professionals to provide critical incidents that subsequently guided the researcher in the development of the items.

To assure the scale's validity, this study isolated or singled out all of the initial content domains and items from measures that had been reported in previous studies (Takeuchi & colleagues, 2007). Specifically, the study isolated the initial content domains and items from three of the measures reported in the review of the literature (See Chuang & Liao, 2010; Sun & colleagues, 2007; Zacharatos & colleagues, 2005) to generate the initial domains and pool of items that subsequently guided the researcher in the development of interview schedule.

As earlier indicated, ten (10) HPWS content domains were isolated and adapted for the purpose of item generation from the previous measures reported in the review of the literature. They include: safety training (training: Chuang & Liao, 2010; extensive training: Sun & colleagues, 2007; training: Zacharatos & colleagues, 2005), safety rewards (compensation/rewards: Chuang & Liao, 2010; incentive reward: Sun & colleagues, 2007; contingent compensation: Zacharatos & colleagues, 2005), internal opportunity for promotion (internal mobility: Sun & colleagues, 2005), safety involvement and participation (involvement and participation: Chuang & Liao, 2010; participation: Sun & colleagues, 2007), performance appraisals (performance appraisals: Chuang & Liao, 2010; results-oriented appraisals: Sun & colleagues, 2007), self-managed team (teams and decentralized decision-making: Zacharatos & colleagues, 2005), safety information sharing (information sharing: Zacharatos & colleagues, 2005), Clear job description (clear job description: Sun & colleagues, 2007), hiring for safety (staffing: Chuang & Liao, 2010; selective staffing: Sun & colleagues, 2007; selective hiring: Zacharatos & colleagues, 2005), and employment security (employment security: Sun & colleagues, 2007; Zacharatos & colleagues, 2005).

3.6.3.1. Step 1: Inductive Approach to the Development of an HPWS for Safety Scale

To supplement the deductive technique, the study also adopted an inductive technique using subject matter experts drawn from the relevant organizational context. This was essential because there is a need to ask a sample of the potential respondents to describe some aspects of their organization's safety-related HR practices not deductively identified (Kinicki, Jacobson, Peterson, & Prussia, 2013; Hinkin, 1998, 1995) and to know the extent to which those deductively identified are relevant to HRM practices relating to safety in the Nigerian context (See Sun & colleagues, 2007). In other words, the inductive or qualitative aspect of this study aimed to achieve two basic purposes: the first was to find out if the HRM practices used in Nigeria's oil and gas industry to promote safety are in consonant with each of the deductively identified content domains ((e.g. safety training, safety rewards, internal opportunity for promotion, safety involvement and participation, performance appraisals, self-managed team, safety information sharing, clear job description, hiring for safety, and employment security)); second, to explore and identify safety-related HRM practices unique to the oil and gas industry in Nigeria.

3.6.3.1.1. Procedure and Participants

I developed a semi-structured interview schedule utilizing the ten (10) content domains and some items identified in the review of the literature. Sample questions are shown in Table 3.3 below:

Table 3.3: Sample Questions in Semi-Structured Interview Schedule

HR Domain	Questions
Workplace safety as an organizational objective	Please explain briefly how workplace safety is reflected in your organization's vision and mission. Answer to be backed up with relevant organizational documents Does your organization emphasize workplace safety as an objective in the same way as it emphasizes the bottom-line (profits)? If yes, how is this accomplished
Hiring for Safety	Does your organization emphasize long-term employee safety potentials in its hiring practices? Can you please give examples of how this is accomplished?
Safety Training	Does your organization provide extensive safety training programmes for employees? What are some of these programmes or practices?
Safety Reward	How do you compare the average pay level (including incentives) of your employees (especially front-line employees) with that of similar organizations (competitor) in the industry?
Employment Security	How much emphasis does your organization attach to employment security for its employees?
Internal Opportunity for Promotion	Using safety-related qualifications and performance as criteria, do qualified employees have good opportunities for internal promotion in your organization
Information Sharing	To what extent do supervisors keep open safety communications with employees in your organization? To what extent does your organization share with employees information about how well the organization is performing in safety-related issues? Can you please give specific examples of how this is done?
Performance Appraisals	How often does your organization measure employee safety performance in terms of objective quantifiable results?
Self-Managed Team	To what extent are team suggestions on safety issues implemented within your organization?
Clear Job Descriptions	Do the jobs employees do have up-to-date safety-related descriptions?
Safety Involvement and Participation	To what extent do supervisors keep open safety communications with employees in your organization? To what extent do you ask your employees for their opinions in advance if a decision made might affect their safety at work?
Others	Are there other practices that your organization has developed or uses to promote health and safety? Please, state them

(See Appendix A for details).

To obtain access to respondents, letters were distributed to twenty-eight (28) oil and gas companies in Nigeria requesting for their participation in the research. The letter specified the objective of the research, the different stages of the research process and the level or extent of participation expected of the management, supervisory staff as well as frontline employees. The letter also emphasized that participation was voluntary and confidential (See Appendix B). This was essential because it was problematic to get individuals' direct consent to participate in the research process without the approval of their respective organizations. The Department of Petroleum Resources (DPR), the regulatory body of oil and gas companies in Nigeria, provided a letter of introduction (See Appendix C) which was submitted to sixteen (16) of the leading national and multi-national oil and gas companies in Nigeria. Furthermore, a letter was obtained from the Group General Manager (GGM-HR) at the corporate head office of the Nigeria National Petroleum Corporation (NNPC), Abuja, granting access to nine (9) of its subsidiaries around the country (See Appendix D).

Although I was not officially granted access to the private oil and gas companies, some of the HR managers and HS managers used their good offices to grant me access to their companies. Utilizing this opportunity as well as the letter of introduction from NNPC, I interviewed eighteen (18) managers and professionals including seven (7) HR managers and eleven (11) health and safety (HSE) managers drawn from two (2) private and six (6) government owned oil and gas companies. All the eighteen (18) participants were male and they had spent between one (1) and eight (8) years (mean = 4years) in their current position and their organizational tenure ranged from twenty-two (22) to thirty-three (33) years (mean = 26 years). The duration of each interview session ranged from 30 minutes to 1 hour 30 minutes with a mean duration of 1 hour. All the interview sessions were both manually and electronically recorded. This was necessary in order to: (i) avoid the human error of taking notes manually; and (ii) enable me to compare the two records at the end of each interview session. In addition, in order to ensure the interview approximates a natural conversation, the electronically recorded interview session was played at the end of each session so as to provide the interviewee the opportunity to confirm the content and to make corrections where necessary. A summary of the interview is presented in Appendix E.

3.6.3.1.2. Interview Findings

The outcome of this interview process confirmed eight (8) out of the ten (10) a priori content domains of HPWS, including safety training (5 items), safety rewards (4 items), internal opportunity for promotion (5 items), safety involvement and participation (4 items), performance appraisals (7 items), self-managed team (5 items), safety information sharing (6 items), and clear job description (4 items). Hiring for safety and employment security did not seem to promote safety in the Nigerian oil and gas industrial context. In addition, six (6) new HRM and safety practices (content domains) that are used for promoting safety in the Nigerian oil and gas companies were identified: safety audit (4 items), safety campaign (5 items), safety equipment maintenance (4 items), accident prevention (4 items), total loss control community (3 items), and safety initiative (4 items).

In all, findings from interviews coupled with the a priori item generation from the deductive phase of scale development generated sixty-four (64) unique safety-related items that were deemed to be widely used in the Nigerian context. Some items that were originally adapted and used as the bases for developing the interview schedule were either completely deleted or modified while others, for example, “The company invests considerable time and money in safety-related training programmes” (Safety Training: Chuang & Liao, 2010), “There is fairness and equity in the distribution of rewards in this company” (Rewards Contingent on Safety Performance: Chuang & Liao, 2010), “Employees who have acquired safety-related skills have career paths in this company ” (Internal Opportunities for Promotion: Sun & colleagues, 2007), “My company supports employees with the necessary equipment and resources to provide high quality safety performance” (Safety Involvement and Participation:

Chuang & Liao, 2010), “The supervisors in my company often meet with their subordinates to set performance objectives” (Performance Appraisals: reverse of Chuang & Liao, 2010), and “The job description for each position is well and clearly defined in the document given to employees” (Clear Job Description: adapted from Sun & colleagues, 2007) were retained.

My decision to identify this large number of items at this stage was deliberate because I anticipated that after the process of item reduction and refinement, there should still be a minimum number of items that should adequately capture the domains of interest. This is consistent with Hinkin’s (1998) observation that approximately one half of the initially generated pool of items are retained for use in the final scale, and therefore, “at least twice as many items as will be needed in the final scale should be generated” (p.109).

3.6.3.2. Step 2: Content Validity Assessment

3.6.3.2.1. Items Sorting or Classification

Research (e.g. Kinicki & colleagues, 2013; American Psychological Association, 1999; Nunnally, 1978) indicates that the content evaluation of the responses (i.e. items) generated from a focus group (i.e. HR and Safety experts) can be obtained by having a panel of judges assign items to the theoretical domains that underpin the content construct. This item reduction exercise provides an initial assessment of the extent to which the pool (second pool) of items generated measures or describes the HR content domains (Kinicki & colleagues, 2013). The present study thus assessed the content validity of the pool of sixty-four (64) items generated deductively and inductively by using eleven doctoral researchers drawn from Aston Business School as judges. I used a sample of doctoral students at this stage of the scale development because sorting or classification is a cognitive task requiring intellectual ability rather than work experience or an understanding of the phenomenon under investigation (Schriesheim, Powers, Scandura, Gardiner, & Lankan, 1993; Schriesheim & Hinkin, 1990).

I distributed a template (both hard and soft copies) containing the detailed descriptions of each of the fourteen (14) HPWS domains or dimensions, and all of the sixty-four (64) items identified through deductive and inductive techniques to the respondents (i.e. judges). I then asked the judges to critically look at the items and the descriptions of the domains or dimensions and assign the randomly ordered items into one of the fourteen (14) categories (i.e. HPWS domains) as well as the "does not match any" category. The percentage of the correct assignments given by the judges for each item was calculated at the end of the exercise. Consonant with prior research (e.g. Kinicki & colleagues, 2013; MacKenzie, Podsakoff, & Fetter, 1991), I used a standard of 80% consensus among the judges to retain items for further analysis. Items on which the judges did not reach consensus, or which were assigned to "does not match any" category were discarded (Kinicki & colleagues, 2013; Nunnally, 1978). This classification procedure is consistent with that described in the literature (e.g. Kinicki & colleagues, 2013; Hinkin, 1998, 1995; MacKenzie & colleagues, 1991; Hinkin & Schriesheim, 1989; Schriesheim, 1978; Nunnally, 1978).

On examination of the outcome of this exercise, it was identified that three (3) of the proposed domains: accident prevention, total loss control community, and safety initiative "appeared to measure outcomes rather than practices". Consequently, these domains were deleted. In all, eleven (11) domains and forty-one (41) items were retained for further analysis. These were safety training (4 items), safety rewards (3 items), internal opportunity for promotion (4 items), safety involvement and participation (4 items), performance appraisals (3 items), self-managed team (4 items), safety information sharing (4 items), Clear Job description (3) safety audit (4 items), safety campaign (4 items), and safety equipment maintenance (4 items) (See Appendix F).

3.6.3.2.2. Inter-Rater Reliability Assessment

The scores of ten (10) out of the eleven (11) doctoral researchers who sorted the items in the preceding section were used for the purpose of interrater reliability assessment. The 41 items that survived this sorting exercise were further subjected to inter-rater reliability assessment. It was expected that the reliability coefficient would be high if the judges' ratings were similar. Thus, in order to further refine the forty-one (41) items from the verdicts of the judges in the classification of the items into categories (i.e. HPWS domains), I utilized Schriesheim, Kinicki, and Schriesheim's (1979) three-stage process of inter-rater reliability assessment by: (i) dividing the ten (10) judges randomly into two equal groups; (ii) calculating the number of times each judge assigned each of the forty-one (41) items to each of the eleven (11) categories; and (iii) establishing the correlation coefficients between the two groups of judges across the pool of items for each of the categories (i.e. content domains) using Pearson Product Moment Correlation Coefficient.

The inter-rater reliability coefficients for the eleven (11) domains are: safety training (.91), rewards contingent on safety performance (.50), internal opportunities for promotion (.33), safety involvement and participation (.33), performance appraisals (.99), self-managed team (.99), safety information sharing (.99), clear job description (.50), safety audit (.99), safety campaign (.99), and safety equipment maintenance (.99). Although two of the domains: "internal opportunities for promotion" and "safety involvement and participation" (r = .33 each) exhibited medium values of reliability coefficient (r) (Cohen, 1988), it could be logically argued that there was a high level of similarity in the ratings of the judges with the average rating of 0.77. This is consistent with Cohen (1988), who found the reliability coefficients of r = .33 to .39 to be strong, whereas the reliability coefficients of r = .50 to 1.0 represent quite a stronger similarity between the judges' ratings. In other words, the inter-rater reliability assessment test demonstrates a high level of similarity among the judges' rating. The next section describes the dimensions of the HPWS for safety.

3.7 Study 2: Scale Development and Construction

3.7.1. Step 1: Exploratory Factor Analysis

Having established a high level of similarity among the judges' ratings through the inter-rater reliability assessment, I then used exploratory factor analysis (EFA) to ascertain the validity of the newly developed HPWS for safety scale. The purpose of the EFA was to uncover the underlying factor structure of the 41 items.

3.7.1.1. Sample and Procedure

The data for the EFA were collected from two sources. First, were managers, deputy managers, assistant managers, superintendents, assistant superintendents, and supervisors (hereafter referred to as supervisory employees) of selected oil and gas companies in Nigeria. The choice of this sample was informed by the fact that they represent the target population of my main study. 200 questionnaires were distributed to supervisory employees purposively drawn from four branches of two different NNPC subsidiaries in Nigeria.

The second source of respondents was the Petroleum Training Institute (PTI), Effuru, Warri, Nigeria. The institute was particularly relevant because it trains junior, including front-line employees, of oil and gas companies in Nigeria. This category of employees constituted the target population of my main study. I personally visited the Petroleum Training Institute (PTI), Effuru, Nigeria to obtain access to their trainees to participate in the pilot study. A supervisor in charge of the part-time programmes of the institute was officially assigned to help me to identify potential respondents.

It should be noted that many of the part-time students of the institute are full time employees in the oil and gas industry who attend lectures on weekends for the purpose of obtaining either Ordinary National Diploma (OND), Higher National Diploma (HND) or a Certificate in specialized programme such as diving, etc. Two hundred and fifteen (215) among the two hundred and eighteen (218) students randomly selected participated in the study.

The main objective for involving both the supervisory employees and frontline employees was to ascertain the extent of the use of HPWS for safety practices and the extent to which frontline employees experience these safety practices in their organizations. In order to ascertain whether there is a significant difference between the mean scores of frontline and supervisory employees (See the measure and scaling method in the next section), an independent t-test statistics was conducted. The result (See Table 3.4) indicates that there was no significant difference in mean scores for frontline employees (M = 3.88, SD = 1.20) and supervisory employees (M = 3.86, and SD = 1.16) at t = .177, df = 301, p >.05 (two-tailed). In line with Pallant (2013), the effect size statistics that provide an indication of the magnitude of the differences between the mean scores of the frontline and supervisory employees was also conducted using eta squared formula as follows:

Eta squared $= \dfrac{t^2}{t^{2+(N1+N2-2\,)}}$

Replacing with the appropriate values from the t-test analysis, we have the following:

Eta Squared $= \dfrac{.177^2}{.177^{2+(205+98-2}}$

Eta squared = .00010

This result indicates that the magnitude of the differences in the mean scores (i.e. mean difference = .026, 95% CI: -.26 to .31) was very small (eta squared = .00010 [.01%])

Table 3.4: Mean scores and standard deviation of the difference between frontline and supervisory employees

Scale	Job Title	N	M	SD	Df	t	p
	Frontline Employees	205	3.88	1.20			
HPWS for safety					301	0.177	0.05
	Supervisory Employees	98	3.86	1.16			

Not significant at P < 0, 05

As indicated in Table 3.4, the results of the independent t-test demonstrate that there was no significant difference in mean scores for frontline employees (M = 3.88, SD = 1.20) and supervisory employees (M = 3.86, and SD = 1.16) at t = .177, df = 301, p >.05 (two-tailed) and that the effect size statistics which provide an indication of the magnitude of the differences between the mean scores of the frontline and supervisory employees was also small (eta squared = .00010 [.01%]). Accordingly, I combined the data from both frontline and supervisory employees to conduct the EFA. In total, 98 (i.e. 49%) usable questionnaires were retrieved from the 200 supervisory employees who received questionnaires and of the 215 questionnaires distributed to the frontline employees, 205 usable questionnaires (95.3%) were retrieved. Thus, 303 usable questionnaires were retrieved in total, of which 67.7% were from frontline employees and 32.3% from supervisory employees.

The age range of the participants is between 21 and 59 years. Two hundred and thirteen (213) (70.3%) participants were male while ninety (90) (29.7) were female. One hundred and sixteen (116) (38.3%) participants had qualifications below a first degree, one hundred and twenty-eight (128) (42.2%) among them had a degree or its equivalence while fifty-nine (59) (19.5) of them had postgraduate qualifications. The participants had spent between 1 and 32 years in their current position, between 1 and 32 years in their current organization, and between 1 and 35 years in the oil and gas industry.

3.7.1.2. Measures

The HPWS for safety scale was designed to measure both the unit's use of HPWS for safety and employees' experiences of the use of HPWS for safety. The supervisory and front-line employees were asked to give an accurate description of the use and experiences respectively, of HPWS for safety practices adopted in their companies. Response options ranged from (1) = 'strongly disagree' to (5) = 'strongly agree.'

3.7.1.3. Data Analytic Technique

The responses to the forty-one (41) survey items were factor analysed using principal axis factoring (PAF) analysis with IBM SPSS version 21. In order to verify whether a data set is suitable for factor analysis, Pallant (2013) recommends checking that: (i) the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) value is .6 or above. The KMO statistic varies between 0 and 1. A value of 0 shows that the sum of partial correlations is large compared to the sum of correlations, suggesting diffusion, hence factor analysis is likely to be inappropriate. A value close to 1 would mean that patterns of correlations are relatively compact and as a result, factor analysis should yield distinct and reliable factors. Values between 0.5 and 0.7 are mediocre, values between 0.7 and 0.8 are good, values between 0.8 and 0.9 are great, and values above 0.9 are superb (Field, 2005). For this data, the value is 0.96 which falls into the range of superb.(ii) The Bartlett's Test of Sphericity is a test statistics used to examine the null hypothesis that the original correlation matrix is an identity matrix. In order for factor to work, we need some relationships between variables under investigation and if the R-matrix were an identity matrix then all correlation coefficients would be zero. As a result, there is need for this test to be significant (i.e. to have a significant value of 0.05 or less: Pallant, 2013). When the test is significant, it tells us that the R-matrix is not an identity matrix, and therefore, some relationships exist between the variables that are included in the analysis (Field, 2005).

For the present data, the Bartlett's test is highly significant ($p < 001$); and (iii) many of the items should indicate correlation coefficients of .3 and above (Pallant, 2013). I also examined the internal consistency of the new scale using Cronbach's alpha coefficient (Cronbach, 1951) while I used Fornell and Larcker's (1981) Index of construct reliability to measure the scale's construct reliability. The results are presented in the next section.

3.7.1.4. Result

The result of the analysis in Table 3.5 indicates that in distribution, Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy value was 0.96, exceeding the recommended value of 0.6 (Kaiser, 1974, 1970). This value falls within the range of superb (Field, 2005), suggesting that the data set is suitable for factor analysis. The Bartlett's Test (Bartlett, 1954) was significant (x^2 = 11604.803, df = 820, p = 000 < 0.001), indicating that relationships exist among the variables that are included in the analysis (See Table 3.5). The analysis also indicates the presence of many correlation coefficients of .3 and above. The analysis therefore supports the factorability of the correlation matrix (Pallant, 2013).

Table 3.5: KMO and Bartlett's Test of Sphericity

KMO Measure of Sampling Adequacy		**0.96**
	Approx. Chi-Square	**11604.80**
	df	**820**
Bartlett's Test of Sphericity	**Significance**	**.000**

As previously noted and in line with extant research (Sun & colleagues, 2007), I conducted EFA with principal axis factoring to uncover the underlying factor structure of the new HPWS for safety scale. To ease the interpretation of the factor loadings, I used Direct Oblimin with

Kaiser Normalization rotation. Furthermore, in addition to selecting those items with loadings of .3 or above on only one factor, Eigenvalues greater than 1.0 and Scree Test (Catell, 1966) were used to retain factors. Consequently, the EFA results yielded a three-factor solution that accounted for 65.97% of the variance, with 29 items loading uniquely on three components.

A close observation of the scree plot demonstrates a clear break after the third component and using Catell's (1966) Scree Test (See Figure 3.2), the three components were retained for further analysis. The three-component solution explained a total of 65.97% of the variance, with Component 1 contributing 55.88%, Component 2 contributing 6.15%, and Component 3 contributing 3.94% (See Table 3.6).

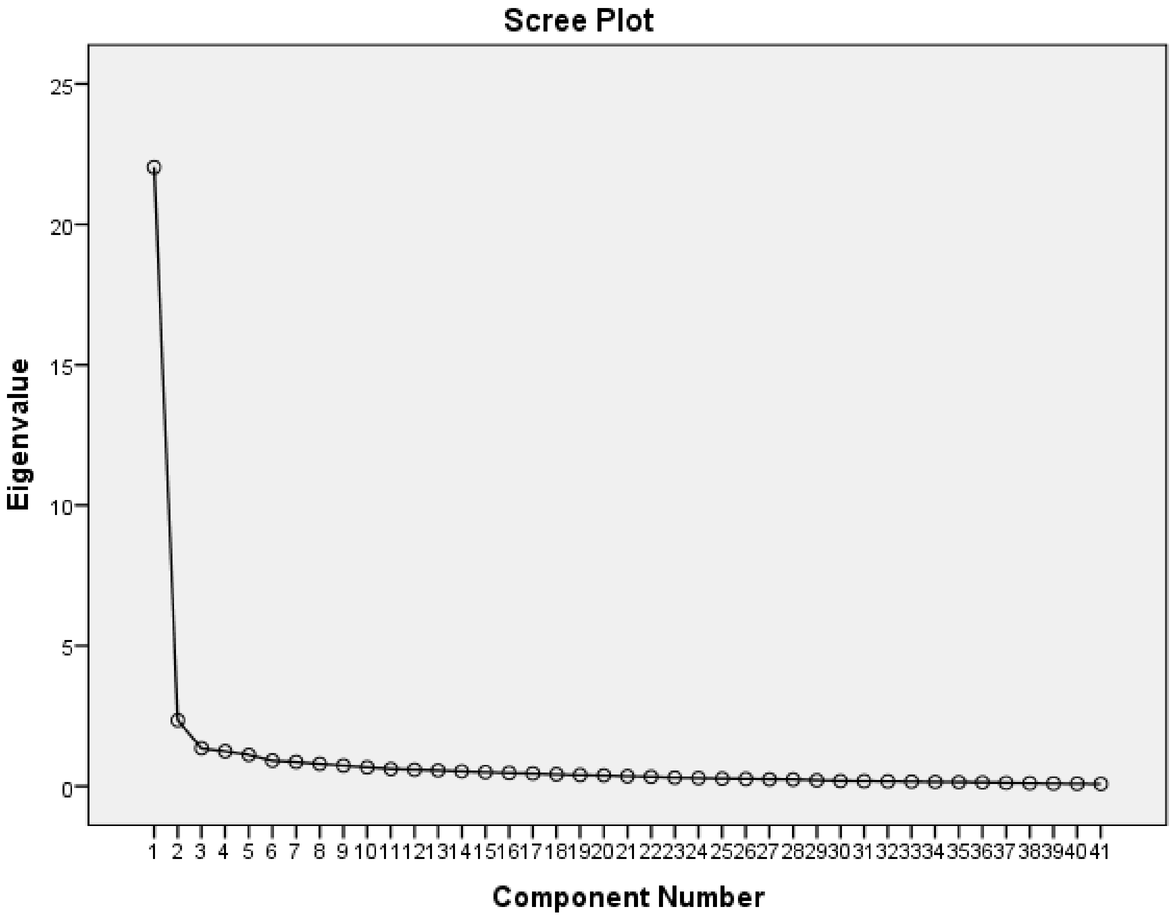

Figure 3.1: Scree plot of the factors

Table 3.6: Results of Factor Analysis (EFA) of the New High Performance Work System for Safety Scale

	Domains/Items	1	2	3
1	**Safety Training**			
	TRA1			.86
	TRA2			.69
	TRA3			.74
	TRA4			.44
2	**Safety Rewards**			
	REW1	.62		
	REW2	.72		
3	**Internal Opportunity for Promotion**			
	PRO1	.74		
	PRO2	.74		
	PRO3	.76		
4	**Safety Involvement and Participation**			
	PAR1	.68		
	PAR2	.60		
5	**Performance Appraisals**			
	APP1	.55		
	APP2	.78		
	APP3	.69		
6	**Self-Managed Team**			
	TEA1	.73		
	TEA2	.56		
7	**Safety Information Sharing**			
	SHA1	.50		
	SHA2	.42		
8	**Clear Job Description**			
	DES1	.49		
	DES2	.32		
9	**Safety Audit**			
	AUD1		.61	
	AUD2		.55	
	AUD3		.56	
10	**Safety Campaign**			
	CAM1		.81	
	CAM2		.85	
	CAM3		.88	
11	**Safety Equipment Maintenance**			
	MAI1		.75	
	MAI2		.73	
	MAI3		.67	
Eigenvalues		16.21	1.78	1.14
Variance Explained (%)		55.88	6.15	3.94

As earlier explained, Oblimin with Kaiser Normalization was performed in order to enhance the interpretation of the three components. The rotated solution yielded 9 iterations and indicated the presence of three components demonstrating a number of strong loadings and seven variables (domains): safety rewards (items 6, 7), internal opportunity for promotion (items 8, 9, 11), safety involvement and participation (items 12, 15), performance appraisals (items 16, 17, 18), self-managed team (items 21, 22), safety information sharing (items 25, 26), and clear job descriptions (items 27, 28) loading on Component 1; three variables: safety audit (items 30, 31, 32), safety campaign (items 34, 36, 37), and safety equipment maintenance (items 38, 39, 40) loading on Component 2; and one variable: safety training (items 1, 2, 3, 4) loading on Component 3.

The three components are consistent with AMO framework, with human resource management items (domains: safety rewards, internal opportunity for promotion, safety involvement and participation, performance appraisals, self-managed team, safety information sharing, and clear job descriptions) loading strongly on Component 1 (Motivation), organization management items (domains: safety audit, safety campaign, and safety equipment maintenance) loading strongly on Component 2 (Opportunity), and skills items (domain: safety training) loading strongly on Component 3 (Ability) (See Tables 3.6 and 3.7).

Table 3.7: Configuration of HPWS for safety Domains in Relation to AMO

HRM Subsystem	AMO Dimensions	HPWS for Safety Dimensions
Skill	Ability	Safety Training
Human Resource management	Motivation	Safety Rewards Internal opportunity for promotion Safety involvement and participation Performance appraisals Self-managed team Safety information sharing Clear job descriptions
Organization management	Opportunity	Safety audit Safety campaign Safety equipment and maintenance

The second analysis conducted on these data aimed to uncover the underlying factor structure of the eleven (11) domains constituting the HPWS for safety as a synergistic system for safety measure. Therefore, consistent with Drasgow and Kanfer's (1985) and Comrey's (1978) subscale summation approach, the mean scores of each subscale (domain) were calculated and used for conducting EFA. Then following Zacharatos and colleagues (2005), I used principal components extraction with listwise deletion and a single factor solution emerged from the data. This single factor solution that now constitutes the high performance work system (HPWS) for safety scale accounted for 66.22% of the cumulative variance explained with an Eigenvalue of 7.28. The results of this analysis are shown in Table 3.8.

Table 3.8: Factor Loadings of Eleven (11) Domains of the New High Performance Work System for Safety Scale

Factor	Component 1/Factor Loadings
Safety Information Sharing	0.87
Safety Audit	0.85
Clear Job Description	0.84
Safety Equipment Maintenance	0.81
Self-Managed Team	0.81
Safety Training	0.81
Safety Involvement and Participation	0.81
Safety Campaign	0.81
Performance Appraisals	0.80
Internal Opportunity for Promotion	0.77
Safety Rewards	0.76

3.7.2. Step 2: Reliability Assessment of the Scale

Two basic issues of concern in assessing the reliability of a new measure are: (i) the internal consistency of the items within the measure; and (ii) the stability of the measure over time (Hinkin, 1995). The two important ways by which this study demonstrated the reliability properties of this new measure are to examine, at the construct level, its internal consistency (Kinicki & colleagues, 2013; Pallant, 2013; Hinkin, 1995; Price & Mueller, 1986; Cronbach, 1951) and construct reliability (Fornell & Larcker, 1981). Specifically, the study examined whether (i) the internal consistency reliability (Cronbach, 1951) of the set of indicators is greater than 0.70; and (ii) Fornell & Larcker's (1981) index of construct reliability is greater than 0.70. The internal consistency of the scale (which is also known as the construct reliability: Fornell & Larcker, 1981) refers to the degree to which the items that constitute the scale or subscale measure the same underlying construct. Fornell & Larcker, (1981) define construct reliability as a summary measure of convergence among a set of items that constitute a construct. In other words, it is expected that the items within each dimension as well as the dimensions should correlate with one another.

The reliability coefficients (Cronbach, 1951) for the measures of each of the eleven (11) subscales or dimensions of the HPWS for safety scale are reported in Table 3.9.

Table 3.9: Reliability Coefficients of the 11 Subscales Constituting HPWS for Safety (Study 2)

Serial Number	Subscales	Number of Items	Reliability Coefficients
1	Safety Training	4	0.88
2	Safety Rewards	2	0.85
3	Internal Opportunity for Promotion	3	0.82
4	Safety Involvement And Participation	2	0.73
5	Performance Appraisals	3	0.84
6	Self-Managed Team	2	0.82
7	Safety Information Sharing	2	0.88
8	Clear Job Descriptions	2	0.81
9	Safety Audit	3	0.91
10	Safety Campaign	3	0.92
11	Safety Equipment Maintenance	3	0.90

Furthermore, the reliability of each subscale was assessed in order to determine whether the second-order latent construct (i.e. HPWS for safety) explains or accounts for the majority of its variance. This was done by showing whether the squared multiple correlation for the subscale is greater than 0.50 (Fornell & Larcker, 1981). Table 3.10 indicates that the squared multiple correlations of the subscales or dimensions (ranging from 0.59-0.75) are each greater than 0.50, the recommended value by Fornell and Larcker (1981). This demonstrates that the second-order latent construct accounts for the majority of the sub-scales' variances, thereby demonstrating a high level of construct reliability.

Table 3.10: Squared Multiple Correlations of the Sub-Scales

Serial Number	Sub-Scales	Squared Multiple Correlations
1	Safety Training	0.65
2	Safety Rewards	0.59
3	Internal Opportunity for Promotion	0.62
4	Safety Involvement and Participation	0.70
5	Performance Appraisals	0.68
6	Self-Managed Team	0.68
7	Safety Information Sharing	0.75
8	Clear Job Description	0.70
9	Safety Audit	0.75
10	Safety Campaign	0.67
11	Safety Equipment Maintenance	0.71

The second-order factor loadings and the residual variances that are associated with the first-order sub-dimensions were used to calculate Fornell & Larcker's (1981) index of construct reliability. In other words, a squared sum of the factor loadings of the HPWS dimensions (numerator) was divided by the squared sum of the factor loadings plus the sum of residual variances of the factor loadings (denominator). Corroborated by Netemeyer, Johnston, and Burton (1990), the Fornell and Larcker's (1981) formula for calculating the construct reliability of an instrument is:

Construct Reliability = $\frac{(\sum\lambda)^2}{(\sum\lambda)^2+\sum\varepsilon}$

Where $(\sum\lambda)^2 = Squared\ sum\ of\ factor\ loadings, and$

$$\sum\varepsilon$$

$= sum\ of\ residual\ variances\ of\ factor\ loadings$

$= \quad (0.87 + 0.85 + 0.84 + 0.81 + 0.81 + 0.81 + 0.81 + 0.81 + 0.80 + 0.77 \ + 0.76\ )^2$

$= 79.92$

$\sum\varepsilon$ = 0.37 + 0.40 + 0.50 + 0.48 + 0.45 + 0.37 + 0.26 + 0.30 + 0.27 + 0.26 + 0.22 = 3.88

Construct-Reliability = $\frac{(\sum\lambda)^2}{(\sum\lambda)^2+\sum\varepsilon} = \frac{79.92}{79.92+3.88}$ = 0.95

The above result indicates that the Fornell and Larcker's (1981) index of construct reliability is 0.95 while the overall Cronbach's (1951) alpha value is 0.97, suggesting very good construct reliability and internal consistency reliability respectively for the scale. This is consistent with previous research (e. g. Pallant, 2013; MacKenzie, Podsakoff, & Podsakoff, 2011; DeVellis, 1991; Fornell & Larcker, 1981; Nunnally, 1978; Cronbach, 1951) which suggests that the minimum level of internal consistency reliability coefficient (α) and construct reliability coefficient that should be considered acceptable for a scale should be greater than 0.70.

Because the study assumes that each indicator (or item) is associated with only one factor that constitutes the HPWS for safety, MacKenzie and colleagues (2011) recommend that the construct reliability of each indicator (item) should be assessed by examining the squared multiple correlation for the indicator (or item). Table 3.11 indicates that each of the indicators had a squared multiple correlation value (i.e. ranging from 0.51 to 0.83) greater than 0.50 (Fornell & Larcker, 1981), suggesting that the majority of the variances in the indicators are due to the latent construct (i.e. HPWS for safety).Furthermore, and as shown in Table 3.11, an examination of the inter-item correlation matrix indicates that all of the items were positively correlated, meaning that the items are measuring the same underlying characteristics.

Table 3.11: The High Performance Work System for Safety Scale and inter-item correlations

Serial Number	Items
1	This company provides safety-related training programmes for all employees
2	This company invests considerable amount of time and money in safety-related training
3	This company provides regular safety-related training programmes for its employees
4	Safety-related issues are well emphasized during the apprenticeship (or induction) programmes for new employees
5	There is fairness and equity in the distribution of rewards contingent on safe performance in this company
6	The management recognizes the safety-related efforts by individual employees in the company by issuing outstanding employees letters of commendation, among others
7	This company gives priority to safety-related experience of internal candidates in terms of job openings
8	Safety-related efforts enhance employees' opportunity for upward movement in this company
9	Employees who have acquired safety-related skills have clear career paths in this company
10	Employees in this company are represented in meetings when issues, including safety-related matters, affecting them are discussed before they are implemented
11	This company acts upon the suggestions provided by employees (e.g. through suggestion boxes)
12	In this company, supervisors set performance objectives or goals (including safety goals) with their subordinates
13	Performance appraisals provide employees feedback on their understanding of safety issues
14	Immediate superior officers appraise their subordinates on their safety performance
15	Teams are held responsible for the safety performance of their members
16	Teams are encouraged to make suggestions regarding improvements in safety-related practices
17	This company shares safety-related information with employees
18	This company shares information regarding new developments in safety practices with employees
19	Job descriptions are clearly defined in line with safety rules and procedures
20	Jobs are clearly designed to highlight safety requirements
21	This company carries out a safety audit of its plant and facilities on a regular basis
22	This company carries out a safety audit of the plants and facilities provided by contractors
23	This company acts on issues raised as a result of the safety audit
24	This company gives priority to periodic safety campaigns
25	Employees are encouraged to discuss safety-related issues during the safety awareness week
26	Safety briefings are provided during the safety awareness campaigns
27	This company provides adequate safety equipment in strategic or appropriate locations on its premises
28	This company ensures that its safety equipment are regularly maintained
29	Safety equipment are inspected on a regular basis

Note: Cronbach Coefficient alpha (α) for the whole scale = 0.97. r refers to corrected item-total correlations, defined as the correlation between one item and other items in the scale (Pallant, 2013; Hayes, 1994); Average Squared Multiple Correlation = 0.70 > 0.50

The descriptive statistics and inter-correlations among the eleven (11) domains comprising the HPWS for safety scale are displayed in Table 3.12.

Table 3.12: Means, Standard Deviations, Reliability Estimates, and Inter-correlations between the Measures of the Eleven (11) Subscales of the High Performance Work System for Safety Scale (HPWSSS)

	Variables	**M**	**SD**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1	Safety Training	4.07	0.95	(0.88)										
2	Safety Rewards	3.62	1.18	0.60	(0.85)									
3	Internal Opportunity for Promotion	3.68	1.02	0.53	0.63	(0.82)								
4	Safety Involvement and Participation	3.98	1.00	0.61	0.62	0.63	(0.73)							
5	Performance Appraisals	3.75	1.01	0.62	0.64	0.64	0.64	(0.84)						
6	Self-Managed Team	3.92	1.01	0.56	0.57	0.63	0.63	0.65	(0.82)					
7	Safety Information Sharing	4.04	1.02	0.71	0.58	0.64	0.64	0.68	0.70	(0.88)				
8	Clear Job Descriptions	4.24	0.92	0.68	0.60	0.56	0.62	0.65	0.71	0.75	(0.81)			
9	Safety Audit	3.97	1.07	0.65	0.59	0.60	0.66	0.60	0.62	0.70	0.66	(0.91)		
10	Safety Campaign	4.08	1.08	0.63	0.52	0.55	0.58	0.55	0.59	0.71	0.62	0.73	(0.92)	
11	Safety Equipment Maintenance	4.15	0.97	0.64	0.52	0.53	0.60	0.55	0.60	0.68	0.64	0.77	0.73	(0.90)

Note: All correlation coefficient values are significant at $p < 0.01$ (2-tailed). Subscales reliability estimates (α) are presented in parentheses on the diagonal, N = 303; Cronbach alpha of the whole scale is 0.97

3.7.3. Discussion

Study 2 of this thesis aimed to achieve three main objectives. First, to examine the factor structure of the 41 items that constituted the HPWS for safety scale. Second, to assess the factor structure of the eleven dimensions that comprised the HPWS for safety scale. Third, to examine the content validity of the scale in terms of reliability coefficients (Cronbach, 1951) and construct reliability (Fornell & Larcker, 1981).

Results of the EFA indicated three components demonstrating seven domains loading strongly on Component 1; three domains loading strongly on Component 2, and one domain loading strongly on Component 3. The three components are consistent with the AMO framework, with human resource management items (domains: safety rewards, internal opportunity for promotion, safety involvement and participation, performance appraisals, self-managed team, safety information sharing, and clear job descriptions) loading strongly on Component 1 (Motivation), organization management items (domains: safety audit, safety campaign, and safety equipment maintenance) loading strongly on Component 2 (Opportunity), and skills items (domain: safety training) loading strongly on Component 3 (Ability).

The findings reveal that the eleven HPWS for safety domains: safety training, safety rewards, internal opportunity for promotion, safety involvement and participation, performance appraisals, self-managed team, safety information sharing, clear job descriptions, safety audit, safety campaign, and safety equipment maintenance reflect a single underlying construct- the HPWS for safety. This is consistent with the result presented in Table 3.12 where the dimensions or practices are found to be highly intercorrelated, suggesting that a configuration (Delery & Doty, 1996)) or bundle (Pil & MacDuffie, 1996; MacDuffie, 1995) of practices are synergistically used together. In the next section, I described the evaluation of the new scale.

3.8. Study 3: Evaluation of the New Scale

The next step is to assess the construct validation of the new scale in terms of convergent validity, discriminant validity, and criterion-related validity. Hinkin (1998) and Nunnally (1978) describe convergent validity as the extent to which a construct relates to other measures of similar construct while discriminant validity is defined as the extent to which a construct has low or null relationships with dissimilar measures. According to them, criterion-related validity refers to the relationship that exists between a particular measure (in this case HPWS for safety scale) and another theoretically independent measure of related constructs.

3.8.1. Convergent, Discriminant, and Criterion-Related Validity Assessment

The aim of Study 3 was to examine the convergent, discriminant, as well as the criterion-related validity of the newly developed HPWS for safety scale. Specifically, Study 3 aimed to examine: (i) the extent to which HPWS for safety scale is related to othermeasures designed to assess similar constructs; (ii) the extent to which HPWS for safety scale is related to measures designed to capture theoretically dissimilar constructs; and (iii) the extent to which there is a nomological network of relationships between HPWS for safety scale and other theoretically independent measures with which it was expected to correlate.

3.8.1.1. Convergent Validity Assessment

In order to adequately capture or establish the convergent validity of the new HPWS for safety scale, this study relied considerably on the theoretical relationships between the newly developed HPWS for safety, (i) Zacharatos and colleagues' (2005) HPWS scale, and (ii) safety-specific transformational leadership scale (Barling, Loughlin, & Kelloway, 2002).

3.8.1.1.1. HPWS for safety scale and HPWS scale (Zacharatos & colleagues, 2005)

HPWS scale (Zacharatos & colleagues, 2005) consists of ten HRM domains including employment security, selective hiring, training, team and decentralized decision-making, reduced status distinctions, information sharing, contingent compensation, transformational leadership, job quality, and measurement. These ten domains of HPWS configuration were designed to enhance employees' safety performance. In other words, the extent to which organizations adopted these HRM practices determines the extent to which they experience greater workplace safety measured in terms of fewer lost time injuries (Zacharatos & colleagues, 2005).

The new HPWS for safety scale consists of eleven dimensions including: safety training, safety rewards, internal opportunity for promotion, safety involvement and participation, performance appraisals, self-managed team, safety information sharing, clear job descriptions, safety audit, safety campaign, and safety equipment maintenance. The new HPWS for safety was predicated on the assumption that employees' safety work attitudes and safety behaviours, and consequently, safety outcomes are fostered by a system of HRM practices that provide employees with the ability to perform safely, motivation to perform safely, and the opportunity to perform safely (AMO). While the two scales are similar in terms of synergistically constituting a configuration or a bundle of HRM practices, they, however, differ in the sense that Zacharatos and colleagues' (2005) HPWS scale was not safety-specific as opposed to the present scale (HPWS for safety scale) under consideration.

Zacharatos (2001) contends that it is more likely that a measure of non-safety-specific management practices would be highly correlated with its safety-specific translation or counterpart. This is consistent with previous studies (e.g. Department of Workplace Relations and Small Business, 1997) which reported the provision of general training to significantly relate to the provision of occupational health and safety training. Thus, this study proposes that both scales (i.e. HPWS for safety scale & HPWS) do converge on the basis that they have a positive impact on employee safety behaviours and safety outcomes.

Hypothesis A1: The new HPWS for safety scale positively relates to Zacharatos and colleagues' (2005) HPWS measure.

3.8.1.1.2. HPWS for safety scale and Safety-Specific Transformational Leadership Scale

Research (e.g. Conchie & Donald, 2009) indicates that supervisor's actions influence subordinates' safety behaviours. For example, it has been shown that subordinates' engagement in safety behaviours is enhanced when supervisors who are committed to safety (i.e. safety-specific transformational leaders) encourage them to be involved, for example, in safety-related activities (Hofmann & Mongeson, 1999; Mearns, Flin, Gordon, & Fleming, 1998). Thus, research evidence indicates that safety-specific transformational leadership makes an incremental contribution to the prediction of safety outcomes above the general transformational leadership style (Mullen & Kelloway, 2006). Barling and colleagues (2002) investigated the effects of safety-specific transformational leadership (using their safety-specific transformational leadership scale) on young workers' perceptions of safety climate, safety-related events, and occupational injuries. They found that respondents whose supervisors utilized safety-specific transformational leadership exhibited more positive perceptions of safety climate and consequently, engaged less in unsafe behaviours.

As earlier indicated, HPWS for safety is built on the assumption that employees' work safety attitudes, safety behaviours and safety outcomes are enhanced by a system of HRM practices that provides employees with the ability to perform safely, motivation to perform safely, and the opportunity to perform safely (AMO). Thus, because employee behaviours that underpin Barling and colleagues' (2002) study (i.e. safety-related behaviours) and those of the present study (i.e. safety behaviours) may be said to be conceptually similar, it was expected that the new scale (HPWS for safety scale) would be positively related to safety-specific transformational leadership scale.

Hypothesis A2: The new HPWS for safety scale positively relates to Barling and colleagues' (2002) safety-specific transformational leadership scale.

3.8.1.2. Discriminant Validity Assessment

To establish the discriminant validity of the new scale, I examined the degree to which the present construct (i.e. HPWS for safety) is dissimilar to (or diverges from) another construct that it theoretically should not be similar to. To test the discriminant validity of the new HPWS for safety scale therefore, this study used a measure of social desirability (Stöber, 2001).

3.8.1.2.1. HPWS for safety scale and Social Desirability Scale (SDS-17)

Social desirability describes the tendency to make biased, distorted, and overly positive descriptions that portray oneself in a manner that can make exaggerated and favourable impressions on others (Paulhus, 2002). Individuals who present themselves in a socially desirable manner attempt to appear excessively morally good by denying undesirable but frequent behaviours or characters and exaggerating desirable but infrequent traits (Stöber, 2001).

Social desirability scale is a standard measure used to control whether responses to a questionnaire are biased by desirable responding (Stöber, 2001). According to Stöber (2001), this is done by showing that the questionnaire(s) under consideration do not correlate with social desirability measures or that a correlation exists but the correlation is not significant.

The new HPWS for safety was designed in order to enhance employees' work safety behaviours and safety outcomes by providing them with the ability to perform safely, motivation to perform safely, and the opportunity to perform safely (AMO). Thus, it was expected that the new HPWS for safety scale will be either unrelated to or exhibit non-significant relationship with Stöber's (2001) social desirability scale (SDS-17).

Hypothesis A3: There is no significant relationship between the new HPWS for safety scale and social desirability scale

3.8.1.3. Criterion-Related Validity Assessment

In addition to establishing the convergent and discriminant validity of the new scale, the study also determined the extent to which the new measure explains criterion variance(s) with other measures (Kinicki & colleagues, 2013) which are thought to be theoretically independent. Thus, in order to capture criterion-related validity, I investigated the relationships between the new HPWS for safety scale, safety compliance scale, safety participation scale, safety initiative scale, and organization-based self-esteem scale from multiple perspectives: the unit (supervisory employees level) and employee (frontline employees level) perspectives. These variables were selected because they were clearly within a nomological network of the new HPWS for safety.

3.8.1.3.1. HPWS for safety scale and Safety Compliance Scale, Safety Participation Scale, Safety Initiative Scale, and Organization-Based Self-Esteem Scale

Griffin and Neal (2000) refer to safety compliance and safety participation as components of safety performance. Safety compliance reflects major safety activities that individual employees are expected to carry out in order to maintain workplace safety. These safety activities include an adherence to rules and procedures such as wearing the prescribed personal protective equipment (Griffin & Neal, 2000). Safety participation, on the other hand, involves the act of assisting co-workers, promoting the safety programme within the workplace, demonstrating initiative, and making efforts to improve safety in the workplace (Neal & colleagues, 2000). Similarly, safety initiative describes employee behaviours that go beyond simply working within safety standards, but acts proactively to improve safety activities in the workplace (Kark & colleagues, 2015; Zacharatos, 2001). An employee is said to have exhibited safety initiative behaviour when, for example, he initiates steps that help to improve work procedures or often tries out new approaches that help to improve workplace safety (Kark & colleagues, 2015). Safety compliance, safety participation, and safety initiative together constitute safety behaviours in the current study.

Researchers have directed efforts to determine the factors that can enhance employee safety behaviours (e.g. Katz-Navon, Naveh, & Stern, 2005). It has been argued that organizational factors act as distal antecedents that cause variability in employee behaviours and performance (Griffin & Neal, 2000). For example, leadership has been found to enhance safety in organizations (e.g. Clarke, 2013; Inness, Turner, Barling, & Stride, 2010; Christian & colleagues, 2009). However, Zohar (2002) suggests that having done behavioural safety research for more than 20 years, the time has come to attempt better integrations with other domains of management research. The current study argues that HPWS for safety constitutes an essential domain of management research. This study therefore posits that since the new scale (i.e. HPWS for safety scale) was built on the premise that it enhances safety-related behaviours and outcomes, and safety compliance, safety participation, and safety initiative represent employee safety behaviours, there should exist positive relationship between the new scale (HPWS for safety scale) and safety compliance scale, safety participation scale, and safety initiative scale.

Organization-based self-esteem (OBSE) describes the self-perceived value that an individual employee has of himself or herself as a member of the organization. It represents the extent to which an employee believes he or she is an important, meaningful, valuable, worthwhile, and effective member of the organization (Pierce, Gardner, Cummings, & Dunham, 1989). According to Pierce and colleagues (1989), the experience an employee gains within an organization shapes his or her OBSE, and this, in turn, influences his or her organization-related behaviours and attitudes. For example, if an organization believes its members or employees are valuable and treats them as such by, for example, allowing them to participate actively in making safety-related decisions that concern them, this is likely to enhance their OBSE. Research has found participatory management, co-worker support, organizational tenure (Lee, 2003), job complexity, and organizational structure (Lee, 2003; Tan, Wei, & Kong, 1997) to be antecedents of OBSE. In addition, while HPWS for safety is a distal antecedent of organization-based behaviours (specifically safety behaviours), OBSE is a proximal antecedents of organization-based behaviours. Thus, both of them are designed to shape employee behaviours. This study therefore, argues that since both HPWS for safety and OBSE are designed to shape employee workplace-related behaviours (or organization-based behaviours), it is expected that the new HPWS for safety scale would be positively related to the OBSE scale. Following the foregoing discussions, the research posits as follows:

Hypothesis A4: The new HPWS for safety scale will relate positively to employees' safety compliance scale, safety participation scale, safety initiative scale, and organization-based self-esteem scale

3.8.2. Method

3.8.2.1. Sample and Procedure

Two categories of healthcare workers (supervisors and frontline employees) randomly drawn from general hospitals in the Niger State of Nigeria responded to the questionnaires. The samples were selected from hospitals because they (hospitals) are safety-sensitive and therefore considered a comparable ground for testing the construct validity of the newly developed HPWS for safety scale. I distributed questionnaires to a sample of one hundred (100) supervisory employees and two hundred (200) frontline employees.

Ninety-one (representing 91%) questionnaires out of the 100 questionnaires given to the supervisory employees were returned and 90 (representing 90%) of them were usable for the purpose of the analysis. Similarly, 182 (representing 91%) of the 200 questionnaires given to the frontline employees were returned and 178 (representing 89%) were usable for the purpose of the research analysis. Because the t-test conducted earlier in Study 2 indicated that there was no significant difference in mean scores for supervisory and frontline employees, I combined the responses of both the frontline and supervisory employees for the purpose of this analysis. Therefore, a total of 268 (representing 89.33%) usable questionnaires were utilized for this purpose (See Table 3.13).

Table 3.13: Demographic Characteristics of Sample Responses in Study 3

VARIABLES	NUMBER OF RESPONSE	PERCENTAGE RESPONSES
SEX		
Male	104	38.8
Female	164	61.2
AGE		
20 – 30 Years	51	19.03
31 – 40 Years	72	26.87
41 – 50 Years	106	39.55
51 – 60 Years	39	14.55
EMPLOYMENT STATUS		
Full-Time	250	93.28
Part-Time	13	4.85
Contract	5	1.87
JOB TYPE		
Doctors	5	1.87
Pharmacists/Pharmacy Technicians	27	10.07
Midwife/Nurses	166	61.94
Lab Technologists/Technicians	31	11.57
Others (Health Information Officers, Medical Scientist/Community Health Workers, etc.)	39	14.55
QUALIFICATIONS		
Below First Degree	91	33.96
First Degree or Equivalence	161	60.07
Postgraduate Degree	16	5.97
JOB TENURE		
Below 3 Years	41	15.30
3 – 6 Years	41	15.30
7 – 10 Years	36	13.43
Over 10 Years	150	55.97

3.8.2.2. Measures

3.8.2.2.1. HPWS for safety scale

The 29-item scale initially validated in Study 2 was used to measure this construct. The scale comprises eleven HPWS for safety practices: safety training (4 items), safety rewards (2 items), internal opportunity for promotion (2 items), safety involvement and participation (3 items), performance appraisals (3 items), self-managed team (2 items), safety information sharing (2 items), clear job descriptions (2 items), safety audit (3 items), safety campaign (3 items), and safety equipment maintenance (3 items). An example of the items is “This hospital gives priority to safety-related experience of internal candidates in terms of job openings”. Response options ranged from (1) = strongly disagree to (5) = strongly agree.

As in Study 2, an additive approach was used to create a unitary index. Table 3.14 presents the descriptive statistics, intercorrelations, reliability estimates, and factor loadings of the 11 practices.

Table 3.14 : Descriptive Statistics, Intercorrelation Coefficients, and Factor Loadings for the 11 Domains of HPWS for Safety in Study 3

	Variables	M	SD	1	2	3	4	5	6	7	8	9	10	11	Factor Loadings
1	Safety Training	3.55	.93												.74
2	Safety Rewards	3.37	1.08	.67**											.74
3	Internal Opportunity for Promotion	3.74	.85	.56**	.63**										.77
4	Safety Involvement and Participation	3.74	.92	.61**	.66**	.66**									.79
5	Performance Appraisals	3.74	.90	.56**	.48**	.59**	.65**								.84
6	Self-Managed Team	3.72	.96	.52**	.49**	.52**	.62**	.70**							.79
7	Safety Information Sharing	3.96	.83	.42**	.40**	.46**	.50**	.63**	.66**						.74
8	Safety Audit	3.64	.93	.52**	.54**	.57**	.55**	.66**	.60**	.60**					.82
9	Safety Campaign	3.84	.88	.55**	.51**	.58**	.56**	.66**	.57**	.56**	.68**				.81
10	Safety Equipment Maintenance	3.92	.90	.48**	.48**	.50**	.50**	.56**	.48**	.44**	.61**	.56**			.72
11	Clear Job Description	3.95	.73	.42**	.44**	.52**	.44**	.65**	.54**	.61**	.63**	.61**	.52**		.75

****p < 0.01, Cronbach's alpha of the whole scale is 0.95**

The CFA was conducted using Mplus software Version 7.3 (Muthén & Muthén, 1998-2014). The result supports the summed scale scores of the 11 domains. In other words, the conceptualized one-factor model was a significantly better fit to the data than the null model, $\Delta\chi^2$ (Δdf = 11, N = 268) = 1718.88, P < 0.001 (Zacharatos & colleagues, 2005; Bagozzi & Yi, 1988). The factor loadings were all significant and ranged from 0.72 to 0.84. Although RMSEA demonstrates a poor fit (Dilalla, 2000; Browne & Cudeck, 1993), The SRMR, CFI, and TLI demonstrate acceptable fits (χ^2 = 218.33, df = 44; RMSEA = 0.12; SRMR = 0.05; CFI = 0.91; TLI = 0.88) (Browne & Cudeck, 1993; Browne & Mels, 1990; Bentler, 1990; Steiger, 1989). Bentler (1990) comments that these values should not be written in stone. Accordingly, the 11 domains were combined to form a single scale reflecting a HPWS for safety for next use. The scale's reliability alpha (α) was 0.95.

3.8.2.2.2. HPWS Scale

An abridged 20-item scale consisting of statements about HRM practices was adapted from the 51-item HPWS scale reported by Zacharatos and Colleagues (2005). Some of the items were adapted to suit the purpose of the present research. For example, item number 2 of job quality: "I have lots of opportunity to decide how to do my work" was revised to read: "Employees of this hospital are given lots of opportunity to decide how to do their work". The items were rated using a five-point Likert-type scale ranging from (1) = 'strongly disagree' to (5) = 'strongly agree.' The scale's alpha reliability was 0.93.

3.8.2.2.3. Safety-Specific Transformational Leadership Scale

Safety-specific transformational leadership was measured using a 10-item scale reported by Barling and colleagues (2002) but adapted from Bass and Avolio's (1990) Multifactor Leadership Questionnaire (MLQ). The scale measures the four components of transformational leadership including idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration. Response options ranged from (1) "not at all" to (5) "frequently or always." An example item is "My supervisor expresses satisfaction when I perform my job safely." The scale's alpha reliability in this study was 0.91.

3.8.2.2.4. Social Desirability Scale

A 17-item scale (SDS-17) developed by Stöber (2001) was used to measure social desirability. Stöber (1999) constructed SDS-17 as a new and alternative scale to the Marlowe-Crowne's social desirability scale (Crowne & Marlowe, 1960). Response options ranged from (0) = "No" to (1) = "Yes." An example item is "I always admit my mistakes openly and face the potential negative consequences." The current study reported an alpha reliabilityof 0.50.

3.8.2.2.5. Safety Compliance

A 4-item scale by Neal and colleagues (2000) was used to measure safety compliance. Response options ranged from (1) = 'strongly disagree' to (5) = 'strongly agree.' An example of the statements is "I carry out my work in a safe manner." The scale's alpha reliability was 0.82.

3.8.2.2.6. Safety Participation

I used a 4-item scale by Neal and colleagues (2000) to measure safety participation. Responses ranged from (1) = 'strongly disagree' to (5) = 'strongly agree.' An example item is "I promote the safety programme within the organization''. The scale's alpha reliability was 0.81.

3.8.2.2.7. Safety Initiative

I used an 8-item scale adopted from Turner and Parker (2004) to measure safety initiative. Response options ranged from (1) = 'strongly disagree' to (5) = 'strongly agree.' Sample items are: "if I think it will make work safer, I initiate steps to improve work procedures" and "I often try to solve problems in ways that reduce risk". The scale's alpha reliability was 0.85.

3.8.2.2.8. OBSE

OBSE was measured with a 10-item scale validated by Pierce and colleagues (1989). Response options ranged from (1) = 'strongly disagree' to (5) = 'strongly agree.' Sample items are: "I am taken seriously in my workplace" and "there is faith in me in my workplace." The scale's alpha reliability in this study was0.91.

3.8.2.3. Data Analysis

To assess the convergent, discriminant, and criterion-related validity of the new scale (i.e. HPWS for safety scale), I used IBM SPSS version 21 to conduct Pearson product-moment correlation coefficient. I also used Cohen's (1988) guideline to interpret the values in order to judge the magnitude of the strength of the correlations obtained. The next section presents the results of these analyses.

3.8.2.4. Results

3.8.2.4.1. Result of Pearson product-moment correlation coefficient of HPWS for Safety Scale

Table 3.15 indicates that using Cohen's (1988) guideline or criteria in the interpretation of small ($r = .10$ to $.29$), medium ($r = .30$ to $.49$), and large ($r = .50$ to 1.0) values to judge the magnitude of the strength of the correlations (or relationships), a strong and positive correlation was found between the new scale (i.e. HPWS for safety scale) and Zacharatos and colleagues' (2005) HPWS scale ($r = 0.72$, $n = 268$, $p < 0.01$). This finding provides supports for Hypothesis A1 and the convergent validity of the new scale.

A strong and positive correlation was also found between the new scale and Barling and colleagues' (2002) safety-specific transformational leadership scale ($r = 0.52$, $n = 268$, $p < 0.01$), suggesting support for Hypothesis A2 as well the convergent validity of the new scale. The findings further revealed moderate and positive correlations between the new scale and safety compliance scale ($r = 0.47$, $n = 268$, $p < 0.01$), safety participation scale ($r = 0.47$, $n = 268$, $p < 0.01$), safety initiative scale ($r = 0.44$, $n = 268$, $p < 0.01$), and a small but positive correlation between the new scale and the OBSE ($r = 0.25$, $n = 268$, $p < 0.01$). Thus, these findings provide support for Hypothesis A4 that HPWS for safety scale would relate positively to employees' safety compliance scale, safety participation scale, safety initiative scale, and OBSE scale. The findings also confirm the criterion-related validity of the new scale. However, a non-significant but positive correlation was found between the new scale and Stöber's (1999) social desirability scale ($r = 0.05$, $n = 268$), indicating support for Hypothesis A3 that states that there is no significant relationship between the new HPWS for safety scale and social desirability scale. This finding also supports the discriminant validity of the new scale.

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Table 3.15: Means, Standard Deviations, and Pearson product moment correlation coefficients of HPWS for Safety and other Measures for Study 3

Serial Number	Scale	M	SD	1	2	3	4	5	6	7	8
1	High Performance Work System for Safety Scale	3.73	0.70	(.95)							
2	High Performance Work System Scale	3.60	0.72	0.72**	(.93)						
3	Safety-Specific Transformational Leadership Scale	3.92	0.77	0.52**	0.68	(.91)					
4	Social Desirability Scale	0.59	0.11	0.05	0.07	0.12	(.50)				
5	Safety Compliance Scale	4.38	0.61	0.47**	0.35	0.33	-.05	(.82)			
6	Safety Participation Scale	4.27	0.67	0.47**	0.45	0.48	0.00	0.66	(.81)		
7	Safety Initiative Scale	4.14	0.57	0.44**	0.41	0.47	0.05	0.64	0.71	(.85)	
8	Organization-Based Self-Esteem Scale	4.53	0.49	0.25**	0.30	0.26	-.03	0.47	0.49	0.44	(.91)

**** $p < 0.01$ level (2-tailed); Cronbach' coefficient alphas (α) are in parentheses; N = 268**

3.8.2.4.2. Result of Shared Variances of HPWS for Safety Scale with other Scales

The results in Table 3.15 show that the new scale demonstrated shared variances with HPWS scale (51.8%), safety-specific transformational leadership scale (27%), safety compliance scale (22.1%), safety participation scale (22.1%), safety initiative scale (19.4%), and OBSE scale (6.3%). The results also demonstrate 0.25% shared variance between HPWS for safety scale and social desirability scale. The preceding results further provide support for convergent, discriminant, and criterion-related validities of the new scale

3.8.2.4.3. Result of Fisher's z-test

To find out if the new HPWS for safety scale is more strongly related to safety behaviour variables than the general HPWS measure, I compared the correlations between the abridged general HPWS measure (Zacharatos & colleagues, 2005) and these safety behaviour variables and the correlations between the new HPWS for safety and the safety behaviour variables using Fisher's Z test.

I compared the correlations between the new scale (HPWS for safety scale) and safety compliance ($r = 0.474$, $p < 0.01$) and the correlations between the abridged general HPWS measure and safety compliance ($r = 0.347$, $p < 0.01$). The result shows that, although the coefficients for the new scale (HPWS for safety) is higher than that of the general measure (HPWS: Zacharatos & colleagues, 2005), this difference is not statistically significant (z-obs = 1.80 < 1.96). Following the same procedure, I also compared the correlations between the HPWS for safety scale and safety participation ($r = 0.474$, $p < 0.01$) and the correlations between the abridged general HPWS measure and safety participation ($r = 0.446$, $p < 0.01$). The result also indicates that there is difference in the coefficients with the new scale slightly higher than the general measure but this difference is not significant (z-obs = 0.44 < 1.96). Furthermore, I followed the same procedure to compare the correlations between the new HPWS for safety scale and safety initiative ($r = 0.443$, $p < 0.01$) and the correlations between the abridged general HPWS measure (Zacharatos & colleagues, 2005) and safety initiative ($r = 0.413$, $p < 0.01$). The result indicates that the coefficient of the new scale is slightly higher than that of the general measure but this difference is not statistically significant (z-obs = 0.41 < 1.96).

3.8.2.4.4 Correlation of HPWS for Safety Scale with other Scales Should be Less than Perfect

To further assess the discriminant validity of the new scale, I examined whether the HPWS for safety scale is less than perfectly correlated with conceptually similar constructs (Anderson & Gerbing, 1988). Again, Fornell and Larcker (1981) suggest a method to assess the discriminant validity of two or more factors. In this case, a researcher compares the average variance explained (AVE) of the construct under investigation with the shared variance (i.e. square of the correlation) between it and other constructs. If the AVE for the construct is greater than its shared variance with any other construct, discriminant validity is supported (Farrel & Rudd, 2009). Following Fornell and Larcker (1981) and Farrel and Rudd (2009), this study examined whether the average variance explained (AVE) in the indicators by the underlying latent construct is greater than the squared correlation or shared variance between the latent construct (i.e. HPWS for safety scale) and similar (Fornell & Larcker, 1981) or any other (Farrel & Rudd, 2009) construct. Fornell and Larcker's (1981) formula was used to calculate AVE as follows:

AVE = $\frac{\sum \lambda^2}{\sum \lambda^2 + \sum \varepsilon}$

Where $\sum \lambda^2 = Sum\ of\ square\ of\ factor\ loadings, and$

$$\sum \varepsilon$$
$$= sum\ of\ residual\ variances\ of\ factor\ loadings\ .$$

$$\sum \lambda^2 = 0.84^2 + 0.82^2 + 0.81^2 + 0.79^2 + 0.79^2 + 0.77^2 + 0.75^2 + 0.74^2 + 0.74^2 + 0.74^2 + 0.72^2 = 6.63$$

$\sum \varepsilon$ = 0.57 + 0.48 + 0.48 + 0.66 + 0.47 + 0.50 + 0.49 + 0.46 + 0.41 + 0.36 + 0.35 = 5.23

AVE = $\frac{6.63}{6.63 + 5.23} = \frac{6.63}{11.86}$ = 0.56

Table 3.16 presents the comparison between the AVE of HPWS for Safety Scale and its shared variances with other constructs. The results indicate that (i) the HPWS for safety scale is less than perfectly correlated with Zacharatos and colleagues' (2005) HPWS scale (r = 0.72 < 1) and Barling and Colleagues' (2002) safety-specific transformational leadership scale (r = 0.52 < 1); (ii) the average variance explained (AVE) in the indicators by the underlying latent construct (i.e. HPWS for safety) is greater than the squared correlations or the shared variances between the latent construct (i.e. HPWS for safety scale) and similar (Fornell & Larcker, 1981) or any other (Farrel & Rudd, 2009) constructs. The HPWS (Zacharatos & colleagues, 2005) and safety-specific transformational leadership were theorized to be conceptually similar to the present construct whereas safety compliance, safety participation, safety initiative and organization-based self-esteem were theorized to be within the nomological network of the construct. The results therefore demonstrate support for the scale's discriminant validity.

Table 3.16: Comparison between the AVE of HPWS for Safety Scale and Its Shared Variances with other Constructs

		High Performance Work System for Safety Scale		
	Other Constructs	**Correlation Coefficient**	**Shared Variance (or Squared Correlation)**	**AVE**
1	HPWS Scale (Zacharatos & colleagues, 2005)	0.72	0.52	0.56
2	Safety-Specific Transformational Leadership	0.52	0.27	0.56
3	Safety Compliance	0.47	0.22	0.56
4	Safety Participation	0.47	0.22	0.56
5	Safety Initiative	0.44	0.19	0.56
6	Organization-Based Self-Esteem	0.25	0.06	0.56

3.8.3. Discussions

The main objective of Study 3 was to investigate the construct validity (i.e. the convergent validity, discriminant validity and criterion-related validity) of the new scale. The results revealed positive correlations between the new scale (i.e. HPWS for safety scale) and Zacharatos and colleagues' (2005) HPWS scale and between the new scale and Barling and colleagues' (2002) safety-specific transformational leadership scale, whereas a moderate and positive correlations were found between the new scale and safety compliance scale, safety participation scale, safety initiative, and a small but positive correlation between the new scale and the organization-based self-esteem scale was found. But a non-significant but positive correlation was found between the new scale and Stöber's (1999) social desirability scale. These findings are consistent with Cohen's (1988) guideline or criteria in the interpretation of small (r = .10 to .29), medium (r = .30 to .49), and large (r = .50 to 1.0) values to judge the magnitude of the strength of the correlations (or relationships). Therefore, the new scale was found to demonstrate convergent validity, discriminant validity, and criterion-related validity.

3.9. Conclusion

In this chapter, I described the procedures I followed to develop and validate the reported HPWS for safety scale. The initial pool of items and content domains for the new scale were deductively isolated from measures that had been used in previous HPWS research. I then conducted three studies to validate the newly developed scale. Study 1 focused on item development utilizing an inductive approach with a focus group. Study 2 used a sample of 303 randomly selected from oil and gas companies, the proposed population of the main study. Study 2 which focused principally on the scale development and construction, utilized the data obtained from supervisory employees and front-line employees (trainees) drawn from oil and gas companies and Petroleum Training Institute respectively in Nigeria to conduct an exploratory factor analysis (EFA) and reliability assessment of the new scale. In

Study 3, I used an independent sample of 268 randomly selected from hospitals in Niger state of Nigeria to validate the scale. The EFA results indicated the presence of three components representing the theorized AMO framework in terms of ability, motivation, and opportunity. The results again indicated the presence of one factor component that now constituted the HPWS for safety scale. The results supported the construct validity of the new scale. Furthermore, the results suggested that the HPWS for safety scale indicated an acceptable level of internal consistency and construct reliability, meaning that the new scale is reliable. In the next chapter, the methodology of the main study, the context of the study, and the analytic technique used to analyze the data are discussed.

4.0. CHAPTER 4: METHODOLOGY

4.1. Introduction

The focus of this study was to examine the intermediate mechanisms through which the use of HPWS for safety affects unit and individual level safety outcomes. To achieve this, data were collected from multiple sources including line managers (e.g. HR and, Health and Safety) and frontline employees from a number of oil and gas companies in Nigeria. This chapter describes the methodology used to test the hypotheses derived from the proposed model in Figure 2.1 (See chapter 2). First, I discuss the ethical issues core to this research (Study 4) and clearly acknowledge how these issues were handled. Second, I discussed the sample and the procedure for collecting data as well as the measures of the study variables. Finally, I explained the data analytic technique used to test the hypotheses postulated in the study.

4.2. Ethics-2

I drafted the research proposal to be used to conduct the Study 4 (i.e. Main Study) in accordance with the Aston University's ethical guidelines for research and this was subsequently approved by the Aston University Research and Ethics Committee. It should be noted, however, that the proposals for Studies 1, 2, 3, and 4 were approved at the same time. Once I received the ethical approval, I personally visited the corporate office of Nigeria National Petroleum Corporation (NNPC), the head office of Department of Petroleum Resources (DPR) as well as the Chief Executive Officers (CEOs) of the organizations of interest to solicit participation in the study. During these visits, I was advised to put in writing the request, the nature of study, and the extent of their participation. Following the outcome of these visits, a letter was written. In the letter, I clarified the ethical stance of the research and assured the organizations regarding the issues of informed consent, confidentiality, and anonymity of the information that would be collected from both management and individual employees. The letter also stated that the potential respondents' express consent was required before they participated in the study. As a follow-up of the letters, I visited the NNPC corporate head office in Abuja and the head office of DPR in Lagos. In response, both the DPR Director (HR) and the NNPC Group Managing Director (HR), through a letter (See Appendices C & D), directed all the zonal offices of DPR and nine (9) of the eleven (11) NNPC subsidiaries (See Table 4.1), respectively, to participate in the research. As soon as this intention to participate (i.e. the letters) in the research was received from the corporate head offices of the organizations, I arranged for personal visit to the organizations, during which an engaged relationship was established with the organizations by arranging for a meeting with either the chief executive officers (CEOs) or their representatives. The primary objective of this meeting was to re-emphasize the ethical stance of the research and to reassure the organizations regarding the issues of informed consent, confidentiality and anonymity procedures involved in this study, and for the CEO to introduce me to the Human Resource Managers and Health and Safety Managers who would, in turn, introduce me to the heads of the various Departments or Units. As I earlier noted, the issue of informed consent was my primary ethical concern. To consider this issue, I made the prospective participants to be aware of the purpose and nature of the study, the nature and extent of their participation, and the potential risk and benefits involved. I ensured that they understood the information they were given concerning their participation. To address the issue of confidentiality, I assured the participants that all information provided would be protected and that it would not be linked to them as individuals or as a group. The prospective participants were also informed as well that they could withdraw from the research process at any time if they so wished. However, they were advised that once they start filling the questionnaires after they have read this message, it would show their informed consent to participate.

It is worthy to note how the Nigerian context and expectations put ethical challenges in the path of the researcher. For example, several prospective participants usually raised the issue of obligations to research participants informally. In other words, they were concerned with what happens within the relationship between the researcher and the research participants at the conclusion of the study. My response was that individual participants in a study seldom receives direct benefits. However, I assured them that they would benefit in the form of training that would be organized by the researcher for the employees of the organizations on successful completion of the study. I gave the survey coordinators my personal contact details in case any of the participants needed to get in touch with me. The obtained data were stored in a secure folder and these would be destroyed after the dissemination of the research findings.

4.3. Sample and Procedure

Data were collected from seven (7) oil and gas companies comprising of six (6) Nigeria National Petroleum Corporation (NNPC) subsidiaries and the Department of Petroleum Resources (DPR) drawn from the oil and gas industry in Nigeria. The NNPC is the Nigeria's national oil company and it has over 9,000 employees. As a Federal Government agency, it has about 11 subsidiaries that serve as the commercial and business ventures as shown in Table 4.1

Table 4.1: NNPC Subsidiaries and Their Functions

	SUBSIDIARIES	OWNERSHIP AND CONTROL AND YEAR ESTABLISHED	FUNCTIONS
1	Duke Oil Company Incorporated	NNPC, Established in 1989 with office in London and Abuja	Engages in direct trading activities in sport market
2	Hyson (Nig.) Limited	Joint Venture between NNPC and Vitol S.A., a Swiss Company. Head office is in Lagos	It is responsible for marketing Nigeria's excess petroleum products in the West and Central African sub-region and elsewhere, and to import various petroleum products in collaboration with Calson Bermuda Ltd, a sister company
3	Integrated Data Services Limited (IDSL)	NNPC, Established in 1988. Head office is in Benin	To provide hydrocarbon exploration services in the local and international oil and gas industry
4	Kaduna Refinery and Petrochemical Company (KRPC)	NNPC, Lubes Plant established in 1983 while the petrochemical plant was commissioned in 1988	To refine crude oil into high value petroleum and petrochemical products and to manufacture packaging products
5	National Engineering and Technical Company Limited (NETCO)	Jointly established by NNPC and American Benchtel Incorporation in 1989, but now wholly owned by NNPC in 1997	To provide basic and detailed engineering services in procurement, construction supervision, project management, quality assessment and quality control, environmental consulting and training
6	Nigerian Gas Company Limited (NGC)	NNPC, established in 1988. Its head office is in Warri	To develop an efficient gas industry and to export natural gas and its derivatives to the West African sub-region
7	Nigeria Petroleum Development Company Limited (NPDC)	NNPE, established in 1988. Head office is in Benin	To carry out activities in petroleum exploration and production
8	National Petroleum Investment Management Services (NAPIMS)	NNPC. Located in Ikoyi, Lagos	An upstream arm of NNPC to oversee the Federation's investment in the Joint Venture Companies (JVCs), Production Sharing Companies (PSCs) and Services Contract Companies (SCs).
9	Port-Harcourt Refinery Company Limited (PHRC)	NNPC. Made up of two refineries: Old one commissioned in 1965 and the new one commissioned in 1988	To optimally process hydrocarbon into petroleum products
10	Pipeline and Products Marketing Company Limited (PPMC)	NNPC	Established as the strategic and business unit of NNPC. To ensure that there is security in the supply of petroleum products to domestic markets at low operating costs
11	Warri Refinery and Petrochemical Company Limited (WRPC)	NNPC. Incorporated in 1988 with a merger of the then Warri Refinery (commissioned in 1978) and the Ekpan Petrochemical Plants	To process crude oil into petroleum products and to manufacture and market petrochemical products.

The NNPC group health, safety and environment (HSE) policy statement provides that "NNPC is committed to conducting its activities in a manner that promotes the Health and

Safety of her Employees, Assets and the Public as well as the protection of the Environment" (Yakubu, 2012, p. 1). To this end, it continues, the NNPC shall:

1. Focus on HSE to safeguard our people and assets. Adopt Health, Safety and Environmental best practices in the design, construction and operations of her facilities;
2. Comply with National and applicable International standards and laws on Health, Safety and Environment in the conduct of her operations;
3. Demonstrate social and ethical responsibility by working together with all relevant stakeholders to promote harmonious HSE compliant relationships;
4. Engage and consult with employees and others on health, Safety and Environmental conditions and provide Occupational Health Services;
5. Maintain emergency response capability to minimize the impact of unfavourable negative incidents related to her operations;
6. Liaise closely with relevant government agencies in the formulation of Health, Safety and Environmental protection, legislations, regulations and policies that may significantly impact the Group business returns to shareholders;
7. Publicly report on her HSE performance;
8. Ensure all staff have the right and duty to intervene and stop any unsafe acts and conditions or when activities are not in compliance with HSE policy and commitment;

"As the Group General Director of the Corporation, I accept full responsibility for the implementation of the Group HSE Policy. I accept HSE-Management as key responsibility for all line managers and I will regularly review this Policy towards improved effectiveness and ensure these goals are achieved at all times" (Yakubu, 2012, p. 1).

This policy statement on HSE covers all the NNPC subsidiaries which have designed their own methods to achieve the NNPC HSE Policy Objectives which states that "NNPC shall be committed to continual improvement in her operations to eliminate personal and industrial accidents as we pursue the goal of no-harm to people and no-harm to environment in all our operations and facilities" (Yakubu, 2012, p. 1).

Although the DPR was initially established as a unit under the NNPC, both NNPC and DPR have since 1988 been operating separately under the Ministry of Petroleum Resources. DPR is charged with the responsibility to allocate oil blocks, collect royalties, enforce the sector's regulations about workplace health, safety, environment, gas flaring, and so on, as well as to carry out other technical oversight tasks (Gillies, 2009). In other words, its main responsibility is to oversee or supervise the activities of all the companies that are licensed to operate in the oil and gas industry, including the NNPC (Iledare & Suberu, 2010). Thus, according to Iledare and Suberu (2010), the duties of DPR are to process all the applications for licenses and leases in the industry, ensure that all the industry operators comply with the applicable national regulations and good oil producing practices. It is also expected to enforce health, safety, and environmental standards, keep and update records on petroleum industry operations, ensure timely and adequate payments of all rents and royalties to the government, promote and monitor progress towards the indigenization or enhancement of local content in the oil and gas industry, and provide appropriate technical advice on oil and gas issues to the government.

These seven companies (See Table 4.2) represent about ten per cent (10%) of the organizations in oil and gas industry in Nigeria. All the units of these companies were purposefully used for collecting data for the multilevel study. Within each unit, a range of sampling techniques was used, dependent on the data being collected. To ensure representativeness across the occupational levels, participants at the individual employee level were surveyed using cluster and stratified random sampling approach to selection (Jensen & colleagues, 2013). According to Sarantakos (1998), this method is useful when: (i) it is difficult or costly to develop a complete list of the population members, or the population elements are widely dispersed in terms of geographical locations; (ii) cluster criteria are important for the study. In order to select the clusters and the subjects from the clusters, a simple random sampling technique was adopted (See Sarantakos, 1998).

Table 4.2: Frequency Distribution of Responses According to Branches

Serial Number	Companies (Branches)	Number of Employees	Percentage (%)	Number of Units
1	Company One (A Branch: IDSL-PH)	9	1.58	3
2	Company Two: Branch One (PPMC-PH)	21	3.69	9
3	Company Two: Branch Two (PPMC-PH Depot)	14	2.46	5
4	Company Two: Branch Three (PPMC-Warri)	24	4.22	7
5	Company Two: Branch Four (PPMC-Warri Depot)	17	2.99	7
6	Company Two: Branch Five (PPMC-Kaduna)	23	4.04	9
7	Company Two: Branch Six (PPMC-Kaduna Depot)	19	3.34	5
8	Company Two: Branch Seven (PPMC-Minna Depot)	14	2.46	6
9	Company Two: Branch Eight (PPMC-Suleja Depot)	17	2.99	5
10	Company Three (Head Office: NGC-Warri)	15	3.34	6
11	Company Three: Branch One (NGC-PH)	19	2.64	7
12	Company Four (PHRC)	76	13.36	23
13	Company Five (WRPC)	112	19.68	29
14	Company Six (KRPC)	142	24.96	31
15	Company Seven: Branch One (DPR-PH)	21	3.69	8
16	Company Seven; Branch Two (DPR-Warri)	26	4.57	8
	Total	569	100	168

In stratified random sampling, the population to be surveyed is separated into mutually exclusive sets or strata, and within these defined strata, simple random selection of samples takes place (Chisnall, 1997). A stratified random sampling technique is more useful than simple random sampling when there is need to represent all strata of the target population in the sample and when the researcher has a special interest in certain strata (Sarantakos, 1998). This sampling technique was considered very appropriate because of the need to represent and reflect the various work areas and hierarchical positions in each unit such that those who perform a particular job, for example, administration, technical (e.g. drilling, refilling, processing) and, in particular, hierarchical positions were represented.

As earlier pointed out, access to participating organizations was through personal contacts. First, the researcher personally visited the corporate office of NNPC, the head office of DPR as well as the Chief Executive Officers (CEOs) of the organizations of interest to solicit participation in the study. During these visits, the researcher was advised to put in writing the request, the nature of study, and the extent of their participation. Following the outcome of these visits, a letter was written. In the letter, the researcher clarified the ethical stance of the research and assured the organizations regarding the use and confidentiality of the information that would be collected from both management and individual employees (See ethics 1 and ethics 2). The letter also stated that there would be need for the potential respondents to express their consent before they participate in the study. As a follow-up of the letters, the researcher again visited the NNPC corporate head office in Abuja and the head office of DPR in Lagos. In response, both the DPR Director (HR) and the NNPC Group Managing Director (HR), through a letter (See Appendices C & D), directed all the zonal offices of DPR and nine (9) of the eleven (11) NNPC subsidiaries (See Table 4.1), respectively, to participate in the research. As soon as this intention to participate (i.e. the letters) in the research was received from the corporate head offices of the organizations, the researcher arranged for personal visit to the organizations, during which I arranged for a meeting with either the chief executive officers (CEOs) or their representatives. The primary objective of this meeting was to re-emphasize the ethical stance of the research and to reassure the organizations regarding the use and confidentiality of the data that would be collected, and for the CEO to introduce the researcher to the Human Resource Managers and Health and Safety Managers who would, in turn, introduce the researcher to the heads of the various Departments or Units.

During the researcher's meeting with the HR managers of each of the participating organizations, similar discussions on the research ethics took place along with consideration of:

i. identifying the primary objectives of the survey and their role as both respondents and facilitators;

ii. the importance of soliciting their cooperation;

iii. Selection criteria of participants (employees and line managers);

iv. Timeline; and

v. The appointment and selection of survey coordinators.

The HR Manager in each organization appointed a survey coordinator who was the main contact person within the organization. Because of the complexity involved in data collection procedure, and to increase participation rate, the researcher, assisted by the coordinator in some cases, personally distributed the survey packages to each participating unit. Each survey package contained two separate questionnaires that were administered to the line managers and frontline employees. A cover letter that explained the objectives of the survey and reassured the respondents of the confidentiality of their responses and the voluntary nature of participating in the survey was attached (See Appendices G & H) to each questionnaire. Before the questionnaires were distributed to either the line managers or the frontline employees, a code was written at the top right hand corner of each questionnaire. This was done in order to ensure that there was a match between the line managers' provisions of information on issues relating to the units and those of their participating frontline employees. Only the researcher knew the code that was attached to each frontline employee's questionnaire and that of the corresponding line manager. The researcher provided an envelope for each questionnaire in which the respondents were requested to enclose the completed questionnaire and drop in a locked drop box that was provided and positioned in the HR manager's office. However, some participants gave their questionnaires directly to the researcher. Table 4.3 presents the sources of data obtained for the purpose of this study.

Table 4.3: Sources of data

SOURCE OF DATA	INFORMATION PROVIDED
Line Manager	Use of HPWS for Safety
Frontline Employees	Experienced HPWS for Safety
	Safety Knowledge
	Safety Motivation
	Safety Initiative
	Safety Compliance
	Safety-Specific Events
	Workplace Injuries
	Safety Climate
	Safety-Specific Transformational Leadership
	Bottom-Line Orientation

Of the 77 questionnaires distributed to the line managers, 64 responses (representing 83.12%) were obtained and found to be usable. These 64 line managers oversee 168 units (i.e. each manager in charge of about 3 units on average). Table 4.4 presents the demographic characteristics of the line managers.

Table 4.4: Demographic Characteristics of the Line Managers

VARIABLES	NUMBER OF RESPONSES	PERCENTAGE RESPONSES
SEX		
Male	58	90.62
Female	6	9.38
AGE		
Under 30 Years	0	0
30-39 Years	3	4.69
40-49 Years	2	3.13
50-60 Years	59	92.18
QUALIFICATION		
Below First Degree	0	0
First Degree or Equivalence	26	40.63
Postgraduate Degree	38	59.37
MANAGERIAL EXPERIENCE		
Under 3 Years	0	0
3-6 Years	0	0
7-10 Years	3	4.69
Over 10 Years	61	95.31
TENURE IN INDUSTRY		
Under 3 Years	0	0
3-6 Years	0	0
7-10 Years	0	0
Over 10 Years	64	100

Of the 696 questionnaires distributed to the frontline employees in 193 units, 569 (81.75%) responses were correctly linked to the corresponding line managers in 168 units (average unit size of 3.39). Table 4.5 presents the demographic variables of the front-line employees.

Table 4.5: Demographic Characteristics of the Front-Line Employees

VARIABLES	NUMBER OF RESPONSES	PERCENTAGE RESPONSES
SEX		
Male	478	84
Female	91	16
AGE		
Under 30 Years	44	7.7
30-39 Years	181	31.8
40-49 Years	206	36.2
50-60 Years	138	24.3
QUALIFICATION		
Below First Degree	114	20
First Degree or Equivalence	366	64.3
Postgraduate Degree	89	15.6
JOB TENUE		
Under 3 Years	62	10.9
3-6 Years	63	11.1
7-10 Years	108	19
Over 10 Years	336	59.1
TENUE IN INDUSTRY		
Under 3 Years	63	11.1
3-6 Years	54	9.5
7-10 Years	108	19
Over 10 Years	344	60.5
EMPLOYMENT STATUS		
Full-time	522	91.7
Part-time	5	0.9
Contract	42	7.4

It is important to note that the part-time employees represent the former employees of the companies who had retired from service but were given the opportunity to return as part-time workers because of the importance of their experiences. The contract workers, on the other hand, were those graduates that were employed by virtue of the agitations of the indigenes of the oil producing areas who protested, inter alia, that their children were denied employment in the oil and gas industry. This category of employees enjoys the same employment benefits as the full-time employees but they are so called (contract employees) because the companies claimed not to have been authorized to award permanent employment.

4.4. Measures

The questionnaires were administered in English as it is the official language of communication, business and commerce in Nigeria, and the respondents were deemed to be proficient in that language. In order to control for unreliability which previous research has identified (See Edgar & Geare, 2009; Boselie & colleagues, 2005; Bowen & Ostroff, 2004; West, Borill, Dawson, Scully, Carter, Aneley, Patterson, & Waring, 2002; Osterman, 1994), this current study collected data not only from two levels of analysis: unit and individual levels of analysis, but also from line managers and multiple employees within each unit (Takeuchi, Chen, & Lepak, 2009; Takeuchi & colleagues, 2007)

4.4.1. Measures of Unit-Level Variables

4.4.1.1. Use of High Performance Work Systems for Safety

The HPWS for safety scale reported in the previous chapter was used to measure HPWS for safety. This scale consists of 11 dimensions or practices with the number of items as follows: safety training (4 items), safety rewards (2 items), internal opportunity for promotion (3 items), safety involvement and participation (2 items), performance appraisals (3 items), self-managed team (2 items), safety information sharing (2 items), clear job descriptions (2 items), safety audit (3 items), safety campaign (3 items), and safety equipment maintenance (3 items) (See Appendix I). This 29-item instrument, which was validated in Study 1, Study 2, and Study 3 (See Chapter 3, Tables 3.7, 3.10, 3.14), was used to collect data on the unit's use of HPWS for safety and frontline employees' experiences of the use of HPWS for safety in this Study 4. However, because of the relatively low factor loadings of the two items that constitute the clear job description (DES) subscale, 27 items and 10 dimensions or domains were retained for study 4 data analyses.

This 27-item questionnaire requested the line managers to indicate the extent of their unit's implementation of each of the dimensions of HPWS for safety. Response options ranged from (1) = ‘strongly disagree’ to (5) = ‘strongly agree.’ Table 4.6 presents the descriptive statistics, internal consistency reliability estimates, intercorrelations of the 10 dimensions or practices, and the EFA results of the measure. As was demonstrated in Studies 2 and 3, EFA was conducted on the summed subscale scores of the 10 dimensions or practices of the focal measure in order to replicate the results obtained in Studies 2 and 3. As Table 4.6 indicates, the one-factor model obtained replicates the results obtained in Studies 2 and 3. All the factor loadings are significant, ranging from 0.65 to 0.84. The scale’s reliability alpha was 0.95.

4.4.1.2. Unit-Level Safety Climate

A 16-item Safety Climate Scale developed by Zohar and Luria (2005) was used to measure safety climate with response options ranging from (1) = ‘strongly disagree’ to (5) = ‘strongly agree.’ Sample items are ‘My supervisor makes sure we receive all the equipment needed to do the job safely’ and ‘My supervisor is strict about working safely when we are tired or stressed’ (See Appendix I). The internal reliability coefficient (i.e. $\propto$) of the scale was 0.96. However, as earlier stated, the data for the unit’s safety climate were collected at the individual-level but aggregated to the unit-level to capture the unit measures of safety climate. The aggregation statistics that justify treating safety climate as a unit-level construct has been provided in the construct aggregation section of this chapter.

Table 4.6: Descriptive Statistics, Reliability Estimates, Factor Loadings, and Intercorrelations between Measures of the Ten (10) Dimensions of the Use of HPWS for Safety (Study 4)

Variable	M	SD	1	2	3	4	5	6	7	8	9	10	Factor Loadings
Safety Training	4.42	0.70	(0.90)										0.65
Safety Rewards	3.94	0.71	0.55**	(0.72)									0.69
Internal Opportunity for Promotion	3.80	0.76	0.46**	0.73**	(0.80)								0.65
Safety Involvement and Participation	3.96	0.77	0.41**	0.47**	0.64**	(0.70)							0.73
Performance Appraisals	3.92	0.80	0.64**	0.56**	0.51**	0.66**	(0.83)						0.76
Self-Managed Team	4.09	0.65	0.40**	0.38**	0.40**	0.53**	0.66**	(0.68)					0.69
Safety Information Sharing	4.40	0.65	0.43**	0.53**	0.49**	0.45**	0.38**	0.54**	(0.90)				0.74
Safety Audit	4.25	0.69	0.42**	0.50**	0.41**	0.57**	0.58**	0.61**	0.71**	(0.85)			0.84
Safety Campaign	4.51	0.55	0.48**	0.39**	0.29**	0.41**	0.42**	0.44**	0.68**	0.79**	(0.88)		0.71
Safety Equipment Maintenance	4.29	0.61	0.52**	0.49**	0.42**	0.61**	0.57**	0.53**	0.60**	0.77**	0.69**	(0.83)	0.81

**** $p < 0.01$ (2 - tailed); Cronbach coefficient alphas are in parenthesis; N = 64; Alpha of the whole scale = 0.95**

4.4.1.3. Safety-Specific Transformational Leadership

I used the same scale reported in the previous chapter to measure this construct (See Appendix I). The internal reliability $\propto$ of the scale was .93. This individual-level variable was aggregated to the unit level and used as a control variable. The aggregation was justified and the details of this are provided in the construct aggregation section of this chapter.

4.4.1.4. Bottom-Line Orientation

A 4-item scale developed by Greenbaum, Mawritz, and Eissa (2012) was used to measure the organization's bottom-line orientation. Response options ranged from (1) = 'strongly disagree' to (5) = 'strongly agree.' Sample statements are: 'In my work unit, we are solely concerned with meeting the bottom-line' and 'Colleagues in my work unit care more about profits than employee well-being' (See Appendix I) The Cronbach's alpha reliability (α) was 0.85. Although the data for this variable were provided at the individual employee level, it was aggregated to the unit-level and used as control variable. The aggregation statistics that justified this aggregation has been provided in the construct aggregation section of this chapter.

4.4.2. Measures of Individual-level Variables

4.4.2.1. Experienced HPWS for Safety

A version of the 27-item scale used to measure use of HPWS for safety was used to measure respondents' experience of HPWS for safety. Response options ranged from (1) = 'strongly disagree' to (5) = 'strongly agree' (See Appendix I). Table 4.7 presents the descriptive statistics, internal consistency reliability estimates, and intercorrelation coefficients of the 10 dimensions or practices. EFA was also conducted on the summed subscale scores of the 10 dimensions or practices of the focal measure using the frontline employees’ data. As shown in Table 4.7, the one-factor model obtained replicates the results obtained in Study 2 and Study 3 in chapter 3. All the factor loadings are significant, and they ranged from 0.72 to 0.80. The scale’s alpha reliability was 0.92.

4.4.2.2. Safety Knowledge

A 4-item scale adopted from Neal and colleagues (2000) was used to assess the extent to which employees felt they had knowledge about the safety-related issues around their job. Response options ranged from (1) = ‘strongly disagree’ to (5) = ‘strongly agree.’ Sample items are ‘I know how to perform my job in a safe manner’ and ‘I know how to reduce the risks of accidents and incidents in the workplace’ (See Appendix I). The scale’s alpha reliability was 0.85.

4.4.2.3. Safety Motivation

A 4-item scale developed by Neal and colleagues (2000) was used to measure safety motivation. Response options ranged from (1) = ‘strongly disagree’ to (5) = ‘strongly agree.’ Sample items include ‘I believe that it is important to reduce the risk of accidents and incidents in the workplace’ and ‘I feel that it is important to maintain safety at all times’ (See Appendix I). The scale’s alpha reliability was 0.80.

Table 4.7: Descriptive Statistics, Reliability Estimates, Factor Loadings, and Intercorrelations between Measures of the Ten (10) Dimensions of Employee Experienced HPWS for Safety (Study 4)

Variable	M	SD	1	2	3	4	5	6	7	8	9	10	Factor Loadings
Safety Training	4.08	0.08	(0.87)										0.72
Safety Rewards	3.43	1.0	0.58**	(0.81)									0.77
Internal Opportunity for Promotion	3.56	0.88	0.53**	0.68**	(0.80)								0.78
Safety Involvement and Participation	3.69	0.78	0.47**	0.56**	0.59**	(0.60)							0.77
Performance Appraisals	3.74	0.84	0.48**	0.58**	0.60**	0.61**	(0.79)						0.80
Self-Managed Team	3.78	0.81	0.42**	0.52**	0.59**	0.61**	0.63	(0.70)					0.77
Safety Information Sharing	4.15	0.70	0.52**	0.48**	0.51**	0.55**	0.51**	0.57**	(0.76)				0.75
Safety Audit	3.94	0.76	0.49**	0.54**	0.52**	0.53**	0.58**	0.55**	0.49**	(0.80)			0.77
Safety Campaign	4.29	0.59	0.49**	0.44**	0.45**	0.48**	0.51**	0.48**	0.58**	0.61**	(.76)		0.73
Safety Equipment Maintenance	4.07	0.81	0.52**	0.49**	0.48**	0.50**	0.54**	0.46**	0.52**	0.57**	0.56**	(0.88)	0.74

**** All correlations are significant at the $p < 0.01$ (2-tailed); Cronbach's alpha coefficients are in parentheses. Alpha of the whole scale is 0.92**

4.4.2.4. Safety Compliance

A 4-item safety compliance scale by Neal and colleagues (2000) was used to measure safety compliance. Response options ranged from (1) = 'strongly disagree' to (5) = 'strongly agree.' Sample items include 'I carry out my work in a safe manner' and 'I ensure the highest levels of safety when I carry out my job' (See Appendix I). The alpha reliability coefficient (α) of the scale was 0.88.

4.4.2.5. Safety Initiative

An 8-item scale adopted from Turner and Parker (2000) was used to measure safety initiative. Response options ranged from (1) = 'strongly disagree' to (5) = 'strongly agree.' Sample items are 'I am involved in improving safety policy and practices' and 'I often make suggestions to improve how safety is handled around here.' (See Appendix I). The reliability coefficient alpha of the scale was 0.88.

4.4.2.6. Workplace Injuries

Drawing on Mearns, Whitaker, and Flin (2001), this study relied on employees' self-reported measure of workplace injuries. Thus, respondents were asked to indicate the frequency with which they have experienced a number of work-related incidents or injuries for which they required first aid over the past six months. Eight (8) of the thirteen (13) injury categories used were adopted from Zacharatos (2001). However, the researcher consulted safety experts in the oil and gas industry in Nigeria to confirm the eight (8) adopted injury categories and to generate four (4) additional injury categories. This was necessary in order to ensure that the scale is consistent with the commonly reported injuries in the oil and gas industry. The injury categories adopted from Zacharatos (2001) include: (i) Fractures, (ii) Dislocations, Sprains and Strains, (iii) Bruising and Crushing, (iv) Scratches abrasions (superficial wounds), (v) Cuts, laceration and punctures (Open wounds), (vi) Burns and Scalds, (vii) Eye injury, (viii)

Concussions and head injuries. The additional injury categories generated by the researcher include: (ix) Gassing, (x) Hernia, (xi) Different types of shocks, (xii) Multiple injuries, and (xiii) others (See Appendix I). Veazie, Landen, Bender, and Amandus (1994) argued for a maximum of six (6) months over which employees can recall and report with accuracy the injuries they sustained. The reliability coefficient alpha estimate was 0.93.

4.4.2.7. Safety-Related Events

Safety-related events were measured using an 8-item scale adapted from Barling and colleagues (2002) based on extensive consultation by the researcher with safety experts in Nigeria's oil and gas industry. Respondents were requested to indicate the frequency (i.e. from 1 = never to 5 = frequently) with which each of the safety events listed had occurred to them over the past one (1) year**.** Sample items are "I was exposed to some dangerous chemicals (e.g. hydro-sulphuric acid, hydro-fluoric acid, etc.)" and "I slipped on liquid substances (e.g. liquid gas) or other objects on the floor" (See Appendix I). The scale's reliability coefficient alpha was 0.85.

4.5. Control Variables

Because of the multilevel nature of this study, controls were used at both the unit and individual levels of analyses. At the unit-level, the study controlled for safety-specific transformational leadership and bottom-line orientation. These controls were necessary because of the potential relationships between the variables of interest (i.e. HPWS and safety climate) and safety-specific transformational leadership (Zacharatos & colleagues, 2005; Barling & colleagues, 2002) on one hand, and bottom-line orientation (Becker & Huselid, 1998) on the other. For example, prior studies (e.g. Barling & colleagues, 2002) found safety-specific transformational leadership to associate with safety climate. Because bottom-line has been linked to management practices (Tornow & Wiley, 1991) and HPWS (e.g. Becker & Huselid, 1998), this study assumes that there should be an association between bottom-line orientation and HPWS for safety. Consequently, this study controlled for safety-specific transformational leadership and bottom-line orientation at the unit level of analysis.

At the individual level of analysis, I controlled for employees' age, sex, level of education and tenure. The choice of these control variables was guided by previous studies (e.g. Jensen & colleagues, 2013; Lepak & colleagues, 2007; Takeuchi & colleagues, 2007; Datta, Guthrie, & Wright, 2005; Zacharatos & colleagues, 2005; Guest, 1999; Huselid, 1995; Fox, Dwyer, & Ganster, 1993). For example, Nishii and colleagues (2008) suggest that long-tenured employees are less likely to have positive view of the HR system than their short-tenured counterparts are. Previous work also demonstrates that the participants' age and gender (Liao & colleagues, 2009; Collins & Smith, 2006; Liao & Chuang, 2004; Guthrie, 2001) are associated with the adoption of high performance human resource practices. Research (e.g. Takeuchi & colleagues, 2007; Judge, Thoreson, Bono, & Patton, 2001; Mathieu & Zajac, 1990) further suggests that age and gender are related to job attitudes and behaviours.

4.6. Construct Aggregation

As previous noted, data on safety climate, safety-specific transformational leadership (control variable), and bottom-line orientation (control variable) were obtained at the individual level but aggregated to the unit-level. Consequently, there was a need to establish the statistical justification (Kozlowski & Klein, 2000) indicating that groups share common variances with regard to variables and that these variances can be used successfully to differentiate between groups.

Bliese (2000) recommends assessing reliability by means of either intraclass correlation coefficient 1 (ICC 1) or intraclass correlation coefficient 2 (ICC 2) or both as they constitute the two major forms of the intraclass correlation coefficient (James, 1982; Bartko, 1976). ICC

(1) takes into consideration individual-level ratings and provides an estimate of the extent to which individual-level variability on a given measure is explained by higher-level units (Kreft & DeLeeeuw, 1998; Bryk & Raudenbush, 1992). In contrast, ICC (2) provides an estimate of the reliability of the group means (James, 1982; Shrout & Fleiss, 1979; Bartko, 1976). Both ICC (1) and ICC (2) are closely related in the sense that they are a function of group size (Glick, 1985; Shrout & Fleiss, 1979). ICC (2) is usually estimated with the use of means squares from a one-way random-effect analysis of variance (ANOVA).

ICC (1) values for the variables were 0.19 (safety climate), 0.07 (safety-specific transformational leadership), and 0.47 (bottom-line orientation). The ICC (2) results for the same variables were 0.95 (safety climate), 0.41 (safety-specific transformational leadership), and 0.73 (bottom-line orientation). All the findings exceeded the values commonly considered as the lowest acceptable, 0.05 (ICC 1: Bliese, 2000) and 0.70 (ICC 2: Klein & Kozlowski, 2000) except the ICC (2) result of safety-specific transformational leadership (i.e. 0.41). Thus, these values justified the aggregation of these variables to the unit-level of analysis. Moreover, because the safety-specific transformational leadership was just used as a control variable, it was aggregated.

4.7. Data Analytic Technique

4.7.1. Structural Equation Modelling (SEM)

Researchers have predominantly focused on individual-level effects which biases the precision of findings (Gerdes, 2011; Geldof, 2010). Thus, it has been observed that the traditional statistical techniques such as analysis of variance (ANOVA), multivariate analysis of variance (MANOVA), and ordinary least squares (OLS) regression analysis may ignore organizational-level or unit-level influences on individual level outcomes (Mitchell, Lunt, & Shaw, 2010). All of these analytical techniques are only able to test individual-level relationships (i.e. micro studies) rather than testing the organizational-level or unit-level effects on individual-level outcomes (i.e. macro studies) (Shek & Lee, 2007). For example, traditionally, multilevel analysis using HLM has been able to test mediation models only when the outcome variable is at individual-level of analysis (Jensen& colleagues, 2013). It is essential to model variables as well as their effects and interactions at different levels of analysis (Geiser, 2013). This is because, in many studies, for example, variables at the unit-level as well as the variables at the individual level of analysis are important in predicting an outcome variable. To address these disadvantages, multilevel modelling (MLM) and structural equation modelling (SEM) techniques have been found to be very useful (Luke, 2004). MLM is capable of modelling, for example, unit-level effects (including effects from an aggregated higher level) on individual-level outcomes (Luke, 2004). However, MLM cannot deal with multiple mediators and outcomes simultaneously. SEM, on the other hand, can link a set of predictors to a number of outcomes in a structural way. Thus, SEM can model multiple predictors, mediators, and outcome variables simultaneously (Hoyle, 2011). However, SEM cannot model, for example, the organizational-level or unit-level effects on individual-level outcomes.

Preacher, Zyphur, and Zhang (2010) and Nezlek (2011) proposed the use of multilevel structural equation models (MSEM) in order to overcome the limitations of traditional statistical techniques in predicting mediation effects through multiple models. Nezlek (2011) suggests that multilevel structural equation modelling (MSEM) can be versatile in dealing with multiple predictors, mediators, and outcomes from different levels of analyses in a single inquiry.

It has been observed that, although MSEM have been used recently for confirmatory factor analytic models (e.g. Preacher, Zhang, & Zyphur, 2011; Preacher, Zyphur, & Zhang, 2010), their true implementation as complete structural equation models (SEM) has been rare (Jensen & colleagues, 2013). This study utilized Mplus software package version 7.3

(Muthén & Muthén, 1998-2014) to estimate the multilevel models (including mediated path analysis models) using Structural Equation Modelling technique.

Hoyle (1995) describes SEM as a comprehensive statistical perspective to testing hypotheses about relations among observed and latent variables. According to Kaplan (2000), SEM is a class of methodologies that seek to represent hypotheses about the means, variances, and covariances of observed data in terms of a smaller number of structural parameters defined by a hypothesized underlying model.

In order to fully understand the fundamentals of traditional SEM, it is essential to grasp two important concepts: measurement models and structural models. The measurement model describes the relationships between observed variables (instruments or items or indicators) and the construct or constructs that those variables are hypothesized to measure (Weston & Gore, 2006). In other words, it establishes the relationships between latent (unobserved) variables and multiple observable items (Holbert & Stephenson, 2002). Holbert and Stephenson (2002) describe latent variables as the underlying constructs that are not directly tapped by any one set of measures, but are hypothesized to influence (or be influenced by certain observable items in the model. According to Duncan (1975, cf: Hentler, 1980), latent variables are what a researcher ultimately desires to capture, but which cannot be directly assessed through any form of observation.

Weston and Gore (2006) suggest that the measurement model of SEM allows the researcher to evaluate how well his or her observed variables (i.e. instruments or items) combine to identify underlying hypothesized constructs (i.e. latent variables). The hypothesized constructs or factors are known as latent variables and confirmatory factor analysis (CFA) is utilized to test the measurement model. The measures or items that are selected by the researcher help to define the latent variables in the measurement model. According to Weston and Gore (2006), a latent variable is defined more correctly to the extent that the measures (or items) that define it are strongly related to one another. For example, a construct will be poorly defined if one item is weakly correlated with other items of the measure of the same construct. This is referred to as model misspecification or misjudgement in the hypothesized relationships among variables. Bollen (1989) indicates that researchers should be discouraged from testing models that include constructs with single indicators. This is because each of the indicators or items represents a separate measure of the hypothesized latent variable in question, which, when combined, represent the underlying construct (Weston & Gore, 2006). However, items that are reliable and have less error are likely to be better indicators of their respective latent variable and hence the items with the highest factor loadings in a factor analysis will most accurately represent their underlying construct.

The structural model, which is based on path analysis, tests a set of hypothesized associations among two or more latent variables (Holbert & Stephenson, 2002). In other words, it specifies the hypothesized relationships among latent variables (Weston & Gore, 2006). Relationships among latent variables can be described as covariances, direct effects, or indirect (or mediated) effects. Weston and Gore describe covariances as analogous to correlations in the sense that they are defined as non-directional relationships among independent latent variables. A direct effect represents a directional relation between two variables and it forms the building block of SEM (Hoyle, 1995). It is the effect of an independent (exogenous) variable on a dependent (endogenous) variable (Schreiber, Nora, Stage, Barlow, & King, 2006). However, a dependent variable in one direct effect can be the independent variable in another. For example, this study hypothesizes experienced HPWS for safety as having direct effects on employees' safety knowledge and safety motivation while safety knowledge and safety motivation are hypothesized to have direct effects on safety compliance and safety initiative. In the first hypothesized relationship, experienced HPWS for safety is an independent variable while safety knowledge and safety motivation are dependent variables. However, in the second hypothesized relationship, safety knowledge and safety motivation have become independent variables while safety compliance and safety initiative are dependent variables. Weston and Gore (2006) also describe direct effects as the relationships among measured (or indicators or items) and latent (unobserved) variables (similar to those found in analysis of variance (ANOVA) and multiple regression).

An indirect effect represents the effect of an independent variable on a dependent variable through one or more intervening or mediating variables (Baron & Kenny, 1986). In other words, it suggests the relationship between an independent latent variable and a dependent latent variable that is mediated by one or more latent variables. For example, and as earlier noted, the current study hypothesizes experienced HPWS for safety to have an indirect effect on safety behaviours in terms of safety compliance and safety initiative via the mediating effects of safety knowledge and safety motivation.

Hoyle (1995) opines that the application of SEM technique starts with the specification or building of a model to be estimated. He describes a model as a statistical statement that is expressed with equations or a diagram about the hypothesized relationships among variables based on theory and research. Specification is described as the exercise of formally stating a model and this varies in form across different analytic approaches (Hoyle, 1995). Specification takes place when a researcher specifies which relationships are hypothesized to exist or not to exist among observed and latent variables (Weston & Gore, 2006). Hoyle (1995) notes that the exercise of model specification is vital in the SEM approach such that analysis cannot take place until the researcher has specified a model of the relations among the variables to be analysed. In SEM, model specification involves the formulation of statement that reflects the relationships among variables (known as parameters or paths) and they are either (i) set to a nonzero value and not estimated, (ii) set to zero and not estimated, or (iii) left free to be estimated (Weston & Gore, 2006; Hoyle, 1995).

MSEM was used in this study for a number of reasons. First, it is possible to test all related paths (for example, mediation analysis) in the model simultaneously rather than going through a series of multiple regression analyses. In addition, the effects on the model of the absence or presence of sets of direct paths from predictor variable to outcome variable can be tested when competing models are compared (Stride, 2014).

Second, it is possible to calculate indirect effects and test them for significance using Mplus. In addition, the use of Mplus has helped to overcome one potential problem of estimating the standard error of the product of regression coefficients that is a major disadvantage of Sobel's Test. This it does by the process of bootstrapping (Stride, 2014). However, bootstrapping cannot be applied in multilevel mediation analysis (Muthén & Muthén, 1998 - 2014).

Third, there is need to conduct several confirmatory factor analyses (CFA) for the unit-level and individual-level data in order to ensure model fit (See next chapter). At the unit-level, for example, the study will test the hypothesized four factor model including unit-level HPWS, unit-level safety climate, aggregated safety-specific transformational leadership (control variable), and aggregated bottom-line orientations (control variable). However, at the individual-level of analysis, the study will test the hypothesized seven factor model including experienced HPWS for safety, safety knowledge, safety motivation, safety compliance, safety initiative, safety-related events, and workplace injuries.

Fourth, it was considered appropriate for testing the direct and indirect (or mediated) relationships (hypothesized) at the individual-level of analysis using multilevel path analysis. This is consistent with prior research (e.g. Jensen & colleagues, 2013) who have utilized MSEM to test models that specify the direct and indirect (i.e. mediational) effects of hypothesized independent variables on dependent variables of interest.

Thus, this technique is suitable for this study because the model includes two levels of analysis (unit-level and individual-level), the data of which will be hierarchically structured. Hence, consistent with Kline (2005), Preacher and colleagues (2010), Jensen and colleagues (2013), both the unit-level and individual-level relationships will be tested using MSEM technique.

4.7.2. Confirmatory Factor Analysis (CFA)

Several fit indices can be used to determine how well assigned structures fit the observed data. The most popular and basic among these fit indices is chi-square goodness-of-fit statistic that is used to test whether the actual data departs from what is expected under the proposed measurement model. A significant chi-square statistic indicates that the relationships between the variables in the measurement model are significantly different from what we would have expected if the measurement model was a true representation. Research (e.g. Hu & Bentler, 1999) however, reports that, in a large or moderately large sample, the difference between the observed and expected covariance matrix that is even small enough to be regarded as insignificant can cause very significant chi-square statistic. Therefore, other fit indices can be used to assess the fit of the model. However, a significant Chi-square is said to be acceptable when the sample size is large (Kline, 1998, although "large" is ill-defined).

Other fit indices have been used to supplement the chi-square goodness of fit. These fit indices have been classified into two different types: (i) absolute, and (ii) incremental fit indices (Hu & Bentler, 1995; Tanaka, 1993; Gerbing & Anderson, 1993; Bollen, 1989; Marsh, Balla, & McDonald, 1988). An absolute fit index examines how well an a priori model reproduces the sample data (Hu & Bentler, 1999) and it is derived from the fit of the observed and expected covariance matrices and the maximum likelihood (ML) minimization function. Examples of absolute fit indices are Goodness of Fit Index (GFI) and the Adjusted Goodness of Fit Index (AGFI: Tanaka & Huba, 1985; Jöreskog & Sörbom, 1984; Bentler, 1983), Hoelter's (1983) Critical N (CN), a Standardized version of Jöreskog & Sörbom's (1981) Root Mean Squared Residual (SRMR: Bentler, 1995), and the Root Mean Square Error of Approximation (RMSEA: Steiger & Lind, 1980).

Incremental fit indices identify the proportionate improvement in fit by comparing the chi-square for the model tested with the chi-square from the baseline or null model. Examples of incremental fit indices are Normed chi-square ($\chi 2 / df < 3$) (Wheaton, Muthén, Alwin, & Summers, 1977), Normed Fit Index (NFI: Bentler & Bonett, 1980), the Tucker-Lewis Index (TLI: 1973), Nonnormed Fit Index (NNFI: Bentler & Bonett, 1980), the Comparative Fit Index (CFI: Bentler, 1990), the Goodness of Fit Index (GFI: Jöreskog & Sörbom, 1989; Tanaka & Huba, 1984), and the Adjusted Goodness of Fit Index (AGFI: Jöreskog & Sörbom, 1989).

In addition to the Chi-Square Goodness of Fit statistic, the study utilized the following fit indices: Standardized Root Mean Square Residual (SRMR) with values less than 0.08 indicating a good fit with the data; Root Mean Square Error of Approximation (RMSEA) with values less than 0.05 indicating a close fit (Browne & Cudeck, 1993; Browne & Mels, 1990; Steiger, 1989), values above 0.05 and as high as 0.08 indicating an adequate fit (Browne & Cudeck, 1993), values above 0.08 and less than .10 indicating a mediocre fit (MacCallum, Browne, & Sugawara, 1996), and values above .10 indicating a poor fit (Dilalla, 2000; Browne & Cudeck, 1993). The study also used Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI) with values between 0.90 and 0.95 being considered a good fit while values of 0.95 and above are considered an excellent fit (Bentler, 1990).

Examining the various cut-offs for many of these fit indices under various conditions such as varying sample sizes, model complexity, and others, Hu and Bentler (1999) contend that, to minimize Type 1 error (i.e. the probability of rejecting the null hypothesis when it is true) and

Type 2 error (i.e. the probability of accepting the null hypothesis when it is false), there is need for a combination of one incremental fit index, usually the CFI, with one of the SRMR and RMSEA.

Before testing for significant relationships in the structural model, Fornell and Larcker (1981) recommends that it is necessary to first demonstrate that the measurement model has a satisfactory level of validity and reliability. Although some evidence of construct validity and internal consistency reliability (Cronbach (1951) and construct reliability (Fornell & Larcker, 1981) had earlier been established in Study 2 and Study 3, it was considered appropriate to undertake, in this section, further statistical analyses using the data from Study 4 in order to confirm and provide further support for the validity and reliability of the new scale. Consistent with Anderson and Gerbing's (1988) two-stage approach, the fit of the measurement model (i.e. CFA) was established before the structural relations (i.e. hypotheses testing) were assessed.

4.8. Conclusion

In this chapter, I described the sample and the data collection procedure. I also described in details the analytic techniques used to analyze the data starting with MLM and SEM. The advantages and disadvantages of each of them were discussed and the two were combined as a MSEM to be used to simultaneously analyze the unit-level, individual- and cross-level hypotheses. The advantages of MSEM over traditional regression and multilevel analytic techniques as well as each of MLM and SEM in isolation were highlighted. Finally, I discussed the issues of confirmatory factor analysis. In the next chapter, I present the results of the MSEM analyses used to test the study hypotheses.

5.0. CHAPTER 5: RESULTS

5.1. Introduction

This chapter aims to achieve two main objectives. The first is to further assess the validity of the newly developed HPWS for safety scale. The second is to present results of the multilevel testing of the model initially presented in chapter 2 regarding the impact of HPWS for safety on safety outcomes. Chapter 3 described the development of the HPWS for safety scale. From that process, a 29-item measure was developed, which yielded a unique three-factor solution that accounted for 65.97% of the variance. These three components were consistent with AMO model, which is the study's underpinning conceptualization of the HPWS for safety scale. The human resource components (component 1) items which are assumed to be motivation-enhancing factors are safety rewards, internal opportunity for promotion, safety involvement and participation, performance appraisals, self-managed team, safety information sharing, and clear job descriptions. The organization management component (component 2) items that are assumed to be opportunity-enhancing factors are safety audit, safety campaign, and safety equipment maintenance. Then the skills component that is assumed to be ability-enhancing factor is the safety training. Chapter 4 described the methodology by which this measure was implemented to test the theoretical model developed in chapter 2, outlining also the analytical approach to be used to test the model. Given the multilevel structure of the data, Multilevel Structural Equation Modelling (MSEM) technique is used with Mplus software package version 7.3 (Muthén & Muthén, 1998 - 2014) to test the hypotheses proposed in Chapter 2. This chapter presents the results of that analysis.

5.2. Exploratory Factor Analysis (EFA) of the New HPWS for Safety Scale

In this section, a further exploratory factor analysis is reported which was conducted in order to verify that the factor structure of the new scale is consistent with that obtained from the initial first data set (Study 2). The data used for this verification were those collected for the main study (Study 4) and reported in chapter 4. It should however be recalled that the two items measuring clear job descriptions (DES) seemed to exhibit poor performance in the data reported in chapter 4, therefore, they were excluded from the analysis. Thus, an EFA was performed on the remaining 27-item HPWS for safety scale using the data from Study 4.

Although the principal axis factoring (PAF) extraction with direct Oblimin rotation revealed the presence of five components with eigenvalues exceeding 1, a closer look at the screeplot (See Figure 5) indicated a clear break after the third component. Therefore, using Catell's (1966) scree test, three components were retained for further investigation. Watkins' (2000) Monte Carlo PCA for parallel analysis was again used and the results indicate only three components with eigenvalues exceeding the corresponding criterion values for a randomly generated data matrix of the same size (27 x 569) (See Tables 5.1 & 5.2).

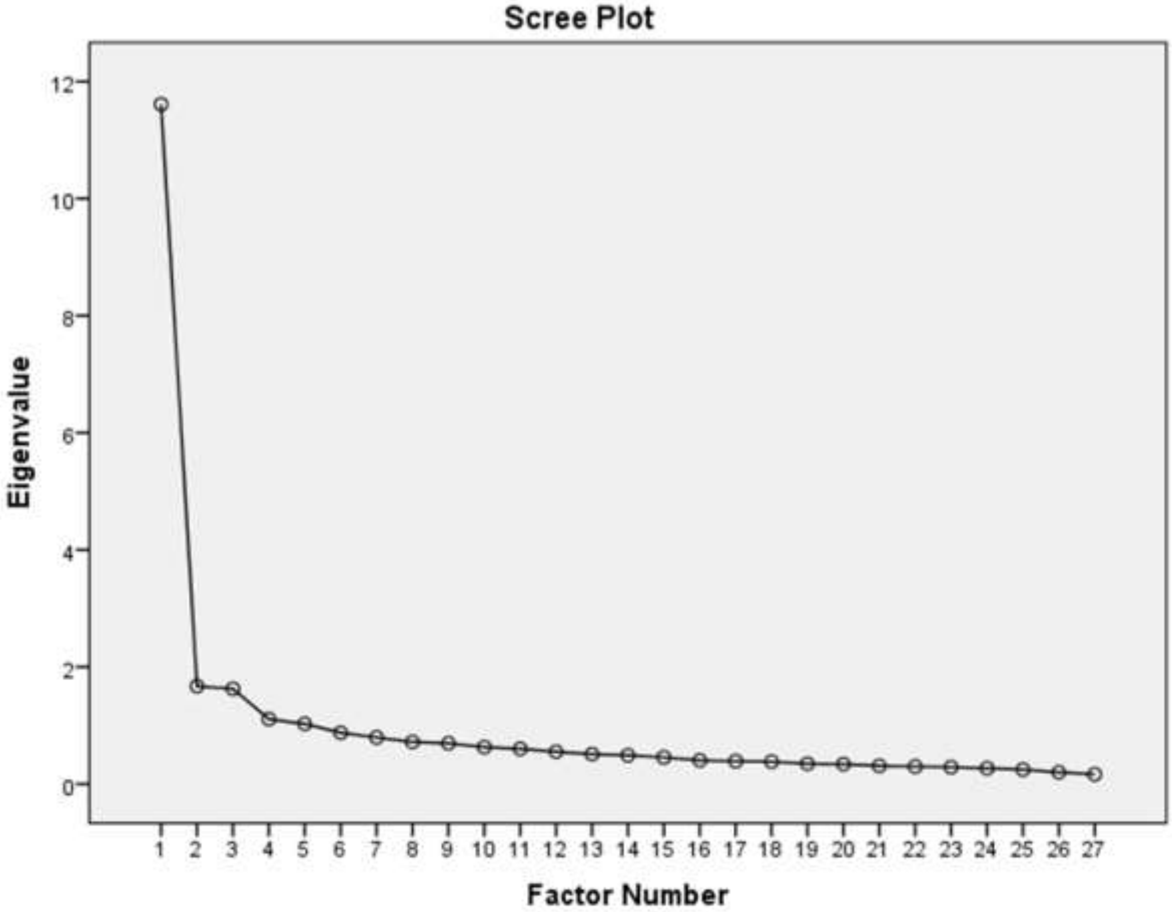


Figure 5.1: Scree plot Test

Table 5.1: Output from Parallel Analysis

Number of Variables:	**27**	
Number of subjects:	**569**	
Number of replications:	**100**	
Eigenvalue	**Random Eigenvalue**	**Standard Dev**
1	1.4259	.0354
2	1.3582	.0253
3	1.3149	.0219
4	1.2752	.0221
5	1.2406	.0178
6	1.2073	.0189
7	1.1752	.0173
8	1.1451	.0163
9	1.1154	.0144
10	1.0909	.0155
11	1.0616	.0127
12	1.0358	.0132
13	1.0133	.0131
14	0.9881	.0133
15	0.9611	.0129
16	0.9374	.0122
17	0.9134	.0134
18	0.8899	.0110
19	0.8660	.0150
20	0.8414	.0132
21	0.8159	.0149
22	0.7912	.0162
23	0.7668	.0158
24	0.7403	.0166
25	0.7118	.0155
26	0.6787	.0194
27	0.6391	.0197

Table 5.2: Comparison of Eigenvalues from PAF and Criterion Values from Parallel Analysis

Component Number	**Actual Eigenvalue from PCA**	**Criterion Value from Parallel Analysis**	**Decision**
1	11.611	1.4259	Accept
2	1.670	1.3582	Accept
3	1.627	1.3149	Accept
4	1.108	1.2752	Reject
5	1.027	1.2406	Reject
6	0.876	1.2073	Reject

Thus, the decision to retain three-factor components was supported. Following these analyses, a three-factor solution was then forced (See Table 5.3).

Table 5.3: Factor Loadings of 27-Item HPWS for Safety in Study 4

	Domains/Items	Opportunity-Enhancing Factors	Motivation-Enhancing Factors	Ability-Enhancing Factors
		F1	F2	F3
1	**Safety Campaign**			
	CAM22	0.59		
	CAM	0.77		
	CAM	0.80		
2	**Safety Equipment Maintenance**			
	MAI25	0.70		
	MAI26	0.65		
	MAI27	0.65		
3	**Safety Audit**			
	AUD19	0.53		
	AUD20	0.51		
	AUD21	0.55		
4	**Safety Information Sharing**			
	SHA17	0.54		
	SHA18	0.45		
5	Self-Managed Team			
	TEA15		0.78	
	TEA16		0.46	
6	**Internal Opportunity for Promotion**			
	PRO7		0.71	
	PRO8		0.76	
	PRO9		0.69	
7	**Performance Appraisals**			
	APP13		0.63	
	APP14		0.66	
8	**Safety Rewards**			
	REW5		0.57	
	REW6		0.66	
9	**Safety Involvement and Participation**			
	PAR10		0.44	
	PAR11		0.59	
10	**Safety Training**			
	TRA1			0.77
	TRA2			0.80
	TRA3			0.73
	TRA4			0.64
	Eigenvalues			
	SHA1			0.49
	SHA2			0.42
	Average of Factor Loadings	0.58	0.70	0.57

The three-factor solution of this EFA result indicates that 55.2% of the variance is accounted for, with opportunity-enhancing factors (or component 1: organization management) contributing 43%, motivation-enhancing factors (or component 2: human resource management) contributing 6.19%, and ability-enhancing factors (or component 3: skills) contributing 6.02% (See Table 5.4).

The interpretation of the three-factor components is consistent with that of Study 2. The only difference between the EFA results in this study and those reported in Study 2 is that safety information sharing (SHA) no longer loads on the motivation-enhancing component but rather the opportunity-enhancing component (See Table 5:3). This is consistent with prior work (e.g. Jiang, & colleagues, 2012; Bailey & colleagues, 2001; Blumberg & Pringle, 1982) which describes information sharing as one of the opportunity-enhancing HR practices that are designed to empower employees to utilize their skills and motivation to achieve organizational goals. Thus, although safety information sharing was initially conceptualized as part of the motivation-enhancing practices, the present EFA result, supported by prior research, has made the researcher to reconsider that it might be better positioned as an opportunity-enhancing HPWS for safety practice. Given the larger sample size of Study 4 and therefore, higher consistency, this would appear to be a more accurate conceptualization.

Table 5.4: Configuration of HPWS for safety Dimensions in Relation to AMO (Study 4)

HRM Subsystem	AMO Theory	HPWS for Safety Dimensions
Skills	Ability	Safety Training
Human Resource management	Motivation	Safety Rewards Internal opportunity for promotion Safety involvement and participation Performance appraisals Self-managed team
Organization management	Opportunity	Safety audit Safety campaign Safety equipment and maintenance Safety information sharing

The results presented in Table 5.5 compare the patterns of relationships in the data obtained from Study 2 and Study 4. This shows a strong and positive correlation between the ability-enhancing and motivation-enhancing factors ($r = 0.61$, $p < 0.01$, $n = 569$), ability-enhancing and opportunity-enhancing factors ($r = 0.61$, $p < 0.01$, $n = 569$), and between motivation-enhancing and opportunity-enhancing factors ($r = 0.75$, $p = 0.01$, $n = 569$) just as we had in the Study 2 which also indicated a strong and positive correlation coefficients of $r = 0.74$, $p < 0.01$, $n = 303$; $r = 0.74$, $p < 0.01$, $n = 303$; and $r = 0.80$, $p < 0.01$, $n = 303$ respectively. It also indicates Cronbach's alpha coefficients ranging from 0.87 to 0.95, suggesting very good internal consistency reliability for the three components of the HPWS for safety scale for both samples. It should be noted that the corrected item-total correlations as shown in this analysis indicate the degree to which the items in each component correlate with the total score (Pallant, 2013; Hayes, 1994). Thus, the results of this analysis support the use of the ability-enhancing items, the motivation-enhancing items and the opportunity-enhancing items as a single HPWS for safety scale.

Table 5.5: Cronbach's Reliability (Alpha) Coefficients and Correlations (Corrected Item-Total Correlation) Among the Three Factors

	Sample 2 (n = 303)					
Serial No	**Factor**	**M**	**SD**	**1**	**2**	**3**
1	Ability-Enhancing Factors	3.94	0.93	(0.88)		
2	Motivation-Enhancing Factors	3.78	0.85	0.74	(0.95)	
3	Opportunity-Enhancing Factors	4.08	0.92	0.74	0.80	(0.95)
	Sample 4 (n = 569)					
Serial No	**Factor**	**M**	**SD**	**1**	**2**	**3**
1	Ability-Enhancing Factors	4.08	0.80	(0.87)		
2	Motivation-Enhancing Factors	3.64	0.71	0.61	(0.91)	
3	Opportunity-Enhancing Factors	4.11	0.59	0.61	0.75	(0.90)

Note: All correlations are significant at the $p < 0.01$ (2-tailed); Cronbach's alpha coefficients are in parentheses.

5.3. Results of Confirmatory Factor Analyses

For this assessment, Mplus version 7.3 (Muthén & Muthén, 1998-2014) was used to conduct confirmatory factor analysis in which the fit statistics for the proposed one-factor HPWS for safety model (included ten dimensions as indicators of the construct) was compared to the fit statistics for three alternative models: two-factor model 1 (included the opportunity-enhancing factors and a combined ability-enhancing and motivation-enhancing factors: O, AM), two-factor model 2 (included motivation-enhancing factors and a combined ability-enhancing and opportunity-enhancing factors: M, AO), and two-factor model 3 (included ability-enhancing factors and a combined motivation-enhancing and opportunity-enhancing factors: A, MO) HPWS for safety models. As indicated in Table 5.6, the Chi-Square Goodness-of-Fit statistic was statistically significant for all the measurement models, suggesting that none of them adequately fit the data. However, because of the limitations of the use of Chi-Square Goodness-of-Fit statistic, among which is its sensitivity to sample size (Byrne, 2011; Hu & Bentler, 1999; Jöreskog & Yang, 1996; Fornell & Larcker, 1981; Jöreskog, 1969), it is rarely used as a sole index of model fit.

As shown in Table 5.6, the CFAs of the second-order one-factor measurement model that used the ten dimensions as indicators of the construct (i.e. HPWS for safety) demonstrated the following fits: χ^2 = 243.24, df = 35, p < 0.01; SRMR = 0.04; RMSEA = 0.10; CFI = 0.93; TLI = 0.91. Although the CFA results demonstrated a mediocre fit (Browne & Cudeck, 1993) for RMSEA (MacCallum, Browne, & Sugawara, 1996), the fit indices were considered acceptable because other fit indicators are not only within the acceptable ranges (Browne & Cudeck, 1993; Browne & Mels, 1990; Bentler, 1990), but also much better fit than the alternative models: (i) two-factor model 1 (O, AM: $\chi^2 =$ 2276.96, df = 323, p < 0.01; SRMR 0.06; RMSEA = 0.10; CFI = 0.88; TLI = 0.86) which included the opportunity-enhancing factors (safety information sharing, safety audit, safety campaign, and safety equipment) and a combined ability-enhancing and motivation-enhancing factors (training, safety rewards, internal opportunity for promotion, safety involvement and participation, performance appraisals, & self-managed team); (ii) two-factor model 2 (M, AO: χ^2 = 2191.94, DF = 311, P < 0.01; SRMR = 0.06; RMSEA = 0.10; CFI = 0.78; TLI = 0.76) that included the motivation-enhancing factors (safety rewards, internal opportunity for promotion, safety involvement and participation, performance appraisals, & self-managed team) and a combined ability-enhancing and opportunity-enhancing factors (training, safety information sharing, safety audit, safety campaign, and safety equipment); and (iii) two-factor model 3 (A,MO: χ^2 = 2022.72, DF = 323, P < 0.01; SRMR = 0.06; RMSEA = 0.09; CFI = 0.81; TLI = 0.79) that included the ability-enhancing factors (training) and a combined motivation-enhancing and opportunity-enhancing factors (safety rewards, internal opportunity for promotion, safety involvement and participation, performance appraisals, & self-managed team, safety information sharing, safety audit, safety campaign, and safety equipment).

Table 5.6: Results of Confirmatory Factor Analyses and Discriminant Validity Assessment of One-Factor Model of HPWS for Safety Scale

Model	χ^2	df	p	SRMR	RMSEA	CFI	TLI
One-Factor Model (included 10 practices of HPWS for Safety) (AMO)	243.24	35	0.000	0.04	0.10	0.93	0.91
Two-Factor Model 1 (O, AM)	2276.96	323	0.000	0.06	0.10	0.88	0.86
Two-Factor Model 2 (M, AO)	2191.94	311	0.000	0.06	0.10	0.78	0.76
Two-Factor Model 3 (A, MO)	2022.72	323	0.000	0.06	0.09	0.81	0.79

Table 5.7 displays the CFA and the discriminant validity of the three-factor model of HPWS for safety comprising ability-enhancing factors (A), motivation-enhancing factors (M), and opportunity-enhancing factors (O). The results indicate that the proposed three-factor measurement model (AMO) that included the indicators or items of the ability (training), motivation (rewards, internal opportunity for promotion, safety involvement and participation, performance appraisals, and self-managed team), and opportunity (safety information sharing, safety audit, safety campaign, and safety equipment maintenance) fit the data ($\chi2$= 1651.34, df = 321, $p < 0.01$; SRMR = 0.05; RMSEA = 0.06; CFI = 0.95; TLI = 0.93). However, the three-factor (2nd-order) model 1 ($\chi2$ = 218.37, df = 62, $p < 0.01$; SRMR = 0.04; RMSEA = 0.07; CFI = 0.96; TLI = 0.96) where the dimensions constituting the ability, motivation, and opportunity were used as indicators or items of the construct (i.e. HPWS for safety) with safety information sharing included in motivation-enhancing factors, and three-factor (2nd order) model 2 ($\chi2$ = 235.12, df = 62, $p < 0.01$; SRMR = 0.04; RMSEA = 0.07; CFI = 0.96; TLI = 0.95) where the dimensions constituting the ability, motivation, and opportunity were used as indicators or items of the construct (i.e. HPWS for safety) but with safety information sharing included in opportunity enhancing factors, fit the data better than the hypothesized first-order three-factor model. These are within the acceptable ranges of the fit indices (Dilalla, 2000; Browne & Cudeck, 1993; Browne & Mels, 1990; Bentler, 1990). The

result further indicates that both second-order three-factor models 1 and 2 with safety information sharing fit the data very well.

The results also show that the motivation-enhancing factor model 1 ($\chi2$ = 377.86, df = 54, $p < 0.01$; SRMR = 0.05; RMSEA = 0.10; CFI = 0.90; TLI = 0.88) that included the indicators or items of the dimensions that constitute motivation without safety information sharing fit the data significantly better than the motivation-enhancing factor model 2 ($\chi2$ = 580.75, df = 77, $p < 0.01$; SRMR = 0.05; RMSEA = 0.11; CFI = 0.87; TLI = 0.85) that included the indicators or items of the dimensions that constitute motivation with safety information sharing ($\text{the chi} - \text{square difference} = \Delta\chi^2 = 202.89$, $\Delta df = 23$, $p < 0.001$). Likewise, the second-order motivation-enhancing factor model 1 ($\chi2$ = 44.94, df = 5, $p < 0.01$; SRMR = 0.03; RMSEA = 0.12; CFI = 0.97; TLI = 0.94) that used the dimensions of the construct as indicators of motivation-enhancing factors without safety information sharing fit the data as well as second-order motivation-enhancing factor model 2 ($\chi2$ = 58.23, df = 9, $p < 0.01$; SRMR = 0.03; RMSEA = 0.10; CFI = 0.97; TLI = 0.95) that used the dimensions that constitute the motivation-enhancing factors as indicators with safety information sharing included.

In the same vein, the opportunity-enhancing factor model 1 ($\chi2$ = 602.75, df = 27, $p < 0.01$; SRMR = 0.08; RMSEA = 0.19; CFI = 0.78; TLI = 0.71) that used the indicators or items of the dimensions that constitute opportunity without items or indicators that comprise safety information sharing did not fit the data well and so also the opportunity-enhancing factor model 2 ($\chi2$ = 746.03, df = 44, $p < 0.01$; SRMR = 0.07; RMSEA = 0.17; CFI = 0.78; TLI = 0.73) that used the indicators or items of the dimensions that constitute opportunity with items or indicators that comprise safety information sharing. However, the second-order opportunity-enhancing factor model 1 ($\chi2$ = 0.000, df = 0; SRMR = 0.00; RMSEA = 0.00; CFI = 1.00; TLI = 1.00) that included the dimensions as indicators of opportunity without safety information sharing fit the data worse off than the second-order opportunity-enhancing factor model 2 ($\chi2$ = 9.47, df = 2; $p < 0.01$; SRMR = 0.02; RMSEA = 0.08; CFI = 0.99; TLI = 0.97) that included the dimensions of the construct as indicators of opportunity with safety information sharing.

The result further demonstrates that the second-order opportunity-enhancing factor model 2 ($\chi2$ = 0.9.47, df = 2; $p < 0.01$; SRMR = 0.02; RMSEA = 0.08; CFI = 0.99; TLI = 0.0.97) that included the dimensions of the construct as indicators of opportunity with safety information sharing fit the data significantly better than the second-order motivation-enhancing factor model 2 ($\chi2$ = 58.23, df = 9, $p < 0.01$; SRMR = 0.03; RMSEA = 0.10; CFI = 0.97; TLI = 0.95) that used the dimensions of the construct as indicators of motivation with safety information sharing included (the Chi-square difference $= \Delta\chi^2 =$ 48.76, Δdf = 7, $p < 0.001$). Thus, this pattern of findings reinforce the EFA results whereby safety information sharing items no longer loaded on the motivation-enhancing practices, as they did in Study 2, but rather on the opportunity-enhancing practices in Study 4.

Table 5.7: Results of Confirmatory Factor Analyses and Discriminant Validity Assessment of Three-Factor Model of HPWS for Safety Scale

Model	χ^2	df	p	SRMR	RMSEA	CFI	TLI
Hypothesized 3-Factor (First-Order) Model (i.e. used indicators or items of AMO factors)	1651.31	321	0.000	0.05	0.06	0.95	0.93
3-Factor (2nd-Order) Model -1 (used dimensions of AMO as indicators + safety information sharing included in motivation-enhancing factors)	218.37	62	0.000	0.04	0.07	0.96	0.96
3-Factor (2nd-Order) Model-2 ((used dimensions of AMO as indicators + safety information sharing included in opportunity-enhancing factors))	235.12	62	0.000	0.04	0.07	0.96	0.95
Ability-Enhancing Factors Model (used items of ability-enhancing factor)	1.07	2	0.58	0.01	0.00	1.00	1.00
Motivation-Enhancing Factor Model-1 (used items of motivation-enhancing factors without safety information sharing)	377.86	54	0.000	0.05	0.10	0.90	0.88
Motivation-Enhancing Factor Model-2 (used items of motivation-enhancing factors with safety information sharing)	580.75	77	0.000	0.05	0.11	0.87	0.85
Motivation-Enhancing Factors (2nd-Order) Model-1 (used the dimensions of motivation-enhancing factors without safety information sharing)	44.94	5	0.000	0.03	0.12	0.97	0.94
Motivation-Enhancing Factors (2nd-Order) Model-2 (used the dimensions of motivation-enhancing factors with safety information sharing)	58.23	9	0.000	0.03	0.10	0.97	0.95
Opportunity-Enhancing Factors Model-1 (used items of opportunity-enhancing factors without safety information sharing)	602.75	27	0.000	0.08	0.19	0.78	0.71
Opportunity-Enhancing Factors Model-2 (used items of opportunity-enhancing factors with safety information sharing)	746.03	44	0.000	0.07	0.17	0.78	0.73
Opportunity-Enhancing Factors (2nd-Order) Model-1 (used the dimensions of opportunity-enhancing factors without safety information sharing)	0.000	0	0.000	0.00	0.00	1.00	1.00
Opportunity-Enhancing Factors (2nd-Order) Model-2 (used the dimensions of opportunity-enhancing factors with safety information sharing)	9.47	2	0.009	0.02	0.08	0.99	0.97

5.4. Convergent and Discriminant Validity

In order to further assess the construct validity of the new scale, some additional psychometric analyses were conducted on the HPWS for safety scale. First, because the reliability of construct measurement does not measure 'the amount of variance that is captured by the construct in relation to the amount of variance due to measurement error' (Fornell & Larcker, 1981, p. 45), the AVE which provides information for this (Fornell and Larcker, 1981) was used to examine the construct validity of the new scale. It is expected that the AVE should be greater than 0.50 (Fornell & Larcker, 1981). Fornell and Larcker (1981) contend that the validity of the individual indicators as well as the construct itself will be questionable if the AVE is less than 0.50, signifying that the variance due to measurement error is larger than the variance captured by the construct.

The formula as shown below is the sum of squared factor loadings of the HPWS for safety dimensions (numerator) divided by the sum of squared factor loadings of the HPWS for safety dimensions plus the sum of residual variances of the factor loadings (forming the denominator).

AVE = $\frac{\sum \lambda^2}{\sum \lambda^2 + \sum \varepsilon}$

$\sum \lambda^2$ = Sum of squared factor loadings

$\sum \varepsilon$= Sum of residual variances of factor loadings

$$\sum \lambda^2 = 0.72^2 + 0.77^2 + 0.78^2 + 0.75^2 + 0.74^2 + 0.77^2 + 0.80^2 + 0.77^2 + 0.77^2 + 0.73^2$$

$$= 5.77$$

$\sum \varepsilon$= 0.31 + 0.43 + 0.47 + 0.46 + 0.49 + 0.41 + 0.24 + 0.33 + 0.24 + 0.23 = 3.61

AVE = $\frac{5.77}{5.77+3.61} = \frac{5.77}{9.38} = 0.62.$

The result indicates that the AVE obtained is 0.62 and is greater than 0.50 (Fornell & Larcker, 1981), suggesting support for the construct validity of the new scale.

Because this study also assumed that each indicator or item is associated with only one factor, MacKenzie and colleagues (2011) recommend that the validity of each of the ten dimensions of HPWS for safety scale should be tested by examining whether it is significantly related, for example, to the system of HPWS for safety scale (Bollen & Lennox, 1991; Bollen, 1989). The norm is that an indicator or item should be highly correlated with its own construct but have low correlations with other constructs in order to establish discriminant validity at the item level (Henseler, Ringle & Sarstedt, 2015). The results in Table 5.8 demonstrate that, using Cohen's (1988) criteria of small ($r = .10$ to $.29$), medium ($r = .30$ to $.49$), and large ($r = .50$ to 1.0) values to interpret the magnitude of the strength of the relationships between the ten dimensions of the HPWS for safety and the construct, it was found (See table 5.8) that the new scale (i.e. High Performance Work System for Safety scale) was significantly related to safety training ($r = 0.75$, $p < 0.01$), safety rewards ($r = 0.77$, $p < 0.01$), internal opportunity for promotion ($r = 0.79$, $p < 0.01$), safety involvement and participation ($r = 0.74$, $p < 0.01$), performance appraisals ($r = 0.79$, $p < 0.01$), self-managed team ($r = 0.74$, $p < 0.01$), safety information sharing ($r = 0.72$, $p < 0.01$), safety audit ($r = 0.77$, $p < 0.01$), safety campaign ($r = 0.71$, $p < 0.01$), and safety equipment maintenance ($r = 0.75$, $p < 0.01$). In all, the results reported above revealed a strong support for the convergent and discriminant validity of the new scale.

Table 5.8: Relationships between the Ten Dimensions of HPWS for Safety Scale and the HPWS for Safety Scale

	Variables	**M**	**SD**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	10	11
1	Experienced HPWS	3.9	.61	(0.92)										
2	Safety Training	4.1	.80	.75**	(0.87)									
3	Safety Rewards	3.4	1.0	.77**	.58**	(0.81)								
4	Internal Opportunity for Promotion	3.6	.88	.79**	.53**	.68**	(0.80)							
5	Safety Involvement and Participation	3.7	.78	.74**	.47**	.56**	.59**	(0.60)						
6	Performance Appraisals	3.7	.84	.79**	.48**	.58**	.60**	.61**	(0.79)					
7	Self-Managed Team	3.8	.81	.74**	.42**	.52**	.59**	.61**	.63**	(0.70)				
8	Safety Information and Sharing	4.2	.70	.72**	.52**	.48**	.51**	.55**	.51**	.57**	(0.76)			
9	Safety Audit	3.9	.76	.77**	.49**	.54**	.52**	.53**	.58**	.55**	.49**	(0.80)		
10	Safety Campaign	4.3	.59	.71**	.49**	.44**	.45**	.48**	.51**	.48**	.58**	.61**	(0.76)	
11	Safety Equipment Maintenance	4.1	.81	.75**	.52**	.49**	.48**	.50**	.54**	.46**	.53**	.57**	.56**	(0.88)

**** All correlations are significant at the p < 0.01 (2-tailed); Cronbach's alpha coefficients are in parentheses**

5.5. Further Evaluation of the Measurement Models

Before the hypotheses postulated for a study (or structural models) are tested, Anderson and Gerbing (1988) advise to conduct series of CFA in order to examine the level of distinctiveness of the variables measured at each level of analysis. Thus, in consonant with Anderson and Gerbing (1988), this study conducted a series of CFAs at both unit-and individual-levels of analysis. To start with, the study conducted a series of CFAs to determine whether the unit-level use of HPWS for safety, safety climate, safety-specific transformational leadership, and bottom-line orientation are distinct variables. Next, a series of CFAs were conducted in order to examine the distinctiveness of the individual-level variables of employees' experienced HPWS for safety, safety knowledge, safety motivation, safety compliance, safety initiative, safety-related events, and workplace injuries. Because the use of HPWS for safety and the experienced HPWS for safety scales are multi-item scales with ten dimensions each, the items within each dimension were averaged and treated as an indicator of either the use of HPWS for safety scale or the employee experienced HPWS for safety scale (Zacharatos & colleagues, 2005).

To conduct the series of CFAs on the unit-level variables, a hypothesized four-factor model (comprising of the use of HPWS for safety, safety climate, safety-specific transformational leadership, and bottom-line orientation) was compared with other alternative models such as (i) Three-factor model (i.e. use of HPWS for safety, safety climate, and a combination of safety-specific transformational leadership and bottom-line orientation), (ii) Two-factor model 1 (combining the use of HPWS for safety and safety climate), (iii) Two-factor model 2 (use of HPWS for safety and the combination of safety climate, safety-specific transformational leadership, and bottom-line orientation), (iv) Two-factor model 3 (safety climate and the combination of the use of HPWS for safety, safety-specific transformational leadership, and bottom-line orientation), and one-factor model (all variables combined to form one factor).

The Chi-Square Goodness-of-Fit statistic, Standardized Root Mean Square Residual (SRMR), Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), and Tucker-Lewis Index (TLI) were used to assess the model fit. The results of the analyses (See Table 5.9) indicate that the hypothesized four-factor model reached acceptable cut-off points for all the fit indices (See Dilalla, 2000; Browne & Cudeck, 1993; Browne & Mels, 1990; Bentler, 1990) (except chi-square goodness of fit) χ^2 = 2931.31, df = 734; SRMR = 0.06; RMSEA = 0.07; CFI = 0.86; TLI = 0.85), and not only that it fits the data well, it also fits the data better than the three-factor model (χ^2 = 3991.33, df = 737; SRMR = 0.07; RMSEA = 0.09; CFI = 0.79; TLI = 0.78), the two-factor model 1 (χ^2 = 2077.00, df = 298; SRMR = 0.07; RMSEA = 0.10; CFI = 0.83; TLI = 0.81), two-factor model 2 (χ^2 = 5292.43, df = 739; SRMR = 0.08; RMSEA = 0.11; CFI = 0.71; TLI = 0.70), two-factor model 3 (χ^2 = 6343.15, df = 739; SRMR = 0.12; RMSEA = 0.13; CFI = 0.56; TLI = 0.54), and the one-factor model (χ^2 = 7628.47, df = 740; SRMR = 0.13; RMSEA = 0.12; CFI = 0.65; TLI = 0.63) . As shown in Table 5.9, the Chi-Square difference also demonstrates that the four-factor model fit the data significantly better than the three-factor model ($\Delta\chi^2 =$ 1060.02, Δdf = 3, p < 0.001), two-factor model 1 ($\Delta\chi^2 =$ -909.31, Δdf = -436, p < 0.001), two-factor model 2 ($\Delta\chi^2 =$ 2361.12, Δdf = 5, p < 0.001), two-factor model 3 ($\Delta\chi^2 =$ 3411.84, Δdf = 5, p < 0.001), and the one-factor model ($\Delta\chi^2 =$, Δdf = , p < 0.001). These results further support the discriminant validity of these variables at the unit-level of analysis.

Table 5.9: Results of Confirmatory Factor Analysis of the Distinctiveness of Unit-Level Variables

Model	χ^2	df	p	$\Delta\chi^2(\Delta df)$	SRMR	RMSEA	CFI	TLI
Hypothesized Four-Factor Model (i.e. use of HPWS for safety, safety climate, safety-specific transformational leadership, & bottom-line orientation)	2931.31	734	0.000		0.05	0.07	0.86	0.85
Three-Factor Model (i.e. use of HPWS for safety, safety climate, & a combination of safety-specific transformational leadership and bottom-line orientation)	3991.33	737	0.000	1060.02(3)***	0.07	0.09	0.79	0.78
Two-Factor Model 1 (i.e. combining the use of HPWS for safety and safety climate)	2077.0	298	0.000	-909.31 (-436)***	0.07	0.10	0.83	0.81
Two-Factor Model 2 (i.e. use of HPWS for safety, and a combination of safety climate, safety-specific transformational leadership, & bottom-line orientation)	5292.43	739	0.000	2361.12 (5)***	0.08	0.11	0.71	0.70
Two-Factor Model 3 (i.e. safety climate and a combination of the use of HPWS for safety, safety-specific transformational leadership, & bottom-line orientation)	6343.15	739	0.000	3411.84 (5)***	0.12	0.12	0.65	0.63
One-Factor Model (i.e. all the four variables combined to form a factor)	7628.47	740	0.000	4697(6)***	0.13	0.13	0.56	54

*** χ^2 **difference test is significant at p < 0.001**

Table 5.10 presents the results of the confirmatory factor analysis of the distinctiveness of the individual-level variables. The hypothesized seven-factor model (experienced HPWS for safety, safety knowledge, safety motivation, safety compliance, safety initiative, safety-related events, and workplace injuries) was compared with other alternative models. These alternative models include: (i) ten-factor model (experienced HPWS for safety, safety knowledge, safety motivation, safety compliance, safety initiative, safety-related events, workplace injuries, safety climate, safety-specific transformational leadership, and bottom-line orientation), (ii) eight-factor model (experienced HPWS for safety, safety climate, safety knowledge, safety motivation, safety compliance, safety initiative, safety events, and workplace injuries), (iii) six-factor model (experienced HPWS for safety, combination of safety knowledge and safety motivation, combination of safety compliance and safety initiative; safety climate, safety-related events, and workplace injuries), (iv) five-factor model (experienced HPWS for safety, safety climate, combination of safety knowledge and safety motivation, combination of safety compliance and safety initiative, combination of safety-related events and workplace injuries), (v) four-factor model (experienced HPWS for safety, combination of safety knowledge and safety motivation, combination of safety compliance and safety initiative, combination of safety events and workplace injuries), (vi) three-factor model (experienced HPWS for safety, combination of safety knowledge, safety motivation, safety compliance, and safety initiative, combination of safety-related events and workplace injuries), and (vii) one-factor model (combination of experienced HPWS for safety, safety knowledge, safety motivation, safety compliance, safety initiative, safety-related events, and workplace injuries).

The results in Table 5.10 indicate that the hypothesized seven-factor model did not only produce an acceptable fit ($\chi2$ = 3355.62, df = 1203, SRMR = 0.05; RMSEA = 0.06; CFI = 0.87; TLI = 0.86) (See Dilalla, 2000; Browne & Cudeck, 1993; Browne & Mels, 1990; Bentler, 1990) but also fit the data better than the alternative models: (i) ten-factor model ($\chi2$ = 27956.08, df = 99171, SRMR = 0.11; RMSEA = 0.08; CFI = 0.86; TLI = 0.85), (ii) eight-factor model ($\chi2$ = 9664.65, df = 3541, SRMR = 0.05; RMSEA = 0.06; CFI = 0.80; TLI = 0.80), (iii) six-factor model ($\chi2$ = 6533.71, df = 2129, SRMR = 0.06; RMSEA = 0.06; CFI = 0.82; TLI = 0.81), (iv) five-factor model ($\chi2$ = 11595.72, df = 3559, SRMR = 0.06; RMSEA = 0.06; CFI = 0.74; TLI = 0.73), (v) four-factor model ($\chi2$ = 5280.17, df = 1218, SRMR = 0.07; RMSEA = 0.08; CFI = 0.75; TLI = 0.74), (vi) three-factor model ($\chi2$ = 5743.40, df = 1221, SRMR = 0.07; RMSEA = 0.08; CFI = 0.72; TLI = 0.71), and (vii) one-factor model ($\chi2$ = 12200.6, df = 1224, SRMR = 0.17; RMSEA = 0.13; CFI = 0.33; TLI = 0.30).

The results further reveal the Chi-Square difference test indicates that the hypothesized seven-factor model fit the data significantly better than the ten-factor model ($\Delta\chi^2 =$ 24600.46, Δdf = 7968, p < 0.001), the eight-factor model ($\Delta\chi^2 =$ 6309.03, Δdf = 2338, p < 0.001), six-factor model ($\Delta\chi^2 =$ 3178.09, Δdf = 926, p < 0.001), five-factor model ($\Delta\chi^2 =$ 8240.10, Δdf =

2356, $p < 0.001$), four-factor model ($\Delta\chi^2 = 1924.55$, $\Delta df = 15$, $p < 0.001$), three-factor model ($\Delta\chi^2 = 2387.7$, $\Delta df = 18$, $p < 0.001$), and one-factor model ($\Delta\chi^2 = 8844.98$, $\Delta df = 21$, $p < 0.001$). These results also demonstrate support for the discriminant validity of the variables at the individual-level of analysis.

Table 5.10: Results of Confirmatory Factor Analysis of the Distinctiveness of the Individual-Level Variables

Model	χ^2	df	p	$\Delta\chi^2(\Delta df)$	$\chi^2/_{df}$	SRMR	RMSEA	CFI	TLI
Hypothesized Seven-Factor Model (experienced HPWS for safety, safety knowledge, safety motivation, safety compliance, safety initiative, safety-related events, and workplace injuries)	3355.62	1203	0.000		2.8	0.05	0.06	0.87	0.86
Ten-Factor Model (experienced HPWS for safety, safety knowledge, safety motivation, safety compliance, safety initiative, safety-related events, safety-specific transformational leadership, bottom-line orientation and workplace injuries)	27956.08	9171	0.000	24600.46(7968)***	3.0	0.11	0.08	0.86	0.85
Eight-Factor Model (experienced HPWS for safety, safety knowledge, safety motivation, safety compliance, safety initiative, safety-related events, safety climate and workplace injuries)	9664.65	3541	0.000	6309.03(2338)***	3.0	0.05	0.06	0.80	0.80
Six-Factor Model (experienced HPWS for safety, combination of safety knowledge and safety motivation, combination of safety compliance and safety initiative, safety-related events, safety climate and workplace injuries)	6533.71	2129	0.000	3178.09(926)***	3.1	0.06	0.06	0.82	0.81
Five-Factor Model (experienced HPWS for safety, combination of safety knowledge and safety motivation, combination of safety compliance and safety initiative, combination of safety-related events and workplace injuries, and safety climate)	11595.72	3559	0.000	8240.10(2356)***	3.3	0.06	0.06	0.74	0.73
Four-Factor Model (experienced HPWS for safety, combination of safety knowledge and safety motivation, combination of safety compliance and safety initiative, combination of safety-related events and workplace injuries)	5280.17	1218	0.000	1924.55(15)***	4.3	0.07	0.08	0.75	0.74
Three-Factor Model (experienced HPWS for safety, combination of safety knowledge, safety motivation, safety compliance and safety initiative, and combination of safety-related events and workplace injuries)	5743.40	1221	0.000	2387.7(18)***	4.7	0.07	0.08	0.72	0.71
One-Factor Model (combination of experienced HPWS for safety, safety knowledge, safety motivation, safety compliance, safety initiative, safety-related events, and workplace injuries)	12200.60	1224	0.000	8844.98(21)***	10.0	0.17	0.13	0.33	0.30

5.6. Descriptive Statistics and Zero-Order Correlations

Having established the appropriateness of the measurement model being used, this analysis now turns to the testing of the overall structural model. Table 5.11 presents the means, standard deviations, zero-order correlations, and internal consistency reliability estimates of the study variables. The findings reveal significant positive relationships between experienced HPWS for safety and safety knowledge ($r = 0.45$, $n = 569$, $p = < 0.01$), safety motivation ($r = 0.15$, $n = 569$, $p < 0.01$), safety compliance ($r = 0.50$, $p < 0.01$), and safety initiative ($r = 0.45$, $n = 569$, $p < 0.01$). The findings also indicate that the experienced HPWS for safety has significant but negative relationship with safety-related events ($r = -0.10$, $n = 569$, $p < 0.05$) and non-significant but negative relationship with workplace safety ($r = -0.\ 01$, $n = 569$, $p > 0.05$).

Table 5.11: Descriptive Statistics, Reliability Estimates, and Zero-Order Correlations among Variables in Study 4 (Main Study)

Variables	M	SD	1	2	3	4	5	6	7	8	9	10	11
Unit-Level Variables													
Use of HPWS for Safety	4.18	0.53	(0.95)										
Unit-Level Safety Climate	3.92	0.72	0.09*	(0.96)									
Safety-Specific Transformational Leadership	3.96	0.77	0.03	0.72**	(0.93)								
Bottom-Line Orientation	2.99	1.07	-0.01	-0.14**	-0.07	(0.85)							
Individual-Level Variables													
Sex	0.16	0.37											
Age	2.77	0.90	-0.03										
Level of Education	1.96	0.60	0.06	-0.11*									
Job Tenure	3.26	1.03	-0.03	0.71**	-0.06								
Experienced HPWS for Safety	3.92	0.61	0.09*	0.13**	-0.06	0.15**	(0.92)						
Safety Knowledge	4.39	0.53	0.02	0.08	0.02	0.07	0.45**	(0.85)					
Safety Motivation	4.72	0.39	0.06	-0.04	0.09*	-0.07	0.15**	0.43**	(0.80)				
Safety Compliance	4.37	0.62	0.06	0.14**	-0.00	0.11*	0.50**	0.60**	0.36**	(0.88)			
Safety Initiative	4.05	0.59	0.12**	0.13**	0.01	0.12**	0.45**	0.50**	0.32**	0.58**	(0.88)		
Safety-Related Events	1.68	0.67	-0.11**	-0.01	-0.02	0.07	-0.10*	-0.12**	-0.08	-.16**	-0.06	(0.85)	
Workplace Injuries	1.21	0.46	-0.10*	0.02	-0.01	0.09*	-0.01	-0.16**	-0.18**	-16**	-0.03	0.56**	0.93

*Correlation is significant at the 0.05 level (2-tailed), ** Correlation is significant at the 0.01 level (2-tailed)

5.7. Tests of Hypotheses

Some of the hypotheses postulated for this study were multilevel in nature. This is because they involved testing relationships between unit-level variables (level 2) and individual-level variables (level 1). To model this appropriately, therefore, I utilized multilevel path analysis with Mplus version 7.3 (Muthén & Muthén, 1998-2014) following Preacher and colleagues (2010) recommendation on how to model multilevel mediation. Preacher and colleagues' (2010) approach to multilevel mediation in the context of path analysis is most appropriate for the current study because it allows estimation of covariances for level 1 random effects and indirect effects, and the multiple paths that are components of these indirect effects without conflating the individual-level and unit-level relationships (Wallace, Butts, Johnson, Stevens, & Smith, 2016). It allows the simultaneous estimation of testing indirect effects in mediation instead of relying on step-wise procedures to test mediation (i.e. Baron & Kenny, 1986) or piecemeal estimation techniques such as hierarchical linear modelling that is likely to bias results because they do not allow for simultaneous estimation of all parameters (Wallace & colleagues, 2016). To test the hypothesized moderation and moderated mediation effect of unit safety climate, I adapted Bauer, Preacher, and Gil's (2006) simultaneous multilevel regression procedure and applied it within Preacher and colleagues' (2010) approach to examine the indirect effect of safety knowledge/safety motivation on safety outcomes of safety-related events and workplace injuries via safety behaviours of safety compliance and safety initiative at different levels of the effects of unit safety climate (i.e. conditional effects). It was necessary to combine Preacher and colleagues' (2010) and Bauer and colleagues' (2006) approaches in testing the current model because Preacher and colleagues' (2010) approach does not address the issue of moderated mediation using path analysis whereas Bauer and colleagues' (2006) approach only addresses moderated mediation in the context of hierarchical linear modelling and not path analysis (Wallace & colleagues, 2016). Thus, utilizing these two approaches together (not in a single run) in testing the current model allowed me to employ the most statistically robust and appropriate framework to test the study's hypothesized relationships.

5.7.1. Unit-Level Analysis

Hypothesis 1 predicts that the use of HPWS for safety would be related to unit-level safety climate. As shown in Table 5.12, HPWS for safety significantly related to unit-level safety climate (β = 0.65, p < 0.01), controlling for safety-specific transformational leadership (β = 0.029, p > 0.05 n.s.) and bottom-line orientation (β = 0.146, p > 0.05 n.s.). This result indicates a support for hypothesis 1.

5.7.2. Cross-Level Analyses

Hypothesis 2 states that the use of HPWS for safety would relate positively to experienced HPWS for safety. As shown in Table 5.12, the use of HPWS for safety significantly relates to employees' experiences of HPWS for safety (β = 0.11, p < 0.05), thus providing a support for Hypothesis 2.

5.7.3. Individual-Level Analyses

5.7.3.1. Results of Analyses of the Influence of Experienced HPWS for Safety on Safety knowledge/safety motivation (H3 – H4)

The study posited that experienced HPWS for safety would positively relate to employees' Safety knowledge (Hypothesis 3) and safety motivation (Hypothesis 4). The results in Table 5.12 reveal that experienced HPWS for safety significantly related to employees' safety knowledge (β = 0.39, p < 0.01) and safety motivation (β = 0.11, p < 0.01), thereby providing support for Hypotheses 3 and 4.

Table 5.12: Multilevel Path Analysis Results (Hypotheses 1- 4)

Hypothesized Relationships	Betas	SE	t-Value	p	Sig
Use of HPWS for Safety → Safety Climate (H1)	0.65	0.05	13.55	0.00	S***
Safety-Specific Transformational Leadership (Control Variable)	0.03	0.34	0.08	0.93	n.s.
Bottom-Line Orientation (Control Variable)	0.15	0.56	0.26	0.79	n.s.
Use of HPWS for Safety → Experienced HPWS for Safety (H2)	0.11	0.05	2.04	0.04	S**
Experienced HPWS for Safety → Safety Knowledge (H 3)	0.39	0.04	9.38	0.000	S***
Experienced HPWS for Safety → Safety Motivation (H4)	0.11	0.03	3.83	0.000	S***

Note: * Significant at p < 0.01 (2-tailed), * significant at p < 0.05 (1-tailed) or P < 0.10 (2-tailed).**

5.7.3.2. Results of Analyses of the Mediating Roles of Safety knowledge/safety motivation on the Relationship between Experienced HPWS for Safety and Safety Behaviours (H4a – H8b)

It was hypothesized that HPWS for safety positively relates to safety compliance (Hypothesis 4a) and safety initiative (Hypothesis 4b). As shown in Table 5.13, the findings show that HPWS for safety positively related to safety compliance (β = 0.29, p < 0.01) and safety initiative (β = 0.27, p < 0.01), thereby suggesting support for Hypotheses 4a and 4b.

Hypothesis 5 posited that the relationship between safety knowledge and safety compliance will be stronger than the relationship between safety knowledge and safety initiative. As shown in Table 5.13, the findings indicate that the relationship between safety knowledge and safety compliance (β = 0.47, p < 0.01) is stronger than the relationship between safety knowledge and safety initiative (β = 0.34, p < 0.01), suggesting support for Hypothesis 5. It was also predicted that safety knowledge positively relates to safety compliance (Hypothesis 5a) and safety initiative (Hypothesis 5b). The findings suggest that safety knowledge significantly related to safety compliance (β = 0.47, p < 0.01) and safety initiative (β = 0.34, p < 0.01) indicating a support for Hypotheses 5a and 5b (See Table 5.13).

It was further hypothesized that the relationship between safety motivation and safety initiative will be stronger than the relationship between safety motivation and safety compliance (Hypothesis 6). The findings in Table 5.13 show that the relationship between safety motivation and safety initiative (β = 0.22, p < 0.01) is weaker than the relationship between safety motivation and safety compliance (β = 0.24, p < 0.01), indicating no support for Hypothesis 6. It was again hypothesized that safety motivation positively relates to safety compliance (Hypothesis 6a) and safety initiative (Hypothesis 6b). The results in Table 5.13 reveal that safety motivation significantly related to safety compliance (β = o.24, p < 0.01) and safety initiative (β = 0.22, p < 0.01) thereby suggesting support for Hypotheses 6a and 6b.

The study posited that employees' safety knowledge would mediate the positive relationship between experienced HPWS for safety and safety compliance (Hypothesis 7a) on one hand, and safety initiative (hypothesis 7b) on the other. In order to examine these hypotheses (i.e. 7a & 7b), I tested a model of the indirect effects of experienced HPWS for safety on safety compliance and safety initiative via safety knowledge. The results of the model tested reveal that experienced HPWS for safety significantly influence safety compliance (β = 0.18, p < 0.01) and safety initiative (β = 0.13, p < .0.01) via safety knowledge, suggesting support for the hypothesized mediating influence of safety knowledge on the relationship between experienced HPWS for safety and the safety behaviours of safety compliance and safety initiative.

It was further proposed that safety motivation would mediate the positive relationship between experienced HPWS for safety and employees' safety compliance (Hypothesis 8a) on one hand and employees' safety initiative (Hypothesis 8b) on the other. To assess these hypotheses, a model of the indirect influence of experienced HPWS for safety on safety compliance on one hand and on safety initiative on the other, via safety motivation was tested. As shown in Table 5.13, experienced HPWS for safety has statistically significant effects on safety compliance (β = 0.03, $p < 0.01$) and safety initiative (β = 0.02, $p < 0.01$) via safety motivation, providing a support for the prediction that safety motivation mediates the influence of experienced HPWS for safety on safety compliance and safety initiative.

Table 5.13: Multilevel Path Analysis Results (Hypotheses 4a-8b)

Hypothesized Relationships	Betas	SE	t-Value	p	Sig
HPWS for Safety → Safety Compliance (H4a)	0.29	0.04	6.72	0.000	S***
HPWS for Safety →Safety Initiative (H4b)	0.27	0.05	5.89	0.000	S***
Safety Knowledge → Safety Compliance (H5a)	0.47	0.06	7.73	0.000	S***
Safety Knowledge → Safety Initiative (H5b)	0.34	0.06	5.39	0.000	S***
Safety Motivation → Safety Compliance (H6a)	0.24	0.06	4.07	0.000	S***
Safety Motivation → Safety Initiative (H6b)	0.22	0.06	3.65	0.000	S***
Experienced HPWS for Safety → Safety knowledge → Safety Compliance (H7a)	0.18	0.03	6.21	0.000	S***
Experienced HPWS for Safety → Safety knowledge → Safety Initiative (H7b)	0.13	0.03	5.22	0.000	S***
Experienced HPWS for Safety → Safety Motivation → Safety Compliance (H8a)	0.03	0.01	2.85	0.000	S***
Experienced HPWS for Safety → Safety Motivation → Safety Initiative (H8b)	0.02	0.01	2.82	0.01	S***

Note: * Significant at p < 0.01 (2-tailed)**

5.7.3.3. Results of Analyses of the Relationship between Safety Behaviours and Safety Outcomes (H9a – H10b)

The study also predicted that safety compliance would negatively relate to safety-related events (Hypothesis 9a) and workplace injuries (Hypothesis 9b). As shown in Table 5.14, safety compliance has a significant negative relationship with safety-related events (β = -0.16, p < 0.01) and workplace injuries (β = -0.13, p < 0.05), thus, providing support for Hypotheses 9a and 9b. It was further hypothesized that safety initiative would negatively predict safety-related events (Hypothesis 10a) and workplace injuries (Hypothesis 10b). The findings in Table 5.14 show that, whereas, safety initiative negatively and significantly relates to workplace injuries (β = -0.11, p > 0.05), it was not so with safety-related events (β = -0.09, p > 0.05). Thus, although safety initiative negatively relates to safety-related events, this relationship is not significant. Therefore, while Hypotheses 10a did not receive support, hypothesis 10b was supported.

Table 5.14: Multilevel Path Analysis Results (Hypotheses 9a – 10b)

Hypothesized Relationships	Betas	SE	t-Value	p	Sig
Safety Compliance → Safety-Related Events (H9a)	-0.16	0.05	-3.02	0.00	S***
Safety Compliance → Workplace Injuries (H9b)	-0.13	0.03	-3.80	0.03	S**
Safety Initiative → Safety-Related Events (H10a)	-0.09	0.06	-1.40	0.16	n.s.
Safety Initiative → Workplace Injuries (H10b)	-0.11	0.04	-2.76	0.00	S**

Note: * Significant at p < 0.01 (2-tailed), ** Significant at p < 0.02 (2-tailed)**

5.7.3.4. Results of the Mediating Influence of Safety knowledge/Safety motivation and Safety Behaviours on the Relationship between Experienced HPWS for Safety and Safety Outcomes (H11 – H18)

Hypotheses 11 and 12 predict that safety knowledge and safety compliance would mediate the negative relationship between experienced HPWS for safety and safety-related events

(Hypothesis 11) on one hand, and workplace injuries (Hypothesis 12) on the other. To assess these hypotheses, a model of the indirect effects of experienced HPWS for safety on safety-related events and workplace injuries through safety knowledge and safety compliance was tested. The results indicate that the model tested show that experienced HPWS for safety has a significant negative influence on safety-related events (β = -0.03, p < 0.01) and workplace injuries (β = -0.02, p < 0.01) through safety knowledge and safety compliance, suggesting support for the Hypotheses 11 and 12.

The study also hypothesized that safety knowledge and safety initiative would mediate the negative influences of experienced HPWS for safety on safety-related events (Hypothesis 13) and workplace injuries (Hypothesis 14). As previously done, a model of the indirect influence of experienced HPWS for safety on safety-related events and workplace injuries via safety knowledge and safety initiative was tested. The results of the model tested indicate that, although experienced HPWS for safety negatively influences safety-related events (β = -0.01, p > 0.05) through safety knowledge and safety initiative, this relationship is not significant and therefore does not seem to have been mediated through safety knowledge and safety initiative (See Table 5.15). Thus, Hypothesis 13 did not receive support. With regard to the relationship between experienced HPWS for safety and workplace injuries through safety knowledge and safety initiative, the results of the model tested indicate that experienced HPWS for safety significantly influences workplace injuries (β = -0.01, p < 0.01), suggesting support for the hypothesis (Hypothesis 14) that safety knowledge and safety initiative mediate the relationship between experienced HPWS for safety and workplace injuries.

To examine hypotheses 15 and 16 which suggest that the negative influences of experienced HPWS for safety on safety-related events (Hypothesis 15) and workplace injuries (Hypothesis 16) would be mediated by both safety motivation and safety compliance, I tested a model of the indirect effects of experienced HPWS for safety on safety-related events and workplace injuries through safety motivation and safety compliance. The results of the model tested demonstrate that experienced HPWS for safety has a significant negative influence on both safety-related events (β = -0.00, $p < 0.05$) and workplace injuries (β = -0.00, $p < 0.05$) through safety motivation and safety compliance, indicating support for the hypotheses that safety motivation and safety compliance jointly mediate the relationship between experienced HPWS for safety and both safety-related events (Hypothesis 15) and workplace injuries (Hypothesis 16).

Hypotheses 17 and 18 posit that safety motivation and safety initiative would jointly mediate the negative relationship between experienced HPWS for safety and safety-related events (Hypothesis 17) on one hand, and workplace injuries (Hypothesis 18) on the other. As was the case with the previous analyses, a model of the indirect effects of experienced HPWS for safety on safety-related events and workplace injuries through safety motivation and safety initiative was tested. The result of the model tested indicates that, whereas experienced HPWS for safety negatively affects safety-related events (β = -0.00, $p > 0.05$), this relationship is not significant and therefore does not appear to have been mediated through safety motivation and safety initiative. In the same vein, the findings demonstrate that, although experienced HPWS for safety negatively affect workplace injuries (β = -0.00, $p > 0.05$), this relationship is not significant, thus, suggesting lack of mediation by safety motivation and safety initiative. The results of the foregoing analyses indicate no support for Hypotheses 17and 18 (See Table 5.15).

Table 5.15: Multilevel Path Analysis Results (Hypotheses 11 - 18)

Hypothesized Relationships	Betas	SE	t-Value	p	Sig
Experienced HPWS for Safety → Safety Knowledge → Safety Compliance→ Safety-Related Events (H11)	-0.03	0.01	-2.64	0.01	S***
Experienced HPWS for Safety → Safety Knowledge → Safety Compliance→ Workplace Injuries (H12)	-0.02	0.00	-3.71	0.00	S***
Experienced HPWS for Safety → Safety Knowledge → Safety Initiative→ Safety-Related Events (H13)	-0.01	0.00	-1.37	0.17	n.s.
Experienced HPWS for Safety → Safety Knowledge → Safety Initiative→ workplace injuries (H14)	-0.01	0.01	-2.36	0.02	S**
Experienced HPWS for Safety → Safety Motivation → Safety Compliance→ Safety-Related Events (H15)	-0.00	0.00	-1.97	0.05	S**
Experienced HPWS for Safety → Safety Motivation → Safety Compliance→ Workplace Injuries (H16)	-0.00	0.00	-2.20	0.03	S**
Experienced HPWS for Safety → Safety Motivation → Safety Initiative → Safety-Related Events (H17)	-0.00	0.00	-1.30	0.20	n.s.
Experienced HPWS for Safety → Safety Motivation → Safety Initiative → Workplace Injuries (H18)	-0.00	0.00	-1.91	0.06	n.s.

***** Significant at** $\boldsymbol{p} < 0.01\ (2 - tailed)$

5.7.4. Moderated Analyses (H19a– H20b)

I now turn to the moderation hypotheses. Unit-level safety climate was hypothesized to moderate the effects of safety knowledge on safety compliance (Hypothesis 19a) and safety initiative (Hypothesis 19b). The results in Table 5.16 show that safety climate significantly moderated the effects of safety knowledge on safety compliance (t = -2.321, P < 0.05) but not safety initiative (t = 0.501, p > 0.05). Thus, Hypothesis 19a is supported while Hypothesis 19b is not supported.

Unit-level safety climate was also hypothesized to moderate the influence of safety motivation on safety compliance (Hypothesis 20a) and safety initiative (Hypothesis 20b). The results in Table 5.16 reveal that, while the cross-level interaction effect between unit-level safety climate and safety motivation on safety compliance was partially significant ($t = -1.743$, $p < 0.10$), thecross-level interaction effect between unit-level safety climate and safety motivation on safety initiative was not significant ($t = 1.352$, $p > 0.10$), indicating partial support for Hypothesis 20a and no support for Hypotheses 20b. Figures 5.3, displays the interaction plot for this result. This figure indicates that employees who expressed greater safety knowledge of their jobs and who are high in safety climate shared perceptions demonstrate higher levels of compliance with safety rules and procedures. Conversely, employees who are low in safety climate shared perceptions demonstrate less compliance with rules and procedures

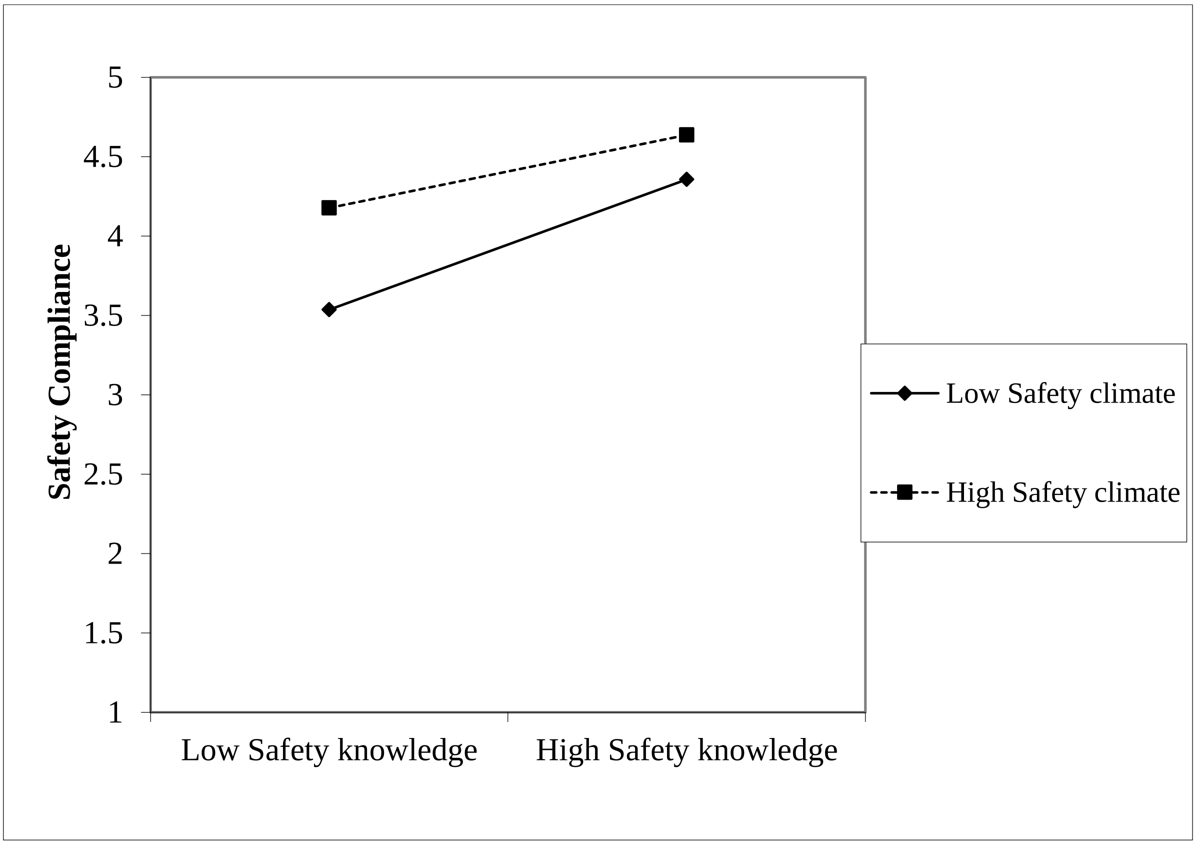


Figure 5.2: Moderation Effects of Safety Knowledge x Unit-Level Safety Climate → Safety Compliance

Table 5.16: Cross-Level Interaction Effect

Hypothesized Path	Betas	SE	t-Value	p	Sig
Safety Knowledge × Safety Climate → Safety Compliance (H19a)	-0.228	0.098	-2.321**	0.020	S**
Safety Knowledge × Safety Climate → Safety Initiative (H19b)	0.053	0.106	0.501	0.617	N.S.
Safety Motivation × Safety Climate → Safety Compliance (H20a)	-0.254	0.146	-1.743	0.081	S*
Safety Motivation × Safety Climate → Safety Initiative (H20b)	0.213	0.157	1.352	0.176	N.S.

$p < 0.05$ ($\mathbf{2-}$ ***tailed*); *$p < 0.10$ ($\mathbf{2-}$ ***tailed***)

5.7.5. Moderated Mediation Analysis

The next is the moderated mediation hypotheses. The unit-level safety climate was hypothesized to interact with safety knowledge to affect both safety-related events (Hypothesis 21a) and workplace injuries (Hypothesis 21b) via safety compliance. I also hypothesized that unit-level safety climate interact with safety knowledge to affect both safety-related events (Hypothesis 21c) and workplace injuries (Hypothesis 21d) via safety initiative. In addition, it was hypothesized that unit-level safety climate interact with safety motivation to affect safety-related events (Hypothesis 22a) and workplace injuries (Hypothesis 22b) via safety compliance. Furthermore, I hypothesized that unit-level safety climate interact with safety motivation to affect both safety-related events (Hypothesis 22c) and workplace injuries (Hypothesis 22d) via safety initiative. The results of these analyses (See Table 5.17) suggest that safety compliance and safety initiative did not mediate the relationship between the interaction of safety knowledge/safety motivation and unit-level safety climate on safety outcomes of safety-related events and workplace injuries. Therefore, Hypotheses 21a to 22d are not supported.

Table 5.17: Moderated Mediation Effect

Safety knowledge x safety climate →safety compliance → safety-related events (H21a)	Betas	SE	t-Value	P
Safety Climate low (= 3.47; -1SD)	-0.019	0.074	-0.252	0.801
Safety climate high (= 4.46; +1SD)	-0.015	0.069	-0.210	0.834
Moderated Mediation	0.004	0.006	0.759	0.448
Safety knowledge x safety climate → safety compliance → workplace injuries (H21b)	**Betas**	**SE**	**t-Value**	**P**
Safety Climate low (= 3.47; -1SD)	-0.007	0.017	-0.412	0.680
Safety climate high (= 4.46; +1SD)	-0.005	0.013	-0.382	0.702
Moderated Mediation	0.002	0.004	0.493	0.622
Safety knowledge x safety climate → safety initiative → safety-related events (H21c)	**Betas**	**SE**	**t-Value**	**P**
Safety climate low (= 3.47; -1SD)	-0.011	0.007	-1.464	0.143
Safety climate high (= 4.46; +1SD)	-0.013	0.011	-1.253	0.210
Moderated mediation	-0.002	0.004	-0.596	0.551
Safety knowledge x safety climate → safety initiative → workplace injuries (H21d)	**Betas**	**SE**	**t-Value**	**P**
Safety climate low (= 3.47; -1SD)	-0.007	0.004	-1.755	0.079
Safety climate high (= 4.46; +1SD)	-0.008	0.005	-1.598	0.110
Moderated Mediation	-0.001	0.002	-0.580	0.562
Safety motivation x safety climate → safety compliance → safety-related events (H22a)	**Betas**	**SE**	**t-Value**	**P**
Safety climate low (= 3.47; -1SD)	-0.009	0.007	-1.226	0.220
Safety climate high (= 4.46; +1SD)	-0.010	0.009	-1.135	0.256
Moderated Mediation	-0.001	0.002	-0.590	0.555
Safety motivation x safety climate → safety compliance → workplace injuries (H22b)	**Betas**	**SE**	**t-Value**	**P**
Safety climate low (= 3.47; -1SD)	-0.004	0.088	-0.051	0.960
Safety climate high (= 4.46; +1SD)	-0.004	0.105	-0.040	0.968
Moderated Mediation	0.000	0.017	0.017	0.986
Safety motivation x safety climate → safety initiative → safety-related events (H22c)	**Betas**	**SE**	**t-Value**	**P**
Safety climate low (= 3.47; -1SD)	-0.001	0.001	-0.902	0.367
Safety climate high (= 4.46; +1SD)	-0.002	0.003	-0.803	0.422
Moderated Mediation	-0.001	0.002	-0.690	0.490
Safety motivation x safety climate → safety initiative → safety-related events (H22d)	**Betas**	**SE**	**t-Value**	**P**
Safety climate low (= 3.47; -1SD)	-0.001	0.001	-1.174	0.241
Safety climate high (= 4.46; +1SD)	-0.001	0.001	-1.123	0.261
Moderated Mediation	-0.001	0.001	-0.910	0.363

5.8. Summary of Findings

Table 5.18 presents the summary of findings of the test of unit- and individual level hypotheses

HYPOTHESIZED RELATIONSHIPS	TYPE OF MEDIATION HYPOTHESIZED	SUPPORTED/NOT SUPPORTED
Use of HPWS for Safety → Safety Climate (H1	NA	Supported
Use of HPWS for Safety → Experienced HPWS for Safety (H2)	NA	Supported
Experienced HPWS for Safety → Safety Knowledge (H 3)	NA	Supported
Experienced HPWS for Safety → Safety Motivation (H4)	NA	Supported
Experienced HPWS for Safety → Safety Compliance (H4a)	NA	Supported
Experienced HPWS for Safety → Safety Initiative (H4b)	NA	Supported
Experienced HPWS for Safety → Safety Compliance (H4a)	NA	Supported
Experienced HPWS for Safety → Safety Initiative (H4b)	NA	Supported
Safety Knowledge → Safety Compliance (H5a)	NA	Supported
Safety Knowledge → Safety Initiative (H5b)	NA	Supported
Safety Motivation → Safety Compliance (H6a)	NA	Supported
Safety Motivation → Safety Initiative (H6b)	NA	Supported
Experienced HPWS for Safety → Safety knowledge → Safety Compliance (H7a)	Mediation	Supported
Experienced HPWS for Safety → Safety knowledge → Safety Initiative (H7b)	Mediation	Supported
Experienced HPWS for Safety → Safety Motivation → Safety Compliance (H8a)	Mediation	Supported
Experienced HPWS for Safety → Safety Motivation → Safety Initiative (H8b)	Mediation	Supported
Safety Compliance → Safety-Related Events (H9a	NA	Supported
Safety Compliance → Workplace Injuries (H9b	NA	Supported
Safety Initiative → Safety-Related Events (H10a)	NA	Not Supported
Safety Initiative → Workplace Injuries (H10b)	NA	Supported
Experienced HPWS for Safety → Safety Knowledge → Safety Compliance→ Safety-Related Events (H11)	Mediation	Supported
Experienced HPWS for Safety → Safety Knowledge → Safety Compliance→ Workplace Injuries (H112)	Mediation	Supported
Experienced HPWS for Safety → Safety Knowledge → Safety Initiative→ Safety-Related Events (H13)	Mediation	Not Supported (No mediation)
Experienced HPWS for Safety → Safety Knowledge → Safety Initiative→ workplace injuries (H14)	Mediation	Supported
Experienced HPWS for Safety → Safety Motivation → Safety Compliance→ Safety-Related Events (H15)	Mediation	Supported
Experienced HPWS for Safety → Safety Motivation → Safety Compliance→ Workplace Injuries (H16)	Mediation	Supported
Experienced HPWS for Safety → Safety Motivation → Safety Initiative → Safety-Related Events (H17)	Mediation	Not Supported (No mediation)

Experienced HPWS for Safety → Safety Motivation → Safety Initiative → Workplace Injuries (H18)	Mediation	Not Supported (No mediation)

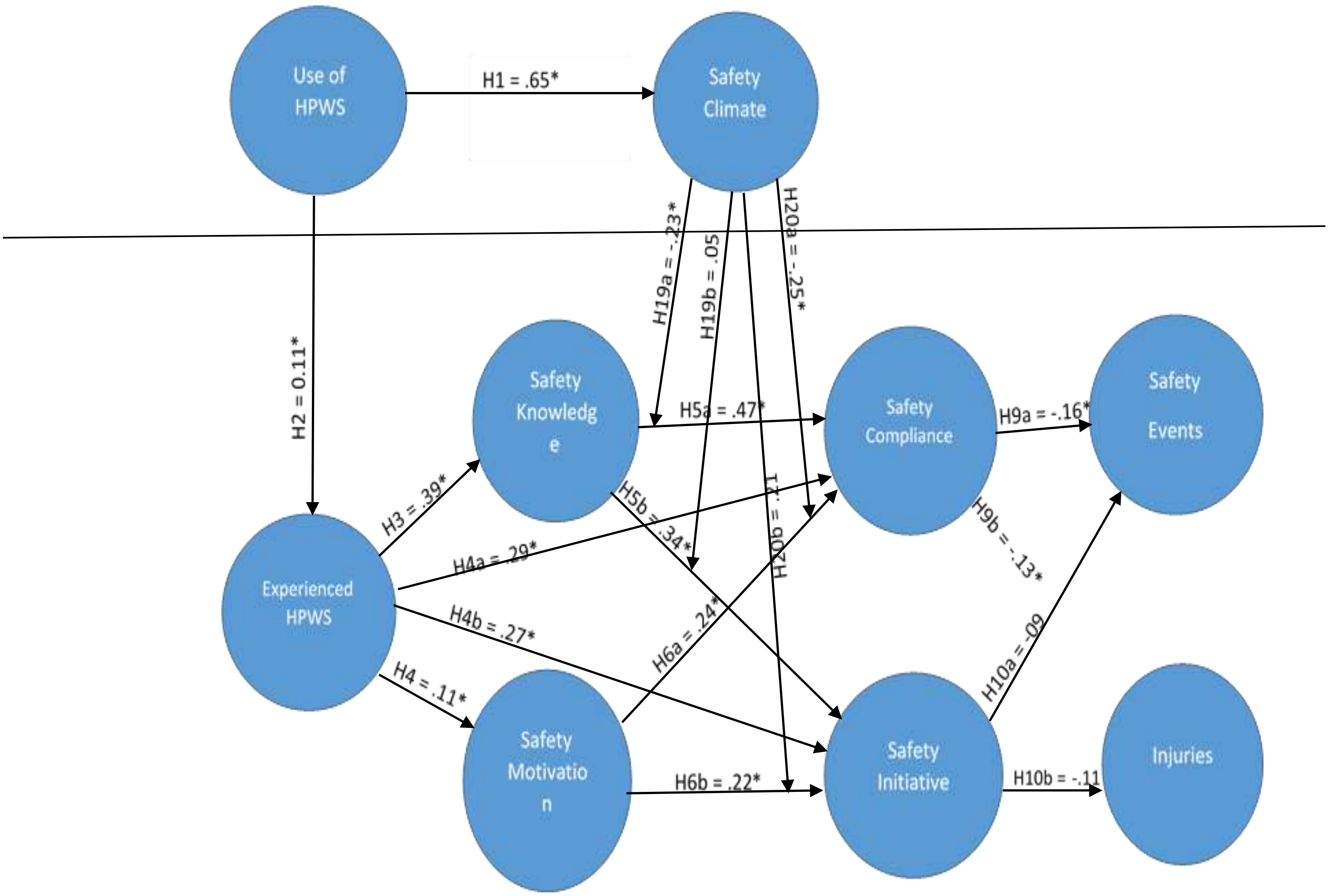
Table 5:19: Summary of Findings of the Test of Moderation Hypotheses

HYPOTHESIZED RELATIONSHIPS	MODERATION	SUPPORTED/NOT SUPPORTED
Safety Knowledge X Safety Climate → Safety Compliance (H19a)	Moderation	Supported
Safety Knowledge x Safety Climate → Safety Initiative (H19b)	Moderation	Not Supported
Safety Motivation X Safety Climate → Safety Compliance (H20a)	Moderation	Partially Supported
Safety Motivation X Safety Climate → Safety Initiative (H20b)	Moderation	Not Supported

Table 5:20: Summary of Findings of the Test of Moderated Mediation Hypotheses

HYPOTHESIZED RELATIONSHIPS	MODERATEDMEDIATION	SUPPORTED/NOT SUPPORTED
Safety Knowledge X Safety Climate → Safety Compliance → Safety-related Events (H21a)	Mod-Med	Not Supported
Safety Knowledge X Safety Climate → Safety Compliance → Workplace Injuries (H21b)	Mod-Med	Not Supported
Safety Knowledge x Safety Climate → Safety Initiative → Safety-related Events (H21c)	Mod-Med	Not Supported
Safety Knowledge x Safety Climate → Safety Initiative → Workplace Injuries (H21d)	Mod-Med	Not Supported
Safety Motivation X Safety Climate → Safety Compliance → Safety-related Events (H22a)	Mod-Med	Not Supported
Safety Motivation X Safety Climate → Safety Compliance → Workplace Injuries (H22b)	Mod-Med	Not Supported
Safety Motivation X Safety Climate → Safety Initiative → Safety-related Events (H22c)	Mod-Med	Not Supported
Safety Motivation X Safety Climate → Safety Initiative → Workplace Injuries (H22d)	Mod-Med	Not Supported

Unit-Level



Individual-Level

Figure 5:3: Pattern of Hypothesized Relationships

5.9. Conclusion

In chapter 5, I further validated the new HPWS for safety scale by conducting more exploratory factor analysis (EFA), reliability coefficient analysis, convergent and discriminant validity analysis, and series of confirmatory factor analyses (CFA) using another independent sample of 64 managers and 569 frontline employees. Finally, all the hypothesized models were tested using Mplus software and then the findings were accordingly summarized. In the next chapter, I present the summary of the key findings of the study, the implications of the findings, and directions for future research.

6.0. CHAPTER 6: DISCUSSION

6.1. Introduction

The aim of this chapter is to demonstrate the research series presented in this study, starting with the process of scale development and validation that involves three separate studies, and the main study (Study 4). In doing so, I have made attempt to identify the salient findings of these studies and their theoretical as well as practical implications or contributions. I also highlighted, in this chapter, the methodological contributions or strengths as well as the limitations of the study, mapping out some possible future research directions. However, before then, I have here presented the summary of the thesis.

6.2. Summary of the Thesis

The purpose of this study is to build on the existing research to develop and validate a theoretically informed measure of HPWS for safety and to propose and test a multilevel model of the mechanisms through which the use of HPWS for safety influence employee safety outcomes. To achieve these objectives, I carried out four independent studies. Studies 1 to 3 aimed to develop and validate a safety-specific HPWS scale while Study 4, though further used to validate the scale, primarily aimed to examine the multilevel model of the mechanisms through which HPWS for safety facilitates safety outcomes of safety-related events and workplace injuries.

Drawing on AMO framework, I developed and validated a theoretically driven, internally coherent and integrative measure of a system of HR and safety practices (i.e. HPWS for safety). Safety outcomes such as injuries and accidents are variables that include individual, unit, and even organizational considerations as antecedents (e.g. Neal & Griffin, 2006; Probst, 2004; Simard & Marchand, 1994). Drawing on SET and SIP, I examined experienced

HPWS for safety and unit safety climate as distal antecedents of safety outcomes of safety-related events and workplace injuries, with safety knowledge/safety motivation and safety behaviours of safety compliance and safety initiative operating as mediating mechanisms. By testing a multilevel mediation model at the individual-level of analysis, I found experienced HPWS for safety (an individual-level distal antecedent) to indirectly predict safety-related events and workplace injuries through safety knowledge and safety compliance. And although experienced HPWS for safety predicted workplace injuries through safety knowledge and safety initiative, it was not so for safety-related events. Furthermore, the individual-level antecedent (i.e. experienced HPWS for safety) was found to predict safety-related events and workplace injuries via safety motivation and safety compliance (a chain mediation process), but not so via safety motivation and safety initiative. In addition, and in line with SIP and SET, safety knowledge and unit safety climate interacted to enhance safety compliance. The use of HPWS for safety was also found to significantly predict unit safety climate and employee experienced HPWS for safety.

6.3. Summary of Key Findings

6.3.1. Psychometric Properties of the HPWS for Safety Scale

To develop and validate a HPWS for safety scale, this study utilized four separate samples from four studies. In Study 1, I conducted a qualitative interview with a number of HR and Safety professionals drawn from oil and gas companies in Nigeria. The interviews confirmed eight (8) a priori content practices (and forty items) of HRM consisting of safety training, safety rewards, internal opportunity for promotion, safety involvement and participation, performance appraisals, self-managed team, safety information sharing, and clear job descriptions. However, six (6) additional HRM practices (and 24 items) that are used to promote safety in the Nigerian oil and gas companies were identified. These include safety audit, safety campaign, safety equipment maintenance, accident prevention, total loss control community, and safety initiative. These fourteen (14) HRM practices and sixty-four items were subjected to eleven doctoral researchers in Aston Business School for classification and subsequently, to interrater reliability assessment in order to refine the items for subsequent validation purposes. In Studies 2, 3, and 4, I validated the scale using EFA and CFA, and subsequently, through convergent, discriminant, and criterion-related validity in order to reduce the length and confirm the factor structure of the scale. In all, the scale emerged in a robust and reliable ten practices and 27-item HPWS for safety scale. Therefore, the findings provide evidence of good psychometric properties of the newly developed HPWS for safety scale. Specifically, the findings supported the reliability as well as the convergent, discriminant, and criterion-related validities of the new scale (See Appendix J).

6.3.2. Unit-Level Findings

Only one hypothesis was tested at this level. Specifically, I hypothesized that the use of HPWS for safety directly relates to unit-level safety climate. The result was found to be significant. This finding has further enhanced our understanding of the significant role of HPWS as a proximal antecedent of unit safety climate. It helps to enhance SHRM literature by establishing the mechanism by which HRM and unit safety climate interrelate (See Bowen & Ostroff, 2004).

6.3.3. Cross- and Individual-Level Findings

As earlier stated, to examine the relationships at the individual-level of analysis, I adapted Preacher and colleagues (2010) approach and tested a path model specifying indirect effects of experienced HPWS for safety on safety outcomes of safety-related events and workplace injuries through safety knowledge/safety motivation and safety behaviours of safety compliance and safety initiative (x → m1 → m2 → y) while simultaneously taking into cognizance direct effects and the nesting of individuals within the units (i.e. the inclusion of random intercepts and slopes: Wallace & colleagues, 2016). In addition, I included sex, age, level of education, and tenure on the job as control variables.

First, controlling for sex and education, the use of HPWS for safety showed a significant effect on experienced HPWS for safety. Second, experienced HPWS for safety significantly influenced employees' safety knowledge and safety motivation. Third, experienced HPWS for safety significantly related to the safety behaviours of safety compliance and safety initiative. Fourth, the relationship between safety knowledge and safety compliance is stronger than the relationship between safety knowledge and safety initiative, whereas, the relationship between safety motivation and safety initiative is weaker than the relationship between safety motivation and safety compliance. Fifth, safety knowledge was found to mediate the influence of HPWS for safety on both safety compliance and safety initiative. Similarly, safety motivation was found to mediate the influence of HPWS for safety on safety compliance and safety initiative. Sixth, safety knowledge and safety compliance jointly (i.e. in a chain) mediated the relationship between experienced HPWS for safety and both safety-related events and workplace injuries. In the same vein, although there seems to be no significant relationship between safety initiative and workplace injuries, safety knowledge and safety initiative jointly (i.e. in a chain) mediated the relationship between experienced HPWS for safety and employees' workplace injuries. This finding is contrary to "conventional wisdom" (Hayes, 2013, p. 88) where it was suggested that, for mediation to be established, x must be related to y, m1, and m2; m1 and m2 must be related; and m1 and m2 must be related to y (See x → m1 → m2 → y mediation chain) (Baron & Kenny, 1986). However, research has shown that "lack of correlation does not disprove causation" and "correlation is neither a necessary nor a sufficient condition of causality" (Bollen, 1989, p. 52: cited in Hayes, 2013, p. 88). Seventh, safety motivation and safety compliance jointly mediated the relationship between experienced HPWS for safety and both safety-related events and workplace injuries (See Table 5.17). Lastly, unit safety climate significantly moderated the effect of safety knowledge on safety compliance.

6.4. Theoretical Implications/Contributions

The findings of this study mostly supported my theoretical framework and offer several implications for SHRM and safety research. In this section, therefore, I provide a general overview of the five specific theoretical contributions of the study.

6.4.1. Scale Development and Validation

The first significant contribution made by this research is the development and validation of HPWS for safety scale. Whereas there is research examining individual HRM practices-workplace safety relationships (e.g. Lauver, 2007; Harvey & colleagues, 2001), with the exception of Zacharatos and colleagues (2005), Evans and Davis (2015), there is a paucity of research that has examined how these practices synergistically combine to impact workplace safety either at the organizational, individual or both levels of analysis. Many studies have used HPWS scales that were neither validated (See Liao & colleagues, 2009; Zacharatos & colleagues, 2005 for exception) nor strategically focused (Bowen & Ostroff, 2004). Consequently, this study fills this gap in SHRM and safety research by developing and validating a theoretically driven, internally coherent and integrative measure of a system of HR and safety practices (i.e. HPWS for safety). This measure which was informed by AMO framework (Boxall & Macky, 2009; Wood & Wall, 2007; Lepak & colleagues, 2006; Purcell, Kinnie, Hutchinson, Rayton, & Swart, 2003; Appelbaum & colleagues., 2000) covers ten HR safety practices domain: safety training, safety rewards, internal opportunity for promotion, safety involvement and participation, self-managed team, performance appraisals, safety information sharing, safety audit, safety campaign, and safety equipment maintenance. It is expected that this will enhance theoretical approach in three ways: (i) speak to Delaney and Huselid's (1996) concern that the SHRM literature "is distinguished by the fact that virtually no two studies measure HRM practices in the same way" (p. 967), (ii) address the absence of a theoretically informed measure of high performance human resource practices (Delery, 1998) in safety context, and (iii) achieving the need for a strategically-focused HPWS which is related to but goes beyond the motivation for Delaney and Huselid's call.

6.4.2. Multilevel Approach

This study contributes to SHRM and safety research by adopting a multilevel perspective to account for the influence of HPWS on workplace safety. Multilevel research designs have the potential to bridge the gap between the previously and popularly known research tradition of SHRM that emphasizes organizational level analysis of the system of HRM and performance outcomes and micro level organizational behaviour that focuses on individuals' attitudinal and behavioural responses (Snape & Redman, 2010). Again, since HRM practices are essentially unit-level management interventions that must transmit to organizational level or individual level outcomes through their effects on individuals' attitudes and behaviours (Snape & Redman, 2010), multilevel research designs have the potentials to open the "black box" of HRM – performance relationships. In addition, research has recognized that organizations do not perform but rather that the performance of individual employees enables organizations to achieve their goals (Kozlowski & Klein, 2000), leading to a focus on individual-level performance implications of HPWS (Kehoe & Wright, 2013; Snape & Redman, 2010; Liao & colleagues, 2009). Drawing on the above, SHRM research (e.g.

Paauwe, 2009; Gerhart, 2005; Bowen & Ostroff, 2004) has called for more multilevel studies. For example, Bowen and Ostroff (2004) suggest that SHRM researchers should move closer to the individual level by emphasizing HRM's influence on employee attributes. Although SHRM researchers have begun to address this issue (e.g. Aryee & colleagues, 2012; Takeuchi & colleagues; Wu & Chaturvedi, 2009), the extant literature has yielded only limited insights into the influence of the use of HPWS on employee performance outcomes in the safety context. In this study, I have examined simultaneously the impact and influence processes of unit safety-specific HPWS (i.e. use of HPWS for safety) on employee safety outcomes. I have demonstrated that unit-level HPWS for safety practices have an effect on employee safety outcomes of safety-related events and workplace injuries through employee experienced HPWS for safety, safety knowledge/safety motivation, and safety behaviours of safety compliance and safety initiative. Specifically, the findings of this study indicates that the use of HPWS for safety is significantly related to experienced HPWS for safety. Specifically, this study integrated safety knowledge and safety motivation perspectives to examine the mediating mechanism of the relationships between experienced HPWS for safety and safety behaviours of safety compliance and safety initiative. Although prior studies have separately examined the influence of human capital (knowledge) (e.g. Jiang & colleagues, 2015; Jiang & colleagues, 2012; Takeuchi & colleagues, 2007) and employee empowerment (motivation) (e.g. Aryee & colleagues, 2012), research integrating the two perspectives to examine their simultaneous influence on the relationship between experienced HPWS for safety and safety behaviours is scant. Because the two perspectives represent different elements of organizational success, I theoretically combined them to provide a more complete understanding of their role in mediating the impacts of experienced HPWS for safety on safety behaviours of safety compliance and safety initiative. In doing so, I have extended prior studies by demonstrating the simultaneous mediating roles of safety knowledge and safety motivation. This finding suggest that safety knowledge and safety motivation are important proximal antecedents of safety behaviours of safety compliance and safety initiative and may contribute to organizational effectiveness in several aspects. The findings also indicate that experienced HPWS for safety has significant direct positive effect on safety knowledge and safety motivation. In addition, the findings show that experienced HPWS for safety is significantly and negatively related to both safety-related events and workplace injuries through the mediating role of safety knowledge and safety compliance. Furthermore, the findings indicate that safety knowledge and safety initiative significantly mediated the negative influence of experienced HPWS for safety on workplace injuries. Again, the results have shown that safety motivation and safety compliance significantly mediated the negative effects of experienced HPWS for safety on both safety-related events and workplace injuries.

Although prior research, linking HPWS to workplace safety (e.g. Zacharatos & colleagues, 2005), has shown experienced HPWS as a distal predictor of personal safety orientation (described in terms of safety knowledge, safety motivation, safety compliance, and safety initiative) through trust in management and safety climate, the cross-level influence of the use of HPWS for safety on Experienced HPWS for safety, the integration of safety knowledge/safety motivation as mediators between experienced HPWS for safety and safety behaviours, and positing safety behaviours as proximal antecedents of safety outcomes, using a multilevel perspective, is a fundamental extension of prior work to help explain the processes of how they operate in unism to facilitate safety outcomes. Thus, it can be argued that the present study is among the earliest to examine the potential mediating role of safety knowledge/safety motivation and safety behaviours in terms of safety compliance and safety initiative, in the relationship between HPWS (for safety) and employee safety outcomes (e.g. safety-related events and workplace injuries). The results demonstrate that when employees perceive that the unit recognizes their contributions toward the organization and demonstrate concern for their safety and well-being through the implementation of HPWS for safety practices, SET demands that they will more likely reciprocate by engaging in positive safety attitudes and safety behaviours which, in turn, engender positive safety outcomes. These findings add to the growing literature on the specific mechanisms through which HPWS contribute to performance and further shed light on the specific process in the safety context. This study has also moved beyond the demonstration of the main effects of HRM practices to an examination of how (Datta & colleagues, 2005) and why high performance HR practices are related to organizational performance (Collins & Smith, 2006), in this case, in safety context.

The findings further demonstrate how integration between micro and macro HRM can further our understanding of how SHRM constructs work and impact outcomes across different levels of analysis (Wright & Boswell 2002), thereby validating Gerhart's (2005) and Bowen and Ostroff's (2004) call that SHRM should move closer to the individual by emphasizing the impact of HR practices on employee attributes.

These findings linking HPWS for safety and individual safety outcomes has significant implication for SHRM literature that has hitherto focused on productivity to the neglect of workplace safety. It shows that performance can be measured in a number of ways and that HPWS can have positive effects on a variety of outcomes including safety outcomes. This is consistent with Zacharatos and colleagues (2005) who argue that HPWS could be applied to improve workplace safety "just as well as firm economic performance" (p. 78). It also resonates with the argument that safety should be regarded as a performance variable just like production, profits, sales, customer services and quality control (Kivimaki, Kalimo, & Salminen, 1995; Griffiths, 1985), suggesting that many of the management practices that are frequently applied to improve organizational performance may have equal or greater effects on workplace injuries (Kaminski, 2001).

6.4.3. Direct Relationship between Use of HPWS for Safety and Unit Safety Climate

The findings of this study have further enhanced our understanding of the significant role of HPWS as a proximal antecedent of unit safety climate. Although the relationship between HRM and climate is well established in SHRM literature, the mechanisms by which they interrelate are poorly understood (Bowen & Ostroff, 2004). For instance, Boxall (1996) notes that knowledge of HRM practices is widespread, but knowledge of how to refine and implement them within a particular context (e.g. a particular strategic focus like workplace safety) may be lacking. Applying this to climate, Schneider (2000) observes that there is little research or understanding of how organizational climate actually develops. Similarly, the effects of HRM and safety-related policies and practices on safety climate have been documented as significant contributors to organization-level safety climate (Neal and Griffin, 2004). Extant safety literature (e.g. Jiang & colleagues, 2010; Clarke, 2006; Zacharatos & colleagues, 2005; Zohar & Luria, 2003; Barling & colleagues, 2001; Neal & colleagues, 2000; Zohar, 2000) also demonstrates that safety climate is related to safety-related variables such as safety knowledge and safety motivation and safety behaviours such as safety compliance and safety initiative. However, what is not well known are the proximal organizational factors that create positive safety climate and the mechanisms by which those factors and climate for something interrelate. This is consistent with Bowen and Ostroff (2004) who opine that intuitive acceptance of an HRM-climate linkage far exceeds theory development of the mechanisms responsible. The finding of this study reveal that the use of HPWS for safety is significantly related to unit-level safety climate. This study extends the organizational climate literature in general and the research of safety climate in particular by examining how safety-specific HRM practices synergistically work together to influence safety climate. It adds to the limited research that has examined HRM practices as proximal antecedents of safety climate (Zacharatos & colleagues, 2005). Thus, finding the direct relationship between HPWS for safety and unit safety climate provides an important empirical support for the notion that climates are formed largely based on organizational practices and procedures, and accordingly adds and extends the research that redresses the dearth of research that examines antecedents of climate (Takeuchi & colleagues, 2009; Ostroff & colleagues, 2003). These findings are consistent with Zacharatos and colleagues (2005) who contend that many of the practices associated with HPWS are hypothesized to result in an individual's positive perceptions of safety climate. For instance, when management is seen to offer extensive safety training or rewards contingent on safety performance because it is committed to employees' safety, rather than simply complying with government regulations or pressure from the union, perceived safety climate is fostered.

6.4.4. Joint Effects of Unit Safety Climate and Safety Knowledge/Safety Motivation on Safety Behaviours/Safety Outcomes

The current study is one of the first attempts to empirically indicate the joint effects of safety knowledge/safety motivation and unit safety climate on either safety behaviours or safety outcomes (i.e. safety-related events and workplace injuries) and to incorporate an explanatory mechanism for these effects. This study did not only adopt an integrative, multilevel approach with all its attendant advantages over prior studies (e.g. Zacharatos & colleagues, 2005), it also extends prior theory and research on SET (Blau, 1964) and SIP (Salancik & Pfeffer, 1978) by providing insights into how employees would respond positively within implied obligations to perceived employers' priority for meeting their obligations, treating employees fairly, and providing valued services and benefits (SET). This study contends that the mediating role of safety knowledge/safety motivation and safety behaviours in the relationship between HPWS for safety and both safety-related events and workplace injuries demonstrates a relational view of employment relationship, with employees reciprocating the favourable treatment received from the unit. This study also contends that the use of HPWS for safety serves as a signalling function by communicating messages to employees concerning a particular strategic focus (i.e. workplace safety). This explanation is based on SIP that suggests that individual employees who work in a shared social environment will receive similar social cues or normative expectations about appropriate safety behaviours. The results of this study support that workplace climate high in employee safety and well-being enhances employee safety knowledge to comply with safety policies and procedures (Neal & Griffin, 2006; Brown & Leigh, 1996). This facilitates safety behaviours. Thus, this study has provided a more comprehensive understanding of how employee safety knowledge interact with unit safety climate to foster employee safety behaviours.

6.4.5. Further Conceptualization of Safety Behaviours and Safety Outcomes

Because different authors have interchangeably used the terms safety behaviours and safety outcomes in research, I have, in this research, clarified the definitions and conceptualization of safety behaviours and safety outcomes. For example, safety performance has been used to refer to two different concepts. First, and as earlier noted, it has been defined as a metric for safety-related behaviours of individuals (e.g. Clarke, 2006; Zacharatos & colleagues, 2005; Neal & Griffin, 2004; Burke & colleagues, 2002; Marchand & colleagues, 1998). It has also been described as an organizational metric for safety outcomes, such as number of injuries per year (e.g. Zacharatos & colleagues, 2005). Thus, it is essential to distinguish safety-related performance/behaviours from safety outcomes of those behaviours because, as Christian and colleagues (2009) observe, each of them might have differential pattern of relationships with antecedents. Emphasizing on the need to differentiate between safety behaviours and safety outcomes, Christian and colleagues (2009) note that when safety performance is conceptualized as individual behaviours, it provides researchers with a measurable criterion that is more proximally related to psychological factors than safety outcomes such as accidents or injuries. In the same vein, Zohar (2000) argues that safety behaviours are better predicted than safety outcomes. Thus, to distinguish between the constructs in this study, I conceptualize safety behaviours as actions or behaviours individuals demonstrate that promote health and safety in the workplace (e.g. safety compliance, safety participation, safety initiative, safety-specific organizational citizenship behaviours, safety-specific creativity, etc.). Similarly, I conceptualize safety outcomes as tangible events or results such as workplace injuries, accidents, fatalities, safety-related events, etc. By clarifying the definitions and conceptualizations of safety behaviours and safety outcomes, this study enhances our understanding of how to promote workplace safety. It also extends the extant safety literature by responding to the clarion call (See Christian & colleagues, 2009) to distinguish between safety behaviours and safety outcomes. Thus, the delineation of the two constructs is a critical step to facilitate not only the organization of accumulated knowledge, but also the development of theory in the safety domain (Christian & colleagues, 2009).

As earlier noted, the final linkage between safety performance as behaviour and safety outcomes (e.g. Neal & colleagues, 2000; Griffin & Neal, 2000; Sigmard & Marchand, 1995) constitutes another issue that is often overlooked in safety literature. Rarely have the two been examined in the same study. In this study, I have examined the effects of the safety behaviours of safety compliance and safety initiative on safety outcomes of safety-related events and workplace injuries. The finding reveals safety compliance to be significantly related to both safety-specific events and workplace injuries. The finding also reveals safety initiative to be significantly related to workplace injuries. HPWS for safety practices promote employee goal attainment in terms of safety and well-being. When employees perceive this kind organizational gesture, SET demands that they reciprocate the organization’s inducement or favourable treatment by engaging in safety-related activities that heighten their safety behaviours, and this, in turn, impact on their safety outcomes in terms of safety-related events and workplace injuries. Thus, this finding fosters our understanding of how the implementation of HPWS for safety practices constitutes an organization’s strategy for managing the employee-organization relationship through enhancing a high-quality relationship.

There are also a number of findings that were not consistent with my expectations. First, safety initiative was unrelated to safety-related events. This could have affected the relationship between experienced HPWS for safety and safety-related events through a mediational chain of safety knowledge and safety initiative. It is also possible that it could have affected the effects of experienced HPWS for safety on both safety-related events and workplace injuries via the mediational chain of safety motivation and safety initiative. The reason for this unexpected result could be that, while the organizations emphasize more employee compliance with safety rules and procedures, the emphasis on employees’ discretionary behaviour such as safety initiative is inadequate to exert expected influence on workplace incidents such as safety-related events and workplace safety. Another plausible explanation for these findings could be because the study adopted a cross-sectional design approach to the study. This is consistent with Neal and Griffin (2006) who note that change in the overall level of safety behaviours in a group should take time to produce changes in safety outcomes for that group, suggesting that the effect is likely to be lagged. It has been argued that a link between safety behaviours and safety outcomes is more appropriate when it is observed at the unit level rather than the individual level of analysis (Neal & Griffin, 2006). It is also plausible that other forms of discretionary behaviour such as safety OCB or safety-related creativity may be more closely associated with safety outcomes. Although safety compliance was found to be related to both safety-related events and workplace injuries, I am of the opinion that adopting a longitudinal design may improve the relationships between these safety behaviours (i.e. safety compliance and safety initiative) and safety outcomes of safety-related events and workplace injuries. In addition, I encourage future studies to explore the relationship between both safety compliance and safety initiative and safety outcomes at the unit level of analysis and to try out the relationship between other forms of discretionary behaviour (e.g. safety OCB) and safety outcomes. Second, the results show that the unit safety climate moderated the effects of safety knowledge on safety compliance and not safety initiative. Probst (2004) suggests that an organization's climate provides employees with cues with regard to what behaviour and outcomes will be reinforced or punished within the organization. Thus, it is plausible that in this circumstance, the organizations convey signals demonstrating the relative importance of organization's safety rules and procedures (safety compliance) as against or compared to discretionary behaviour (e.g. safety initiative). In other words, the supportive environment is more in favour of compliance with organization's rules and procedures rather than safety initiative. In response, employees might interpret these messages to mean that they should focus more on safety compliance if they wish to retain their employment. Thus, the findings of the present study could indicate that the extent to which safety behaviours (i.e. safety compliance and safety initiative) were affected was directly related to the extent to which employees perceived these behaviours to be differentially emphasized within the organization. However, future research should employ some other discretionary behaviour such as safety OCB or safety-related creativity in place of safety initiative. Third, contrary to my prediction, the relationship between safety motivation and safety initiative was weaker than the relationship between safety motivation and safety compliance. Fourth, the results indicate that safety compliance and safety initiative did not mediate the relationship between the interaction of safety knowledge/safety motivation and unit-level safety climate on safety outcomes of safety-related events and workplace injuries. The reason for this unexpected result could be attributed to the fact that the study adopted the cross-sectional research design. The cross-sectional research design indicates, for example, that employee safety behaviours were measured after the performance period leading to the prediction of past safety outcomes (Wright & colleagues, 2005). The explanation is that organizations can decide to create a supportive environment (Nahrgand, Morgeson, & Hofmann, 2011) or a shared perception of safety climate among employees by, for example, (i) investing in induction programmes that emphasize safety practices and on-the-job safety-related training programmes that help facilitate employees' safety knowledge, (ii) sharing information with regards to new development in safety practices with employees and thus, enhancing their safety-related knowledge, and (iii) organizing health and safety awareness through specific health and safety campaign programmes that can enhance employees' safety knowledge. However, the fact remains that before employees apply the safety knowledge gained and be motivated to perform safely (in terms of safety-related events and workplace injuries), they need more time to engage safety behaviours such as safety compliance and safety initiative. Therefore, future research that employs longitudinal design may be better suited to ascertain the causal status of the relationships reported in this thesis.

6.5. Practical Implications

This study has important managerial implications for fostering workplace safety. This section outlines the five most prominent practical implications stemming from the findings of this research.

First, it is apparent that HPWS for safety is significantly related to unit safety climate, implying that organizations should consider creating a supportive environment (Nahrgand & colleagues, 2011) or a shared perception of safety climate among employees using appropriate HPWS for safety practices. Organizations can create this supportive environment when they (i) invest in induction programmes that emphasize safety practices and on-the-job safety-related training programmes that help facilitate employees' safety knowledge, (ii) share information with regards to new development in safety practices with employees and thus, enhancing their safety-related knowledge, (iii) organize health and safety awareness through specific health and safety campaign programmes that can enhance employees' safety knowledge, (iv) provide employee with a favourable working environment through the provision of extensive safety-related training and development, (v) deliberately consider the investment of managerial time in appraising the performance and training needs of employees, and (vi) creating a favourable social exchange with the employees (Liao & colleagues, 2009)). Based on SET, employees are likely to perceive that their exchange relationship with the organization is characterized by supportive environment based on investments in their safety and well-being. In return, employees are likely to be obliged to the organization by developing positive behaviours towards the achievement of organizational goals. Thus, these approaches can make unique contributions to fostering desirable safety behaviours, and ultimately, influencing safety outcomes and hence financial costs and corporate reputation of the organization. Thus, the findings of this study show that establishing a supportive environment will benefit organizations across the industry.

Second, the finding indicates the cross-level influence of the unit-level safety climate on the effects of individual safety knowledge on safety compliance. It suggests that if improvements in safety climate are to have any meaningful impact on safety behaviours, they must first produce changes in safety knowledge. The finding also suggests that safety climate can have independent effects on safety knowledge and that safety knowledge is an important determinant of safety behaviour (Neal & colleagues, 2000). This information can be used to guide the development of measurement systems to evaluate the effectiveness of safety management practices in an organization. So incorporating assessment of safety knowledge into monitoring systems will provide a more complete assessment "not only of the effectiveness of safety practices, but also of their operation" (Neal & colleagues, 2000, p. 107).

Third, the present study found employees' experiences of the use of HRM and safety practices (i.e. HPWS for safety) to associate positively with employees' safety behaviours. This demonstrates that, most of the time, safety outcomes are potential indicators of managerial practices (Zacharatos & colleagues, 2005; Ruth, 2004) rather than indicators of individual employees and engineering or ergonomically unsafe environment (Lauver, 2007; Zacharatos & colleagues, 2005). These findings are consistent with Kaminski (2001) who suggests that many of the management practices that are often applied to improve organizational performance (such as pay-based performance, teams, etc.) may have equal or greater effects on workplace injuries. Thus, the role of management in workplace safety is highlighted. Put together, these findings suggest strong implications for intervention designed to enhance workplace safety. It provides evidence that organizations seeking to improve workplace safety should adopt HPWS practices that have been shown in the literature to be associated with employee as well as organizational safety performance in terms of safety behaviours and safety outcomes.

Fourth, the study also provides important insights into how safety knowledge and unit safety climate interact to influence safety behaviour (i.e. safety compliance). The findings indicate that workplace climates characterized by high employee safety and well-being facilitate employee safety behaviours (i.e. safety compliance) through a positive interaction with safety knowledge. These findings provide for organizations an example of how applying SET and SIP within multilevel framework can give a more detailed view of the mechanisms underlying safety behaviours. Importantly, these findings can be adopted by organizations to leverage their employees' characteristic by bringing in those aspects of the work environment that facilitate employee safety and well-being in order to enhance their safety behaviours in the workplace.

Lastly, International Labour Organization (2007) acknowledges the global enormity of occupational injuries, deaths, and illnesses and posits the need to develop policies and practices that continuously promote preventive health and safety culture. Therefore, research that aims to improve safety promotion represents a vital shift in the approach to workplace safety. The findings of this study suggest that the use of HPWS for safety practices such as safety training, reward contingent on safety performance, safety information sharing, internal opportunity for promotion, safety involvement and participation, self-managed teams, safety-related performance appraisals, safety audit, safety campaign, and safety equipment maintenance may represent management accountability for safety in the workplace.

6.6. Limitations and Strengths/Methodological Contributions of the Study, and Avenue for Future Research

6.6.1. Limitations of the Study

Despite the aforementioned theoretical and practical implications of the findings of this study, there are a number of limitations. In the current study, data were derived from employees' self-reports with regard to their experiences of safety-related events and workplace injuries in the workplace. These types of data are said to be subject to accident underreporting, cognitive biases, and recall errors due to limitations in human memory and cognitive processing (Probst, 2015). Individual level underreporting occurs when the individual does not report an experienced accident to his or her employer (Probst, 2015). Second, it is possible that this method could have heightened the possibility of mono-method bias (Zacharatos & colleagues, 2005). However, the use of self-reported data is very necessary in some studies especially in studies like the one under consideration where data on all the variables except the use of HPWS for safety were self-reported. The alternative could have been to collect data on safety outcomes (safety-related events and workplace injuries) from company records. Apart from the fact that such records are grossly unreliable due to underreporting (Probst, 2015; Zacharatos & colleagues, 2005), they are not easily accessible. Underreporting at the organizational level occurs when an organization's official recordable injury rates reported to occupational safety and health administration (OSHA) is an "undercount of the true number of work-related illnesses and injuries that the company is aware of" (Probst, 2015, p.1905). Therefore, there are no organizational records that can serve as a true report of experienced accidents. While mono-method bias is of concern in this study, Crampton and Wagner (1994) observe in their study that mono-method bias does not take place as often as we think. In addition, Wall, Michie, Paterson, Wood, Shehan, Clegg, and West (2004) found self-reported measures or data to compare favourably with other measures in terms of their convergent, discriminant, and construct validity. Because self-reports of safety attitudes, safety behaviours, and perceptions are commonly used in safety research (e.g. Neal & Griffin, 2006; Zacharatos & colleagues, 2005) and are in some cases preferable to using data available from management (Thompson, Hilton, & Witt, 1998), it is believed that the findings of this study are still valid.

Second, the respondent sample was collected from only seven companies. Out of these seven oil and gas companies, six of them are under the control of NNPC while the seventh is under the control of the Ministry of Petroleum Resources. Thus, the two organizations are Federal government parastatals. In other words, they are public companies and no private company among them. Obtaining data from the public companies with the exclusion of the private companies limits the generalizability of the findings to all the companies within the oil and gas industry. Therefore, generalization of the findings to a broader Nigerian context should be approached with caution. To enhance external validity, therefore, future research should obtain data from both private and public companies in the oil and gas industry.

Third, the cross-sectional research design limits the extent to which cause-effect relations can be inferred from the findings reported in this thesis. The cross-sectional research design indicates that HPWS practices are measured after the performance period leading to the prediction of past performance (Wright & colleagues, 2005). Future research that employs longitudinal design may be better suited to ascertain the causal status of the relationships reported in this thesis.

Fourth, the findings of this study cannot be interpreted to indicate that HPWS for safety practices lead to improvement in workplace safety (safety outcomes) through safety initiative despite the postulated hypotheses in this direction. As earlier suggested, it is plausible that other forms of discretionary behaviour such as safety OCB may be more closely associated with safety outcomes. It is also likely that adopting a longitudinal design may improve the relationships between these safety behaviours (i.e. safety compliance and safety initiative) and safety outcomes of safety-related events and workplace injuries.

6.6.2. Strengths/Methodological Contributions of the Study

These limitations are counterbalanced by the methodological strengths of this thesis. Thus, in addition to the study's theoretical extensions and implications, it also contributes to the literature methodologically in terms of its study design.

6.6.2.1. Multi-rater Design

Although the importance of HRM practices has been acknowledged by scholars in fostering workplace safety (e.g. Zacharatos & colleagues, 2005; Kivimaki, Kalimo, & Salminen, 1995; Griffiths, 1985), prior studies show that research in this area is characterized by measure of HRM practices at the organizational level of analysis (See Boselie & colleagues, 2005) where single-source respondents, whose perceptions are essentially prone to 'noise' and bias (Whitener, 2001; Gerhart, Wright, McMahan, & Snell, 2000b; Purcell, 1999; Ichniowski, Kochan, Levine, Olson, & Strauss, 1996), are asked about the HR practices that account for the whole organization. For example, in their first study, Zacharatos and colleagues (2005) utilized a single organizational representative to provide data with regard to the existence or use of high commitment management practices in their respective companies.

Osterman (1994) and West, Borill, Dawson, Scully, Carter, Anelay, Patterson, and Waring (2002) have, however, expressed scepticism about the level of typical HR manager's awareness and impartiality as to his or her organization's people management processes. Gerhart and colleagues (2000a, p. 807) contend that "the reliability of single raters is typically quite weak." Therefore, even if the single respondent is adjudged knowledgeable, Edgar and Geare (2009) suggest that that system is problematic. According to Wright, Gardner, Moynihan, Park, Gerhart, and Delery (2001, p.876), the problem even becomes worse when we realize that it is "difficult for the senior VP of HR to accurately describe the practices that exist across the whole corporation" in large diversified organizations. Similarly, Bowen and Ostroff (2004) are concerned about the questionable reliability status of single-rater design and suggest that, rather than relying on an HR executive, “a better alternative is to assess these characteristics of the HRM system from the employees themselves” (p.216). Thus, in order to control for unreliability, Gerhart and colleagues (2000b) recommend at least four raters per level of analysis for HRM indicators to average the raters’ scores per independent HPWS into more reliable variables.

The present study contributes to literature by adopting a multi-source design. The study was approached through two levels of analysis: the unit as well as the individual employee levels of analysis. Data on experienced HPWS for safety were obtained from a minimum of three (3) and maximum of six (6) frontline employees in each unit amounting to useable 569 responses while sixty-four line managers provided data on the use of HPWS for safety representing 168 units. This is consistent with Gerhart and colleagues (2000b) who observe that unit (or establishment) level surveys may be more reliable than organizational (or corporate) level surveys because the managers are likely to be more familiar with the HR practices that are in use in their unit as a result of the smaller size (See Batt, 2002). This design also provides more confidence to rule out the possibility of questionable reliability (Bowen & Ostroff, 2004). In addition, obtaining data from multiple sources help to reduce common method bias and assisted my examination of the associations of the use of HPWS for safety with both unit safety climate and experienced HPWS for safety and, consequently safety outcomes through safety knowledge/safety motivation, and safety behaviours of safety compliance and safety initiative.

6.6.2.2. Research Uncovered New HPWS for safety Domains/Practices

This study developed and validated a theoretically driven, grounded, and integrative measure of HPWS for safety. As a part of the inductive approach to the study, a sample of the potential respondents were asked to describe some aspects of their organization's safety-related HRM practices that were not deductively identified in the literature (Kinicki, Jacobson, Peterson, & Prussia, 2013; Hinkin, 1998, 1995). This was done in order to know the extent to which those deductively identified in the extant literature were relevant to HRM practices relating to safety in the Nigerian context (See Sun & colleagues, 2007). This qualitative approach aimed to achieve two basic purposes: the first was to find out if the HRM practices used in Nigeria's oil and gas industry to promote safety are in consonant with each of the practices identified in the extant literature (e.g. safety training, safety rewards, internal opportunity for promotion, safety involvement and participation, performance appraisals, self-managed team, safety information sharing, clear job description, hiring for safety, and employment security). The second was to explore and identify safety-related HRM practices unique to the oil and gas industry in Nigeria. In the process, I generated the initial pool of items through interviews with a sample of potential respondents who were subject matter (i.e. HRM and Health and safety) experts. Importantly, in addition to the previously demonstrated domains, this approach uncovered three other domains such as "safety audit", "safety campaign", and "safety equipment maintenance."

6.6.2.3. Multilevel Model of Intermediate Linkages

This research proposed and tested hypotheses drawn from a multilevel model of intermediate linkages in the performance implications of HPWS for safety. I sample across a range of workplaces, using line managers' ratings of HPWS for safety practices at the unit level to predict employees' experienced HPWS for safety, which predicted safety outcomes via safety knowledge, safety motivation, and safety behaviours. The findings extend our understanding of the mechanism through which HPWS for safety may influence employee safety knowledge/safety motivation and safety behaviours and, in turn, safety outcomes. Safety knowledge and safety motivation were found to mediate the relationship between HPWS for safety and safety behaviours of safety compliance and safety initiative.

6.6.3. Suggestions for Future Research

Several issues demand further investigations. First, although the new HPWS for safety scale has been theoretically developed and validated based on AMO, there is need for future research to provide more evidence for the scale's validity. In addition, given the ongoing debates in SHRM literature on "the best" vs business strategic goal specific HRM systems (Chuang, Jackson, & Jiang, 2013; Delery & Doty, 1996), future research should test the incremental validity of the new HPWS for safety scale. This is particularly necessary in the light of the dominance of the behavioural approach to safety. Furthermore, there is no significant difference when I compared the correlations between the new HPWS for safety scale and safety behaviours of safety compliance, safety participation, and safety initiative with the correlations of an abridged version of Zacharatos and colleagues' (2005) general HPWS measure with safety compliance, safety participation, and safety initiative, using Fisher's z test. Future research may endeavour to replicate this comparison but using complete version of Zacharatos and colleagues' (2005) or any other general HPWS measure. Future research could also compare the correlations of the safety-specific HPWS measure and safety outcomes as defined in this study with the general HPWS measure and the same safety outcomes.

Second, from a SHRM perspective, prior research has primarily emphasized the influence of systems of HRM practices on organizational climate (e.g. Chuang & Liao, 2010; Zacharatos

& colleagues, 2005). In spite of the importance of HRM practices, climate researchers (e.g. Bowen & Schneider, 2014) contend that, although focusing on HRM practices is good, it may not be sufficient to fully understand how to promote organizational climate. Bowen and Schneider (2014, p. 12) observe that “a focus only on HRM practices is limiting because so many other practices and issues influence employee experiences and their likely perceptions”. Thus, it becomes necessary to identify other antecedents to explicate how they interact with HRM practices to influence organizational climate. One factor that may influence organizational climate but has not been fully utilized jointly with HRM practices is safety-specific transformational leadership. There is the need for future research to combine safety-specific transformational leadership and HPWS for safety to understand unit safety climate. This is necessary because Bowen and Ostroff (2004) suggest that leaders serve as interpretive filters of HRM practices and thus help convey messages of HRM practices to employees about expected behaviours. In this circumstance, HRM practices and leadership may work in a synergistic way to enhance the influence of one another (Jiang & colleagues, 2015) on unit safety climate.

Third, although safety and productivity are both important dimensions of overall performance on many jobs, unfortunately, the safety literature suggests that managers are more often concerned about production as an organization’s bottom-line to the neglect of employees’ health and safety (Wallace, Chen, & Kanfer, 2005; Zohar, 2000; Janssens, Brett, & Smith, 1995). They see the provision of health and safety as a cost to be incurred (Goldenhar, Ruder, Ewers, Earnest, Haag, & Petersen, 1999). This situation will not be remedied until further research consistently shows that workplace incidents such as injuries and fatalities represent financial costs to organizations (Zacharatos, 2001). This is a necessary direction for future research because once this gap in the literature is filled, the findings of this study will be more meaningful in the sense that there will be more evidence to conclude that HPWS positively affects workplace safety in terms of safety behaviours and safety outcomes which, in turn, positively affect organization's financial performance. It is only when this is empirically demonstrated that management can be expected to consider the adoption of HPWS for safety practices for the management of workplace safety.

Fourth, the present study adopted social exchange theory (SET) and social information processing perspective (SIP) as the theoretical perspectives to explore the relationships depicted in its conceptual model (See figure 2.1). Social exchange theory, for example has become a strong theme (Snape & Redman, 2010) in the SHRM and safety literature. Thus, in the extant literature, HRM practices-outcome linkages have been under-theorized (Guest, 1997). These linkages have been addressed using SET, but this framework has been criticized in research (Cropanzano & Mitchell, 2005; Coyle-Shapiro & Conway, 2004). Consistent with the call for researchers to diversify their attention from SET in analyzing the antecedents of employee behaviours (Zellars & Tepper, 2003), this study provides complementary perspective by examining SIP theoretical framework. Future research should employ other theoretical perspectives such as job characteristic theory explanation of HRM practices-outcomes relationships, which lies outside the tradition of SET explanation.

Fifth, as earlier noted, the sampling frame for this study (Study 4) focuses upon data obtained from only seven public-sector organisations and none from private-sector of the oil and gas industry in Nigeria. This sampling frame provides a unique context that limits the generalizability of the study's findings. For example, it may be that, because the government manages all the public-sector organizations by laws of the parliament, the employees in the public oil and gas companies have low perceptions of HPWS for safety practices, which serve to shape their safety knowledge, safety motivation, and safety behaviours. Consequently, the extent to which these findings are generalizable to the oil and gas industry in Nigeria is somewhat limited. Future research that includes data from both public and private sectors of the oil and gas industry would be helpful in ascertaining the external validity of these findings.

Sixth, this study focuses on the examination of the effects of HPWS for safety on employee safety outcomes. Thus, as earlier noted, the use of cross-sectional research design suggests that the findings are correlational rather than causal. Thus, future research that employs longitudinal research design will be better suited to demonstrate the causal basis of the relationships reported in this thesis. In doing so, more light can be shed on the question over whether employee experienced HPWS for safety changes over time, with subsequent effects on safety knowledge, safety motivation, safety behaviours, and, safety outcomes. Although several studies in this area have begun to examine longitudinal effects of HRM practices on performance (e.g. Ployhart, Weekley, & Ramsey, 2009; Bird, Clegg, Patterson, Robinson, Stride, Wall, & Wood, 2008), given that most of these studies focus on productivity, there is need for a focus on workplace safety.

Seventh, the HRM practices experienced by employees are largely those delivered or enacted by line managers with the direct responsibility. Purcell and Hutchinson (2007) observe that there is a gap between what is formally required in HRM policy and what is actually delivered by line managers. The manner in which line managers undertake their HRM duties is linked to a wider range of leadership behaviours, which aim to influence employee attitudes and behaviours. Employees are likely to be influenced by both HRM practices they experience and their managers' leadership behaviours. Future research should focus on the examination of the extent to which line managers' enactment of HRM practices and the HRM practices as perceived by the employees converge. Purcell and Hutchinson (2007) suggest that the outcome effects on employee attitudes and behaviours might be greater when both are positive. If this proposition is confirmed, it will have an implication for practitioners in the way they seek to ensure successful implementation of HRM practices and enhance line managers' leadership behaviours.

6.7. Conclusion

Research in workplace safety has focused on either the physical approach that emphasizes ergonomic design of the environment and work-related equipment, an environmental approach that emphasizes potential hazards such as noise, toxins, and temperature, or a behavioural approach that emphasizes changing employee behaviours that are deemed to be responsible for workplace incidents such as accidents, injuries, fatalities, and safety-related events. Motivated by two factors: (i) the costs of pain, sufferings, and grief that employees undergo in times of accidents or injuries and the high financial costs of accidents and damage to corporate reputation, and (ii) the fact that management attitudes toward workplace safety are directly related to employee attitudes toward workplace safety (Margolis, 1973), this study focused on how and why organizational practices and management behaviours interrelate with employee behaviours to promote employee safety behaviour and, in turn, safety outcomes.

It has been noted that safety problems stem from not only the poor attitudes of management towards workplace safety (Coyle, Sleeman, & Adams, 1995) but also from employees' unsafe behaviours including recklessness, violation of safety rules and regulations and nonchalant attitudes to hazards (Laurence, 2005; Zohar & Luria, 2003; Hobbs & Williamson, 2002). Building on the above, research (e.g. Clarke, 2013; Clarke, 2006; Neal & Griffin, 2006, 2000; Zohar & Luria, 2005; Wallace & Chen, 2005; Probst, 2004; Probst & Brubakar, 2001; Griffin & Neal, 2000) has examined the workplace safety particularly the predominance of behavioural approach. However, despite this behavioural approach research, there is a paucity of research that has examined HR practices and the few have focused on single practices (e.g. Lauver, 2007; Harvey, Bolam, Gregory, & Erdos, 2001). However, extant research has shown that HRM practices are more likely to yield positive effects for the organization when they are introduced as part of a coherent system, rather than as single "best practices" (Kling, 1995).

Furthermore, although productivity and safety have been recognized as the twin objectives of performance (Wallace & Chen, 2006) on many jobs, prior research in SHRM that has linked HPWS to performance outcomes (e.g. Aryee & colleagues, 2012; Combs & colleagues, 2006; Wright, Gardner, Moynihan, & Allen, 2005; Boselie & colleagues, 2005; Bartel, 2004; Batt, 2002; Arthur, 1994), has focused primarily on productivity to the neglect of workplace safety. Zacharatos and colleagues (2005) noted this gap and consequently extended prior research on HPWS-performance relationships to include occupational safety. I built on this research to: (i) develop and validate an HPWS for safety scale, and (ii) proposed and tested a model of processes through which unit level HPWS for safety influence individual level safety outcomes.

This thesis reports the findings of four studies. Three of these studies focused on the development and validation of an HPWS for safety scale while the fourth study used the validated scale to examine the processes through which HR practices influence workplace safety. First, and underpinned by social information processing perspective (SIP), I examined how the use of HPWS for safety influences unit-level safety climate and experienced HPWS for safety. Second, and underpinned by social exchange theory (SET), I examined individual level processes through which experienced HPWS for safety influences safety outcomes. Third, and informed by SIP, I examined how unit-level safety climate moderates the effects of safety knowledge/safety motivation) on safety behaviours (i.e. safety compliance and safety initiative) on one hand, and on safety outcomes of safety-related events and workplace injuries via safety behaviours, on the other.

Data were analyzed using multilevel structural equation modelling (MSEM) with Mplus version 7.3. The findings revealed that (i) experienced HPWS for safety directly relates to safety behaviours and also indirectly through safety attitudes, (ii) experienced HPWS for safety relates to both safety-specific events and workplace injuries through safety knowledge and safety compliance, (iii) experienced HPWS for safety relates to workplace injuries through safety knowledge and safety initiative, (iv) experienced HPWS for safety relates to both safety-related events and workplace injuries via safety motivation and safety compliance, (v) the use of HPWS for safety significantly related to unit safety climate, (vi) the relationship between safety knowledge and safety compliance is stronger than the relationship between safety knowledge and safety initiative, (vii) the use of HPWS for safety significantly related to experienced HPWS for safety while unit-level safety climate moderated the safety knowledge-safety compliance relationship such that in a high safety climate, safety behaviour is valued, expected and rewarded in the unit and, as a result, employees would be more likely to comply with the unit's safety rules and procedures. In contrast, in a low safety climate, safety performance would attract less emphasis and as a result, the effects of safety knowledge on employees' safety behaviours would diminish. Lastly, the findings provide support for the psychometric properties of the scale.

By indicating that safety knowledge/safety motivation and safety behaviours mediated the relationships between HPWS for safety and safety outcomes, this study provides empirical evidence in support of the notion that employees' perceptions and interpretation of HRM practices, rather than actual HRM practices themselves, that directly influence their attitudes and behaviours (Wright and colleagues, 2005; Gerhart & colleagues, 2000) which, in turn, influence outcomes. By developing and validating a theoretically driven, internally coherent and integrative measure of a system of HR and safety practices (i.e. HPWS for safety), this study enhances theoretical approach in three ways: (i) speaks to Delaney and Huselid's (1996) concern that the SHRM literature "is distinguished by the fact that virtually no two studies measure HRM practices in the same way" (p. 967), (ii) addresses the absence of a theoretically informed measure of high-performance human resource practices (Delery, 1998) in safety context, and (iii) achieves the need for a strategically-focused HPWS which is related to but goes beyond the motivation for Delaney and Huselid's call. Together, the findings of this study provide evidence of the important role the management/organization rather than individual elements play in workplace safety and this forms the paramount contribution of this study.

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APPENDICES

Appendix A: Interview Questionnaire

AN INTERVIEW WITH HUMAN RESOURCE AND OCCUPATIONAL HEALTH AND SAFETY PROFESSIONALS IN ORGANIZATIONS OF INTEREST IN OIL AND GAS INDUSTRY IN NIGERIA

This project aims to examine how organizations use human resource practices to promote health and safety in the oil and gas industry in Nigeria. Therefore, the objective of this interview is to ascertain HR practices that your organization uses to promote health and safety. The information gathered from this interview will contribute to the development of a measure of HR practices for safety performance.

SECTION A

What is your job title? ....

How long have you been working in your current position?

..........years ....months.

How long have you been working with your current organization?

..............years ....months

Please explain briefly how workplace safety is reflected in your organization's vision and mission statements (please, back-up with relevant organizational documents)

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SECTION B

Below is a list of human resource management practices for promoting workplace safety. Kindly and carefully look through them and respond to the questions or statements with regard to each of them:

Workplace safety as an organizational objective

Does your organization emphasize workplace safety as an objective in the same way as it emphasizes the bottom-line (profits)? If yes, how is this accomplished?

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Do you have a separate health and safety unit and if so how different are its functions relative to the HRM department?

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How do these two departments work to promote workplace safety? Can you please give specific examples?

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Hiring for safety

Does your organization emphasize long-term employee safety potentials in its hiring practices? Can you please give examples of how this is accomplished?

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Are the health and safety values and beliefs of the individual potential employee discussed when hiring an employee?

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Does your organization emphasize traits and abilities that promote workplace safety? How is this accomplished?

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Do you have specific safety practices or criteria when hiring employees? Specifically, is one's ability to work safely a consideration when hiring new employees? How is this done? In what ways do your hiring practices focus on safety?

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Extensive Safety Training

Does your organization provide extensive safety training programmes for employees? What are some of these programmes or practices?

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Does your organization invest time and money in safety-related training? Please, provide examples and evidence.

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Does your organization normally provide induction for new employees? If yes, to what extent are health and safety emphasized in this training?

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What specific safety training practices/programmes do you have? How often do employees undergo such practices?

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Compensation contingent on safe performance

How do you compare the average pay level (including incentives) of your employees (especially front-line employees) with that of similar organizations (competitors) in the industry?

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To what extent are employees' salaries and rewards determined by their safety performance?

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Does your organization give monetary and non-monetary rewards for exemplary safety performance? If yes, please, give some examples of such specific safety-contingent monetary and non-monetary rewards

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How much importance does your organization attach to fairness or equity in the distribution of safety-related compensation/rewards?

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Do you have specific practices to encourage or motivate employees to work safely? Are these practices focused on individuals or work groups?

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What other specific safety-contingent compensations or practices do you have and how do you actually carry them out in practice?

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Employment security

How much emphasis does your organization attach to employment security for its employees?

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With reference to safety performance, please describe the extent to which your organization would try to find an employee another position if he/she were to lose his/her job.

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All being well, can employees expect to work for your organization for their entire career? If not, can safety-related concerns be a cause for termination or retention?

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Please explain the extent to which safety performance is important in employee retention in your organization.

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Internal opportunities for promotion

Using safety-related qualifications and performance as criteria, do qualified employees have good opportunity for internal promotion in your organization?

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To what extent do internal candidates, who are beneficiaries of the organization's investment in safety-related orientations and training, have priority in terms of job openings?

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To what extent do employees who have acquired safety-related skills have clear career paths in your organization?

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Does your organization consider safety performance when making internal promotion decisions? In other words, do you have practices that encourage employees to engage in safe work-related behaviours? Can you please elaborate?

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Employee safety involvement/safety participation

To what extent do supervisors keep open safety communications with employees in your organization?

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To what extent do you ask your employees for their opinions in advance if a decision made might affect their safety at work?

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Do you have practices that give employees discretion to resolve safety-related issues in the workplace? Can you please, give examples of such practices?

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What are some practices through which your organization supports employees with necessary equipment and resources to provide high quality safety performance?

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Do you have practices that enable employees to make suggestions or recommendations regarding safe work practices? Please elaborate on these practices.

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Performance appraisals

How often does your organization measure employee safety performance in terms of objective quantifiable results?

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What are some practices that your organization uses to assess the safety performance of employees?

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Do employee appraisals emphasize long term and group-based safety achievements?

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To what extent do safety performance appraisals provide employee feedback for personal development?

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To what extent are safety performance appraisals based on multiple sources (e.g. self, co-workers, supervisors, etc.)?

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To what extent do supervisors get together with employees to set their personal safety goals?

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How important is ability to work safely relative to ability to meeting production targets in appraising the performance of employees? What makes one an ideal employee in your organization-meeting production targets or meeting safety targets? Please explain with some examples

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Self-managed team and collaboration

To what extent are team suggestions on safety issues implemented within your organization?

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Please explain the extent to which your organization supports safety-related team development (e.g. encouraging self-management and collaboration on safety-related issues).

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Safety information sharing

To what extent does your organization share with employees information about how well the organization is performing in safety-related issues? Can you please, give specific examples of how this is done?

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To what extent does your organization share information on its safety performance with employees?

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What specific practices do you have for ensuring employees are kept informed about safety-related issues? Please explain or elaborate.

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Job and work design

Do the jobs employees do have an up-to-date safety-related descriptions?

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Are safety requirements or rules clearly defined?

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To what extent do employees perform simple and repetitive tasks as part of their safety-related work?

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To what extent does the job description for a position accurately describe all of the safety rules and procedures?

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How is the work employees do designed or structured to promote safety? Are there any specific practices that are used?

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Are there other practices that your organization has developed or uses to promote health and safety? Please state them.

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Are there organizations in the oil and gas industry that are considered leaders in the promotion of health and safety? What do you think is unique about these organizations? What can other organizations learn from them in terms of promoting health and safety?

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Thank you for sparing me your time

Appendix B: Letter to Organizations Seeking for Access

Aston University

Aston Triangle
Birmingham B4 7ET
United Kingdom
Tel +44 (0)121 204 3000
www.aston.ac.uk

Reference: RTPPhD/28/09/13/5

The Group Managing Director,
ASCON Oil Company Limited,
39A Bishop Aboyade Cole Street,
Victoria Island,
Lagos

ASCON OIL COMPANY LIMITED
RECEIVED
NAME Onyeagam Victor
SIGN
DATE 02/10/13

30/09/2013

Dear Sir,

Request for Participation in PhD Research

I am Paulson Okhawere, a doctoral researcher from Aston Business School, Aston University, Birmingham, U.K. I am currently conducting a study to investigate the relationship between human resource management practices (HRMP) and workplace safety outcomes such as accidents, injuries, and fatalities in the oil and gas industry in Nigeria. Currently, very little is known about the role of management practices in reducing workplace accidents, injuries, and fatalities. I am therefore writing to invite you to participate in this very important study in Nigeria. This study is unique in the sense that it differs from the existing safety research which focuses on the engineering and monitoring of work. It focuses, instead, on how human resource management practices can be used to enhance awareness of safety-related issues and motivate safety performance.

A starting point in this research therefore is to understand human resource practices that organizations use to create workplace safety and to motivate employees to engage in safety performance. I would like to arrange a day and time through your PA to meet with you or your representative to further explain my research and its potential benefits, and to seek your organization's cooperation in the project. I anticipate this will take no longer than 20 minutes and I will be happy to schedule the meeting at your convenience.

I am seeking your consent to permit me to collect data in the form of interviews and questionnaires with three groups of your employees; specifically human resource and health and safety managers, front-line employees and their supervisors.

ASCON Oil Company's input into this study will contribute to a better understanding of how to manage accidents, injuries, and other safety-related incidents in the workplace. The research seeks to generate actionable knowledge that organizations can use to implement intervention programmes to enhance workplace safety and ultimately, their survival in an increasingly competitive global marketplace. You will receive regular updates on the progress of the study and pre-publication notice of the key findings and recommendations it generates.

I would like to encourage ASCON Oil Company to participate in this study as I believe it offers unique insights into the subject matter. This will be a mutual gains enterprise. As a researcher, this study would help me to identify practically important research outcomes relating to workplace safety. From the perspective of ASCON Oil Company, my findings will generate actionable knowledge that can be used to promote workplace safety and ultimately, reduce the financial, human, and psychological costs associated with unsafe work environments and its inherent high rates of accidents and injuries.

Finally, I am to inform you that all ethical rules will be strictly adhered to during the research process and all information that will be supplied by both management and individual employees will be absolutely confidential and anonymous. There will also be the need to obtain an express consent from each potential respondent before participating in the study.

Should you have any query with regard to this issue, please feel free to communicate with any of the contacts provided below.

Thank you very much for your understanding.

Yours Sincerely,

Okhawere, Paulson

Doctoral Researcher

Aston Business School

Aston University

Birmingham B4 7ET

Email: okhawerp@aston.ac.uk,

Phone: +44(0)777493 4994

Supervisors:

Dr. Ann Davis

Aston Business School

Aston University

Birmingham B4 7ET

Email: a.j.davis@aston.ac.uk

Phone: +44(0)121 204 3261

Prof. Sam Aryee

King's College, London

Email: s.aryee@aston.ac.uk

Phone: +44(0)791421 3046

Appendix C: Letter from Department of Petroleum Resources (DPR)

MINISTRY OF PETROLEUM RESOURCES

DEPARTMENT OF PETROLEUM RESOURCES

7, KOFO ABAYOMI STREET, V/ISLAND, LAGOS

P.M.B. No: 12650

Telephone: 01-2790000

Website: www.dprnigeria.com

Ref. RI/SVM/11128/Vol.1/9

Date: 20th November, 2013

The Managing Director,
MRS Oil Nigeria Plc,
8, McCarthy Street
Onikan,
Lagos.

Dear Sir,

LETTER OF INTRODUCTION - MR. PAULSON OKHAWERE

We are writing to introduce **Mr. Paulson Okhawere**, a PhD research student from Aston Business School, Aston University, Birmingham, United Kingdom

Mr. Okhawere is currently conducting a study to **investigate the relationship between human resource management practices (HRMP) and workplace safety outcomes in the oil and gas industry in Nigeria.**

We therefore solicit your support to provide him with the necessary assistance with regards to his research work.

The student has been advised to treat such data as confidential and make copies of the final project paper available on completion of the research.

We convey the esteemed regards of the Director of Petroleum Resources.

Yours faithfully,

Wole Akinyosoye
for: Director of Petroleum Resources

Appendix D: Letter from Nigeria National Petroleum Corporation

NNPC

INTERNAL MEMORANDUM

To:	Underlisted	Ref:	GM/HR/038
From:	GGM,HR	Date:	6th NOVEMBER, 2013

RESEARCH LEADING TO PHD IN HUMAN RESOURCE MANAGEMENT PRACTICES AND SAFETY IN THE NIGERIAN OIL AND GAS INDUSTRY: PAULSON OKHAWERE

Mr. Paul Okhawere is a doctoral student at the Aston University in the United Kingdom, (see attached document).

He is undertaking a study on HR Management Practices and Safety in the Nigerian Oil and Gas Industry.

He will be interviewing Management staff in HR and Safety at the Corporate Headquarters and the SBUs/CSUs. The exercise will take him about five (5) months.

Management has approved for him to undertake the exercise.

HR Managers in SBUs/CSUs shall be his focal point and Manager, ER at the Corporate Headquarters.

Kindly accord him every assistance.

Peter Odjoji
for: GGM, HR

Distribution

MDs: KRPC, WRPC, PHRC, NPDC, NGC, PPMC, IDSL
GGMs: NAPIMS, R & D
GM: GHSE
HR Mgrs: KRPC, WRPC, PHRC, NPDC, NGC, PPMC, IDSL, NAPIMS, R & D
Mgrs., HSE: KRPC, WRPC, PHRC, NPDC, NGC, PPMC, IDSL, NAPIMS, R & D
Mr. Paulson Okhawere - Aston University, UK

Appendix E: Summary Report of Interview Schedule

My first point of contact was Lagos. I stopped in Lagos because most of the oil and gas companies in Nigeria have their head offices in Lagos. I used the first four weeks to distribute my letters to about twenty-eight (28) companies out of the thirty-five (35) letters I prepared. The major problems were that: (i) some of the companies had relocated and to find their new locations became very difficult; (ii) some of them have ceased to exist while some are just doing some skeletal work trying to come back to life; and (iii) it was very difficult to gain access to the companies' premises because of tight security as result of the turbulent political and religious terrain in Nigeria. However, I was able to deliver the mails either to their mail rooms or to the security and most of the mails were acknowledged immediately.

Along the line I was able to discover the Department of Petroleum Resources, the Government Company responsible for regulating the health, safety and the environmental activities of all the oil and gas companies operating in Nigeria. I was able to gain access and I applied requesting for their participation in my research and an introduction letter to all of the private oil and gas companies in Nigeria. The approval to participate was given within three days but to give letter of introduction was a little bit controversial. Meanwhile, the Human Resource Manager of Conoil had given me access to interview himself, Health, Safety, and Environment manager, and another safety expert without the official approval of the company. This was possible because the Managing Director (MD) was indisposed. I was able to interview two people in Conoil within that week and the appointment with third the person failed. Department of Petroleum Resources (DPR) also gave me audience to interview two people, the Human Resource Manager and the Director of Medical Services but the HSE manager was a little bit controversial so I let him go. All put together, I was able to interview four people within the first five weeks of my stay in Lagos. I then decided to go to Abuja since I had already made contact with Nigerian National Petroleum Corporation

(NNPC) through my brother’s connection. However, I sent letters of reminder to all the companies I had earlier visited.

My journey to Abuja was very fruitful. I interviewed the Head of Safety Unit in Petroleum Technology Development Fund (PTDF) in the first day of my visit to that company. And within the next few days I was able to interview the second person the Human Resource Manager (HRM) in PTDF. The Group General Manager (GGM) of NNPC gave me a letter of introduction to all NNPC subsidiaries in the country (see appendix 1). There are nine (9) of them including:

- Kaduna Refinery and Petrochemical Company Limited (KRPC);
- Warri Refinery and Petrochemical Company Limited (WRPC);
- Port Harcourt Refinery and Petrochemical Company (PHRC)
- Nigerian Petroleum Development Company (NPDC) Ltd, Benin City;
- Nigeria Gas Company Limited (NGC) Ltd, Warri;
- Petroleum Product Marketing Company Limited (PPMC) Ltd, Abuja;
- National Petroleum Investment Services (NAPIMS), Lagos;
- Research and Development (R&D), Port Harcourt;
- Integrated Data Services Limited (IDSL), Benin City.

I interviewed the Manager, Manpower and Welfare Management, Manager, Health, Safety and Environment, and Deputy Manager, Fire and Safety in Petroleum Product Marketing Company Limited Abuja. I then moved to Benin City after my interaction with PPMC. I interviewed the Human Resource Manager (HRM) and the Manager, HSE in Nigerian Petroleum Development Company, Benin City. Then in Warri, I interviewed the Manager, HSE, the Superintendent, Fire and Safety, and another Safety Officer in Nigeria Gas Company Limited, Warri. I also interviewed the Heads of Departments of Human Resource Management (HRM) and Health, Safety, and Environment in Petroleum Training Institute

(PTI), Warri. The Institute had also given a letter of consent to participate in my research and in fact, the students of the Institute will be used to pilot-test the employee version of HPWS for safety scale since they train junior and intermediate employees of oil and gas industry in Nigeria.

I returned to Lagos and within few days I was able to interview the Manager, HSE in Conoil and Human Resource Manager, South Atlantic Petroleum (SAPETRO) and also obtained letters from DPR introducing me to sixteen (16) major private oil and gas companies in Nigeria (see appendix 2) and a letter of access (see appendix 3) to their zonal offices: Port Harcourt, Warri, Kaduna, Abuja, Lagos and Owerri, who will in turn, introduce me to their twenty-one (21) locations in the country.

In summary, I interviewed eighteen (18) professionals drawn from eight (8) different oil and gas companies as follows:

Conoil..3

Department of Petroleum Resource..2

Petroleum Technology Development Fund..2

Petroleum Product Marketing Company...3

Nigeria Gas Company...3

Petroleum Training Institute..2

Nigerian Petroleum Development Company..2

South Atlantic Petroleum..1

Total =18

Workplace safety is broadly reflected in the companies' vision and mission statements as shown in the documents given to me by some of them. Their responses as well as the HSE policy statements indicate that the NNPC or Ministry of Petroleum Resources issued the policy guidelines on HSE which was adapted by each of the companies.

SERIAL NUMBER	PRACTICES	STATEMENT/QUESTION	YES	NO	COMMENTS/SUMMARY OF RESPONSES
	WORKPLACE SAFETY AS ORGANIZATIONAL OBJECTIVE				
1		Does your organization emphasize workplace safety as an objective in the same way as it emphasizes the bottom-line?	18		The emphasis is on safety as the core value because without the safety of the employees, equipment, and the environment the profit will be adversely affected.
2		Do you have a separate health and safety unit and if so how different are its functions relative to the HRM department?	17	1	The law governing the oil and gas industry in Nigeria makes it compulsory for all the organizations to have Occupational Health, Safety, and Environment department (HSE). However, the Petroleum Training and Development Fund (PTDF) has safety unit as part of HR department because its objectives are different from those of other oil and gas companies.
3		How do HR department and HSE department work to promote workplace safety?			The HSE department identifies the training needs of the technical as well as other staff and the HR department organizes for the training using experts either from outside the organization or within the organization. The HSE department provides the safety equipment and the HR department distributes them to all the departments.
	HIRING FOR SAFETY				
4		Does your organization emphasize long-term employee safety potentials in its hiring practices?	14	4	Only those companies that are highly technical in their operations consider safety potentials when they are hiring their employees. Others only consider safety potentials when they employ HSE staff.
5		Are the health and safety values and beliefs of the individual potential employee discussed when hiring an employee?	18		The emphasis on safety values and beliefs however varies depending on the department to which the individual is being considered. Safety values and beliefs are

					more highly emphasized when employing staff to HSE department.
6		Does your organization emphasize traits and abilities that promote workplace safety?	18		Just as in item 5 above, issues on safety are more emphasized when employing people to HSE department than other departments. However, some of the companies utilize psychological tests to identify some of the traits and abilities they need.
7		Do you have specific safety practices or criteria when hiring employees? Specifically, is one's ability to work safely a consideration when hiring new employees?	17	1	One's ability to work safely is specifically considered when employing HSE staff and this they do by applying psychological tests to identify their safety values, beliefs, traits and abilities that promote safety, and other related safety requirements. Others are just asked questions relating to safety at work.
	EXTENSIVE SAFETY TRAINING				
8		Does your organization provide extensive safety training programmes for employees?	18		Although all the employees receive safety-related training, only the HSE staff receive extensive training programmes. Both general and specific training programmes include Firefighting, first aid application, auxiliary fire training programme, fire drills, survival swimming training, environmental awareness, equipment awareness and management, defensive safety, quarterly health talks (e.g. fit to work programme, etc.), off-shore training, induction programme (for new employees),
9		Does your organization invest time and money in safety-related training?	18		The interview responses suggest that the organizations invest time and money in safety-related training. However, the amount of money and time they invest each year varies from organization to organization and from

					department to department. The type of training also varies from department to department. The safety professionals like other departments are trained both within the country and abroad. The other staff are trained on safety-related matters within the country in form of seminars, workshops, and safety week programme. The HSE staff receive initial professional (safety-related) training between six and one year at the point of entry and after that, at least once a year. Some respondents could not give the range of the amount they spend on individual employee with regard to training while some gave an average of one million naira (#1,000,000 or about £4,000) per employee in HSE department (training includes both home and abroad). Little amount is expended on other staff with regard to safety-related training since their safety-related training is only within the organization.
10		Does your organization normally provide induction for new employees?	18		The responses show that the organizations emphasized more on safety-related issues during induction. The new employees are introduced to all various units, the equipment, facilities, and the implications of their use.
11		What specific safety training practices/program do you have?			Both general and specific training programmes include Firefighting, first aid application, environmental awareness, equipment awareness and management, defensive safety, quarterly health talks (e.g. fit to work programme, etc.), off-shore training, induction programme (for new employees), auxiliary fire

					training program, fire drills, and survival swimming training. The general safety-related training programmes are for all the staff and they are on regular basis. The duration of the professional (specific safety training for HSE staff only) training ranges from six months to one year at the point of entry and at least once in a year there after. This however depends on each organization.
	COMPENSATIONS CONTINGENT ON SAFE PERFORMANCE				
12		How do you compare the average pay level (including incentives) of your employees (especially front line employees) with that of similar organizations in the industry?			All the employees (except management staff) of the oil and gas companies in Nigeria belong to one trade union-Petroleum and Gas Association of Nigeria (PENGASSON). Although, the employees negotiate salary through the trade union, the government owned companies pay a little less than what the private companies pay. The allowances and incentives also vary from company to company though very competitive.
13		To what extent are employees' salaries and rewards determined by their safety performance?			The entry point pay of employees is determined by qualifications and cognate experience in all the companies and not safety performance. However, incentives and rewards/awards vary from department to department and from organization to organization.
14		Does your organization give monetary and non-monetary reward for exemplary safety performance?	18		Although, all of them agreed that they give letter of commendation for exemplary safety performance, some do actually give more than that. For example, the drivers of some highly technical-oriented companies are given safety performance or accident free bonus in

					addition to the letter of commendation. Some companies also identify the staff of the year based on safety-related issues and reward them in one way or the other.
15		How much importance does your organization attach to fairness or equity in the distribution of safety-related compensation/rewards?			All the responses indicate that there is fairness and equity in the distribution of compensation/rewards. For example, the staff of the month or staff of the year is nominated by the staff and to be ratified by the head of department for management approval. Moreover, the records of each employee are usually referred to before such nominations for rewards are ratified.
16		Do you have specific practices to encourage or motivate employees to work safely? Are these practices focused on individuals or work groups?	18		The management's acknowledgement of safety-related efforts by the individuals and groups is meant to motivate them. This is because the letter of commendation and other reward systems can add value to their appraisal and consequently facilitate their upward movement.
17		What other specific safety-contingent compensations or practices do you have and how do you actually carry them out in practice?			As in 16 above.
	EMPLOYMENT SECURITY				
18		How much emphasis does your organization attach to employment security for its employees			All the responses show that their companies place a great deal of emphasis on employment security
20		With reference to safety performance, describe the extent to which your organization would try to find an employee another position if he/she were to lose his/her job.			This type of situation has never been experienced by any of the interviewees and therefore could not make any statement. However, one of them remarked that a staff of his company resigned to go to a similar organization but the company gave him what the other company offered him in order to retain him because of his

					performance (not necessarily safety performance).
21		All being well, can employees expect to work for your organization for their entire career?	18		However, all of them are of the opinion that safety-related concerns (as much as other concerns) can be a cause for employee termination or retention.
22		Please, explain the extent to which safety performance is important in employee retention in your organization			In two (2) companies, an employee in HSE department must have a particular minimum score (70% for one of them) for general safety performance before he/she is considered for promotion. Others except three (3) have 10% or 15% rating for safety-related performance in the employee appraisal form and an employee must have this score before he/she is considered for promotion. One of the companies has considered including a particular score for safety performance in employees' appraisal form but this would be effected in January, 2014
	INTERNAL OPPORTUNITIES FOR PROMOTION				
23		Using safety-related qualifications and performance as criteria, do qualified employees have good opportunity for internal promotion in your organization?		18	Although all of them suggest that safety-related qualifications and performance can serve as an opportunity for internal promotion, this is particularly true for the HSE department employees. However, all the employees are expected to do their work safely as gross safety infraction by any employee can lead to termination of appointment
24		To what extent do internal candidates, who are beneficiaries of the organization's investment in safety-related orientations and training have priority in terms of job opening?			All the interviewees suggest that, generally, their companies give priority to internal candidates in terms of job openings irrespective of the department except where the company is hiring for a particular

					experience and the experience is not found within the organization.
25		To what extent do employees who have acquired safety-related skills have clear career paths in your organization?			All the responses suggest that all the employees (including the HSE staff) have clear career paths in their companies. This is demonstrated by the fact that most of their employees work until they retire from service or transfer to other companies.
26		Does your organization consider safety performance when making internal promotion?	18		As stated in item 23 above, safety performance is highly considered when making internal promotion for the HSE employees only but gross safety infraction can have adverse effect on the promotion of all the employees in the company.
	EMPLOYEE SAFETY INVOLVEMENT/SAFETY PARTICIPATION				
27		To what extent do supervisors keep open safety communications with employees in your organization?			All the interviewees suggest that supervisors, to a very large extent, keep open safety communications with all their subordinates.
28		To what extent do you ask your employees for their opinion in advance if a decision made might affect their safety at work			In all the companies, employees have a powerful union that represents them in any meeting where issues including safety-related matters that might affect the employees at work are discussed and decisions taken on them before they are implemented.
29		Do you have practices that give employees discretion to resolve safety-related issues in the workplace?	18		The responses indicate that employees are given opportunity to handle some safety-related issues to some extent. Thus they have safety initiative as a common practice among the employees. For example, all the employees are trained to understand accident prevention strategies and what the safety signs in the organization represent, the use of safety

					equipment, what total loss control signifies, and so on. The employees are therefore expected to use their initiative to operate at their various levels. This must however, conform with the company's rules and regulations.
30		What are some practices through which your organization supports employees with necessary equipment and resources to provide high quality safety performance?			The use of safety equipment depends on the type of work an employee does and the nature of the organization. Generally, the HSE employees must have and wear their safety equipment while other employees in less hazardous companies, though provided with protective equipment, wear them when they want to visit the areas with hazards. Some of the practices to ensure that the employees have the necessary equipment and resources are: disposition, meaning the practical evaluation of pre- and post-event issues to ascertain if lack of equipment or resources played a role; visibility, meaning going round by a team to ensure safety; and training
31		Do you have practices that enable employees to make suggestions or recommendations regarding safe work practices?	18		They have some practices that enable employees to make suggestions and recommendations on general matters including safety-related issues. For example, all the organizations have such provision like suggestion box, while many others have 'focal points' in HSE where all the departments are represented. Latest information on safety-related issues is shared with the representatives for onward transmission to their departments for sampling of opinions. Routine safety updates

					and messages are disseminated from the focal points through emails.
	PERFORMANCE APPRAISALS				
32		How often does your organization measure employee safety performance in terms of objective quantifiable results?			At the beginning of each year the supervisor and his subordinates get together to set objectives for the year and these objectives are pursued at the individual as well as team levels though there is monitoring and weekly or monthly or quarterly review of achievements. Responses indicate that before a particular safety-related job is performed the individual concerned will fill a form and at the completion of the job, a certificate is issued indicating that the job is done. This is however different from normal routine job. This performance of their job is documented and the annual appraisal is based, among others, on these documentations of the employees.
33		What are some practices that your organization uses to assess the safety performance of employees?			The HSE employees are said to be safety professionals and are therefore assessed basically on their safety-related performance as shown in the record.
34		Do employee appraisals emphasize long-term and group-based safety achievements?	17	1	Responses from seventeen (17) of the professionals interviewed suggest that long-term and group-based safety achievements are emphasized in HSE employees' appraisals but not for other employees.
35		To what extent do safety performance appraisals provide employees feedback for personal development?			All the professionals interviewed suggest that their superior officials regularly report on the individual employee (irrespective of your department) performance and the outcome of this report is made known to the individual employee concerned. This report

					helps the employee to know his standing and to adjust accordingly.
36		To what extent are safety performance appraisals based on multiple sources (e.g self, co-workers, supervisors, etc)?			All the eighteen (18) interviewees suggest that, generally, supervisors appraise their subordinates and the outcome is given to the employee concerned for his information and comment (if any) before the report is sent to the management. The co-workers do not appraise the employees in any company
37		To what extent do supervisors get together with employees to set their personal safety goals?			The supervisors get together with their employees to set objectives (including safety objectives) at the beginning of each year in most of the companies and get together again on regular basis to review the progress and achievements.
	SELF–MANAGED TEAM AND COLLABORATION	How important is ability to work safely relative to ability to meeting production targets in appraising the performance of the employees? What makes one an ideal employee in your organization-meeting production targets or meeting safety targets?			It is a consensus statement by all the interviewees that safety is priority and that safety determines productivity. The safety of the employees, equipment, and the environment goes a long way in promoting companies productivity. So meeting safety targets makes one an ideal employee.
39		To what extent are suggestions on safety issues implemented with your organization?			The companies believe more on team work because they assumed that the team work is the bedrock for every organization. Therefore, team's suggestion and recommendations on safety-related matters are more acceptable to the companies than those of the individual employees.
40		Please explain the extent to which your organization supports safety-related team development (e.g encourages self-management and collaboration on safety-related issues)?			Team development is highly supported by their companies because they are more achievement-oriented than the individual. So seminars, workshops, monthly and quarterly drills focus on

					team development.
	SAFETY INFORMATION SHARING				
41		To what extent does your organization share with employees information about how well the organization is performing in safety-related issues?			Responses indicate that safety-related information about the organization is regularly shared with the employees through web, tool box talks, safety talks, awareness lecture, journals, safety tips, notice board, sensitization talks, safety briefs, routine safety messages dissemination, focal points, and so on.
42		To what extent does your organization share information on its safety performance with employees?			As in 41 above.
43		What specific practices do you have for ensuring employees are kept informed about safety-related issues?			As in 41 above.
	JOB AND WORK DESIGN				
44		Do the jobs employees do have an up to date safety-related descriptions?	18		Every job description is clearly defined in line with safety rules and procedures and jobs are designed to promote safety.
45		Are safety requirements or rules clearly defined?	18		Safety rules and requirements are clearly defined.
46		To what extent do employees perform simple and repetitive tasks as part of their safety-related work?			Most of the work is done as a team.
47		To what extent does the job description for a position accurately describe all of the safety rules and procedures?			The company provides safety-related document with regard to each job and safety requirements or rules and job description for position are clearly stated in the document.
48		How is the work employees do designed or structured to promote safety?			Safety is said to be paramount in oil and gas companies and everyone is trained to be safety conscious. So the work employees do especially in the technical-oriented departments is designed to meet safety requirements, rules and procedures. In order to achieve this, employees are exposed to refresher, exigency, and incidental

					courses. There is also a regular job safety analysis.
49		Are there other practices that your organization has developed or uses to promote health and safety?			Some other practices include total lost control community, internal technical safety audit of plants and facilities, safety campaign, fire equipment maintenance, accident prevention, management discretionary payment/reward, and safety initiative. The management discretionary payment/reward in this case can be explained in terms of the compensation contingent on safety performance.
50		Are there organizations in the oil and gas industry that are considered leaders in the promotion of health and safety? What do you think is unique about these organizations? What can other organization learn from them in terms of promoting health and safety?			Some of the interviewees suggest that some oil and gas companies are actually leading in terms of promotion of health and safety. They believe that they are unique because of their high level of technology, level of awareness and their level of investment on safety. They also consider their leadership commitment to safety policy as unique.

The following practices were found to be in vogue in many of the companies:

Internal Technical Safety Audit of Plants and Facilities

The companies have in place a practice where the NNPC safety policy guideline is followed by carrying out internal technical safety audit of all their plants and facilities as well as third party facilities. This is done by the HSE staff. During this exercise, the unsafe acts, operators' constraints and the conditions of the plants and facilities are noted. The observation of non-compliance (if any) is made known to the location manager for his information. The committee then writes its report on each of the locations to the management through the HSE manager.

Safety Campaign

The safety campaign activities are in compliance with the NNPC safety policy guideline. It is the responsibility of the manager, HSE, the Superintendent, Fire and Safety, and the Safety Officers to ensure that banners, flyers, billboard, T-Shirts, Caps, Refreshment and items of stationary are adequately provided for this purpose. During the campaign, the officers concerned move from location to location to address staff on the objective of safety campaign, entertain questions on all aspects of safety and ensure that satisfactory responses are provided for the questions. During this exercise every unsafe acts and conditions are also observed. The committee submits its report at the end of the exercise to the manager HSE through the Superintendent, Fire and Safety.

Fire Equipment Maintenance

In compliance with NNPC safety policy guideline, most of the companies have detailed guideline for Fire Equipment Maintenance. It is the responsibility of the HSE manager, Superintendent, Fire and Safety and Fire Officers to ensure that fire extinguishers, caution tapes, barricades, gas detectors/explosimeters, work permit, working tools, and first-aid kits are provided and in the right positions within the locations. It is also their responsibility to see that these equipment are adequately maintained in line with the laid down procedure of the company. There is therefore constant inspection of the fire equipment in order to ensure adequate maintenance.

Accident Prevention

The NNPC safety policy guideline also provides for activities to ensure accident prevention in each company. Thus it is the responsibility of the Manager HSE, Superintendent Fire and

Safety, and Safety Officers to ensure that safety sign posts, safety manuals, safety awareness signs, safety flyers, speed breakers, barricades and warning signs are adequately provided for employees and in the appropriate positions. It is also their duty to educate staff at each location on the importance of the safety signs and to ensure compliance by staff at locations. They are also to issue safety violation to defaulters and induct them on the effect of non-compliance. The report on accident is prepared by them on monthly, quarterly and yearly basis and sent to the manager HSE through the Superintendent Fire and Safety.

Total Loss Control Community

The total loss control community represents a situation where the company strives to achieve a complete condition or state of no loss of personnel, equipment and environment. Thus before any job is done the members of the team concerned will be invited for a practical informal discussion requiring every member to frankly talk why the task at hand will not be hundred per sent (100%) achieved. Following this frank talk, adequate provisions will be made to solve every potential problem and this will lead to 100% success in the task accomplishment with any loss.

Safety Initiative

Safety is said to be the responsibility of everybody from the top (i.e. the CEO) down the hierarchy to the peon or the general factotum. Therefore, all hands must be on deck in order to have, if not a complete accident-free workplace, a very close to accident-free workplace. This can only be achieved when the employees' safety-related opinions are allowed. In other words, employees are openly allowed to give safety suggestions, advice and recommendations that will promote the current safety practices of the organization.

Appendix F: List of 41 Items Retained for Further Analysis

Safety Training

1. This company provides safety-related training programmes for all employees
2. This company invests considerable amount of time and money in safety-related training
3. This company provides regular safety-related training programmes for its employees
4. Safety-related issues are well emphasized during the induction programmes for new employees

Rewards Contingent on Safety Performance

5. The company gives non-monetary rewards for exemplary safety performance
6. There is fairness and equity in the distribution of rewards contingent on safe performance in this company
7. The management recognizes the safety-related efforts by individual employees in the company by giving a letter of commendation, among others

Internal Opportunity for Promotion

8. This company gives priority to safety-related experience of internal candidates in terms of job openings
9. Safety-related efforts enhance employees' opportunity for upward movement in this company
10. The letter of commendation given to an employee for exemplary safety-related efforts in this company enhances his/her opportunity for promotion
11. Employees who have acquired safety-related skills have clear career paths in this company

Safety Involvement and Participation

12. Employees in this company are represented in meetings when issues, including safety-related matters, affecting them are discussed before they are implemented
13. Employees are allowed to use their discretion to handle some specific safety-related issues
14. My company provides suggestion boxes and other avenues through which employees make suggestions and recommendations on general matters including safety issues
15. This company acts upon the suggestions provided by employees (e.g. through suggestion boxes)

Performance Appraisals

16. Supervisors set performance objectives or goals (including safety goals) with their subordinates
17. Performance appraisals provide employees feedback on their understanding of safety issues
18. The immediate superior officers appraise their subordinates on their knowledge of safety-related issues but with the knowledge of the individual employee concerned

Self-Managed Team

19. Teams are responsible for regulation the safety performance of their members
20. A member of the team ensures members are up to date in safety-related issues
21. Teams are held responsible for the safety performance of their member
22. Teams are encouraged to suggest improvement on safety-related practices

Safety Information Sharing

23. This company shares safety-related information with employees on regular basis
24. Employees are given safety-related information to understand and perform their job safely
25. Company-level safety performance information is shared with employees

26. The company shares information regarding new development in safety practice with employees

Clear Job Description

27. Every job description is clearly defined in line with safety rules and procedures
28. Jobs are designed to enable employees to work safely
29. The job description for each position is clearly defined in the document given to employees

Safety Audit

30. This company carries out a safety audit of its plant and facilities on a regular basis
31. This company carries out a safety audit of the plants and facilities provided by contractors
32. This company acts on issues raised as a result of the safety audit
33. The company has procedure for ensuring compliance with statutory safety regulations

Safety Campaign

34. My company has a periodic safety campaign
35. My company has safety awareness week
36. Employees are encouraged to discuss safety-related issues during the safety awareness week
37. Safety briefings are provided during the safety awareness week

Safety Equipment Maintenance

38. My company provides fire safety equipment in the right position within the locations
39. My company ensures that its fire safety equipment are regularly maintained
40. The fire safety equipment are inspected on regular basis
41. My company provides safety sign posts, safety manuals, safety awareness signs, safety flyers, speed breakers, barricades and warning.

Appendix G: Sample of Cover Letter of Line Manager's Questionnaire

Dear Sir/Madam

Request for Participation in a PhD Research

I am Paulson Okhawere, a doctoral researcher from Aston Business School, Aston University, Birmingham, United Kingdom. Despite the high financial and human costs of unsafe work behaviours, there is very little research on how companies in Nigeria's oil and gas industry can promote safe work behaviours. Accordingly, I am currently conducting a study to investigate the extent to which companies in this industry have adopted safe work practices. I am therefore writing to invite you to participate in this study by completing the attached questionnaire. If successful, this study will generate actionable knowledge that oil and gas companies in Nigeria can use to promote workplace safety.

Please read each question carefully. There are no RIGHT or WRONG answers so I urge you to answer each question according to how you personally feel about it. That is, as an accurate description of your company's hazardous environment and safety practices adopted in your company. For the survey to be meaningful, please answer all questions.

In accordance with the ethics of behavioural science research, your responses would be completely CONFIDENTIAL and will only be used for the purposes of this study.

Thank you very much for your understanding.

Yours sincerely

Paulson Okhawere

Appendix H: Sample of Cover Letter of Frontline Employee's Questionnaire

Dear Sir/Madam

Request for Participation in a PhD Research

I am Paulson Okhawere, a doctoral researcher from Aston Business School, Aston University, Birmingham, United Kingdom. Despite the high financial and human costs of unsafe work behaviours, there is very little research on how companies in Nigeria's oil and gas industry can promote safe work behaviours. Accordingly, I am currently conducting a study to investigate the extent to which companies in this industry have adopted safe work practices. I am therefore writing to invite you to participate in this study by completing the attached questionnaire. If successful, this study will generate actionable knowledge that oil and gas companies in Nigeria can use to promote workplace safety.

Please read each question carefully. There are no RIGHT or WRONG answers so I urge you to answer each question according to how you personally feel about it. That is, as an accurate description of safety practices adopted in your company. For the survey to be meaningful, please answer all questions.

In accordance with the ethics of behavioural science research, your responses would be completely CONFIDENTIAL and will only be used for the purposes of this study.

Thank you very much for your understanding.

Yours sincerely

Paulson Okhawere

Appendix I: Scales used for data collection in Study 4

Code: ....

Section A: Personal Information

Sex:

☐ Male

☐ Female

Age at last birthday: ☐ Under 30 years ☐ 30-39 year ☐ 40-49 years; ☐ 0-60 years

Employment Status:

☐ Full-time

☐ Part-time

☐ Contract

Level of education:

☐ Below First Degree (e.g. OND, NCE, WASC, NECO, etc.)

☐ First Degree or its equivalence (e.g. BSc, BA, HND, B.TECH, etc.)

☐ Postgraduate Degree (e.g. MSc, MA, MBA, M.TECH, PG etc.)

Your experience on the job: ☐ Under 3 yea ☐ 3-6 y rs; ☐ 10 years; Over 10 years

How long have you worked in the oil and gas industr ☐ Under 3 ye ☐; 3 – 6 years; ☐ 7 – 10 years, ☐ Over 10 years

How long have you worked under your present supervisor? ☐ Under 3 y ☐ rs; 3 – 6 years; ☐ 7– 10 years, ☐ Over 10 years

HIGH PERFORMANCE WORK SYSTEM FOR SAFETY

Below are practices that a company may adopt to promote health and safety at work. For each practice, please indicate the extent of your agreement or disagreement (by ticking the appropriate box) as a description of the extent to which you experience it in your present organization

1 = Strongly Disagree (SD), 2 = Disagree (D), 3 = Undecided (UND), 4 = Agree (A), 5 = Strongly Agree (SA)

S.No.	Statement	SD	D	UND	A	SA
1	This company provides safety-related training programmes for all employees	1	2	3	4	5
2	This company invests considerable amount of time and money in safety-related training	1	2	3	4	5
3	This company provides regular safety-related training programmes for its employees	1	2	3	4	5
4	Safety-related issues are well emphasized during the apprenticeship (or induction) programmes for new employees	1	2	3	4	5
5	There is fairness and equity in the distribution of rewards contingent on safe performance in this company	1	2	3	4	5
6	The management recognizes the safety-related efforts by individual employees in the company by issuing outstanding employees letters of commendation, among others	1	2	3	4	5
7	This company gives priority to safety-related experience of internal candidates in terms of job openings	1	2	3	4	5
8	Safety-related efforts enhance employees' opportunity for upward movement in this company	1	2	3	4	5
9	Employees who have acquired safety-related skills have clear career paths in this company	1	2	3	4	5
10	Employees in this company are represented in meetings when issues, including safety-related matters, affecting them are discussed before they are implemented	1	2	3	4	5
11	This company acts upon the suggestions provided by employees (e.g. through suggestion boxes)	1	2	3	4	5
12	In this company, supervisors set performance objectives or goals (including safety goals) with their subordinates	1	2	3	4	5
13	Performance appraisals provide employees feedback on their understanding of safety issues	1	2	3	4	5
14	Immediate superior officers appraise their subordinates on their safety performance	1	2	3	4	5
15	Teams are held responsible for the safety performance of their members	1	2	3	4	5
16	Teams are encouraged to make suggestions regarding improvements in safety-related practices	1	2	3	4	5
17	This company shares safety-related information with employees	1	2	3	4	5
18	This company shares information regarding new developments in safety practices with employees	1	2	3	4	5
19	Job descriptions are clearly defined in line with safety rules and procedures	1	2	3	4	5
20	Jobs are clearly designed to highlight safety requirements	1	2	3	4	5
21	This company carries out a safety audit of its plant and facilities on a regular basis	1	2	3	4	5
22	This company carries out a safety audit of the plants and facilities provided by contractors	1	2	3	4	5

S.No.	Statement	SD	D	UND	A	SA
23	This company acts on issues raised as a result of the safety audit	1	2	3	4	5
24	This company gives priority to periodic safety campaigns	1	2	3	4	5
25	Employees are encouraged to discuss safety-related issues during the safety awareness week	1	2	3	4	5
26	Safety briefings are provided during the safety awareness campaigns	1	2	3	4	5
27	This company provides adequate safety equipment in strategic or appropriate locations on its premises	1	2	3	4	5
28	This company ensures that its safety equipment are regularly maintained	1	2	3	4	5
29	Safety equipment are inspected on a regular basis	1	2	3	4	5

SAFETY CLIMATE

The following statements indicate the priority an organization (or manager) may place on workplace safety. Please indicate the extent to which each of the following statements describes your immediate supervisor by ticking the appropriate box

1 = Strongly Disagree, 2 = Disagree, 3 = Undecided, 4 = Agree, 5 = Strongly Agree

Serial Number	Statements	Strongly Disagree (1)	Disagree (2)	Undecided (3)	Agree (4)	Strongly Agree (5)
1	My supervisor makes sure we receive all the equipment needed to do the job safely	1	2	3	4	5
2	My supervisor frequently checks to see if we are all obeying the safety rules	1	2	3	4	5
3	My supervisor discusses how to improve safety with us	1	2	3	4	5
4	My supervisor uses explanations (not just compliance) to get us to act safely	1	2	3	4	5
5	My supervisor emphasizes safety procedures when we are working under pressure	1	2	3	4	5
6	My supervisor frequently tells us about the hazards in our work	1	2	3	4	5
7	My supervisor refuses to ignore safety rules when work falls behind schedule	1	2	3	4	5
8	My supervisor is strict about working safely when we are tired or stressed	1	2	3	4	5
9	My supervisor reminds workers who need reminders to work safely	1	2	3	4	5
10	My supervisor makes sure we follow all the safety rules (not just the most important ones)	1	2	3	4	5

11	My supervisor insists that we obey safety rules when fixing equipment or machines	1	2	3	4	5
12	My supervisor says "good words" to workers who pay special attention to safety	1	2	3	4	5
13	My supervisor is strict about safety at the end of the shift, when we want to go home	1	2	3	4	5
14	My supervisor spends time helping us learn to see problems before they arise	1	2	3	4	5
15	My supervisor frequently talks about safety issues throughout the work week	1	2	3	4	5
16	My supervisor insists we wear our protective equipment even if it is uncomfortable	1	2	3	4	5

SAFETY KNOWLEDGE

The following statements describe an employee's safety-related knowledge. For each statement, please indicate the extent to which you agree or disagree.

1 = Strongly Disagree, 2 = Disagree, 3 = Undecided, 4 = Agree, 5 = Strongly Agree

Serial Number	Statements	Strongly Disagree (1)	Disagree (2)	Undecided (3)	Agree (4)	Strongly Agree (5)
1	I know how to performance my job in a safe manner	1	2	3	4	5
2	I know how to use safety equipment and standard work procedures	1	2	3	4	5
3	I know how to maintain or improve workplace health and safety	1	2	3	4	5
4	I know how to reduce the risks of accidents and incidents in the workplace	1	2	3	4	5

SAFETY MOTIVATION

The following statements describe an employee's safety motivation at work. For each statement, please indicate the extent to which you agree or disagree.

1 = Strongly Disagree, 2 = Disagree, 3 = Undecided, 4 = Agree, 5 = Strongly Agree

Serial Number	**Statements**	**Strongly Disagree (1)**	**Disagree (2)**	**Undecided (3)**	**Agree (4)**	**Strongly Agree (5)**
1	I believe that workplace health and safety are important issues	1	2	3	4	5
2	I feel that it is worthwhile to put in effort to maintain or improve my personal safety	1	2	3	4	5
3	I feel that it is important to maintain safety at all time	1	2	3	4	5
4	I believe that it is important to reduce the risk of accidents and incidents in the workplace	1	2	3	4	5

SAFETY COMPLIANCE

The following statements represent an employee's safety compliance in the workplace. Please, indicate the extent to which each of these statements describes you

1 = Strongly Disagree, 2 = Disagree, 3 = Undecided, 4 = Agree, 5 = Strongly Agree

Serial Number	Statements	Strongly Disagree (1)	Disagree (2)	Undecided (3)	Agree (4)	Strongly Agree (5)
1	I carry out my work in a safe manner	1	2	3	4	5
2	I use all the necessary safety equipment to do my job	1	2	3	4	5
3	I use the correct safety procedures for carrying out my job	1	2	3	4	5
4	I ensure the highest levels of safety when I carry my job	1	2	3	4	5

SAFETY INITIATIVE

The following statements describe an employee's safety initiative in the workplace. Please, indicate the extent to which you agree or disagree with each of these statements.

1 = Strongly Disagree, 2 = Disagree, 3 = Undecided, 4 = Agree, 5 = Strongly Agree

Serial Number	Statements	Strongly Disagree (1)	Disagree (2)	Undecided (3)	Agree (4)	Strongly Agree (5)
1	I am involved in improving safety policy and practices	1	2	3	4	5
2	If I think it will make work safer, I initiate steps to improve work procedures	1	2	3	4	5
3	If I see something unsafe, I go out of my way to address it	1	2	3	4	5
4	I voluntarily carry out tasks or activities that help to improve workplace safety	1	2	3	4	5
5	I often make suggestions to improve how safety is handled around here	1	2	3	4	5
6	I often try new approaches to improving workplace safety	1	2	3	4	5
7	I often try to solve problems in ways that reduce safety risks	1	2	3	4	5
8	I keep abreast of changes to do with safety	1	2	3	4	5

SAFETY-SPECIFIC TRANSFORMATIONAL LEADERSHIP

The following statements represent an organization's management style with regards to safety. Please indicate the extent to which the following statements describe your immediate supervisor by ticking the appropriate box

1 = Not at all, 2 = Once a While, 3 = Sometimes, 4 = Fairly Often, 5 = Frequently or Always

Serial Number	**Statements**	**Not at all (1)**	**Once in a While (2)**	**Sometimes (3)**	**Fairly Often (4)**	**Frequently Or Always (5)**
1	My supervisor expresses satisfaction when I perform my job safely	1	2	3	4	5
2	My supervisor makes sure that we receive appropriate rewards for achieving safety targets on the job	1	2	3	4	5
3	My supervisor provides continuous encouragement to do our job safety	1	2	3	4	5
4	My supervisor shows determination to maintain a safe work environment	1	2	3	4	5

5	My supervisor suggests new ways of doing our jobs more safely	1	2	3	4	5
6	My supervisor encourages me to express my ideas and opinions about safety at work	1	2	3	4	5
7	My supervisor talks about his/her values and beliefs of the importance of safety	1	2	3	4	5
8	My supervisor behaves in a way that displays a commitment to a safe workplace	1	2	3	4	5
9	My supervisor spends time showing me the safest way to do things at work	1	2	3	4	5
10	My supervisor would listen to my concern about safety on the job	1	2	3	4	5

BOTTOM-LINE ORIENTATION

Below are statements that describe orientation to the bottom-line (usually profit/productivity) or whatever is worth paying attention to while neglecting everything else. For each statement, please indicate the extent of your agreement or disagreement as a description of your work unit's orientation to the bottom-line

1 = Strongly Disagree, 2 = Disagree, 3 = Undecided, 4 = Agree, 5 = Strongly Agree

Serial Number	Statements	Strongly Disagree (1)	Disagree (2)	Undecided (3)	Agree (4)	Strongly Agree (5)
1	In my work unit, we are solely concerned with meeting the bottom-line	1	2	3	4	5
2	Colleagues in my work unit only care about the business	1	2	3	4	5
3	In my work unit, we treat the bottom-line as more important than anything else	1	2	3	4	5
4	Colleagues in my work unit care more about profits than employee well-being	1	2	3	4	5

SAFETY-RELATED EVENTS

Please indicate the frequency with which each of the following events has occurred to you over the past one (1) year

1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Often, 5 = Frequently

Serial Number	Statements	Never (1)	Rarely (2)	Sometimes (3)	Often (4)	Frequently (5)
1	I was exposed to some dangerous chemicals (e.g. hydro-sulphuric acid, Hydro-fluoric acid, etc.)	1	2	3	4	5
2	I was exposed to some dangerous gases (e.g. carbon monoxide, ammonia gas, hydrogen sulphide, etc.)					
3	I tripped over something on the floor (e.g. empty cans, metal scraps, liquids, work tools/instruments, etc.)	1	2	3	4	5
4	A sharp object (e.g. rotating parts of machines such as compressors, fin fans, etc.) cut my hand while working	1	2	3	4	5
5	My clothes got caught in something (e.g. rotating parts of pumps, compressors, fin fans, etc.) while working	1	2	3	4	5
6	I slipped on liquid substances (e.g. liquid gas) or other objects on the floor	1	2	3	4	5
7	I came in contact with dangerous equipment (e.g. high pressure and high temperature steam lines, etc.) that almost caused an injury	1	2	3	4	5
8	A heavy object (e.g. a sledge hammer, spanner, screw, etc.) dropped on my body part (e.g., foot).	1	2	3	4	5

WORKPLACE INJURIES

Please indicate how often, over the past SIX (6) months, you required First Aid treatment for each of the types of injuries listed below

1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Often, 5 = Frequently

Serial Number	Statements	Never (1)	Rarely (2)	Sometimes (3)	Often (4)	Frequently (5)
1	Fracture	1	2	3	4	5
2	Dislocation, sprain, strain	1	2	3	4	5
3	Bruising, crushing	1	2	3	4	5
4	Scratch, abrasion, (superficial wound)	1	2	3	4	5
5	Cut, laceration, puncture (open wound)	1	2	3	4	5
6	Burn, scald	1	2	3	4	5
7	Eye injury	1	2	3	4	5

8	Concussion, head injury	1	2	3	4	5
9	Gassing	1	2	3	4	5
10	Hernia	1	2	3	4	5
11	Different types of shocks	1	2	3	4	5
12	Multiple injuries	1	2	3	4	5
13	Others (please specify)	1	2	3	4	5

END

Please go over the questionnaire and ensure every item has been completed. Thank you for taking the time to complete this questionnaire.

Appendix J: Summary of the Psychometric Properties of HPWS for Safety Scale

Type of Validity	Study 1	Study 2	Study 3	Study 4
Face Validity	Conducted interview with managers and professionals to generate 14 domains and 64 items			
Content Validity	Engaged 11 doctoral researchers drawn from Aston Business School as judges to classify or sort the 64 items to the 14 theoretical domains underpinning the construct. 14 domains and 41 items were retained.	EFA conducted indicated that 29 items loaded on three factors, explaining 55.88% of the total variance. This is consistent with the theoretical foundation (AMO) upon which the construct was built.		EFA conducted indicated that the 27 items (having removed two items on clear job description) loaded on five-factor components. A closer look at the screeplot (See Figure 5.1) suggested a clear break after the third component. So Catell's (1966) test was used to retain three-factor component for further investigation.
	My supervisory team observed that three of the proposed domains appeared to measure outcomes rather than practices. The 3 domains: accident prevention, total loss control community, and safety initiative were dropped. 11 domains and 41 items were retained for further analysis.	Consistent with some researchers' (e. g. Aryee, et al. 2012; Zacharatos & colleagues, 2005; Kanfer, 1985; Comrey, 1978) subscale summation approach, the average of the scores of items of each subscale was calculated and used for conducting EFA. Table 3.9 shows a one-factor solution, accounting for 66.22% of the total variance explained. This now constitutes a system of HPWS for safety scale,		Watkin's (2000) Monte Carlo PCA for parallel analysis indicates three-factor components with eigenvalues exceeding the corresponding criterion values for a randomly generated data matrix of the same size (27 x 569) (See Tables 5.1 & 5.2). This supports the decision to retain three-factor solution. Three-factor solution was then forced (see Table 5.3).

				Note: The three-factor solution here is similar to that obtained in Study 2 except that safety information sharing loaded on opportunity-enhancing component instead of motivation-enhancing component.
	Interrater Reliability Assessment was done to determine the level of similarity among the judges' ratings. The interrater reliability coefficients ranged from 0.33 to 0.99 with an average of 0.77, indicating a high level of similarity among the judges' ratings. The 11 domains and 41 items were used to form a HPWS for safety scale for pilot testing.	The internal consistency reliability coefficients (Cronbach, 1951) of the Subscales range from 0.73 to 0.92 and the alpha for the whole scale was 0.97 (See footnote of Table 3.12), all greater than 0.70 suggested by Nunnally (1978) (See Table 3.10).		Table 5.5 indicates that positive and significant correlations exist among the variables in each factor.
		To determine whether the HPWS for safety scale accounts for the majority of the variance of each subscale, the squared multiple correlation for the subscale was calculated to see whether it is greater than 0.50 (Fornell & Larcker, 1981). Table 3.11 shows that the squared multiple correlations of the subscales range from 0.59 to 0.75, > 0.50, demonstrating very high construct reliability. Fornell and Larcker's (1981) construct reliability coefficient of the whole scale was 0.95 > 0.70 suggested by Netemeyer, Burton, & Lichtenstein (2003)		The Cronbach's (1951) alpha coefficients of the three components range from 0.87 to 0.91 as compared to 0.88 to 0.95 in Study 2. The Cronbach's (1951) alpha coefficients range from 0.70 to o.88 except safety involvement and participation (0.60). The Cronbach's (1951) alpha coefficient of the whole scale was 0.92.
		Because the study		

		assumes that each item or indicator is associated with only one factor constituting the HPWS for safety scale, MacKenzie, Podsakoff, and Podsakoff (2011) recommend that the construct reliability of each item or indicator should be assessed by examining the squared multiple correlations for the item or indicator. Table 3.12 shows that each item had a squared multiple correlation value (ranging from 0.51 to 0.83) greater than 0.50 (Fornell & Larcker, 1981).		
		Table 3.12 also shows that all the items were positively correlated, meaning that the items or indicators are measuring the same underlying construct or characteristics.		
Convergent Validity			The new scale correlated positively and significantly with theoretically or conceptually similar constructs: HPWS scale (Zacharatos and colleagues, 2005) (r = 0.72, p < 0.01), and safety-specific transformational leadership scale (r = 0.52, p < 0.01).	The CFA results confirm the three-factor and one-factor solutions obtained in the EFAs in Study 2 and Study 4
			The average variance explained (AVE: Fornell & Larcker, 1981) is 0.56 > 0.50	The average variance explained (AVE: Fornell & Larcker, 1981) was 0.62 > 0.50
				Each of the 10 subscales is significantly related to the system of HPWS for safety scale (Bollen & Lennox, 1991; Bollen, 1989) (See Table 5.8)
Discriminant			The new scale	Tables 5.9 and

Validity			demonstrated a non-significant but positive correlation with a theoretically dissimilar construct: social desirability (r = 0.05) (See Table 3.15).	5.10 present the results of the confirmatory factor analyses of the distinctiveness of the unit-level and individual-level variables respectively. The hypothesized four-factor model at the unit-level fit the data well and better than all the alternative models. In the same manner, the hypothesized seven- factor model at the individual-level of analysis fit the data well and better than all the alternative models.
			Z-test statistics was used to compare the correlations between the new scale and theoretically or conceptually similar and dissimilar constructs (Kinicki, Jacobson, Peterson, & Prussia, 2013). The result shows that the new scale's correlation with HPWS scale (r = 0.72) is significantly different (Z-obs = 9.84 > 1.96, p < 0.01) from the new scale's correlation with social desirability (r = 0.05). The result also shows that the new scale's correlation with safety-specific transformational leadership scale (r = 0.52) is significantly different (Z-obs = 6.03 > 1.96, p < 0.01) from the new scale's correlation with social desirability scale (r = 0.05).	
			The study examined whether the HPWS for safety scale is less than perfectly correlated with the conceptually similar	

			constructs (Anderson & Gerbing, 1988). Table 3.15 shows that the HPWS for safety scale is less than perfectly correlated with HPWS scale by Zacharatos and colleagues (2005) ($r = 0.72 < 1$) and safety-specific transformational leadership scale ($r = 0.52 < 1$) being the constructs that were considered to be conceptually similar to the new scale.	
			The AVE of HPWS for safety scale (0.56) is greater than its shared variances with HPWS (0.52,), safety-specific transformational leadership (0.27), safety compliance (0.22), safety participation (0.22), safety initiative (0.19), and organization-based self-esteem (0.06). These results support discriminant validity of the scale (Farrel & Rudd, 2009; Fornell & Larcker, 1981).	
Criterion-Related Validity			The HPWS for safety scale is significantly related to safety compliance ($r = 0.47$, $p < 0.01$), safety participation ($r = 0.47$, $p < 0.01$), safety initiative ($r = 0.44$, $p < 0.01$), and organization-based self-esteem ($r = 0.25$, $p < 0.01$) which were hypothesized to be within its nomological construct (See Table 3.15).	