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The Impact of Safety Climate on Safety Performance in a Gold Mining Company in Ghana

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Abstract- *The study investigated the influence of safety climate on safety performance among employees in a multi-national gold mining company in Ghana. Safety climate was conceptualized and measured in terms of employee perceptions of management value for safety, supervisor safety practices, safety communication, safety training and safety system. Safety performance was conceptualized and measured in terms of employee safety compliance and safety participation, that is, how they make suggestions to improve safety in the mining environment. Using a cross-sectional survey design, 235 workers in the mines completed questionnaires on safety climate and safety performance. Pearson correlations and multiple regression analysis of the data indicated positive relationship between safety climate and safety performance as predicted. Safety systems predicted both safety compliance and participation. Safety communication and supervisory practices predicted safety compliance and safety participation respectively. The results are discussed in the framework of the theories of reasoned action and planned behaviour.*

Keywords- Mining environment; safety climate; safety performance; occupational safety; Ghana

1. INTRODUCTION

The mining environment is considered hazardous despite the technical improvement regarding safe work conditions and equipment. Mining workplaces can be classified as very dynamic work environments. This is because they are in a constant state of change by their nature. Physical work demands and environmental stressors such as exposure to extreme weather conditions, exposure to high levels of vibration and significant amounts of repetitive and manual work, make the mining environment very dynamic (Scharf, Vaught, Kidd, Steiner, Kowalski & Wiehagen, 2001 [49]; Steiner, Cornelius & Turin 1999 [51]). Despite considerable efforts in many countries to curb workplace mishaps, the toll of death, injury and disease among the world's mine workers indicate that mining remains the most hazardous occupation when it comes to the number of people exposed to risk (Amponsah-Tawiah, 2010) [5].
Mining, although accounting for just 0.4% of the global workforce, is responsible for over 3% of fatal accidents at work – about 11,000 per year and 30 each day (ILO, 2005) [33]. In Ghana, mining accounts for about 0.7% of the economic active population (Ghana Statistical Service, 2012) [22]. In trying to study and control workplace accidents and injuries, several approaches including behaviour modification have been used. To this end, safe behaviour programs have been the most popular strategy for improving safety in large organizations and industries. This approach to safety focuses on workers' behaviour as the cause of most work-related injuries. Thus safe behaviour programs run the risk of focusing on unsafe behaviour as the only cause of accidents when in fact it is often the last in the causal chain (Hopkins, 2006) [31].
During approximately the past two decades, emerging trends, however, have considered organizational factors as equally important as technical and human aspects for accident prevention and mitigation. Accident investigations have revealed that organizational and cultural factors, considered as new research interests after the Chernobyl nuclear accident in 1986 are the underlying causal factors of accidents (Cox & Flin, 1998 [13]; Seo, 2005 [50]). The realization that organizational accidents occur within cultural and social contexts has led to the rise in popularity of the concept of safety climate (Glendon, 2008) [24]. There has been considerable debate regarding the definition of safety climate though most definitions indicate that it is employees' perceptions of the work environment relating to safety (Barling, Loughlin & Kelloway, 2002 [7]; Zohar, 1980 [56]). Neal and Griffin (2006) [45] define perceived safety climate as 'individual perceptions of policies, procedures and practices relating to safety in the workplace' (pp. 946–947). These

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perceptions reflect the priority that employees believe the organisation gives to safety issues in relation to other organizational concerns such as productivity (Clarke, 2010) [12]. Safety climate thus represents the attitudes of the individual toward safety and is formed through the individual's interaction with his/her environment specifically the safety-specific characteristics of the organizational environment. It is through this interactive process that the individual develops perceptions, attitudes, and beliefs about organizational safety, which combine to form the safety climate. Hence, safety climate provides a framework for the interpretation of organizational events and processes in relation to personal and organizational safety values and reflects the appropriateness of safety-related behaviour (Clarke, 2010 [12]; Weyman, Clarke & Cox, 2003 [53]).

Studies that linked safety climate with safety performance (Griffin & Neal, 2000 [26]; Guldenmund, 2000 [27]; Wiegmann, Zhang, Von Thaden, Sharma & Mitchell, 2002 [54]; Zohar, 1980 [56]) have identified several dimensions of safety climate with the commonly measured dimension being management commitment to safety. However, there are inconsistencies and limited studies regarding other constructs that have also been included in the broader conceptualization of safety climate. The present research was based on the safety climate model proposed by Griffin and Neal (2000) [26] developed in the manufacturing and mining industries, hence considered appropriate for the current purpose. Specifically, we focused on five dimensions of safety climate and hence conceptualised safety climate to include management value, safety communication, safety training, safety systems and supervisory practices (Griffin & Neal, 2000 [26]; Zohar, 1980 [56]).

1.2 Problem Statement

Occupational accidents and injuries are a source of considerable human and economic cost. It accounts for 34 million lost work days; 28 million due to work related illness and 6 million due to workplace injury (HSE, 2009) [30]. In developing countries, over 120 million work related accidents with over 200,000 fatalities occur every year (Gyekye, 2006) [28]. The costs of unsafe workplaces are horrific in personal, economic and social terms and therefore require immediate attention from different perspectives such as safety climate. Good safety practices have enormous benefits including safer work environment; reduction of injuries; attraction, acquisition and retention of quality employees; boosts the morale and commitment of employees and prevent the cost associated with production delays and replacing equipment and staff (Amponsah-Tawiah & Dartey-Baah, 2011[4]; ASCC, 2006 [6]).These notwithstanding, organizations and earlier researchers tend to focus more on the individual unsafe behaviours in tackling the accident menace instead of completely investigating the incident and the underlying factors that may have contributed to the situation. This makes efforts towards reducing accidents occurrence yield less results.

In the current study context, Ghana, available statistics on accidents resulting in fatal and serious injuries reported to the Inspectorate Division of the Minerals Commission from the year 2000 to 2004, indicated that there has been a significant reduction of these cases over the period but more effort is still required to curb the menace.

While some studies (Cheyne, Tomas, Cox & Oliver, 1999 [9]; Lu & Tsai, 2010 [40]) have regarded some elements of safety climate as predictors of unsafe behaviours, a consensus is yet to be developed that a favourable safety climate is essential for workers to do their jobs safely (Clarke, 2006 [11]; Mearns, Whitaker & Flin, 2003[43]). Although there is some evidence to suggest a relationship between safety climate and safety outcomes, such as unsafe acts and accidents (Cigularov, Chen & Rosecrance, 2010 [10]; Fernández-Mu˜niz, Montes-Peón1 & Vázquez-Ordás, 2011 [17]) there is limited investigation into the relationship between safety climate and either its organizational antecedents or its individual outcomes, particularly within the broader organizational context (Clarke, 2010 [11]; Ismail, Asumeng & Nyarko, 2014 [34]), hence the need for further investigations in the mining industry in Ghana, given the large investment inflows into that industry, its significant economic contribution, and the associated accident implications . Hence, the study on safety climate and safety performance in the mining environment in Ghana was considered appropriate and timely.

1.3 Objectives of the Study

- To determine the relationship between workers' perceptions of safety climate and their safety performance
- To investigate the influence of the various components of safety climate; employee perceptions of management value for safety, supervisor safety practices, safety communication, safety training and safety systems, on safety performance.

2. LITERATURE REVIEW

2.1 Theoretical Framework

The theories of reasoned action (TRA) and planned behaviour (TPB) can be used as basis for, and explain the expected relationship between safety climate and safety performance.

2.1.1 Theory of Reasoned Action

The underlying argument of the Theory of Reasoned Action (TRA) is that social behaviour is motivated by an individual's attitude towards executing that behaviour. Hence, the change of behaviour is a function of one's beliefs about the outcomes of the behaviour and an evaluation of the value of each of those outcomes (Ji-Won & Young-Gul, 2001) [36]. TRA, as originally conceptualized, states that behaviour is a function of a person's willingness to carry out a behavioural intention. That is the only immediate cause for any behaviour is an individual's intentions to engage in or refrain from that behaviour. Intention in turn, is a function of the attitude

toward performing the behaviour plus the subjective norms about the behaviour or the individual's perceptions of the social pressures to engage in or refrain from that behaviour. This suggests a causal relationship with attitudes and norms predicting behavioural intentions and behavioural intentions subsequently predicting behaviour.

Drawing from the TRA, managers' and supervisors' practices are likely to have both direct and indirect effects on workers' behaviour. The indirect effects relate to the establishment of attitudes, norms and values relating to the practices of managers and supervisors. In the mining industry, the researchers propose that employees' perception of the work environment will affect their intentions and those who have some intention to put up safe behaviours will more likely behave safely while those who have no such intentions may not.

2.1.2 Theory of Planned Behaviour

Theory of planned behaviour (TPB) is an extension of TRA that offers room to address those behaviours considered somewhat questionable with regard to being under volitional control of the individual (Ajzen, 1991)[1]. The main components of the TPB are the person's own attitudes, subjective norms, perceived behavioural control, behavioural intentions, and behaviour (Ajzen, 1991, 2001) [1]. The theory posits that attitudes often fail to predict behaviour because of a large number of factors that potentially prevent the attitude from being converted to behaviour. Perceived behavioural control (PBC) which refers to the perceived barriers and facilitators of engaging in a behaviour was thus added to the TRA to predict behavioural intentions and behaviours that are not under volitional control. Under this new model, behaviour is taken as a function of intentions and perceived behavioural control (PBC). Intentions are themselves shaped by attitudes, subjective norms, and perceived behavioural control and these determinants of behaviour intentions are each based on an underlying belief structure (Fogarty & Shaw, 2010) [21]. The present study considers the TPB can be used to explain the relationship between management and supervisors attitudes to safety and employees' safety performance. Management and direct supervisors attitudes will exert an influence on workers' attitudes, subjective norms, and perceived behavioural control and in turn affect their safety behaviours.

2.2 Review of Related Studies

A number of causal models on the relationship between safety climate and safety outcomes have been proposed, but empirical support for the connection between safety climate and safety performance is less conclusive (Guldenmund, 2000) [27]. For example, whereas Mearns et al. (2003) [43] found partial support for the idea that safety climate predicts accident reporting among employees, Neal and Griffin (2006) [45] reported that safety climate positively predicted subsequent safety motivation and self-reported safety-related behaviours. On the other hand, in a meta-analysis, Clarke (2006) found a significant positive effect of safety climate on employee safety compliance and participation. Although safety climate did not predict accident involvement, workers' response to safety and conflict between production and safety significantly predicted unsafe behaviour.

There are inconsistencies in findings from studies on the relationship between safety climate perceptions and safe behaviour. In a study, Jiang, Yu, Li and Li (2010) [35] presented a safety climate model predicting a relationship between unit-level safety climate and perceived colleagues' safety knowledge/behaviour (PCSK/B) as antecedents and safety behaviour (safety compliance and safety participation), as well as safety performance (injuries and near misses) as consequence. Taking PCSK/B as an individual-level predictor, the results indicated significant cross-level interaction effects of unit-level safety climate and PCSK/B on safety behaviour. That is the more positive the safety climate, the stronger the effects of PCSK/B on safety behaviour. It was also found that a cross-level interaction effect between unit-level safety climate and PCSK/B can predict safety behaviour. Both safety compliance and participation were related to injuries. The results further showed that the effect of PCSK/B on safety outcome (e.g. injuries) was mediated by safety behaviour. In contrast, Glendon and Litherland (2001)[23] in an observational study failed to find support for the relationship between safety climate perceptions and safe behaviour.

2.2.1 Dimensions of Safety Climate as Predictors of Safety Performance

Empirical evidence explaining the relationships between specific dimensions of safety climate (management value, supervisory practices, safety communication, safety training and safety systems) and safety performance are presented.

Management Value for Safety and Safety performance

Despite the differences among researchers regarding the dimensions of safety climate, a large number of studies stress management's commitment to safety as an essential element of an organisation's safety climate and as an extremely important factor in achieving a good safety performance (Donald & Canter, 1994 [15]; Yule, Flin & Murdy, 2007 [55]; Zohar, 2000 [57]). Managers demonstrate commitment through their knowledge of the existing problems, their conviction that the firm can achieve high levels of safety, their ability to exhibit a lasting positive attitude towards safety, and their ability to promote safety actively at all levels in the organisation (Fernández-Mu˜niz, Montes-Peón & Vázquez-Ordás, 2011 [18]). Management's attitudes and decisions can also directly or indirectly affect employees' attitudes and consequently their behaviours (Rundmo & Hale, 2003) [48].

Supervisory practices and Safety performance

Supervisors exercise influence through their control of how organizational messages are communicated to subordinates either verbally or through supervisors' actions. These behaviours of supervisors are interpreted by their subordinates as representative of organizational actions, policies, and procedures. Thus by informing

subordinates of organizational policies, supervisors interpret organizational priorities as they understand them as against officially set priorities and convey this information as part of their supervisory duties (Gonzalez-Roma, Peiro & Torera, 2002 [25]). The behaviours of supervisors reflect their commitment to safety and the prioritization of safety over other organizational goals (Rundmo & Hale, 2003 [48]; Flin & Yule, 2004 [19]). Supervisors in an organization can modify their employees' safety related behaviour to fit the safety climate of the organization. Mearns et al. (2003)[43] contended that supervisors' commitment to safety might improve safety performance, since supervisors play a role as trainers and instructors at the front line. Supervisors are important in instilling safety awareness and supporting safe behaviour within an organization (Barling et al., 2002 [7]; Zohar & Luria, 2003[59]) .

Safety communication and Safety performance

Open communication and frequent interactions between employees' and supervisors are important organizational characteristics, which differentiate companies with low accident rates from those with high accident rates. Regular communication about safety issues between managers, supervisors and employees is an effective practice for improving safety in the workplace (Vinodkumar & Bhasi, 2010 [52]).The provision of risk identification and safety information to employees through safety communication and replying quickly to safety related problems are key responsibilities of managers and supervisors. For organizations to foster a climate where employees are alert to hazards, they must provide and communicate risk and safety information (Fernandez-Muniz, Montes-Peon & Vazquez-Ordas, 2007 [18]). Bentley and Haslam (2001) [8] identified safety communication between managers and employees as one of five desirable management safety practices, which differentiated between low and high accident rate postal delivery offices. Research has also indicated that safety communication is significantly associated with safety behaviour such as compliance (Griffin & Neal, 2000[26]; Parker, Axtell & Turner, 2001[46]), safety knowledge (Griffin & Neal, 2000) [26], safety participation (Griffin & Neal, 2000) [26], and success of safety programs (Harper, Cordery, De Klerk, Sevastos, Geelhoed & Gunson, 1997[29]). Moreover, open communication makes employees feel less nervous about raising and discussing safety issues with their supervisors (Cigularov, Chen & Rosecrance, 2010)[10] . Consequently, open communication and frequent interactions between employees and managers favour safety behaviour. On the basis of this, it is expected that mine workers who feel free and comfortable to raise and discuss safety issues with their supervisors, are likely to comply with safety rules and regulations and participate in safety related behaviours.

Safety training and Safety performance

Safety training is defined as knowledge of safety given to employees to enable them work safely and ensure their wellbeing (Law, Chan & Pun, 2006) [38]. Lin and Mills (2001)[39] found that clear policy statements and safety training played an important role in reducing accident rates. Other studies found the link between safety training and increased safety performance (Huang, Ho, Smith & Chen, 2006) [32]. Consequently, effective training assists workers to have a sense of belonging and thus, is more accountable for safety in their workplace.

In order for employees to do the job correctly and to be active participants in safety related activities, they must receive occupational safety training. Such training is the process whereby shortfalls in skills or knowledge that may impact on safety are met by providing information and assisting individuals to practice, in a supportive learning environment, the skills necessary to carry out activities safely. Hence, adequate and effective safety training with regard to safety precautions, rules and procedures has been found to lead to improvement in safety performance (Lu & Yang, 2011; Zohar, 2010)[41].

Safety systems and Safety performance

Safety systems comprise safety rules, policies and procedures put in place by an organisation to ensure safe work environment. Safety policy refers to the extent to which a firm creates a clear mission, responsibilities and goals in order to set standards of behaviour for employees, and establishes a safety system to correct workers' behaviours that are essential for workplace safety (Lu & Yang, 2010) [41]. Development of a safety policy demonstrates the organization's commitment to safety, and formally expresses objectives, principles, strategies and guidelines to follow regarding safety behaviour in the workplace (Fernandez-Muniz et al., 2007) [18]. Safety policy presents the organizational principles, values strategies, goals, practices and leadership styles relating to workplace safety. It provides a basis for defining the key features of safety climate (DeJoy, Schaffer, Wilson, Vandenberg & Butts, 2004; Lu & Yang, 2011)[14]. Extant literature have shown that safety systems, that is, safety policies and procedures can help to create and significantly influence workers' safety behaviours (Barling et al., 2002[7]; Lu & Tsai 2011 [40]; Lu & Yang, 2010 [41]).

2.3 Statement of Hypotheses

1. Employees' perceptions of safety climate will be positively and significantly related to their safety performance.
2. Supervisory practices will significantly account for more variance in safety performance than all the other component factors of safety climate.

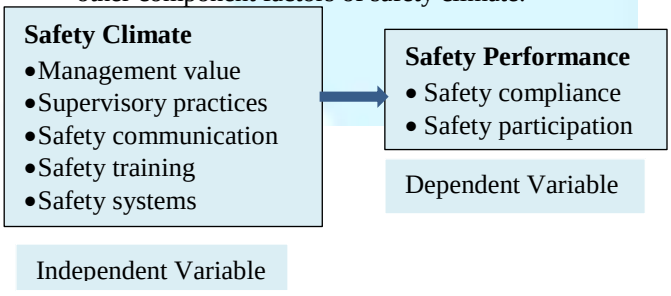

Figure 1: Hypothesised model of safety climate as predictor of safety performance

3. METHODOLOGY

3.1 Sample

Data were collected from employees of a multinational mining company in Ghana which has acquired International Standards Organisation (ISO) 14001 and Occupational Health and Safety Assessment Series (OHSAS) 18001 certifications. The sample consisted of 235 (males = 197, 84% , females = 38,16%) with ages between 23 and 57 years (mean= 31) and between 1-21 years of working experience (mean = 13 years) in the company.

Participants were selected from across all departments and units including all job levels. Newly employed workers with less than 3 months working experience were excluded as they were yet to familiarised themselves well with safety issues in the work environment.

3.2 Instruments/Measures

Safety climate scale was made up of five elements and is measured with five (5) subscales measuring workers' perceptions of management value for safety (α =.90), safety communication (α =.80), safety training (α =.74), safety systems (α =.75) and Supervisory practices (α = .90). All scales were in the 5-point Likert with responses ranging from strongly agree (5) to strongly disagree (1). Scores ranged from 23 to 115 where high scores on safety climate mean more positive perceptions of safety climate.

Safety performance scale consisted of two dimensions - safety compliance (α = .56) and safety participation (α = .73), and is measured with two subscales. The scales were 5-point Likert with responses ranging from strongly agree (5) to strongly disagree (1). Similarly, a respondent safety performance score is the sum of his/her sub-scores on the two dimensions of safety performance. Scores ranged from 8 to 40 and higher scores on safety performance indicate more safety compliance and participatory behaviours. The sub-scales are all extracts from Griffin and Neal's (2008)[26] workplace health and safety scale, except the supervisory practices sub-scale which is an extract from Zohar's (2000)[57] safety climate scale adopted, modified and used by Lu & Tsai (2011**) [42]**.

3.3 Data Collection Procedure

Questionnaires were sent to the company on an agreed time period and administered face-to-face on employees who were present and willing to participate in the study. With assistance of the various departmental/divisional heads, the questionnaires were administered and collected by the researcher. Data were collected by the first author of this paper during his MPhil Industrial/Organisational Psychology internship/industrial attachment in the mining company under the supervision of the two co-authors of the paper. A total of 235 questionnaires were correctly completed and were used for the analysis.

4. RESULTS

4.1 Descriptive Statistics

Descriptive statistics, reliability coefficients and normality test for skewness and kurtosis was done and the results shown in Table 1. Cronbach alpha values of the subscales ranged between .74 and .89. Intercorrelations between the variables are presented in Table 2. All the variables were normally distributed or did not substantially deviate from normality.

Table 1: Means, Standard Deviations, Skewness, Kurtosis and Alpha values of the study variables (N= 235)

Variable	Mean	SD	Skewness	Kurtosis	α
Management value	18.34	2.08	-0.98	0.97	.83
Supervisory practices	26.97	5.87	-0.56	0.03	.88
Safety communication	21.73	2.78	-0.48	-0.62	.74
safety training	16.86	2.66	-0.99	0.98	.80
Safety systems	12.62	2.11	-0.92	0.97	.74
Safety compliance	18.14	2.03	-0.73	-0.23	.81
Safety participation	17.31	2.44	-0.77	0.43	.78

Table 2: Intercorrelations between the study Variables (N = 235)

Variable	1	2	3	4	5	**6**	7	8	**9**
1. Management value	_								
2. Supervisory practices	.487**	_							
3. Safety communication	.603**	0.65**	_						
4. safety training	.476**	0.60**	0.68**	_					
5. Safety systems	.299**	0.30**	0.34**	0.35**	_				
6. Safety Climate	.686**	0.87**	0.84**	0.79**	0.59**	_			

7. Safety compliance	.348**	0.45**	0.49**	0.43**	0.27**	0.52**	_	
8. Safety participation	.310**	0.47**	0.45**	0.38**	0.30**	0.51**	0.57**	_
9. Safety Performance	.368**	0.52**	0.53**	0.45**	0.33**	0.58**	0.86**	0.91**

**p< .01

4.2 Hypotheses Testing

Hypothesis 1 predicted a positive relationship between employees' perceptions of safety climate and their safety performance. From the correlation matrix (Table 2) safety climate was significantly and positively related to safety performance r = .58, p < .01 on the zero-order correlations. From Tables 3 and 4, safety climate elements significantly predicted both compliance ($F_{(1, 234)}$ = 19.07, p < .001) and participatory ($F_{(1, 234)}$ = 21.66, p < .001) safety behaviours, accounting for 30.1% (R^2 = .301) and 32.9% (R^2 = .329) of the variances respectively. Safety communication predicted safety compliance (β = .19, p = .036) and supervisory practices predicted safety participation (β = .25, p = .001) while safety systems predicted both safety compliance (β = .27, p = .001) and participation (β = .31, p < .001). The results in whole supported Hypothesis 1 that 'Employees' perceptions of safety climate will be positively and significantly related to their safety performance'. However, Management value and safety training had non-significant influence on both compliance and participatory behaviours.

Table 3: Safety Climate Factors Predicting Safety Compliance

Model		B	Std. Error	B
1	(Constant)	9.398	1.08	
	Management value	0.06	0.06	0.06
	Supervisory practices	0.03	0.03	0.09
	Safety communication	0.14	0.07	0.19*
	safety training	0.04	0.07	0.05
	Safety systems	0.25	0.07	0.27***

Note: R^2= .301, *p< 0.05.

Table 4: Safety Climate Factors Predicting Safety Participation

Model		B	SEB	B
1	(Constant)	7.886	1.302	
	Management value	-0.02	0.08	-0.02
	Supervisory practices	0.11	0.03	0.25***
	Safety communication	0.06	0.08	0.06
	safety training	0.07	0.08	0.07
	Safety systems	0.36	0.09	0.31***

Note: R^2= .329, ***p<0.001

Hypothesis 2 predicted that "supervisory practices will significantly account for more variance in safety performance than all the other component factors of safety climate." Table 6 provides summary of the results.

Table 5: Hierarchical Regression Coefficients of Safety Climate Factors Predicting Safety Performance

Model		B	SEB	B
Step 1	(Constant)	26.07	1.04	
	Supervisory practices	0.35	0.04	.52***
Step 2	(Constant)	18.47	2.04	
	Supervisory practices	0.18	0.05	.26***
	Safety communication	0.37	0.12	.26**
	safety training	0.09	0.11	.06
	Safety systems	0.16	0.07	.13*
	Management value	0.03	0.13	.02

Note: R^2= .266 for step1, R^2 = .349 for step 2, ΔR^2= .082 for step 2, *p<0.05, **p<0.01, ***p<0.001

The first model with the predictor variable supervisory practices was significant ($F_{(1, 234)}$ = 84.56, p < .001), accounting for 27% (R^2 = .27) of the variation in safety performance. When the other variables (safety communication, safety training, safety systems and management value) were added, the percentage of variation increases from 27% to 35% (R^2 = .35 for step 2) explaining additional 8.2% (R^2change = .082) of the variance in safety performance ($F_{(5, 234)}$ = 24.52, p < .001). It was found that supervisory practices (β = .26, p < .001), safety communication (β = .26, p = .003) and safety systems (β = .16, p = .026) significantly predicted safety performance. Comparing their t and probability values, supervisory practices (t = 3.54, p = .000) is the strongest predictor of safety performance followed by safety communication (t = 3.05, p = .003) and then safety systems (t = 2.25, p = .026). Therefore hypothesis 2 which states that 'Supervisory practices will account for more variance in safety performance than all the other components of safety climate' is supported. Management value (β = .02, p = .830) and safety training (β = .06, p = .411) made non-significant contribution in predicting the variation in safety performance.

5. DISCUSSION

Figure 2 provides the observed model of relationships between the independent and dependent variables.

As predicted in hypothesis 1, employees' perceptions of safety climate in their workplace positively correlated with their safety related behaviours. That is employees who

perceived their work environment to be supportive of their safety at work turn to behave safely. They comply with safety rules and regulations or procedures and also participate in safety related behaviours to ensure the general safety of all workers. Consistent with other studies (Jiang et al., 2010[35]; Lu & Tsai, 2010[40]; Clarke, 2006 [11]), this finding implies that organisations with positive safety climate encouraged employees to put up safe behaviours and therefore experience high safety performance. These results support Clarke's (2006)[11] earlier finding, in that safety climate has a positive effect on employee safety compliance and participation. Lu and Tsai (2011)[42] reiterated this claim in an empirical examination of safety climate and its effects on safety behaviours from seafarers' perceptions in a container shipping context. They found a positive association between safety climate and seafarers' safety behaviour.

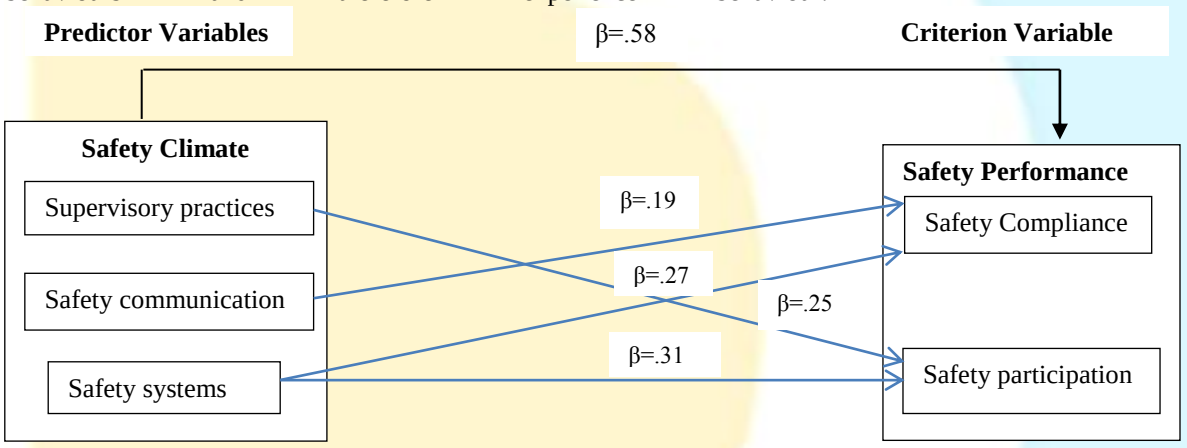

Figure 2: Observed Model of the impact of safety climate on safety performance

The results also supported Hypothesis 2 which predicted supervisory practices to significantly account for more variance in safety performance than management value, safety communication, safety training and safety systems. That is, supervisory practices appear to be the most important factor to consider when explaining workers safe or unsafe behaviours compared to safety communication and then safety rules and procedures. Explaining human behaviour Ajzen and Fishbein's (1980)[3] theory of Reason Action claimed that humans are rational and are capable of using information available to them to make sound behavioural decisions. Drawing from this theory, the findings indicate that supervisors' attitudes towards safety influenced subordinates' behavioural intentions about safety with behavioural intentions subsequently predicting safety behaviours. Thus supervisors through their attitudes and actions demonstrated that safety is important which determined behavioural intentions among subordinates and consequently safe behaviour outcomes.

The results also indicate positive relationship between safety communication and safety behaviour. Safety communication predicted safety compliance but failed to significantly predict safety participation. That is employees' perceptions of the flow of safety related information influenced their safety behaviours such that those who perceived the information as sufficient and relevant to their safety also reported complying with safely rules and procedures. The present finding indicates that employees, who perceived the safety communication dimension of safety climate as favourable, accordingly reported safe behaviours at work. The present findings therefore reemphasised the importance of communication regarding safety compliance. That is communicating through observable actions served as a medium of learning (Edmondson, 1996)[16] for employees and hence increased their safety knowledge. The increased knowledge due to open communication therefore encouraged safe working behaviour. This confirms previous findings that open communication and frequent interactions between employees and supervisors favour safety behaviour. More simply, communication between organisation members and the transmission of information to and from the worker have a direct positive effect on safety compliance.

Safety systems predicted both safety compliance and participation. This result support researches by Lu and Tsai (2011), Lu and Yang (2010) [41] and Dejoy et al. (2004) [14] who found safety policy to be a significant predictor of safe behaviours. The result presented in this research is understandable in the mining context. The reason being that while safety participation is voluntary and may not be recognised by the organisation, compliance-type behaviours are strongly regulated by the formal systems established by the organization. These systems are mostly decisions by top management implemented during supervisors' interaction with subordinates. Supervisors interpret and translate these procedures according to their own understanding into required workplace instructions (Zohar, 2000, 2003) [57][59]. These supervisors in performing their role of instructing workers on what ought to be done may create a context that assigns a high value to safety behaviours. Accordingly, the importance supervisors place on safety therefore supports the social norms for safety and has a critical influence on safety

behaviours but not necessarily the appropriateness or suitability of the safety systems in place. In effect these policies transmitted by supervisors are seen as supervisors' discretionary behaviours instead of company policies and procedures. As emphasised by Zohar and Luria (2005) [59], company policies set the boundaries for acceptable variation, but supervisor discretion results in group-level difference within organisations. Reiterated in the hospital setting Naveh et al. (2005)[44] demonstrated that employee perceptions of the suitability of the organization's safety procedures for their daily work reduced treatment errors but only when managers practiced safety and through their influence on the level of priority given to safety that this relationship is possible. In summary, we agree that written safety policies and rules are vital parts of safety climate (Dejoy et al. 2004[14]; Lu & Yang, 2011[42]), but warn that workers may not read such documentations and so these policies and rules need to be demonstrated at the worksite.

Management value for safety did not independently predict employees' safety behaviours (both compliance and participation). This may be because management are only involved in making new polices but are not directly involved in enforcing these policies at the worksite. Thus, formal declaration of safety rules and procedures by management is not enough to change workers' behaviours or increase safety related behaviours; visible acts are required from management (Kletz, 1985) [37]. Studies (e.g. Flin et al., 2000 [20]; Rundmo & Hale, 2003 [47]) have established that, managers can only communicate effectively, an attitude of concern for safety to their employees, through their participation in daily safety related operations - rewarding or punishing workers behaviours, transmitting information, or giving priority to safety over productivity, and this attitude will subsequently affect the extent to which the employees comply with operational rules and safety practices. In the mines, supervisors are the direct and immediate contact for workers at the worksite. So it is not surprising that employees' perceptions of management value for safety could not influence their safety performance as it is the supervisor who transmits information and from their actions (not management) that the subordinates deduce whether priority is given to safety over other job demands or vice versa. Managers should also explicitly demonstrate their commitment to safety through their actions so that the workers can perceive it (Griffin & Neal, 2000) [26]. It is only when workers can observe clearly from managers' behaviours that their perceptions could be influenced and subsequently their behaviours. From the social exchange theory view point when employees perceive that management through their actions are concerned about their safety, they will reciprocate through compliance with rules and participate in safety related behaviours.

Likewise, safety training correlated significantly and positively with safety performance but did not significantly predict either safety compliance or participation in the current work. Employees' perceptions of the safety training that they received did not have significant impact on their safe behaviours. This finding seems to contradict previous studies (e.g., Lu & Yang, 2011[42]; Lu & Tsai, 2008[40]) which found safety training as an important dimension of safety climate. Nonetheless, the finding implies that employees' perceived safety training as not a key factor in determining their safety. If employees perceive the training as relevant and addressing the kind of problems they face at the worksite then their behaviours will change accordingly. On the contrary, safety training may not have any influence on workers safe behaviours if it is perceived as not relevant to their safety at the work site.

5.1 Organizational Implications of Findings

The findings of the current work are important both for practitioners working in the field and organizational researchers. Organizations can improve safety by committing some resources to improving supervisory safety practices and enhancing good relationships between supervisors and their subordinates, instead of solely applying them to enhance safety policies and procedures through other means like leaflets and sign posts which workers may not read or ignore. Findings imply that in the mining context, supervisors play a significant role in creating a work environment in which workers perceive a strong safety climate. Thus if supervisors are given the ability to provide reinforcement through for example praise, performance appraisal and reward power, they may create a strong positive safety climate leading to high safety performance. In addition to the safety climate's influence on workers' behaviours, it is possible that the strong climate created by supervisors will also shape the quality of worklife of employees and its resulting positive outcomes (Ismail, Asumeng & Nyarko, 2014[34]).

The results also suggest that whereas management is in a position to establish ground rules and policies for safety management in the mines, supervisors who are the first contact of employees are more likely to put forth plans that enforce safe behaviours and shape the climate, which emphasizes certain worksite behaviours as being important. In support, research suggests that the influence of more senior leaders within an organization is mediated by group leaders (Zohar & Luria, 2005 [59]). This implies that to improve safety performance in the mines, supervisors should play a key role in managing safety or implementing safety procedures through their own role behaviours.

Safety communication has also been proven to be important. Organizations can also improve safety of the workplace by increasing safety communication between managers, supervisors and their subordinates. Perhaps organizations can organise relationship building programs to have managers, supervisors and subordinates participate to develop and or improve the relationship between them (Wayne et al., 1997).

Another implication of the findings is that instead of organisations compelling their employees to comply with

safety rules and procedures, they could simply ensure that the safety climate of the workplace is supportive of compliance type behaviours and also encourages employees to participate in safety related behaviours. Managers and supervisors need to demonstrate that they are concerned about the safety of their subordinates so that the subordinates will in return feel some social pressure to behave safely. Employees will also be motivated to communicate safety concerns if they perceive that management or their supervisors care about their safety. Through the actions of these same managers and supervisors, employees will also feel that they are important and valued by their organisation and hence are likely perceive high quality of work life (Ismail, Asumeng & Nyarko, 2014[34]).

5.2 Study Limitation

The study did not take into consideration the individual respondent's accident involvement which might have biased his/her perception of safety (Rundmo, 1997 [47]). Accidents occurrence right before the study may have influenced employees' perceptions of safety climate. Probably, major accidents might have accounted for the inability of perceived management value for safety and safety training to significantly predict safety performance. Such a study would have been more beneficial if it explored various possible determinants and components of safety climate and its effects on safety performance across various work places.

5.3 Recommendations for Future Research

The study has indicated a significant positive relationship between safety climate and safety performance. Researchers might further investigate this link and probably extend it to contain the antecedent factors or conditions (e.g. what makes employees think that management is not concerned about their safety) that influenced employees' perceptions of safety climate. Studies are also warranted to extend the present model to include the actual outcome of safety behaviours which is accident reduction.

6. CONCLUSION

From the results, the only safety climate factors that have significant impact on safety performance are supervisory practices, safety communication and safety systems. Generally, organisations should consider employees' perceptions of their work environment regarding safety as important in their efforts towards ensuring safe workplace. Particular attention should be given to supervisory practices, safety communication and safety systems which have been found to have significant influence on workers' safety related behaviours. Organisations could do this by enforcing good safety systems and allocating resources towards enhancing supervisory practices, giving supervisors some kind of reward power and organising programs that could promote strong positive relationships between supervisors and their subordinates.

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