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Investigation of the Multi-level Safety Climate of Working Groups for Perceptional Differences

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Abstract
Construction is among the hazardous industries with poor safety performance. Both safety culture and safety climate shared common grounds such as beliefs, values, attitudes etc about safety. Safety climate termed to be the leading indicator of safety performance which frames the positive safety culture. Organizational structure mainly comprised of working groups (manager, supervisor and workers) exhibit sub-cultures which create barriers to the common safety climate. This papers aims to investigate the multi-level safety climate for *Between Group Differences*. A questionnaire has been developed and is comprised of 40 safety climate statements (using Likert scale), and the survey was done with 21 major companies (contractors) on 36 construction sites. 150 valid responses (83.33%) were received through self interviews and post mail. Collected data was analyzed by SPSS 17.0, to assess multi level safety climates, differences among groups by one way ANOVA (sig. value < 0.05). The results found that; Front line workers' suggestions were not considered by Managers, Managers do not involve Front Line workers for development/review of safety procedures/instructions/rules, Front Line workers have opinions that people are just unlucky to suffer an accident, and Managers confirmed that every accident/near miss happened on site is reported but workers revealed that every accident/near miss is not reported. Front line worker's played major role in pivotal conflicts upon safety climate perceptions in multi-level context. Construction companies can induct above findings to formalize the positive safety climate which helps to enhance safety culture in the right direction.

Keywords
Multi-Level Safety Climate, Perceptional differences, Working groups, Pakistan

1. Introduction

The construction industry is economically and socially important but is also recognized as most the hazardous (Suao and Jaselskis, 1993; Hinze 1997; Sawacha et al. 1999; Choudhry et al.2008). Generally, construction sites are one of the most dangerous workplaces because of the high rate of incidence or accidents (Teo et al, 2005; Ahmed et al., 2000). Construction work is typically performed by semi-autonomous, often contracted, work crews, engaged on a temporary basis to complete a package of work. This situation presents a management challenge with regard to creating a shared understanding of the

importance of safety within organizations (Lingard & Rowlinson, 1994). Blockley (1995) advocates that the construction industry would be better characterized as one with a poor safety culture and that attempts to improve the safety record will not be fully effective until the safety culture is improved; progress over the last decade on defining and measuring the safety culture concept in construction appears to have been somewhat slow. Safety culture is becoming critically important to the safety of employees within the construction site environment (Choudhry and Fang, 2006). Arboleda and Abraham (2004) demonstrate a distinction between management attitudes and workers behaviors, advocating that, in order to be useful as a means of analyzing and categorizing safety culture, management activities and workers activities should be viewed as separate but related phenomena. Cooper and Philips (1994), state that the safety climate is concerned with the shared perceptions and beliefs that managers and workers hold regarding safety in the workplace (i.e., safety climate is, to some degree, dependent on the prevalent safety culture). Therefore, it can be, argued that safety climate is largely a product of safety culture, and the two terms should not be viewed as alternatives. Mohamed (2003) suggested that safety culture is concerned with the determinants for the ability to manage safety (top-down organizational attribute approach); whereas, safety climate is concerned with the workers' perceptions of the role safety plays in the workplace (bottom-up perceptual approach). Most studies seem to have focused on climate measurement issues, including factorial structure of measurement scales and its predictive validity with regard to a variety of safety outcomes (Zohar, 2010). Integrating both quantitative and qualitative approaches to measuring safety climate, and verifying perceptions of safety climate shared by workers and the management groups assist the organization to further advance its safety-related policies, procedures, and practices. The implementation of multi-level safety needs assessment surveys can identify major safety issues of concern (Gittleman et al. 2010).

2. Safety Perspectives of the Pakistan Construction Industry

The Pakistani construction industry is contributing to the national economy with 2.3% of GDP (Ahmad) and is attributed as labor intensive comprising 15.5% of the workforce with 10.77% (Anonymous1) from rural areas and 51.41% of them being illiterate (both civilian and non civilian labour force) (Anonymous2). According to the General Labour Laws of Pakistan (Anonymous3), the main emphasis has been given to industrial safety and there are no proper and legislative rules and regulations defined for construction sites. Implementation of a safety, health, and environmental management system is not widespread in developing countries (Koehn et al. 1995). In the context of the Pakistani construction industry, attention can be raised over the implementation of safety in construction site environments as a gradual increase in percentage for occupational injuries and diseases (Survey of Pakistan, 2002 - 2009) has been observed from 12.54 (2002) to 14.54 (2009), evidently stemming from the lacking safety culture. A mean value of the Safety Performance Index of 0.52 indicates that even the basic practices required for safety are not present at most construction sites. Also, the scattered safety performance levels of firms indicate the lack of a standard safety management system. (Farooqui et al. 2008). The most significant barriers towards implementing site safety have been found, in descending order of significance as follows: lack of safety awareness, lack of familiarity with safety management techniques, worker cooperation/behavior, shortage of safety personnel, and scheduling pressures (Saqib et al. 2010). In reference to research done earlier, there is a significant need to enhance the safety culture on construction projects through safety climate constructs because there is no legislative administrative body in the country to put forth efforts for improvement in safety performance.

3. Objectives

This paper is an attempt to investigate the multi-level safety climate in working groups (position wise managers, supervisors and workers). The study aims to address Between Group differences upon the safety climate dimensions/factors.

4. Literature Review

4.1 Safety Climate

Choudhry et al. (2007) provided the definition that *a safety climate reflects employees' perceptions about the organizations'safety management system including policies, practices, and procedures that show how safety is implemented in construction sites environments*. It is regarded as a descriptive measure reflecting the workforce's perception of, and attitudes toward, safety within the organizational atmosphere at a given point in time (Gonzalez-Roma et al. 1999). The *safety climate* relies and focuses on current safety activities to establish the success of the safety management system rather than the system failure (Cooper and Phillips, 2004; Choudhry et al. 2009). O'Toole (2002) proposed that there is a connection between management's approach to safety and employees' perception of how important safety is to the management team. Mohamed (2002) presented a model of safety climate determinants and found that there was a significant relationship or positive association between perceptions of the safety climate and self-reported safe work behavior.

4.2 Safety Climate diemensions/factors

Dimensions of safety climate are the major features or levels of the safety climate (Glendon and Stanton, 2000). Addressing safety climate dimensions specifically in the construction industry, Glendon and Litherland (2001) found six factors for safety climate in a road construction organization including communication and support, adequacy of procedures, work pressure, personal protective equipment, relationships, and safety rules. Mohamed (2002) has identified 10 dimensions of safety climate in construction site environments including management commitment, communication, safety rules and procedures, supportive environment, supervisory environment, workers' involvement, personal risk appreciation, appraisal of work hazards, work pressure, and competence. In the Hong Kong construction industry, Fang et al. (2006) evaluated 10 dimensions as safety attitudes and management commitment, safety consultation and safety training, supervisor's role and workmates' role, risk taking behavior, safety resources, appraisal of safety procedure and work risk, improper safety procedure, worker's involvement, workmate's influence, and competence and Choudhry et al. (2009) reduced these factors to two as management commitment and employees involvement, and inappropriate safety procedures and work practices. The investigation of consensus and differences among safety climate dimensions among groups help to formalize the direction to enhance safety culture on construction sites.

4.2 Multi-Level Safety Climate

Studies identifying group differences in the safety climate suggests that groups do not share an overall view of safety (Collinson, 1999). Zohar (2000) proposed two levels in the safety climate; (i) that arising from the formal organization-wide policies and procedures established by top management; and (ii) that arising from the safety practices associated with the implementation of company policies and procedures within workgroups. Zohar (2000) tested this proposition in a manufacturing context and confirmed that workgroup members develop a shared set of perceptions of supervisory safety practices, and discriminate between perceptions of the organization's safety climate and the workgroup safety climate. Glendon et.al (2001) reported differences in the safety climate between construction and maintenance job categories within the road construction industry. Sub-climates for safety can exist within an organization and many differ on dimensions of the safety climate (Glendon et al. 2001). Group differences in safety climate indicate the existence of multiple safety cultures that can negate the effectiveness of safety programs and communication (Findley et.al, 2007).

Modern organizations are large and complex and thus the notion of a single uniform safety climate seems overly simplistic (Lingard et al. 2005). Zohar(2000) suggests that the group-level safety climate relates to patterns of supervisory safety practices, or ways in which organization level policies are implemented within each workgroup or sub-unit. This finding has significant implications for safety management because it suggests that the role played by supervisors in defining the workgroup safety climate is likely to be just as important as, if not more so, than the actions of top management in defining safety policy or of safety professionals in developing safety procedures. These dissimilarities in safety attitudes and perceptions among different groups within an organization were attributed to divergent

management styles and levels of concern for safety issues. While these dissimilarities are not viewed as necessarily undesirable, neglect of these differences could a result in failure to identify competing agendas and disparate risk perceptions (Findley et al. 2007). As opposed to behavior-based interventions targeted solely at the worker level, this leader-based approach recognizes that contributing factors to adverse events are multifaceted and complex, requiring conditions allowing for true company (multi-level) priority of safety (Kines et al. 2010). Workgroups within the same organization can have significantly different group safety climates, providing a good theoretical explanation for why some organizational sub-units consistently perform better in terms of safety than others (despite having very similar risk exposures) (Cooke et al 2006).

A comparison of organization-level and group-level consequences suggests that they differ in terms of two important behavioural parameters, that is, outcome frequency and immediacy (Zohar et al. 2005). Construction work is largely non-routine, necessitating the exercise of supervisory discretion in the interpretation of formal safety policies/procedures. In this context, the role of supervisors in shaping subordinates' safety behaviour is likely to be considerably greater than in work contexts with routine production processes. Thus, it is useful, in the construction context, to test whether group-level safety climates develop within construction organizations and, if so, what impact group-level climates have on safety performance (Cooke et al. 2006).

5. Research Methodology

Following are the main phases of the research study:

1. Initially in depth knowledge gained regarding the research stream through review of books, conference papers, journal papers, articles, internet browsing etc., which were sorted upon the degree of relevance to the study.
2. A questionnaire, developed by Choudhry et al. (2009) of 31 safety climate items, which has been formatted with required modifications, inducting the pivotal research aspects derived from earlier studies for the Pakistani construction industry (adding 9more safety items). The questionnaire in its final form consisted of 45 statements about safety issues at the organizational, group, and individual levels and consisted of four parts. The first part of the questionnaire related to the respondents' general information. The questions include respondent's project name, name of the company, department and working group. Further questions included the respondent's job information that, is he/she a worker or, supervisor or a manager. The second part consisted of 40 safety climate items which asked the participants to endorse the statements using a five-point Likert - type (from 1 = "strongly disagree" to 5 = "strongly agree") scale.
3. In the data collection phase, a questionnaire survey has been done on 36 construction projects (of different types such as industrial, facility, housing, community buildings etc) located in different cities in Pakistan, moreover both lower and higher categories of contractors (as per P.E.C). Cumulatively 150 valid responses were received from both self interview and post mail at about 83.33% of the distributed questionnaires.
4. Collected data was fed into SPSS 17.0 for statistical analysis, in order to assess multi level safety climates, as differences among groups by one way ANOVA (sig. value < 0.05).
5. The results of the data analysis provided thought provoking issues for the development of a safety culture and should be taken as a valid addition to safety research in the perspective of the Pakistani construction industry. In the same tune both conference and journal papers will be published to validate the research work.

6. Data Analysis

Major research streams under this heading are within group consensus and between group differences which were measured statistically.

A one-way between-groups analysis of variance was conducted to explore the perceptions of position against safety climate statements (40Nos). Subjects were divided into three groups according to position (Manager, Supervisor and Workers).

Initially a test of homogeneity of variances was done, according to Levene's test 07 items have violated the assumption (i.e sig. value > 0.05) as CQ2, CQ5, CQ6, CQ20, CQ30, CQ38 and CQ39. After that the Robust Tests of Equality of Means was performed to explore the valid items with differences (with sig. value < 0.05), which resulted items CQ2, CQ3, CQ4, CQ12, and Q40. According to ANOVA Table 2 items have been found with sig. value < 0.05 which were CQ2, CQ3, CQ11, CQ12, CQ34 and CQ40. Finally taking in to account the criteria (i.e sig. value < 0.05) Welsh and Brown-Forsythe (for Robust Tests of equality of means) 4 items were taken for further analysis and discussion, which are CQ2, CQ3, CQ12 and CQ40. Effect size of each difference is measured by eta square value to assess the impact of variance between groups; Cohen (1988) classifies 0.01 as a small effect, 0.06 as a medium effect and 0.14 as a large effect.

Working Groups	Safety Climate statements	Sig. value	eta squared score	Effect size
Front Line worker > Manager	(Q2) Suggestions to improve health and safety are seldom acted upon.	0.003	0.08	Medium
Manager > Front Line worker	(Q3) I feel involved when health and safety procedures / instructions / rules are developed or reviewed.	0.011	0.06	Medium
Front Line worker > Supervisor	(Q12) People are just unlucky to suffer an accident.	0.006	0.07	Medium
Manager > Front Line worker	(Q40) Accidents which happen here are always reported.	0.038	0.04	Small

Table 1: Differences between groups with effect size by One way ANOVA.

There was a statistically significant difference between workgroups (Front line worker and Manager). At the $p<0.05$ level workers' suggestions are not considered by Management to improve safety, and have a medium effect size ($F(2, 146) = 6.2$, $p = 0.003$). Managers do not involve Front Line workers for development/review of safety procedures/instructions/rules ($F(2, 147) = 4.6$, $p = 0.011$) with medium effect size. Front Line workers perceived that people are just unlucky to suffer an accident but supervisors deviated and considered personal mistake or unsafe site conditions ($F(2, 145) = 5.2$, $p=0.006$) with medium effect size. Last three differences termed to of major influence in respect to multilevel safety climate (refer to effect size). Managers confirmed that every accident/near miss happened on site is reported but workers revealed that every accident/near miss is not reported ($F(2, 147) = 3.3$, $p = 0.038$) with smaller effect size.

7. Conclusion and Discussion

There are perception gaps (relating to health and safety in the workplace) between managers, supervisors and the workforce (HSE, 2002). This study attempts to identify the key differences in the perception about safety climate.

There was conflict about the statement that workers' suggestions to improve safety were not considered by Managers which refer to the weak participation of workers. Rules and procedures for safety are demonstrated safety policies which are company specific and there is no provision for amendments or modification conformance to site conditions. Mostly there was no representation of workers found in safety related meetings on construction sites; rather site reports are referred for safety audits. In the same line Managers do not involve workers for development or review of safety rules/procedures/instructions. Managers perceived that workers are not capable of addressing safety issues and helping to improve safety, which is not the case for experienced workers. Rules and procedures are the core component of safety management systems. A successful safety management system program is based upon the premise that safety is both a management responsibility and a line function (Mohammad, 2002). Although top management helps formulate safety policies, its actual success depends upon the ability of site management and supervisory personnel to ensure that rules and policies are adhered to during daily operations (Agrilla, 1999). Senior managers reported they were always informed of the outcome of

meetings that addressed health and safety. At the same time foremen and the workforce felt they were not always informed. (Findley et al, 2007)

Inadequate knowledge and lacking competency for safety helps to develop wrong perceptions. Uneducated and untrained workers are of opinion that the person suffered from accident only with God's will, and ignore aspects such as personal mistake or unsafe job site conditions. Safety knowledge is another influencing factor for safety climate and can be controlled and promoted through education and training in the company (Fang et al, 2006).

In safety initiates accident reporting is effective and Managers also consider it significant. Managers have the opinion that all accidents/incidents/near misses are reported but workers have the opposite opinion. There may be hurdles in communication channels which cause this malfunction but the responsibility of foreman and supervisors cannot be ignored. Senior managers reported that accidents are always reported while foremen believed accidents were not always reported. (Findley et al, 2007). On the individual level, if one has suffered from a near miss, incident, or accident due to his own fault and manages the mishap well, then he may not communicate this to higher levels, this under lies the job security aspect.

8. Future Research

It is pertinent to further investigate the multi-level safety climate in respect to difference between groups to evaluate the drivers for a common safety climate to resolve conflicts.

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