

DYNAMIC INTERPLAY BETWEEN SAFETY CULTURE AND WORKPLACE DIVERSITY

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ABSTRACT

It has been reported that, in the U.S., Hispanic construction workers are at higher risk of work-related injuries and illnesses. The disproportionate risk is also associated with other subgroups, including non-union workers, women workers, new workers, young/older workers, day labourers, etc. In recent years, the concept of safety culture has started gaining popularity in the construction industry. It has been gradually perceived that a positive safety culture can improve the safety performance of an organization and reduce accident costs in all aspects. However, the complexity of a safety culture related to multiple subgroups has not been adequately studied, understood, and manipulated. This limits the development and implementation of a positive safety culture in a diverse workforce environment.

This paper presents exploratory research that aims to explicate the dynamic interplay between organizational safety culture and diverse subgroups. The final goal is to enhance safety performance of these subgroups by developing, improving, and implementing a goal-directed group-oriented safety culture model. The paper not only explains the interactions between an overall organizational safety culture and safety sub-cultures of diverse groups of workers, but also emphasizes that: 1) the variation of construction workforce and its safety awareness/behaviour climate, 2) the creation of a goal-directed group oriented safety management system; 3) the effectiveness of group oriented communication, supervision and implementation; and 4) enhancing the overall organization culture should be considered in the development and improvement of a safety culture model. This will advance an organizational safety culture and its efficacy in improving safety performance of diverse subgroups.

Keywords: Safety culture, Workplace diversity, Construction, Immigration workers.

INTRODUCTION

It is well known that construction is a risky occupation for workers, particularly within the US construction industry. According to the most current census data provided by U.S. Bureau of Labour Statistics (BLS, 2008), of the 5,488 fatal work injuries recorded in 2007, 1,178 or 21.5% occurred in construction. The fatality rate (10.3 per 100,000 employed) ranked fourth highest among various industries. Besides elevated safety regulations and prevailing safety enhancement solutions such as behaviour-based safety, the establishment of a positive safety culture has been

gradually perceived as an effective measure to prevent accidents and improve safety performance of construction firms (Vecchio-Sudus and Griffiths, 2004; Choudhry et al., 2007b).

In recent years, the U.S. construction industry has undergone rapid demographic changes due to labour shortage. In 2008 the U.S. construction trades workforce was made up of just below 30% Hispanic workers (BLS, 2008). This large number of immigrant workers, female workers, and young/older workers can be seen throughout the workforce. New workers (change of jobsite or turnover) and non-union/union workers have intensified the workforce diversity. Though the impact of such a diverse workforce has not been adequately understood, in terms of safety, it has been noted that these subgroups are facing higher or substantial risk of work-related injuries or illnesses (Welch et al., 2000; Fabrega and Starkey, 2001; Dong and Platner, 2004; Windau and Meyer, 2005; EU-OSHA, 2006; Mah, 2007). The trend is more obvious in non-union and/or smaller construction firms as well as in special trades such as roofing (Suruda et al., 2003).

This study explores the dynamic relationship between a company's safety culture and its diverse workforce and proposed to focus the development of a superior safety culture model on 1) enhancing the overall organizational culture, 2) goal-directed group-oriented safety management systems, 3) enhanced supervisory roles for effectively communicating and implementing safety policies and measures, and 4) establishment of positive safety culture and safety climate of subgroups. This will advance an organizational safety culture and its efficacy in preventing accidents and improving safety performance of diverse subgroups.

LITERATURE REVIEW

Accident Causation

Understanding of root causes of accidents instead of symptoms is always important before proposing any remedies. Among various accident causation theories and models, the work of Heinrich is most fundamental (Heinrich, 1959). According to Heinrich's Domino Theory, five factors leading to an accident in the sequence of events are: ancestry and social environment, fault of person, unsafe act or condition, accident, and injury. The first two dominos are related to worker personality that can be passed along through inheritance and/or developed from a person's social environment. In fact, according to the Accident Prone Theory, permanent characteristics in some workers make them more likely to have an accident than others. Personnel factors including lack of understanding or ability, improper motivation (bad attitude), and illness, mental, or personal (non-work-related) problems are also contributors (Vincoli, 1994). These findings are important for us to understand why Hispanic construction workers may have higher safety and health risks than whites within the U.S. construction industry.

The Human Factors Theory suggests three broader factors leading to accidents: overload, inappropriate response, and inappropriate activity. Overload results from imbalance between a worker's capacity and the load that person is carrying in a given state. However, the environmental factors, internal factors (personal problems, emotional stress, worry), and situational factors (level of risk, unclear instruction, novelty) magnify the work load. Inappropriate response is also determined by the worker's abilities, limitations, social behaviours, and practices. According to

Kerr's Adjustment Stress Theory, workers, who are not adjusted to their situation or integrated with it, will tend to have more accidents than others. This adjustment is affected by the tensions and stresses (i.e., physical and psychological) to which workers are subject (Kerr, 1957). These understandings are very beneficial when we deal with safety issues associated with vulnerable workers, notably young/old workers, new workers, and female workers.

Safety Culture

For a long time, safety research and industry practice mainly focused on safety management controls and procedures, safety programs and performance, and safety training of jobsite operations/behaviours to reduce unsafe acts and unsafe work environments (Jaselskis et al., 1996; Tsai et al., 2003). In recent years, the role of organizational safety culture in promoting a safe work environment as well as the methods to define and assess safety culture have been established by researchers (Mohamed, 2003; Nieva and Sorra, 2003; Choudhry et al., 2007a, b). Culture interventions have also been gradually adopted by individual companies and government agencies in their practice. The "Culture and Safety Awareness" campaign launched by Dutch Ministry of Social Affairs and Employment showed very positive intermediate results one year after launching the program. A 30% incident reduction was reported in participated companies in the concrete construction industry (Oh and Sol, 2008).

Cox and Cox (1991) define safety culture as "the attitudes, beliefs, perceptions and values that employees share in relation to safety." Safety culture relates to both organization and individuals since policies and procedures are established at the organizational level but are executed at the subunit/group level (Zohar, 2000). Williams et al. (1989) argue that beliefs, attitudes and values about the organization, its function or purpose can vary among divisions, departments, workgroups, or individuals, leading to the existence of sub-cultures, which can also be named in a hierarchical way as executive culture, engineer culture and operator's culture (Schein, 1996). As highlighted by Pidgeon (1998), subcultures serve a useful purpose and can provide a diversity of perspectives and interpretation of emerging problems in safety. They can be measured to enable comparisons within an organization or among organizations to promote "best safety practice" (Cooper, 2000).

Safety climate is viewed as a subcomponent of safety culture and defined as a summary of molar perceptions that employees share about their work environments (Zohar, 1980). There are organization-level and group-level safety climates. The latter could be found different in an organization due to between-groups variation mainly caused by supervisory safety practices (Zohar, 2000).

Creating and implementing a superior safety culture model is a very challenging task due to the complexity of safety culture. The proposed culture models in the literature focus on three dynamic and interactive factors: person/people (measured by safety climate surveys), job/behaviour (measured by behaviour sampling), and environment/situation (measured by safety management system audits) (Geller, 1994; Cooper, 2000; Choudhry et al., 2007b). However, such full safety culture models are rarely applied in practice.

Also a top-down approach is often seen, which strengthens the influence of safety culture in the direction from higher level management personnel (e.g., executives, superintendents, etc.) to low level workers in subgroups. The least studied is how the group workers' characteristics, traits, or culture (mainly referring to the inheritance and social environment which affects their attitudes, perceptions, and behaviours) can differentiate the effect of organizational safety culture. This issue is critical especially when the worker's group is very unique and influential, like Hispanic workers. Also, the work relationship among co-workers and the interactions between supervisors and their subordinate workers can affect group-level safety climate (workers' perception) and contribute to their actual safety performance.

RESEARCH METHODOLOGY

At the current stage, this study is mainly focused on a review of literature related to safety causation, safety culture and climate, and safety culture models and their main elements. The purpose is to identify major contributing factors from the cultural aspects that might influence the safety performance of construction workers. Those factors need to be incorporated in the superior safety culture model and corresponding measures need to be established and properly implemented. Also, data published by safety- and health-related public agencies, organizations, and programs worldwide are collected and analyzed to help explore and understand characteristics and safety performance of the studied sub-workgroups and underlying causes leading to poor safety records. Based on the findings, recommendations for improving existing safety culture models are made.

CHARACTERISTICS AND SAFETY STATUS OF SUBGROUPS

The disproportionate risks of injury and illness to the afore-mentioned subgroups have begun to receive increasing attention from safety- and health-related agencies. National Institute for Occupational Safety and Health (NIOSH) indicated that more profound understanding of underlying causes needs to be established to address those disproportionate risks to subgroup workers; in the U.S. this is especially relevant to Hispanics. The National Occupational Research Agenda (NORA) Construction Sector also highlighted that certain sub-populations such as immigrant workers, new workers, young/older workers, etc. are at higher risk of injury or illness due to various risk factors including language proficiency, literacy, inexperience, and group culture. It is necessary to evaluate how safety and health culture influences these key construction subgroups and to identify ways that will reduce risks to these workers. The Construction Economics Research Network met on December 5th and 6th, 2007 to address the role of immigrant workers in construction and discuss their safety and health issues that might hinge on various variables such as immigration status, education, unionization, training, day labour, etc. Unfortunately, so far, a thorough understanding on what caused disproportionate risks of injury and illness to these construction workers is still not well developed in the literature of construction safety management.

In the following, the characteristics and safety performance of three selected subgroups are presented. Through exploring potential causes of their poor safety performance, this study provides clues on what needs to be addressed and dealt with in a safety culture model (Table 1).

Immigrant Workers

According to Pew Hispanic Center, the U.S. construction sector employed 11.8 million workers in 2006, among which Hispanics accounted for 2.9 million or 25%; 75% of them are foreign-born workers. Although the latest data showed that the unemployment rate of Hispanics in the U.S. rose to 6.5% in the first quarter of 2008, there are no signs that they are leaving the U.S. labour market. Hispanic workers are more likely to work in production for the trades of drywall, concrete, roofer, labourer/ helper (new immigrants), carpet and tile, brickmason, welder, etc.

According to the June 4th issue of CDC's *Morbidity and Mortality Weekly Report*, in 2006, Hispanic workers had a fatality rate of 5.0 per 100,000 compared with 4.0 for white workers and 3.7 among black workers. 34% of such deaths from 2003-2006 occurred in the construction industry. Although safety- and health-related agencies have made great efforts in recent years to improve the safety and health conditions among Hispanic workers (OSHA, 2002), progress is still limited.

OSHA's past efforts mainly target language deficiency of Hispanic workers. However, the literature reveals that unique features of Hispanic construction workers include their group culture, living status, work condition, job or non-job related stress, limited construction experience, etc., which also need to be adequately addressed. National Safety Council's *OSHA Up To Date* (2008) pointed out that efforts should be focused on ensuring safe work environments and providing safety education and training that is not only linguistically but also culturally appropriate.

Female Workers

Recruiting women workers into the construction industry is a viable solution to labour shortage. According to BLS' Current Population Survey, women workers made up nearly 10% of the U.S. construction industry or more than 900,000 nationally in 2003. While 2-3% actually work as skilled tradeswomen in the fields of paperhangers, woodworkers, insulation workers, welders, construction helpers, painters, etc., the rest (7-8%) work as architects, engineers, project managers, secretaries, surveyors and the like.

The average fatality rate for women working in the construction field was more than twice the all-industry average for women based on a study of 139 deaths of U.S. female construction workers for the period of 1980-1992 (Ore, 1998). BLS (2008) discloses that 8% of total jobsite fatalities involve women workers. The risk is high considering that tradeswomen only account for 2-3% of construction workforce. WorkSafeBC statistics (2007) show that the percentage of female claimants has increased from 28% in 1998 to 31% in 2007 in British Columbia, Canada. Research found that women have a different pattern of fatal injuries and other nonfatal injuries than men. For example, female labourers were at a higher risk (10.8 deaths/100,000 workers) for motor vehicle injury (Welch et al., 2000) and more prone to sprain/strains and nerve conditions of the wrist/forearm when working as carpenters (Lipscomb et al., 1997).

Welch et al. (2000) and OSHA (1999) state that women in construction face six safety and health issues including reproductive hazards, ergonomic concerns, lack of adequate sanitary facilities, workplace culture, ill-fitting personal protective equipment and clothing, and lack of proper health, safety, and skills training. Workplace culture is one of the most critical issues since it could make other issues worse. As pointed out by OSHA (1999), many tradeswomen were reluctant to report

workplace safety and health problems due to unfriendly workplace relationships; mistreated by co-workers and supervisors were frequently reported. Distractions while working and hostile workplace also resulted in on-the-job injuries and chronic stress reactions. Suggestions to improve women’s job satisfaction and safety performance are provided by Dabke et al (2008). Welch et al. (2000) emphasize that “working smarter, not harder” is the key to staying safe, uninjured, and healthy for both women and men.

Old Workers

Due to the baby boom during 1946-1964, the size of the 50+ populations in the U.S. will more than double over the next 35 years. In 2000, only 13% of the workforce is 55 and older. The number will grow to 21% by 2014 (Rix, 2006). The U.S. inevitably faces an aged workforce in various industries including construction. To view this trend in a positive way, the employer can actually benefit from old workers because of their strong work ethics, loyalty, better knowledge and expertise. They could serve as excellent mentors to train young workers.

However, the safety performance of old workers is not optimistic. Reported by BLS (2008), while fatalities incurred by workers age 65 and older decreased 7%, these workers were still about 3 times more likely than all workers to be killed on the job. Although WorkSafeBC (2007) disclose that mesothelioma (lung cancer) is the dominant cause of death of old workers after years of exposure to asbestos, comparatively, they were still more prone to back-related and shoulder injuries because of the physical demands of construction. This leads to a higher number of medical claims and longer average duration of lost workdays (LHSFNA, 2005). The adoption of ergonomic interventions is the best strategy deemed by OSHA but weakly accepted by companies though those interventions are beneficial to all workers.

Table 1. Potential causes of injury and illness and expected remedies for subgroup workers

Subgroup categories	Characteristics that affect safety performance	Needs to be addressed in safety culture model
<p>Immigrant workers (mainly refer to Hispanic workers)</p>	<p>Language proficiency; Literacy; Communication/understanding level; Age; Culture and human dynamic; Past construction practice and experience; Training and documentation; Legal status; Living status and pressure; Discrimination; Job security; Pay and benefit; Unionization rate; Temporary job/day labours</p>	<p>Safety materials in English and Spanish; User-friendly visual materials; Safety training programs and on-the-job training; Cultural awareness training for supervisory personnel; Increase supervision; Increase of construction knowledge; Work in pairs and/or groups; Toolbox meetings and lunch conversations related to safety; Incentives; Mentors; Good communication channel with their supervisors; Promotion of Hispanics to supervisory positions</p>

Female workers	On-the-job training/mentoring; Ill-fitting PPE, PPC, equipment & tools, and inadequate facilities; Severe jobsite work conditions and inclement weather; Attitude barriers caused by the male-dominated environment; Discrimination and sexist/hostility atmosphere; Isolation; Level of support; Overly masculine workplace culture; Difficult assignments (e.g., lifting); Job security; Family pressure; Union membership; Gender-related personality traits	Women work as supervisors and co-workers; Considering physiological limitations when assigning tasks; Supporting them during pregnancy and childcare; Training program for supervisors focusing on communication and techniques to manage diversity; Ergonomic improvement; Apprenticeship programs sponsored by employer and labour groups; The change of construction culture; Fostered equality in the workplace; Sexual harassment prevention
Old workers (defined as 55 and above)	Physical condition; Pre-existing injuries; Assignment (e.g., bending, lifting, etc.); <small>Easy to feel weak and tired;</small> Job security	Adaptations in the workplace (e.g., better lighting and less clutter); Ergonomic adjustments/staging; Better jobsite planning; Train supervisors to value ergonomic interventions; Part-time and flex schedule; Shared jobs; Mentoring system to value their knowledge, skills, and experiences

ENHANCED SAFETY CULTURE MODEL

In practice, constructors seldom develop and apply a comprehensive safety culture model (three dynamic and interactive factors) in their organizations when using safety culture as a measure to improve safety performance, not to mention how they would adapt the model based on their workforce characteristics, subgroup culture, and people’s actual perception/behaviour. Problems perceived often include: standard safety policies and procedures without adaptation, ineffective communication and enforcement at the lower level, poor safety climate perception from workers, lack of safety culture assessment and feedback, etc. This study recommends enhancement in the following four aspects to improve the effectiveness and completeness of a safety culture model.

Enhancing Organizational Culture

Safety culture is an integrated subcomponent of organizational culture, but often times ignored. When rebuilding the safety culture, it is necessary to investigate and rearrange the relationship between safety culture and other components of organizational culture. When necessary other organizational culture components should be adapted to strengthen the safety culture. The organizational culture profile usually comprises the following main components:

- Structure, leadership, and power distance
- Communication

- Individualism vs. teamwork/collectivism
- Personal (life) value, work value, organizational value, occupational value, social value, and world value
- Work ethics
- Job performance
- Development of the individual
- Innovation, adaptive to changes, and attitude to unknown

In order to mitigate the above-presented issues related to various construction subgroups, a few components of organizational culture should be added or strengthened. For example, “*equality*” and “*diversity*” should be added and strengthened in an organization; this applies to the situation when Hispanic and women workers are present. Knowing the difference between American culture and subgroup culture is very helpful to determine the appropriate strategies and measures. At the same time, “*teamwork*,” “*trust*” and “*cooperation*” should also be emphasized since working as a group has already been approved an effective measure to reduce jobsite accidents/incidents. In evaluating job performance, productivity should not be the dominant factor or only factor. Training and continuous professional development should be valued and related costs should be granted. These adjustments are required to be integrated into an organization’s overall culture.

Creating Goal-Directed Group-Oriented Safety Management Systems

Goal-directed safety management systems are not rare in practice. For example, constructors were seen to set up safety performance goals as: raising the safety knowledge and awareness, positively changing individual safety behaviour, cutting down the number of fatalities and injuries in categories such as fall, struck-by, caught-in-between, and/or electrical. However, seldom were the goals set up for special subgroups, whose disproportionate risks were caught up mainly by safety- and health-related agencies rather than individual companies.

Since the development and improvement of safety culture is goal-directed, it is possible to consider the variations of the construction workforce, their associated risks and subculture and to determine multi-dimensional safety cultural goals, focuses, and corresponding policies/procedures based on the workforce the company deals with. For example, instead of cutting down the total fatality and/or injury rates by 50%, specific goals such as reducing fatality and/or injury rates for Hispanic workers by 75% or zero motor vehicle injury for female workers might be more appropriate. A simple demographical check or survey within the organization associated with past accident statistics can provide better information for this purpose.

When procedures and measures are to be determined, their effectiveness to different workers may be considered by constructors. In practice, it has been proven that promoting the importance of family to Hispanic workers is more effective than purely talking about the importance of safety. Visual materials are more effective than textual safety documents no matter what language is used. Providing fitting clothing and personal protective equipment to women workers is the basis for preventing accidents and injuries. The more adequately the group difference is considered in the development of safety management systems, the more effective and comprehensive those policies, procedures and measures are.

Enforcing Supervisory Role

The developed organizational safety policies, procedures, and measures at the high management level have to be implemented at the subunit level, for which supervisors are deemed as the most important bridge. How effective those measures can be executed in subgroups is largely dependent on supervisors' communication skills and implementation ability. Supervisors' attitudes toward safety also have a huge impact on workers' perception about the company's safety culture.

In practice, safety training such as 30-hour OSHA certification is often mandatory for construction supervisors. However, training for communication skills and techniques for managing diversity is usually not required. Universities such as Iowa State University provide training specifically for American supervisors with Hispanic craft workers to increase their awareness of Hispanic cultures, skills for jobsite communication, and construction-related Spanish language skills. The reason is just simple: Supervisors are fewer in number and much better educated.

To effectively implement the safety culture model, enforcing the supervisory role is crucial. This includes: increasing the level of supervision; providing more training to supervisors, and promoting Hispanic and women supervisors. Supervisors should be at key positions to reduce and eliminate jobsite discrimination and hostile work environments for minority and other vulnerable workers.

Enhancing Personal/Subgroup Safety Climate

One of the research questions raised by this study is whether workers at different subgroups can perceive the safety culture at the same level when considering the biologic, social, economic, and cultural characteristics variations among those groups. Such a concern is natural by simply thinking about the language and cultural barriers Hispanic workers face. Perceptions will be affected by the ways in which messages about safety culture are communicated to them, whether relevant resources for safety performance improvement are readily available, and how effective and strict the implementations are.

Safety climate surveys are considered an important instrument to assess the effectiveness of transmitting organizational-level safety culture to group-level safety climate perception. The surveys can also provide comparison and feedback to the management for improving the safety culture model. However, this is merely done in the field. This paper recommends that constructors design safety climate surveys that meet the needs of the organizations as well as their diverse workforce and use the results for continuously improving their safety culture model instead of using accident statistics as an assessment instrument.

CONCLUSION

This paper addressed the interactions between safety culture and workforce diversity. In building and implementing a positive safety culture model, specifically, unique characteristics, culture, and safety behaviour associated with diverse subgroup workers such as Hispanic workers, women workers, young/old workers, etc. in the U.S. construction industry were considered. This paper

briefly reviews the root causes of accidents in a diverse workforce in order to disclose some underlying reasons that are often ignored by safety management personnel. Safety culture and its multiple levels were discussed to explicate its complexity. After exploring the characteristics and safety performance of various subgroup workers, this paper further identified, from the cultural aspects, potentially underlying causes for elevated safety and health risks associated with these workers. This helped the identification of elements that might need to be addressed in a superior safety culture model and corresponding measures that might be effective to solve the problems. Finally, recommended enhancement to the safety culture model is summarized in four aspects:

- Enhancing organizational culture: It is necessary to investigate and rearrange the relationship between safety culture and other components of organizational culture. Equality, diversity, teamwork, trust, and cooperation should be either added or strengthened in an organization.
- Creating goal-directed group-oriented safety management systems: Specific safety performance goals should be set up for subgroups with disproportionate safety and health risks. The group difference should be considered in the development of safety management systems and evaluation of the effectiveness of procedures and measures applied.
- Enforcing supervisory role: Training must be provided for supervisors to increase their awareness of cultural difference of subgroup workers, skills for jobsite communication, and techniques for managing diversity. Increasing the level of supervision and promoting supervisors from subgroup workers are also beneficial.
- Enhancing personal/subgroup safety climate: Safety climate surveys designed for specific subgroups will be used to assess the effectiveness of transmitting organizational-level safety culture to group-level safety climate perception. Feedback should be used to continuously improve the safety culture model of an organization.

Future research will be focused on detailing goal-directed group-oriented safety management systems and developing a safety climate survey (or a set of surveys) that can monitor the issues associated with various subgroups as discussed in this paper. This will enhance the effectiveness and completeness of the applied safety culture models.

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