MANAGING SITE SAFETY ON INTERNATIONAL CONSTRUCTION PROJECTS – DEVELOPING A TOOL TO ASSESS NATIVE WORKFORCE SAFETY CULTURE

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Abstract

While international projects may appear as attractive investments, such projects usually involve elevated levels of risk and uncertainty. Morris and Hough (1990) found that 63 percent of 1,778 projects funded by the World Bank between 1974 and 1988 experienced significant cost overruns owing to risk factors including safety risks. The loss or injury of trained and experienced workers, and the worker disruption to progress of work, undeniably represent reduction in the performance of construction. The cost of accidents which includes increased insurance cost, lost productivity, and disruptions, provides an economic motivation to try and prevent accidents from happening; safety culture can set the tone for implementation of safety in construction site environments.

Based on the above premise, this study attempts to develop a research instrument that can be utilized by construction contractors working in international markets to assess the safety culture of the native workforce in order to better manage the risks of safety, as well as to take better procurement and management decisions. The research instrument has been developed through structured surveys and interviews of major U.S. contractors (general and specialty) pursuing international business opportunities in the commercial and industrial sectors, in various countries around the globe. The research deliverable provides a structured mechanism for international contractors to assess and curtail site safety risks on international projects and to better respond to the challenges faced by their management in implementing safe construction projects internationally. Strategically, this provides them with a structured approach to decision making under uncertainty for procurement of construction projects in an international context.

Keywords: Site Safety; Safety Culture; International Construction; International Joint Ventures (IJV); Risk Management.

Introduction

Developing countries need new infrastructure and buildings and welcome specialized contractors from industrialized countries. This drive for globalization provides the possibility of new opportunities to construction companies. Furthermore, the lowering of international barriers also allows construction companies to conduct business internationally. However, the international construction business is sensitive to world events and it entails political, financial, cultural, and legal risks. Hence, understanding the opportunities and threats associated with international markets and assessing a company's preparedness for international ventures are crucial to the growth and sometimes the bare survival of construction companies.

More often than not, foreign construction companies are encouraged to enter the local market in the form of a joint venture (JV) with a local entity. In Singapore, for example, a preferential margin scheme was introduced to provide an incentive for foreign-local JVs. Malaysia set a target of 30% ‘‘Bumiputra’’ (refers to people of Malay origin) share-holding in the public sector in the National Economic Policy. The Indonesian laws require a foreign participant to enter a JV with a local partner. Thailand restricts foreign ownership of construction companies up to 49%. The Philippines gives more freedom, but incentive is given to JVs with local partners. In Vietnam and China, foreign construction companies tendering for projects must have at least one suitable local partner and are required to obtain a license on a project-by-project basis (Balachandran 1995).

International joint ventures (IJVs) can be of particular benefit to less-developed and developing areas. Trans-global economic developments offer an opportunity to develop products using the most up-to-date expertise and knowledge in a cost-effective manner (Clark and Ip 1999). However, researchers have found that a large number of cooperative ventures fail to achieve the goals and objectives that were originally established (Geringer and Hebert 1991). In developing countries in particular, the number of JVs that failed is significantly high, >50%, (Makino and Beamish 1998). This is because international construction is much riskier than domestic construction. The complex international environment is affected by diverse variables that are not part of the domestic markets and that create risks never encountered in domestic conditions. The complex variables that affect the performance of construction companies in overseas markets need to be considered in this decision. Furthermore, the threats and opportunities associated with target countries should be well understood (Hastak and Shaked 2001). IJVs are frequently plagued with high degrees of instability and poor performance (Parkhe 1993). The core concepts of IJV operation and of the relationships between its partners are still not well understood (Parkhe 1993). This largely stems from the inherent complexity of IJVs involving a mixture of different cultures (Tatoglu and Glaister 1998).

The majority of the current literature on IJVs concentrates on manufacturing industries, while IJV theories have not been investigated empirically in the construction industry, except for a small group of studies associated with the risks of IJVs in construction (Bing and Tiong 1999; Bing et al. 1999) and factors affecting the performance of IJVs (Mohamed 2003; Gale and Luo 2004). One of the findings of these researches is that, as one of the major issues affecting the management of international construction projects, culture deserves wide research (Chan and Tse 2003).

Cultural difference has received a great deal of attention in the international business literature (Kogut and Singh 1988; Barkema et al. 1997; Park and Ungson 1997; Morosini et al. 1998; O’Grady and Lane 1996; Evans and Mavondo 2002). There is no one single definition which encapsulates the term “culture” wholly. It has been referred to as a set of shared experiences, understandings, and meanings among members of a group, an organization, a community, or a nation (Hofstede and Hofstede 2005; Mead 1998). Culture is also that complex whole which includes knowledge, beliefs, arts, morals, customs, and any other capabilities and habits acquired by men and women as members of a society (Low and Leong 2000). Culture is an ingrained behavioral influence which affects the way collective groups approach, evaluate, and negotiate opportunities for international business. Different cultures have different models of management and different ideas of the nature of organizations (Hofstede and Hofstede 2005). Culture has been identified as a key factor in explaining foreign market attractiveness, expansion patterns, the degree of adaptation of marketing and retailing strategies, modes of entry, and organizational performance (Evans 2000).

Several attempts have been made to assess the cultural risks associated in IJVs [e.g., Ding (1996) and Swierczek (1994)]. However, most of these studies have not concentrated on safety related cultural risks. Although they have been very useful to the construction industry in general, they have not offered a satisfactory treatment of the safety cultural distance problem as a whole.

The core objective of the study presented in this paper was to provide a tool to assess the differences in safety culture between IJV partners. A questionnaire survey was administered to US construction companies that have established IJVs with foreign partners in order to develop the tool.

Background and Rationale

Cultural Context to Safety

The Advisory Committee on the Safety of Nuclear Installations (ACSNI, 1993) provides the definition that "the safety culture of an organization is the product of *individual and group values, attitudes perceptions, competencies* and *patterns of behaviour* that determine the *commitment* to and the *style* and *proficiency* of an organization's health and safety management."

Safety culture is crucial (Fang et al., 2006) to construction; particularly given the construction industry is notorious for its poor safety records (Mohamed, 2002). Safety culture can set the tone for implementation of safety in construction site environments. Although, the concept of safety culture is relatively new in the construction industry; it is, however,gaining popularity due to its ability to embrace all perceptional, psychological, behavioural, and managerial factors. Improving site safety is a top priority for construction companies throughout the world. Having a positive and mature safety culture is becoming crucially important to facilitate such improvement as anecdotal evidence suggests that in many major accidents, safety management system's defences broke down because of the prevailing safety culture in which safety management activities were carried out (ACSNI, 1993).

Researchers tend to use safety culture, safety climate, and perhaps safety management interchangeably, as the terms are not so clear cut. Kennedy and Kirwan (1998) reveal that safety management is regarded as the documented and formalized system (policy, procedures, training, instructions, and resources, etc) of controlling against risk or harm. Nevertheless, the standard of an organization's safety management system as it exists on paper does not necessarily reflect the way it is carried out in practice. This is where the concept of safety culture comes into the picture. It is the safety culture of the organization that will influence the deployment and effectiveness of the safety management resources, policies, practices, and procedures as they represent the work environment and underlying perceptions, attitudes, and habitual practices of employees at all levels (Kennedy and Kirwan, 1998).

Lee and Harrison (2000) reveal that basically, any safety management system is a social system, wholly reliant upon the employees who operate it. Its success depends on three things: its scope, whether employees have knowledge about it, and whether they are committed to making it work. The concept of safety culture has evolved as a way of formulating and addressing this new focus.

In international construction projects, any party involved must be cross-culturally competent in all respects and particularly in regard to safety. Construction professionals involved with international projects should at least be able to recognize the safety expectations and behaviour of others. Health and Safety Executive (2002) reveals that 80% to 90% of all workplace accidents and incidents can be attributed to unsafe work behaviours. Moreover, cultural issues are expected to contribute to conflicts among parties in an international project and increase difficulties in the management of the project (Fellow and Hancock 1994).

Impeding Safety Culture in Developing Countries

Since most IJV projects are undertaken in developing countries, it is extremely useful for international contractors originating from developed countries to understand the prevailing safety culture in most of the developing countries, which, in most cases, will be impeding towards a desirable safety performance. Salient features of the culture affecting safety behaviours widespread in most developing countries are given in the following paragraphs. Most of these findings come from a research conducted by the first author in Pakistan (Farooqui et al., 2007). It is important to note here that the fact that the culture in most developing countries is highly inhibitive towards a satisfactory safety performance and is enough to justify the need for a structured mechanism, useful for an international contractor, to formally assess the organizational safety culture of the local entity of the IJV.

Construction in developing countries, such as Pakistan and India, is more labour intensive than that in the developed areas of the globe, involving 2.5-10 times as many workers per activity (Koehn and Regmi 1991). Typically, workers tend to be unskilled and migrate in a group, with or without their families, throughout the country in search of employment. In fact, they are usually divided into various factions. Communication problems related to differences in language, religion, and culture tend to inhibit safety on the work site.

In numerous developing countries, such as Pakistan, there is a significant difference between large and small contractors. Most large firms do have a safety policy, on paper, but employees in general are not aware of its existence. Nevertheless, a number of major constructors exhibit a concern for safety and have established various safety procedures. They also provide training for workers and maintain safety personnel on the jobsite. For the majority of contractors, however, maximizing profit is the prime concern. Unsafe conditions exist on many sites, both large and small, and labourers are subjected to numerous hazards.

On many sites, no training programs for the staff and workers exist; therefore, no orientation for new staff or workers is conducted, hazards are not pointed out, and no safety meetings are held. Employees are required to learn from their own mistakes or experience. In addition, lack of medical facilities, shanty housing, and substandard sanitation tend to exist on remote projects. Workers undertake a risk while at work and the following problem areas are common:

- While excavating in deep trenches (with no proper shoring or bracing), accidents due to cave-ins often occur.
- Concreting is done mainly by labourers, and cements burns due to the unavailability of protective gloves and boots are common.
- Workers fall from heights due to weak scaffolding and the unavailability of safety belts.
- Workers sustain injuries on the head, fingers, eyes, feet, and face due to absence of personal protection equipment.
- There is improper housekeeping.

Lack of understanding of the job and poor equipment maintenance are also major causes of accidents. Injuries, generally, are unreported; however, if necessary, a labourer might receive first aid or preliminary medical care. In most cases, specialized medical treatment or compensation is unavailable. Workers themselves consider accidents as due to their own negligence, and accept that construction is a dangerous occupation. Nevertheless, major accidents involving the death of a worker may be reported due to the financial expenses and litigation that could be involved.

Maintenance and inspection schedules often are not followed, and only after a breakdown is equipment repaired. This approach leads to loss of time, idle workers, and project delays. It may also cause damage to property. Breakdown of concrete mixers, vibrators, water pumps, and tractors are common. Electrocution is also a major hazard, due to use of substandard electrical

equipment and underground cables. Workers, especially young ones, take chances, and often do not follow safety norms or use personal protective equipment. Also labourers and staff are sometimes under the influence of alcohol and drugs. Unfortunately, crew members are not checked for drugs and alcohol before the start of and during work.

One of the impeding factors that prevents a developing country such as Pakistan from developing a construction safety program is pervasive corruption, a by-product of the system of bureaucratic controls. As an example, for any accident that takes place on-site due to lack of safety practices, the particular low-level activity supervisor (engineer/ technician), not the construction manager, is theoretically held responsible and may, in exceptional cases, be subject to physical abuse and harm from the victim's group of friends. In extreme circumstances, the supervisor may also be charged with a criminal offence. However, cash payments are usually accepted in lieu of pressing charges. In addition, because workers are usually non-residents of the local area and are often unaware of their rights, accidents are often not reported to the proper authorities or, if reported, are lost in the local bureaucracy.

Owners and consultants do stress safety before work commences, but as the work progresses their concerns for deadlines becomes a priority and they tend to pay less attention to safety. On large projects, the owners may provide medical facilities at the site, but ultimately safety is the contractors' responsibility.

Measuring Safety Culture

Traditionally, organizational culture is measured through the application of qualitative methods, such as observations and interviews. Nevertheless, the three main dimensions (psychological, situational, and behavioural) can be measured through a combination of qualitative and quantitative methods (Cooper, 2000). The situational aspects of safety culture can be seen in the structure of the organization: policies, working procedures, management systems, etc. The behavioural aspects of safety culture can be measured through peer observations, self-reporting, and outcome measures. The identified safe behaviours are placed on observational checklists, and trained observers regularly take observations which are then translated into 'percentage of safe scores' to provide feedback to those being observed. The psychological dimension is most commonly examined by safety climate questionnaires devised to measure people's perceptions of safety.

Many modern approaches advocate a shift to using proactive measures, upstream, or leading indicators', such as measurement of safety climate (Flin et al., 2000; Mohamed, 2002); safety culture (Cooper, 2000; Choudhry and Fang, 2005), hazard identification, and/or observed percent safe behaviour (Strickoff, 2000; Cooper and Philips, 2004). These approaches rely and focus on current safety activities to establish the success of the safety management system rather than system failure.

Benefits of Assessing Native Safety Culture to the IJV

The benefits of assessing the native safety culture to the international joint venture would very much depend on the realization of the cultural differences and an attitude of collaborative working. The benefits achieved could be the following:

- Reducing the number of injuries to personnel and operatives in the workplace through better understanding of the cultural issues and improved cultural interaction;
- Minimizing the risk of major accidents by reduced cultural distance;
- Controlling workplace risks improve employee morale and enhances productivity;
- Minimizing production interruptions and reducing material and equipment damages;

- Reducing the cost of insurance as well as the cost of employee absences;
- Minimizing legal costs of accident litigation, fines, reducing expenditures on emergency supplies;
- Reducing accident investigation time, supervisors' time diverted, clerical efforts, and the loss of expertise and experiences.

Research methods

The research instrument was developed through interviews of internationally experienced project managers of 20 major U.S. contracting firms (general and specialty) housed in Florida, USA pursuing international business opportunities in the commercial, infrastructure and industrial sectors in various countries around the globe, particularly in East Asia: Singapore, Malaysia, Indonesia, Philippines, Vietnam, and China. International contractors were selected from the Engineering News Record, 2007, *list of 225 Top International Contractors* that have businesses in at least two Asian countries.

Research Question:

- How can a simple yet effective structured tool be developed that enables a contractor from a developed country confronted with a decision to develop a JV with a foreign contractor in a developing/ under-developed country, that allows it to assess the organizational and workforce safety culture of the foreign counterpart and take a more appropriate bidding decision under uncertainty?

Research Objectives:

- To provide a structured tool to assess the native workforce safety culture, which is useful for a contractor working in an IJV to manage project safety performance;
- To provide a mechanism for a contractor working in an IJV to evaluate its company's safety expectations and create policies to ensure desirable safety performance in IJV;
- To provide a means to assess the cultural distances between contractors working in IJVs, which will be useful towards developing an effective culturally non-conflicting project-specific safety plan;
- To provide critical information for bid decision to a contractor for a future opportunity to work on an IJV in a country.

Consistent with the research question and objectives, interviews were created to assess a number of key issues. Firstly, using literature review, an extensive list of attributes defining safety culture on work sites was developed. Secondly, the list was presented to interview participants who were asked to respond to the following key issues.

- What key attributes define safety culture on international work sites?
- How can these attributes be prioritized? (for short listing)
- How can these attributes be categorized into various management, individual, and behavioral constructs?
- What recommendations can be proposed for contractors looking for IJV opportunities for developing an effective safety culture on their IJV projects?

Face to face interviews were conducted with selected professionals. The response was highly encouraging and all respondents provided detailed experience-based input. Based on the responses, the results were compiled as given in the following section.

Research results

Based on information gathered via interviews, the survey tool given in Table 1 was developed. The survey tool can be used to assess the safety culture of the native workforce on an IJV project. The tool has been devised such as to collect inputs from front line workers, clerical staff, supervisors, and site/ project managers of the native entity involved in the IJV. The tool provides a series of statements (categorized in 10 groups) about safety culture on work sites. All statements are measured on a five-point scale. Respondents will indicate their level of agreement or disagreement with the statements about safety in their organizations in relation to their work behaviours and patterns by ticking an appropriate box (1=strongly disagree; 3=neither disagree nor agree; 5=strongly agree).

Table 1. Tool to assess native workforce safety culture

Safety Culture Attribute	**Score**				
	1	2	3	4	5
I. Management Commitment					
Management clearly considers safety to be equally important as production					
Management expresses concern if safety procedures are not adhered to					
Management acts decisively when a safety concern is raised					
Management acts quickly to correct safety problems					
Management acts only after accidents have occurred					
Management praises site employees for working safely					
Management disciplines site employees for working unsafely					
II. Communication					
Management clearly communicates safety issues to all levels within the organization					
Management operates an open-door policy on safety issues					
Management encourages feedback from site employees on safety issues					
Management listens to and acts upon feedback from site employees					
Management communicates lessons from accidents to improve safety performance					
Management undertakes campaigns to promote safe working practices					
Current safety rules and procedures are made available to protect us from accidents					
Current safety rules and procedures are adequate sources of information on safety					

Safety Culture Attribute	Score				
	1	2	3	4	5
III. Safety Rules and Procedures					
Current safety rules and procedures are so complicated that some workers do not pay much attention to them					
Current safety rules & procedures should be consulted only by new recruits					
Current safety rules and procedures require us to report any malpractice by a fellow worker					
Current safety rules and procedures enforce the use of personal protective equipment whenever necessary					
Current safety rules and procedures require detailed work plans from subcontractors or self-employed individuals					
IV. Supportive Environment					
As a group, we adopt a no-blame approach to highlight unsafe work behavior					
As a group, we often remind each other on how to work safely					
As a group, we believe it is our business to maintain a safe workplace environment					
As a group, we always offer help when needed to perform the job safely					
As a group, we endeavor to ensure that individuals are not working by themselves under risky or hazardous conditions					
As a group, we maintain good working relationships					
As a group, we ensure that the workload is reasonably balanced among ourselves.					
V. Supervisory Environment					
My supervisor/safety manager has positive safety behavior					
My supervisor/safety manager believes safety is very important					
My supervisor/safety manager usually engages in regular safety talks					
My supervisor/safety manager welcomes reporting safety hazards/incidents					
My supervisor/safety manager is a good resource for solving safety problems					
My supervisor/safety manager advocates working around safety procedures to meet important deadlines					
My supervisor/safety manager values my ideas about improving safety when significant changes to working practices are suggested					
VI. Workers' Involvement					
Everyone aims to achieve high levels of safety performance					
Everyone plays an active role in identifying site hazards					
Everyone reports accidents, incidents, and potentially hazardous situations					

Safety Culture Attribute	Score				
	1	2	3	4	5
Everyone participates in safety planning, according to our safety policy if being asked					
Everyone has the responsibility to reflect on safety practice					
Everyone avoids being involved in accident investigations					
Everyone contributes to job safety analysis if being asked.					
VII. Personal Appreciation of Risk					
I am sure that it is only a matter of time before I am involved in an accident					
I am sure I can influence the level of safety performance					
I am clear about what my responsibilities are for safety					
I am aware that safety is the number one priority in my mind while working					
I believe some rules are really necessary to get the job done safely					
I believe some rules and policies are not really practical					
I cannot do the job safely without following every safety procedure					
VIII. Appraisal of Physical Work Environment and Work Hazards					
Safety is a primary consideration when determining site layout					
Poor site layout planning is an accepted feature of the industry					
The chances of being involved in a site accident are quite large					
Operating site conditions may hinder one's ability to work safely					
Detecting potential hazards is not a major aim of the site planning exercise					
Working with defective equipment is not allowed under any circumstances					
Potential risks and consequences are identified prior to execution					
IX. Work Pressure					
Under pressure I work under a great deal of tension					
Under pressure I am not given enough time to get the job done safely					
Under pressure It is necessary for me to depart from safety requirements for production's sake					
Under pressure I perceive operational targets in conflict with some safety measures					
Under pressure It is normal for me to take shortcuts at the expense of safety					
Under pressure I tolerate minor unsafe behaviors performed by co-workers					
Under pressure It is not acceptable to delay periodic inspection of plant and equipment					

Safety Culture Attribute	Score				
	1	2	3	4	5
X. Competence					
I received adequate training to perform my job safely					
I am aware, through training, of relevant safety procedures					
I do fully understand current, relevant legislation					
I am skilled at avoiding the dangers of workplace hazards					
I am capable of identifying potentially hazardous situations					
I am proactive in removing workplace safety hazards					
I am capable of using relevant protective equipment					

Furthermore, the following recommendations were compiled for contractors looking for IJV opportunities for developing an effective safety culture on their IJV projects.

1. Developing and maintaining a positive safety culture of your workforce can be an effective tool for improving the safety behaviours of the native workforce. The challenge is how to develop a culture that is favourable to good safety performance in an environment mostly unfavourable to good safety performance.

2. A number of elements that can help develop a good safety culture in an IJV includes: importance to safety, involvement of workers at all levels, role of safety staff, the caring trust (that all parties to have a watchful eye and helping hand to cope with inevitable slips and blunders), openness in communication, belief in safety improvements, and integration of safety into the project organization.

3. Safe behaviours can be enhanced by capitalizing on activities such as verbal instructions, training, and warning signs. Nevertheless, if things are communicated in the way that the work is easier, and the task can be finished earlier and thus rewarded with monetary incentive, then certainly employees will be cutting corners, may not be observing safety rules, not wearing personal protective equipment, and ultimately not working safely. Long-term values include employees being able to work without injury so they can continue to provide earning for both the company and for her/his family.

4. Collaborative management plays a key role in promoting a positive safety culture. This can be best demonstrated by allocating resources, time, *walk the talk*, inspections, by participating in risk assessments and consultative committee meetings, and by completing actions.

5. For a positive safety culture, employees' involvement, ownership and commitment is necessary; in particular empowerment promotes feelings of self-worth, belonging, and value. Employees should be involved in training, consultation about noise, machinery isolation, sound barriers, job rotation, PPE, and wearing different earmuffs.

6. In order to enhance safety awareness amongst employees, promotional strategies to be used should include the following:
    a. Mission statements, slogans, and logos;
    b. Published materials (libraries, statistics, newsletters);

c. Media (posters, displays, audiovisual, e-mail, Internet).

7. Training activities should include short talks, group meetings, training for personal fitness, hygiene, workplace stress, and responsibilities towards safety (including compliance with rules and regulations, hazard identification and risk assessment, incident investigation and job safety analysis);

8. Special campaigns should include Health and Safety Week, health promotion, safety inductions, emergency response, incident reporting and investigation, risk assessment, introduction to existing health, safety and environment management systems.

Discussion and conclusions

This study has attempted to develop a research instrument that can be utilized by construction contractors working in international markets (in IJVs) to assess the safety culture of the native workforce in order to better manage the risks of safety and to better respond to the challenges faced by their management in implementing safe international construction projects. Strategically, this provides them with a structured approach to decision making under uncertainty for procurement of construction projects in international context.

Promoting collaborative management commitment and collaborative employee participation in safety can enhance the IJV's safety culture. When employees become more aware of their responsibilities for incident and injury prevention, they will exhibit more interest in maintaining a safe and healthy work site.

The authors take the view that a positive safety culture in an IJV comprises five components which include: *international contractor's commitment to safety; international contractor's concerns for the native workforce, mutual trust and credibility between management of the two firms as well as management and employee,; workforce empowerment, and continuous improvement to reflect the safety at the work site*. The authors postulate that within any IJV project organization, a positive safety culture will ascertain and reflect the effectiveness of a safety management system in the construction site environment.

Developing and maintaining a positive safety culture of international contractor's workforce can be an effective tool for improving the safety behaviours of the native workforce. A number of elements that can help develop a good safety culture in an IJV includes: importance to safety, involvement of workers at all levels, role of safety staff, the caring trust (that all parties to have a watchful eye and helping hand to cope with inevitable slips and blunders), openness in communication, belief in safety improvements, and integration of safety into the project organization.

Collaborative management plays a key role in promoting a positive safety culture. This can be best demonstrated by allocating resources, time, *walk the talk*, inspections, by participating in risk assessments and consultative committee meetings, and by completing actions.

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Author's Biography

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