Safety Issues on Global Projects

Ashwin Mahalingam[1] and Raymond E. Levitt, M.ASCE[2]

Abstract: Global construction projects that involve collaboration between participants from multiple countries can often lead to conflicts and delays due to different cultural perceptions of acceptable levels of safety among the different project participants. The current literature has not explored the origins, extent and costs of these delays, as well as ways to remedy them on global projects. Detailed case studies of four comparable global infrastructure projects indicate that legal rules, cultural values and the prevailing economic situation in their countries of origin, influenced project participants' perception of safety. Differing mindsets on these projects clashed, leading to project delays and costs. Project participants unsuccessfully attempted to use a strategy of education to improve safety levels, and then resorted to more successful coercive strategies such as the imposition of fines. This research contributes to: practice, by identifying challenges that international contractors face when attempting to transfer safety techniques to developing countries on short-term global projects; and to theory by shedding light on cultural challenges faced on global projects.

CE Database subject headings: Safety; International development; Care reports; Organizational policy.

Introduction

Analysis of safety issues on construction sites has been a popular area of focus and has been extensively dealt with in the construction research literature (Abudayyeh et al. 2004). Several scholars have documented the causes of unsafe incidents on construction sites. Baxendale and Jones (2000) point to the inefficient role played by management in influencing site safety. Kartam (1997) identifies workers themselves as being liable to perform unsafe acts and cause accidents. Others highlight poor planning and poor site conditions as hazards to project safety (e.g., Cooke and Williams 1998; Kartam 1997). A large body of work also deals with ways in which project safety can be improved upon. Researchers have investigated how the safety climate (Zohar 1980) contributes to site performance (Gonzalez et al. 1999; Mohamed 2002). Scholars have analyzed the roles that clients (CII 1993; Wilson and Koehn 2000; Hinze 1997a,b), management (Levitt and Parker 1976; Hinze and Raboud 1988), and subcontractors (Hinze and Gambatese 2003) can play and strategies that they can adopt to improve site safety. Incorporating safety in the design of the project has also been investigated as a possible strategy to reduce the possibility of accidents on site (Korman 2001; Gambatese et al. 1997, 2005).

[1]Assistant Professor, Dept. of Civil Engineering, Indian Institute of Technology, Madras India and Room 225, Building Sciences Block (BSB), Dept. of Civil Engineering, IIT-Madras, Chennai 600036, Tamil Nadu (State), India (corresponding author). E-mail: gandalf@ stanfordalumni.org

[2]Professor, Dept. of Civil and Environmental Engineering, Stanford Univ.; Room 290, Terman Engineering Building, 380 Panama Mall, Stanford, CA 94305-4020. E-mail: Ray.Levitt@stanford.edu

However, most of these studies focus on monocultural projects performed within the boundaries of a single country. Virtually none of these studies explicitly considers safety issues on global projects, where participants from a variety of countries are present on the construction site. Such projects, in particular those where participants from both developed and developing countries are present, throw up a novel set of challenges with respect to site safety. First, the expectations of what constitutes good or acceptable safety practices might differ culturally from one nation to another. In order to implement safety policies and to proceed with the construction of a global project, disparate and often conflicting views must be resolved on such projects to reach an agreed understanding. In addition, cultural and well-institutionalized beliefs and work-practices might lead certain factions of project participants to oppose the imposition of new safety guidelines. When they do, contentious discussions ensue that can delay the project and contribute to increased costs. Further time may be lost in rectifying work that certain national groups (such as international contractors from developed countries) might consider to be unsafe or defective, in contrast to other groups (e.g., subcontractors from developing countries) who consider their work practices to be safe enough.

What are the kinds of difficulties that are present on such projects? How and to what extent do disparate views of safety affect these projects in terms of cost and quality? What steps can be taken to improve safety performance on global projects? Answering these questions will help both researchers and practitioners design and implement policies that will lead to smoother, cost effective and more efficient site performance on global projects.

In this paper, we take a first step toward answering these questions. We provide some initial insights into the kinds of safety issues that arise on global projects and how they are currently being dealt with. We address this set of questions through detailed ethnographic case studies of four international projects in Asia.

In the following section, we describe our research setting. Next we describe our research methodology. We then describe the types of issues and conflicts that arose on these projects and probe

Fig. 1. Research design

into the incentives facing parties on the project and the reasons for their observed behavior. We then document and analyze the strategies that were used to resolve safety issues on these projects. We conclude this paper with recommendations for practice and research.

Research Setting and Design

We chose to conduct multiple case studies so as to not misjudge the representativeness of events that occurred within a single case (Tversky and Kahneman 1986). This allowed us to use a "case replication" methodology to test the generality of our findings across cases (Yin 1984). In order to be able to compare across cases, we attempted to select cases that were similar in nature and scope, and yet systematically differed from one another in terms of the nationalities and organizations involved, so as to explore the varied conditions along which our constructs varied. We sought a set of projects where several organizational or national groups were involved on each project, where participants were present from both developed and developing countries, and where some of the organizations and national groups were present on multiple projects, so that each project did not have an entirely new set of players. Commonalities between projects in terms of the actors involved would provide an aid in project-to-project comparisons.

Based on these considerations, we settled on a research design that involved conducting case studies on four matched railway infrastructure projects—two in India and two in Taiwan. The scope of work on the Indian versus Taiwanese rail projects was roughly the same, making them quite comparable. Firms and professionals from several countries—both developed and developing—were involved in the design and construction phases of all of these projects making this an ideal case for our research purposes. Also, we had personal contacts on all these projects, which increased the probability of obtaining access to the sites. This combination of relevant cases along with good access to the sites has been cited by researchers as being important for the

successful completion of a field study (Pettigrew 1990). Fig. 1 graphically describes our research design.

Projects in Taiwan

In Taiwan, we studied two projects that were in essence two contracts within a larger project—the construction of a high-speed rail system. We shall refer to this larger project as Project 1. The project sponsor for the entire high-speed rail system was a government-supported consortium of local and international firms, staffed by a few Taiwanese business people along with a large number of expatriates from various countries (predominantly from the United Kingdom) who had been hired as consultants and formed the organization's operational core. The financing was obtained through a mix of public and private investment.

The civil engineering works were split into twelve sequential sections. We chose to study two adjacent civil contracts, both of which were bid out as Design-Build packages. On one contract (which we shall designate as Contract 1A), a large Japanese contractor formed a joint venture (JV) with a local Taiwanese contractor, whereas on the other contract (which we shall designate as Contract 1B), two large Korean firms formed a JV with another local Taiwanese contractor. The contractors' organizations were composed of people from several other nationalities as well. Several freelancers from various countries (including the United Kingdom, Australia, and parts of South East Asia) were hired by the JVs for various roles (design, construction management, quality assurance, safety, etc.) for the duration of the project. The subcontractors and laborers used were mostly selected from the local Taiwanese market.

Projects in India

In India, we studied two projects that were also two contracts within a larger project—the construction of a metro rail system by a regional government. We shall refer to this larger project as Project 2. The entire metro rail project was financed partially by a multilateral institution and by the Indian government. An organization staffed by public sector employees from the Indian railways (a government organization) was set up to monitor and manage this project. This organization then employed a consulting firm to help manage relationships with the contractors, to provide expertise in the building of an underground metro system (a type of structure that the Indian railways did not have much experience in building), and to help with the day-to-day affairs of running the project, such as reviewing submissions. The consultants organization was a JV agreement between five organizations: one American organization, three Japanese organizations, and an Indian subsidiary of the Indian railways (also staffed by Indian railways employees). However, most of the Japanese and American organizations' employees were experienced freelance expatriates, primarily from the United Kingdom, recruited to fill positions for the duration of this project.

The entire metro consisted of several sections. This research studied two of the underground sections that were awarded as separate design-build contracts of approximately the same size. These contracts included the construction of stations and installation of some of the electrical and mechanical equipment. One contract (which we shall designate as Contract 2A) was awarded to a JV between a Swedish, Japanese, and an Indian contractor, whereas the other contract (which we shall designate as Contract 2B) was a JV between a German, a Korean, a Japanese, and an

Indian contractor. Both these JVs employed the freelance expatriates described earlier. As in Taiwan, the subcontractors and laborers used were mostly selected from the local Indian community.

Comparability of the Projects

The four projects/contracts (two in India and two in Taiwan) had several features that made them comparable. First, they were all transportation infrastructure projects in developing regions and had been set up as design-build contracts. The four contracts we studied mainly involved standard civil engineering and construction techniques and were roughly similar in terms of the overall scope of work. Further, the project organization on all of these contracts was very similar and consisted of local client representatives, international contractors, designers, and consultants from developed countries, who in turn worked with local subcontractors and local laborers. In all of these contracts, the JV partners were well integrated. The number of representatives from any company in the JV depended proportionally on their share of the project contract. However, representatives from each partner were present on all aspects of the project, and there were no instances where say, a particular company was asked to deal exclusively with the electrical works or the work in a certain geographical area etc. The relationships between partners in a JV can influence their responsibilities and accountability, which in turn can have an effect on project safety. For instance, if one partner alone were put in charge of the site and labor management, and if this partner was the local partner within the JV, then the safety dynamics would be totally different than if the partner in charge of the site were a foreign partner. In the former case the site managers might relate more to the safety levels of the workers and not raise as many issues as in the latter case. Also, if another partner to a JV was solely in charge of the project management of the entire site, there could be scope for infighting between JV team members on what constituted an acceptable level of safety. In our cases however, the JV partners were fully integrated and functioned in a cohesive manner while determining acceptable safety standards. In addition, safety managers who were hired were all freelancers who were not permanent employees of any of the companies. As a result, we did not observe the above dynamics on the projects that we studied.

These commonalities between projects allowed us to control for variables such as project scope, contract type, and technology used and therefore focus more on the variations in cultural norms and values. Using this design we evaluated the safety issues that arose due to the presence of different national groups on these projects.

Research Methodology

We adopted a qualitative research approach. Scholars have noted that such a method is particularly apt for exploratory research in areas were much prior research has not been done and where the objective is to gain familiarity with a problem or to generate new insights for future research (Scott 1965; Eisenhardt 1989). We spent a total of four months physically on the four project sites that we had selected for our research. We were able to conduct an ethnographic study, and simultaneously collected retrospective data. We sat in as a "fly on the wall" in several site review meetings. We accompanied teams on site for safety inspections. However our major source of data was through conducting several unstructured or "ethnographic" interviews (Spradley 1979). Such

Table 1. National Background of Our Informants

National background of informants	Number of interviews in India	Number of interviews in Taiwan	Total
Indian	15	—	**15**
Taiwanese	—	5	**5**
British	11	2	**13**
Korean	2	12	**14**
Japanese	2	9	**11**
Swedish	1	—	**1**
German	4	1	**5**
Australian	—	2	**2**
South African	1	1	**2**
Malaysian	—	6	**6**
Austrian	1	—	**1**
USA	—	2	**2**
Total	**37**	**40**	**77**

open-ended interviews are considered appropriate for conducting exploratory research, wherein researchers do not possess enough data to generate a priori hypotheses (Barley 1990; Eisenhardt 1989; Spradley 1979). Using this technique, researchers can obtain a wide variety of information from their informants to understand better the nuances of the social setting that they wish to study. Following this, researchers can then develop their own theories on the phenomenon that they have observed. By not conducting interviews with structured, pointed or leading questions, researchers open the door to variables and relationships that they might not have anticipated before, given their limited understanding of the situation. In addition, this technique avoids biasing the informants' response by asking pointed or leading questions.

We often followed up our unstructured interviews with more semistructured interviews. The primary purpose of these interviews was to clarify or probe deeper into phenomenon that the ethnographic interviews had unearthed. This process is described in greater detail below. Our main role as interviewers was to direct the conversations toward themes that were of interest to our research objectives. Typically, we asked the informants to talk about safety issues on the project. We interviewed a total of 77 participants from 12 different nationalities. Table 1 summarizes a list of our interviews. Each interview ranged from a minimum of forty minutes to a maximum of three hours with certain participants. We interviewed client representatives, expatriate and local consultants, international contractors and designers, and local subcontractors on each of the projects that we visited. In several cases, we conducted multiple interviews with several of our informants and compared comments made by various people on a given issue, to increase the internal consistency and validity of our data (Yin 1984).

We transcribed our interviews and then "coded" these interviews (Strauss and Corbin 1998; Glaser and Strauss 1999). During the process of coding, we went through each of the interview transcripts and separated every reported incident or comment that was related to project safety. Each of these incidents was assigned to a category. We did not use predetermined codes to code our data. Rather, the categories or codes emerged from our data. The process of generating codes was iterative. We initially started out with broad categories. As more incidents were coded, we were able to classify incidents into subcategories within the main category. For instance, a British expatriate's opinion on the poor safety standards in India was first classified under the main

"code" "participants attitudes and views on safety." Subsequently, this comment was classified under the subcode "expatriate attitudes and views on project safety" within this main code. As we transcribed and classified comments and anecdotes, we further categorized the expatriate's comments into the subcode "expatriate views on the inadequacy of safety standards" under the subcode expatriate attitudes and views on project safety.

We then identified those subcategories that were populated by recurring incidents or comments. These densely populated subcategories indicated the different types of safety issues that were likely to occur on global projects. As each of these subcategories featured multiple incidents from different projects, they represented general types of cross-national safety issues with the potential to arise on other global projects and were not specific to any single project that we studied.

Simultaneously, we also eliminated those subcategories that were populated by very few comments or incidents. For instance, we coded the different strategies used to improve safety performance. One of our coded strategies was "improving safety through engineering," wherein participants changed the technology used or the site layout to help reduce the possibility of accidents. However, only 2 of our 77 informants spoke about such incidents. As a result, we eliminated this code as it did not seem to be generally applicable to global projects.

Through the previous processes, we arrived at a set of codes that described the salient safety related issues on the global projects that we studied. Our next step was to analyze each code in detail and to determine the relationships between the codes in order to obtain a better understanding of the safety dynamics on global projects. For instance, we found relationships between the subcode expatriate views on the inadequacy of safety standards and the subcode "local attitudes toward safety." The expatriate's views in this case confirmed and provided explanations for the attitude of the local participants. Similarly, we were able to construct relationships between the differences in safety attitudes between the local Indians and Taiwanese versus the expatriate participants, and safety-related altercations that occurred on the projects. We were able to investigate the relationship between the various "strategies used to improve safety," and "outcomes of safety interventions."

While conducting interviews, we also followed a technique of "theoretical sampling" (Strauss and Corbin 1998). If we identified a set of parameters that led to a certain outcome, we then directed our enquiries to determine the change in the outcome, given a change in the set of parameters. This enabled us to obtain a better understanding of the causes and drivers behind the incidents on these projects. As an example, we first encountered several safety related comments and incidents where foreign participants were present. We then attempted to determine the opinions and dynamics when only local participants were present. We also investigated the type of outcomes that were associated with a particular safety improvement strategy, say a strategy of enforcement. We then investigated whether these outcomes varied, given a different safety improvement strategy. This technique also helped us determine the relationships between our codes.

Hence, through the systematic process of asking open-ended questions, coding across informants at various levels and from various nationalities, and by comparing their anecdotes and generated codes, we were able to arrive at a model of the safety issues on global projects. Further, these issues are general to the extent that they have been observed to occur on multiple projects within our small sample.

Findings

Through the process of coding identified above, we identified the following four main categories:
1. Participants attitudes and views on safety;
2. Safety related incidents;
3. Strategies used to improve safety; and
4. Outcomes of safety interventions.

In addition, we identified the following nine subcategories that pertained to cross-national challenges on global projects.
1. Expatriate attitudes and views on project safety:
   - Expatriate views on the inadequacy of local safety standards;
   - Expatriate attitudes towards safety; and
   - Reasons for the expatriates views and attitudes;
2. Local (Indian/Taiwanese) attitudes and views on project safety:
   - Local views on the inadequacy of local safety standards;
   - Local attitudes toward safety; and
   - Reasons for the locals views and attitudes;
3. Incidents relating to injuries and fatalities;
4. Minor safety violations;
5. Strategy of education;
6. Strategy of enforcements;
7. Successful safety interventions;
8. Unsuccessful safety interventions; and
9. Improvements in site safety.

Fig. 2 depicts the codes that we generated.

We now discuss each of these codes and their interrelationships in detail.

Safety-Related Conflicts on Global Projects

Attitudes of Local Indian and Taiwanese Contractors and Laborers toward Safety

The local Indian and Taiwanese laborers did not have a high level of safety consciousness on the construction site. A British freelance expatriate who had been hired as a safety manager on behalf of the Indian clients and who had almost 20 years of experience as a safety manager on global projects, described the condition of the project thus:

> When I arrived, they'd (the local subcontractors) already started work. I had gone on site, and it was terrible! Nobody was wearing helmets, no one was wearing safety shoes, cranes were being used that were bad, welding sets were used that were leaking—a traditional Indian constructor site. Safety nowhere.

The situation in Taiwan was almost identical. A Korean construction manager working in Taiwan bemoaned the lack of local safety consciousness:

> Their safety. They don't care (about) the safety. (They) don't wear the helmet, don't put on the shoes.

In the eyes of the laborers both in India and Taiwan, safety measures needed to be taken only in extreme or dangerous situations. On the other hand, the international contractors considered it wise to wear safety equipment at all times, since there were many dangers on the construction site apart from heavy machinery such as reinforcing bars that stuck out, tools that lay around, etc.
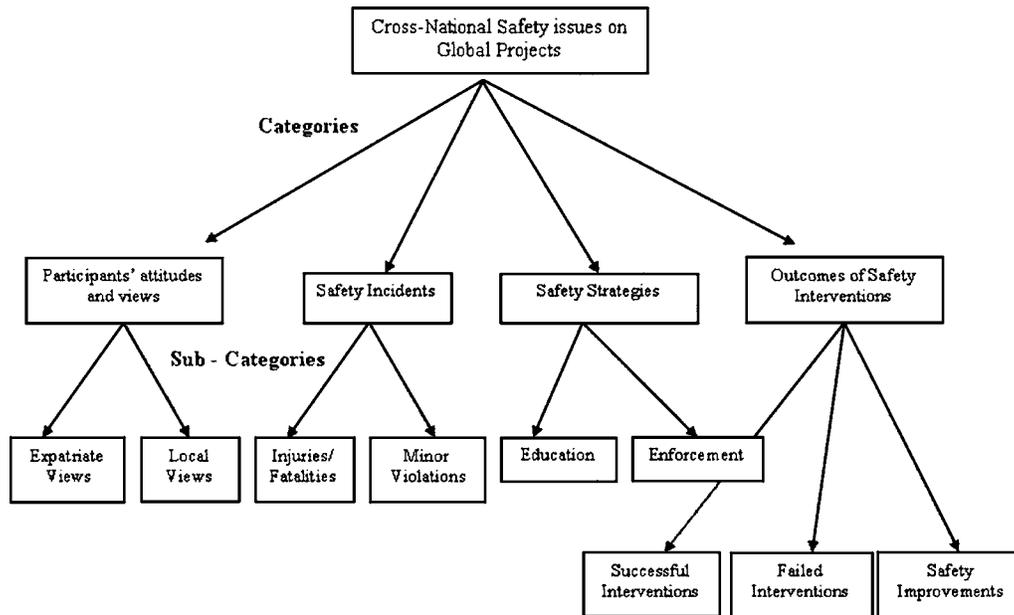
Fig. 2. Generated codes

It was not only the laborers who exhibited poor safety practices. The local contractors, who worked on subcontracts on this project, were also not very safety conscious. They frequently paid "lip service" to any safety regulations that they were asked to obey and were not very serious about following safe practices, as they were keener on advancing the work quickly. A British expatriate working in India, gave an example:

(Local Indian) contractor C never had to produce a site safety plan before, so they got a consultant to write it for them. The consultant got the project safety manual and basically turned it into their site safety plan. So everything that we said they should do, C in their safety manual said, "this is how we're going to do it." Excellent! You think! What happened then was that we started to audit against the safety plan. I went in to see their project manager and started asking questions about their safety plan—and he had not read it—it was just a document sent to him by head office.

This was not an isolated incident. As the project wore on, some of the other local Indian contractors had confessions to make on their commitment toward safety and professed to not having read the project safety plans. They did not care to ensure that workers wore appropriate safety gear site and that the construction site was accident-free. They never put their laborers under pressure to adhere to safety rules.

In their paper on construction safety in developing countries, Koehn et al. (1995) describe the safety situation in India and concur with our observation. They claim that Indian contractors often have a safety policy on paper but that most employees are not aware of its existence. They list a host of safety problems prevalent in most construction sites in India such as injuries due to the lack of personal protection equipment (PPE), improper housekeeping and so on. They also describe the lack of safety consciousness among the laborers and the workers (Koehn et al. 1995).

The local contractors in Taiwan also exhibited a poor attitude toward construction safety. A Taiwanese engineer working in a Japanese–Taiwanese joint venture pointed out:

Basically the Japanese enterprise management style is they always think safety first and then quality. But among the Taiwanese company, they don't have such a high safety awareness. So the safety will not be their top priority.

As these views indicate, the Indian and Taiwanese contractors expressed a lack of interest in safety issues, whereas the local workers did not realize the importance of safety.

Reasons for the Attitude of the Local Contractors and Laborers toward Safety

There were several reasons why the Indian and Taiwanese contractors were not interested in safe work practices. First, the cost of manual labor was very cheap, and the amount of money paid as compensation to an injured worker was quite small. Further, there was no shortage of laborers who were willing to work on these sites. As a result, when an accident or a fatality occurred, the contractors easily recruited a new worker in place of the injured worker. The cost of purchasing safety equipment for all the laborers was much higher compared to the small amount of compensation money that they paid to the injured victims. The financial equation in terms of low labor and compensation costs therefore discouraged the local contractors from investing in safety equipment and following safety procedures. An expatriate safety manager on the Indian project who had several years of experience working in several countries described the situation in India:

You see where a lot of local contractors come from. "If (a worker) chops his toes off, we'll pay him a few hundred rupees and he's set and we'll get someone else" (is the contractor's mentality). In the U.K. or the U.S., workers have a big compensation plan. The Indian contractors pay

out peanuts. Workers compensation is less than a lakh (a hundred thousand rupees)–maybe a lakh for someone who is killed. That cost benefit does not yet exist in India, because if you kill a worker, it's a lakh. That's nothing. On a project that's worth 62 crore (620 million Rupees) that's nothing! Until that changes, until compensation becomes more expensive, the cost benefit analysis (will discourage contractors from caring for worker safety).

A seriously injured worker in India was paid Rs. 500 (US \$11) and released from service. Even if a worker were killed in India, the workers' family was only paid around \$2,500, and a new worker was promptly hired! This economic equation was identical in Taiwan.

In addition, a laborer's life was not valued very highly in India and Taiwan. As a result, the contractors did not feel guilty or morally hurt if a laborer had an accident on their construction site. An Indian engineer noted,

In Indian society you know, very bluntly, life is not valued here that much. Safety comes when you are talking about lives and the local contractors don't feel "oh! This worker is injured." (Instead) he just pays him some money and he (the worker) goes (back) to the village. So the concept is not there for human value.

This lack of compassion for the well being of the workers further discouraged local contractors from taking precautions regarding site safety.

To compound this predicament, India in particular had no official safety legislation that levied norms and standards on construction firms to coerce them to improve worker safety. Over several years, this led the local contractors to develop a mindset of not being concerned about safety. Also, clients rarely enforced safety specifications present in the contract. Contractors had thus become used to ignoring safety specifications and brought this attitude to the global projects that we investigated.

It was not only the contractors who were to blame. The laborers themselves discarded PPEs even if they were given them. They did not seem to realize that there was a danger of their getting injured, and that an injury affected the amount of money they earned as well as their livelihoods. The laborers had become accustomed to working without wearing safety gear and they considered it to be a hindrance that they now had to get used to. They thus resisted attempts at having higher safety standards imposed on the work site. One of the Indian construction managers who worked for the clients and who had worked on construction projects in India for over ten years remarked:

Still there is not enough safety consciousness (on the part of the laborers). Laborer feels that he will be considered a better guy if he achieves more productivity. If he is given a harness at a height, that impedes his movement. So he will not hang it. So that has not yet sunk into their mind.

The cheap cost of compensating an injured laborer in both India and Taiwan coupled with the lack of regulations or enforcement mechanisms to ensure safe work practices in India, as well as a lack of concern for personal safety on the part of the laborers themselves were the reasons behind the lack of attention to safety in India and Taiwan.

Attitude of the International Contractors and Consultants toward Safety

In contrast, the international contractors and consultants from Japan, Germany, Sweden, the United Kingdom, and Korea were very concerned about safety on the project. The international contractors were contractually required to have a person on their team in charge of safety. Instead of making this a "token" position with no real responsibilities attached merely in order to abide by the contractual regulations, the international contractors took this position very seriously. Their safety managers were tasked with ensuring that there were no accidents or fatalities on site, and were given the backing and the authority to do so. They received the full support of the contractors' management team to effectively perform their duties and to ensure that there were no accidents on site. The contractors placed a lot of emphasis on good safety practices on site, even if it interfered with the progress of the works. Both in India and Taiwan, the international contractors and consultants attempted to ensure that all workers wore PPE, that proper housekeeping was done on the site (i.e. ensured that sharp and dangerous objects that might be safety hazards were promptly cleared away) and so on.

Reasons for the Attitude of the International Contractors toward Safety

In industrialized countries, safety is often considered by management as a priority item in discussion (Koehn et al. 1995). Most of the international contractors came from countries and construction systems where site safety was considered very important. The presence of official safety legislation, enforcement mechanisms and a concern for the well being of their workers ensured that the international contractors were trained to implement safety procedures on their projects. The Indian clients' expatriate safety manager observed:

You have the two international JV's (joint ventures). They read the contract and for a lot of them—Germans and Swedes etc., this was nothing new to them. In fact, it was probably slightly lower standards than they were expecting or used to. That's the case when your safety legislation is quite high. So they looked at it and said "Well ok, fine," and they priced safety into the project.

The international contractors were used to following safe procedures on their projects and exhibited a very high level of safety consciousness on the projects.

Consequences of Differing Perceptions of Site Safety

The international contractors and the local contractors had very different mindsets when it came to dealing with safety on these projects. The local groups did not pay much attention to safety while the international actors felt that safety was a very important consideration on such projects. This frequently led to heated altercations. The low safety consciousness on the part of the local Indian and Taiwanese workers led to numerous accidents and fatalities. For instance, the local contractors often times did not inspect the cranes to make sure that they were safe to lift heavy loads. In one case in India, a local team attempted to lift a large beam. However, the crane's rope that held the load was frayed. Further, the lifting technique was unsafe as the contractors attached the rope to the bottom of the load and not to the top, and thus increased the chances that the beam would "somersault" as it

was lifted. As they attempted to lift the load, the beam toppled over and killed a worker on site. A British site engineer described this incident:

> They (local Indian Contractor C) had cranes with twisted jibs! Slings that were falling apart! December last year, they killed a man in a fatal accident. It was a mixture of lifting and stupidity. They had a steel lateral beam that weighed eight tons, made up of steel braces. They were trying to lift it, and they had only got two lifting devices and they were trying to lift it off two points. They tried to lift it off the two bottom members! Anyway, it fell over and killed a man. How he didn't kill half a dozen others, I have no idea! They were a nightmare! An absolute nightmare!

Such incidents that could easily have been avoided left the international contractors and consultants feeling extremely frustrated. Apart from the larger accidents, the international contractors were also irritated by normal day-to-day safety violations such as the failure to wear safety gear or the absence of safety harnesses. They therefore lodged frequent complaints to the local subcontractors and fought with the crews on site.

In several cases, the altercations on site were quite direct and the international contractors or the consultants stopped the work that was being performed until the safety violation was rectified. Such stoppages delayed the subcontractors' progress and made them susceptible to penalties due to delayed completion of the work. The international contractors hoped that this would offer incentives to the local contractors to avoid safety violations. In Taiwan, for instance, a South African quality control specialist who worked for the Korean–Taiwanese joint venture described an incident where he had stopped a part of the project because the foreman had not worn a safety helmet. The crew had to wait until the foreman went to his trailer and returned with his helmet.

The local contractors felt that such stoppages were unfair to them and rarely accepted such productivity losses without protest. They frequently argued with the international contractors, and in some instances turned physical! As we were conducting an interview with a German engineer in Taiwan, he received a phone call that informed him that one of his construction managers had been hit by a piece of reinforcing steel for attempting to stop the project! Differing perceptions of project safety thus led to misunderstandings, constant conflicts and inefficiencies such as delays on these projects.

Strategies Employed to Improve Safety Standards

The international contractors devised two broad strategies to improve safety standards—a strategy of convincing and educating the local workers (an education strategy) and a strategy of forcing them into compliance (an enforcement strategy). An experienced Singaporean safety manager who was born and raised in India and now worked for one of the international joint ventures in India, remarked:

> Education is important. I will first explain why (a certain safety procedure has to be adopted). Then if this fails, you start enforcement. Penalties, fines, and so on. So this is how I get the job done.

Educating the Local Workforce

Contractors on all four projects employed numerous methods to convince and educate the subcontractors and laborers to work

safely. They held daily "tool box talks" and lectured workers on safety issues relevant to the tasks that they were going to perform on that particular day. They organized periodic construction meetings to talk about safety. Workers were shown drawings and pictures of what to do and what not to do and in many cases performed trials or "mock-ups" that were used to point out safety flaws so that they could employ corrective measures when they performed the actual work. A Korean engineer in Taiwan described some of the educational techniques used on his project:

> We have organized weekly construction meetings. Then we will check how you built the first pier. Then we see if something is wrong. Then we can go through a discussion to establish the standards to be followed. So based on that kind of system, we can avoid repeating the same mistake. We don't want to repeat our (mistake) again and again.

The international contractors' intent was that by constantly educating the workers, by training them through mock trials and by providing them with feedback, the workers would learn from their mistakes and their safety consciousness would improve.

Apart from merely telling the workers "what" to do, the international contractors and consultants also attempted to explain "why" safety was important and tried to get the workers to take pride in their work. The international participants spoke about issues such as the loss of life involved, the time lost on a project due to safety accidents and so on. They tried to educate the local workers on the consequences to their livelihoods if they did not work safely.

The international contractors and consultants were quite experienced and understood the need to tailor their arguments to the local environments. As opposed to making a prepackaged presentation on safety practices in industrialized countries, they made presentations that were relevant to the people on the project. The British expatriate safety manager in India described his method of providing educational training:

> A lot of this is done by training. I do a lot of courses. I spent the first few weeks just going around and taking a lot of photographs. The Project Director said to me, "Haven't you got any safety videos?" Now I have a good stock of safety videos—a couple of them are just U.K. ones and a couple are Chinese—but there's no point in showing any of those videos to people here. You see they use steel scaffolding and they use a lot of mechanical equipment (in the U.K.), (while) here they do a lot by hand. I can remember 30 years ago looking at American videos and yawning—"well that's in America. It's not the way it's being done here." So showing a U.K. scaffolding video, everything is completely different. People would just switch off. So I had to amass a series of photos here. Some of them would actually recognize where the photos were taken—it's meaningful.

Thus, the international participants felt that they would be able to improve project safety through the use of various methods of educating the workers.

Success of the Strategy of Education

Much to the disappointment of the international contractors however, their attempts to educate the local workforce did not yield the desired results as the local workers seldom changed their safety practices. A German project manager in Taiwan who was

part of the Japanese–Taiwanese JV could not understand why the workers had difficulties following relatively simple safety guidelines. He said:

> When I got an introduction here on the safety things, I was thinking, "'It might be very easy to follow all these rules,'" but daily our safety inspectors are reporting from site and saying, "'They are not following our regulations.'" So it happened already that we stopped the production on site.

Several other international employees on the projects in India and Taiwan also felt that educating the workers did not lead to a discernible improvement in safety. This finding is consistent with the findings of Wilson and Koehn (2000) from a study of several construction projects in the United States, that tool-box talks and other educational sessions were very inadequate in improving safety levels on these projects. Although the projects in the research study of Wilson and Koehn (2000) were not global in nature, they also involved interactions between safety conscious contractors and workers who did not pay much attention to project safety. Their findings are therefore relevant to the problem that we uncovered in our field observations.

As a result, the international participants on all four projects resorted to another strategy—that of coercing the local subcontractors and laborers to employ safe work practices.

Strategy of Coercive Enforcement

One of the primary methods of coercion that the international contractors and consultants used was to impose a monetary penalty for unsafe work. The Singaporean safety manager of Indian origin who worked for the contractors described an incident:

> Take the example of the bottles. So we started saying "these bottles need to go back in their canisters." So initially we used to catch one bottle and put it back. First of all I made a guideline—blah blah, all this should happen. This was education and I started giving pamphlets to all. So then we would go on and site, and if we found something and it wasn't hazardous, we would say, "by tomorrow you change it." They still don't do it when I go tomorrow, then I say Rs 500 fine and we will kick them out. When money comes into the picture you know, then everyone starts to (comply).

The safety manager had unsuccessfully tried to educate workers to put the bottles back in and so he imposed a fine on the workers for every bottle that was found outside a canister. Once the workers found that they were going to lose money by following an unsafe practice, they started to comply with the manager's wishes. Safety standards improved.

The same strategy was adopted by several other contractors' representatives in India as well as in Taiwan. A Korean Project Manager on one of the projects in Taiwan spoke about how his organization tried to bring about improved safety standards on their project:

> Every morning (we have) the meeting with the Taiwanese workers and continuously persuade them. If (you) do not follow this safety rule (then) there is a big penalty. So we control the money. We are the dam to the money. If you don't follow the safety rule, then you are issued the pen-

alty and we deduct the money from your salary. Yes, so it takes about 3 or 4 months but (then) they follow our instructions.

The fact that laborers were paid very little also implied that they were highly averse to losing their income through fines and as a result quickly learnt to adopt the safe work practices espoused by the international contractors.

A related approach that the international contractors used was to stop the work if appropriate safety measures were not followed. This was an indirect form of imposing monetary penalties as work stoppages resulted in delays that often forced the subcontractors to pay liquidated damages. In certain cases, delays also meant that assets such as construction equipment sat around unused for long periods of time and incurred higher rental costs. A work stoppage notice therefore galvanized the local workers to change their approach to safety. The British safety manager who worked as a consultant to the Indian clients observed:

> So at various stages we stopped the work! "This is not acceptable—so stop. You'll go no further until you put this right" (we said). And they received a written stop work notice. That had an effect. We don't like stopping the work, but the risk there was phenomenal!

Although stopping the work had an adverse effect on the timely completion of the project, the international participants placed high importance on project safety, and thus felt justified in stopping the work occasionally if it led to safety improvements.

Success of the Strategy of Enforcement

In contrast to the strategy of education, the strategy of coercive enforcement was quite successful in bringing about a change in safety practices in India and Taiwan. After having failed in their attempt to educate workers on safety issues the international contractors concluded that the use of force (in the form of fines, etc.) was the only way to improve site safety. As the above incidents have indicated, enforcement of monetary penalties often coerced the local workers into adopting safe work practices such as wearing PPE, etc. Even though there was no guarantee that they would not revert back to their old unsafe practices on another local project, there was an overall marked increase in safety standards on these current projects.

Some empirical information backs up our anecdotal data in this regard. A presentation on safety at the Construction Institute in 2004 (http://construction-institute.org/scriptcontent/ac2004slides/will.ppt) indicated that in India, 1 in every 2,000 construction workers (or 0.05% of workers) suffered an injury or were involved in a safety accident *every day* (This is an aggregate value that includes all types of injuries—minor as well as major. Fatalities were excluded from this value). An internal study conducted by the Indian clients on the projects we studied after coercive enforcement strategies were adopted, indicated that the daily safety incident rate was 0.0006% per worker. The Indian projects we studied were thus almost 85 times safer than normal construction projects in India. Safety was also an agenda item on weekly internal clients' meetings in India. An analysis of the meeting minutes in India indicated that 18 months prior to our arrival on the projects in India, when the strategy of coercive enforcement was first being enacted, five safety incidents were discussed on average in internal weekly clients' meetings. Toward the end of our tenure on the site, the average number of safety

issues discussed per week at the weekly meetings was close to 1. These data by no means provide conclusive quantitative evidence that the strategy of enforcement served to improve safety performance. However, they do provide some nonanecdotal evidence that supports our conclusions and indicates a decreasing trend in the number of safety incidents on the Indian projects, after the advent of the strategy of coercive enforcement.

Improvements in Site Safety

Although the local contractors and workers were successfully coerced into adopting safer work practices, the magnitude of improvement was not quite as much as the international contractors had wished for. The international contractors understood that it was difficult for the local workers to completely change their practices overnight and were prepared to accept less than perfect work, as long as there was a marked improvement in safety standards.

Some managers took a practical approach toward safety and categorized issues as being serious or non-serious. They used force to ensure that the serious issues were addressed, while nonserious issues were dealt with less harshly. They did not strive to completely eliminate safety violations.

In the final analysis, the international contractors and the local workers reached a compromise as to an acceptable level of safety on these projects that was in between each party's preferred level.

Discussion

Scholars have recommended an enfolding of concepts or theories that emerge from qualitative studies with the extant literature in order to make a meaningful contribution to knowledge (Stablein 1996; Eisenhardt 1989). Institutional theory, a branch of organizational theory helps explain in large part, the phenomena that we observed. Institutions are a set of taken-for-granted rules, norms and values that the environment imposes on a set of actors and organizations, that in turn constrain, enable and influence these actors to generate a regularity of behavior among them (Greif 2005; Scott 2001). This regularity of behavior may not necessarily be completely rational or consistent. Thus, for instance, a set of legal rules, work practice norms, and cultural values might influence a certain group of actors (construction industry workers in a certain country) to regard site safety in a certain way. All actors within this group would have relatively homogeneous conceptions that generate a regularity of behavior. This behavior might be different than that exhibited by another group (construction workers in another country). Several studies have shown that institutions persist and are very difficult to change (e.g., Zucker 1977; Van de Ven and Garud 1994). Many comparative studies indicate that it is advantageous to embed one's organization within one's familiar institutional environment and resist change (e.g., Hall and Soskice 2001; Singh et al. 1986). Thus, when multiple competing institutional views are present, reconciling these differences and/or determining how to act in the face of unfamiliar, "foreign" institutions is likely to be difficult and can often lead to misunderstandings and conflicts.

These insights help explain the behaviors that we observed. Based on their backgrounds, the international contractors in our case studies had highly institutionalized views about the work practices on a job site. They were committed to observing high standards of safety. On the other hand, the local subcontractors

and workers had been influenced by a different set of forces over the course of their careers and were in the habit of paying lesser attention to project safety. These two differing viewpoints collided on the projects. As institutional theory predicts, neither national group was willing to give up their institutionalized ideas, and a series of impasses resulted. These, in turn, led to poor performance on the projects.

The international contractors attempted to change the mindsets of the local workers. However, as many scholars in the field of institutional theory have observed and as our data indicate, the process of institutional change is not an instantaneous one. Changing the "mindset" or bringing about institutional change is often a contentious process that takes place over a long time span—typically over decades (e.g., Townley 2002).

In her study of the introduction of American work practices into Europe after World War II, Djelic (1998) deals with a somewhat related situation. Based on the work of Powell and DiMaggio (1983), Djelic describes three strategies—coercive, normative and mimetic—that American sponsors and local champions undertook to bring about a change in the mindsets of the European workers and the institutions underlying commerce and production in Europe. The American sponsors in this case understood that even though coercive strategies led to the adoption of American practices in the short term, this shift was likely to only be temporary. In the long term, they felt that if the local workers did not fully embrace the new sets of rules, norms and values, the American model would not be adopted. They therefore used more time intensive normative and mimetic strategies and tried to inculcate American practices into the education system, attempted to persuade and convince political leaders and so on. Over a period of decades, they succeeded in using these tactics to bring about a change in the European mindset.

By contrast, the projects that we studied lasted for only three to five years, and the need for change was more short term. As the international employees were not assured of working in India or Taiwan in the future, they wanted to spend as little effort as possible and only ensure that the current global projects progressed safely. They gladly accepted temporary compliance toward safety objectives on these particular projects, even if this did not translate into any improvements in the safety standards of the Indian construction industry as a whole. Therefore, the very strategy that the Americans had chosen *not to* pursue in Djelic's work (use of coercion) was the strategy that best fit these global projects. When the international contractors realized that a normative approach involving education did not lead to quick results, they abandoned it in favor of the enforcement approach of imposing fines and stopping work that successfully yielded short-lasting results that enabled the project to advance. In contrast to the more normative strategies adopted in a "nation building" environment, coercive means were used to resolve institutional conflicts regarding safety levels on short-term global projects.

Several scholars on construction safety have pointed to education as a key strategy in promoting site safety (e.g., Laukkanen 1999; Jaselskis et al. 1996; Hinze and Harrison 1981). Wilson (1989) strongly emphasizes education as the most powerful strategy to improve construction safety. Yet, counter to these suggestions, we observed that the international contractors in our study regarded enforcement as the preferred method of improving site safety, due to the one-time nature of these projects and the time involved in educating to change safety practices. Although the fact that all safety problems were not resolved and the likelihood that behavioral changes that occurred on these projects were unlikely to be automatically emulated on other projects implies that

the enforcement strategy was not completely successful and that a strategy of education might have yielded better long term results, this study indicates the constraints present while applying a strategy of education to improve site safety on global projects.

The above discussions indicate that our findings contradict and complement the existing literature on safety and institutional conflicts, by introducing the nuances on global projects. While both sets of literature suggest that education and similar normative tactics are more likely to lead to improved safety over the long run, our research indicates that on short-term, one-time global projects, enforcement and not education is the widely adopted and more effective strategy to improve site safety. We next discuss the implications of this finding to practitioners.

Implications to Practice

The key finding and implication from this study is that educating workers in developing countries to follow safe work practices is very difficult to achieve on global projects, since changing safety behavior is a slow process. International contractors who may not have long-term plans of working in a particular country do not have incentives to invest significant amounts of time on safety education, as their projects in developing countries are short, one-time occurrences, and these contractors may not necessarily conduct future work in these locations. They may therefore not be able to reap the future benefits of their efforts. As a result, in regions where safety infrastructure is quite poor, enforcement is the most likely safety enforcement strategy to succeed. In fact, international construction firms entering such environments on one-off projects might be advised to directly enforce coercive measures to improve safety and not to expend resources on the more difficult task of education.

Although these arguments hold when looking only at a single project, we do not imply that safety education as a strategy must be eschewed in all cases. In particular, Levitt and Samelson (1993) report that even small amounts of time (less than one hour) spent on safety orientation for new workers before they begin working can significantly reduce injuries to new workers. Longer term, bringing about "cultural change" and thereby developing good relationships with local subcontractors and workers is certainly advantageous to international firms that have longer-term plans in a given country and are interested in improving the local construction environment. In such cases, firms can benefit by looking beyond a single project and expending effort in transferring safety best-practices to local workers. A dual approach of coercion along with safety orientation and training can enhance immediate as well as long-term safety performance.

As a corollary, this research also implies that it is up to local regulators and contractors who are likely to work on a recurring basis with local subcontractors and laborers to encourage a safer working environment by introducing and enforcing regulations and educating and training the workforce. Our evidence shows that it is less realistic to expect international firms to easily transfer their best practices to thereby improve site safety. Proactive action by local contractors and regulators in improving safety might also serve as a competitive advantage in attracting infrastructure investment into developing regions.

Conclusion

The objective of this paper was to provide a rich description of the processes and motivations regarding safety issues on cross-national projects, and to shed some light on these unexplored areas. Our study shows that for the four projects involving workers and firms from developed and developing countries, conflicts did occur due to differing cultural perceptions of safety, and that coercive enforcement mechanisms such as fines were the most successful of the strategies used on these projects to improve safety performance, contrary to extant theories on monocultural projects.

Our study has several limitations that constrain the generality of these results. First, although we performed detailed studies, our sample consists of only four projects. Future researchers can validate and extend our observations by conducting studies on additional global projects in other areas of the world. Research on safety issues on global projects is still in its early stages, so we first need to obtain a comprehensive understanding of the relevant phenomena in question. Data collection, coding and analysis of safety issues on other global projects can help us understand the nuances and variations in safety issues given a different set of cultural and project parameters. By pursuing this agenda in future work, researchers can uncover other types of safety improvement strategies that are used; analyze the effect of different contractual arrangements between the contractors on project safety, etc. These findings can, in turn, lead to the development of a more nuanced model of safety on global projects, and to the development of more detailed hypotheses that can be tested.

Second, although qualitative analysis offers a "thick description" (Geertz 1973) of social phenomena, researchers can construct hypotheses once sufficient observations have been conducted. Quantitative data can then be collected through the use of surveys on a large number of projects to test and refine our assumptions about safety rigorously. Potential hypothesis that arise from our research and which can be validated on a larger set of global projects and over a larger time frame are:

- H1: International firms with a project-specific focus will tend to use and be more successful in using coercive strategies for safety improvement on global projects in developing countries; and
- H2: In countries where safety performance is poor, coercive strategies will only lead to temporary improvement that will rarely meet desired safety standards. Over a longer period, a strategy of safety education might yield better results compared to enforcement strategies.

Validated hypotheses that describe behavior on global projects can then be used to develop handbooks, diagnostic "expert systems" and similar predictive tools to aid practitioners in the field.

In our study, we also categorized players into those that came from "high safety" or developed cultures and those that came from developing cultures. A finer-grained approach to studying how different project subgroups react to project safety can also be undertaken to add to our understanding of this area. Future research can also look at different noncoercive ways in which safety compliance can be increased over the long term on global projects. Applied experiments can be performed to determine how to penetrate cultural barriers in order to transfer safety principles from developed economies.

The goal of our research was to generate some initial insights on safety issues on global projects, through conducting a limited number of detailed studies. We hope researchers can use and build upon our insights to deepen understanding of these issues. Following a thorough understanding of the types of issues that occur and the strategies that are currently used, researchers can design interventions to improve safety performance on global projects.

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