

**Influence of National Culture on Construction Safety Climate in
Pakistan**

Author

Ali, Tauha Hussain

Published

2006

Thesis Type

Thesis (PhD Doctorate)

School

School of Engineering

DOI

[10.25904/1912/2162](https://doi.org/10.25904/1912/2162)

Downloaded from

<http://hdl.handle.net/10072/366047>

Griffith Research Online

<https://research-repository.griffith.edu.au>

Influence of National Culture
on
Construction Safety Climate in Pakistan

A thesis submitted in fulfilment of the requirements
for the award of the degree of

Doctor of Philosophy

By

Tauha Hussain Ali
B.E., PGD (Civil), MSc (Project Management)

From

School of Engineering
Faculty of Engineering and Information Technology

Griffith University
Gold Coast Campus

May 2006

Declaration

This work has not previously been submitted for a degree or diploma in any university. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made in the thesis itself.

A handwritten signature in black ink on a light blue background. The signature is stylized and appears to read 'Tauha Hussain Ali'.

Tauha Hussain Ali
May, 2006

Acknowledgements

Firstly, All the glory and my heartiest thanks goes to God Almighty for His provisions, mercy and help, without which this doctoral research would have been impossible to achieve.

I would like to wholeheartedly and with deepest gratitude thank my principal supervisor, Professor Sherif Mohamed, for his excellent guidance and continuous and relentless encouragement at every stage of the preparation and writing of this thesis. His patience, kindness and approachable manner was much appreciated. I consider it a privilege to have worked under the supervision of such a high calibre researcher. I truly believe that this thesis would not have been completed without his magnificent support. My deepest thank also to my associate supervisor, Dr. Rodney Stewart, for his encouragement, interest and support.

I spent thirty-nine months at Griffith University undertaking my PhD degree. This journey has been filled with many challenges and personal tests of will. Throughout this time I met many friends who helped me during difficult times and with whom I shared many happy moments.

Thanks are due to Professor Yew-Chaye Loo (Dean, Faculty of Engineering and IT) and Dr. Sam Fragomeni (Head, School of Engineering) for their moral and financial support.

I am grateful to Dr. Khalid Ahmed (Associate Professor, Bond University) and Rajaguru Gulasekaran (Assistant Professor, Bond University) for their valuable advice and assistance in statistics.

I am indeed thankful to Sandra Paine, Mary Ping, Carol Tseng, Heather Elliot and Lucy Dickson for providing their administrative support and assistance throughout my PhD research.

I would also like to acknowledge a very good friend of mine, Jae Ho Lee, for his active assistance and support in editing this PhD thesis.

I am indebted to my another friend Ali Sher Siddiqui for his continuous help, advice and facilitating contacts within the construction industry and for always keeping my morale high whenever I was down.

This thesis would not have been completed without the assistance of the following individuals who generously contributed valuable help in the data collection phase:

- Engr. Mohiuddin Siddiqui (Project Director Sachel Engineering Works)
- Mr. Saeed Awan (Director of Centre for the Improvement of Working Conditions & Environment (CIWC&E)).
- Engr. Irfan Jhatial
- Engr. Jaffer Makhdoom
- Engr. Shakeel Almani
- Engr. Asif Memon
- Engr. Jehangir Mangi
- Engr. Niaz Khuhawar

I also wish to thank Suzan Barrett of Griffith University Post-Graduate Association (GUPSA) for her help and assistance in statistics; Gold Coast Association of Post Graduates (GCAP) for awarding my conference grant and Carmel Wild for her professional editing of the thesis.

I would be failing in my duty if I did not thank all my RHD colleagues and the Academic Staff of the School of Engineering for their encouragement and moral support.

Last but by no means least, My heartiest words of gratitude and final acknowledgement is to my family members: *Father* (Ghulam Hussain); *Mother* (Afroze); *Wife* (Saima); *Son* (Hammas); *Brother* and his *Spouse* (Saad and Nusrat); and *Sister* and her *Spouse* (Saman and Shaukat). I thank you all from the bottom of

my heart for your un-matched love, patience, endless support (moral and financial) and constant prayers.

List of Publications

The following conference papers were produced to disseminate the concept and some results of the work undertaken by the author during the course of this PhD research study.

- Mohamed, S. and Ali, T. (2005). “Safety Behaviour in the Construction Industry in Pakistan”. *Proceedings of the 4th Triennial International Conference, “Rethinking and Revitalizing Construction Safety, Health, Environment and Quality”*, 17-20 May, Port Elizabeth, South Africa, pp.64-75.
- Ali, T. and Mohamed, S. (2005) “Predicting Safe Work Behaviour: The Case of Pakistan”. *Proceedings of the 3rd International Conference on Construction in the 21st Century (CITC-III) “Advancing Engineering, Management and Technology”*, 15-17, September, Athens, Greece, pp.247-254.
- Ali, T. and Mohamed, S. (2005) “Empirical Investigation of Managers Preferences for Construction Safety Practices in Pakistan”. *Proceedings of the 1st International Conference on Construction Engineering and Management (ICCEM)*, 16-19 October, Seoul, Korea, pp.486-490

Abstract

Safety in the construction industry has always been a major issue. Wherever reliable records are available, construction is found to be one of the most dangerous on safety and health criteria, particularly in developing countries. Though much improvement in construction safety has been achieved, the industry still continues to lag behind most other industries with regard to safety. In developing countries, safety rules usually do not exist; if any exist, the regulatory authority is usually very weak in implementing such rules effectively. Further, work hazards at the construction workplace are either not perceived at all, or perceived to be less dangerous than what they actually are.

The safety climate of any organisation consists of employees' attitudes towards, and perceptions of, health and safety behaviour. Construction workers' attitudes towards safety are influenced by their perceptions of risk, management, safety rules and procedures. Although research into safety climate has continued for more than two decades, there is still no universally accepted theory of safety climate. Nevertheless, positive correlation exists between workers' safe behaviour and safety climate in construction site environments.

Workers' attitudes and behaviours discernible in safety climate, could be regarded as the micro-elements of an organisation, which themselves are determined by macro-elements of safety management systems and practices. Thus, it could be argued that management safety systems and practices permeate down through the organisation to the workforce. Classic construction safety management functions (such as recruitment, training, supervision, etc.) are determined by different conceptions of the role and nature of management effectiveness. These conceptions are underpinned by related cultural values. Therefore, national culture can be a key characteristic that may manifest itself in varying approaches to the safe work behavior.

Pakistan is a developing country that is currently enjoying a relatively strong growth in construction activities. Unfortunately, Pakistan's construction industry suffers

from poor safety and health conditions. The framework of the existing occupational and health conditions is fragmented and inadequately enforced, making construction sites more hazardous. It may even be argued that relevant regulations are outdated and irrelevant in day-to-day construction operations.

This thesis is broadly concerned with national culture and its influence on safety climate in the construction industry in Pakistan. More specifically, it investigates the safety perceptions, attitudes, and behaviour of Pakistani construction workers and management safety practices. It presents the empirical results of a number of questionnaire surveys administered in Pakistan targeting construction workers, and managers with safety management responsibilities. Based upon the survey analysis results, this study demonstrates that the majority of Pakistani construction workers have a good degree of risk awareness and self-rated competence, and a relatively high degree of safety awareness. Further it was found, empirically, that overall workers' intentional behaviour seems to be best explained by workers' attitudes towards their own and managements' safety responsibilities, as well as their perception of the risk they are generally exposed to in their workplace environment.

The study also showed that workers are more collective, feminist, believe in less power distance and opt for higher uncertainty avoidance in their attitudes. The analysis of the interrelationship between workers' behaviour and national culture revealed that the more workers working in a collective, feminist, and higher uncertainty avoidance environments, the more they are going to exhibit safer behaviour.

The management safety practices survey analysis showed that managers' safety management preferences are being influenced by their cultural trends. Their safety related decisions, whether being developed in head office or on site, are influenced by their high collectivistic, feministic, power distance and uncertainty avoidance attitude. This study thus establishes a statistically significant positive relationship between the factors of workers' perceptions, attitudes and safe work behaviour, and management practices.

Finally, this study gauges empirically the influence of cultural dimensions on workers' perceptions, attitudes, and safe work behaviour and managers' safety practices. The analysis showed that managers' operational practices on site have the most statistically significant relationship with workers' attitudes and perceptions. It was also found that the more collectivistic and higher uncertainty avoidance attitude of workers, the stronger their safety attitudes and perceptions will be.

Table of Contents

<i>Declaration</i>	i
<i>Acknowledgements</i>	ii
List of Publications	v
Abstract	vi
Table of Contents	ix
List of Figures	xii
List of Tables	xiii
Chapter 1	1
Introduction	1
1.1. The Construction Industry	1
1.2. Construction Industry in Developing Countries	3
1.3. Research Rationale	4
1.4. Research Objectives	6
1.5. Research Design	7
1.6. Thesis Structure	9
Chapter 2	12
Safety Climate	12
2.1. Safety Management in the Construction Industry	12
2.2. Safety Performance Management	14
2.3. Safety Climate	16
2.3.1. Role of safety perceptions and attitudes in safety climate	23
2.3.2. Safety Climate and Safe Behaviour	24
2.3.3. Attitude and Behaviour	25
2.3.4. Sub-Group Differences in Safety Climate	25
2.3.5. Measurement Method	26
2.3.6. Non-Uniformity in Safety Climate Factors	27
Chapter 3	29
National Culture	29
3.1. National Culture and Construction Issues	31
3.2. National Culture and Management	33
3.3. Dimensions of National Culture	34
Chapter 4	40
Pakistan	40
4.1. Overview	40
4.2. Pakistani Culture	43
4.3. Pakistani Construction Industry	47
4.4. Construction Safety Practices in Pakistan	50
Chapter 5	54
Research Methodology	54
5.1. Introduction	54
5.2. Methodology	54
5.2.1. Compilation of Relevant Knowledge	56
5.2.2. Selection and Development of Data Collection Tools	56

5.2.2.1.	Questionnaire Survey	57
5.2.2.1.1.	Workers' Survey	59
5.2.2.1.2.	Management Survey.....	61
5.2.2.1.3.	National Culture Survey (NCS)	64
5.2.2.2.	Face-to-Face Interviews	64
5.2.3.	Data Collection	65
5.2.3.1.	Selection of Sites and Samples	65
5.2.3.2.	Data Collection Process	66
5.2.4.	Data Analysis	67
Chapter 6	68
Workers Survey Analysis & Results	68
6.1.	Background Information	68
6.1.1.	Experience.....	69
6.1.2.	Safety Training.....	70
6.2.	Attitude and Perception Survey Analysis	70
6.2.1.	Factor Analysis	70
6.2.2.	Checks for Factor Analysis	70
6.2.3.	Factors Interpretation	73
6.2.4.	One-Way Analysis of Variance	74
6.3.	Workers' Behavioural Analysis.....	75
6.3.1.	Experience in Working at Heights	75
6.3.2.	Frequency of the Situations Occurring on Site	76
6.3.3.	Perception of Risk	77
6.4.	Prediction of Workers Intentional Behaviour by Attitudes and Perceptions	80
6.4.1.	Binary Logistic Regression	80
6.4.2.	Interpretation of Results.....	80
6.4.3.	Bonferroni Type Adjustment	81
6.4.4.	Assessment of Overall Model Fit.....	82
6.4.5.	Factors Influencing Likelihood of Continue Working.....	83
6.5.	Workers Cultural Analysis.....	88
6.5.1.	Factor Analysis	88
6.5.2.	Factors Interpretation	90
6.6.	Prediction of Workers Intentional Behaviour through Cultural Dimensions.....	92
6.6.1.	Bonferroni Type Adjustment	93
6.6.2.	Assessment of Overall Model Fit.....	93
6.6.3.	National Cultural Dimensions Influencing Workers Behaviour.....	94
6.7.	Relationship between Workers' Attitudes, Perceptions and Cultural Dimensions.....	98
6.8.	Conclusion	100
Chapter 7	103
Managers Survey Analysis & Results	103
7.1.	Background Information	103
7.1.1.	T-Test for Independent Groups.....	104
7.1.2.	Working Experience.....	104
7.1.3.	Safety Training.....	105
7.2.	Manager's Safety Practices	106
7.2.1.	Safety Plan	106
7.2.2.	Safety Competence/Training.....	107
7.2.3.	Safety Monitoring	107
7.2.4.	Safety Communication.....	108

7.2.5. Safety Co-operation	108
7.2.6. Suggestions for Improvement	109
7.3. Factors Analysis	110
7.3.1. Factors Interpretation	111
7.4. Managers' Cultural Survey (MCS)	112
7.4.1. Factor Analysis	113
7.4.2. Factors Interpretation	115
7.5. Relationship between Safety Management Systems and National Culture	116
7.6. Conclusion	118
Chapter 8	121
Prediction of Worker's Perceptions and Attitudes through National Culture & Manager's Safety Practices	121
8.1. National Culture	122
8.1.1. Difference in Opinions in National Culture Items	123
8.1.2. National Culture Dimensions	127
8.2. Prediction of Worker's Perceptions and Attitudes through National Culture and Managers' Safety Practices	129
8.2.1. Regression Analysis	129
8.2.2. Interpretation of Statistical Findings	130
8.3. Conclusion	133
Chapter 9	137
9.1. Background Information	137
9.2. Key Findings	137
9.3. Contributions to the Existing Body of Knowledge	145
9.4. Contributions to the Pakistani Construction Industry	146
9.5. Recommendations for Future Research	146
9.6. Closure	147
References	148
Appendix A	162
Appendix B	164
Appendix C	170
Appendix D	181
Appendix E	183

List of Figures

Figure 1.1	Graphic Overview of Thesis Structure.....	11
Figure 3.1	Mapping Pakistan and Australia on Hofstede’s Dimensions.....	39
Figure 4.1	Map of Pakistan	41
Figure 5.1	Research Activities and Expected Output.....	55
Figure 5.2	Flow Chart for the section 5.2.2 Depicting Developed Data Collection Tools Procedure	57
Figure 6.1	Frequency of Distribution of Trades Interviewed.....	69
Figure 6.2	Workers Construction Experience in Years.....	69
Figure 6.3	Workers Experience in Working at Heights	76
Figure 6.4	Frequency of Occurrence of the situations.....	76
Figure 6.5	Average Risk Perceived by Workers for Nine Behavioural Situations, in a Scale of Low (0-1), Medium (1-2), and High (2-3).	79
Figure 6.6	Preferred Behaviour of the Workers	79
Figure 7.1	Professional Breakdown of Personnel Interviewed	104
Figure 7.2	Managers Construction Experience in Years.....	105
Figure 7.3	Graphical Distribution of Managers Safety Training Received.....	106
Figure 8.1	A model of statistically significant predicted relationships between IVs & DVs	132

List of Tables

Table 2.1	Safety Climate Factors(as presented in order of date of publication)..	18
Table 4.1	Spot analysis of the construction sector in Pakistan (Board of Investment, Government of Pakistan, http://www.pakboi.gov.pk).....	47
Table 6.1	Factor Loadings for the 3-factor model of Workers’ Attitudes and Perceptions	73
Table 6.2	One way ANOVA analysis between Worker trades and their Attitude and Perception Factors	75
Table 6.3	Summary of Logistic Regression Models Fit	82
Table 6.4	Logistic Regression Table Predicting Workers’ Behaviours through Attitudes and Perception	85
Table 6.5	Factor Loadings for the 3-factor model of Workers Cultural Survey ..	90
Table 6.6	Summary of Logistic Regression Models Fit	93
Table 6.7	Results of Logistic Regression for Workers Culture factors and Behavioural Situations	94
Table 6.8	Correlations between Workers' Attitudes Perceptions and Cultural Dimensions.....	100
Table 7.1	Factor Loadings for the 2-factor model of Managers’ Safety Practices	111
Table 7.2	Factor Loadings for the 3-factor model of Managers Cultural Survey	114
Table 7.3	Statistically Significant Correlations between Safety Management Survey and Cultural Factors.....	117
Table 8.1	Results of Multiple Regression Analysis	133

Chapter 1

Introduction

1.1. The Construction Industry

The construction industry plays a vital role in the social and economic development of all countries. The importance and role of the construction industry in the economy of any country has been confirmed by several studies, including Coble and Haupt (1999). However, when compared with other (labour intensive) industries, the construction industry has historically experienced a disproportionately high rate of disabling injuries and fatalities for its size (Hinze, 1997). This industry alone produces 30 % of all fatal industrial accidents across the European Union (EU), yet it employs only 10 % of the working population; in the United States (US) it accounts for 20 % of all fatal accidents and only 5 % of the employed (McKenzie *et al.*, 1999). In Japan, construction accidents account for 30 % - 40 % of the overall total of industrial accidents, with the totals being 50 % in Ireland and 25 % in the United Kingdom (Bomel, 2001). The numbers of fatalities within the industry are only the tip of the iceberg, with thousands of major injuries, and even more minor ones, resulting in lost time (Smallwood, 2000). Kartam and Bouz (1998) identified the advancement in social sciences as having promoted a greater awareness of the sanctity of life and the unacceptability of premature death due to work-related accidents.

The injury data discussed above highlights that the high number of construction site accidents is a universal problem of much concern. Though notable improvements in construction worker safety at sites have been achieved, the industry continues to lag behind most other industries with regard to safety (National Safety Council, 1999). According to Davies and Tomasin (1996), there are a number of reasons why accident records within the construction industry compare poorly with those of the

manufacturing industry. In factories, there is normally a controlled working environment, with little change in the working procedures and equipment over long periods; additionally, the labour force usually remains fairly constant. Thus once identified, hazards can be remedied with relative ease, and the danger mitigated. However the case is quite different in the construction industry as the working environment is constantly changing.

Dangers to health and safety exist within the construction industry because of its fragmented nature, the uncertain and technically complex nature of construction work, the uncontrollable environment in which production takes place, the employment practices, and the financial and time pressures imposed upon project participants (King & Hudson, 1985; Halender & Holborn, 1991).

The construction industry is a mixture of different organisations, which directly and indirectly influence the construction process. These organisations include property developers, architects, engineers, quantity surveyors, accountants, lawyers, civil engineering contractors, engineering contractors, management contractors, labourers, subcontractors and specialist trades. The same complexity can be found with construction workplaces. Within the workplace Construction processes involve hazardous activities, such as working at height, manual handling, exposure to hazardous materials, demolition, frame erection, lifting operations, scaffolding and ground works, bulk materials and heavy equipment handling, as well as the varying jobsite personnel and the regularly changing worksites. A further characteristic of the industry, that makes management of this sector more troublesome, is the unfavourably high supervisor-worker ratio. Supervisors who have more a personal and positive relationship with workers have more favourable safety performance records (Hinze, 1997; Levitt & Samelson, 1993). This relationship is harder to develop if the ratio is too high, which is generally the case within the construction industry (Smallwood, 2000). Rowlinson and Lingard (1996) have attributed the prototype nature of construction projects, the transient nature of work, low education levels of the workforce and high levels of subcontracting, as major contributing factors to poor safety records within the construction industry worldwide.

1.2. Construction Industry in Developing Countries

There is a wide variation in economic structures, occupational structures, working conditions, work environment, and the health status of workers in different regions of the world, in different countries and in different sectors of the economy. Therefore the mechanisation of the construction industry is not uniform throughout the world. However, as stated earlier, the construction industry plays a vital role in boosting the economy of any country, especially a developing country. It provides the infrastructure required for other sectors of the economy to flourish. Many studies, such as Coble and Haupt (1999) have shown that construction industry reflects the level of economic development within the country. The construction sector everywhere faces problems and challenges. However, in developing countries, these difficulties and challenges are present alongside a general level of socio-economic stress and a lower productivity rate when compared to developed countries (Ofori, 2000). Nevertheless it is generally believed that the industry is a good source of employment at various levels of skills, from a general labour to semi-skilled, skilled and specialist workforce. Other major areas that impacts on this sector are lack of research and development, lack of trade and safety training, client dissatisfaction, and the continuously increasing construction costs (all of which result in less profitability).

Construction within developing countries often fails to meet the needs of modern competitive businesses in the marketplace and rarely provides the best value for clients and taxpayers (Datta, 2000). Additionally, this sector also demonstrates poor performance in respect of health and safety due to the absence of any stringent safety and construction laws. International labour organization (ILO) (1987) attributes the poor health and safety records in construction projects within developing countries to:

- The high proportion of small firms and the high number of self-employed workers;
- The variety and comparatively short life of construction sites;
- The high turnover of workers;
- The large proportion of seasonal and migrant workers; and

- Various trades and occupations working in the same area.

Kothari *et al.* (1995) found that, in most developing countries, for example like India, there are: no training programs for staff and workers; therefore, no orientation for new staff or workers is conducted; hazards are not pointed out; and no safety meetings are held. Employees are expected to learn from their own mistakes and experience.

In adopting different approaches to health and safety in developed and developing countries, two main differences can be identified. The first is the existence of legislation and its effective implementation; the second is hazard awareness. In developed countries, many safety acts and legislation exist and are implemented effectively. Nominated safety officers promote hazard awareness with the help of regular safety training sessions. In developing countries, however, safety rules barely exist at all; and any that do are inappropriate, ineffective, out-of date and based on conditions that prevailed while the country was still being colonised. Additionally, the regulatory authority is usually very weak in implementing rules effectively, and work hazards are either not perceived at all, or perceived to be less dangerous than they actually are (Larcher & Sohail, 1999; Hinze *et al.*, 1999).

1.3. Research Rationale

It is widely accepted that unsafe behaviour is intrinsically linked to workplace accidents. A positive correlation exists between workers' safe behaviour and the safety climate within construction site environments. Construction workers' attitudes towards safety are influenced by their perceptions of risk, management, safety rules and procedures. A variety of studies, including Niskanen (1994); Glendon and Litherland (2001) and Mohamed (2002), have investigated the construction safety climate within developed countries. In the majority of these studies, researchers have either developed a new model or replicated an already tested model with a view to improving its adequacy. However, there is a lack of research in this area in the context of developing countries.

Pakistan is a developing country that is currently enjoying relatively strong growth in construction activities. Unfortunately, the enforcement of safety regulations is not widespread within Pakistan. Some may even argue that the framework of existing occupational and health conditions of Pakistan's construction industry is fragmented and inadequately enforced. Likewise in any industry, good health and safety conditions constitute good and safe business practice. Therefore, it is believed the integration of safety and health measures into a total management system, within the construction sector in Pakistan, could contribute significantly to the cost efficiency, quality assurance and environmental protection of the company and its employees.

Cultural differences have a significant impact upon industrial safety culture and help in understanding the different approaches to accident prevention and safety management. Knowledge of cultural differences cannot be acquired without first understanding what culture is. Although "culture" is used widely to describe variations among people from different nations or of different ethnicities, there is no single, accepted definition. There is, however, a commonly-used set of characteristics that helps to identify culture: 1) culture includes systems of values; 2) culture is learned, not innate; 3) culture distinguishes one group from another; and 4) culture influences beliefs, attitudes, perceptions and behaviour in a somewhat uniform and predictable way (Bird, 2003). As safety climate is often portrayed as a temporal measure of culture (Cheyne *et al.*, 1998); this last characteristic of culture is most important, as it relates the national culture to the safety climate. Safety climate also refers to the shared perceptions, beliefs, attitudes and behaviour of the worker, regarding safety in their workplace. Ngowi and Mothibi (1996), in a study of 30 construction sites in Botswana, found cultural differences were a major reason for viewing safety procedures differently. Site managers in that study stated that the safety gear provided to employees from impoverished backgrounds were often sold. The managers also referred to the cultural habits of drinking alcohol or taking herbal drugs. They identified a tendency for workers to travel to work in smart clothes, and to leave the construction site to spend their money as soon as they received their wages. Experience with traditional construction techniques, such as the use of mud mixed by hand, proved to be obstacles in getting workers to appreciate the need to wear gloves when working with concrete. Further, some local cultures were

considered more emotional or more dominant, thus causing certain difficulties with effective safety management.

The literature review revealed a lack of research work undertaken on the influence (direct or indirect) of national culture on local safety conditions in the construction industry. This deficiency is a major contributor to the development of this current research rationale which focuses on workers' and management characteristics, and how these characteristics in turn, can influence the safety climate of the workplace.

This research study is broadly concerned with the safety climate and its determinants in Pakistan's construction industry. More specifically, the study investigates the safety perceptions, attitudes, and behaviour of construction workers, and management safety practices in Pakistan. It seeks to establish whether statistically significant relationships exist between the factors of a worker's perception, attitudes and safe work behaviour and management practices. Finally, this study attempts to gauge the influence of selected national cultural dimensions on the identified statistically significant relationships.

1.4. Research Objectives

The primary objective of this PhD research project is to explore the **influence of national culture on construction safety climate in Pakistan**. During this process other objectives to be achieved include:

- Investigating perceptions and attitudes of Pakistani workers regarding safety at construction sites;
- Identifying workers level of risk perception and their preferred behaviour in risky situations;
- Establishing whether significant relationships exist between workers' perceptions, attitudes and their behaviour;
- Investigating local construction safety management practices;

- Establishing whether statistically significant relationships exist between workers' perceptions, attitudes, work behaviour and management practices; and
- Exploring the influence of key national, cultural dimensions on workers' perceptions, attitudes and work behaviour, as well as management practices.

1.5. Research Design

Generally, research design directs the research strategy by defining an action plan that proceeds from the initial research questions to the conclusion. It is the overall configuration of the research, including specifying what kinds of evidence were gathered and from where and how such evidence was interpreted, that provides worthwhile answers to the research questions.

The research design of this study is based largely on the work recently conducted by McDonald *et al.* (2001), which investigated the behaviours, perceptions and attitudes associated with safety within the Irish construction industry. The adopted research design is cross-sectional, based on a representative sample of eight (8) large construction sites in three (3) large cities in Pakistan. This Doctoral (PhD) research study was carried out in four (4) main phases: background research; fieldwork; data analysis; and thesis writing.

This section summarizes the various research activities undertaken to achieve the overall research objectives listed in Section 1.4. Each of the following research activities is discussed in detail in Chapter Five.

Phase 1: Background research

1. Review of literature;
2. Research proposal formulation and approval;
3. Data collection tool identification and formulation:
 - Workers' attitudes and perceptions survey (WAS)
 - Workers' behavioural survey (WBS)
 - Managers' safety practices survey (MS 1)

- Managers' safety practices survey (MS 2)
 - National culture survey for workers and managers (NCS);
4. Identification of research sample; and
 5. Requests for assistance and co-operation from different local construction companies.

Phase 2: Fieldwork (Pakistani Construction Sites)

Stage One: Eight (8) construction sites were selected (detailed discussion on site selection criteria and sampling is presented in Chapter Five).

Stage Two: Data were collected by:

1. Visiting eight (8) identified construction sites;
2. Meeting with site engineers, site managers and site supervisors, and requesting that they complete the questionnaire surveys *via* face-to-face interviews;
3. Filling out survey questionnaires from workers by the survey team; and
4. Visiting the head offices of companies operating those projects to secure interviews and to obtain questionnaires from project directors / project managers.

Phase 3: Data analysis

1. Firstly, all responses were checked to ensure completeness and readability, before proceeding with the statistical analysis of the data through SPSS (version 11.5).
2. Secondly, by applying various statistical techniques, such as descriptive analysis, factor analysis, binary logistic regression and multiple regression analysis, the previously listed objectives of this research study were realised.

Phase 4: Thesis writing

1. Thesis write-up and submission.

1.6. Thesis Structure

The structure of the thesis is describe in following paragraphs, with Figure 1.1 providing a graphic overview of the thesis structure

Chapter One summarizes the literature on the vulnerable nature of the construction industry in terms of fatal and non-fatal accidents. It then describes the rationale for the current research, followed by the setting of the research objectives and an overview of the research methodology.

Following the introduction to the research study in Chapter one, **Chapter Two** commences with the role and importance of safety management within the construction industry. It then presents a review of the available literature, addressing the different techniques for measuring safety performance within the industry. Further, this chapter thoroughly reviews the concept of “Safety Climate” as an identified popular safety performance measurement tool. In the safety climate section, an introduction, along with a detailed review of the research to date on this concept is presented. Additionally, the role of safety perceptions, attitudes and behaviour within the safety climate is discussed. This chapter then provides a review of the importance of safe work behaviour and its relationship to the safety climate concept. Chapter Two concludes by exploring the literature on the measurement methods of safety climate and also addresses the different reasons for the non-uniformity in safety climate factors.

Chapter Three reviews the literature on national culture, including different frameworks and cultural dimensions developed to measure national culture, along with its importance to the construction industry.

Chapter Four provides a general overview on Pakistan, initially with an introduction on the geographical position and salient features of the economy. Further it discusses the national culture and reviews the literature on factors which have influenced Pakistani culture. It then assesses Pakistan’s construction industry, discussing the main players in the industry. The chapter then concludes with an

overview of the prevailing safety and health conditions in Pakistan's construction industry.

Chapter Five discusses in detail, the research methodology adopted for this research study. The chapter contains a detailed description of the selection and development of data collection tools, the method of data collection and a brief introduction to the data analysis.

Chapter Six and **Chapter Seven** present, in detail, the data analysis and results of the administrated surveys for Workers (WAS, WBS and WCS) and Management (MS-I, MS-II and MCS) , respectively.

Chapter Eight discusses the results, in detail, of the role of national culture and managers' safety practices in predicating workers' perceptions and attitudes, which then affect their behaviour.

Chapter Nine provides the reader with a summary of the main findings discussed in Chapter Six, Seven and Eight viz the possible contribution of this research study to academic knowledge and its implication for the industry in Pakistan. It looks into future research work avenues.

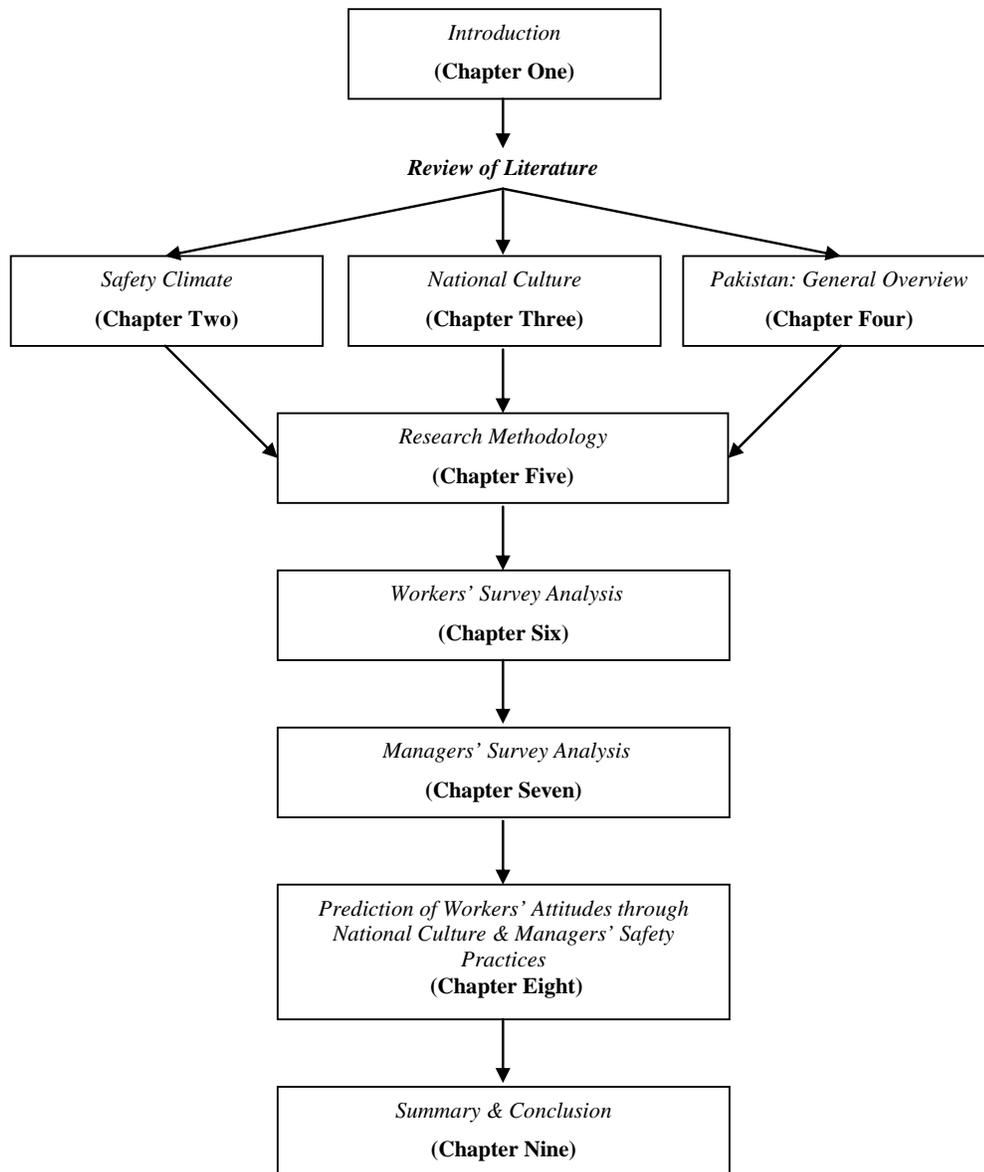


Figure 1.1 Graphic Overview of Thesis Structure

Chapter 2

Safety Climate

This chapter commences with the general overview of the importance of safety management within the construction industry. The different techniques available to measure safety performance are reviewed and, on the basis of that literature review, safety climate is identified as a key safety performance measuring tool. Safety climate and its related issues are then thoroughly discussed.

2.1. Safety Management in the Construction Industry

Construction accidents cause many human tragedies, de-motivate workers, disrupt sites, delay project progress, and adversely affect the overall cost, productivity and reputation of the construction industry (Mohamed, 1999). The deteriorating conditions of workplace health and safety, as well as the emergence of new regulations and international standards, have driven organisations to improve their safety performance. Both developed and developing countries have recognised the necessity of improving occupational safety and health management on construction sites, particularly to reduce the number of occupational accidents. As a result, organisations have, to some extent, shifted from a reactive to a proactive approach toward safety (Weibye, 1996; Kandola, 1997; Crawley, 1999). Many construction industries around the world are showing an increasing interest in the concept of construction safety management as a means of reducing the potential for large-scale disasters, as well as accidents associated with routine tasks. The causes of the accidents are not only the carelessness of the workers; sometimes accidents happen due to the failure of control, which is the responsibility of management. Thus the shift of the focus on the accidents has been driven by the awareness that organisational, managerial and human factors, rather than purely technical failures, are prime cause of accidents (Weiek *et al.*, 1999).

Governments worldwide have maintained an on-going commitment towards establishing a working environment free of injury and disease. This commitment is reflected by establishing performance-based workplace health and safety legislation which sets generalised performance objectives and provides a system of clearly stated responsibilities to encourage greater self-regulation for the construction industry (Mohamed, 1999). However the introduction of legislation alone cannot be the solution, with an improvement in the cultural approach being essential to achieving workplace safety (Blockely, 1995).

Comparisons of high and low accident rate companies (Simonds and Shafai-Sahrai, 1977; Smith *et al.*, 1978; Zohar, 1980; Chew, 1988; Nichols and Marcus, 1990) show that organisations with a low accident record have a list of factors that appear to be associated with good safety performance. Construction managers often view safety as a cost that conflicts with production, take little direct interest in safety, and rely on the site supervisor to manage safety; they neglect safety when they feel strong programme and / or financial pressures (Leather, 1987). Other key factors affecting safety management are the lack of the provision of safe working conditions, safety training, effective control of site hazards by the main contractors, and specific safety responsibilities for managers and workers (Jannady, 1996).

Safety management relates to actual practices, roles and functions associated with remaining safe (Kirwan, 1998). It is therefore more than a 'paper system' of policies and procedures. An audit of the official safety management system may begin and end with an analysis of what is contained within the paperwork but it therefore says little about how the system is being enacted in the field. Such an analysis identifies what an organisation should be doing to protect its workers, the public, and the environment from harm but it does not reveal what is actually happening at the work site; whether people and the environment are being protected; and whether adverse events are occurring (Mearns *et al.*, 2003).

The development of a safety management system is seen as essential for the control of risk. Research work by Lai *et al.* (1996) suggests that safety management should

be proactive rather than reactive, and that management should assess the adequacy of its safety management effort through safety performance audits.

2.2. Safety Performance Management

To determine the existing safety level of any organisation, a safety performance measurement is essential (Tarrants, 1970). Safety performance management involves assessing and controlling risks, planning activities, detecting latent failures and active failures, and monitoring and reviewing performance. Therefore success of any action taken to control risks is assessed through appropriate active monitoring, which may involve a range of techniques. This includes an examination of both hardware (premises, plant and substances) and software (people, procedures and systems), as well as individual behaviour (Lindsay, 1992). Failures of control are assessed through reactive monitoring which requires the thorough investigation of any injuries, ill health or incidents, with the potential to cause harm or loss. In both proactive and reactive monitoring, the objectives are not only to determine the immediate causes of sub-standard performance but, more importantly, to identify the underlying causes and the implications for the design and operation of health and safety management systems (Lindsay, 1992).

One of the conventional measures of safety performance relies primarily on some form of accident statistics. Grimaldi (1970) claimed that accident statistics are insensitive, and cannot reliably measure safety. One major disadvantage of conventional safety measures is that they are retrospective, measuring unsafe behaviour after it has occurred (Rockwell & Bhise, 1970; Tarrants, 1970). Thus it is that the consequences of unsafe behaviour are measured, rather than the problems or causes of unsafe behaviour. Ideally, a safety measurement technique would be representative of what it is measuring, be replicable, uncomplicated and realistic (Grimaldi, 1970). Glendon and McKenna (1995) identify fifteen (15) reasons why accident data, or similar outcome data, are poor measures of safety performance. The main reasons identified were: being insufficiently sensitive, of dubious accuracy, retrospective, and ignorance or ignoring risk exposure.

Another measurement technique developed to provide positive performance measurement of occupational health and safety is the observation of, and reporting

on, the individual behaviour, generally known as a behavioural sampling technique. It follows that once behaviour has been measured, strategies to promote modification can be developed. This method is based on the principle of random sampling, and involves observing samples of worker behaviour at random and evaluating whether the observed behaviour is safe (Tarrant, 1980).

Behavioural sampling has been widely used by several researchers implementing behaviour modification safety programs (Komaki *et al.*, 1978; Chhokar & Wallin, 1984; Walker, 1995). Walker (1995) contend that behavioural observation data were superior to accident statistics as they focus on unsafe behaviour prior to accidents occurring. Unfortunately, behavioural sampling also has several disadvantages. For example, sampling studies provide average results that disregard individual differences in safe behaviour (Litherland, 1997).

Another technique that could be beneficial for safety measurement, is measuring people's attitudes towards safety (Schroder, 1970). Schroder found that the more mature employee's safety attitudes were, the more likely they would search for safer environments, thus resulting in a decrease in unsafe behaviour. DeBobes (1986) also highlighted the importance of safety attitudes in accident prevention and defined attitude as a reflection of the predisposition to respond in a particular way.

Within many organisations there is increasing acceptance of the need to encourage staff to: adopt a questioning attitude; search for ways to improve safety; constantly be aware of what can go wrong; and feel personally accountable for safe operations (Cooper, 1998). Ojanen *et al.* (1988) suggest that safety performance should be measured on multiple levels (one of them being safety attitudes), in order to determine the true safety level of an organisation. They suggest that measuring the safety climate, or peoples' attitudes towards safety, can indicate changes in organisational safety behaviour, and thus can be a useful measure for evaluating safety programs. Glendon and McKenna (1995) propose a process (triangulation), which involves using at least two different measures to gauge the effectiveness of safety programmes or safety performance. The key benefit in triangulation is that it provides a more valid estimate of what is being measured. According to Lutness

(1987), a measure of the safety climate could be used to identify those areas of safety that need more attention and improvement; it also detects different safety trends within an organisation's safety programme level and benchmarks for safety levels of different organisations. Safety climate will be discussed, in the following section as, one of the alternative measures of safety performance.

2.3. Safety Climate

Safety climate and culture are respectively considered subsets of organisational climate and culture (Coyle *et al.*, 1995), and both have received considerable attention in the safety literature. The Advisory Committee on the Safety of Nuclear Installations (ACSNI, 1993) has defined safety culture in a comprehensive manner. In their view;

“Safety culture is the product of individual and group values, attitudes, perceptions, competencies and patterns of behaviour that determine the commitment to safety, and the life style and proficiency of an organization's health and safety management.” (p. 23).

Safety culture is important because it forms the context within which individual safety attitudes develop and persist, and safety behaviours are promoted (Zohar, 1980). It is interesting to note that the concept of safety culture was developed in response to major organisational accidents; however, it is now being more widely applied to explain accidents at the individual level (Mearns *et al.*, 2003). Safety climate is regarded as a manifestation of safety culture in the behaviour and expressed attitude of employees (Cox and Flin, 1998). Coyle *et al.* (1995) define safety climate as an objective measurement of attitudes and perceptions towards health and safety issues. Indeed safety climate, as with organisational climate, can be regarded as the surface features of culture derived from a sample of employees' attitudes and perceptions at a particular point in time (Flin *et al.*, 2000). Neal and Griffin (2000) found that safety climate operates as a mediating variable between organisational climate and safety performance, which describes individual perceptions of the value of safety within the work environment.

Safety climate has been researched for the last twenty five (25) years, dominantly in four directions: (1) Designing psychometric measurement instruments and

ascertaining their underlying factor structures; (2) Developing and testing theoretical models of safety climate to ascertain determinants of safety behaviour and accidents; (3) Examining the relationship between safety climate perceptions and actual safety performance; and (4) Exploring the links between safety climate and organizational climate (Cooper and Phillips, 2004). As one of the objectives of this study is to measure safety climate perceptions, and then examine its relationship with actual safety behaviour of construction workers in Pakistan, this section and onwards presents a detailed literature review with reference to directions 1 and 3 listed above.

Several safety climate questionnaires have been developed to determine the factors that contribute to safety climate. Table 2.1 displays various safety climate studies, ascertaining various underlying safety climate factor structures. The table does not include other studies that dealt with safety climate factors in a generic form (i-e not targeting any specific sector). However, all of these studies are discussed in detailed below.

Zohar (1980) constructed the first measure and validated a 40-item measure of organisational climate for safety on twenty (20) industrial samples in Israel. Zohar's measure of safety climate was developed by first undertaking a review of safety literature with the goal of defining the characteristics and practices that differentiated between companies that experienced a high rate of accidents and those that experienced low rates. The underlying assumption was that the perception of those dimensions within the plant forms the basis of the safety climate. Zohar organized the questionnaire into eight (8) different dimensions based on the literature review: (a) perceived management attitudes on safety; (b) perceived effects of safe work practice on promotion; (c) perceived effects of safe conduct on social status of individuals; (d) status of safety officer, (e) status of safety committee; (f) perceived effectiveness of safety training; (g) perceived level of risk at the workplace; and (h) the importance of safety training programs. After administering the questionnaire to 120-production workforce, the data were factor-analysed using principal component analysis, resulting in eight (8) factors that largely overlapped with the original dimensions. Based on the results, Zohar concluded that safety

climate is directly related to a company's safety record, and could provide a means for identifying the areas of safety within a company that can be improved.

Table 2.1 Safety Climate Factors Derived for Specific Sectors (as presented in order of date of publication)

Study	Sector (s), Country	Factors Extracted
Zohar (1980)	Manufacturing <i>Israel</i>	Safety training Management attitudes Risk in workplace Promotion Work pace Status of security officer Social status Status of safety committee
Brown & Holmes (1986)	Manufacturing <i>USA</i>	Management concern Management activity Risk perception
Dedobbeleer & Beland (1991)	Construction <i>USA</i>	Management commitment Work involvement
Cox & COX (1991)	Offshore Environment <i>Europe</i>	Personal scepticism Individual responsibility Safeness of work environment Effectiveness of safety arrangements Personal immunity
Niskanen (1994)	Road Construction <i>Finland</i>	Changes in job demand Attitudes to safety in organization Value of work Safety as a part of productive work
Glendon, Stanton & Harrison (1994)	Electricity <i>UK</i>	Communication Relationships Incident investigation Procedure development Adequacy of procedures Work pressure Personal proactive equipment Spares Safety rules
Coyle, Sleeman & Adams (1995)	Office, Nursing and Social Workers <i>Australia</i>	<u>ORGANISATION 1</u> Maintenance and management issues Company policy Accountability Training and management attitudes Work environment Policy/procedures Personal authority

Table 2.1 Safety Climate Factors Derived for Specific Sectors (as presented in order of date of publication) (Cont'd)

Study	Sector (s), Country	Factors Extracted
Coyle, Sleeman & Adams (1995)	Office, Nursing and Social Workers <i>Australia</i>	<u>ORGANISATION 2</u> Work environment Personal Authority Training and enforcement of policy
Williamson, Feyer, Cairns & Bianotti (1997)	Manufacturing <i>Australia</i>	Personal motivation Positive safety practice Risk justification Fatalism Optimism
Mearns, Flin, Gordon,& Fleming (1998)	Offshore Oil & Gas <i>UK</i>	Speaking up Supervisors Site management Violations Rules/regulations Work clarity Work pressure Communication Risk perception Safety measures
Glendon & Litherland (2001)	Road Construction and Maintenance <i>Australia</i>	Communication and support Relationships Adequacy of procedures Work pressure Personal proactive equipment Safety rules
Garavan & O'Brien (2001)	Manufacturing <i>Ireland</i>	Employees willingness to participate in safety management Negative stereotype workers Belief about employees who have accidents Management commitment Riskiness in job Belief in accidents proneness Safety strategies Proactive approaches to safety Management responsibility for safety Strict adherence to rules Employees safe conscious
Mohamed (2002)	Construction <i>Australia</i>	Management Risk perception Work pressure Competence Safety rules

Zohar's model was replicated by Brown and Holmes (1986) and Coyle *et al.* (1995) on different samples. Brown and Holmes (1986) at first used the same model as

Zohar's on the manufacturing industry in the United States of America (USA), while Coyle *et al.* (1995) added a number of questions that had been developed through polling employees about safety issues at their subject facilities which were important in those facilities. Both studies failed to replicate Zohar's exact factor solution. The reasons attributed to this difference was simply the differences within the organisations themselves, and possibly to the differences in the cultures within which the facilities were located (Zohar, *Israel*; Brown & Holmes. *USA*; Coyle *et al.*, *Australia*). Brown and Holmes (1986) therefore, in their next step, used existing American data to refine the model utilizing an exploratory approach to factor analysis model building. Based on their extracted factors for safety climate, they were able to determine only three (3) principal factors: employee perception of how concerned management was with employees' well being; employee perception of how active management was in responding to this concern; and employee physical risk perception.

Dedobbeleer and Beland (1991) tested Brown and Holmes's three-factor safety climate model on construction workers. Their sample consisted of American construction workers at nine (9) different construction sites. Using a maximum likelihood factor solution with varimax rotation, they were able to replicate Brown and Holmes' solution; however, they went on to recommend that their own two-factor solution was better. The reason given for the improvement was the different industry sampled. The two (2) factors were interpreted as management commitment to safety and worker's involvement in safety. A study by Cox and Cox (1991) of employees' attitudes within an industrial organisation produced five (5) factors: personal skepticism; individual responsibility; the safeness of the work environment; and the effectiveness of arrangements for safety and personal immunity. A three-factor model of safety climate was produced by Seppala (1992): organisational responsibility for safety; workers' concern about safety; and workers' indifference towards safety. Niskanen (1994), in his study of road construction workers, found two (2) separate four-factor solutions for workers and for supervisors. Both included attitudes towards the safety of the organisation, changes in work demands, value of work, and safety as part of productive work.

Using a safety climate questionnaire, Glendon *et al.* (1994) conducted research to identify performance-shaping factors that would be generic to all organisations. This study concluded with nine (9) factors: communication and support; adequacy of procedures; work pressure; personal protective equipment; spares; relationships safety rules; incident investigation; and development of procedures. Hofmann and Stetzer (1996) used the Dedobbeleer and Beland (1991) and Zohar's (1980) measure of safety climate to examine safety climate at the different group level of the organization. They demonstrated that safety climate was correlated with both reported rates of unsafe behaviour and actual accidents. This finding provides some critical evidence, indicating that safety climate has some criterion-related validity, a relationship that had previously not been established.

Williamson *et al.* (1997) proposed a 67-item measure of safety climate. Factor analysis on this study revealed five (5) factors: personal motivation for safe behavior; positive safety practice; risk justification; fatalism; and optimism.

Flin *et al.* (2000), on the basis of the intensive reviews in their study, found the most frequently measured factors were related to management, risk and safety arrangements. Work pressure and competence were two other emerging, although less frequently used, factors in this particular study. Glendon and Litherland (2001), in their study on an Australian road construction organisation, investigated the relationship between safety climate and safety performance by using a modified version of Glendon *et al.*'s (1994) safety climate factor questionnaire. Their study revealed the presence of six (6) factors as compared to the nine (9) factors of Glendon *et al.*, (1994). The factors were: communication and support; relationships; adequacy of procedures; work pressure; personal proactive equipment; and safety rules. This study could not establish the relationship between safety climate and safety performance. The reasons attributed to such failure included; the safety climate measure may tap a different aspect of safety than the behavioural measure of safety. The safety climate questionnaire used in the research was a subjective self-report measure, while behaviour observation is a more objective method. Different measurement methods may reflect different aspects of safety.

Garavan and O'Brien (2001) found evidence of a positive relationship between safety climate and safe behaviour. This study also showed strong effects of age, gender and experience, but there were no effect of accident history variables on the perception of safety climate.

Mohamed (2002), using structural equation modeling, studied the impact of safety climate on safe work behaviour at nineteen (19) Australian construction sites. Five (5) independent sets of safety climate factors (management, safety, risk, work pressure and competence) were taken directly from the study of Flin *et al.* (2000). Support was found in this study for the influence of management, safety and risk systems on safety climate. Mohamed's results showed a significant positive relationship between safety climate and safe work behavior. He (2002) argued that recent studies have investigated the impact of one or more elements of the five factors on construction safety climate (Rowlinson & Lingard, 1996 ; Sawacha *et al.*, 1999; Mohamed. 1999), however individual relationship of these factors with safety climate had not been measured specifically.

Mearns *et al.* (2003) conducted safety climate surveys on thirteen (13) offshore oil and gas installations over two years time spans. The questionnaire surveys were developed from the previous studies of Rundmo (1994, 1997) and Mearns *et al.* (1997, 1998). Their 2003 study aimed to explore the association between safety climate and safety performance, and between safety management practices and safety performance. On the basis of their hypothesis formation, they found partial support for the associations between safety climate, management practices and performance.

A recent exploratory study on safety climate factors and their relationship with safe behaviour, by Cooper and Phillips (2004), revealed the importance of safety training as an important factor, predicting actual levels of safe behaviour. This study was the extension of the old behavioural study of Cooper *et al.* (1994). The safety climate survey was distributed to manufacturing employees. Twelve months after the first safety climate survey, a second survey was conducted using the original survey

content. The results showed an empirical link between a limited set of safety climate perceptions and actual safety behaviour.

2.3.1. Role of safety perceptions and attitudes in safety climate

In understanding a workplace's safety climate, the perceptions and attitudes of the workforce are important factors in assessing safety needs. Indeed safety solutions may fail if these prevailing attitudes and perceptions are not taken into account (Williamson *et al.*, 1997). Attitudes are defined as "*a psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour*" (Eagly and Chaiken, 1993). Neal and Griffin (2004), in their study, found that attitude measures exhibited greater variability than did perceptual measures, as attitudes are influenced by individual differences in addition to environmental factors. Thus, they argue that attitudes and perceptions of safety should be clearly differentiated. In an earlier work Neal and Griffin (2000) defined safety perceptions as "*how workers view safety related policies, procedures and other workplace attributes concerned with safety*". They proposed a framework for investigating perceptions of safety within organisations. This framework differentiates between individual perceptions of the work environment and the factors that may mediate individual work performance from perceptions of the workplace. Zohar (1980) conceptualised safety climate as a summary of the beliefs and perceptions of employees about safety within the workplace. In its original conception it was assumed that the safety climate acts as a frame of reference that guides behaviour, such that employees develop "*coherent sets of perceptions and expectations regarding behaviour-outcome contingencies and behave accordingly*" (Zohar, 1980, p.96). Donald *et al.* (1991) revealed three (3) facets of safety attitudes: people or the organisational role that make up the safety climate; attitudes, behaviour or aspects of an individual's safety behaviour; and safety activity or type of safety behaviour. Neal and Griffin's (2000) study considered only those perceptions related to safety climate, viz. those involve individuals' assessment of workplace attributes concerned with safety. For example, employees' views about management values for safety, and personnel policies about safety, are clearly perceptions about values and procedures within the wider work environment. So, in short, safety climate as a concept describes the safety ethic within a workplace, which is reflected in workers'

beliefs about safety and is supposed to predict the way workers behave with respect to safety within that workplace (Williamson *et al.*, 1997).

2.3.2. Safety Climate and Safe Behaviour

Various studies have revealed that safety climate can predict safety-related outcomes, such as accidents or injuries (Zohar, 1980; Brown and Holmes, 1986; Diaz and Cabrera, 1997). Consequently safety climate is regarded as the manifestation of safety culture in the behaviour and expressed attitude of the employee (Cox and Flin, 1998). Zohar (1980) was one of the first researchers to suggest a relationship between safety climate and specific measures of safety performance. Indeed he correlated safety climate scores with a ranking for safety practices and accident prevention programs. From a comparison of these rankings with an overall safety climate score, Zohar concluded that safety climate is related to the safety levels of the organisation. Two years later Glennon (1982) compared safety climate scores with measures of safety performance. Though he acknowledged the difficulties in using accident-based measures, he found that safety climate appears to be related to traditional measures of safety performance. Canter and Donald (1990) and Cox and Cox (1991) also demonstrated, respectively, a correlation between safety climate and behaviour

Tomas and Oliver (1995) found safety behaviour could be significantly predicted by workers attitudes, co-workers' response, hazards and supervisors' response. Further, Neal and Griffin (2000) found that safety climate influences safety performance. More recently, Mohamed (2002) examined the relationship between safety climate factors and the safety climate on Australian construction sites, as well as the correlation between safety climate and workers' safe behaviour. In this particular study support was found, for the influence of management, safety and risk systems on safety climate. A significant positive relationship between safety climate and safe work behaviour was also found.

From the above overview, it is clear that a positive correlation exists between workers' safe behaviour and safety climate within construction site environments. Additionally, construction workers' attitudes towards safety appear to be influenced by their perceptions of risk, management, safety rules and procedures.

2.3.3. Attitude and Behaviour

Research on attitudes, behaviour and safety management within the construction industry has been undertaken by authors such as Levitt *et al.* (1976), Hinze (1978, 1979, 1981, 1988) and Dedobbeleer *et al.* (1987, 1991) in North America; Andriessen (1978) and Laufer (1987) in Holland; Mattila and Hydoynmaan (1988) and Laitinen and Ruohomaki (1994) in Finland; Lingard and Rowlinson (1994, 1997) and Siu *et al.* (2003) in Hong Kong; MacDonald *et al.* (2001) and Garavan and O'Brien (2001) in Ireland; Mohamed (2002) in Australia; and Fang *et al.* (2004) in China. Literature searches did not reveal any similar studies having been undertaken in the context of developing countries in general, or in Pakistan in particular.

A number of studies have been found showing that attitudes and behaviours are significantly associated. Studies based on the theory of reasoned action and planned behaviour (Ajzen and Fishbein, 1980) show a significant association between health attitudes and risk behaviour. The theory of reasoned action was developed as a means of explaining health-related beliefs, attitudes and behaviour. Health-related beliefs are similar to safety beliefs in that they might affect one's health. A major assumption in this theory is that people behave sensibly; that is, they deliberately employ information from their surroundings and consider the implications of their actions.

Health-related attitudes may affect middle and top management decisions, which also exert an influence on the conditions under which an employee's individual decision-making takes place. The attitudes may affect company priorities, as well as company policy, about safety. Additionally, they may affect employees' attitudes and behaviour, both directly and indirectly (Rundmo and Hale, 2003).

2.3.4. Sub-Group Differences in Safety Climate

Some of the previous research on sub-group differences in safety climate, has concluded that different organizations can differ on the same dimensions of safety climate. Glennon (1982) analysed safety climate of seven different organizations from six different industries. He concluded that not only each of the organizations

differed on each of the safety climate dimensions but even organizations within the same industry showed different profiles of safety climate. Waring (1992) attributed these sub-group differences in safety climate due to different daily work demands and experiences which shape safety attitudes. Mason and Simpson (1995), and Budworth (1997) examined perceived differences among the seniors and juniors staff members' attitude to safety climate. Budworth (1997) concluded that major advantage of using a safety climate measure is that it can identify strengths and weakness of different sub-groups within an organization, thus allowing for safety management strategies to be developed specifically for each one. Glendon and Litherland (2001) developed a six-factor safety climate structure of road construction organization. One of the focuses of their study was to compare their safety climate structure on two sub-groups in construction. Differences in the safety climate of job sub-groups were found in two safety climate factors (i.e. safety attitudes and safety rules). Recently, Lu and Shang (2005) in an empirical investigation of safety climate in container terminal operators of Taiwan found statistically significance differences in perceptions at the level of; Supervisors and general employees, and junior and senior staff.

2.3.5. Measurement Method

The measurement of a safety climate may be used to supplement traditional measures of safety as it overcomes many of the limitations of traditional safety measurement, such as reporting biases and after-the-fact measurement (Litherland, 1997). The prime research method for investigating safety climate is the questionnaire, typically completed by sufficient numbers of employees to allow statistical analysis to reduce a large number of items to a small number of dimensions (e.g. Williamson *et al.*, 1997; Mearns *et al.*, 1998). Many of the researchers, listed in Table 2.1, have focused on developing and using surveys in their respective studies. Lutness (1987) promoted safety climate surveys as reliable tools when appropriately applied. Indeed Lutness claimed that safety climate surveys will deliver information on employee's perceptions of management's commitment to safety, detect areas for improvement and provide benchmarks for different organisations. Ojanen *et al.* (1988) argued that any effort to improve safety should be perceived as such by employees, and that the only way to measure the safety climate is through conducting a safety climate survey. Cohen (1977)

suggested that the potential uses for safety climate questionnaires are considerable. The perception of management commitment to safety can be measured by safety climate questionnaires, allowing feedback to management about how workers perceive management behaviour. Safety climate surveys are constituted with factors that can also be termed as the determinants of the safety climate. A list of common safety climate factors has yet to be uncovered. The reason for this non-uniformity in safety climate factors is discussed in the following section.

2.3.6. Non-Uniformity in Safety Climate Factors

Coyle *et al.* (1995) administered a safety climate questionnaire to two (2) similar organisations to investigate the uniformity of the safety climate factors in similar organisations using the same questionnaire. They factor-analysed each organisation's questionnaire separately, but failed to find a consistent safety climate factor structure. As a result, although they concluded that obtaining a universal stability of safety climate factors is highly doubtful, they argued that failing to produce a specific factor solution did not mean that the comparison of safety climate factors were meaningless. Instead, they prostituted that the identification of different factor sets for a given organisation was an effective means of determining where attention might be most usefully focused. Flin *et al.* (2000) reviewed existing safety climate measures in an effort to establish a common set of factors that can be grouped into organisational, managerial and human themes. They concluded that, although research into safety climate and safety culture has continued for more than two decades, no universally accepted theory of climate or culture exists. Flin *et al.* (2000) summarised the three (3) most common factors emerging from different studies as: perceptions of management's commitment to safety; perceptions of safety management systems; and perceptions of risk. They also found a few less common (but still important) factors, specifically work pressure consisting of workload, and work pace, and competence relating to the general competence level of the workers.

One explanation for such inconsistencies in factor structure is the variety of questionnaires, samples and methodologies used by different researchers; as a result no consistency exists in the factor structure of the safety climate (Glendon and Litherland, 2001). Although safety climate factors have been identified within organisations, there is increasing evidence that a consistent safety climate factor

solution may not transfer from one organisation to another, especially as organisations differ in their management style and safety regulations (Glendon and Litherland, 2001). In all the studies reviewed on safety climate, the presence of inconsistencies shows there is no universal set of safety climate factors; however some similarities can be found between the different safety climate studies.

From the discussion in Section 2.3 on safety climate, it can be concluded that the dimensions identified from studies of safety climate appear to be mostly related to employees' perceptions of the organisational characteristics and their own competence, both of which impact upon safety. Schneider (1990) states that findings on safety climate are in general consistent with definitions of climate constructs found in the organisational literature, viz that individuals do attach meanings to, and interpret the environments within which they work. Also the discussion in the subsections on safety climate highlights the conclusion that the interpretation or the meanings that an individual attaches to that safe or un-safe environment then influences their behaviour. To further explain this reasoning, Hofmann and Stetzer (1996), in their study, demonstrated that, where supervisors do not place emphasis on safety issues, employees are less likely to perceive safety as an important issue. Schneider's (1990) remarks also support this view that a strong safety climate has the potential to motivate employees to take greater ownership of, and responsibility for, safety within the organization.

Based on the literature review for this PhD study, and in particular three recent investigations by Flin *et al.* (2000), McDonald *et al.* (2001), and Mohamed (2002), the delimitation is to investigate safety climate through; the perceptions of workers for management's commitment to safety; perceptions of safety management systems; workers' risk perception and competence; physical work environment; safety supervisions and inspections; and relationships. The described safety climate determinants will be used to develop the questionnaire survey used in this study for workers' attitudes and perceptions in Pakistan.

Chapter 3

National Culture

Having discussed safety management and performance, and then having identified safety climate as key tool to measure safety performance, this chapter now focuses on national culture and its importance in construction and management in general. This chapter also reviews the different frameworks developed to measure national culture, finally concentrating on the research undertaken by Hofstede (1980), and discussing his identified cultural dimensions in detail.

The societies in which we grow up have their own sets of rules about the way we behave and interact with others. These rules or norms are not written down, and often we are not even conscious of them. Such norms or rules, which enable societies to act accordingly with-in their own environment, are collectively called “Culture” (Hope, 2004). As organisations are in many ways embedded in the larger society in which they exist. Consequently workers working within those organisations constitute part of the organisations; thus the workers will ultimately exhibit the society’s attitude and behaviour as well. An organisation's safety culture cannot flourish without interacting in harmony with the prevailing societal culture (Meshkati, 1995). Indeed societal forces that dictate prevalent attitudes and behaviours relating to safety within a given culture are fundamental to the study of safety climate (Peckitt *et al.*, 2002). Cultures are developed within countries as a product of national patterns of early childhood and formative experiences and education, language, religion and geography (Derr and Laurent, 1989). As culture is a learned behaviour not genetically transformed (Islam, 2004), therefore studying culture has become very important in understanding management and employee styles of working.

A great deal of research has been undertaken in an attempt to understand just what culture is and how it differs from region to region. The larger portion of available literature on culture has addressed cross-cultural studies, rather than inter-cultural investigations.

"Culture" is composed of shared assumptions, beliefs, norms and values that guide people's behaviour (Tayeb, 1994). Samovar *et al.* (1981) define culture as the culmination of

“knowledge, experiences, beliefs, values, attitudes, meanings, hierarchies, religion, timing, roles, spatial relations, concepts of the universe, and material objects and possessions acquired by a large group of people in the course of generations through individual and group striving”.

For Hofstede (1980), culture is to humans collectively what personality is to an individual. Personality is defined by Gilkey and Greenhalgh, (1991) as the patterns of an individual's behaviour that reappear in a variety of situations. Therefore, individual beliefs, values and behaviours are echoes of the habits and practices of the cultural group from which an individual hails. The cultural literature argues that behaviours differ from culture to culture because cultural groups hold divergent values. Thus different societies have different and distinctive sets of values and priorities within their respective cultures that give guidance on how their members should proceed (Halender and Holborn, 1991). Britannica online (2003) attributes cultural variation to usually:

- Physical habitants and resources;
- The range of possibilities inherent in various areas of activity such as language, customs, the use of tools and the degree of social development; and
- Attitudes, values, ideals and beliefs of individuals, which are greatly influenced by the culture in which they live.

Thus changes take place within and among cultures by:

- Means of ecological and environmental changes;

- Diffusion of advantageous cultural traits;
- Acculturation, which refers to the process of changes that result from contact of societies with different cultural traditions; or
- The evolution of cultural elements over a period of time.

Expressions of culture include observable artefacts, patterns of behaviour, values and assumptions (Rousseau, 1990). Macro aspects of culture (located at the societal level) include language, laws, rituals and worldviews; while micro aspects, e.g. motivation, trust and violations, are located at the individual or group level.

In summary then, national culture makes a unique contribution to understanding management policies and practices (Evans, 1992). National culture is the software of the mind (Hofstede, 1994), and it is deeply embedded in everyday life and fairly resistant to change (Newman and Nollen, 1996).

3.1. National Culture and Construction Issues

National culture is increasingly capturing the attention of researchers as an issue of concern in construction. He (1995) studied cultural influence from the risk management point of view, identifying that the risk factor, at the national or regional level in international construction projects, can be classified into three (3) categories:

1. Political situation;
2. Economic and financial situation; and
3. Social environment

He (1995) concluded that social environment problems are most likely to be caused by cultural differences, such as the language barrier, religious inconsistency, differences in traditions, and so on. Moreover, He (1995) points out that these risk factors are beyond the control of companies, but that they can be managed, and are comparatively predictable and measurable by adequate statistics.

Baba (1996) found that, in transferring and utilizing the systems and methods developed in the field of construction management in some advanced Western

countries to suit Asian countries' needs, strong resistance and conflicts come mainly from the differences in cultures. These differences are classified into three (3) categories:

1. Traditional organisation structure;
2. Managerial differences; and
3. Differences in fundamental concept and philosophy upon which contracts and laws are based.

Ngowi (1997) reports on a study undertaken in Botswana to determine the influence of cultural background on construction project team members with reference to innovation in the adopted procurement systems. It was found that for the projects in which team members were from different cultural backgrounds, there were inhibitions to innovation compared with these in which team members had similar cultural backgrounds. Ngowi concludes that the cultural background of project team members should be taken into consideration in project management to create a conducive environment for innovation.

Chan (1997) also demonstrated cross-cultural influence on construction project management through the identification of cultural influence on the resolution of foreign-related construction disputes in China. Chan argues that the cause of these disputes is closely related to the culture of a society, and that the different methods for resolving disputes are also social phenomena closely associated with a society's unique culture.

Ngowi (2000) later attempted to highlight the influence of national culture and organisational culture on Total Quality Management (TQM) application within the construction industry in Botswana. In this study, he aimed to determine the outcome of implementing TQM in a workplace that does not share a cultural base. A survey of 100 construction firms in Botswana found that, although the values embedded in TQM could be adopted within the organisation into which it is implemented, the cultural context of the greater society resisted some of the values. It was concluded

that, for TQM to be successful in a particular cultural setting, it must take on some of the host culture values.

Low and Shi (2002), in a cross-cultural exploratory study, examined what constituted Singaporean and Chinese culture with particular reference to construction firms. Their study was based on the four dimensions of national culture established by Hofstede (1980) to explore the cross-cultural influences brought about by the two cultures within the context of construction projects in China. Similarly Tijhaus (2002) highlighted the impact of cultural issues when transferring western technologies abroad. The failure to consider local cultural issues, such as problematic infrastructure, lack of training opportunities, local conflicts and other matters, can cause projects to fail. Therefore, decisions made by keeping the national culture in mind during the procurement process impacts significantly upon the success of construction projects. Phua (2002) explored the reasons for the general lack of cooperation within the Hong Kong construction industry. He found an impact from collectivism and individualism on projects' participants' cooperative behaviour in the Hong Kong construction industry.

3.2. National Culture and Management

The IAEA (1998) suggests that understanding the impact of societal culture upon safety culture allows identification of most of the antecedents of safety related attitudes and behaviours. The different studies on cultural differences also suggest that management controls that are effective in one country may be ineffective or even dysfunctional in another. Such cross-cultural differences can arise both internally (by affecting the work-related behaviour of a given set of employees) and at the interface between the organisation and the external labour market (Chow *et al.*, 1994). Preferred management styles have their roots in (and in turn are influenced by) national culture. A large number of empirical studies have examined the relationships between national culture and various aspects of management, which include planning and strategic decision-making. Meshkati (1995) has identified risk perception, motivation, workgroup dynamics, and attitudes to work, technology, hierarchy, time and religion as important cultural factors, which have a strong impact on safety culture. Lagrosen (2002), in his study on exploring the impact of

culture on quality management, and using Hofstede's (1994) model, found that uncertainty avoidance and individualism-collectivism are the dimensions that mainly affect the implementation of quality management.

Low (1995, 1997) in his two (2) studies have analysed some important cultural phenomena and concluded that an understanding of these phenomena can help international corporations from the West market their services more effectively as well as enhance their ability to manage adversities.

3.3. Dimensions of National Culture

To study the cultural influence on societies, one needs typologies (Schein, 1985) or dimensions (Hofstede, 1980) that can be used to analyse the behaviours, actions and values of the members of a society (Pheng and Yuquan, 2002).

Hall (1959, 1976) drew attention to the difference between the nature of “low context” and “high context” societies. Context refers to ‘the information that surrounds an event’, and is inextricably bound up with the meaning of that event and conceptions of time (Hall and Hall, 1990). “Low context people”, such as Americans, Germans, Swiss, Scandinavians and other Northern Europeans, appreciate explicit, clear, written forms of communication, as provided by computers, books, reports and letters. In contrast, “high context people”, such as Asians, Arabs and Southern Europeans, divulge less information officially in written form. In relation to perceptions of time, low context people are generally “monochronic” in that they are used to doing one activity at a time and dislike interruptions, whereas high context peoples are “polychronic”, i.e. more flexible or elastic in the management of work or that of others (Hall and Hall, 1990).

Hofstede's (1980) extensive research on culture has helped conceptualise one of the most popular theories of cultural types, as evidenced by well over 1000 citations from Cultural Consequences reported in the *Social Science Citation* since 1980. His approach to culture initially identified four underlying value dimensions: (1) individualism vs. collectivism; (2) large vs. small power distance; (3) strong vs. weak uncertainty avoidance; and (4) masculinity vs. femininity. These dimensions

group together a number of social phenomena, which occur in combination. Hofstede (1994) in a later study adds a fifth dimension to his analysis of differences among societal cultures, namely that of a long-term orientation Vs a short-term orientation to life.

From a different perspective, Schein (1985) identifies five (5) basic assumptions around which cultural paradigms form, namely: (1) relationship to nature; (2) truth and reality; (3) human nature; (4) human activity; and (5) human relationships.

Another framework for the understanding of culture was developed by Hampden-Turner and Trompenaars (1993). It was based on 50,000 cases of managers from multinational and international corporations representing more than 100 countries, and identifies seven cultural dimensions, namely: (1) universalism vs. particularism; (2) analysing vs. integrating; (3) individualism vs. collectivism; (4) inner-directedness vs. outer-directedness; (5) time sequential vs. time synchronising; (6) achieved status vs. subscribed status; and (7) equality vs. hierarchy.

In this approach, cultures differ in the specific solutions they choose for problems. Hampden-Turner and Trompenaars (1993) cultural dimensions combine many aspects of Hofstede's (1980) categories, but the correspondence between the two is not always perfect (Peckett *et al.*, 2002).

House *et al.* (2001) designed GLOBE (Global Leadership and Organizational Behaviour Effectiveness), a research project to examine the interrelationships between societal culture, organisational culture and leadership styles. The meta-goal of GLOBE was to develop an empirically-based theory to describe, understand and predict the impact of cultural variables on leadership styles and organisational process and the effectiveness of these processes. The GLOBE project studied nine (9) cultural dimensions, adopted on the basis of a review of the literature relevant to the measurement of culture from previous large-sample studies, the existing cross-culture theory. The GLOBE's cultural dimensions are: (1) uncertainty avoidance; (2) power distance; (3) collectivism I: societal collectivism; (4) collectivism II: in-group

collectivism; (5) gender egalitarianism; (6) assertiveness ;(7) future orientation; (8) performance orientation; and (9) human orientation.

The first six (6) cultural dimensions had their origins in the dimensions of culture identified by Hofstede (1980). The first three dimensions were intended to reflect the same constructs as Hofstede's dimensions labeled Uncertainty Avoidance, Power Distance, and Individualism. The Collectivism-I dimension measured societal emphasis on collectivism, with low scores reflecting individualistic emphasis, and high scores reflecting collectivistic emphasis by means of laws, social programs or institutional practices. The Collectivism-II scale measured group (family and/or organisation) collectivism – pride in and loyalty to family and/or organisation and family and/or organisational cohesiveness. In lieu of Hofstede's Masculinity dimension, they developed two dimensions labeled Gender Egalitarianism and Assertiveness.

Future Orientation was derived from Kluckhohn and Strodtbeck's (1961) Past, Present, Future Orientation dimension, which focused on the temporal mode of a society. Performance Orientation was derived from McClelland's work on need for achievement. The Humane Orientation dimension had its roots in Kluckhohn and Strodtbeck's (1961) work that Human Nature is Good vs. Human Nature is Bad, as well as Putnam's (1993) work on the Civic Society and McClelland's (1985) conceptualisation of the affiliative motive.

For this research study, the relevant delimitation is that the culture of Pakistan will be seen only from the framework of Hofstede (1994) and the cultural dimensions Hofstede has formulated. As mentioned above, while many other scholars have proposed alternative frameworks, the work of Hofstede was found to be most comprehensive and most suitable to serve as a basis for this study. The reason for this is that Hofstede's framework is the most referred to and well validated. It is worth noting that Hofstede's survey respondents were doing similar work in the same company; thus many intervening variables had been controlled. The only significant difference was their nationality. Therefore, Hofstede's study could claim the differences in attitudes and values were due to cultural differences (Islam, 2004)

Based on a survey of 116,000 individuals from 72 countries, most of whom were employees of a single global corporation, Hofstede (1980), after applying factor-analysis to the survey data sets, identified four (4) work-related cultural dimensions along which the countries differed. He also suggested specific relationships among these cultural dimensions and individuals, with preferences for, and reactions to elements of a management control system. Hofstede's dimensions (power distance, uncertainty avoidance, individualism, and masculinity) are briefly discussed below.

Large vs. Small power distance (PDI)

The dimension of power distance reflects the degree of inequality in which power is distributed among the members of institutions, organisations and societies. For large power distance countries, power is distributed unequally among the members, with more powerful persons at the top of those organisations. In such organisations centralised decisions are made in an autocratic manner. On the other hand, for small power distance countries, power are shared much more equally among the members and the decision-makers by acting interdependently, thus resulting in the decisions being made in a consultative manner.

Strong vs. Weak uncertainty avoidance (UAI)

The dimension of uncertainty avoidance relates to the mental programming of people in terms of the manner in which they respond to ambiguous and uncertain future situations. People in a weak uncertainty avoidance culture have a greater acceptance, tolerance, and feeling of security, despite facing a possibly uncertain future. In contrast, people from a strong uncertainty avoidance culture tend to feel threatened by a possibly uncertain future, engaging in coping behaviours to reduce their levels of anxiety and stress.

Individualism vs. Collectivism (IND)

The IND is the extent to which a society believes people should take care of themselves and remain essentially independent from any group. In cultures characterised by high individualism, people believe individuals should take care of themselves. Thus, people have personal and family lives separate from their work;

have opinions independent of the groups to which they belong; and believe management has a role of co-ordinating individual efforts to achieve collective goals. In cultures characterised by low individualism, people regard their relationship to their firm as being similar to a family link; are trained to know and adhere to the “firm way”; have opinions that tend to be consistent with those of others within their firm or group; expect what they mean will be understood with little explanation; and place a high priority on the maintenance of harmonious group working relationships.

Masculinity vs. Femininity (MAS)

This dimension reflects the extent to which the “masculine” ego’s values of assertiveness, money and material prevail (rather than the “feminine” values of nurturing, quality of life and people). In cultures characterized by high masculinity, gender roles are distinct and highly defined by boundaries and distinctions, as well as assertive and competitive behaviour being emphasised. Masculine stereotypes are clearly preferred and valued highly. Fighting, arbitrary behaviour and withdrawal most often resolve disputes. In cultures characterised as low masculinity, gender role distinctions overlap. Boundaries and distinctions are de-emphasised, while socially and environmentally sensitive behaviour is emphasized. “Feminine” behaviour is valued throughout the culture, with disputes preferably being resolved by compromise and negotiation.

One of the attractions of Hofstede’s work is that he used his survey data to locate countries along each of the four dimensions, thereby allowing for relatively straightforward comparisons. He has produced actual figures on the dimensions for many countries including, Pakistan. Figure 3.1 demonstrates how mapping the culture traits and their associated scores on Hofstede’s scale differs between Pakistan and Australia. It is strongly believed by the author that the in-depth knowledge of these four cultural dimensions, in relation to Pakistan, can help to identify and explain both weak and strong aspects of local construction safety climate, and its influence on both workers’ behaviour and management styles. Therefore the current research is unique in drawing evidence of the national cultural influence on construction workers’ attitudes, perceptions and behaviours and managers’ safety practices in Pakistan. This aspect has so far not been studied. It is

therefore intended that this research study develop a national culture questionnaire, so as to: (a) explore the four defined dimensions of national culture with particular reference to Pakistan's construction industry; and (b) study the influence of those national cultural dimensions on the behaviour of construction workers and management safety practices. The development of a national culture questionnaire in the context of construction safety, for construction workers and managers, is discussed in Chapter Five.

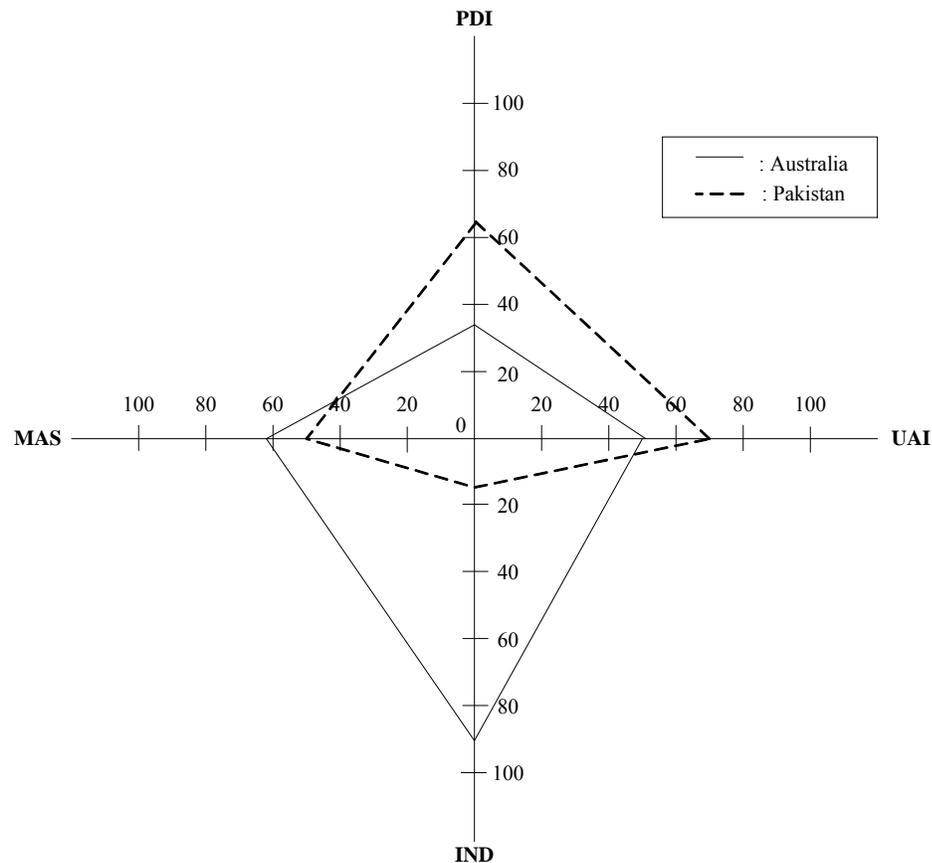


Figure 3.1 Mapping Pakistan and Australia on Hofstede's Dimensions
(Adapted from Hofstede, 1980)

Chapter 4

Pakistan

Chapter Four, unlike the previous chapters, provides a general overview on Pakistan so as to provide the reader with a broader knowledge of the country and its salient features. This overview includes; Pakistan's geographical location, state of economy, its national cultural trends, factors that influence national culture, and prevailing construction safety and health conditions.

4.1. Overview

Pakistan (figure 4.1), located in Southeast Asia, is a developing country that was born on 14 August 1947, as a result of the partition of British India. The total area of Pakistan is 803,940 sq. kilometres, which comprises 778,720 sq. kilometres of land and 25220 sq. kilometres, of water (Government of Pakistan, 2005). Pakistan shares an eastern border with India and a north-eastern border with China. Iran makes up the country's southwest border, while Afghanistan runs along its western and northern edge. The Arabian Sea is Pakistan's southern boundary, with 1,064 kilometres of coastline. Refer to figure 4.1 for the geographical map of Pakistan

The total population of Pakistan is 140.5 million, with a male/female ratio of 52.50:47.50. At an increment of 2.1 per cent per annum, Pakistan has one of the world's highest population growth rates. Two-thirds of the population lives in villages, with agriculture as the main source of livelihood. The density population per square kilometre is 156 persons. The literacy rate is estimated to be 36.8 per cent. Per capita Gross Domestic Product (GDP) is around 2,146 US dollars (Central Investigation Agency, 2005). According to government statistics, the labour force in Pakistan was estimated at 39.4 million in 2003; out of which the industrial labour force constituted 6,005,487; while agriculture represented 17,518,204 and service

10,586,309. About 67 per cent of the total urban population of the country lives in twenty-eight (28) cities with populations of 100,000 or more, further 57 per cent of the total urban population lives in twelve (12) cities with populations of 200,000 or more.



Figure 4.1 Map of Pakistan

Pakistan is a federation of: four (4) provinces (Punjab, Sindh, North-West Frontier Province, and Balochistan); the Federal Capital Area of Islamabad; and some federally administered regions. Of the four provinces, Punjab, - with 25.8 per cent of the land area of the country, has 56.5 per cent of the total population; Sindh, with 17.7 per cent of the land area, has 22.6 per cent; North West Frontier Province (NWFP), (including federally administered tribal areas (FATA)), with 12.8 per cent

of land area, has 15.7 per cent; and Balochistan, with 43.6 per cent of land area, has 5.1 per cent. Punjab is thus the most densely populated province (240 persons per sq km), followed by Sindh and the NWFP. Balochistan is the least populated province, with 19 persons per square kilometre. Administratively, the provinces are made up of divisions, which are further divided into districts of small sub-divisions.

The government of Pakistan is a bicameral system of government, with a President as head of state and a Prime Minister elected by members of the National Assembly. According to the constitution of Pakistan elections are to be held every five (5) years, with every graduate Pakistani over the age of 21 entitled to elect representatives from each constituency. Elections are also held concurrently to elect members of the four (4) Provincial Assemblies for each province. A higher chamber, the Senate, is then elected on the basis of representation from each Provincial Assembly. Together the electoral college of the National and Provincial Assemblies elect the President of Pakistan, who has extensive powers due to amendments to the 1973 Constitution of Pakistan. Local government plays no role in the elections of either the Senate or the President, nor within the political and electoral structure of Pakistan.

The country's political and electoral system is loosely based on the principles from the British Westminster model, which is prevalent in most countries that have been colonies of the United Kingdom of Great Britain. A thriving multi-party system exists at both the national and provincial levels in Pakistan. Hundreds of parties exist within the political arena, often with scores of candidates contesting one assembly seat.

Pakistan is a multi-ethnic and multi-linguistic state; it has six (6) ethnic groups and eight (8) regional languages. Urdu, the national language, is the language of instruction in secondary schools. English is widely used in commerce and business, and continues to be the official language of Pakistan. It is also the language of instruction at the higher levels of education, particularly for the science and technology fields (CIA, 2005).

The economy gathered greater momentum during the fiscal year 2003-2004. Indeed the acceleration in growth was accompanied by a sharp pick-up in industrial production, a strong upsurge in investment, and a further strengthening of the external balance of payments; such were the hallmarks of that year's performance. Real GDP growth also surpassed the target (5.3 %) with a headline number of 6.4 percent, compared with the previous year's (2002-2003) 5.1 percent rate. This buoyant growth was aided by a 13.1 percent and 5.2 percent growth in the manufacturing and services sectors, respectively. Another star performer was the construction sector, registering a growth rate of 7.9 percent against a target of 5.4 percent. Construction and housing has been identified as one of the major drivers of growth within Pakistan; the government has taken various budgetary and non-budgetary measures to boost this sector, which has responded positively, despite higher input prices (Government of Pakistan 2005).

The land of Pakistan is of much splendour. The scenery changes northward from coastal beaches, lagoons and mangrove swamps in the south to sandy deserts, desolate plateaux, fertile plains, dissected upland in the middle, and high mountains with beautiful valleys, snow-covered peaks and eternal glaciers in the north. The variety of landscapes divide Pakistan into six (6) major regions: the North High Mountainous Region; the Western Low Mountainous Region; the Balochistan Plateau; the Potohar Uplands; the Punjab; and the Sindh Plains.

4.2. Pakistani Culture

Despite its unique cultural set-up, a large and capable workforce, liberal privatisation and investment policies, and strategic geographical importance (gateway to Central Asian Republics), Pakistan has been largely ignored in previous management research (Khilji, 2001). Very little literature is available addressing either Pakistan or the different aspects of its culture, in practice. Published works identified by the author focused on Human Resource Management (Khilji, 2001, 2002, 2003, 2004), administration and leadership style (Islam, 2004), and governance and civil society (Malik, 1994).

Pakistani culture, like that of many developing countries, has been characterised as collectivist, inclined towards moderate masculinity, high uncertainty avoidance and high power distance (Hofstede, 1980,1994; Khilji, 2001). These characteristics imply that, within such a culture, there is a general unquestioning respect for authority, people integrate in the form of cohesive groups, and are emotional. Indeed Pakistanis have been found to score halfway along the masculinity index (Hofstede, 1980,1991), which suggests that people exhibit the tougher qualities usually associated with men (being aggressive, ambitious and competitive) on the one hand, and feminine qualities (modesty and caring for others) on the other. The evidence suggests the inclination is definitely towards masculine qualities (Khilji, 1999).

Research has proven that social institutions (such as family, education and surrounding environments) as well as many other factors, influence individuals from early childhood (Khilji, 1999). In her study, Khilji (1999) describes Pakistani culture as a mixture of religion (Islam), origins (Indian), and inheritance (British), with some American influence. She claims the described characteristics of Pakistani culture in Hofstede's study are based on a mixture of such ingredients. The following is a brief overview of all these factors, as studied by Khilji (1999), which contribute to the creation of the Pakistani national culture.

Religion: Islam

As Pakistan emerged from a belief in the ideology of Islam; thus the assumption about the influence of religion on the Pakistani culture appears to be prominent. Tayeb (1997) in his study on HRM in organisations, argues that, within a predominantly Muslim country, Islam, through national culture, influences organisations. Arguing further, he claims that, in those countries, HRM (being a part of organisational culture) would also be influenced. Khilji's (1999) study showed that this was not in the case in Pakistan. She found only a limited influence of religion on the composition of Pakistani national culture. She reinforced the findings of Ahmed (1996), that the influence of religion within Pakistani organizations is limited to its basic or outer shell. Examples are: allocation of prayer rooms in all working areas, so that employees can say their prayers during office hours; extended lunch break hours or even shorter office hour times on Fridays so as to facilitate the

saying of Friday prayers. Additionally, shorter hours are allowed during the holy month of Ramadan (the month of fasting) (Ahmed, 1996; Malik, 1996). Further, Latifi (1997, as cited in Khilji, 2003)), concluded that Pakistan (as in other Muslim countries) has become localised due to the overshadowing impact of other influences. Therefore, it can be argued here that religion has not been such an influential factor in shaping the norms of behaviour for society in general, as the people have adopted religion to a certain limit; that is religion is part of their routine life, rather than being embedded in their life style and their beliefs.

Origin: Indian

Pakistan, having formally been a part of the Indian sub-continent, and once dominated by Indian culture, still exhibits prevailing customs and traditions that form the infrastructure of its society, which can be traced back to Indian origins. The influence of the Indian origin can easily be detected in the general lifestyle of Pakistanis, whether rich, poor, old or young. Examples which include the “family-centred” nature of social setup; obligations to family, include both financial and ritual practices, roles expected of women, and the manner in which children are raised, especially the males. Children are expected to always be obedient to their elders (parents, teachers and significant others). Lyon (1993) refers to such a pattern of dependence (upon elders) as pervading all human contact, with the people having a strong need for dependence/security. Islam has been successful in influencing some of the inherited Indian prevailing culture, like the elimination of the caste system; and the forming of family-like ties even with those who are not biological relatives; however, it is still felt that Islam, has not been fully absorbed into the many aspects of daily life.

Inheritance (British Rule)

Being a colony under British rule for almost a century, the sub-continent embraced some of the predominant cultural effects. Some can still be observed in different aspects of people’s day-to-day lives. The creation of an elite class in society, notably the feudal and civil servants, is the main example of such influence. The elite class exemplifies money, power and status. Meanwhile, the non-elite struggle for the fundamental rights of justice and democracy (Khilji, 2004). As with their

counterparts in the colonial era, law and law-enforcing bodies also protect the affluent and the powerful. Such inequality causes frustration among the general public, who hold that there are no checks and balances to curb the power of the influential (Hussain, 1999). Over the past few decades, the relatively small, educated elite has increasingly been displaced by an educated middle class, but without, bringing an essential change of attitude (Khilji, 2003).

American Influence

Since the creation of Pakistan, the United States of America has been perceived as the most significant foreign player in its politics, and probably the most vital element in the formation of various economic and foreign policies (Hussain and Hussain, 1993). In particular, following the Russian invasion of Afghanistan in the 1980s, cultural influences peaked as Americans came to Pakistan and Pakistanis also found the way to America. (Khilji, 1999). Such exposure brought many American ideas into some of the more limited aspects of life, like the schooling systems and organisational management systems. Zakiria (1994, as cited in Khilji, 2003) and Khilji (1999) observed that Pakistani managers now preferred the American style of management, because of its more progressive and more result-focused approach over the old, slow, and bureaucratic systems Pakistan seems to have inherited from the British. However, American cultural influences did not have a great effect on the overall general public lifestyle and behaviour. Though always impressed by American style talking, clothes, and movies, their own religious restrictions meant that it was not embraced completely.

It is clear from the above discussion that four (4) different ingredient factors influence (to differing degrees) how Pakistanis shape their national culture. These ingredient factors both complement, and or conflict with, each other. Khilji (2003) observes that the first two factors, religion and origin (i.e. social set up) are embedded to a certain level of emotional experiences of childhood, education and upbringing, and permeate in a pervasive subconscious manner; whereas the third and fourth factors contribute as an influencing factor only when Pakistani people acquire knowledge and make informed choices.

4.3. Pakistani Construction Industry

The construction and engineering service sector is one of the most neglected sectors within Pakistan, although Pakistan's construction industry contributes greatly towards the GDP and employs about 9 % of the total labour force (Labour Force Survey Report-Government of Pakistan, 2001). Table 4.1, presents a spot analysis of the construction industry of Pakistan showing the total number of construction companies; share in GDP; and contribution to employment.

Table 4.1 Spot analysis of the construction sector in Pakistan (Board of Investment, Government of Pakistan, <http://www.pakboi.gov.pk>)

<i>Spot Analysis of the Construction Sector in Pakistani</i>		
Category	Number of Company Registered	Project Cost Limit
C-1	242	No Limit
C-2	127	Up to Rs.100 Million
C-3	900	Up to Rs.50 Million
C-4	769	Up to Rs.20 Million
<i>Contribution to Employment</i>		
Total Employed Labour Force	38.9 million.	
Construction Sector Share in Total Employment	3.50 million (8.97%)	
Construction Share in GDP	3.5 %	
Foreign Direct Investment (July-April 1999-2000.)	US\$ 16.1 million	
Import of Construction Machinery	US\$ 67.9 million	
Average turnover per year	Rs 250 billion	

1 US \$ = 61 Pak Rs (Approx.)

The industry consists of public and private sector clients, design, management, and construction specialists. Many foreign-originated construction firms (such as Chinese, Singaporean, American, Australian, and Italian) also operate within the country on various projects ranging from large infrastructure projects to local road projects.

As mentioned earlier, this industry is more labour intensive, with moderately less use of mechanisation. Therefore, compared with other industries in Pakistan (like the manufacturing industry) this industry is labelled as being backward because of its relative lack of use of the latest advances in technology, management styles and procedures. Indeed it invests very meagre amounts in research and development, which hinders the industry's ability to adopt new technology and processes.

Despite the use of less mechanisation, Pakistan's construction industry is still characterised as pressured and adversarial, with long working hours comprising underpaid jobs. Further, construction projects in Pakistan generally: run over time and over cost schedules; do not necessarily meet user expectations; and often require remedial works due to construction defects. Usually finance, time schedules and standards of work are the main conflicting issues, leading to project disputes and thus litigation.

Most clients demand high speed, high quality work at the lowest cost. Time and financial pressures often mean that the client does not give sufficient time for preparation of the design. Costs are affected by the standard of workmanship specified, the complexity of the work and the contract conditions.

The working pattern of the local construction industry has the same conventions as other construction industries elsewhere. Consultants (architects and engineers) usually work directly for the client, and their appointment is made well before that of the contractors. These consultants help the client to finalise the design and construction cost, and to choose the appropriate type of contract.

As with other developing countries, the fact that the government is a major public sector client has a profound effect on Pakistan's construction industry, both directly and indirectly.

Pakistan's construction industry consists of around 24,000 construction companies, registered with the Pakistan Engineering Council (PEC), a statutory body, constituted by the government of Pakistan. Its major functions include:

- Registration of professional engineers; and
- Registration of construction and consulting firms for public and private contracts.

In Pakistan, it is a legal obligation for every construction and consultant firm to obtain a practicing licence, which must be renewed annually. This licence allows the firms to bid for all types of public and private projects according to bid limitation allocations (refer to Table 4.1).

Large contracting organisations registered in Category *CI* (Table 4.1), usually dominate the market in terms of the value of the contracts won. Most of the time, the construction work is then sub-contracted, to facilitate completion of the project. Small contracting organisations are mostly interested in securing contracts for the maintenance and repair of government buildings, roads and some small-scale building projects, and always prefer to restrict their bidding for small portions of either large-scale local or internationally-funded projects. This approach can be attributed to a shortage of resources, such as finance, and technical or non-technical staff.

Pakistan's construction industry's workforce is male dominated; has a very low literacy rate (limited to some reading and writing abilities); has low pay with long working hours; and indulges in dangerous manual work. These workers are of transitory nature, usually migrating from rural areas. Their employment within the construction industry is often for the short-term, intermittent, and generally involves living away from home for months on end. Females have much less or limited involvement in construction works. Interestingly some cities in Pakistan are famous for their workforce in procuring speciality work on projects. For example, the general un-skilled labour from the northern part of the country is always considered a reliable workforce for scaffolding work and also for other tough jobs on construction sites. The workforce from another town "*Mianwali*" usually dominates the surveying and levelling works in mega projects. Dominancy of kinship or family systems in workers trades is another worth mentioning factor here. Thus workers

usually prefer to work within family or tribe systems, as they feel more comfortable and confident in such environments.

4.4. Construction Safety Practices in Pakistan

The regulatory environment in Pakistan, which comprises safety laws, regulations, procedures, and policies, has prime importance in safety management systems. Evidence has been found, in many research studies that workers' perceptions relate to a reduction in accident rates within an existing regulatory environment (Gun, 1993; Cox and Cheyne, 2000).

Nevertheless, Pakistan's construction industry lacks formal safety management systems and effective health and safety regulations. Though the industry contributes 3.5 % towards GDP and holds 9 % share of the total labour force (refer to Table 4.1), most of labour laws still do not apply to this sector. As a consequence construction workers are not provided with the protection available to industrial workers. The absence or deficiency of such a set of safety regulations adversely affects the enforcement of safety on the job site, thereby resulting in more vulnerable conditions in the Occupational Health and Safety (OHS) area for workers. Construction and safety laws are also fragmented; no single comprehensive piece of legislation dealing with occupational safety and health exists. The methods for the setting of standards, codes of practice and occupational exposure limits, have not been identified.

The main law governing Occupational Health and Safety (OHS) is the *Factories Act 1934*. The *Hazardous Occupation Rules of 1978* regulate certain occupations as hazardous, and contain special provisions to regulate the working conditions in those occupations. Unfortunately, construction has never been added to such laws or provisions. Other laws dealing with OHS are:

- *The Mines Act 1923;*
- *Workmen's Compensation Act 1923;*
- *Dock Labourer Act 1934;*
- *Social Security Ordinance 1965; and*
- *Shop and Establishment Ordinance 1969.*

Regrettably, the health and safety measures prescribed in most of the above laws have not kept pace with the rapidly changing times, conditions or industry requirements. Many of the sectors, with serious OHS hazards (including those with most of the workers) are not covered by these laws, even though they contain very few technical standards. These laws urgently require revision and updating (Awan, 2001).

Additionally, due to the lack of enforcement of labour laws, the majority of construction accidents are not reported to the Labour Department. Usually only those incidents that result in fatalities, or gain media interest, are reported. It therefore seems unlikely that available occupational health and safety data would be reliable. Thus, without the proper information on the basic causes of accidents and injuries, it is difficult to initiate effective measures to reduce the frequencies of accidents, or to improve the overall safety standards within the construction industry of Pakistan. Further, as the majority of construction companies belong to the private sector, and due to limited financial and technical resources, poor working conditions are quite common. From the interviews held with site engineers and foremen in this study, it was clear that existing training techniques are infrequent and of a poor quality.

From the site visits, the author observed that generally, on-site personnel (and, at management level, clients and contractor organisations) are not too concerned with safety requirements. Smaller contractors rarely pay attention to basic occupational health and safety requirements, safety training or site safety induction talks. Site inspection services are not of an adequate standard to recognise and evaluate occupational hazards.

Large multinational construction organisations based in Pakistan, which are usually involved in the construction of mega-projects, and form joint ventures with foreign / local firms, have compiled their own site safety manuals. In these manuals some of the standards have been adapted from different safety manuals provided by the American organization for Occupational Health and Safety Administration (OHSA) and the American Society of Civil Engineers (ASCE). However, this approach lacks

consistency as it is not uncommon for the local organizations to select different items / parts of the international standards to minimise risk exposure. For example, sometimes, in these manuals, the main contractors are held responsible for safety, while at other times it is the responsibility of the client. Thus there is no uniform policy for developing and revising safety manuals. Only in government projects It is necessary for the contractor to insure his workforce against accidents, and thus be eligible for the contract; such is not the case for the private sector, where no one takes responsibility for an accident due to the lack of safety procedures. As a result, the construction industry is a fertile ground for costly disputes and claims, which badly affects the performance of the projects, and the industry as a whole.

The same is true for many international construction companies, which are operating in Pakistan; the country could inherit their mature safety culture. However, as the government and overall regulatory environment does not adequately support safety issues, this approach assuages the function of the international firms in terms of their safety planning and procedures. Such omissions give international companies a good opportunity to increase their profit margin by cutting down their safety costs / investments.

The high illiteracy rate among the workforce can also be identified as one of the main causes for poor health and safety status in Pakistan. Illiteracy does not allow workers to become familiar with occupational health and safety issues. Further, the presence of “irresponsible attitudes” by some workers, not only towards their job but towards the workplace as well, is another factor in reducing or eliminating the potential safety culture. The workers have little experience or skills in specialised construction industry. Examples of the impact of culture are: the popular use of bamboo scaffolding; working barefooted on construction sites; and the mixing of concrete with bare hands. These and other behaviours would never be acceptable as safety and health practices within developed countries; In Pakistan, these practises are not only well-accepted, but have become part of the construction culture.

A lack of expertise at the policymaking level has resulted in a lack of development for effective and practical safety rules and a positive climate for safer worksites.

There is no formal education available. Indeed, there is no national focal institution that can provide training and advisory services to the workforce. However, and to the best of the author's knowledge, there are a very limited number of local institutions, such as the *Centre for Improvement of Working Conditions and Environment (CIWCE)*, which provide basic occupational health and safety training. This centre though a provincial government department, strives hard to enhance safety and health awareness in all labour-based industries (manufacturing, construction, chemical, etc). Presently, CIWCE is providing general as well specialised safety training to workers and managers throughout Pakistan.

Additionally financial constraints within the construction industry are also a major factor of the unsafe performance of the worker, as are job security and low payment rates. Such factors push the worker to take extra risks and work overtime. When a worker is aware of the short-term nature of employment, their priority will be to get more hours for work so as to earn more money for their livelihood. Therefore, they find little or no justification for becoming concerned with safety policies and other related safety issues; to them it is nothing but a waste of time.

Chapter 5

Research Methodology

5.1. Introduction

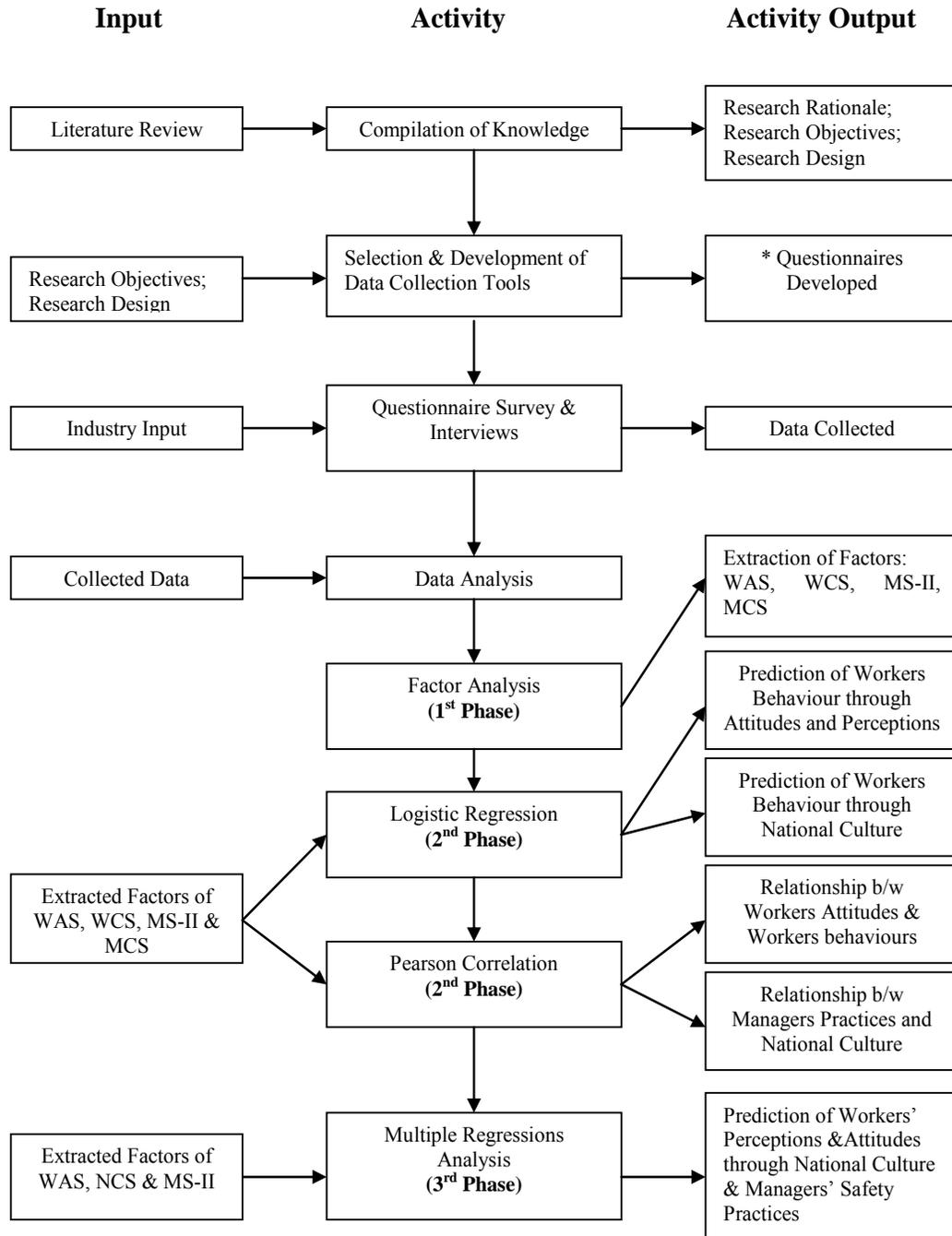
Chapter five presents the research methodology used to explore the influence of national culture on safety climate within Pakistan's construction industry during the course of the thesis. A schematic representation of the research activities and their expected output are depicted in Figure 5.1.

5.2. Methodology

The methodology adopted for carrying out this research is described below:

- Compilation of relevant knowledge; and
- Selection and development of data collection tools (instruments);
- Data collection:
 - Selection of sites and samples; and
 - Data collection process;
- Data analysis:
 - Phase 1: Extracting factors representing workers' attitudes and perceptions; managers' safety practices and main aspects of workers' and managers' national culture through undertaking factor analysis for four different questionnaires.;
 - Phase 2: Predicting workers' behaviour through their perceptions, attitudes and cultural dimensions and correlation between attitudes and cultural dimensions (using Binary logistic regression and Pearson correlation); and

- Phase 3: Predicting workers' perceptions and attitudes through national culture dimensions, and managers' safety practices (using multiple regression analysis).



* WAS, WBS, WCS, MS-I, MS-II, MCS, and NCS [WCS+MCS] (For questionnaires' description refer to Figure 5.2)

Figure 5.1. Research Activities and Expected Output

5.2.1. Compilation of Relevant Knowledge

The literature review, which always acts as a sound foundation for a PhD research, was undertaken on construction safety management and related topics, including safety management performance and its measurement. Additionally, a detailed literature review was conducted on national culture, its different existing models and related dimensions.

5.2.2. Selection and Development of Data Collection Tools

The majority of research within the social sciences and management spheres involves: asking and obtaining answers to questions through conducting surveys of people; using questionnaires, interviews (face-to-face interviews or telephone interviews); and case studies (Fellows and Liu, 1997). There is a finite supply of resources available for carrying out fieldwork, especially when those resources are restricted. Therefore, a decision on the choice of a research method is necessary. The choice is affected by a consideration of the scope and depth required. According to Fellows and Liu (1997), the choice is between a broad, but shallow, study at one extreme and a narrow in-depth study at the other, or a study intermediate of these extremes.

Survey research was selected as an appropriate method for data collection in this study. Where a combination of facts and opinions is to be obtained, Dane (1990) stated that survey research is the most appropriate. Moreover, survey methods are most appropriate for description and prediction. Further, because surveys rarely involve manipulation of independent variables or the random assignment to conditions, they are not generally used for testing cause-effect hypotheses. Survey research includes methods in which participants are asked questions directly through questionnaires or interviews.

The data collection instruments used in this study were simple and concise, so as to facilitate the process involving respondent understanding and respondent responses at the same time. For ease of understanding this section is graphically explained in Figure 5.2

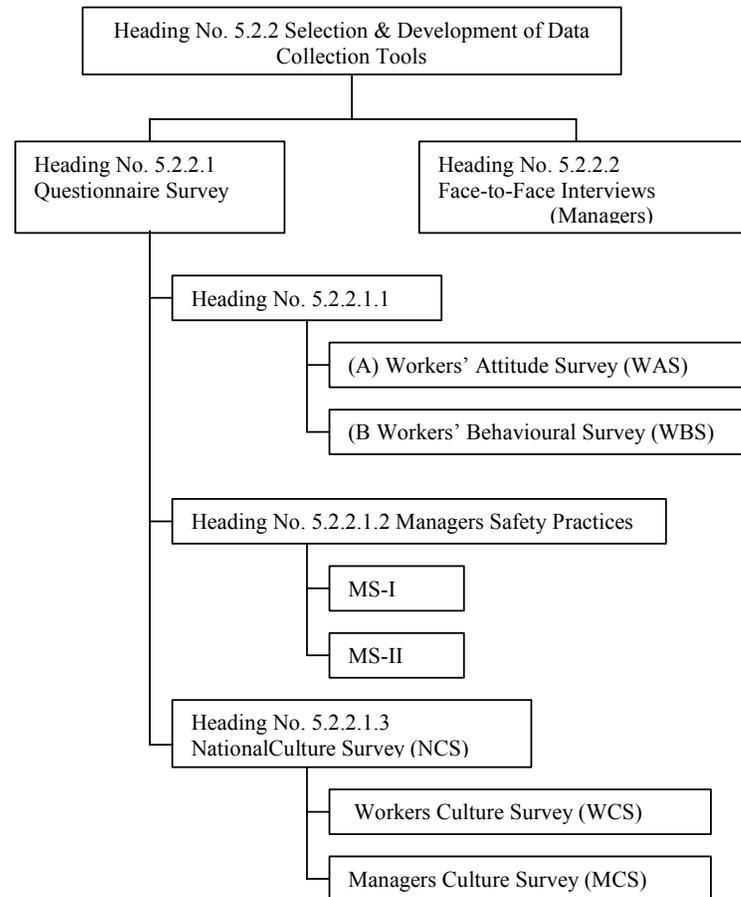


Figure 5.2 Flow Chart for Section 5.2.2 Depicting Developed Surveys

5.2.2.1. Questionnaire Survey

A questionnaire is a preformatted written set of questions to which respondents record their answers. The questionnaire is an efficient data collection mechanism when the researcher knows exactly what is required, and how to measure the variables of interest (Sekaran, 1992). Questionnaires can be administered personally or mailed to the respondents. When the survey is confined to a local area and to certain respondents, and the organisation is willing and able to assemble groups of employees to respond to the questionnaires at their work places, personally administering the questionnaires is the best way to collect the data. Any doubts arising from the survey questions can be clarified immediately when personally administering questionnaires. Moreover, the researcher also has the opportunity to

introduce the research topic and motivate respondents to give honest answers. As questionnaires are commonly used in surveys, it is thus necessary to know how to design an effective questionnaire. In designing the questionnaire for this research study, the following three (3) areas, as identified by Sekaran (1992), were kept in mind:

1. The wording of the questionnaire;
2. How the items are to be categorized, scaled and coded after the questionnaire responses are received; and
3. The general appearance of the questionnaire.

In the construction industry, Safety Climate is one of the most popular methods of measuring safety management performance (as discussed in Chapter Three). To assist in this process a popular and effective method to explore workers and managers attitudes and perceptions is the questionnaire survey. (The rationale for identifying specific choice for such a tool has been discussed in Chapter Three.)

Recent investigations by Flin *et al.* (2000), McDonald *et al.* (2001) and Mohamed (2002) have made a significant contribution towards developing the structured questionnaire surveys adopted for this research study. The surveys were developed to investigate attitudes, perceptions and behaviour of Pakistani workers, regarding safety at local construction sites, as well as management practices (i.e. research objectives: Nos: 1 and 2).

For this research study, five (5) distinct questionnaire surveys were developed, as shown in Figure 5.1:

1. Workers Surveys
 - Workers' Attitude and Perception Survey (WAS)
 - Workers' Behavioural Survey (WBS)
2. Managers' Safety Practices Survey (MS):
 - Survey – I
 - Survey – II

3. National Culture Surveys:

- Workers' National Culture Survey (WCS)
- Managers' National Culture Survey (MCS)

Each of these surveys is discussed in detail in the following sections.

5.2.2.1.1. Workers' Survey

A recent study, conducted by McDonald *et al.*, (2001) on safety behaviour within the Irish construction industry, investigated whether perceptions, attitudes and behaviour were associated with safety for a sample of eighteen (18) sites. This particular study made a significant contribution towards developing the structured questionnaire surveys adopted in this Irish study. Consequently, two-part, interview-based questionnaire surveys were developed targeting "front line" workers, who are considered to be the main agents for reporting on safety in the workplace, in order to investigate:

- Part (A) Perceptions and attitudes of workers regarding safety at construction sites; and
- Part (B) Safe work behaviour of workers at construction sites.

(A) Workers Attitude, Perception Survey (WAS)

As explained earlier in Chapter Two, Section 2.3, the items for questionnaire survey for part (A) were taken from a literature review and recent studies conducted by Flin *et al.* (2000), McDonald *et al.* (2001) and Mohamed (2002). To demonstrate, Flin *et al.* (2000) study helped in identifying the themes of safety climate, which assisted in exploring the perceptions and attitudes of Pakistani construction workers. The studies by McDonald *et al.* (2001) and Mohamed (2002) aided the development of the items; helped match the themes to develop the questionnaire, which comprised twenty five (25) statements dealing with perceptions of workers, management's commitment toward safety, perceptions of safety management systems, workers' risk perception and competence, physical work environment, safety supervisions and inspections, and relationships. (See Appendix A for the WAS questionnaire)

For each statement, workers were required to express the level of their agreement (provided the item was relevant to their particular trade) on a five-point Likert-type scale (where 1= *strong disagreement*, and 5= *strong agreement*).

(B) Workers Behavioural Survey (WBS)

A literature review on the causes of fatal construction accidents revealed that falls from height was the leading cause of death. Berg (1999) found falls were the main cause of fatalities within the construction industry (worldwide). Davies and Tomasin (1996) reported that 70 - 80 % of all fatalities in the United Kingdom (UK), each year were attributed to falls. A study by Shah (2003) on the causes and types of accidents within Pakistan's construction industry showed falls as a significant type of accident. Although official statistical data on construction accidents in Pakistan is not available as such, from the basis of the literature review an overview of the situation was gained. A few studies (Kartam and Bouz, 1998; Pipitsupaphol and Wantanabe, 2000; Awan, 2001; Lubega *et al.*, 2001) conducted on the types and causes of construction accidents within developing countries, which reflects a similar operations environment to Pakistan, has highlighted that the category of falls from height is the most frequently occurring type of accident. Therefore the instrument was developed to explore workers intentional behaviour by asking them questions regarding falling from height (See Appendix B for the WBS questionnaire). The procedure of behavioural questionnaire development is explained in the following section.

The three (3) most common scenarios of working at height were identified from the literature review. These were:

- (a) Working on scaffolds;
- (b) Using ladders; and
- (c) Working on roofs.

Each of these were then classified into three different situations related to each scenario. These nine (9) situations are as follows:

(a) Working on Scaffolds

- Situation 1: Working on scaffolds not totally boarded [SS1].
- Situation 2: Working on scaffolds with missing guardrails [SS2].
- Situation 3: Climbing up or down a scaffold when a ladder has not been provided [SS3].

(b) Using Ladders

- Situation 4: Using a ladder not tied or secured [LS1].
- Situation 5: Using a ladder broken or somehow defective [LS2].
- Situation 6: Using a ladder shorter than 1 metre above landing place [LS3].

(c) Working on Roof

- Situation 7: Working on fragile roofs without crawling boards [RS1].
- Situation 8: Working on roofs without edge protection (and no harness provided) [RS2].
- Situation 9: Working on roofs in bad weather [RS3].

The workers were presented with these nine situations and were requested to analyse each from three perspectives. They had to: 1) evaluate their perceived level of risk for each situation (low risk, medium risk or high risk); 2) state the frequency at which these situations occur in the construction sector and at the present site (rare, usual or frequent); and 3) predict their intentional behaviour if the situation occurred on the site “today” (stop working or continue working). To determine their level of experience, workers were asked about the frequency at which they worked on scaffolds, with ladders and on roofs. Only those workers who reported working in those specific areas either “sometimes” or “often” were allowed to answer questions on the three specific situations in the relevant categories.

5.2.2.1.2. Management Survey

According to Mearns *et al.* (2003), the examination of safety management practices should be considered an adjunct to the assessment of safety climate within an organization. During the past decade, there has been increased interest in trying to understand how management practices and organizational factors impact on workplace safety. Research has focused on managers as role models for instilling

safety awareness and supporting safe behaviour (Flin *et al.*, 1996; Mattila *et al.*, 1994). Advocating the importance of safety management systems and practices, Hofmann *et al.* (1995) described individual attitudes and behaviours in safety climate as micro-elements of an organisation. These micro-elements are themselves determined by macro- elements of an organization, like safety management practices. Kirwan (1998) relates safety management practices to the actual practices, roles and functions associated with remaining safe. It is therefore more than a “*paper systems*” of policies and procedures (Mearns *et al.*, 2003). Duff *et al.* (1993) and Robertson *et al.* (1999) carried out a two-phased study on the effectiveness of different management strategies. Specifically, they looked at the effects of feedback, goal setting and training, on safety performance. Duff *et al.* (1993) concluded that management commitment was an important moderator of the effectiveness of the management practices. While six years later, in phase two of their research, Robertson *et al.* (1999) also found that the techniques used produced marked improvements in site safety, with participative goal-setting being the most effective of the three and recommended a continuous and consistent management commitment along the life-cycle of the site commitment as “*vitaly important*”.

Tam and Fung (1998) studied the effectiveness of safety management strategies of 45 construction firms in Hong Kong. Their study identified seven (7) management strategies to reduce accident rates on sites. The strategies were: level of management responsibility; orientation programmes; safety personnel on site; safety awards and incentive schemes; post-accident investigation and feedback; safety training and its intensity; and presence of safety committees.

Lingard and Rowlinson (1998, cited in McDonald *et al.*, 2001) used a similar design to Duff *et al.* (1993) in the Hong Kong construction industry. They reported highly significant improvements due to site housekeeping as a management strategy. They concluded that, “*in behaviour-based safety management programs... safe behaviour can only be achieved where a basic safety infrastructure is already in place*”.

To investigate the role-played by management, and the safety related activities/practices carried out by management, a structured survey was conducted.

This structured questionnaire, taken from the study of McDonald *et al.* (2001), explored the following areas of management practices:

- Existence of proper safety action plan;
- Workers, managers and subcontractors competence and training;
- Safety monitoring and accident reporting systems;
- Communication systems within the workplace;
- Assumptions about the responsibility for safety; and
- Co-operation of the main contractor with sub contractor/s and vice versa.

Additionally, each management staff was asked for their personal and professional information background (i.e. age, job title, experience in construction and safety training received). Finally management was asked to provide personal suggestions for improvements to the safety systems at the site.

The sample included managers with safety management responsibilities (project managers, project engineers, site engineers and site supervisors). The questionnaires had both qualitative and quantitative items that evaluated the key features of the managers' safety practices. Managers' questionnaires were of two types. Type one questionnaire, labelled as managers' survey-1 (MS-I), contained a detailed format of questionnaire addressing the key issues of the management safety systems. It included open-ended and close-ended questions. The open-ended questions were provided with a view to obtain as much as information possible about site safety conditions and plans. This questionnaire also had several quantitative measures (Keys) built into it. These quantitative measures (Keys) were provided to facilitate the intention to translate the qualitative impressions gathered after each interview into some measurable rating scales (See Appendix C for the MS-I questionnaire). The second questionnaire was labelled as managers' survey-II (MS-II); it was the summary of the first, and was developed to confirm the respondent is bias. The second questionnaire acted as a counter check tool for the results from the first questionnaire. The second questionnaire contained 14 closed-ended type statements, which addressed key safety issues of management systems. For each statement, management were required to express the level of their agreement on a five point Likert-type scale, where 1 = *strong disagreement*, and 5 = *strong agreement* (See

Appendix D for the MS-II questionnaire). The collected interviews for MSI were transcribed and a single and comprehensive description of the safety management systems was then generated from that questionnaire. Those generated descriptions were matched with the answers given by the same respondents to MSII.

5.2.2.1.3. National Culture Survey (NCS)

In order to explore the main aspects of national culture in workers and in managers, a national culture questionnaire was developed for both samples (Workers' Culture Survey (WCS) and Managers' Culture Survey (MCS)). It contained twenty five (25) statements dealing with the four identified dimensions of Hofstede's (1980) study. These dimensions included: power distance, individualism, masculinity and uncertainty avoidance. The statements of the cultural questionnaire were developed primarily from the values survey module (VSM) of Hofstede (1980). A few items referred to the themes of power-distance and uncertainty avoidance and were adopted as well from the study by Van Oudenhoven (2001). All these statements were modified to reflect the context of construction safety management, and in order to investigate how culture could affect safety perceptions and attitudes. For each statement, workers and managers were required to express the level of their agreement on a five point Likert-type scale, where 1= *strong agreement*, and 5= *strong disagreement* (See Appendix E for the NCS questionnaire).

5.2.2.2. Face-to-Face Interviews

The main advantage of face-to-face or direct interviews is that the researcher can adapt the questions as necessary, clarify doubts, and ensure the responses are properly understood by repeating or rephrasing the questions. However, the main disadvantages of face-to-face interviews are the geographical limitations they may impose on the surveys, and the vast resources needed if such surveys need to be conducted nationally or internationally.

5.2.2.2.1. Managers Interviews

The management staffs of 11 construction companies were interviewed face-to-face by the author to capture their thoughts and suggestions on safety issues in Pakistan.

5.2.3. Data Collection

5.2.3.1. Selection of Sites and Samples

One of the main objectives of this research was to explore the safety perceptions, attitudes, and safe /unsafe behaviours of the construction workers. Therefore it was considered desirable to select those sites which have a wide range of construction activities. Also another aspect, which made this selection task more problematic, was the perceived lack of cooperation between industry professionals and researchers. To overcome this problem the author had to initiate contacts with local industry professionals to facilitate access to a number of sites.

Keeping this limitation in mind, the eight (8) sites were selected on the following basis:

- Different Mega projects in progress, including high-rise buildings, fly-overs and bridges.
- Sufficient numbers, sizes and different trades involved.
- Personal exploration to identify construction companies running those construction sites. Eleven (11) construction companies were identified as operating those eight sites. They were selected from Pakistan Engineering Council (PEC) index for construction companies. All 11 were from the top 20 companies of Pakistan, which were rated under category C-1 (refer to Table 4.1 in Chapter Four for companies classification in Pakistan). Out of these eleven (11) companies, eight (8) were working as main contractors and three (3) as specialized sub-contractors. The selection of these 11 companies was based mainly on the assurance given for co-operation by the management of the companies working on different projects.
- Co-operation of the Labour Department of the Sindh and Punjab provinces.

Therefore it could be argued that this study was generally representative due to:

- The cross-sectional research design adopted.
- The sample not including very small sites or sites in rural areas;
- The eight (8) large construction sites operating versatile projects, such as: flyovers, bridges and high-rise buildings in three (3) major cities in Pakistan;

- The 140 workers being randomly selected, across a range of the six most common and exposed trades at hazardous sites; and
- The 130 responses from managers representing 11 construction companies being selected. This sample varied from project managers to site supervisors.

5.2.3.2. Data Collection Process

Workers Data Collection

The primary goal of this research was to investigate the perceptions, attitudes and behaviours of Pakistani workers regarding safety at construction sites. To achieve this goal, a total of eight (8) large construction projects, in a number of large cities in Pakistan, were included in the research. One hundred and forty (140) workforce members from the six (6) of the most common trades exposed to hazardous site conditions were surveyed. These trades included scaffolder, mason, steel fixer, carpenter, electrician and painter. A total of three sets (Appendices A,B and E) of 140 questionnaires were completed across the eight sites. At the beginning of each site survey, the site administration (main contractor or sub-contractor) management staffs were contacted for permission to undertake the surveys. Additionally management staff was requested to introduce the survey administrator to workers, or their respective supervisors, to facilitate the process of data collection. Each survey respondent was briefed about the objectives and nature of the study. A total of 420 questionnaires were completed across these eight sites.

A survey team of three (3) persons (including the author) was involved in administrating the survey at each site. Each interviewer approached the operative, briefed them about the objectives and nature of the study and asked for their co-operation in this regard. As mentioned earlier, on most of the sites, the management introduced the survey team, either directly to operatives or through their respective supervisors; as a consequence, operatives did not show much hesitation in extending their co-operation.

Managers Data Collection

For managers' data collection, management staff from 11 construction companies from the same 8 construction projects was interviewed. The managers' sample size included 100 management personnel for managers' safety practices questionnaires (MS-I & MS-II) and 130 for the cultural survey (MCS). The Head Offices for these 11 companies were contacted first. The project directors/project managers at the head offices were requested to participate in the questionnaire survey; permissions were granted for interviewing managerial staff at the site as well, including of project engineers, site engineers and site supervisors.

5.2.4. Data Analysis

The data collected from the questionnaire surveys and interviews were analysed. The analytical analysis was undertaken using Statistical Package for Social Sciences (SPSS) version 11.5. The analysis included: descriptive analysis, factor analysis, reliability testing Pearson correlation testing, binary logistic regression analysis, and regression analysis. (Refer to Figure 5.1 for phase-wise distribution of data analysis).

The data analysis and the results for the whole set of workers surveys are detailed in Chapter Six. Additionally, the data analysis and the results of managers' surveys are reported in Chapter Seven.

Chapter 6

Workers Survey Analysis & Results

Chapter Six exclusively discusses the procedures adopted to statistically analyse the collected data from the workers' surveys and then details all the results, along with the related tables and graphs.

6.1. Background Information

As mentioned previously in Chapter Five, 140 workers, representing the six most common trades exposed to hazardous site conditions (refer to Figure 6.1 for graphical distribution of trade classification) were interviewed using the following three (3) questionnaires/surveys:

1. Attitude and Perception Survey (WAS) - Appendix A
2. Behavioural Survey (WBS) - Appendix B; and
3. National Culture Survey (NC) – Appendix E

A total of $(140 \times 3) = 420$ survey responses were completed across eight large construction projects in three (3) large cities in Pakistan. About 62% of the sample (87 workers) was employed directly by the main contractor, while 38% (53 workers) were employed by sub-contractors. This section presents brief background information of the survey respondents. It is worth noting here that, for background information, the workers "age" criteria was not taken into account. At the initial stage of the questionnaire surveys, the author tried to ask the workers for their age, but as expected from the authors' previous industry working experience, the workers were not able to tell their correct age. As the majority of the workers working in Pakistani construction industry are illiterate, there is often no way for them to know

their age thus, to avoid any bias or confusion in the data, age was not considered for the analysis.

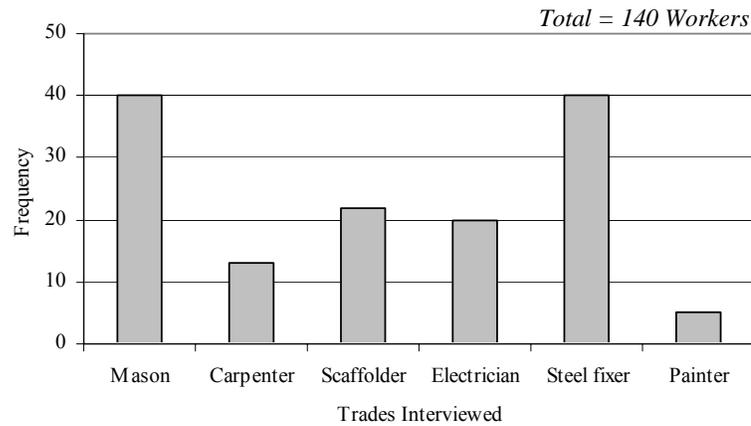


Figure 6.1 Frequency of Distribution of Trades Interviewed

6.1.1. Experience

Most of the operatives who were interviewed had a good deal of working experience in the construction industry. Out of 140 workers, 23 (16 %) had worked for 5 years or less; 50 (36 %) for around ten years; 28 (20 %) for around fifteen years; 14 (10 %) for around twenty years; and 25 (18 %) for more than twenty years. (Refer to Figure 6.2 for workers' experience distribution.)

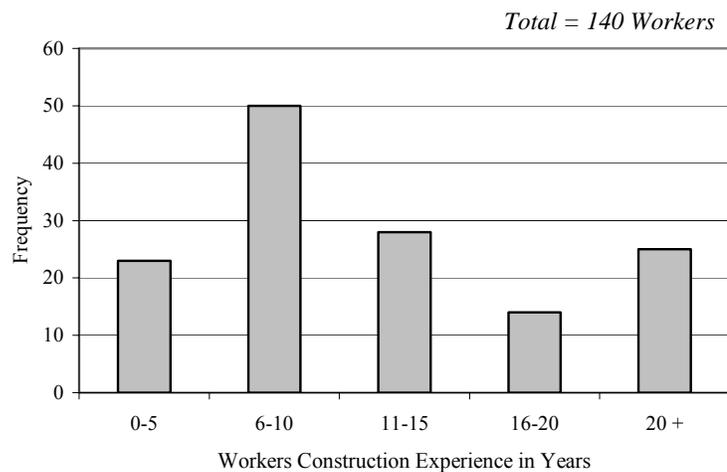


Figure 6.2 Workers Construction Experience in Years

6.1.2. Safety Training

It was observed from the replies of the questionnaires, that very few workers had basic safety training. Almost 80% of the respondents stated that they had not received any sort of safety training at all; 15.5% of the sample reported having a half-day training session, which they considered as just a basic one. The remaining 5.5% of respondents had received training for one whole day. It was interesting to observe that most of the workers with construction experience of twenty or more years had received training either for a half or full day.

6.2. Attitude and Perception Survey Analysis

As an early step in the data analysis, all questionnaire responses were checked to ensure completeness and readability before the data were processed using the Statistical Package for Social Sciences (SPSS) version 11.5. The questionnaire (Appendix A) comprised 25 variables dealing with workers' perceptions of safety-related issues. The data gathered from the WAS were factor-analysed to examine the interrelationships among the 25 variables and to reduce this number of original variables into a smaller set of factors.

6.2.1. Factor Analysis

Factor analysis, a multivariate statistical technique, is commonly used to identify a smaller number of relevant factors than the original number of individual variables. The application of this technique can reduce the data to a representative subset of variables or even create new variables as replacements for the original variables, while still retaining their original characteristics (Hair *et al.*, 1998).

6.2.2. Checks for Factor Analysis

Prior to performing factor analysis, the suitability of data for the analysis was assessed. In order to do that, the first check was to measure the adequacy of sample size. The preferable sample size should be 100 or larger. As a general rule, the minimum should have at least five times as many observations as there are variables to be analysed (Hair *et al.*, 1998). The sample size of the workers total led 140, with the ratio of 5.6 cases to 1 variable, which satisfies the specified limit. The second check was to assess the factorability of the correlation matrix via the visual

inspection of the workers' attitude survey correlation matrix. If the visual inspection revealed no substantial number of correlations greater than 0.30, then the factor analysis was probably inappropriate (Hair *et al.*, 1998). Inspection of the correlation matrix revealed that more than 60 percent of the correlations were greater than 0.30 at the 0.01 level of significance. This result provides an adequate basis for proceeding to the next level, the empirical examination of the adequacy for factor analysis.

The third check was to examine the anti-image correlation matrix; the diagonals on that specific matrix should have an overall Measure of Sampling Adequacy (MSA) of 0.50 or above (Hair *et al.*, 1998). The same criterion of MSA applies to the values of individual variables; which should be considered for elimination from further analysis if they are low on this measure (Hair *et al.*, 1998). Examination of the values of each variable revealed four variables with low MSA values (ranged from 0.36 to 0.40). The four eliminated variables were:

- *My site managers, foremen and supervisors always inform me of safety concerns and issues;*
- *Management encourages feedback regarding safety issues from site workers;*
- *Safety inspections are carried out on a regular basis; and*
- *Under work pressure, it is normal to take shortcuts at the expense of safety.*

After omitting the above variables, the MSA test was conducted again, to check the revised values for overall and individual MSA. The revised set of variables exhibited satisfactory values ranging from 0.57 to 0.92 and therefore were deemed fit for further analysis.

The reduced data set of 21 variables resulted in a Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy of 0.83, which is considered as meritorious (Kaiser, 1974). Another mode of determining the appropriateness of factor analysis, the Bartlett test of sphericity, reached statistical significance with chi-square 5904.29, df190 and significance level of 0.000. Therefore factor analysis was deemed

appropriate. Several unsuccessful attempts were made before an acceptable final three-factor solution was chosen. However, the learning experience achieved through the earlier versions helped to give confidence in the final solution as both representative of the data set and the realistic terms of interpretation. An initial capture of factors was made for the data set of workers' attitude and perception survey, using the principal component analysis approach with exploratory factor analysis through SPSS 11.5. Factor solutions without rotation were computed. The latent root criterion was used with eigenvalues equal to or greater than unity, in order to establish the number of extraction factors (Tabachnick and Fidell, 2001). This exercise revealed the presence of three (3) distinct factors. To obtain interpretable results for those three factors, a varimax rotation was then performed. Varimax rotation minimizes the number of variables that have high loadings on any one given factor.

A varimax solution yields results that make it as easy as possible to identify each variable with a single factor. The three-factor solution accounted for 79 percent of the total variance. The factors were then examined to identify the number of items that loaded on each factor. For practical significance, factor loadings were restricted to 0.50 and above (Hair *et al.*, 1998). The pattern of factor loadings revealed the presence of only one odd variable, which had a factor loading (0.35) less than the required level, therefore it was deemed fit for elimination. The eliminated variable was:

- *Working with defective equipment is not allowed under any circumstances.*

The reliability scores (Cronbach's α) were also calculated for individual factors; they ranged from 0.695 to 0.761, indicating adequate internal consistency (Kaplan and Saccuzzo, 1993). Table 6.1 details the remaining 20 variables in three factors, and their respective factor loadings, the explained variances, eigenvalues and Cronbach's α for the three factors.

Table 6.1 Factor Loadings for the 3-factor Model of Workers' Attitudes and Perceptions

Factor 1: Awareness and Beliefs	
(Variance = 38%, Eigenvalue = 7.517, Cronbach's α = .761)	
	Loadings
I find working with a certain amount of risk exciting	[.845]
I believe safe work habits improve production	[.586]
I am capable of identifying potentially hazardous situations	[.731]
Management acts decisively when a safety concern is raised	[.962]
Working safely is the top priority for site managers, foremen & supervisors	[.902]
Management "turns a blind eye" on basic safety issues	[-.739]
I am never encouraged to raise any safety concern	[.755]
I am clear about what my responsibilities are for safety	[.847]
I am aware of my trade relevant safety procedures	[.810]
I am not given enough time to do the job safely	[.861]
Personal protective equipments are useful for increasing the safety level	[.818]
Factor 2: Physical Work Environment	
(Variance = 25%, Eigenvalue = 4.790, Cronbach's α = .712)	
Construction sites are dangerous places	[-.865]
My job carries a considerable level of risk	[-.589]
I am rarely worried about being injured on the job	[-.766]
Usually I don't get the right equipment to do job safely	[.810]
All equipment and materials supplied to work are in good conditions	[.743]
Factor 3: Supportive Environment	
(Variance = 16%, Eigenvalue = 2.421, Cronbach's α = .695)	
Safety training is provided on skills specific to individual tasks and equipment	[.784]
Potential risks and consequences are identified in training	[.819]
I believe that prevention of accidents is the responsibility of everyone	[.920]
Good working relationship among the workers is often necessary for safety	[.901]

6.2.3. Factors Interpretation

As mentioned above, three factors were extracted. They were assessed and numbered in a descending order of the amount of variance explained to determine underlying features that linked them. Each factor was subjectively labelled in accordance with the set of individual items it contained. The first factor, "Awareness and Beliefs", accounts for 38% of the total variance and comprises 11 items. All of which indicate the degree of awareness or belief workers have of both their own and management's safety responsibilities. The majority of items enjoy relatively large factor loadings (>0.75). Loadings, however, suggest that a belief in the item (safe work habits improve productivity) is relatively weakly associated with this factor. It is encouraging to see respondents having a positive attitude towards safety and its related aspects. This positive belief was reflected in items focusing on respondents' competency, awareness, and ability to work safely. Workers seem to share a common belief that working safely is a top priority for all involved. They also recognize management as a safety associate; this is reflected by a reasonable degree

of agreement (mean scores narrowly fluctuating about 4.0) with items addressing management safety responsibilities.

The second factor, “*Physical Work Environment*”, contains five items and accounts for 25% of the total variance. This factor includes three items relating to risk perception, and the other two to the use of equipment. Collectively, this group of items demonstrates the workers’ perception of the risk that they are generally exposed to in their workplace environment, and how such an environment contributes positively or otherwise to their personal safety. Overwhelmingly, the responding workers seem to perceive construction sites as dangerous places, and their jobs to be associated with high risks. The mean scores for these two items were 4.65 and 4.75, respectively. The respondents appear to be relatively satisfied with the availability, but not the condition of the equipment needed to carry out the job safely.

The third and last factor, “*Supportive Environment*”, has four items and accounts for 16% of the variance. Two items demonstrated a strong belief that shared responsibility and good working relationships are prerequisites to making sites a safe workplace environment. Two more items loaded on this factor appear to be related to training. The combination of these four items indicates the intensity of support given by peers (through shared responsibility and involvement) and management (through training) to perform the job safely. A closer examination, however, revealed that training is scarce, and only a few workers have had limited experience with formal safety training; thus respondents were less inclined to agree with statements referring to on-site hazard-identification skills gained through training.

6.2.4. One-Way Analysis of Variance

To evaluate the perceived statistically significant differences between workers’ attitude and perception factors (*Awareness and Beliefs*, *Physical Work Environment*, and *Supportive Environment*) and the different trades of the workers (i.e. masons, scaffolders, carpenters, electricians, steel fixers and painters), a one-way analysis of variance was performed. Differences in the mean scores in different trades, related

to their attitude and perceptions factors, along with F-Ratio and statistical significance of F-Ratio are shown in Table 6.2. The mean scores for the trade of “Scaffolders” tends to be higher in “*Awareness and Beliefs*” and “*Supportive Environment*” factors than that of other trades. There were no statistically significant differences found among the factor of “*Physical Work Environment*” and the six trades.

The tendency of scaffolders, to have a relatively higher agreement with “*Awareness and Beliefs*” and “*Supportive Environment*”, as compared to other trades, depicts that workers, belonging to the trade of scaffolding, possess a higher rate of consciousness towards safety awareness and beliefs and prefer a more supportive environment.

Table 6.2 One way ANOVA analysis between Worker trades and their Attitude and Perception Factors

Workers Attitude & Perception Factors	Trades												F-Ratio	Sig. of F
	Masons		Scaffolders		Carpenters		Electricians		Steel Fixers		Painters			
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD		
Awareness and Beliefs	3.51	0.84	3.79	0.58	3.28	1.06	3.45	0.45	3.63	0.94	3.50	1.03	2.43	*0.038
Physical Work Environment	3.58	1.06	3.47	0.74	3.37	0.52	3.28	0.64	3.37	0.47	3.65	0.85	1.06	0.383
Supportive Environment	3.52	0.66	3.77	0.61	3.54	0.69	3.48	0.94	3.59	0.81	3.36	1.01	4.254	**0.001

Mean scores based on a 5-point scale (1=strongly disagree, 5=strongly agree); S.D.= Standard Deviation; *Represents significance level $p < 0.05$; **Represents significance level $p < 0.01$

6.3. Workers’ Behavioural Analysis

This section deals with the second questionnaire (Appendix B) and is concerned with risk perception and the intentional behaviour associated with working at heights.

6.3.1. Experience in Working at Heights

Workers in the sample reported high levels of experience in working on scaffolds, ladders and roofs. For example, 100% of the sample agreed that they sometimes or always work on ladders. In relation to roofs, a substantial 93% of the sample

reported working on roofs sometimes or always. (Refer to Figure 6.3 for workers experience in working at heights.)

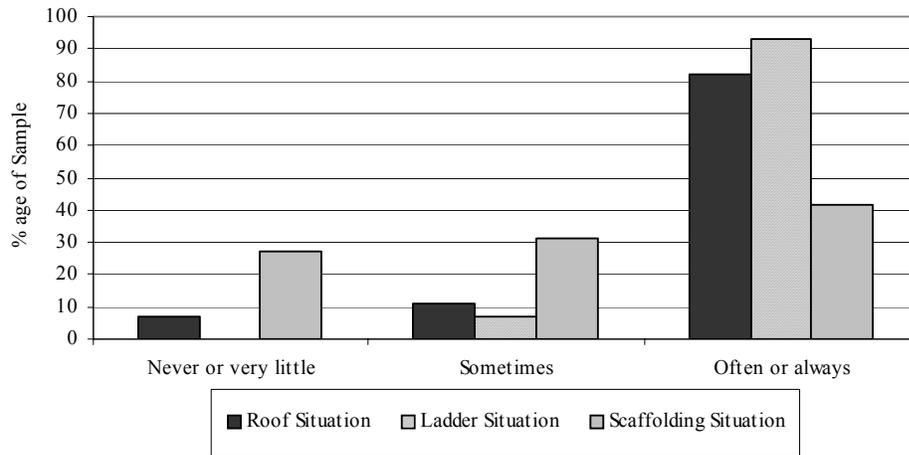


Figure 6.3 Workers Experience in Working at Heights

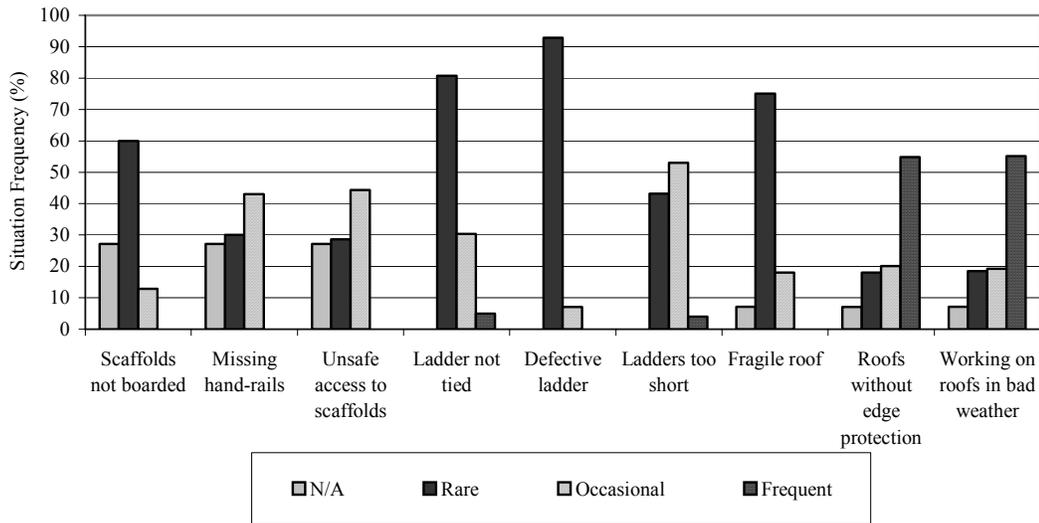


Figure 6.4 Frequency of Occurrence of the Situations

6.3.2. Frequency of the Situations Occurring on Site

In the behavioural questionnaire, workers were asked to state the frequency of all nine situations occurring on the site on a scale of *rare* to *frequent* (for the nine behavioural situations refer to Chapter Five). Working on roofs without edge

protection and working on roofs in windy weather were considered more frequently occurring situations as compared to other the situations. Refer to Figure 6.4 for graphical distribution of frequency occurring on sites.

6.3.3. Perception of Risk

As mentioned earlier, workers were asked to consider the risk levels for nine given working situations and their intentional (i.e. preferred) behaviour whenever each situation was encountered. With the exception of one situation, all the remaining presented situations regarding working on scaffolds, using ladders and working on roofs were perceived as of either medium or high risk. Workers perceived working on: 1) scaffolds which are not totally boarded; 2) ladders which are not tied or secured well; and 3) fragile roofs, as being the most risky of the nine situations presented. Working on roofs in windy weather, however, was perceived as the least risky. Only a small percentage of workers (i.e. no more than 10% of the sample) reported a low risk perception of the following situations:

- Working on scaffolds with some handrails missing;
- Accessing scaffolds by climbing them up and down; and
- Using broken or somehow defective ladders.

The findings on risk perception for these three risky situations show that the majority of workers do not have a misperception of the risks associated with these situations. However, there is a minority of workers who do misperceive them and so could be exposing themselves and other co-workers to risks due to their misperception. This result is in line with the findings of McDonald *et al.* (2001), where typically 3-5% of workers on site were found to have a low perception of risk to situations seen by others as of medium-to-high risk. It is worth mentioning that this minority of workers, in the sample, appears to be inexperienced workers with only 1-5 year's construction working experience. (Refer to Figure 6.5 for graphical average distribution of risk as perceived by workers and Figure 6.6 for their preferred behaviour.)

An interesting finding concerned the relation between workers' perceptions of risk and preferred behaviour. For situations clearly perceived as of medium-to-high risk, the majority of workers preferred to stop working. These situations included:

- Working on scaffolds which are not totally boarded (74 % perceived it as of high risk, and 97 % of those, reported stop working as the preferred behavioural option);
- Working with ladders that are not tied well or secured (64 % perceived it as of high risk, and 94 % of those reported stop working as the preferred behavioural option);
- Working on broken or somehow defective ladders (40 % perceived it as of high risk, and 73 % of those reported stop working as the preferred behavioural option); and
- Working on fragile roofs without crawling boards (60 % perceived it as of high risk, and 93 % of those reported stop working as the preferred behavioural option).

In the situation of working on roofs without edge protection, 65 % of workers perceived it as of low-risk and 94 % of them opted to continue working. Working on roofs in windy weather was also perceived by the majority of workers as a low-risk situation and hence they were more likely to continue working. The reported frequency of encountering the following three situations on site was occasional:

- Working on scaffolds with hand-rails missing;
- Working with scaffolds with alternative of climbing up or down due to no ladder provided; and
- Working on too short ladders for the task being performed.

Despite their occasional frequency on site, workers reported a medium to high perception of risk level for the above three situations. It was interesting to note that almost half of them opted to continue working. This result could be attributed to the situation's occasional occurrence where workers believe that they know how to handle it safely.

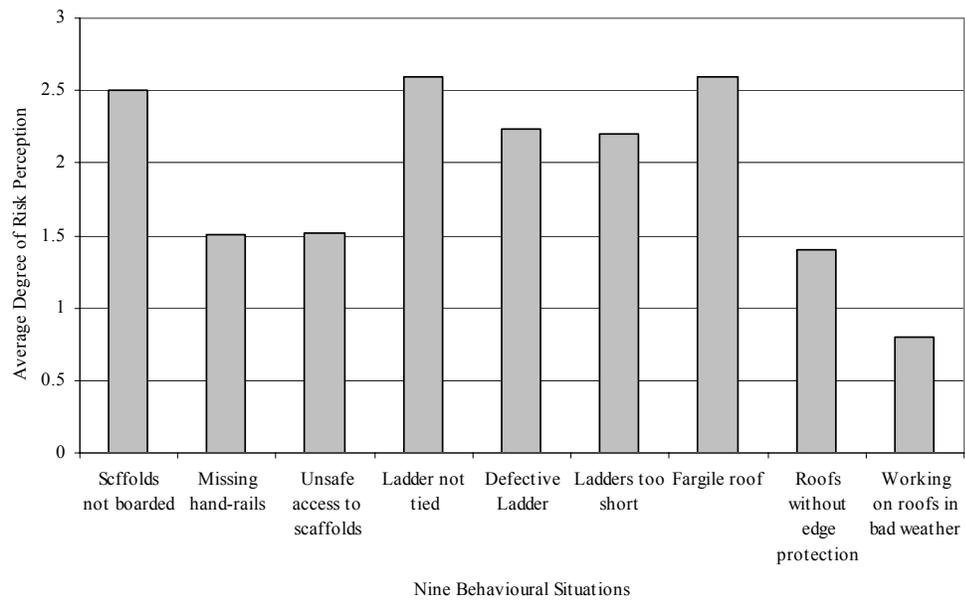


Figure 6.5 Average Risk Perceived by Workers for Nine Behavioural Situations, in a Scale of Low (0-1), Medium (1-2), and High (2-3).

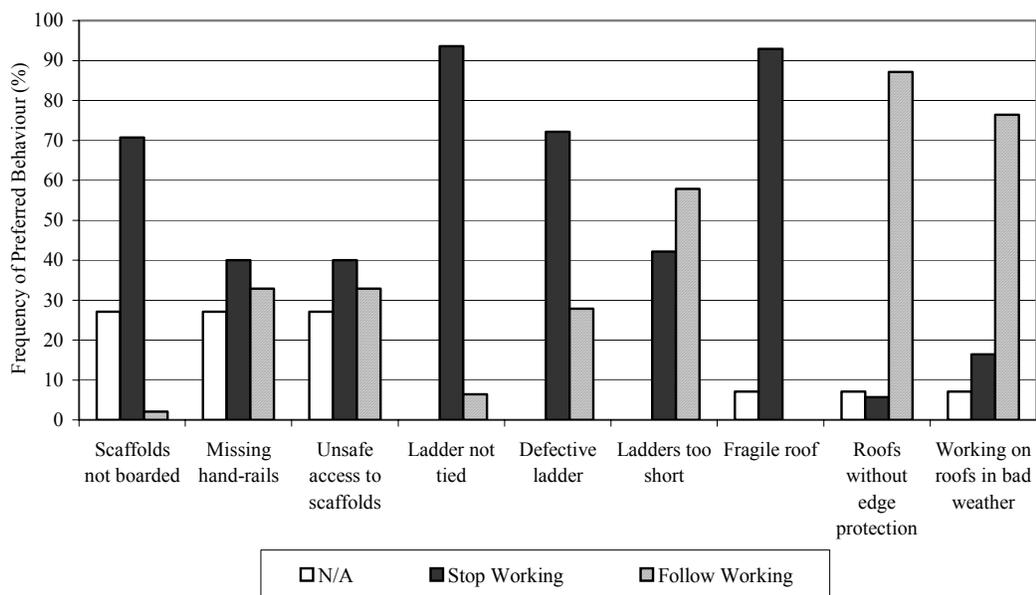


Figure 6.6 Preferred Behaviour of the Workers

6.4. Prediction of Workers Intentional Behaviour by Attitudes and Perceptions

6.4.1. Binary Logistic Regression

In order to determine whether workers' intentional behaviour is best explained by their attitudes and perceptions, a binary logistic regression analysis test was conducted in SPSS Version 11.5. Binary logistic regression, or logit analysis as it is otherwise known, is a form of regression, which is used when the dependent variable is dichotomous, and the independent variables are either continuous or categorical or both (Hosmer & Lemeshow, 1989). Although similar to discriminant analysis, logistic regression is often preferred, as it does not require that the assumptions of multivariate normality and equal variance covariance matrices across the group can be met (Norusis, 1994; Hair *et al.*, 1995). Logistic regression applies the maximum likelihood estimation after transforming the dependent into logit variable. In essence, logistic regression is used to determine which variables affect the probability of a particular outcome occurring (Hazard Munro, 1997). In the context of the current study, logistic regression was used to assess the independent effect of each of the already identified three factors of workers attitude and perception on the nine behavioural situations. In other words, the nine behavioural situations were taken as dependent variables (DVs), whereas awareness and beliefs, physical environment and supportive environment (factors for workers attitude and perception) were taken as covariates (IVs). The dependent variable is coded as zero for the non-occurring of the event, which is "stop working", and one for the occurring of the event, which is "continue working". The results of the logistic regression are discussed in Section 6.4.5 and all variables entered for regression are presented in a tabular form in Table 6.4, on page 85.

6.4.2. Interpretation of Results

The estimated logistic regression coefficients are reported under the column headed 'B' in Table 6.4. It can also be called "BETA". The sign of these coefficients in logistic regression works exactly the same as in standard regression models, with a negative value indicating a negative relationship between the dependent and independent variables and *vice-versa*. As it is not easy to think in terms of log-odd

probabilities, the logistic regression is generally reworked to report the findings in terms of odds-ratios using the following equation (Norusis, 1999):

$$\frac{\text{Prob (event)}}{\text{Prob (no event)}} = e^{B_0 + B_1 X_1 + \dots + B_p X_p} = e^{B_0 + B_1 X_1} \dots e^{B_p X_p} \quad \text{Eq. [1]}$$

In Equation [1], e is the base of natural logarithm (approximately 2.718) and B_0 , B_1, \dots, B_p are the logistic regression coefficients. The odds-ratios are given in the column Exp (B) in Table 6.4. This parameter is usually the main point of interest in logistic regression due to its ease of interpretation (Hosmer & Lemeshow, 1989). In essence, the odds-ratio reports the factor by which the odds of an event occurring will increase or decrease with a unit change in the independent variable. The significance of individual variables in the logistic regression equation is assessed by the Wald statistic (W), which has a chi-square distribution. This statistic is generally used to assess whether a coefficient is statistically different to zero, similar to the t-test used in multiple regression. The Wald statistic, however has an undesirable property when the absolute value of the regression coefficient becomes large, the estimated standard error is too large as well, producing a Wald statistic that is too small and leading to non-significant results (Norusis, 1999). In Table 6.4, no particularly large coefficients are observed so the Wald statistic is considered a reliable source of evaluation for the contribution of individual variables.

6.4.3. Bonferroni Type Adjustment

Bonferroni type adjustment or correction involves adjusting the desired alpha level (needed to check statistical significance) downward to compensate for the increased probability of type 1 error, “*you reject null hypothesis, when you should accept it*”. In regression analysis, when multiple tests are performed on the same data set, as in this data analysis, multiple binary logistic regressions are carried out; therefore a Bonferroni type adjustment was made. An alpha was assigned to each DV so that alpha for the set of DVs does not exceed some critical value (Tabachnick and Fidell, 2001)

Equation of Bonferroni adjustment:

$$\text{Overall } \alpha = 1 - (1 - \alpha_1)(1 - \alpha_2)(1 - \alpha_3) \dots (1 - \alpha_p) \quad \text{Eq. [2]}$$

Now, as there were nine (9) DVs; by default, the alpha level was set on 0.05; therefore the overall alpha level, according to the above stated equation, will be 0.370, which is above the 0.05. Therefore the alpha level for each DV was set as 0.005, thus the overall alpha came as 0.047, which comes under the acceptability level of 0.05 .

6.4.4. Assessment of Overall Model Fit

As indicated previously, nine (9) DVs were put under binary logistic testing with three (3) IVs separately; therefore the binary logistic regression analysis was bundled out around 27 logistic regression models. Out of these 27 regression models only 17 models were found statistically significant, using the overall level of alpha (α) acceptability determined in the previous section.

Table 6.3 Summary of Logistic Regression Models Fit

	Logistic Models	Chi-square	<i>p</i>	Nagelkerke R-Square	Percentage of cases correctly predicted
Awareness and Beliefs (FAC-1)	1 (SS1)	4.475	.034	0.65	97
	2 (SS2)	4.163	.041	0.60	58
	3 (SS3)	3.939	.047	0.70	72
	4 (LS1)	4.285	.038	0.55	92
	5 (LS2)	3.874	.047	0.76	81
	6 (LS3)	4.504	.034	0.65	80
	7 (RS1)	5.098	.024	0.55	92
	8 (RS2)	0.443	.506	0.60	80
	9 (RS3)	0.763	.368	0.55	82
Physical Work Environment (FAC-2)	1 (SS1)	0.308	.579	0.50	91
	2 (SS2)	4.418	.036	0.45	63
	3 (SS3)	4.342	.037	0.50	81
	4 (LS1)	3.797	.050	0.50	93
	5 (LS2)	4.136	.042	0.67	80
	6 (LS3)	4.504	.034	0.75	81
	7 (RS1)	3.777	.051	0.63	84
	8 (RS2)	0.238	.625	0.48	92
	9 (RS3)	0.548	.459	0.71	82
Supportive Environment (FAC-3)	1 (SS1)	0.071	.790	0.35	92
	2 (SS2)	1.029	.310	0.40	59
	3 (SS3)	1.029	.310	0.67	53
	4 (LS1)	3.806	.051	0.65	93
	5 (LS2)	0.165	.684	0.45	69
	6 (LS3)	3.938	.047	0.66	77
	7 (RS1)	1.006	.939	0.65	92
	8 (RS2)	5.967	.015	0.55	93
	9 (RS3)	5.788	.016	0.57	90

The proportion of variation explained by the logistic regression model can be assessed by the R-square measure derived by Nagelkerke (Norusis, 1999). As many regression experts have warned against the sole reliance of this measure to assess the overall model fit (Pedhazur, 1997), other measures are used to assess model fit in logistic regression. One such measure is the percentage of cases correctly predicted by the classification table. The classification table indicates how many cases could be correctly classified by chance (Hair *et al.*, 1995). Table 6.3 depicts the models summary, including: chi-square values along with their level of significance (p), Nagelkerke R-square values, and overall correct prediction of cases in classification tables.

6.4.5. Factors Influencing Likelihood of Continue Working

All three attitudes and perceptions factors, acting as IVs, predicted a large number of behavioural situations. As Table 6.4 depicts, the first factor, *Awareness and Beliefs*, emerged as the most influential predictor; it predicted seven out of nine behavioural situations showing statistically significant correlations (using the standard alpha level of 0.05). The predicated seven situations are as follows:

- Working with scaffolds, which are not totally boarded (SS1);
- Working with scaffolds with guard rails missing (SS2);
- Accessing scaffolds by climbing up and down (SS3);
- Working with ladders that are not tied (LS1);
- Working with ladders that are too short for the task being performed (LS2);
- Using a broken or defective ladder (LS3); and
- Working on a fragile roof without crawling boards (RS1).

As stated in Section 6.4.2, the Wald statistic should be used to find out the sequence or order of prediction, as well as for determining the model fit for each significant prediction; Table 6.3 will be cross-referenced. As stated in Section 6.4.4, the percentage of correct prediction by the classification table and level of significance will be used as a measure to identify the significance of the particular model for a particular prediction. Out of these seven behavioural situations, the Scaffolding situation (SS1), because of the high Wald statistic ($W=4.845$), emerged as the most obvious one in predicting the behaviour. The model was statistically significant with

97 % of the overall prediction of the cases, along with $p = .034$ (refer to Table 6.3). As shown by the associated odds ratio (Exp (B)) of 0.623, workers are likely to have 0.623 times less probability to continue working if they are faced with situation SS1. The negative sign of Beta ($B = -.473$) shows that the more workers are aware of safety issues and have strong beliefs in safety, the less the chance they will continue working in this situation.

The second most predominant behavioural situation was situation (LS1) with the Wald Statistic as 4.601. The overall prediction of the cases for this statistically significant model was 92 % with $p = .038$. Having an odds ratio of 0.499, workers in this situation were less likely to continue working, if this particular situation happens to them. Beta was again negative ($B = -.695$) for this prediction as well, which again can be interpreted as meaning that the higher the degree of awareness and belief in safety issues, the less likely they are going to continue working.

According to Wald statistic ($W = 4.416$), the next most influential predicted situation was (SS2). The relationship for this situation was negative as well ($B = -.418$), indicating that the workers in this particular situation have 0.658 times less probability to continue working. The statistical significance of this model was $p = .041$, with an overall correct prediction of the classification table as 58 %.

The significance of the influence for the factor of *Awareness and Beliefs* on the ladder situation 3 (LS3) and roof situation (RS1) were found to be similar ($p = .037$ and the Wald statistics $W = 4.340$). Both situations had a negative influence on the probability of continuing the work (odds ratios are 0.691 & 0.147, respectively). The model fit for LS3 and RS1 with an overall prediction of 80 % ($p = .034$) and 92 % ($p = .024$), respectively

Ladder situation (LS2) and scaffolding situation (SS3) were the last in the series of prediction by the *Awareness and Beliefs* factor. Having the Wald statistic as 4.128 and 3.939 respectively and model fit with an overall prediction of 81 % ($p = 0.48$) and 72 % ($p = .047$), respectively. The probability of workers to continue working in both situations was found to be 0.682 and 0.673, respectively.

Table 6.4 Logistic Regression Table Predicting Workers' Behaviours through Attitudes and Perception

IVs	Behavioural Situations (DVs)	B	S.E	Wald	df	p	Exp(B)	95% Confidence Interval for EXP(B)	
								Lower	Upper
Awareness and Beliefs (FAC-1)	SS-1	-.473	.215	4.845	1	.028	.623	.408	.949
	SS-2	-.418	.199	4.416	1	.035	.658	.445	.972
	SS-3	-.395	.199	3.939	1	.047	.673	.456	.995
	LS-1	-.695	.324	4.601	1	.032	.499	.264	.941
	LS-2	-.382	.188	4.128	1	.042	.682	.472	.986
	LS-3	-.370	.178	4.340	1	.037	.691	.487	.979
	RS-1	-1.915	.919	4.337	1	.037	.147	.024	.892
	RS-2	.239	.357	.449	1	.503	1.270	.630	2.55
	RS-3	.199	.227	.771	1	.380	1.221	.781	1.90
Physical Work Environment (FAC-2)	SS-2	-.373	.736	.257	1	.612	.689	.162	2.91
	SS-2	-.391	.182	4.615	1	.032	.676	.473	.966
	SS-3	-.429	.199	4.647	1	.031	.651	.440	.961
	LS-1	-.670	.327	4.198	1	.040	.511	.269	.971
	LS-2	-.382	.185	4.263	1	.039	.682	.474	.980
	LS-3	-.304	.173	3.098	1	.078	.738	.624	1.035
	RS-1	-1.434	.715	4.022	1	.045	.239	.058	.967
	RS-2	.191	.407	.220	1	.639	1.210	.545	2.68
	RS-3	.178	.248	.517	1	.472	1.195	.734	1.94
Supportive Environment (FAC-3)	SS-1	.244	1.010	.059	1	.809	1.277	.176	9.24
	SS-2	-.280	.290	.926	1	.336	.755	.428	1.33
	SS-3	-.280	.290	.926	1	.336	.755	.428	1.33
	LS-1	-.686	.330	4.321	1	.037	.503	.263	.961
	LS-2	-.074	.180	.169	1	.681	.929	.652	1.32
	LS-3	-.399	.201	3.940	1	.047	.670	.452	.989
	RS-1	-.053	.680	.006	1	.938	.948	.250	3.59
	RS-2	.479	.191	6.317	1	.012	1.615	1.11	2.34
	RS-3	.478	.193	6.118	1	.013	1.612	1.10	2.35

The above mentioned seven situations, as stated earlier in Section 6.3.3, all were perceived to be as of either medium risk or high risk (Refer to Figure 6.5), and thus the majority of respondents indicated their preference to stop working when facing such situations (refer Figure 6.6). Therefore, it was not surprising to see the significant correlations of all these situations with the *Awareness and Beliefs* factor; the logistic regression re-confirmed the results of the workers behavioural analysis. It is worth noting that *this factor* contains items related to workers' competence, awareness, and self-perceived ability to work safely. In all seven situations, negative

values for the B coefficient were obtained indicating that the higher the level of workers' awareness towards safety, the less likely they will continue working when faced with a medium-to-high risk situation.

Behavioural situations RS2 and RS3 emerged as non-significant situations to be predicted by the *Awareness and Beliefs* factor. Both situations had positive Beta signs ($B = .239$ and $.199$) and much lower Wald statistics as compared to the rest of the situations (Wald = $.449$ and $.771$). The odds ratio for these two particular situations showed that the workers in these situations were more likely to continue working, but the significance of such a prediction was very low ($p = .503$ & $.380$).

The second factor, *Physical Work Environment*, significantly predicted five of the nine situations and showed significant correlations. The situations are as follows:

- Working with scaffolds with guard rails missing (SS2);
- Accessing scaffolds by climbing up and down (SS3);
- Working with ladders that are not tied (LS1);
- Working with ladders that are too short for the task being performed (LS2);
and
- Working on a fragile roof without crawling boards (RS1).

The two most obvious predictions by this factor were situations (SS3) and (SS2) containing Wald statistic as (Wald = 4.647 and 4.615). The model fit for both situations was significant with the overall prediction of the cases as 81% and 63% respectively. Both of these situations had negative Beta signs ($B = -.429$ and $-.391$), which implies that workers in (SS3) and in (SS2) are 0.651 and 0.675 times less likely to continue working if faced with these two situations, respectively.

The three other predicted situations LS2, LS1, and RS1 had negative Beta sign ($B = -.38$, $-.670$, and -1.434 , respectively) with Wald statistic as (4.263 , 4.198 , 4.022). These three situations, by virtue of their negative Beta signs and Exp (B) values can be narrated as: the workers in these three situations are less likely to continue working. For LS2 there is a 0.682 time less probability that the workers will

continue working. Workers in LS1 and RS1 situations are 0.511 and 0.239 times, respectively, less likely to continue working. A sixth situation (LS3) was predicted by this factor as well, but with moderate correlation ($p = .078$), having Wald statistic as 3.098 and Exp (B) as 0.738. The items within this particular factor of physical work environment demonstrate workers' perception of the risk to which they are exposed to on sites. Once again, the predicated negative B values depict that the higher the perceived level of risk, the lower the chance that workers will continue working. The model fit for these three predicted situations were found statistically significance with LS2 (80 %, $p = .042$), LS1 (93 %, $p = .050$), and RS1 (84 %, $p = .051$) overall prediction of the cases.

The third and last factor, *Supportive Environment*, showed significant correlations with the following four situations:

- Working with ladders that are not tied (LS1);
- Using a broken or defective ladder (LS3);
- Working on roof without edge protection (RS2); and
- Working on roof in strong windy conditions (RS3).

The most obvious predicted situations by this factor by virtue of Wald statistic were RS2 and RS3, having the Wald statistic value (6.317 and 6.118) and significance values ($p = .012$ and $p = .013$), respectively. The correct overall predictions of the cases for these two situations were found as 93 % and 90 % respectively. These two situations were not predicted by any of the earlier two factors FAC-1 and FAC-2. As mentioned earlier, these two situations appear to be encountered on a frequent basis on sites, and were perceived by many workers as low-risk situations, thus workers are more inclined not to stop working. The positive B values and odds ratio more than 1, indicating that the higher the level of support given by peers (i.e. co-workers), the higher the chance that workers will continue working. Comments that were verbally made and freely added to the questionnaire provided insight into the thinking of the respondents. For example, peer support might give rise to unsafe work behaviour. To illustrate, considering situation RS3, a re-occurring voiced opinion was:

“I would be labelled a coward if I do not follow my co-workers who continue to work despite the strong windy conditions”.

The remaining two situations (LS1 and LS3) predicted by this factor had Wald statistic values of 4.321 and 3.940, with significance value of $p = .037$ and $p = .047$ respectively. For these two situations, negative Beta values and odds ratio less than 1 was obtained. Workers with an odds ratio of 0.503 and 0.670, in both situations respectively, have less probability to continue working in such situations.

It is interesting to see the same factor (Supportive Environment) predicted two situations (RS2 and RS3) as with positive Beta with an odds ratio more than unity (1), and two with negative Beta with odds ratio less than unity (1). As stated earlier in this section, regarding the first two predicted situations of RS2 and RS3, that both these situations were perceived as of low-risk by the workers and were encountered on a frequent basis; thus the workers intended to continue working in such situations.

The last two predicted situations (LS1 and LS3) by this factor were perceived as of medium-to-high risk by the workers and were encountered rarely on sites (refer to Section 6.3.3); thus workers’ intentional behaviour was to stop working if they encounter such situations.

6.5. Workers’ Cultural Analysis

The total gathered data from the third part of the questionnaire was also factor analysed by using principle component analysis with varimax rotation to determine the underlying dimensions of the national culture.

6.5.1. Factor Analysis

Again, in order to assess the suitability of data for factor analysis, all the checks were performed same as detailed in Section 6.2.3. The test for the measuring of the sampling adequacy (MAS) was conducted and, on the basis of results, one variable had to be dropped before proceeding with further analyses. The variable, which could not meet the standards of (MAS), was:

- *Safety problems are openly discussed between workers and supervisors.*

Again, the measure for sampling adequacy (MAS) test was conducted after deleting the above variable. The results revealed that all the remaining variables had a good sample adequacy, ranging from .58 to .97. The Kaiser-Meyer-Olkin (KMO) test gave the value of .803 and Bartlett test of sphericity, reached statistical significance with chi-square 7272.887, $df = 276$ and significance of 0.000. On the basis of such results it was deemed fit to proceed with factor analysis.

Thus the 24 variables were included in the factor analysis, by conducting a principal factor analysis. The results revealed the presence of three factors having an eigenvalue of more than unity. The Varimax rotation was then performed so as to obtain interpretable results for those three factors. This three-factor solution accounted for 80 percent of the total variance. Factors were then examined to identify the number of items that were loaded on each factor by keeping in mind the rule for selecting only those items which had loadings equal to or more than 0.5 (Hair *et al.*, 1998). On the basis of such restriction, thirteen, six and four items were loaded on the first, second and third factor, respectively. One item had a factor loading of .255 which was far less than the factor loading criteria as defined by Hair *et al.* (1998) Therefore the following item was dropped:

- *Workers lose respect for a supervisor, who seek their input before he makes any safety decision.*

Confirmatory factor analysis was carried out to assess the uni-dimensionality of the scales developed using exploratory factor analysis (Gerbing and Anderson, 1988). All thirteen items that were loaded on the first factor in exploratory factor analysis were then put into the confirmatory factor analysis to confirm the existence of all these 13 items in a single factor. Confirmatory factor analysis reconfirmed the results of the exploratory factor analysis, by loading all items in a single factor. Similarly, the results of confirmatory factor analysis confirmed the existence of the second and third factor with six and four items, respectively, loading onto them. Table 6.5 depicts the 23 items in three factors, and their respective factor loadings, explained variances, eigenvalues and Cornbach's α for three factors.

Table 6.5 Factor Loadings for the 3-factor model of Workers Cultural Survey

Factor 1: Collectivism & Femininity (Variance = 48%, Eigenvalue = 11.399, Cronbach's α = .771)	Loadings
Managers and supervisors do encourage feedback regarding safety issues from site workers	[.938]
Personally I enjoy the risk aspects associated with my job	[.942]
I often feel nervous or tense at work	[.909]
A company should have major responsibility for the health and welfare of its injured worker	[.949]
Co-workers often give tips to each other on how to work safely	[.901]
A safe place to work has a lot of personal meaning to me and my co-workers	[.860]
It would help in improving the site safety, if my co-workers support safe behaviour	[.942]
Safety training can help me in improving my attitude to work more safely	[.783]
Safety decisions made by me alone are usually more effective than decisions made by my co-workers together	[.885]
It is not always important to have a good working relationship with my supervisor	[-.849]
When workers ignore safety procedures at my workplace, I feel it is none of my business	[-.867]
I will not change my attitude towards safety rules, even if my supervisor praises safe work behaviour	[-.856]
I prefer the company having higher pay rates but lower safety records to the company having better safety records but average pay rates	[.956]
Factor 2: Uncertainty Avoidance (Variance = 18%, Eigenvalue = 4.461, Cronbach's α = .792)	
Major decisions regarding site safety issues, always take place after consulting with site workers/subcontractors	[.670]
Generally workers follow safety rules without being told to do so	[.784]
Safety rules should not be broken, even when a worker believes it affects the production	[.852]
Safety decisions made by the management usually seems to be more effective then decisions made by workers	[.817]
Many accidents just happen, there is little one can do to avoid them	[.826]
I prefer to work with larger company as they have more effective safety practices on site than the smaller one	[.865]
Factor 3: Power Distance (Variance = 14%, Eigenvalue = 3.517, Cronbach's α = .701)	
I am always encouraged to raise any safety concern with my supervisor	[.895]
Workers are always being consulted regarding preparation of site safety plans	[.661]
I am allowed to act decisively if I find any situation contrary to safe conditions on site	[.886]
I prefer the company having less strict rules and where I easy to work with, to the company having more strict rules and long working hours.	[.771]

6.5.2. Factors Interpretation

Each of the three factors was labelled in accordance with the set of individual items loaded onto it. The first factor was labelled "*Collectivism and Femininity*". This factor contained thirteen items describing the themes referring to the collectivism and femininity of the workers.

In the questionnaire, workers were given six items posed to measure Collectivism VS. Individualism and seven items addressing the issue of Femininity VS. Masculinity. The descriptive analysis results show that workers believe, and have faith, in carrying out their construction operations safely on sites more collectively

rather than individually. The mean values for these items ranged from 1.5 to 2.2., where 1 = *strong agreement*, and 5 = *strong disagreement*. It was expected to have these two measures in separate factors. However, as stated earlier, exploratory factor analysis loaded all these 13 items of two different, but related, cultural dimensions together; moreover confirmatory factor analysis also confirmed the same. Therefore, the factor was given a shared label as of “*Collectivism and Femininity*”. A similar experience was reported by Hofstede (1985), where items representing power distance and individualism were loaded on the same factor in his factor analysis. Although these two dimensions were highly correlated, Hofstede felt that these two dimensions were completely distinct and thus inappropriate to combine. He justified his decision to separate those dimensions on three grounds:

1. That the statistical correlation disappears when the analysis is controlled for countries’ economic wealth;
2. That the two dimensions are conceptually different ; and
3. That even though most collectivistic cultures are also high in power distance, this is not always the case, as for example France or Costa Rica (Hofstede,1984,1985).

Hofstede’s decision to separate individualism–collectivism and power distance attracted a few criticism as well (Bond, 1996; Erez and Early, 1993; Triandis *et al.*, 1988). Bond (1996) criticised, Hofstede’s decision, arguing that “...had Hofstede not split power distance and individualism, it might have reduced the tendency to reify these constructs as separate and have simplified our search for external correlates of the unified concept” (p.13) Thus, because of these criticism and also the present PhD research study was to explore “inter-culture” not “cross-culture” influence, therefore it was decided to keep “Collectivism and Femininity” as one combined factor. Having collectivism and femininity as one combined factor indicates that cultural dimensions can and do overlap. A dimension is not an isolatable unit, but dependent upon the other dimensions.

In the work environment context, collectivism can be measured by; working in cohesive groups, workers giving safety tips to each other, and combining efforts to

make physical work environment safer. Femininity in the context of the work environment can be defined as: the degree of co-operation, the nature of working relationship, and employment security. This is complementary to collectivism, where the society tends to integrate people into cohesive working groups. A combination of collectivism and femininity leads to “Moralism”, where the focus is shifted from following rigid rules to more interpersonal relationships. These relationships then lead to enhancing workers safety awareness and beliefs which, in turn, results into safe work behaviour.

The second factor, “*Uncertainty Avoidance*”, contained six items addressing this particular theme. Workers’ responses to these items showed a good perception of both safe and unsafe conditions, and the majority of them are prone towards more uncertainty avoidance. This finding confirms the earlier findings of this study’s workers’ behavioural survey, where most respondents opted for stopping work in what is perceived as risky situations.

The third factor gathered all those items which were posed to measure the power distance between the workers and managers. Therefore, this factor was named, accordingly, as “*Power Distance*”. The responses to these items revealed that the majority of workers do not see much power distance between themselves and the management whenever safety-related issues need to be discussed and/or actions to be implemented.

6.6. Prediction of Workers Intentional Behaviour through Cultural Dimensions

To predict workers’ behaviour through their national culture or to explore the influence of workers national culture on their safe/unsafe behaviour, binary logistic regression was used. As mentioned in Section 6.4.1, the rationale for adopting such multivariate technique was due to the binary nature of our dependent variable “behaviour”. In the behavioural questionnaire, workers were asked only for their two intentional behaviours. In any given situation, will they “continue” or “stop” working? Therefore, binary logistic regression was deemed fit in such type of

prediction. The detailed introduction to this technique has already been discussed previously in Section 6.4.1.

6.6.1. Bonferroni Type Adjustment

Bonferroni type adjustment was carried out on this analysis as well. Same as the previous analysis of binary logistic regression there were nine (9) dependent variables (DVs) and, by default, the alpha level was set on 0.05; therefore the overall alpha level, according to the above stated equation, would be 0.370, which is above the 0.05. Therefore the alpha level for each DV was set as 0.005, thus the overall alpha was as 0.047, which comes under the acceptability level of 0.05.

6.6.2. Assessment of Overall Model Fit

Table 6.6 details the summary of the assessment of model fit for 27 models, obtained in logistic regression of cultural dimensions (3 IVs) and workers behavioural situations (9 DVs). This table includes chi-square values along with their level of significance (p), Nagelkerke R-Square values, and overall prediction of classification tables.

Table 6.6 Summary of Logistic Regression Models Fit

	Logistic Models	Chi-square	p	Nagelkerke R-Square	Percentage of cases correctly predicted
Collectivism & Femininity (FAC-1)	1 (SS1)	4.163	.041	0.60	97
	2 (SS2)	3.834	.050	0.70	61
	3 (SS3)	3.834	.050	0.70	71
	4 (LS1)	4.136	.042	0.62	91
	5 (LS2)	3.777	.052	0.39	81
	6 (LS3)	3.777	.052	0.42	62
	7 (RS1)	4.342	.037	0.60	65
	8 (RS2)	0.053	.818	0.49	88
	9 (RS3)	3.427	.064	0.47	82
Uncertainty Avoidance (FAC-2)	1 (SS1)	4.475	.034	0.59	97
	2 (SS2)	4.285	.038	0.60	62
	3 (SS3)	4.220	.040	0.55	72
	4 (LS1)	4.222	.041	0.50	96
	5 (LS2)	5.788	.016	0.57	71
	6 (LS3)	3.839	.050	0.60	59
	7 (RS1)	4.136	.042	0.71	95
	8 (RS2)	0.123	.726	0.75	93
	9 (RS3)	1.976	.160	0.71	81
Power Distance (FAC-3)	1 (SS1)	1.408	.235	0.37	97
	2 (SS2)	1.867	.172	0.55	57
	3 (SS3)	1.867	.172	0.60	61
	4 (LS1)	1.867	.172	0.70	93
	5 (LS2)	1.714	.190	0.65	71
	6 (LS3)	0.204	.651	0.55	58
	7 (RS1)	0.051	.479	0.81	98
	8 (RS2)	0.143	.705	0.49	93
	9 (RS3)	1.388	.239	0.71	83

6.6.3. National Cultural Dimensions Influencing Workers Behaviour

Table 6.7 details the results of the binary logistic regression along with Exp (B) values. The first two cultural dimensions “*Collectivism and Femininity*” and “*Uncertainty avoidance*” predicted seven and six behavioural situations, respectively. The third cultural dimension, “*Power Distance*”, did not predict any of the behavioural situations at all.

Table 6.7 Results of Logistic Regression for Workers Culture factors and Behavioural Situations

IVs	Behavioural Situations (DV's)	B	S.E	Wald	df	p	Exp(B)	95%Confidence Interval for EXP(B)	
								Lower	Upper
Collectivism & Femininity	SS1	-.418	.199	4.416	1	.035	.658	.445	.972
	SS2	-.400	.202	3.928	1	.047	.670	.451	.995
	SS3	-.400	.202	3.928	1	.047	.670	.451	.995
	LS1	-.382	.185	4.263	1	.029	.682	.474	.980
	LS2	-.263	.123	4.534	1	.033	.249	.604	.978
	LS3	-.521	.255	4.172	1	.041	.604	.360	.979
	RS1	-.431	.199	4.699	1	.030	.650	.439	.959
	RS2	-.089	.399	.050	1	.823	1.093	.418	1.94
Uncertainty Avoidance	SS1	-.473	.215	4.845	1	.028	.623	.408	.949
	SS2	-.695	.324	4.601	1	.032	.499	.264	.941
	SS3	-.427	.198	4.650	1	.031	.665	.442	.961
	LS1	-.777	.370	4.419	1	.036	.463	.222	.949
	LS2	-.401	.193	4.288	1	.038	.669	.458	.977
	LS3	-.343	.178	3.729	1	.053	.709	.500	1.00
	RS1	-.382	.185	4.263	1	.039	.682	.474	.980
	RS2	.132	.381	.120	1	.729	1.141	.540	2.40
Power Distance	SS1	-1.823	2.200	.687	1	.407	.162	.002	.655
	SS2	-.377	.225	2.806	1	.094	.694	.441	1.06
	SS3	-.375	.225	2.776	1	.096	.684	.441	1.06
	LS1	-.377	.225	2.806	1	.094	.694	.441	1.06
	LS2	-.286	.176	2.635	1	.105	.751	.532	1.06
	LS3	-.077	.171	.205	1	.651	.925	.662	1.29
	RS1	-.807	1.528	.279	1	.598	.446	.022	8.19
	RS2	-.126	.323	.152	1	.696	.881	.468	1.66
RS3	-.244	.200	1.478	1	.224	.784	.529	1.15	

The first national cultural dimension predicted seven out of nine behavioural situations. The predicted situations were:

- Working with scaffolds, which are not totally boarded (SS1)
- Working with scaffolds with guard rails missing (SS2)
- Accessing scaffolds by climbing up and down (SS3)
- Working with ladders that are not tied (LS1)
- Working with ladders that are too short for the task being performed (LS2)
- Using a broken or defective ladder (LS3)
- Working on a fragile roof without crawling boards (RS1)

Again, according to the Wald statistic, the most obvious predicted behavioural situation by this factor was situation (RS1) ($W = 4.699$). The model for this prediction was found statistically significant with an overall percentage of prediction for the cases as 65 % at significance level (p) of 0.037 (refer to Table 6.5). Workers in this situation are 0.650 times less likely to continue working if facing this situation. The negative sign of Beta ($B = -.431$) shows that the more they work collectively and towards the feminist attitude the less chance they will continue working. The second most obvious behavioural situation predicted by this factor was (SS1) with Wald statistic as 4.416. For this given situation, workers are 0.658 times less likely to continue working. This situation again had a negative Beta value ($B = -.418$) and the model fit for this particular prediction was found statistically significant with 97 % of the overall prediction of the cases (refer to Table 6.5). The third predicted situation was the ladder situation (LS1). The model fit for this prediction came as of 91 % with a statistically significance level of 0.041. This situation contained Wald statistic as 4.263 and beta as negative ($B = -.382$), indicating that the workers in this particular situation has 0.682 times less probability to continue working. Ladder situations (LS3) and (LS2) were predicted as the 4th and 5th influential, respectively ($W = 4.172$ & $W = 4.022$) with overall model prediction as 62 % and 81 %, respectively. Both situations had negative Beta values as well ($B = -.521$ & $B = -1.434$, respectively).

The significance of the influence of the factor of *Collectivism and Femininity* for scaffolding situations (SS2) and (SS3) were found to be similar ($p = .047$), with same Wald statistic value as 3.928. Both situations had a negative influence on the probability of continuing with the work. For both situations workers are 0.670 times less likely to continue working, if those particular situations happen to them. The statistical significance of the model fit, with overall prediction for these two situations, came as 61 % and 71 %. Thus we can say that the higher the collectivistic and feminist attitude of the workers, the higher is the probability that workers would avoid continuing to work in risky situations.

The second cultural dimension predicted six behavioural situations. They were:

- Working with scaffolds, which are not totally boarded (SS1);
- Working with scaffolds with guard rails missing (SS2);
- Accessing scaffolds by climbing up and down (SS3);
- Working with ladders that are not tied (LS1);
- Working with ladders that are too short for the task being performed (LS2);
- and
- Working on a fragile roof without crawling boards (RS1).

The most influential situation predicted by this factor was situation (SS1). It had a Wald statistic of 4.845 at a significance level of 0.028. The model for this situation was statistically significant with overall prediction for the cases to be 97 % at the significance level of 0.034 (refer to Table 6.5). For this particular situation, workers were 0.658 times more likely to stop working if that situation happens to them. The negative sign of Beta again depicts that the higher uncertainty avoidance among the workers the less they are going to continue working. The second most influential situation was situation (SS3) with a model fit prediction of 72 %. This situation had a Wald value of 4.650 and a negative Beta sign at the significance level of 0.031. The third situation on the prediction sequence was situation (SS2). The workers in this situation were 0.499 times less likely to continue working with having a Wald statistic value of 4.601 at the 0.032 significance level (p). Again, the negative sign of Beta can be interpreted as, the higher degree of uncertainty workers have, the more

inclined they are to stop working. Ladder situations (LS1) and (LS2) were also predicted by the uncertainty avoidance factor. LS1 had a Wald value of 4.419 at 0.036 level of significance and LS2 had 4.288 as the Wald value with .038 level of significance. Both of these situations have negative Beta sign. The last two predicted situations were roof situation (RS1) and ladder situation (LS3). The Wald and significance values for these situations were (4.263, 0.039) and (3.729, 0.053), respectively.

The third and last cultural dimension of “*Power Distance*” did not predict any of the given behavioural situations. This implies that, when it comes to workers’ decision in risky situations, cultural dimensions of “*Uncertainty Avoidance* and “*Collectivism and Femininity*” play an important and significant role in deciding their intentional behaviour, rather than power distance.

The following two situations were not predicted by any of the cultural dimension;

- Working on roof without edge protection (RS2); and
- Working on roof in strong windy conditions (RS3)

It is worth noting here the same two behavioural situations were positively predicted by one of the factors of workers’ attitude and perception “*Supportive Environment*” only. The positive prediction depicts that the more supportive environment for workers. The more they will continue working in the above mentioned situations. It was concluded for such a prediction, in Section 6.4.5, that peer support might give rise to unsafe work behaviour, thus creating an impression of negative team work outcomes. For behavioural prediction through workers’ cultural dimension, it was expected that the cultural dimension of “*Collectivism and Femininity*” might predict these two situations, thus confirming that workers can behave negatively when they work collectively. As mentioned earlier, none of the workers’ cultural dimensions predicted either of these two situations. This finding demonstrates that, in these situations, workers’ behaviour to continue working might be because of the formation of the team they belong to. Turner and Parker (2004) demonstrate three possibilities which can lead to the negative outcomes. According to them, one

possibility is that work characteristics might be negatively affected, which could then impinge on safety. The second possibility for the negative effect of teamwork could be the potential negative effects on the team process. The third possibility could be the composition of the team. Sometimes it is possible that introducing teams within diverse workplaces might negatively affect the group processes (Turner and Parker, 2004). Therefore it could be concluded that teamwork does not necessarily mean, working “Collectively”. Collectivism in cultural literature has been clearly defined as a phenomenon which places high priority on the maintenance of harmonious group working relationships (Hofstede, 1980). Hofstede, further implementing collectivism in the workplace narrates that in collectivistic society, the workplace itself may become an in-group in the emotional sense. The relationship between a worker and its co-workers is seen in moral terms.

6.7. Relationship between Workers’ Attitudes, Perceptions and Cultural Dimensions

As in previous sections, two statistical analyses were carried out in order to predict:

- Intentional behaviour through workers’ perceptions and attitudes (Section 6.4); and
- Workers’ Intentional behaviour through their cultural dimensions (Section 6.6)

Sections 6.4 and 6.6 statistically depicted that workers’ intentional behaviour can be predicted by their attitudes, perceptions and by cultural dimensions. Therefore, it was felt necessary to explore the relationship between identified cultural dimensions (*Collectivism & Femininity, Uncertainty Avoidance, and Power Distance*), and workers’ perceptions and attitudes factors (*Awareness and Beliefs, Physical Work Environment, and Supportive Environment*).

A Pearson correlation test was carried out in order to explore the linear relationship between the above-mentioned national cultural dimensions and the workers’ attitudinal factors. The Pearson correlation results revealed strong linear correlations between cultural dimensions and workers’ attitudes and perceptions. Table 6.8 details the values of Pearson correlations along with their associated significance

values (p). National culture dimension of *Collectivism and Femininity* (COL and FEM) showed strong positive correlations with two attitudinal factors of; “*Awareness and Beliefs*” and “*Physical Work Environment*”.

The strong positive relationship with both of the two attitudinal factors depicts that the more that dominant collectivism and femininity nature exist in workers attitude, the more they will be aware of safety issues by identifying and communicating safety issues among themselves. The results of the descriptive analysis of the workers’ cultural questionnaire relating to the measurement of collectivism and femininity have revealed that workers’ attitudes tend towards collectivism rather than individualism and also towards femininity rather than masculinity.

Therefore, the presence of such a strong positive correlation is not surprising at all; workers tend to be more supportive in sharing and conveying safety concern issues so as to help each other and also because the majority of the workers tend to stop working when faced with a perceived risky situation.

The second cultural dimension of *Uncertainty Avoidance* (UA) showed a strong correlation with “*Awareness and Beliefs*” and with “*Physical Environment*”, and a relatively less strong correlation with the third attitudinal factor “*Supportive Environment*”. The direction of these relationships was again positive, thus, depicting that, if workers are more safety aware and have a strong belief in safety issues, the higher would be their uncertainty avoidance.

The third and last cultural dimension of *Power Distance* (PD) showed a negative correlation with the attitudinal factor of “*Awareness and Beliefs*” only with significance value (p) of 0.044 and Pearson correlation value as -0.606. Though it did not show any statistically significance with the other two workers’ perception and attitude’ factors, but the Pearson correlation values for “*Physical work Environment*” (0.588) and “*Supportive Environment*” (0.555) were not too different from the Pearson correlation value of “*Awareness and Beliefs*”. The negative correlation between Power Distance and Awareness and Beliefs can be interpreted

as the more power distance between workers and management, the less will be the workers' awareness and beliefs in regarding safety issues.

Table 6.8 Correlations between Workers' Attitudes Perceptions and Cultural Dimensions

		Col & FEM	UA	PD
Awareness & Beliefs	Pearson Correlation	.880	.796	-.606
	Sig. (2-tailed)	.001	.018	.044
	N	140	140	140
Physical Work Environment	Pearson Correlation	.896	.783	.588
	Sig. (2-tailed)	.001	.024	.081
	N	140	140	140
Supportive Environment	Pearson Correlation	.426	.519	.555
	Sig. (2-tailed)	.078	.057	.604
	N	140	140	140

6.8. Conclusion

There is a growing general recognition that construction workers' attitudes towards safety are influenced by their perceptions of risk, management, safety rules and procedures. An examination of the literature suggests that a positive correlation exists between such perceptions and workers' safe behaviour. However, the literature review showed that little work had been carried out to explore such correlations in a developing country's setting.

Respondents, on average, tended towards a good degree of risk awareness and self-rated competence, and a relatively high degree of safety awareness. The work experience an individual has seems to positively influence their perception of risk. However, a minority of workers do misperceive risks attached to a number of situations and thus could be exposing themselves and other co-workers to risks due to their misperception. Overall, workers' intentional behaviour seems to be best explained by workers' attitudes towards their own and management safety responsibilities, as well as their perception of the risk they are generally exposed to in their workplace environment.

Perceived differences in safety climate dimensions between and within groups of organizations have been examined in previous studies (Budworth, 1997; Glendon

and Litherland, 2001; Mason and Simpson, 1995). In this doctoral study, the different trades of the workers were tested with attitude and perception factors to evaluate the statistically significant differences of perception factors within those trades. The test of one-way analysis of variance (ANOVA) demonstrated scaffolders to be in higher agreement with their two perception factors: *Awareness and Beliefs*, and *Supportive Environment*. It is worth noting here, that the majority of the scaffolders in their interview clearly mentioned their trade as being dangerous in terms of safety and health. The reasons provided by them related to the site and their quality of work. Also when the job is completed they are the last on site removing the scaffolding from the structure. As mentioned earlier in Section 4.3, the scaffolding trade is considered as “specialized” in terms of job technicality and also availability of relevant workforce from specific parts of the country. This lack of availability of a workforce makes scaffolding a monopolized trade, where usually the workers belong to either the same family or tribe. Therefore scaffolders are less threatened by their co-workers in terms of job security, preferring to work in a supportive environment.

In summary, it was very encouraging to identify such a positive attitude towards safety among the sample. Prevalent attitudes are that the workers: are well aware of the risk associated with their job; do not find working with a certain amount of risk exciting; believe in having shared responsibility and in maintaining good working relationships to prevent accidents; are confident about their ability to identify hazards; and do generally trust management. Contrary to the notion that construction workers in many developing countries are in favour of a fearless attitude (i.e. the tendency to perceive accidents as unavoidable, and thus, a negative attitude towards accident prevention measures), respondents, on average, tended towards a good degree of risk awareness and self-rated competence, and a relatively high degree of safety awareness.

Pakistani culture is characterized as distinct (Khilji, 1999). In this study the first three cultural dimensions were found to be similar to those in the study of Hofstede (1980), Khilji (1999) and Islam (2004), except for the dimension of power distance. The majority of workers denied the feeling of the existence of power distance

between them and the management. This particular difference can be attributed to one specific reason. The items through which the attempt was made to measure the power distance were addressed through safety issues so as to know what type of power distance prevails on construction sites, not at the head office level. Therefore it can be assumed that when there is a matter of safety concern, the stronger perception workers have regarding their safety, the more open is the management to discuss safety issues with them or vice-versa. The cultural analysis reported in this chapter provides strong evidence that Pakistani workers are more collective, feminist, believe in less power distance and opt for higher uncertainty avoidance in their safety attitudes.

The binary logistic analysis predicted workers' cultural dimensions of "*Collectivism and Femininity*" and "*Uncertainty Avoidance*" as the influential predictors of workers' safe behaviour. The results again support this study's finding of workers' behavioural analysis, which showed workers' attitudes lean more towards uncertainty avoidance so as to be safer. The third cultural dimension of "*Power Distance*" failed to predict any of the workers' behaviour; this finding also confirms the findings of the workers' cultural analysis, that they do not find or perceive much power distance with management, therefore their behaviour is not affected by that particular cultural dimension at all. Look again at into the definition of power distance, "*power distance relates both to autocracy and the willingness to tolerate differences in power*". This definition identifies that, as is the case of Pakistan with higher power distance, the workers more willingly accept and expect power distance from their managerial staff. Islam (2004), in his study on administrative culture in Pakistan reports, that workers do expect power distance with their boss, or else they do not appreciate his/her administration. Thus it can be then concluded that, although there might be the power distance within a construction organisation, workers themselves expect such an attitude, and thus for them it is a fact of life.

The Pearson correlation analysis of the interrelationship between workers' attitude and perceptions and national culture revealed that workers, working in a more collective, feminist, and higher uncertainty avoidance environment, are more likely to have safety awareness and beliefs and thus exhibit safer behaviour.

Chapter 7

Managers Survey Analysis & Results

This chapter is dedicated to detailing the data-analysis procedures and results, along with tables and graphs, obtained from the two managers' surveys (MS-I and MS-II).

7.1. Background Information

As mentioned earlier in Chapter Five, two different surveys were conducted to explore management safety practices and cultural trends in management. A total of 100 structured interviews were conducted with managers representing eleven (11) construction companies across eight (8) sites using safety management surveys I and II (MS-I and MS-II), and 130 interviews were conducted using cultural survey (MCS). It is also mentioned earlier in section 5.2.2.1.2 under the heading of management survey, that MS-II was the summary of MS-I questionnaire. The aim of developing MS-II was to counter check the respondents responses of MS-I. A statistical requirement for carrying out factor analysis requires the minimum ratio of five to each variable to be analysed. MS-II contained 14 variables, thus getting responses of 100 was deemed fit for the analysis, as the sample size went well above the threshold. The same procedure was adopted for the NC survey. NC survey contained 25 variables, thus due to the statistical requirement for factor analysis on NC survey, 100 sample size was not enough. Therefore in addition of 100 responses, thirty (30) more responses were sought, so as to reach the threshold requirement for factor analysis. Figure 7.1 below provides a breakdown of the total personnel interviewed (130). The following sections of this chapter will present and discuss each survey, its analysis and results, in detail.

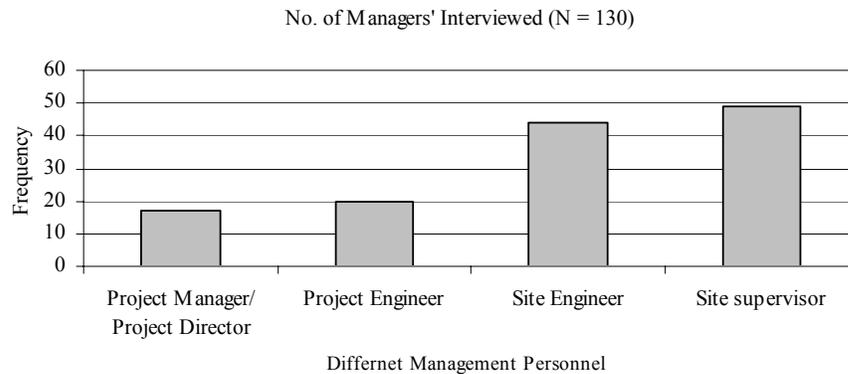


Figure 7.1 Professional Breakdown of Personnel Interviewed

7.1.1. T-Test for Independent Groups

Before proceeding to the formal descriptive analysis of MS-I and MS-II, it was deemed fit to perform a T-test between the managers' sample of 100. It was hypothesized that, as in the sample of managers, there must be a difference of opinion between qualified engineers, such as project managers, project directors, project engineers and site engineers and those working as site supervisors (as the majority of site supervisors are promoted or appointed from the workers rank on the basis of their relevant technical experience and their managerial attitude). Therefore, considering qualified engineers as one group and site supervisors as another, a T-test was performed. The result showed no difference in the opinions between these two groups, thus allowing the author, without any hesitation, to combine these two hypothesized groups as a single one group.

7.1.2. Working Experience

The majority of interviewed managers had a good deal of working experience. Out of 130 management staff interviewed: 27 (21 %) had more than 20 years; 34 (26 %) had more than 15 years, 25 (19 %) had more than 10 years; 22 (17 %) more than 5 years; and 22 (17 %) 5 years or less, construction experience. (Refer to Figure 7.2 for a graphical distribution of manager's construction experience.)

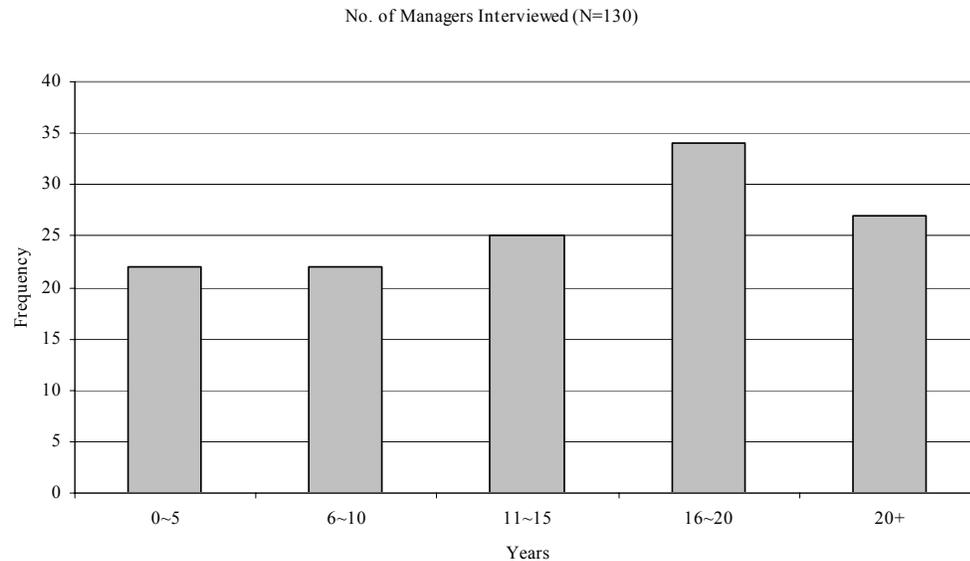


Figure 7.2 Manager's Construction Experience in Years

7.1.3. Safety Training

From the interviews, it was observed that very few managers had the opportunity to receive proper safety training. As depicted in Figure 7.3 below, out of 130 subjects interviewed: 73 (56 %) had no formal safety training at all; 22 (17 %) had half a day; 27 (21 %) had a full day; and only 8 (6 %) had two days or more. (Refer to Figure 7.3 for graphical distribution of training days received). The majority of the subjects referred to the training they had as generic and basic. Only seven (7) managers had safety training certificates, such as the Abu-Dhabi Company for onshore oil operation Health, Safety and Environment (ADCO-HSE) certified course, or diploma courses in health and safety. It is worth mentioning here that two (2) out of these seven (7) managers were working as project managers by virtue of their twenty or more years of international and local industry experience. Two (2) out of those remaining five (5) had twelve years experience working both internationally and locally. The remaining three (3) managers were working as project engineers and had more than fifteen years of construction experience.

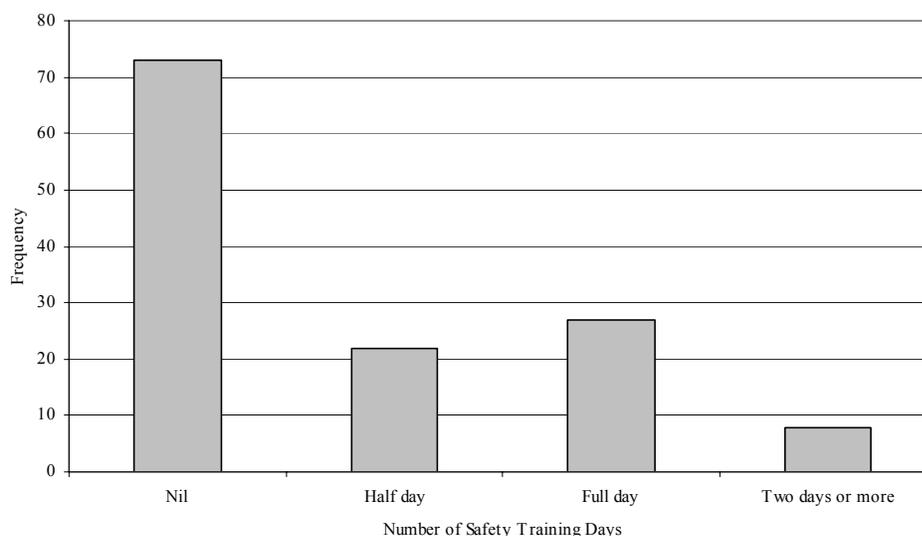


Figure 7.3 Graphical Distribution of Managers Safety Training Received

7.2. Manager's Safety Practices

The author carried out interviews targeting managers' safety practices at each of the eight (8) selected sites. Gathered data involved both qualitative and quantitative measures of the key features of the safety management systems. This section provides an overview of the qualitative data whereas Section 7.3 discusses, in detail, the results for the quantitative analysis.

7.2.1. Safety Plan

It is worth mentioning here that the term "Existence of safety plans" as understood by the "Interviewer" and "Interviewee" as a proper written, comprehensive clear plan of action addressing the problems of the site. The survey results revealed a very low level of available organisational safety plans that allow managers to monitor and audit safety performance. The majority of survey respondents were of the opinion that their organisations do not have printed and published safety documents at the organisation level. However, they did indicate the existence of site safety plans at the site level, which, according to them, may not meet international safety and health standards, but are being effectively implemented on the sites. Surprisingly, out of the eight (8) sites, only two had proper documented site safety plans. These two sites were operated by one company which specialises in providing project management, engineering, construction and maintenance services. On these two sites the managers

briefed the author about the regular monitoring of safety activities and the incentives schemes they implement to promote safety activities.

7.2.2. Safety Competence/Training

Managers seem to have little interest in using safety competence as a criterion for selecting and recruiting construction workers. However, managers of two out of the eight sites reported having a recruiting policy for workers, managers and subcontractors that refers to safety competence. These two sites are being operated by the same company as mentioned earlier, and it pays attention to safety competence when recruiting operators for special tasks, such as crane operators. This particular company was found to organise mandatory safety induction and periodical one-day programmes for its workers. In contrast, the managers representing the rest of the companies reported the lack of such programmes. Some of them also reported that, as they themselves have done some basic training in safety, though a long time ago, they try hard to train their staff on some occasions. As noted earlier, many of the project managers and project engineers had relevant working experience, either working with some foreign company or overseas, therefore they are aware of the importance of such training and they wanted to do the “right thing” for their workers, but budget restrictions did not allow them to do so.

7.2.3. Safety Monitoring

The majority of the managers reported having some level of monitoring systems for safety on site, which usually included hazard, incident and accident reporting. According to the majority of the managers their monitoring systems might not be up to the international site safety monitoring standards or they might not be using proper safety monitoring channels. However they again indicated that they prefer to use conventional and simple safety monitoring channels and to their belief monitoring systems are working effectively and fine. At two different sites – operated by the same company – a flow chart depicting clearly the process of safety monitoring and accident reporting was sighted. During discussions, it was made clear to the author that managers believe workers feel reluctant to report hazards or incidents on their own, until they are reminded again and again to do so. This complaint, when cross-referenced with workers to find out the reason for that

attitude, was flatly denied by many of them. However, a fear of the penalty of being laid off from the job, and a lack of trust between the managers and workers were common explanations given by some workers. When such reasons were fed back to managers, they had a very different view. The managers partially agreed in the lack of trust factors. Nevertheless, to show how much they were committed to reduce that alleged mistrust situation, managers quoted some of the following examples:

- Introduction of safety awards for the employees;
- Introduction of hazard detection awards; and
- Delegation of few administrative powers to site supervisors (i.e. leave authorizations, advance wage payments up to a certain amount, and medical cost up to certain amount). As these site supervisors are usually promoted from the workers cadre to the supervision (management) cadre, on the basis of their experience and discipline, workers feel free to contact them directly and discuss private issues.

A site manager, while denying the mistrust concept said:

“When any of the workers gets even a minor injury or cut, even due to his own negligence, he straight away runs to us for help. If there would have been any mistrust situation, then why they do not think of that before they approach us. To them it might be a minor injury but to us it would be a near miss”.

7.2.4. Safety Communication

Management on all eight (8) sites appeared to be relying on informal channels to communicate safety matters. They rely heavily on individual briefings to communicate safety messages, as this one-to-one approach was considered more reliable and effective. Only two sites reported having informal safety meetings on a regular basis, and also the incorporation of poster campaigns.

7.2.5. Safety Co-operation

Effective working relationships especially, on safety issues, were reported by managerial staff, between the main contractor (its operatives) and the different subcontractors. Managerial staff appointed by sub-contractors also validated the

effective level of co-operation. It was strongly believed that the main contractor is always responsible for safety issues on the site, whether they are legally bound or not through a contract. One of the site representatives confirmed that their main contractor was always ready to take-up his responsibilities for safety issues, and to show his commitment towards safety through the distribution of safety helmets, hard boots and safety signs.

7.2.6. Suggestions for Improvement

The following suggestions were provided by the interviewed managers to achieve an overall improvement of safety and health conditions in local construction sites:

- Establishing an independent health and safety monitoring agency or national safety and health council as an effective organisation, having a broad mandate for:
 - establishing current states of the safety and health conditions in the local construction industry and then benchmarking it with international standards;
 - proposing the relevant technical, legal and voluntary standards and codes of practice;
- Developing Construction Safety laws and regulations;
- Establishing commitments from the Federal Government to:
 - enforce safety regulations;
 - run national campaigns for wide publicity and public awareness;
 - provide obligatory safety training through provincial labour departments; and
 - allocate funds for promotion of awareness, training, information dissemination and research in occupational safety and health issues.
- Introducing new safety clauses to the company registration forms for Pakistan Engineering Council (PEC);
- Asking all enterprises to engage/employ a safety, health and environment officer. The minimum qualifications for such an officer should be prescribed in the law;

- Encouraging the government to establish Occupational Safety and Health (OSH) consultancy businesses and develop operational criteria for these businesses;
- Encouraging local universities to introduce Diploma, MSc and PhD level programmes in OSH disciplines to prepare a professionally trained cadre of manpower in the country. The government and industry should sponsor such educational and training programmes at least for the next five (5) years. The national OSH Council should also work to promote OSH education and training in the country;
- Introducing severe penalties for some safety breaches occurring at organizational levels;
- Improving management commitment to safety at organizational levels; and
- Increasing client and designer influence over safety issues.

7.3. Factors Analysis

The data gathered from the MSII survey was factor analyzed by using the principle component analysis with Varimax rotation. In order to assess the suitability of data for the factor analysis all the appropriate checks were performed, as mentioned in Section 6.2.3.3. The sample size of the managers for this analysis was 100, with the ratio of 7.1 cases to 1 variable, being well above the minimum permissible limits (Hair *et al.*, 1998). The test for measuring sampling adequacy (MSA) was conducted, showing 12 out of a total of 14 variables within the adequacy limits of 0.5 or above. Two variables were found to be short of the limit, therefore it was deemed fit to eliminate them from further analyses. The eliminated two variables are:

- *Main contractor takes all responsibility for the safety duties and rights of all site staff.*
- *Sub contractors' employees follow all safety related decisions made independently by the main contractor.*

Again the measure for the sampling adequacy (MSA) test was conducted after deleting the above two variables. The results of the second time test revealed that all the remaining variables had good sample adequacy ranging from .60 to .87. The KMO test gave the value of .798 and the Bartlett test of sphericity reached statistical significance with chi-square 2372.887 and significance level of 0.000. On the basis

of such results it was deemed fit to proceed with conducting the principle factor analysis using the remaining 12 variables.

The results revealed the presence of two distinct factors having an eigenvalue of more than unity. A Varimax rotation was then performed to obtain interpretable results for those two factors. The two-factor solution accounted for 82 percent of the total variance. Factors were then examined to identify the number of items that loaded on each factor by keeping in mind the rule for selecting only those items which have got the loadings equal to or more than 0.5 (Hair *et al.*, 1998).

On the basis of such restrictions, seven items were loaded on the first factor and accounted for 63% of the total variance, and five items were loaded on the second factor and accounted for 19% for the total variance. Table 7.1 depicts the 12 items in two factors, and their respective factor loadings, explained variances, eigenvalues and Cornbach's α for two factors.

Table 7.1 Factor Loadings for the 2-factor model of Managers' Safety Practices

Factor 1: Strategic	Loadings
<i>(Variance = 63%, Eigenvalue = 7.528, Cronbach's α = .944)</i>	
The company has a highly effective safety plan for site.	[.738]
The company has safety related criteria for worker's recruitment.	[.826]
The company has safety related criteria for managers and supervisors recruitment.	[.755]
The company has safety related criteria for sub-contractors selection.	[.787]
The company has highly effective training programme for workers.	[.872]
The company has highly effective training program for managers and supervisors.	[.860]
There is high level of cooperation between main contractor and different subcontractor (s) to handle safety at site.	[.860]
Factor 2: Operational	
<i>(Variance = 19%, Eigenvalue = 2.265, Cronbach's α = .756)</i>	
The company has safety monitoring policy and keeps safety records.	[.898]
The company has an effective hazard reporting system	[.864]
The company has an effective incident/near misses and accident reporting system	[.840]
Communication on safety is an important issue for the company.	[.794]
Communication channel/s used by the company proves to be highly effective in promoting the safety in the workplace.	[.876]

7.3.1. Factors Interpretation

Each of the two factors was labelled in accordance with the common thread that connects together the set of individual items loaded onto it. The first factor was

labelled “*Strategic*” because it contained seven items addressing safety management strategic issues. These items include: existence of effective safety plans for site; recruitment policy for workers; managers and sub-contractors with particular reference to their safety experience; training programmes for workers, managers and supervisors; and expected level of cooperation between main contractor and sub-contractors on safety issues. The majority of these items enjoy relatively large factor loadings (>0.77). The mean and standard deviation scores showed that a majority of the managers were of the opinion that their organisation did not have a proper and highly effective site safety plans [mean score = 1.49]; there is neither policy for having a safety experience criteria for the recruitment of staff (which includes, workforce, managers, site supervisors) nor for hiring sub-contractors [mean score = 1.35]; no proper or specific safety training is conducted for the workforce [mean score = 2.01], managers, supervisors [mean score = 2.0]. Managers did, however, indicate that the relationship of cooperation between the main contractor and sub-contractors regarding safety is satisfactory [mean score = 4.29].

The second factor, “*Operational*”, contained five items addressing the operational aspects of site work. Such items include: monitoring safety policy and keeping safety records; having an efficient hazard, incident and near miss reporting system; and the effectiveness of communication styles on promoting safety issues in the workplace. Many of the managers confirmed the existence of proper safety monitoring policies [mean score = 4.68] and effective hazard reporting systems on the sites [mean score = 4.15]. The presence of an effective communication systems for safety issues was also strongly acknowledged [mean score = 4.88].

7.4. Managers’ Cultural Survey (MCS)

The same questionnaire, used for the workers’ culture survey, was also administrated for the managers. The sample was increased to 130 to reach the required adequacy level of sample size for performing factor analysis. Hair *et al.* (1998) mentions that, as a general rule, the minimum sample size should be at least five times as many observations as there are variables to be analysed.

7.4.1. Factor Analysis

Prior to proceeding with the factor analysis, a suitability test was also conducted on this set of data. The test of measuring sampling adequacy (MSA) was conducted. This test showed that five variables of the culture questionnaire could not meet the required minimum value of 0.5. Therefore each of the five variables was removed one by one, and each time the test was repeated to check the MSA. Finally, it was found that all these five variables had to be removed so as to proceed with factor analysis. The deleted variables were:

- *Safety problems are openly discussed between workers and supervisors;*
- *Workers lose respect for a supervisor, who asks them for their input before he makes any safety decision;*
- *I prefer the company having less strict rules and where I feel easy to work with, to the company having more strict rules and long working hours to follow;*
- *I will not change my attitude towards safety rules, even if my supervisor praises safe work behaviour; and*
- *I prefer the company having higher pay rates but lower safety records to the company having better safety records but average pay rates.*

After deleting the five variables, the MSA test was again conducted to identify the changing effect of individual MSA values in each of the variables. Individual MSA values were found ranging from 0.59 to 0.88. The Kaiser-Meyer-Olkin (KMO) value was found to be .809 and the Bartlett test of sphericity reached statistical significance with chi-square 5962.778, df190 and significance level of 0.000.

The 20 variables were now deemed fit for factor analysis tests. They were put into the factor analysis by conducting a principle factor analysis. This test revealed the presence of a three-factor solution, which accounted for 81 % of the total variance. Eigenvalues for the three factors were found to be greater than one. Varimax rotation was performed so as to interpret results of those loadings on the three-factor solution. The factors were then examined to identify the number of items that loaded on each factor. Care was taken to pick only those items that had loadings equal to or more than 0.5 (Hair *et al.*, 1998). The first factor catered for nine items, followed by six and five in the second and third factors, respectively. As with the factor analysis

for workers' cultural survey, a confirmatory factor analysis was conducted on the three-factor solution for managers' cultural survey.

All nine items, which were loaded previously on the first factor through the exploratory analysis, were then put in for the confirmatory factor analysis. The rationale for adopting this procedure was to confirm the results of the exploratory factor analysis. Confirmatory factor analysis identified the existence of the first factor with all those nine factors homed in it. Also, the result of the confirmatory factor analysis identified the existence of the second and third factor with the same six and five item loadings respectively. Table 7.2 depicts the 20 items in the three factors and their respective factor loadings, explained variances, eigenvalues and cornbach's alpha (α).

Table 7.2 Factor Loadings for the 3-factor model of Managers Cultural Survey

Factor 1: Power Distance & Femininity	
<i>(Variance = 37%, Eigenvalue = 7.449, Cronbach's α = .743)</i>	
Major decisions regarding site safety issues, always take place after consulting with site workers / subcontractors	[.751]
Managers and supervisors do encourage feedback regarding safety issues from site workers	[.703]
I am always encouraged to raise any safety concern with my site supervisor	[.807]
Workers are always being consulted regarding preparation of site safety plans	[.772]
I am allowed to act decisively if I find any situation contrary to safe conditions on site	[.931]
Personally I enjoy the risk aspects associated with my job	[.975]
Safety decisions made by me alone are usually more effective then decisions made by my co-workers together	[.706]
It is not always important to have a good working relationship with my supervisor	[-.826]
When workers ignore safety procedures at my workplace, I feel it is none of my business	[-.761]
Factor 2: Uncertainty Avoidance	
<i>(Variance = 24%, Eigenvalue = 4.835, Cronbach's α = .850)</i>	
Generally workers follow safety rules without being told to do so	[.985]
Safety rules should not be broken, even when worker believes it affects the production	[.703]
Safety decisions made by the management usually seems to be more effective then decisions made by workers	[.985]
Many accidents just happen, there is little one can do to avoid them	[.842]
I prefer to work with larger company as they have more effective safety practices on site than the smaller one	[.837]
I often feel nervous or tense at work	[.853]
Factor 3: Collectivism	
<i>(Variance = 20%, Eigenvalue = 4.022, Cronbach's α = .701)</i>	
A company should have major responsibility for the health and welfare of its injured worker	[.756]
Co-workers often give tips to each other on how to work safely	[.762]
A safe place to work has a lot of personal meaning to me and my co-workers	[.986]
It would help in improving the site safety, if my co-workers support safe behaviour	[.747]
Safety training can help me in improving my attitude to work more safely	[.978]

7.4.2. Factors Interpretation

The first factor on the basis of the nine items loaded to it was labelled “*Power Distance & Femininity*”. It contained 37 % of the total variance. The items loaded on this factor were basically addressing the issues of perception of power distance, masculinity, and femininity. Similar to the workers’ cultural survey analysis, the managers’ cultural survey also revealed the overlapping of two cultural dimensions. This time it was “*Power Distance*” and “*Femininity*”. Out of the nine items, the first five were posed to measure the perception of power distance and the rest of the items addressed femininity/masculinity. The Likert type of scale was measured as 1= *strong agreement* and 5= *strong disagreement*. The mean values for the second and third, regarding “to encourage feedback on safety issues from workers” and “encouraging workers to raise any safety concern”, showed that managers are a little happy or feel less power distance in giving such “liberty” to workers (1.97 - 2.12). The remaining power distance statements, surprisingly, showed that managers have a strong perception for power distance (4.12 – 4.65). These mean values depict that managers do not accept the idea to include all the workers into that process, to save time and avoid confusion. This shows that managers do feel comfortable welcoming feedback on any concerns on safety issues from workers, on one hand. However, they feel reluctant to ask for the participation of workers while developing site safety plans. From the managers’ perspective, it would be difficult and confusing to ask all of the workers to contribute their ideas in order to come up with site safety plans or such issues. Also they hesitate to allow or authorise the workers to stop work immediately, if they encounter any safety hazard conditions.

The mean values ranged from 4.28 to 4.85 for the four statements, which were posed to ascertain the perception of femininity, revealed their feminist attitude rather than the masculinity.

The second factor for managers’ cultural survey catered for six items, all of which were posed to measure the perception of uncertainty among the managers. This factor, which was labelled “*Uncertainty Avoidance*”, contained 24 % of the total variance. Items or statements for this item were of two different styles. Out of the six items, two were presented in such a way that agreement with them would

represent high uncertainty avoidance (mean values ranging from 1.52 to 1.54) and the rest of the four items were presented in a way that disagreement with those items would represent high uncertainty avoidance (mean values ranging from 4.42 to 4.56). The managers' responses to all these statements (whether agree or not) revealed a high degree of uncertainty avoidance attitude.

The third factor had five items and contained 20 % of the total variance. This factor was labelled "*Collectivism*" because all the items it catered for were posed to measure the perception of collectivism among the managers. The mean values (1.20 to 1.59) for the responses showed that managers also possess a strong perception towards work collectively rather than individually.

7.5. Relationship between Safety Management Systems and National Culture

A Pearson correlation test was carried out to explore the linear relationship (if any) between the two already identified safety management factors (strategic and operational) and national culture dimensions.

The Pearson correlation results revealed some strong linear correlations between the national culture dimensions and the two safety management systems factors. Table 7.3 details the values of the Pearson correlations along with the significance values (α). The national culture dimension of *Power Distance & Femininity* showed strong positive correlations with the two factors "*Strategic*" and "*Operational*". The results of the descriptive analysis of the managers' cultural questionnaire relating to the measurement of power distance and femininity revealed that managers possess more power distance and a less masculine attitude. Therefore the presence of such a strong correlation and descriptive analysis shows that there is a strong effect of femininity and power distance on the strategic and operational issues of safety. Managers' decisions regarding safety plans, safety monitoring, hazard reporting, cooperation between main contractor and sub contractor issues are strongly affected by the femininity and power distance cultural dimension. They tend to tolerate the power distance issue to some extent (till where they feel the workers will not take this "facility" or "luxury" for granted and become too demanding). After that they

feel they have to be strict and maintain discipline and so their level of power distance increases.

Table 7.3 Statistically Significant Correlations between Safety Management Survey and Cultural Factors

		PD & FEM	UA	COL
Strategic	Pearson Correlation	.639	-.720	.598
	Sig. (2-tailed)	.018	.037	.061
Operational	Pearson Correlation	.632	.720	.818
	Sig. (2-tailed)	.001	.023	.017

The second cultural dimension of “*Uncertainty avoidance*” showed a negative relationship with the first factor of safety management systems “Strategic” and a surprisingly positive relationship with the second factor “Operational”. As the descriptive analysis showed that managers have a stronger uncertainty avoidance nature, this negative relationship could be explained as: the higher uncertainty avoidance, the lower will be their risk taking attitude/behaviour in their strategic planning for safety. The positive relationship between *Operational* and *Uncertainty avoidance* factors shows the higher the uncertainty avoidance the more intense will be site safety activities, such as hazard reporting, accident reporting and the use of effective communication channels for safety.

The third cultural dimension of *Collectivism* showed a strong positive relationship with the *Operational* factor. From the descriptive analysis of the cultural dimension “*Collectivism*”, it was obvious that managers tend to be more comfortable and confident while working in a collectivistic environment. Therefore, this positive relationship depicts that the operational aspects of safety will be more effective and efficient, if managers work closely together. These operational aspects include: monitoring safety performance; having a combined effort for hazard reporting; and using effective communication channels.

The same third cultural dimension of *Collectivism* failed to show a statistically significant relationship with *Strategic* safety management factor. At the strategic level, where recruitment policy regarding workers, managers and sub-contractors is discussed or the training programmes (if any) worked out, the collectivistic part of

the culture does not play an important part as compared to the operational level. At operational level managers' responsibilities usually include monitoring safety hazards, incident/near misses reports, and safety communication between managers and workers, as well the sub-contractors. Therefore this non-significant relationship with *Strategic* factor can be interpreted as managers feel confident and comfortable in a collectivistic environment and prefer to carry on the "Operational" duties collectively as compared to "Strategic" ones.

7.6. Conclusion

It was good to see that the majority of interviewed managers had good deal of working experience in the construction industry. While fewer numbers of managers had a chance to obtain safety training, it was encouraging to see all that managers did understand and appreciate the importance of training in reducing the number of site accidents. It was interesting to find that many of the managers had a good working experience abroad, and that they were utilising their *safety consciousness* attitude to the maximum extent by: developing local site safety plans; the mandatory wearing of hard hats and hard boots; and using safety signs throughout some construction sites.

Both the management surveys (MS-I and MS-II) indicated that the majority of the sites did not have site safety plans. Only two out of the eight visited sites had safety plans; these were mostly generic documents that could be applied to any construction site. Six out of the eight sites had no recruiting policy on the basis of safety experience or the competence for workers, managers and sub-contractors. Almost all sites showed affirmative attitudes to the existence of safety monitoring systems, at least to basic level. Managers were found to be satisfied using the informal approach (e.g. individual briefings) to communicate safety issues. Some evidence was found to show that the main contractor had a good level of safety co-operation with his sub-contractor staff as well.

The cultural analysis revealed again the merging of two cultural dimensions into one, as with the workers cultural analysis covered in Chapter Six. Power distance and

femininity came as one factor, along with uncertainty avoidance and collectivism. The mean and standard deviation values revealed that managers are also of a collective, feminist nature and have higher uncertainty avoidance in their attitudes towards safety. For power distance, it was interesting to see that unlike workers, managers believe in power distance and do not believe in participatory culture. It was clearly observed, from the descriptive analysis of the cultural items regarding power distance, that majority of the interviewed managers showed quite a lot of flexibility with the “feedback” issue (if it is not challenging managers’ decision), regarding safety on site, and encouraging workers to “raise any safety concern” (if it is not too demanding). It was surprising to see the firm and rigid attitude of the managers on the non-participation culture for issues like “major decisions on safety” and “preparations of site plans”. Managers recommended “*power distance*” as a useful tool for effective administration. Managers tended to be more collectivistic and supportive, less masculine and more uncertainty averse while they make their safety decisions either in head office or on site. These findings regarding power distance and collectivism are in line with Khilji’s (2001) and Islam’s (2004) findings. Khilji’s (2001) findings show that the organizational structure in Pakistan is bureaucratic, centralized and not generally responsive to the needs of the employees. Also, she pointed out that several managers have resisted the development of participatory culture, to retain the power and non-questioning culture. According to Islam (2004), Pakistan’s collectivist orientation and its kinship-based culture go a long way in explaining the prevalence of power distance within their administration. Pakistani traditions of a value system based on kinship and the high tolerance of inequality (power distance) goes side by side. Though the norms, values and institutions vary to some degree from region to region, the central place of the family and kinship remains constant (Islam, 2004).

The Pearson correlation analysis of the interrelationships between managers’ cultural trends and their safety practices revealed some strong relationship patterns. This analysis shows that managers’ cultural trends do have an influence on their safety practices. Their safety related decisions, whether developed in head office or on site, are definitely influenced by their collectivistic, feministic, power distance and high uncertainty avoidance attitude.

Managers' feminist and power distance attitudes influence their strategic and operational decisions directly. This case was found between uncertainty avoidance, collectivism and their operational site-based safety management practices.

Chapter 8

Prediction of Worker's Perceptions and Attitudes through National Culture & Manager's Safety Practices

After exploring the effect of workers' culture on their perceptions and attitudes (detailed in Chapter Six) and then the effect of managers' culture on their safety practices (detailed in Chapter Seven), the next statistical task was to combine the responses of both culture samples (workers and managers) and bring it to a single sample of national culture. This approach was to help explore the effect of national culture, along with the managers' safety practices on workers' perceptions and attitudes, which in turn influence or predict workers' behaviour (detailed in Chapter Six). In other words, this would be the strongest test of the hypothesis concerning which independent variables (National Cultural dimensions and Managers' Safety Practices factors) predict, or are associated with, the dependent variables of workers' perceptions and beliefs regarding safety (Safety Climate). The combining procedure of the two culture samples, the factor analysis on the combined sample, and the results are reported in this chapter. It also details the results of the regression model for independent and dependent variables.

The results reported here are presented under two main sections. Section 8.1 discusses the procedure for combining the culture surveys for workers and managers, differences in their opinions, and the extraction of cultural dimensions through factor analysis. Section 8.2 details the results obtained for prediction of workers' perceptions and attitudes (dependent variables) through managers' safety practices and national culture (independent variables). This prediction analysis was carried out through a linear multiple regression analysis using SPSS (version 11.5)

8.1. National Culture

The procedure adopted for combining the two culture questionnaire samples (workers and managers) into a single sample, labelled from this point onwards as National Culture, are presented here.

A T-test for independent groups is useful when the goal is to compare the difference between the means of two groups with the same variable. An independent sample T-test was conducted to compare the mean values between workers' and managers' cultural questionnaire responses.

It was hypothesized that the mean values between those two samples will be the same, thus allowing the author to combine the two samples together. However, the results showed a difference in mean values for 18 items, consequently initially rejecting null hypothesis. The national cultural questionnaire (both for workers and managers) had a Likert-type scale, where 1 = *strong agreement*, and 5 = *strong disagreement*. A careful examination of the mean values revealed that the means score of twenty (20) items only fluctuated between scale 1 and 2, or scale 4 and 5, thus making no significant change in the opinions. Only five items were found, whose mean values had a big difference on the scales and thus clearly showed a marked difference in the opinions between these two samples. As a result, the following five items were removed prior to proceeding with combining the two samples; this was done as it was felt that those particular items could not be combined together as they showed a clear difference in opinions. The five items were:

- *Managers and supervisors do encourage feedback regarding safety issues from site workers;*
- *Generally workers follow safety rules without being told to do so;*
- *Personally I enjoy the risk aspects associated with my job;*
- *Many accidents just happen, there is little one can do to avoid them; and*
- *I prefer to work with a larger company as they have more effective safety practices on site than the smaller one.*

consideration of their representation; they are just informed after the decision is made. An interesting point was that all those workers were unconcerned with such non-participation. The workers reported that they have faith in their management, so whatever decision made regarding safety, they believe management will make a decision that would be beneficial for the workers. Workers also believed that the company they had worked for so long now was like a family to them, with the managers being as an elder who possessed a better decision-making ability. Therefore, it could be concluded that workers tend to see some acceptable power distance from the management side; they are also more linked to the uncertainty avoidance side; they do not want to take risks in making safety decisions; and they are satisfied with delegating this responsibility totally to the managers.

From the management side 70 % of the managers did not agree that they involve workers in their decisions on safety matters. To the managers, involving workers or even their representatives in their safety policy decisions is just a waste of time. Two reasons were quoted by most interviewed managers for such an attitude: 1) workers will then become too demanding; and 2) workers or even their representatives are not competent enough for such tasks. The rest of interviewed managers agreed that they do involve workers' representatives, just for the sake of developing participatory working culture. When this group of managers was asked about the issue of the competency of the workers' representative, their views were not different to other managers. They endorsed the issue of fewer competencies in workers, which involved: illiteracy, limited experience and sometimes a hyper attitude which hinders their ability to make the right decision. The mean value for workers on this item was 2.09 and for managers it was 4.17.

Item 2 *“Personally I enjoy the risk aspects associated with my job”*

The mean value for workers on this item was 4.14 and for managers it was 2.17. Eighty-five percent of the workers disagreed with the above statement. This means that they do not get excited by the risk they perceive in their job, rather they take the chance of a risk seriously and cautiously, so as to avoid any possible injury or mishap. The remaining 15 % of workers agreed with this item. This particular

finding confirms the earlier finding of this study regarding the unsafe behaviour of a minority of workers; the majority of the workers showed more careful attitudes and safe perceptions for behavioural situations, as presented to them. Fewer workers (not more than 10 %) were found to have misperceptions about the potential risks on site.

Seventy-two percent managers, on the other hand, agreed with the statement, while 20 % were negative and 8 % were not sure what to say. The majority of managers' affirmative replies show that to managers the nature of risk associated with their job may differ according to the characteristics of the workers. Or the managers do not find themselves directly exposed to construction hazards, as the workers do, so for them the risk perception can be different to that of the workers.

Item 3 “Generally workers follow safety rules without being told to do so”

This item showed a clear-cut split in opinions between the workers and the managers. It appears from the mean values of the respondents that both samples were pandering to their ego, the mean value for workers on this item was 2.14, where as for the managers it was 4.53.

Seventy percent of the workers thought that it was not always necessary to be reminded of their safety responsibilities. They understand the difference between safe and unsafe acts, therefore they do follow safety rules. However, 25 % of the workers did not agree with this item and the remaining 5 % were not sure what to answer.

Ninety-five percent of the managers on the other hand declined this proposition and consented that they have to remind workers every minute, every day to comply with the safety rules, for the workers' own self interest. Further, the managers also felt that workers were careless and thus, if managers do not consistently remind them of the basic safety issues they would never follow. The remaining 5 % of the managers thought that the workers did follow the safety rules without repeatedly being reminded.

Item 4 *“Many accidents just happen, there is little one can do to avoid them”*

The frequency of distribution of the replies for this item was interesting. For workers: 50 % said yes, 30 % said no and 20 % were not sure, while for the managers: 20 % said yes, 65 % said no and 15 % were not sure. The agreement with the above item highlights that people have less uncertainty avoidance and that disagreement poses a higher uncertainty avoidance. Looking into the frequency distribution of both samples for this particular item, it appears that workers stand towards less uncertainty avoidance as compared to managers. Managers seem to have a higher uncertainty avoidance because, they feel in charge of the site and it is their responsibility to avoid accidents as much as they can. Consequently managers prefer to act as the main player in making the site safer, rather than just sitting around and waiting for accidents to happen; then accounting for them as past of destiny. Workers on the other hand, feel that they are not the controlling agents of the site, therefore they can not help much with avoiding accidents. Therefore the workers’ agreement to this item depicts their less un-certainty avoidance attitude. The mean value for the workers was 2.77 and for the managers it was 4.08.

Item 5 *“I prefer to work with larger company as they have more effective safety practices on site than the smaller one”*

The mean value for the workers’ response on this item was only 2.28 and for managers it was 4.15. Sixty-five percent of the workers said that they prefer such arrangements where the management might be more interested in keeping the workplace safe and they have the chance to work more safely. It is worth mentioning here that 80 % of the workers who consented in the affirmative for this item were working with sub-contractors, in relatively small companies as compared to others. Thirty-five percent of the workers thought that, whether working in a small or large, organisation they are doing just fine and they did not opt for any change. One of the general reservations for not positively consenting to this item was the risk of job insecurity in bigger companies.

Sixty-five of managers on this item said no to this proposition preferring to work with a smaller company. They were not concerned whether the smaller or larger

company had more or less safety practices. Again, this response was in connection with the item of un-certainty avoidance, in which they were asked about enjoying the risk associated with their job. For managers there might not be much of risk in their related job, therefore they did not care much for the working with larger organisation just for the sake of their safety record. They instead prefer to work with those companies that offer them good pay and positions. The rest of 35 % did care about safety and responded yes to the item.

8.1.2. National Culture Dimensions

After removing the above items, the number of items left on the culture questionnaire were now 20. Out of those 20, five more items were dropped/deleted from further analysis. The rationale was that those five items were already deleted from the individual analysis of the culture for workers and managers due to either not reaching to MSA minimum value or to item section criteria values. Out of these deleted items, two items were commonly deleted from both analyses (workers' and managers' cultural analysis) and, in addition to those two items, three more were deleted from the managers' cultural analysis. The deleted items were:

- *Safety problems are openly discussed between workers and supervisors;*
- *Workers lose respect for a supervisor, who seeks their input before he makes any safety decision;*
- *I prefer the company having less strict rules and where I feel easy to work with, to the company having more strict rules and long working hours to follow;*
- *I will not change my attitude towards safety rules, even if my supervisor praises safe work behaviour; and*
- *I prefer the company having higher pay rates but lower safety records to the company having better safety records but average pay rates.*

The remaining 15 items of the national culture survey were then factor analysed by using component analysis with Varimax rotation. In order to assess the suitability of data for factor analysis all the checks were performed as previously mentioned in earlier chapters.

Table 8 1 Factor loadings for the 3-factor model of National Culture

Factor 1: Collectivism & Femininity (Variance = 42%, Eigenvalue = 6.293, Cronbach's α = .679)	Loadings
I often feel nervous or tense at work	[.914]
A company should have major responsibility for the health and welfare of its injured worker	[.905]
Co-workers often give tips each other on how to work safely	[.840]
A safe place to work has a lot of personal meaning to me and my co-worker	[.876]
It would help in improving the site safety, if my co-workers support safe behaviour	[.909]
Safety training can help me in improving my attitude to work more safely	[.588]
Safety decisions made by me alone are usually more effective then decisions made by my co-workers together	[.878]
It is not always important to have a good working relationship with my supervisor	[-.602]
When workers ignore safety procedures at my workplace, I feel it is none of my business	[-.701]
Factor 2: Power Distance (Variance = 21%, Eigenvalue = 3.153, Cronbach's α = .600)	
Major decisions regarding site safety issues, always take place after consulting with site workers/subcontractors	[.886]
I am always encouraged to raise any safety concern with my supervisor	[.849]
Workers are always being consulted regarding preparation of site safety plans	[.698]
I am allowed to act decisively if I find any situation contrary to safe conditions on site	[.940]
Factor 3: Uncertainty Avoidance (Variance = 15%, Eigenvalue = 2.232, Cronbach's α = .590)	
Safety rules should not be broken, even when worker believes it affects the production	[.787]
Safety decisions made by the management usually seems to be more effective then decisions made by workers	[.730]

The sample size for this analysis was 270 (workers = 140 and managers = 130). Therefore the ratio of 18 cases to 1 variable was found and was deemed fit for further analysis (Hair *et al.*, 1998).

The test for sample adequacy (MSA) showed that all 15 variables were well within the adequacy limits of 0.5 or above. Also the Kaiser-Meyer-Olkin (KMO) test gave the value of 0.790. The factor analysis revealed the presence of three factors having the eigenvalues of more than unity. The Varimax rotation was then performed so as to obtain an interpretable result for that three-factor solution. These three factors accounted for 78% of the total variance. Factors were then examined to identify the number of variables or items that loaded on each factor by keeping in mind the threshold value mentioned by Hair *et al.* (1998). Table 8 1 depicts the 15 items in three (3) factors and their respective factor loadings, explained variances eigenvalues and Cornbach's α for three-factor solution.

Nine items were loaded on the first factor, which accounted for 42% of the total variance. This first factor was labelled "*Collectivism and Femininity*" because of the nature of the items contained in this factor. The second factor catered four items

with 21% of variance and was labelled “*Power Distance*”. The third factor accounted only for 15 % of the total variance and two items were grouped into this factor referring to the uncertainty avoidance theme; therefore it was labelled as “*Uncertainty Avoidance*”.

8.2. Prediction of Worker’s Perceptions and Attitudes through National Culture and Managers’ Safety Practices

8.2.1. Regression Analysis

The prediction of workers’ perceptions and attitudes through the national culture and the managers’ safety practices was investigated using the regression analysis technique. Regression analysis informs how strongly a related pair of variables is, via a measure of correlation. It also measures the extent of the effect that a change in the independent variable (IV) has on the dependent variable (DV) (Rose and Sullivan, 1993). The linear regression technique, using ordinary least squares (OLS), is suitable for this analysis as the dependent variables (i.e. Awareness & Beliefs, Physical Work Environment, and Workers Supportive Environment) are of continuous nature. These variables were assessed against two sets of independent variables:

1. The three national cultural dimensions identified in the previous section (i.e. *Collectivism & Femininity*, *Power distance*, and *Uncertainty avoidance*); and
2. Managers’ safety practices factors, namely *Strategic* and *Operational* (identified in Section 7.3).

Each of the three dependent variables was put into a regression model separately with the two independent variables. The results revealed that two cultural dimensions (*Collectivism & Femininity* and *Uncertainty avoidance*) and two *Strategic* and *Operational* factors showed statistically significant relationships with the three dependent variables, suggesting that these IVs have an influence in predicting the attitudes and perceptions of the workers (DVs). (Refer to Table 8.2 for multiple regression analysis results and also Figure 8.1, which provides a graphical summary of the statistical findings of the test.)

8.2.2. Interpretation of Statistical Findings

The regression analysis revealed that the most significant predictor on workers' perceptions and attitudes was the “*Operational*” factor (Beta = 0.916, $p = 0.007$). The operational factor, as explained in Chapter 7, dealt mainly with site safety issues. The items which contributed to this factor were: having effective hazard reporting system; effective incident/near misses and accident reporting, and the importance of safety communication and its effectiveness on construction site.

The correlation of this operational factor with workers' “*Physical Work Environment*” was in fact expected. The positive relationship between these two variables shows that the greater the managers' safety record in terms of their site safety issues; the more positive the workers' attitudes and perceptions will be. An interesting point in this particular finding was that this factor showed the strongest relationship with workers' attitudes on their work environment. This means that workers, before relying on their instincts and initiative, first rely on the managers' safe practices. The particular finding confirms the previous finding of this research for relating to the workers' higher uncertainty avoidance and acceptance of power distance. Workers in more hierarchical organisations expect their bosses to be a “model” which they follow. Also in higher uncertainty avoidance culture workers mostly rely to their bosses's decisions/instructions. So the more the safe operational practices on the site that the managers adopt, the workers will perceive them in a positive light; thus the safer will be the physical work environment.

According to the Beta value, the second most influential factor predicting workers' “*Safety Awareness and Beliefs*” was the national cultural dimension of “*Collectivism and Femininity*” (Beta = 0.761, $p = 0.000$). This relationship had a positive Beta sign. Thus, if managers have more collectivism and feminist attitudes in designing and planning the safety plans, the result would be more awareness and a stronger belief by workers in safety issues. If managers openly discuss safety issues with workers and if workers observe the cooperative attitudes of managers, workers in turn will feel more secure, involved and will confidently behave in a cohesive or collective manner, which will definitely help to improve or increase their safety awareness and safety beliefs.

The third significant influential predictor was again “*Collectivism and Femininity*”, but this time it predicted workers “*Physical Work Environment*” (Beta = 0.421, $p = 0.000$). This relation depicts that a more collectivistic and feminist nature of workers will result in a more combined effort for making the work environment safer. It has been proved from the workers’ cultural analysis that the more they are allowed to work in collectivistic and feminist environment, the more they can advise each other regarding safety; thus ensuring a safer work place.

One of the last two predictions was by managers’ safety practices’ first factor “*Strategic*” (Beta = 0.273, $p = 0.005$). This factor contains all those items, which are usually used for the strategic planning for safety on sites, for example, the existence of site plans, site safety procedures, recruitment policy and training programmes. This positive relationship can therefore be narrated as: the stronger the management commitment on safety issues, the higher will be the workers’ safety awareness and beliefs. This is because they will see how committed their management is in terms of safety issues on site, and result in the safer attitude of the workers on safety issues.

The last predictor for workers safety awareness and beliefs was “*Uncertainty Avoidance*” (Beta = 0.252, $p = 0.027$). Again the positive Beta sign shows that the higher the uncertainty avoidance attitude of the workers the more likely it is they will be safe; they never want to take risks, thus they increase their safety perceptions and beliefs. As they will be having a higher uncertainty attitude, therefore they will always be searching for safe work practices.

The managers safety practices factor of “*Strategic*” failed to predict workers’ attitudinal factor of “*Physical Work Environment*”. The items loaded on the “*Strategic*” factor included all those items which dealt with strategic planning for safety issues, which were usually carried out in offices not on sites. On sites, only safety strategies were executed, but these have been designed or planned at the head office. Therefore the non-prediction of any of the workers attitudinal factors through “*Strategic*” demonstrates that workers’ perceptions and attitudes are affected by those “*Operational*” aspects, which they practically use on site, rather than “*Strategic*” aspects which are planned in the offices.

The third cultural dimension of “*Power Distance*” did not predict any of the workers’ perceptions and attitude factors (i.e. “*Physical Work Environment*” and “*Awareness and Beliefs*”) (refer to Table 8.2). This finding was not surprising to the author as, in Chapter Six, Section 6.6.3, while predicting workers’ behaviour through their national culture dimensions, power distance failed to predict any of the given behavioural situations. In Section 6.7, while exploring the relationship between workers’ attitudes and perceptions and their national cultural dimensions, the cultural dimension of “*Power Distance*” showed a relationship with only one workers’ attitudinal factor “*Awareness and Beliefs*” (refer to Table 6.8) and failed to demonstrate any relations with the other two factors.

Therefore it can be concluded that there is a linear relationship between “*Power Distance*” with workers’ attitudinal factors of “*Awareness and Beliefs*”, but when it comes to exploring the level of prediction of workers’ attitude and perception, specifically, “*Power Distance*” fails to do so. It seems, when it comes to shaping workers attitudes and perceptions regarding their own safety “*Awareness and Beliefs*” and “*Physical Work Environment*”, the cultural dimension “*power distance*” start losing its effect and becomes less significant, as compared to the two other cultural dimensions, (i.e. *COL & FEM* and *UA*).

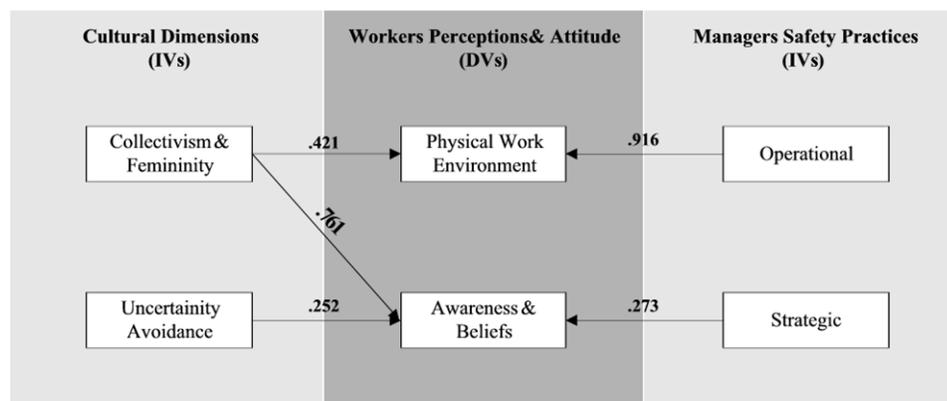


Figure 8.1 A model of statistically significant predicted relationships between IVs & DVs

Table 8.2 Results of Multiple Regression Analysis

		Unstandardized Coefficients		Standardized Coefficients	t-test	Sig.
		B	S.E	Beta		
Awareness And Beliefs	(Constant)	.306	.094		3.242	.001
	COL&FEM	.149	.017	.761	9.049	.000
	PD	-.079	.125	-.072	-.631	.530
	UA	.242	.108	.252	2.251	.027
	Strategic	.793	.244	.273	3.245	.005
	Operational	-.050	.112	-.052	-.445	.657
Physical Work Environment	(Constant)	2.861	.887		3.228	.001
	COL&FEM	1.784	.435	.421	4.027	.000
	PD	.059	.120	.054	.490	.625
	UA	.050	.108	.049	.460	.647
	Strategic	.013	.119	.011	.106	.916
	Operational	1.500	.326	.916	3.219	.007
Supportive Environment	(Constant)	-1.118	.656		-1.708	.000
	COL&FEM	-.027	.129	-.023	-.211	.833
	PD	-.035	.149	-.027	-2.35	.815
	UA	.059	.120	.054	.490	.625
	Strategic	-.074	.096	-.078	-.773	.442
	Operational	.162	.134	.142	1.208	.230

8.3. Conclusion

After dropping five items off the cultural questionnaire, the two samples (workers and managers) were combined so as to perform the factor analysis. The factor analysis revealed the presence of three distinct dimensions for national culture. These dimensions were labelled according to the items they contained. The three-dimension solution, along with the managers' safety practices factors, was then put into the multiple regression analysis in order to predict perceptions and attitudes of workers. Multiple regression analysis parcels out the significance of predictions between dependent and independent variables. Figure 8.1 illustrates the predictive relationships, along with the Beta values, obtained from the analysis. The strongest relationship was found to exist between managers "Operational" safety practices factor and the "Physical Work Environment". This pattern of relationship highlights that there is a greater likelihood of management commitment, in terms of providing effective safety procedures, in relation to accident reporting, accident monitoring, and safety communication, they are even more important than the culture trends in shaping workers' awareness for keeping the physical work environment safe.

Regression analysis findings, for one of the major objectives (influence of national culture on workers attitude and perceptions) revealed that workers safety awareness and beliefs is influenced by two cultural dimensions: *Collectivism & Femininity*, and *Uncertainty Avoidance*. Both cultural dimensions had a positive relationship with both workers' attitude and perception factors (*Awareness and Beliefs* and *Physical Work Environment*). This positive relationship shows that, if workers are allowed to work in a collectivist and femininus environment, with their high uncertainty attitude, there is a greater likelihood that the workers' awareness and beliefs for safety issues will increase, which, in-turn, directly affects the working environment.

The second managers' safety practices factor "*strategic*" predicted workers' awareness and beliefs. This relationship was positive as well and states that safety beliefs will be stronger, if management commitment persists. If workers are convinced by the seriousness of their management towards safety issues, in terms of developing site safety plans, providing safety trainings programmes and improvement in the level of cooperation between main contractors and sub contractors, then workers' attitudes towards safety will be stronger.

The difference in opinions between workers and managers on the five national cultural items showed that managers believe more in power distance and generally in less uncertainty avoidance. These findings are in line with the findings for the managers' cultural trends (Chapter Seven). Workers, on the other hand, showed fewer assumptions about power distance and a higher uncertainty avoidance. According to Khilji (2003), hierarchical differences are learned early in life; a child is taught to be respectful in relationships and is discouraged from questioning authority. This is carried over to organizational settings where a formal, hierarchical structure exists. Hofstede (1980) found that Pakistan seems to have a moderately high score on the Power Distance Index (PDI). Pakistan ranked 18th among a group of 52 countries on his PDI index. This signifies that Pakistanis tolerate a rather high degree of inequality. Only a low level of autonomy is given to employees and they are rarely encouraged to rely on themselves or to learn new things.

The findings on workers' and managers' cultural analysis showed their inclination towards collectivism rather than individualism. Supporting this finding is Hofstede's (1980) study which found Pakistan scored very low on individualism, but very high on collectivism. Pakistan remains essentially a collectivist country, where individualism, in the sense of the western urban society, does not exist, particularly in rural areas. An individual is an inalienable part of the multiple groups which completely dominate his or her individuality (Islam, 2004). The most significant manifestation of Pakistani collectivism is the key role played by the family and the kinship structures. This is especially so in the rural areas which are dominated by a value system based on kinship, family, *zat* (lineage group), *qaum* (occupational group) and tribe (Khilji, 2003). As mentioned in Chapter Four, in the discussion on Pakistani national culture, construction workers also feel more comfortable and confident working in groups, which usually are made up of their own social groups.

Another interesting finding was the mis-trust of workers towards management on a number of items. Though generally workers trust managers on safety issues, when it comes to "open communication" as an indication of site safety hazards, workers seem reluctant to express their feelings as they fear job loss, may be blamed for the hazard or may receive another penalty. Fukuyama (1995) makes it clear that a collectivistic society is not necessarily one in which all are united towards a common goal, but rather one in which innumerable different collectives (usually kin-based) compete, and where the success of one collective is interpreted as the failure of another. That is why a "collectivist" society is also a "low-trust" society. Jamal (1998) mentions that Pakistani employees have low-trust among themselves and with management. The current study confirms this view, finding that workers distrust management's promises because they are rarely implemented.

Uncertainty avoidance (UA) is the cultural tendency to feel uncomfortable with uncertainty and risk in everyday life. It reflects the degree to which people in a country prefer a structured, over an unstructured, situation. High UA cultures prefer formal rules and structured organizations (Hofstede, 1980). Pakistan ranks fairly high on Hofstede's Uncertainty Avoidance Index. Pakistan's high uncertainty is evident in its organizational structure. Its highly hierarchic structures, with

centralized power are used as the principal means to coordinate and resolve conflicts. Hierarchy is used to reduce uncertainty (Islam, 2004).

Chapter 9

Conclusion

9.1. Background Information

A review of the literature on the construction industry, safety management, safety climate and its factors and national culture in chapters One, Two, Three and Four, provided a framework for the research methods in Chapter Five. Chapters Six, Seven and Eight presented the analysis of the data and the results in detail. This chapter (Chapter Nine) outlines the three types of findings from the research. It begins by summarising the key outputs of the work presented in each chapter. It then identifies key contributions made by the research to extend and further develop the existing body of knowledge. Finally, it outlines the implications of the work for other researchers and the construction industry, in general, and the Pakistani construction industry in particular, and also suggests a number of possible directions for future research.

9.2. Key Findings

The main objective of this research was to explore the influence of national culture on the construction safety climate in Pakistan. With this end in mind eight secondary objectives listed below were identified as important:

1. Undertake a literature review on: occupational health and safety conditions in the construction industry in general; the construction industry in developing countries; safety performance management and its requirement in the construction industry; and safety climate and its relation with safe behaviour.

2. Undertake a literature review on national culture so as to explore its relationship with, and importance to the construction industry, and then to identify the framework for national culture to be adapted for this research.
3. To investigate the perceptions and attitudes of Pakistani workers regarding safety at construction sites.
4. To identify workers' level of risk perception and their preferred behaviour in risky situations.
5. To establish whether significant relationships exist between workers' perceptions, attitudes and their behaviour.
6. To investigate local construction safety management practices.
7. To establish whether statistically significant relationships exist between workers' perceptions, attitudes, work behaviour and management practices.
8. To explore the influence of key national cultural dimensions on workers' perceptions, attitudes and work behaviour, as well as on management practices.

These objectives have successfully been achieved, as described below:

- Chapter One: Along with the introduction, a review of literature on the vulnerable nature of the construction industry in general, as compared to any other labour intensive industry, is presented. The scope is then narrowed-down to the current occupational health and safety conditions in the construction industry in developing countries, so as to provide a basis for the research on occupational health and safety issues.
- Chapter Two: On the basis of Chapter One's review on the poor occupational health and safety condition in the construction industry in general, and in

developing countries in particular, the importance of safety management and safety performance in any organization was highlighted, with the conclusion that, to determine the existing level of safety management in any organization, a safety performance instrument is essential (Tarrants, 1970). Moving along further in the discussion, this chapter presented different techniques used to measure the safety performance of any organization. The different techniques considered for measuring safety performance included an analysis of the accident data (Girmaldi, 1970), behavioural sampling (Tarrants, 1980), and the measuring of people's attitudes towards safety (Schroder, 1970). Safety climate (measuring people's attitude towards safety) was identified as one of the measuring techniques for safety performance in any organization. It was discussed in detail.

- Chapter Three focused on national culture. It began with the introduction of national culture and its definitions. It then justified the relevancy of national culture with construction and presented a brief literature review of the research on national culture in management, generally, and in construction, specifically. This chapter then reviewed the available literature on various frameworks: Hall (1959, 1976), Hofstede (1980), Schein (1985), Trompenaars and Hampden-Turner (1993) and Project GLOBE (2001). On the basis of this review, Hofstede's framework was identified as suitable for this research and provided a rationale for that reason. Hofstede's framework was described in detail.
- Chapter Four exclusively provided an overview on Pakistan. It began with an introduction of the geographical position. Followed by a discussion on the Pakistani national culture and a review of the literature on factors which have influenced Pakistani culture over a long period of time. It then looked into Pakistan's construction industry and discussed its main players. This chapter then concluded with an overview on the prevailing safety and health conditions in Pakistan's construction industry.

- Chapter Five was devoted to discussing and detailing the research technique adopted for this research study. This chapter commenced with outlining the research methodology, supported by research activities and expected output flow diagram. Each step of the methodology was then discussed in detail, providing all possible rationales in the development of five different questionnaires (i.e. WAS, WBS, MS-I, MS-II, and MC (WCS + MCS)) for two different research samples (construction workers and managers). The objective and utility of each questionnaire survey was discussed in respective sections of the chapter.

- Chapter Six presented the results of all the statistical procedures adopted for the data analysis so as to achieve objectives number 3, 4 and 5. A safety climate questionnaire was administered in order to investigate perceptions and attitudes of Pakistani workers regarding safety at construction sites. The results, after statistical analysis, revealed that workers had a good degree of self-rated competence, and thus a relatively high degree of safety awareness. The work experience of individual appears to be positively influenced by their perception of risk. The descriptive analysis showed that the more the working experiences of the worker, the higher the degree of risk awareness. Though a minority of the workers did misperceive risks attached to a number of behavioural situations, overall workers' intentional behaviour seems to be best explained by their attitudes towards their own and management's safety responsibilities. The key findings from this chapter are discussed below:
 - In the workers' attitudes and perception analysis, it was found that workers were well aware of the risk associated with their work or trade. They do not find working with a certain amount of risk exciting. The mean and standard deviation values demonstrated that workers strongly believe in having shared responsibility for safety with management. Also they generally trust management's decisions on safety issues.

- An interesting finding related to the positive relationship between work experience and the perception of risk, which was found while analysing the workers' attitudes and perceptions questionnaire. The descriptive analysis showed that, in majority of the cases, higher risk perception was associated with experienced labouring.
- This study also attempted to explore the linkage among workers' attitudes, perceptions and their intentional behaviour. The binary logistic regression depicted a statistically significant relationship between workers' perception and preferred behaviour. Workers' (1) awareness and beliefs, (2) physical work environment, and (3) supportive environment predicted workers' intentional behavioural situations. For all those behavioural situations which were clearly perceived as of medium-to-high risk, the majority of the workers preferred to stop working.
- In the workers' behavioural analysis, only two out of the nine behavioural situations gave the impression of negative team work outcomes (for situations, please refer to Section 6.4.5). These two specific behavioural situations were: predicted by the workers' attitudes and perceptions factor of "*Supportive Environment*". Workers perceived these two situations as low-risk. Their intentional behaviour was not to stop working if such a situation happens to them. The reason for such behaviour was that they would be labelled a coward by their co-workers if they failed to continue working in such situations. These findings give the impression that some teamwork factors could have a detrimental affect on safety, under some circumstances (Turner and Parker, 2004). One of the reasons attributed to this negative aspect of teamwork is its potential negative effects on the team process. For example, group members might engage in social loafing and reduce their efforts (Karau and Williams, 1993). Overall workers preferred behaviour was best explained by

their attitudes towards their own and management' safety responsibilities.

- This doctoral study also analysed a variety of trades of the workers (i.e. masons, scaffolders, carpenters, electrician, steel fixers and painters) with their attitudes' and perceptions' factors (i.e. awareness and beliefs, physical work environment and supportive work environment). A one-way of analysis (ANOVA) was used so as to explore statistically significant differences in the perceptions and attitudes of the workers belonging to different trades. The results showed a higher agreement for the trade of scaffolders with the awareness and beliefs and supportive environment.
- Two decades ago Hofstede (1980) published his "Cultural consequences", which stated that national cultures can be distinguished on the basis of four dimensions. His study included Pakistan, along with other countries. One of the purposes of this study was to find out whether his classifications for Pakistan are still valid in terms of high uncertainty avoidance, high-power distance, collectivism and femininity, as well as to find out their influence on workers behaviour and management safety practices. It was found that the cultural dimensions of collectivism, uncertainty avoidance and femininity were similar to Hofstede's (1980) study, except power distance. The majority of the workers denied the existence of the feeling of power distance between themselves and management.
- The results for the prediction of workers' safe behaviour, through national cultural dimension, demonstrated cultural dimensions of "collectivism and femininity" and "uncertainty avoidance" as the influential predictors.
- The results of the Pearson correlation for exploring the interrelationship between workers' attitudes and perceptions and the

national culture showed some strong positive relationships. The findings revealed that workers working in more collective, feminist and higher uncertainty avoidance environments were more likely to have safety awareness and beliefs, which in-turn will exhibit safe behaviour.

- The management survey analysis in Chapter Seven indicated that the majority of the sites did not have a proper site safety plans. Only two out of the eight visited sites had safety plans; these were mostly generic documents that could be applied to any construction site. It was encouraging to observe that many of the managers had a good working experience abroad, and thus they understood the importance of training in reducing site accidents. Many of the site engineers and project engineers, due to their safety consciousness attitude, had developed local site safety plans so as to allow them to monitor and audit safety performance. A common comment from site engineers, regarding the proper site safety plans, was :

“Though their organizations do not have printed and published safety documents at the organization level, they do confirm the existence of local site safety plans at the site level, which may not meet the international safety and health standards, but are being effectively implemented on the sites”.

Six out of the eight sites did not have any recruiting policy on the basis of safety experience or competence for the workers, managers or sub-contractors. Almost all the sites showed an affirmative attitude on the existence of safety monitoring systems, at least to some level. Managers were found to be happy in using the informal approach, such as individual briefings to communicate safety issues. Some evidence was found to show that the main contractor had effective safety co-operation with his organisation and sub-contractor staff as well. Cultural analysis revealed the presence of three cultural dimensions. Managers recommended “*power distance*” as a useful tool for effective administration. They tend to be more

collectivistic and supportive, less masculine and more uncertainty avoiders, while they make their safety decisions either in head office or on sites. These cultural findings for managers regarding power distance and collectivism are in line with Khilji (2001) and Islam's (2004) findings. Khilji (2001) identified that the typical organizational structure in Pakistan is bureaucratic, centralized and not generally responsive to the needs of employees. Also she pointed out that several local managers have resisted the development of participatory culture, in order to retain power and non-questioning culture. The Pearson correlation analysis of interrelationships between managers' cultural trends and their safety management preferences revealed some strong relationship patterns. This analysis showed that managers' safety management preferences are being influenced by their cultural trends. Their safety related decisions, whether being developed in head office or on site, are definitely influenced by their high collectivistic, feministic, power distance and uncertainty avoidance attitude.

- Chapter Eight presented the results for the prediction of worker's perceptions and attitudes through national culture and manager's safety practices. The difference of opinion between workers and managers, on a number of cultural statements, depicted workers' belief in less power distance, and their tendency for collectivism, femininity and high uncertainty avoidance. Managers demonstrated their high power distance attitude in administration and generally less uncertainty avoidance. The managers felt quite comfortable and confident while working in a collectivistic atmosphere. Multiple regression analysis for workers' attitudes and perceptions factors against national cultural factors and managers' safety practices factors predicted some statistically significant perception and attitude factors. Managers' safety practices factor "Operational" came out as the most influential independent variable.
- Finally, the multiple regression analysis findings, for one of the major objectives; influence of national culture on workers' attitudes and perceptions, gave evidence that: (1) workers attitudes and perceptions with

particular reference to their safety “*Awareness and Beliefs*” and “*Physical Work Environment*” is influenced positively by two cultural dimensions (i.e. *Collectivism and Femininity* and *Uncertainty Avoidance*). This positive prediction of independent variables depicted that if workers were provided with an environment of collectivism to complement their feminist and uncertainty attitude, there was a greater probability that workers’ awareness and beliefs for safety issues would be increased; (2) managers safety practices factors “*Operational*” and “*Strategic*” also showed a statistically significant prediction for workers’ safety “*Awareness and Beliefs*” and “*Physical Work Environment*”.

9.3. Contributions to the Existing Body of Knowledge

Despite the large number of studies having addressed the concept of safety climate and safety performance, limited research has focused on: (1) safety climate and safety performance in the construction industry with particular reference to developing countries; and (2) the inter-cultural study of Pakistani culture. In the majority of available studies, researchers have either developed a new model or replicated an already tested model with a view to improving its’ adequacy. Moreover, to the best of the authors’ knowledge, none of the available research has explored the influence of Pakistani culture on construction safety climate. The work concluded through this doctoral study, for the first time, has looked into the inter-cultural aspects of Pakistani construction workers and managers, and has then attempted to explore the influence of Pakistani national culture on workers’ attitudes, perceptions, and safe/unsafe behaviour, and manager’s safety practices. Therefore, it adds to a small but growing body of empirical research concerning developing countries’ construction safety climate and its relationship with respective national culture values. Possibly the most notable contribution of this thesis is in examining the cultural issues on workers and managers and identifying the difference in opinions in national culture in workers and managers. These differences in opinions shaped workers as of high-tolerant of power distance, high uncertainty avoidance, more feminist and high collectivistic. While managers appeared to be believing in more power distance, high uncertainty avoidance, more feminist and high collectivistic.

9.4. Contributions to the Pakistani Construction Industry

Due to a relatively new awareness of construction safety in Pakistan, the construction industry lacks infrastructure for proper construction safety standards and plans. This study provides some useful insights into the main players of the Pakistani construction industry for a greater understanding of: (1) risk perceptions, attitudes and safe/unsafe work behaviour of construction workers; (2) managers' safety practices and their preferences; and (3) the extent to which workers' attitudes and perceptions and their behaviour are associated with their national culture. This data not only adds to the understanding of the implications of Pakistani cultural values on the construction organization, but also provides new knowledge for construction managers who will be better able to understand the culture within which they operate and improve outcomes. The results of this doctoral research will be of use to a cross-sectional range of workers and managers.

9.5. Recommendations for Future Research

Recommendations for future research as a result of this project are listed below.

- This study focused on safety climate in the Pakistani construction industry and to what extent Pakistani national culture can influence that safety climate. However, no attempt was made to do any sort of comparative study either with any other developed country or developing country. Therefore further research is recommended in this area; especially a comparative study could be carried out on the same pattern in any developed country like Australia, so as to compare the results within these two countries. Another comparison can be undertaken by utilising the same questionnaires for safety climate and for national culture from this doctoral study for any other developing country which reflects similar construction operations environment.
- Further research can also be recommended in the area of safety climate within Pakistan, but this time to include Pakistani construction managers for their safety attitudes and perceptions and then to compare the results of perceptions and attitudes of construction workers and managers on safety climate and managers' safety practices.

- This research did not attempt to develop a cause and effect model of relationship between national cultural dimensions and workers attitudes, perceptions and managers' safety practices. Therefore it is recommended to study the cause and effect between workers attitudes perceptions factors, managers' safety practices and national cultural dimensions by using structural equation modelling (SEM). This study will help, in-depth understanding the behaviour of each variable and its direct/indirect link with other variables.
- For further future research it is recommended, to test the direct or indirect influence of safety climate factors, that could be relevant to Pakistan construction industry (i.e. regulatory environment, management characteristics, worker characteristics, physical work environment and work pressure) on safety climate. A conceptual model for safety climate for Pakistan's construction industry could then be proposed, and statistically tested.

9.6. Closure

This research made fundamental contributions in three areas: 1) Examining of safety climate and safe work behaviour of construction workers in a developing country namely Pakistan; 2) evaluating the influence of national culture of construction workers on their safety attitudes, perceptions and safe performance; and (3) exploring the influence of national culture on the safety practices of managers in the Pakistani construction industry. The questionnaire surveys, face-to-face interviews and statistical data analyses provided useful insights into the influence of national culture on workers attitudes, perceptions, and behaviour and managers safety practices.

References

- Advisory Committee on the Safety of Nuclear Installations (ACSNI) (1993) “Organizing for Safety”. *Third Report of the Human Factors Study Group of the Advisory Committee on Safety in the Nuclear Industry*. Health & Safety Commission, HMSO, London.
- Agrilla, J.A. (1999) “Construction Safety Management Formula for Success”. *Proceedings of the 2nd International Conference of International Council for Research and Innovation in Building and Construction (CIB) Working Commission W99*, Honolulu, pp. 33–36.
- Ahmed, M. (1996) “The Crescent and the Sword: Islam, the Military and Political Legitimacy in Pakistan”. *Middle East Journal*, 50 (3), pp. 372-386.
- Ahmed, M. (1997). *Education: Pakistan in Perspective 1947-1997*. Oxford University Press, Karachi, pp. 238-275.
- Ahmed, S.M., Tang, S.L. and Poon, T.K. (1999) “Problems of Implementing Safety Programs on Construction Sites and Some Possible Solutions”. *Proceedings of the 2nd International Conference of International Council for Research and Innovation in Building and Construction (CIB) Working Commission W99*. Honolulu, pp. 525–529.
- Ajzen, I. and Fishbein, M. (1980) *Understanding Attitudes and Predicting Social Behaviour*. Prentice-Hall. Englewood Cliffs, NJ.
- Andriessen, J.H. (1978) “Safe Behaviour and Safety Motivation”. *Journal of Occupational Accidents*, Elsevier Scientific Publishing Company, Amsterdam, pp. 363-376.
- Awan, T. (2001) “Occupational Health and Safety in Pakistan”. *Asia Labour Update Report No. 39*.
- Baba, K. (1996) “Development of Construction Management Based on Regional Culture”. In Langford, D.A. and Retik, A. (Eds), *The Organization and Management of Construction: Shaping Theory and Practice*, Vol. 1. E & FN Spon, London.
- Baxendale, T. and Jones, O. (2000) “Construction Design and Construction Management Safety Regulations in Practice: Progress and Implementation”, *International Journal of Project Management*, 18 (1), pp. 33–40.
- Bentil, K.K. (1990) “Construction Site Safety: A Matter of Life and Costs”. *Cost Engineering*, 32 (3), pp. 7-10.
- Berg, U. (1999) “Safety Campaign: Fall Risk in Construction Work, Implementation of Safety and Health on Construction Sites”. *Proceedings of the 2nd International Conference of International Council for Research and Innovation in Building and Construction (CIB) Working Commission W99*. Honolulu, pp. 853-866.
- Berger, J. (1998) “The Health and Safety Protection Plan and the File Containing Features of the Building According to ECC Directive (92/57)”. *ME Rinker Lecture Series on Safety and Health in Construction*. University of Florida, Gainesville, US.

- Bird, A. (2003) "The Impact of National Culture on Collaboration". *Proceedings of the Symposium for Collaborating Across Professional Boundaries: From Education to Practice*. Chicago, IL. [<http://www.stuart.iit.edu/ipro/papers/html/bird.htm>].
- Blockely, D. (1995) "Processes Re-Engineering for Safety". *Proceedings of the Conference on Risk Engineering and Management in Civil, Mechanical and Structural Engineering*. ICE, London, pp. 51-66.
- Bomel Ltd. (2001) "Improving Health and Safety in Construction Phase 1: Data Collection, Review and Structuring". *Contract Research Report 386/2001*. HSE Books, Sudbury.
- Bond, M.H. (1996) *Chines Values*, in Bond, M.H. (Ed), *The Handbook of Chinese Psychology*, Oxford University Press, Hong Kong.
- Britannica online (2003) <http://www.britannica.com/ebc/article-9362009>. Accessed on March, 2003.
- Brown, R.L. and Holmes, H. (1986) "The Use of a Factor-Analytic Procedure for Assessing the Validity of an Employee Safety Climate Model". *Accident Analysis and Prevention*, 18(6), pp. 455-470.
- Budworth, N. (1997) "The Development and Evaluation of a Safety Climate Measure as a Diagnostic Tool in Safety Management". *Journal of the Institution of Occupational Safety and Health*, 1, pp.19–29.
- C.I.A. (2005) <http://www.odci.gov/cia/publications/factbook/geos/pk.html>. Accessed on April, 2005.
- Canter, D. and Donald, I. (1990) "Accident by Design: Environmental, Attitudinal and Organizational Aspects of Accidents, Culture Space History". *Proceedings of the 11th International Conference of the International Association of the Study of People and Their Physical Settings*. Turkey, pp. 228-232.
- Carthey, J., Hale, A.R., Heming, B. and Kirwan, B. (1994) "Extension of the Model of Behavior in the Control of Danger: Literature Review and Analysis of Model Development Needs". *Report to the Health & Safety Executive UK*. Industrial Ergonomics Group, School of Manufacturing & Mechanical Engineering, University of Birmingham.
- Chan, E.H.W. (1997) "Amicable Dispute Resolution in the People's Republic of China and its Implications for Foreign Related Construction Disputes". *Construction Management and Economics*, 15 (6), pp. 539-548.
- Chew, D.L.E. (1988) "Effective Occupational Safety Activities: Findings in Three Asian Developing Countries". *International Labour Review*, 127, pp. 111- 125.
- Cheyne, A., Cox, S., Oliver, A. and Tomas, J.M. (1998). "Modelling Safety Climate in the Prediction of Levels of Safety Activity". *Work and Stress*, 12, pp. 255-271.
- Chhokar, J.S. and Wallin, J.A. (1984) "Improving Safety through Applied Behaviour Analysis". *Journal of Safety Research*, 15, pp. 141-151.

- Chow, W.C., Yutaka, K. and Shields, D.M. (1994) "National Culture and the Preference for Management Controls: An Exploratory Study of the Firm-Labour Market Interface". *Accounting Organization and Society*, 19 (4), pp. 381-400.
- Coble, R.J. and Haupt, T.C. (1999) "Construction Safety in Developing Countries: Implementation of Safety and Health on Construction Sites". *Proceedings of the 2nd International Conference of International Council for Research and Innovation in Building and Construction (CIB) Working Commission W99*. Honolulu, pp. 903-908.
- Cohen, A. (1977) "Factors in Successful Occupational Safety Programs". *Journal of Safety Research*, 9, pp. 168-178.
- Cooper, M.D., (1998) *Improving Safety Culture: A Practical Guide*. Wiley, Chichester.
- Cohen, A., Smith, M. and Anger, W. (1979) "Self-Protective Measures Against Workplace Hazards". *Journal of Safety Research*, 11, pp. 121-131.
- Cooper, M.D. and Phillips, R.A. (1995) "Killing Two Birds With One Stone: Achieving Quality Via Total Safety Management". *Leadership and Organizational Development Journal*, 16(8), pp. 3-9.
- Cooper, M.D. and Phillips, R.A. (2004) "Exploratory Analysis of the Safety Climate and Safety Behaviour Relationship". *Journal of Safety Research*, 35, pp. 497-512.
- Cooper, M.D., Phillips, R.A. Robertson, I.T. and Duff, A.R. (1991) "Improving Safety on Construction Sites by the Utilization of Psychologically Based Techniques: Alternative Approaches to the Measurement of Safety Behaviour". *Paper given at the 5th European Congress of Psychology on Work and Organization, Rouen, France*.
- Cooper, M.D., Phillips, R.A., Sutherland, V.J., and Makin, P.J. (1994) "Reducing Accidents Using Goal Setting and Feedback: A Field Study". *Journal of Occupational and Organizational Psychology*, 67, pp. 219-240.
- Cox, S. and Cox. T. (1991) "The Structure of Employee Attitudes to Safety: A European Example". *Work and Stress*, 5(2), pp. 93-106.
- Cox, S.J. and Cheyne, A.J.T. (2000) "Assessing Safety Culture in Offshore Environments". *Safety Science*, 34, pp. 111-129.
- Cox, S. and Flin, R., (1998) "Safety Culture: Philosopher's Stone or Man of Straw?" *Work and Stress*, 12, pp. 189-201.
- Coyle, I., Saleeman, S.D. and Adams, N. (1995) "Safety Climate". *Journal of Safety Research*, 26, pp. 247-254.
- Crawley, F.K. (1999) "The Change in Safety Management for Offshore Oil and Gas Production Systems". *Institution of Chemical Engineers Transactions. IChemE*, 77 (B), pp. 143-148.
- Dane, F.C. (1990) *Research Methods*. Brooks / Cole Publishing, Pacific Grove, California.
- Datta, M. (2000) "Challenges Facing the Construction Industry in Developing Countries". *Proceedings of the 2nd International Conference on Construction in Developing*

- Countries: Challenges Facing the Construction Industry in Developing Countries.* Gaborone, Botswana, pp. 15-17.
- Davies, V.J. and Tomasin, K. (1996) *Construction Safety Handbook*, (2nd edition). Thomas Telford Publishing, London.
- DeBobes, L. (1986) "The Psychological Factors in Accident Prevention". *Personnel Journal*, 65, pp. 34-38.
- Dedobbeleer, N. and Beland, F. (1991) "A Safety Climate Measure for Construction Sites". *Journal of Safety Research*, 22, pp. 97-103.
- Dedobbeleer, N. and German, P. (1987) "Safety Practices in the Construction Industry". *Journal of Occupational Medicine*, 29 (11), pp. 863-868.
- Derr, C.B. and Laurent, A. (1989) "The Internal and External Career: A Theoretical and Cross-Cultural Perspective". In Arthur, M., Lawrence, P.R. and Hall, D.T. (Eds).
- Diaz, R.I. and Cabrera, D.D. (1997) "Safety Climate and Attitude as Evaluation Measures of Organizational Safety". *Accident Analysis and Preventions*, 29(5), pp. 643-650.
- Donald, I., Cantaer, D. and Chalk, J. (1991) "Measuring Safety Culture and Attitudes". *Proceedings of the 1st International Conference on Health, Safety and Environment in Oil and Gas Exploration and Production.* Society of Petroleum Engineers.
- Duff, A.R., Robertson, I.T., Cooper, M.D. and Phillips, R. (1993) "Improving Safety on Construction Sites by Changing Personnel Behaviour". *Health Safety Executive Contract Research Report; No. 51/1993*, Health and Safety Executive.
- Eagly, A.H. and Chaiken, S. (1993) *The Psychology of Attitudes*. Harcourt Brace Jovanovich Fort Worth.
- Erez, M. and Early, P.C. (1993) *Culture, Self-identity, and Work*, Oxford University Press, New York, NY.
- Evans. P.A.L. (1992) "Management Development as a Glue Technology". *Human Resource Planning*, 15, pp. 85-105
- Fang, D.P., Xie, F., Haung, X.Y. and Li, H. (2004) "Factor Analysis Based Studies on Construction Workplace Safety Management in China". *International Journal of Project Management*, 22 (1), pp. 43-49.
- Fellows, R. and Liu, A. (1997). *Research Methods for Construction*. (2nd edition). Blackwell Science, Australia.
- Flin, R., Conner, P.O. and Bryden, R. (2000) "Measuring Safety Climate: Identifying the Common Features". *Safety Science*, 34 (1-3), pp. 177-192.
- Flin, R., Mearns, K., Fleming, M. and Gordon, R. (1996) "Risk Perception and Safety in the Offshore Oil and Gas Industry". *Health and Safety Executives Offshore Technology Report (OTH94 454)*, HSE Books, Sudbury.
- Fukuyama, F. (1995) *Trust: The Social Virtues and the Creation of Prosperity*. Penguin Publications, London.

- Garavan, T.N. and O'Brien, F. (2001) "An Investigation into the Relationship between Safety Climate and Safety Behaviours in Irish Organisations". *Irish Journal of Management*, 22 (1), pp. 141-170.
- Gerbing, D.W. and Anderson, J.C. (1988) "An Updated Paradigm for Scale Development Incorporating Unidimensionality and its Assessment". *Journal of Marketing Research* 25, pp.186-192.
- Gilkey, R.W. and Greenhalgh, L. (1991) "The Role of Personality in Successful Negotiating". In Breslin, J. W. & Rubin, J. Z. (Eds.), *Negotiation Theory and Practice*. Cambridge: Program on Negotiation. pp. 279-290
- Glendon, A.I. and Litherland, D.K. (2001) "Safety Climate Factors, Group Differences and Safety Behaviour in Road Construction". *Safety Science*, 39 (3), pp. 157-188.
- Glendon, A.I. and McKenna, E.F. (1995) *Human Safety and Risk Management*. Chapman & Hall, London.
- Glendon, A.I. and Stanton, N.A. (2000) "Perspectives on Safety Culture". *Safety Science*, 34 (1-3), pp. 193-214.
- Glendon, A.I., Stanton, N.A. and Harrison, D. (1994) "Factor Analysing a Performance Shaping Concepts Questionnaire". In S. A. Robertson (Ed.). *Contemporary Ergonomics: Ergonomics for all*. Taylor & Francis, London:
- Glennon, D. (1982) "Safety Climate". *Australian Safety News*, pp. 23-28.
- Government of Pakistan (2005) www.pak.gov.pk . Accessed on March, 2005.
- Grimaldi, J. V. (1970) "The Measurement of Safety Engineering Performance". *Journal of Safety Research*, 2(3), pp. 137-159.
- Guldenmund, F.W. (2000) "The Nature of Safety Culture: A Review of Theory and Research". *Safety Science*, 34, pp. 215-257.
- Gun, R.T., (1993) "The Role of Regulations in the Prevention of Occupational Injury". *Safety Science* , 16, pp.47- 66.
- Hair, J., Anderson, R. and Black, W. (1998) *Multivariate Data Analysis*. (5th edition), Prentice-Hall International, INC., New Jersey
- Halender, M. and Holborn, M. (1991) *Sociology Themes and Perspectives*. (3rd edition), Collins Educational, London.
- Hall, E.T. (1959) *The Silent Language*. Anchor Press/Doubleday, New York, NY.
- Hall, E.T. (1976) *Beyond Culture*. Anchor Press/Doubleday, New York, NY.
- Hall, E.T. and Hall, M.R. (1990) *Understanding Cultural Differences*. Inter-cultural Press, Yarmouth, M.E
- Hampden-Turner, C. and Trompenaars, F. (1993) *The Seven Cultures of Capitalism*. Doubleday. Cambridge University Press, Cambridge.

- Hazard Munro, B. (1997) *Statistical Methods for Health Care Research*. (3rd edition). Lippincott, New York.
- He, Z. (1995) "Risk Management for Overseas Construction Projects". *International Journal of Project Management*, 13 (4), pp.231-237.
- Hinze, J. and Appelgate, L.L. (1991) "Costs of Construction Injuries". *Journal of Construction Engineering and Management*, 117 (3), pp. 537-550.
- Hinze, J., Singh, A. and Coble, R.J. (1999) "Construction Safety in Developing Countries" *Proceedings of the 2nd International Conference of International Council for Research and Innovation in Building and Construction (CIB) Working Commission W99*. Honolulu, pp. 24-27.
- Hinze, J.W. (1978). "Turnover, New Workers and Safety". *Journal of Construction Division ASCE*, Vol 104, No CO4, pp. 409-418.
- Hinze, J.W. (1981). "Human Aspects of Construction Safety". *Journal of Construction Division ASCE*, Vol 107, No CO1, pp. 253-262.
- Hinze, J. W. and Gordon, F. (1979) "Supervisor - Worker Relationship Affects Injury Rate". *Journal of Construction Division ASCE*, Vol 105, No CO3, pp. 253-261.
- Hinze, J.W. and Raboud, P. (1988) "Safety on Large Building Construction Projects." *Journal of Construction Division ASCE*, Vol 114, No 2, pp.497-509.
- Hinze, J.W. (1997) *Construction Safety*. Prentice Hall Publications, New Jersey.
- Hofmann, D.A., Jacobs, R. and Landy, R.L. (1995) "High Reliability Process Industries: Individual, Micro, and Macro Organizational Influences on Safety Performance". *Journal of Safety Research*, 26, pp. 131-149.
- Hofmann, D.A. and Stetzer, A. (1996) "A Cross-Level Investigation of Factors Influencing Unsafe Behaviours and Accidents". *Personnel Psychology*, 41, pp. 307– 339.
- Hofstede, G. (1994) *Culture and Organisations: Software of the Mind*. Harper Collins Publishers, London.
- Hofstede, G. (1980) "Cultures' Consequences, International Differences in Work Related Values". Vol.5, *Cross Cultural Research and Methodology Series*. SAGE Publications, London.
- Hofstede, G. (1985) "The Interaction between National and Organizational Value Systems". *Journal of Management Studies*, Vol.22, pp. 347-357.
- Hofstede, G. and Bond, M.H. (1988) "The Confucius Connection: From Cultural Roots to Economic Growth". *Organizational Dynamics*, 16, pp. 4-21.
- Hope, C.A. (2004) "The Impact of National Culture on Transfer of Best Practice Operations Management in Hotels in St.Lucia". *Tourism Management*, 25, pp. 45-59.
- Hosmer, D.W. and Lemeshow, S. (1989) *Applied Logistic Regression*. John Willey & Sons, NY.

- House, J. and Dorfman, M. (2001) "Project GLOBE: An Introduction". *Applied Psychology: An International Review*, 50 (4), pp. 489-505.
- HSE (2002). "Statistical Data of Accidents". <http://www.hse.gov.uk/statistics/index.htm>. Accessed on March 2003.
- Hussain, I. (1999) "Democracy in Doldrums". Dawn online, available <http://www.dawn.com> (16 October 1999). Accessed on march 2003.
- Hussain, M. and Hussain, A. (1993) *Pakistan: Problems of Governance*. Vanguard Publications, Lahore.
- ILO (1987) "Safety, Health and Welfare on Construction Sites: A training manual". International Labour Organization (ILO), Geneva.
- International Atomic Energy Authority (IAEA). (1998) "Developing Safety Culture in Nuclear Activities-Practical Suggestions To Assist Progress". *SRS no.11. IAEA Vienna*.
- (ILO) (2003) *Year Book of Labour Statistics*. International Labour Organization ILO Publications Series.
- Islam, N. (2004) "Sifarish, Sycophants, Power and Collectivism: Administrative Culture in Pakistan". *International Review of Administrative Sciences*, 70 (2), pp. 311-330.
- Jamal, A. (1998) "Can We Learn from the Perceptions and Consumption Practices of Transnationals South Asia Communities Living in the West". *Proceeding of Conference of Asia Academy of Management, Hong Kong*, pp. 104-110.
- Jannady, T.M.O. (1996) "Factors Affecting the Safety of the Construction Industry". *Building Research and Information*, 24 (2), pp. 108-112.
- Jaselskis, E.J. and Suazo, G.A.R. (1994) "A Survey of Construction Site Safety in Honduras". *Construction Management and Economics*, 12, pp. 245-255.
- Jonson, K.M. (1982) "Diagnostic Analysis of Safety Issues". *Proceedings of the 1st National Conference on Industrial Safety*, Sydney.
- Kaiser, H.F. (1974) "An Index of Factorial Simplicity". *Psychometrika* 39, pp. 31-36.
- Kandola, B. S. (1997) "Risk Based Approach to Fire Safety Engineering". *Fire Engineers Journal*, pp. 21-26.
- Kaplan, R. and Saccuzzo, D.P. (1993) *Psychological Testing: Principles, Applications & Issues*. Brooks & Cole Publications, California.
- Karau, S.J. and Williams, K.D. (1993) "Social Loafing: A meta-analytic review and theoretical integration". *Journal of Personality and Social Psychology*, 65, pp. 681-786.
- Kartam, N.A. and Bouz, R.G. (1998) "Fatalities and Injuries in Kuwait Construction Industry". *Accident Analysis and Prevention*, 30 (6), pp. 805-814.
- Khilji, S.E. (1999) "Management in Pakistan". *International Encyclopedia of Business and Management*. Warner, M. (ed). International Thomson, London.

- Khilji, S.E. (2001) "Human Resource Management in Pakistan". In P. Budhwar and D. Yaw (eds) *Human Resource Management in Developing Countries*. Routledge. London.
- Khilji, S.E. (2002) "Modes of Convergence and Divergence: An Integrative View of Multinational Practices in Pakistan". *International Journal of Human Resource*, 13 (2), pp. 232-253.
- Khilji, S.E. (2003) "To Adapt or Not to Adapt: Exploring the Role of National Culture in HRM – A Study of Pakistan". *International Journal of Cross Cultural Management* 3 (1), pp. 121–144.
- Khilji, S.E. (2004) "Whiter Tradition? Evidence of Generational Differences in HR Satisfaction from Pakistan". *International Journal of Cross Cultural Management*, 4(2) pp. 141-156.
- King, R.W. and Hudson, R. (1985) *Construction Hazard and Safety Handbook*. Butterworth, London.
- Kirwan, B. (1998) "Safety Management Assessment and Task Analysis—A Missing Link?" In Hale, A. and Baram, M. (Eds.), *Safety Management: The Challenge of Change*. Elsevier, Oxford, pp. 67–92.
- Kluckhohn, F.R. and Strodtbeck, F.L. (1961) *Variations in Value Orientations*. Harper Collins, New York.
- Kohen, E. (1999) "Safety and Construction in India: Implementation of Safety and Health on Construction Sites". *Proceedings of the 2nd International Conference of International Council for Research and Innovation in Building and Construction (CIB) Working Commission W99*. Honolulu, pp.
- Komaki, J., Barwick, D.D. and Scott, L.R. (1978) "A Behavioural Approach to Occupational Safety: Pinpointing and Reinforcing Safe Performance in a Food Manufacturing Plant". *Journal of Applied Psychology*, 63, pp. 434-445.
- Kothari, R.K., Ed, K. and Pan, C.S. (1995) "Safety in Developing Countries: Professional and Bureaucratic Problems". *ASCE Journal of Construction, Engineering, and Management*. 121 (3), pp. 261-265.
- Labour Force Survey Report (2001) Department of Labour, Govt. of Pakistan, Islamabad.
- Lagrosen, S. (2002) "Exploring the Impact of Culture on Quality Management". *International Journal of Quality and Reliability Management*, 20 (4), pp. 473-487.
- Laitinen, H. and Ruohomaki, I. (1994) "The Effects of Feedback and Goal Setting on Safety Performance at Two Construction Sites". *Safety Science*, 24 (1), pp. 61-73.
- Lai, K.C., Tang, S.L. and Poon, S.W. (1996) "Management Effort and Safety Performance of Construction Projects". *Asia Engineer, Journal of HKIE*, January Issue, pp.26-28
- Langford, D., Rowlinson, S. and Sawacha, E. (2000) "Safety Behaviour and Safety Management: Its Influence on the Attitudes of Workers in the UK Construction Industry". *Engineering, Construction and Architectural Management*, 7 (2), pp.133–140.

- Larcher, P. and Sohail, M. (1999) "Review of Safety in Construction and Operation for the WS&S Sector". *Report Summary of WELL Task No.166 (Part 1)*.
- Latif, S. (1997) "Management Learning in National Context". [Unpublished PhD Thesis], Helen Management College, UK.
- Laufer, A. (1987) "Construction Accident Cost and Management Safety Motivation". *Journal of Occupational Accidents*, 8, pp. 295-315.
- Laukkanen, T. (1999) "Construction Work and Education: Occupational Health and Safety Reviewed". *Construction Management and Economics*, 17 (1), pp. 53–62.
- Leather, P.J. (1987) "Safety and Accidents in the Construction Industry: A Work Design Perspective". *Work and Stress*, 1 (2), pp. 167-174.
- Levitt, R.E. and Samelson, N.M. (1993) *Construction Safety Management*. John Wiley and Sons, Inc. New York.
- Levitt, R.E. and Parker, H.W. (1976) "Reducing Construction Accidents-Top Management's Role". *Journal of Construction Division ASCE*, Vol 102 No CO3, pp. 465-478.
- Lindsay, F.D. (1992) "Successful Health and Safety Management. The Contribution of Management Audit". *Safety Science*, 15 (2), pp. 387-402.
- Lingard, H. and Rowlinson, S. (1994) "Construction Site Safety in Hong Kong". *Journal of Construction Management and Economics*, 12, pp. 501–510.
- Lingard, H. and Rowlinson, S. (1997) "Behaviour-Based Safety Management in Hong Kong's Construction Industry". *Journal of Safety Research*, 28, pp. 243–256.
- Lingard, H. and Rowlinson, S. (1998) "Behaviour-Based Safety Management in Hong Kong's Construction Industry: The Results of a Field Study". *Construction Management and Economics*, 16, pp. 481–488.
- Litherland, D. (1997) "Safety Climate: An Investigation of Its Underlying Factor Structure and the Relationship with Safety Behaviour". [Unpublished Bachelor Thesis]. School of Applied Psychology, Griffith University, Queensland, Australia
- Low, S.P. (1995) "Western Generic Business and Corporate Strategies: Lessons from the Thirty-Six Chinese Classical Strategies of War". *Marketing Intelligence and Planning*, 13 (6), pp. 34-40.
- Low, S.P. (1997). "Thick Face, Black Heart and the Marketing of Construction Services in China". *Marketing Intelligence and Planning*, 15 (8), pp. 221-226.
- Low, S.P. and Shi, Y. (2002) "An Exploratory Study of Hofstede's Cross-Cultural Dimensions in Construction Projects". *Management Decision*, 40 (1), pp. 7-16.
- Lu, C.S. and Shang, K.C. (2005) "An Empirical Investigation of Safety Climate in Container Terminal Operators". *Journal of Safety Research*, 36, pp. 297-308.
- Lubega, H., Kiggundu, B.M. and Tindiwensi, D. (2001). "An Investigation into the Causes of Accidents in the Construction Industry in Uganda".
http://buildnet.csir.co.za/cdcproc/dpcs/2nd/lubega_h.pdf. Accessed on March 2003.

- Lutness, J. (1987) "Measuring Up: Assessing Safety With Climate Surveys". *Occupational Health and Safety*, 56(2), pp. 20-26.
- Lyon, P. (1993) "Epilogue" In P. James (ed.). *Pakistan Chronicle*. Hurst, London.
- Malik, I.H. (1994) "Governability Crisis in Pakistan: Policies of Authority, Ideology and Ethnicity". *The Round Table*. London. Carfax Publishing, London. pp 332-341.
- Malik, I.H. (1996) "The State and the Civil Society". *Asia Survey*, 36 (7), pp.71-79.
- Margolis, B. (1973) "Psychological-Behavioural Factors in Accident Control". *Proceedings of the ASSE Professional Development Conference: Accident Causation*, Dallas.
- Mason, S. and Simpson, G. (1995) "Measuring Safety Attitudes to Target Management Actions". *The Safety and Health Practitioner*, November., pp.17– 20.
- Matilla, M. and Hyodynmaan, M. (1988) "Promoting Job Safety in Building: An Experiment on the Behaviour Analysis Approach", *Journal of Occupational Accidents*, 9, pp. 255-276.
- Matilla, M., Rantanen, E. and Hytinen, M. (1994) "The Quality of Work Environment, Supervision and Safety in Building Construction". *Safety Science*, 17, pp. 257-268.
- McClelland, D. C. (1985) *Human Motivation*. Scott, Foresman. Glenview, IL.
- McDonald, N., Hrymak, V. and Gonzalez, J. (2001). "Safety Behaviour in the Construction Industry". *Report to Health and Safety Authority, Dublin & Health and Safety Executive, Northern Ireland*.
- McKenzie, J., Gibb, A.G.F. and Bouchlaghem, N.M. (1999) "Communication of Health and Safety in Design Phase". Implementation of Safety and Health on Construction. Sites. *Proceedings of the 2nd International Conference of International Council for Research and Innovation in Building and Construction (CIB) Working Commission W99*. Honolulu. pp. 419-426.
- Mearns, K., Flin, R., Fleming, M. and Gordon, R. (1997) "Human and Organisational Factors in Offshore Safety". *HSE Report OTH 543*, HM Stationary Office, Norwich, UK.
- Mearns, K., Flin, R., Gordon, R. and Fleming, M. (1998) "Measuring Safety Climate on Offshore Installations". *Work and Stress*, 12, pp. 238-254.
- Mearns, K., Whitaker, S. and Flin, R. (2003) "Safety Climate, Safety Management Practice and Safety Performance in Offshore Environment". *Safety Science*, 41(8), pp. 641-680.
- Meshkati, N. (1995) "The Culture Context of Safety Culture: A Conceptual Model and Experimental Study in Safety Culture in Nuclear Installations". *Proceedings of the International Topical Meeting on Safety Culture in Nuclear Installations*, Vienna, Austria , pp. 261-270.
- Mohamed, S. (1999) "Empirical Investigation of Construction Safety Management Activities and Performance in Australia". *Safety Science*, 33, pp. 129-142

- Mohamed, S. (2002) "Safety Climate in Construction Site Environments". *ASCE Journal of Construction Engineering and Management*, 128(5), pp. 375-383.
- National Safety Council (1999) "Accident Facts (1052-1997)". National Safety Council, Itasca, IL.
- Neal, A. and Griffin, M.A. (2000) "Perceptions of Safety at Work: A Framework for Linking Safety Climate to Safety Performance, Knowledge, and Motivation". *Journal of Occupational Health Psychology*, 5, pp. 347-358
- Neal, A. and Griffin, M. A. (2004) "Safety Climate and Safety at Work". In *Psychology of Workplace Safety*, (eds) J. Berling & M.R. Frone, American Psychological Association, Washington, pp. 15-34.
- Newman, K.L and Nollen, S. (1996) "Culture and Congruence: The Fit Between Management Practices and National Culture". *Journal of International Business Studies*, 27 (4), pp. 753-778.
- Ngowi, A.B. and Mothibi, J. (1996) "Culture and Safety at Work Site - A Case Study at Botswana". Alvez Dias L.M. and Coble R.J. (eds). In *Implementation of Safety and Health on Construction Sites*, CIB W99 1996 Lisbon. Balkema, Rotterdam , pp. 417-429.
- Ngowi, A.B. (1997) "Impact of Culture on Construction Procurement". *Journal of Construction Procurement*, 3 (1), pp. 3-15.
- Ngowi, A.B. (2000) "Impact of Culture on the Application of TQM in the Construction Industry in Botswana". *International Journal of Quality & Reliability Management*, 17(1), pp. 3-15.
- Nichols, M.L. and Marcus, A.A. (1990) "Empirical Studies of Candidate Leading Indicators of Safety in Nuclear Power Plants: An Expanded View of Human Factors Research". *Proceedings of the Human Factors Society*, pp. 876-880.
- Niskanen, T. (1994) "Safety Climate in the Road Administration". *Safety Science*, 17, pp. 237-255.
- Norusis, M.J. (1994) *SPSS Professional Statistics 6.1*. SPSS Inc. Chicago.
- Norusis, M.J. (1999) *SPSS Regression Models 10.0*. SPSS Inc. Chicago.
- Ofori, G. (2000) "Challenges Facing the Construction Industry in Developing Countries". *Proceedings of the 2nd International Conference on Construction in Developing Countries: Challenges Facing the Construction Industry in Developing Countries*. Gaborone, Botswana.
- Ojanen, K., Seppala, A. and Aaltonen, M. (1988) "Measurement Methodology for the Effects of Accident Prevention Programs". *Scandinavian Journal of Work, Environment and Health*, 14, pp. 95-96.
- Peckitt, S.J., Glendon, A.I. and Booth, I.T. (2002) "A Comparative Study of Safety Culture in Construction Industry of Britain and the Caribbean". *Proceedings of the International Symposium of the Working Commission CIB W92, Procurement Systems and*

- Technology Transfer*. The Engineering Institute, University of West Indies, Trinidad & Tobago. pp.195-214.
- Pedhazur, E.J. (1997) *Multiple Regression in Behavioural Research: Explanation and Prediction*. (3rd edition). Forth Worth: Harcourt Brace College Publishers.
- Phua T.K. (2002) "Effects of Cultural Differences on Project Participants, Behaviour in Construction Projects". *Proceedings of the International Symposium of the Working Commission CIB W92, Procurement Systems and Technology Transfer*. The Engineering Institute, University of West Indies, Trinidad & Tobago, pp. 497-511.
- Pipitsupaphol, T. and Wantanabe, T. (2000) "Identification of Root Causes of Labour Accidents In The Thai Construction Industry". *Proceedings of Conference on Asia Pacific Structural Engineering & Construction (APSEC)*, Malaysia, pp. 93-98.
- Putnam, R.D. (1993) *Making democracy work*. Princeton University Press. Princeton. NJ.
- Robertson, I.T., Duff, A.R., Marsh, T.W., Phillips, R.A., Weyman, A. K. and Cooper, M.D. (1999) "Improving Safety on Construction Sites by Changing Personnel Behaviour: Phase 2". *HSE Contract Research Report No. 229*. Health and Safety Executive, London. UK.
- Rockwell, T.H. and Bhise, V.D. (1970) "Two Approaches to Non-Accident Measure for Continues Assessment of Safety Performance". *Journal of Safety Research*, 2, pp. 176-187.
- Rose, D. and Sullivan, O. (1993) *Introducing Data Analysis for Social Scientists*. Open University Press, Buckingham.
- Rosseau, D.M. (1990) *Assessing Organizational Culture: The Case for Multiple Methods*. Josey-Bass. San Francisco.
- Rowlinson, S. and Lingard, H. (1996) "Behavioural Safety Management in Hong Kong's Construction Industry; Success and Limitations, In Implementation of Safety and Health on Construction Sites". Alvez Dias L.M and Coble R.J. (eds), *CIB W99* Lisbon. Balkema, Rotterdam, pp. 281-289.
- Rundmo, T. (1994) "Associations between Safety and Contingency Measures and Occupational Accidents on Offshore Petroleum Platforms". *Scandinavian Journal of Work Environment and Health*, 20, pp. 128-131.
- Rundmo, T. (1997) "Associations Between Risk Perception And Safety". *Safety Science*, 24, pp. 197-209.
- Rundmo, T. and Hale, A.R. (2003) "Managers' Attitudes Towards Safety and Accident Prevention". *Safety Science*, 41, pp. 557-574.
- Samovar, L.A., Porter, R.E. and Jain, N.C. (1981) *Understanding Intercultural Communication*. Wadsworth. Belmont, C.A.
- Sawacha, E., Naoum, S. and Fong, D. (1999). "Factors Affecting Safety Performance on Construction Sites". *International Journal of Project Management*. 17 (5), pp. 309-315.

- Schein, E. H. (1997) *Three Cultures of Management: The Key to Organizational Learning in the 21st Century*. - Internet document. <http://learning.mit.edu/res/wp/10011.html>. Accessed on August 2002.
- Schein, E.H. (1985) *Organizational Culture and Leadership*. Jossey-Bass, Oxford.
- Schneider, B. (1990) *Organizational Climate and Culture*. . Jossey-Bass, Oxford.
- Schroder, H.M. (1970) "Safety Performance Measurement". *Journal of Safety Research*, 2, pp. 188-195.
- Sekaran, U. (1992) *Research Methods for Business: A Skill Building Application*. John Wiley & Sons, USA.
- Seppala, A. (1992) "Evaluation of Safety Measures, Their Improvement and Connections to Occupational Accidents". Referred to in Niskanen, T. (1994). Safety Climate in Road Administration. *Safety Science*, 17, pp. 237-255.
- Shah, H. (2003) "Identification of Root Causes of Accidents in Pakistan Construction Industry". [Unpublished Master Dissertation]. Griffith University, Queensland, Australia.
- Simon, J.M. (1991) "Construction Safety Performance Significantly Improves". *Proceedings of 1st International Health, Safety and Environment Conference*, Netherlands, pp. 465-472.
- Simonds, R.H. and Shafai-Sahrai, Y. (1977) "Factors Affecting Injury Frequency in 11 Matched Pairs of Companies". *Journal of Safety Research* 9(3), pp. 120-127.
- Siu, Oi-Ling., Phillips, D.R. and Leung, Tat-Wing. (2003) "Age Difference in Safety Attitudes and Safety Performance in Hong Kong Construction Workers". *Journal of Safety Research*, 34, pp. 199-205.
- Smallwood, J.J. (2000) *Safety and Health Team Building. Construction Safety and Health Management*. Edited by Coble.R.J., Hinze, J. and Haupt, T. Prentice Hall Publications.
- Smith, M.J., Cohen, H.H., Cohen, A. and Cleveland, R.J. (1978) "Characteristics of Successful Safety Programs". *Journal of Safety Research*, 10 (1), pp. 5-15.
- Sparrow, P. and Wu, P.C. (1998) "Does National Culture Really Matter? Predicting HRM Preferences of Taiwanese Employees". *Employees Relations*, 20 (1), pp. 26-56.
- Tabachnick, B.G. and Fidell, L.S. (2001) *Using Multivariate Statistics*. (4th Edition). Allyn and Bacon.
- Tam, C.M. and Fung, I. (1998) "Effectiveness of Safety Management. Strategies on Safety Performance in Hong Kong". *Construction Management and Economics*, 16, pp. 49-55
- Tarrants, W.E. (1970) "A Definition of the Safety Measurement Problem". *Journal of Safety Research*, 2, pp. 106-108.
- Tarrants W.E. (1980). "The Measurement of Safety Performance". Garland STPM Press, New York.

- Tayeb, M. (1994) "Organisations and National Culture: Methodology Considered", *Organisation Studies*, 15, pp. 429-446.
- Tayeb, M. (1997) "Islamic Revival in Asia and HRM". *Employees Relations*, 19 (4), pp. 352-364.
- Tijhaus W. (2002) "Improving Technology Transformation in the Construction Industry by Understanding Culture's Influences". In Lewis, M. (ed). *Proceedings of the International Symposium of the Working Commission CIB W92, Procurement Systems and Technology Transfer*. The Engineering Institute, University of West Indies, Trinidad & Tobago, pp. 513-530.
- Tomas, J.M. and Oliver, A. (1995) "The Perceived Effect of Safety Climate on Occupational Accidents". *Proceedings of the conference on work and well-being: An agenda for Europe*. University of Nottingham, UK.
- Triandis, H.C., Brislin, R. and Hui, C.H. (1988) "Cross-cultural Training Across the Individualism-Collectivism Divide". *International Journal of Inter-Cultural Relations*, Vol.12, pp. 269-289.
- Turner, N. and Parker, S.K. (2004) "The Effect of TeamWork on Safety Process and Outcomes". In *Psychology of Workplace Safety*, (eds) J. Berling & M.R. Frone, *American Psychological Association*, Washington, pp. 35-62.
- Van Oudenhoven, J.P. (2001) "Do Organisations Reflect National Cultures? A Ten Nation Study". *International Journal of Intercultural Relations*, 25, pp. 89-107
- Walker, M.B. (1995) "Group-Averaged Behavioural Feedback: An Evaluation of Its Utility for Improving Employees' Safety Behaviour". [Unpublished Doctoral Dissertation], Griffith University, Queensland, Australia.
- Waring, A. (1992) "Developing a Safety Culture". *The Safety and Health Practitioner*, Vol.10, pp. 42-44.
- Weibye, B. (1996) "Safety Management Under Different Regimes". In *Offshore Northern Seas (ONS) Conference*, Stavanger, Norway.
- Weiek, K., Sutcliffe, K. and Obstfeld, D. (1999) "Organizing For Reliability: Processes of Collective Mindfulness". *Organizational Behaviour*, 21, pp. 81-123.
- Whittington, C., Livingston, A. and Lucas, B.A. (1992) "Research into Management, Organisational and Human Factors in the Construction Industry". *HSE Research Report* No 45.
- Williamson, A.M., Cairns, D. and Biancotti, D. (1997) "The Development of a Measure of Safety Climate: The Role of Safety Perceptions and Attitudes". *Safety Science* 25, (3), pp. 15-27.
- Zakaria, S. (1994) "Investment Culture in Pakistan". [Unpublished MPhil Thesis], University of Cambridge. UK.
- Zohar, D. (1980) "Safety Climate in Industrial Organizations: Theoretical and Applied Implications". *Journal of Applied Psychology*, 65(1), pp. 96-102.

Appendix A

Workers Attitudes, Perception Questionnaire (WAS)

Attitudes and Perceptions Questionnaire

To what extent do you agree or disagree with the following statements affecting safety in your job? Please **circle** the number on the right against each question that best indicates your

Not relevant	Strongly disagree	Disagree	Not sure	Agree	Strongly agree
0	1	2	3	4	5

1. Construction sites are dangerous places	0	1	2	3	4	5
2. My job carries a considerable level of risk.	0	1	2	3	4	5
3. I am rarely worried about being injured on the job	0	1	2	3	4	5
4. I find working with certain amount of risk exciting	0	1	2	3	4	5
5. I believe safe work habits improve production	0	1	2	3	4	5
6. I am capable of identifying potentially hazardous situations	0	1	2	3	4	5
7. Management acts decisively when a safety concern is raised	0	1	2	3	4	5
8. Working safely is the top priority for site managers, foremen & supervisors	0	1	2	3	4	5
9. Management 'turns blind eye' on basic safety issues	0	1	2	3	4	5
10. My site managers, foremen and supervisors always inform me of safety concerns and issues.	0	1	2	3	4	5
11. I am never encouraged to raise any safety concern	0	1	2	3	4	5
12. Management do encourages feedback regarding safety issues from site workers	0	1	2	3	4	5
13. Safety training is provided on skills specific to individual tasks and equipment	0	1	2	3	4	5
14. Potential risks and consequences are identified in training	0	1	2	3	4	5
15. I am clear about what my responsibilities are for safety	0	1	2	3	4	5
16. I am aware of my trade relevant safety procedures	0	1	2	3	4	5
17. Safety inspections are carried out on regular basis	0	1	2	3	4	5
18. I believe that prevention of accidents is the responsibility of everyone	0	1	2	3	4	5
19. Good working relationship among the workers is often necessary for safety	0	1	2	3	4	5
20. I am not given enough time to get the job done safely	0	1	2	3	4	5
21. Under work pressure it is normal to take shortcuts at the expense of safety	0	1	2	3	4	5
22. Usually I don't get the right equipment to do the job safely	0	1	2	3	4	5
23. All equipment and materials supplied to work safely are in good conditions	0	1	2	3	4	5
24. Working with defective equipment is not allowed under any circumstances	0	1	2	3	4	5
25. Personal protective equipments are useful in increasing the safety level	0	1	2	3	4	5

Appendix B

Workers Behavioural Survey (WBS)

Safety Behaviour Questionnaire for Construction Workers

Background information

Age: _____

Company/Subcontractor for which you work:

Job Title: _____

Years working in:

a) Construction industry: _____

b) Your Present Job: _____

c) Time on this site: _____

Safety Training received.

Have you received safety training from your employee?

Yes

No

If, Yes then How long?

Hours

Days

Weeks

1

SCAFFOLDING

1. How frequently do you work on scaffolds in your job?

Never or very little (do not go further with this area)	Sometimes	Often or Always
--	-----------	-----------------

IMAGINE THE FOLLOWING SITUATION: YOU HAVE TO CARRY OUT SIMILAR TASKS TO YOUR PRESENT JOB, BUT THE JOB REQUIRES THAT YOU HAVE TO WORK AT HEIGHTS, ON A SCAFFOLD.

SITUATION 1: - Once you are ready to start your job, you climb the **scaffold** up to the level you must work at. Once there you realise that **the scaffold is not totally boarded.**

- | | | | |
|---|-------------------------------|----------------------------|-----------|
| 1. In your opinion, is it risky to work in this situation? If 'yes,' how risky? | Low risk | Medium risk | High risk |
| 2. How frequently you find this situation on this site ? | Rare | Usual | Frequent |
| 3. What would you do if this situation happened today , on this site? | Stop working/
don't use it | Use it / follow
working | |

SITUATION 2: Now imagine that the scaffold is correctly boarded, but you find that **some guard-rails are missing.**

- | | | | |
|--|-------------------------------|----------------------------|-----------|
| 1. In your opinion, is it risky to work in this situation? If 'yes,' how risky? | Low risk | Medium risk | High risk |
| 2. How frequently do you find this situation on this site ? | Rare | Usual | Frequent |
| 3. What would you do if you that situation happened today , on this site? | Stop working/
don't use it | Use it / follow
working | |

SITUATION 3.- Now imagine that the scaffold looks OK, but you realise that a ladder has not been provided (or has been removed) and you must face the alternative of **climbing up or down the scaffold.**

- | | | | |
|---|-------------------------------|----------------------------|-----------|
| 1. In your opinion, is it risky to work in this situation? If 'yes,' how risky? | Low risk | Medium risk | High risk |
| 2. How frequently do you find this situation on this site ? | Rare | Usual | Frequent |
| 3. What would you do if that situation happened today , on this site? | Stop working/
don't use it | Use it / follow
working | |

2

USING LADDERS

2. How frequently do you use ladders in your job?

Never or very little (do not go further with this area)	Sometimes	Often or Always
--	-----------	-----------------

IMAGINE THE FOLLOWING SITUATION: YOU HAVE TO CARRY OUT SIMILAR TASKS TO YOUR PRESENT JOB, BUT THE JOB REQUIRES THAT YOU HAVE TO USE ONE OR SEVERAL LADDERS.

SITUATION 4.- You are ready to start your job when you realise that the **ladder** you need to use to climb up to a higher level is **not tied or secured.**

- | | | | |
|---|-------------------------------|----------------------------|-----------|
| 1. In your opinion, is it risky to work in this situation? If 'yes,' how risky? | Low risk | Medium risk | High risk |
| 2. How frequently do you find this situation on this site ? | Rare | Usual | Frequent |
| 3. What would you do if that situation happened today , on this site? | Stop working/
don't use it | Use it / follow
working | |

SITUATION 5: Now imagine that **the ladder** is tied but you realise that it is **broken or somehow defective**.

- | | | | |
|---|-------------------------------|----------------------------|-----------|
| 1. In your opinion, is it risky to work in this situation? If 'yes,' how risky? | Low risk | Medium risk | High risk |
| 2. How frequently do you find this situation on this site ? | Rare | Usual | Frequent |
| 3. What would you do if that situation happened today , on this site? | Stop working/
don't use it | Use it / follow
working | |

SITUATION 6: Now imagine that the **ladder** looks OK but it is **not 1 metre (approximately 5 rungs) above the landing place** you are intended to work in.

- | | | | |
|---|-------------------------------|----------------------------|-----------|
| 1. In your opinion, is it risky to work in this situation? If 'yes,' how risky? | Low risk | Medium risk | High risk |
| 2. How frequently do you find this situation on this site ? | Rare | Usual | Frequent |
| 3. What would you do if that situation happened today , on this site? | Stop working/
don't use it | Use it / follow
working | |

3

WORKING ON ROOFS

3. How frequently do you work on roofs in your job?

Never or very little (do not go further with this area)	Sometimes	Often or Always
--	-----------	-----------------

IMAGINE THE FOLLOWING SITUATION: YOU HAVE TO CARRY OUT SIMILAR TASKS THAN IN YOUR PRESENT JOB, BUT THE JOB REQUIRES THAT YOU HAVE TO WORK AT HEIGHTS, ON A ROOF.

SITUATION 7: Once you are ready to start your job, you climb up to the **roof** and you realise it is a **fragile roof and crawling boards have not been provided**.

- | | | | |
|---|-------------------------------|----------------------------|-----------|
| 1. In your opinion, is it risky to work in this situation? If 'yes,' how risky? | Low risk | Medium risk | High risk |
| 2. How frequently do you find this situation on this site ? | Rare | Usual | Frequent |
| 3. What would you do if that situation happened today , on this site? | Stop working/
don't use it | Use it / follow
working | |

SITUATION 8: Now imagine that what you find up there is a **roof without edge protection, and personal protection (as harness, etc.) has not been provided**.

- | | | | |
|---|-------------------------------|----------------------------|-----------|
| 1. In your opinion, is it risky to work in this situation? If 'yes,' how risky? | Low risk | Medium risk | High risk |
| 2. How frequently do you find this situation on this site ? | Rare | Usual | Frequent |
| 3. What would you do if that situation happened today , on this site? | Stop working/
don't use it | Use it / follow
working | |

SITUATION 9: Now imagine that the **roof** is OK but you have to **work in bad weather** (windy)

- | | | | |
|---|-------------------------------|----------------------------|-----------|
| 1. In your opinion, is it risky to work in this situation? If 'yes,' how risky? | Low risk | Medium risk | High risk |
| 2. How frequently do you find this situation on this site ? | Rare | Usual | Frequent |
| 3. What would you do if that situation happened today , on this site? | Stop working/
don't use it | Use it / follow
working | |

4. Personal suggestions to improve safety

Appendix C

Managers Survey – I (MS-I)

Managers Interview Questionnaire

1. Background information for managers, supervisors, and safety representatives

Age: _____

Company/subcontractor for which you work: _____

Job Title: _____

Years working in:

- a) Construction industry: _____
- b) Your present position: _____
- c) Time working in this site: _____

Personal competence in Safety:

- 4. Training received: _____
- 5. Quality of this training: How long? When? Where? _____

2. Safety Plan

This section aims to find out the existence of any documented safety policy and site safety plans and their effectiveness

1. Does the company have a documented safety policy?

Y N

2. Does the company have documented site safety plans?

Y N

3. Are those site safety plans fully enforced?

Y N

4. How would you rate the effectiveness of those plans in promoting site safety?

Low Medium High

5. Main Reason for that particular rating

<p style="text-align: center;"><u>No Plan of Action</u> Some ideas of how to handle with safety, but not integrated in a comprehensive documented plan of action.</p>	<p style="text-align: center;"><u>There is a plan of action</u> A written one, comprehensive, effective one, addressing the problems of the site</p>	<p style="text-align: center;"><u>Good plan of action</u> Clear plan of actions, fully enforced. Having high effectiveness in promoting the safety on the site.</p>
---	--	---

3. Competence of the workforce and safety training

This sections aims to find out if the company has any safety criterion for recruitment and training for their workforce [includes managers, supervisors and workers]

6. Does the company have any safety related criterion for;
- Workers' recruitment (experience, safety training)

Y	N
---	---
 - Managers and supervisors' recruitment (experience, safety training).

Y	N
---	---
 - Sub-contractors selection (past safety records)

Y	N
---	---
7. Does the company have a safety-training program?
- | | |
|---|---|
| Y | N |
|---|---|
8. If yes then at what level (managers, supervisors and workforce).
9. How effective would you rate the role of that safety-training program in enhancing the safety level?
- | | | |
|------------|---------------|-------------|
| Low | Medium | High |
|------------|---------------|-------------|

1. The company is concerned about workforce and subcontractors' competence at the time recruitment?		
NO	YES	
Safety backgrounds are rarely considered as an important issue in operatives and contractors' recruitment	Company considers safety background at the time of recruitment.	
2. The company is concerned about managers / supervisors' competence at the time of Recruitment		
NO	YES	
Safety background are rarely considered as an important issue in operatives recruitment	Company considers safety background at the time of recruitment.	
3. The company provides safety training for workers.		
Low	Medium	High
Company training is reduced to an induction program	Company training on safety considers more then an induction program and takes over different times and phases along site life cycle	Company has an articulated safety training aimed both to an active training on safety and to an active feedback of the effectiveness of the training program.
4. The company provides safety training for managers and supervisors		
Low	Medium	High
Company training is reduced to an induction program	Company training on safety considers more then an induction program and takes over different times and phases along site life cycle	Company has an articulated safety training aimed both to an active training on safety and to an active feedback of the effectiveness of the training program.

4. Safety Monitoring & Accident Reporting System

This section aims to find out existence of any safety monitoring activity and to find out what channels are being used for hazard, accidents and incidents/near misses reporting.

10. Does your organization monitor safety or keep safety records?
Y N
11. What monitoring activities are used on site?
12. What is recorded as safety related aspects (personal injuries, structural damage, mechanical damage...)
13. Reporting System:
- Hazard Reporting
 - What are the formal channels for reporting hazards?
 - Accident Reporting
 - What are the formal channels for reporting accidents?
 - Incident / Near misses
 - Do you consider incidents / near misses in your reporting system?
Y N
 - What are the formal channels for reporting incidents / near misses?

Existence of site safety monitoring policy		
<p><u>No Site safety monitoring policy</u></p> <p>May be a few ideas to monitor site safety in general, but not in particular.</p>	<p><u>There is a site safety monitoring policy</u></p> <p>Site monitoring policy does exist, but no effective channels are used to monitor and not much site safety related aspects are recorded</p>	<p><u>Good site safety monitoring policy</u></p> <p>Clear site safety monitoring policy, effective channels are used to monitor, site safety aspects are recorded very efficiently</p>

Quality of reporting system		
<p>Low</p> <p>.Company doesn't have any proper hazard, accident and incident reporting system, only a few accidents are reported</p>	<p>Medium</p> <p>Company does have a reporting system for accidents and hazards conditions on the site, but incidents and near misses are not taken into account for</p>	<p>High</p> <p>Company does have a efficient reporting systems which includes not only accidents and hazards reporting but as well as incidents/near misses too</p>

5. Communication in the workplace

This section aims to check the quality of communication channels used to promote safety in the workplace.

14. Is communication on safety, important for the company?

Y N

What kinds of communication channels are normally used by the company when dealing with safety related aspects?

<p style="text-align: center;">Verbal communication</p> <ul style="list-style-type: none"> ○ Meetings ○ Team briefings ○ One-to-one discussions 	<p style="text-align: center;">Observed communication</p> <ul style="list-style-type: none"> ○ Regular inspection tours ○ Joint consultation meetings ○ Presentations/trainings sessions and workshops
<p style="text-align: center;">Written communication</p> <ul style="list-style-type: none"> ○ Policy statements ○ Posters ○ Performance standards 	<p style="text-align: center;">External communication</p> <ul style="list-style-type: none"> ○ Reporting accident and ill health ○ Liaison with statutory undertakings and bodies.

15. Generally, how would you rate the effectiveness of those communication channels combined used by your organization in promoting the safety in the workplace?

Low Medium High

16. Main reason for that particular rating

Effectiveness of the quality of that communication		
Low It is mere informative communication without a clear link with safety level	Medium Communication seems to be useful to keep the level of safety in workplace.	High Communication seems to be useful to enhance the level of safety in the workplace.

6. Responsibility for safety in the work place& Co-operation

This sections aims to explore what degree the main contractor has assumed the responsibility of all site staff, the degree and difficulties it can have in co-operating with subcontractor ,and general employees on safety related aspects

17. Responsibility for Safety (Please tick only **one**)
- Does the main contractor take responsibility for the safety duties and rights of all site staff?

All **some** **none**

- If some responsibilities are taken, which ones?

18. Co-operation

- What is the level of cooperation between the main contractor and the different sub-contractors to handle safety on site?

Low **Medium** **High**

- Is the input by different subcontractors or their safety representatives, taken into account in safety meetings and related discussion?

Y

N

- To what level, would subcontractors' employees follow safety related decisions made independently by the main contractor?

Low**Medium****High**

- Would that level be improved through subcontractor's mediation?

Y

N

Assumption of responsibility by main contractor for the general level of safety in workplace.		
None	Some	All
Main contractor tries to delegate her legal responsibility on subcontractors and workers	Main contractor assumes only some responsibilities for the general safety of the work place	Main contractor assumes its responsibility for the general safety of the workplace.
General appreciation of the quality of co-operation between main contractor and sub contractor		
Low	Medium	High
Subcontractor rarely cooperates in the workplace in safety aspects.	Subcontractors are co-ordinated with the main contractor in safety aspects	Sub contractors are highly involved in cooperate with main contractor and others to guarantee safety in the workplace
Degree of respect of each others decision on safety aspects between main contractors' and sub contractors.		
Low	Medium	High
There is no degree of respect of each others decisions on safety aspects	To some extent they both respect each other decision, although it looks more like compliance with main contractor's ideas and intervention rather than a active involvement with safety	Both highly respect each others decisions, as they co-operation as an important variable to handle with safety in site. A good level of cooperation among the different agents is actively pursued

7. Personal suggestions to improve safety

This section aims to record particular ideas of the different managers and supervisors to improve safety in the workplace

Appendix D

Managers Survey – II (MS-II)

Managers Interview Questionnaire

To what extent do you agree or disagree with the following statements affecting safety in your job? Please **circle** the number on the right against each question that best indicates your opinion.

Not relevant	Strongly disagree	Disagree	Not sure	Agree	Strongly agree
0	1	2	3	4	5

1. The company has a highly effective safety plan for site	0	1	2	3	4	5
2. Company does have a safety related criteria for workers' recruitment	0	1	2	3	4	5
3. Company does have safety related criteria for Managers and supervisors' recruitment	0	1	2	3	4	5
4. Company does have a safety related criteria for sub-contractors selection	0	1	2	3	4	5
5. Company does have a highly effective training program for workers	0	1	2	3	4	5
6. Company does have a highly effective training program for managers and supervisors	0	1	2	3	4	5
7. Company does have a safety monitoring policy and keep safety records	0	1	2	3	4	5
8. Company has an effective hazard reporting system	0	1	2	3	4	5
9. Company has an effective incident/near misses and accident reporting system	0	1	2	3	4	5
10. Communication on safety is an important issue for the company.	0	1	2	3	4	5
11. Communication channels/means used by the company proves to be highly effective in promoting the safety in the workplace	0	1	2	3	4	5
12. Main contractor takes all responsibility for the safety duties and rights of all site staff	0	1	2	3	4	5
13. There is a high level of cooperation between main contractor and different subcontractor (s) to handle safety at site.	0	1	2	3	4	5
14. Sub contractors' employees <u>highly</u> follow all safety related decisions made independently by the main contractor	0	1	2	3	4	5

Appendix E

National Cultural Survey (NCS)
For Both Workers and Managers

Cultural influence Questionnaire

To what extent do you agree or disagree with the following statements affecting safety in your job? Please **circle** the number on the right against each question that best indicates your opinion.

Strongly agree 1	Agree 2	Not sure 3	Disagree 4	Strongly disagree 5
----------------------------	-------------------	----------------------	----------------------	-------------------------------

1. Major decisions regarding site safety issues, always take place after consulting with site workers / subcontractors	1	2	3	4	5
2. Managers and superiors do encourage feedback regarding safety issues from site workers	1	2	3	4	5
3. I am always encouraged to raise any safety concern with my site supervisor	1	2	3	4	5
4. Safety problems are openly discussed between workers and supervisors	1	2	3	4	5
5. Workers are always being consulted regarding preparation of site safety plans	1	2	3	4	5
6. Generally workers follow safety rules without being told to do so	1	2	3	4	5
7. I am allowed to act decisively if I find any situation contrary to safe conditions on site	1	2	3	4	5
8. Safety rules should not be broken, even when worker believes it affects the production	1	2	3	4	5
9. Safety decisions made by the management usually seems to be more effective then decisions made by workers	1	2	3	4	5
10. Workers loose respect foe a supervisor, who asks them for their input before he makes any safety decision	1	2	3	4	5
11. Personally I enjoy the risk aspects associated with my job	1	2	3	4	5
12. Many accidents just happen, there is little one can do to avoid them	1	2	3	4	5
13. I prefer to work with larger company as they have more effective safety practices on site than the smaller one	1	2	3	4	5
14. I often feel nervous or tense at work	1	2	3	4	5
15. A company should have major responsibility for the health and welfare of its injured worker	1	2	3	4	5
16. Co-workers often give tips to each other on how to work safely	1	2	3	4	5
17. A safe place to work has a lot of personal meaning to me and my co-workers	1	2	3	4	5
18. It would help in improving the site safety, if my co-workers support safe behaviour	1	2	3	4	5
19. Safety training can help me in improving my attitude to work more safely	1	2	3	4	5
20. Safety decisions made by me alone are usually more effective then decisions made by my co-workers together	1	2	3	4	5

21. It is not always important to have a good working relationship with my supervisor	1	2	3	4	5
22. I prefer the company having less strict rules and where I feel easy to work with, to the company having more strict rules and long working hours to follow	1	2	3	4	5
23. When workers ignore safety procedures at my workplace, I feel it is none of my business	1	2	3	4	5
24. I will not change my attitude towards safety rules, even if my supervisor praises safe work behaviour	1	2	3	4	5
25. I prefer the company having higher pay rates but lower safety records to the company having better safety records but average pay rates	1	2	3	4	5