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Health and safety in the construction industry: challenges and solutions in the UAE

Alhajeri, Mohamed

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Alhajeri, M.

UNIVERSITY OF COVENTRY
FACULTY OF ENGINEERING AND COMPUTING
DEPARTMENT OF BUILT ENVIRONMENT

HEALTH AND SAFETY IN THE CONSTRUCTION INDUSTRY: CHALLENGES AND SOLUTIONS IN THE UAE

MOHAMED ALHAJERI

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ABSTRACT

Health and safety issues have always been a major problem and concern in the construction industry. Wherever reliable records are available, construction is found to be one of the most dangerous on health and safety criteria, particularly in developing countries. Efforts have been made to address this problem, but the results have been far from satisfactory, as construction accidents continue to dominate the overall construction industry. Despite the programs implemented by government authorities and measures introduced by companies themselves, the number of construction accidents still remains alarmingly high.

In developing countries, safety rules usually do not exist; if they do, the regulatory authority is usually very weak in implementing such rules effectively. The UAE is one of developing countries that are currently enjoying a strong growth in construction activities. Unfortunately, some sectors of its construction industry suffer from poor safety and health conditions. Any 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 It may even be argued that relevant regulations are outdated and irrelevant in day-to-day construction operations. From this perspective this research explores the approved methods adopted in the UK in order to improve the existing code of practice in the UAE and thus introduce the foundations on which appropriate health and safety systems may be built. A framework for Health and Safety management in the UK is suggested. To reach this objective an overview of the published materials as well as the legislation has been undertaken. Questionnaires were designed and distributed to potential construction industry players and interview sessions have been conducted to meet the first objective of the project which to determine the health and safety measures currently applied on construction sites. In addition, structured interviews were carried out with selected managers from a selection of construction and oil companies, medium and large size. This thesis specifically, it investigates the safety perceptions, attitudes, and behaviour of construction workers and management safety practices. Based upon the analysis of the results, this study has demonstrated that the majority of those questioned UAE construction companies have a poor degree of risk awareness and do not seems to take health and safety as an important issue.

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LIST OF Abbreviation

UAE: United Arab Emirates

H&S: Health and Safety

HSE: Health and Safety Executive

HSW: Health and Safety at Work

Dh: Dirham

ISOH: Institution of Occupational Safety and Health

OSHA: Occupational Safety and Health Administration

CDM: Construction Design and Management

CHAPTER ONE

1 INTRODUCTION

1.1 Introduction

Health and safety is relevant to all branches of industry, it is particularly important for the construction industry. It has always been a major issue as it is considered as among the most exposed sectors when it comes to occupational accidents. Although tremendous improvements have been made in health and safety performance in some countries, the construction industry continues to lag behind most other industries. This has been the experience within most countries. The reality is that the construction industry continually has injury and fatality statistics that make it one of the most dangerous industries in which to work predominantly in developing countries. As a result of the increasing number of accidents, the development and publication of standards and good engineering practices based on experience and codes started. In the UK for example, the generally accepted technical level is published in publicly accessible documents like official governmental publications, laws, directives and in standards, such as Health and Safety at Work Acts (HSWA, 1974). Based on occurred accidents, the technical weaknesses of the designs (such as poor use of codes, poor judgement because of lack of experience, etc.) were reduced by adding new requirements but after that it became apparent that many accidents still occurred and that the root causes of these accidents were hardly the result of technical failures but rather of the consequence of inadequate organisational issues (such as lack of adherence to standard health and safety rules or lack or poor communication within the company). Many studies for example (Hinze, 2002; Vredenburgh, 2002) have shown that health and safety improvements will only be achieved if workers change their behaviours and incentive schemes are implemented to motivate them. It is evident that these efforts are not sufficient truly to curb the occurrence of unsafe acts on construction sites. Accordingly, preventing occupational injuries and illness should be a primary concern for all employers and employees in any countries.

On the other side, as the world has become smaller through technology and through cooperative arrangements that cross many borders; the issue of the construction worker's health and safety has become a well-recognised problem and represents a concern that is shared worldwide. Even though the mechanisation of the construction industry is not uniform throughout the world especially in the developing countries, which use labour intensive construction methods, high accidents and fatalities rates are vastly different to developed regions. This is due, in part to the minimum use of equipment, shortages of adequately craftsmen (skilled worker), difficulty in acquiring needed materials, and lack of adequate infrastructure and other facilities. Furthermore there are many other obstacles to the achievement of good standards such as pressure of production or performance targets, and the complexity of the organisation are typical examples of such obstacles including the most crucial factor of cultural and behavioural aspects. The workforce may be drawn from many different countries, use many languages and have a variety of cultural backgrounds. Culture frames the ways in which we express ourselves (Langford et al, 2000) and how we interpret the actions of others. People from different nationalities and ethnic groups express themselves and understand the behaviours of others in different ways, which are informed by specific sets of cultural knowledge and conventions. Thus cross-cultural misunderstandings occur which can lead to health and safety problems. Therefore a new approach to the management of health and safety is required. Thus it can be considered that the health and safety problems that exist in construction are rarely unique to a single country and as the global community continues to shrink, it will benefit to share ideas and to learn from the lessons already experienced by others. Since, in the global market, construction problems are very similar from country to country and this is quite evident when attending international health and safety conferences where the themes of primary interest have general appeal to all participants, construction health and safety problems appear to be everywhere. Consequently health and safety can be improved by addressing construction problems in many different ways as it reflects the common threat that binds the global research efforts in construction safety.

A variety of studies, for example (Glendon and Litherland, 2001) have investigated the construction health and safety within developed countries. In the majority of these studies, researchers have either developed a new framework model or replicated an already tested one with a view to improving its adequacy. However, there is a lack of research in this area in the context of developing countries with specific requirements.

Although much research has been directed at health and safety, very little is concerned with the UAE and the particular characteristics of health and safety in their environment. This country has experienced a construction boom during the past two decades to the point where the construction industry was the greatest recipient of government spending during that period of time, attracting construction professionals from all over the world due to the growing foreign investments and favorable fiscal policies that have improved considerably the industrial growth rate. Constructions are still ongoing on in and around cities on a big scale. Apart from doing the routine spot checks in construction sites to ensure compliance by contracting companies with the health and safety practice code, an effort must be made to raise the level of awareness among both employees and employers of the importance of health and safety at work sites.

1.2 Aim and objectives

The principal aim of this research is to determine the importance of integrating and improving health and safety standards within construction project management in the UAE, to investigate the extent health and safety influence the construction project performance and finally to develop a model that will assist construction project organisations to assess, in terms of performance, the possible outcomes of their health and safety level. The study research will be conducted through questionnaire and interview surveys to be distributed and conducted with a numbers of construction companies.

In order to achieve the above mentioned aim, the following objectives were set:

- Assessing health and safety in the construction industry, description of the general problems inherent, circumstances that allowed accident events to occur and the lessons that should be learnt to improve health and safety in the construction
- Overview of health and safety legislation with special emphasis on the updated UK regulations and the existing code of practice in the UAE. Determine the level of integration of health safety in the construction sites in the United Arab Emirates.
- The effect of globalisation and culture, challenge in developing countries and health and safety records in the UAE

- Investigating current improved methods of integrating health and safety within construction project management and identifying the keys factors leading to effective health and safety within construction project.
- Producing a best practice guide for health and safety for the UAE construction industry.

In meeting the above objectives, an extensive literature review, questionnaires and interviews were carried out and critically analysed.

1.3 Scope of the study

As mentioned above, problems of health and safety in construction can be addressed and solved on a global scale resulting in improvements that can be observed on a global scale. Therefore, solutions to health and safety problems in one country may readily be adapted to other countries to generate further improvements. The scope of this research, based on the approved methods adopted in the UK, is to introduce the foundations on which appropriate health and safety systems may be built in the UAE.

- to improve health and safety standards at construction sites by covering general health and safety provisions as well as duties and responsibilities of the employers, engineers, contractors, and sub-contractors regarding safety measures and the minimum necessary requirements.
- Measures to be followed during all the stages of the project to provide safe workplace to all employees and to protect them against accidents.
- To ensure that there are satisfactory health and safety standards within their organisation

This research, therefore, presents the results of a study of the results of a study of the problems pertaining to health and safety in construction companies in the UAE and how these may be addressed.

1.4 Significance of the research

The importance of the research stems from the need to develop an understanding and investigate the problem of health and safety in construction in the United Arab Emirates (UAE) and make a contribution to knowledge in this area where very little information exists. Addressing health and safety issues should not be seen as a regulatory burden as it offers significant opportunities and benefits to the construction companies. Such benefits

include: reduced risks in the workplace, less absences by employees and hence increased productivity, fewer accidents and less threats of legal action, improved standing among clients and partners, and obviously reduced costs to the business.
This research offers a best practice guide to health and safety in UAE construction companies.

1.5 Organisation of the chapters

The thesis is organised into 9 chapters as shown in the diagram in Figure 1.1.

Chapter 1: Gives the introduction defining the problem and stating the aims and objectives of the research and its scope.

Chapter 2: Provides a literature review of the topic being researched, reviewing documents from the wide literature on health and safety issues.

Chapter 3: Reviews the legislative governing health and safety in construction with emphasis on the United Arab Emirates and the UK, for comparison purposes.

Chapter 4: Explains the research methodology adopted in meeting the research aims and objectives. It also explains the hypotheses and questions to be answered by the research.

Chapter 5: Reviews the process adopted in designing the research questionnaire and interviews.

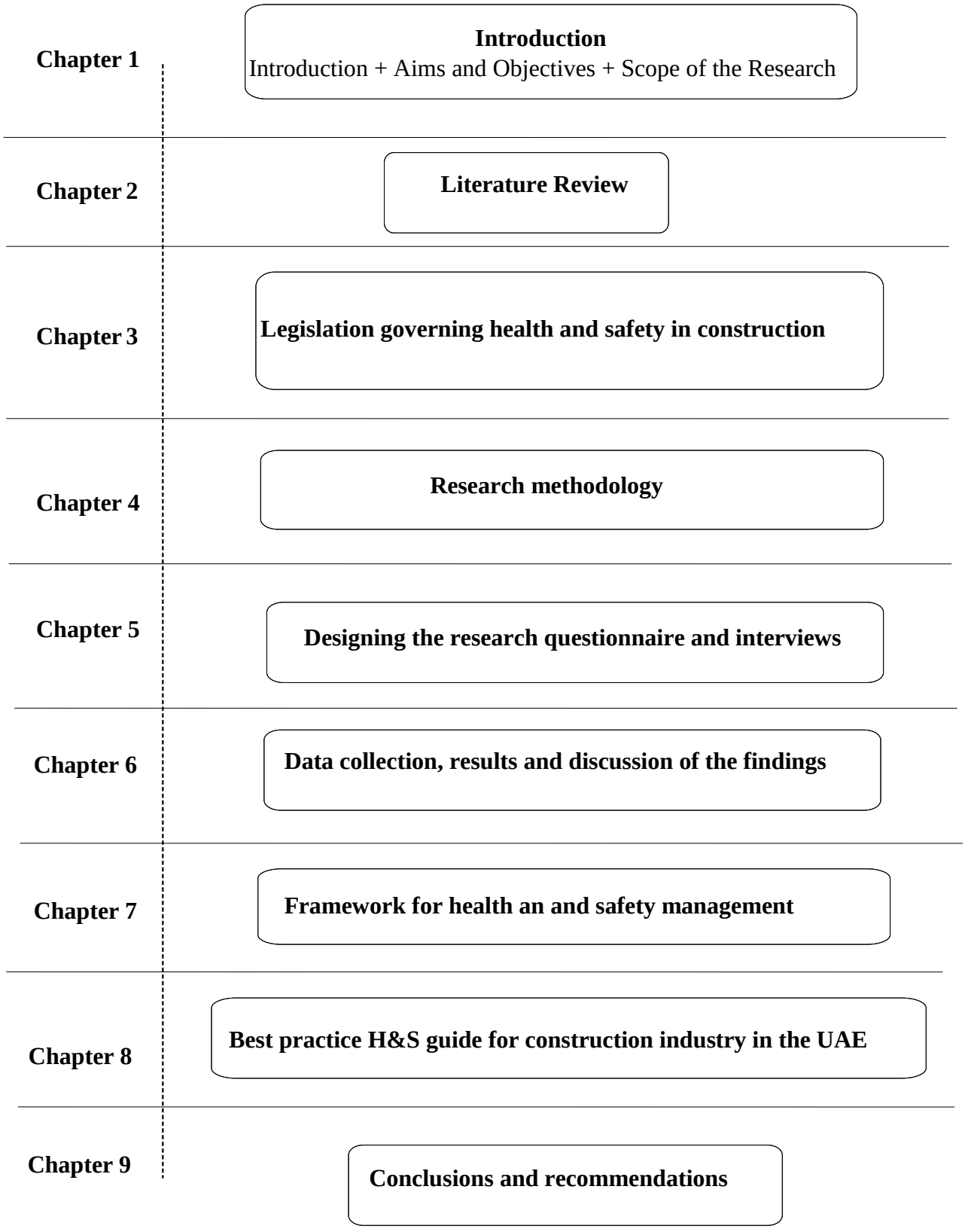
Chapter 6: Presents data, results and discusses the findings from the literature review, questionnaires and interviews.

Chapter 7: Provides the framework for health and safety management and how it can be enhanced, with an emphasis on the issue of accidents and accident reporting.

Chapter 8: Presents the best practice guide for health and safety for construction companies in the UAE

Chapter 9: Summarises the conclusions and recommendations from the research work.

Figure 1.1 Organisations of Chapters



CHAPTER TWO

2 LITERATURE REVIEW

2.1 Introduction

The main aim in carrying out the literature reviews is to gather information on the research topic. As it will be mentioned in the bibliography at the end of the report the mains sources are from journal papers, seminar and conference articles, paperwork and reference books. The study begins with a detailed literature review on health and safety in the construction industry focusing firstly on the nature of the scope of the construction industry and the most activities that involve perilous and dangerous operations. Subsequently an overview of the dramatic level of occupational injuries and fatalities occurring throughout the word is highlighted in order to point out the huge importance of managing health and safety performance. Thereafter the focus would be on the need to improve the process of health and safety in the construction project taking into account the factors responsible for major causes of sites accidents with the effect of globalisation aspect and cultural issues which are also analysed. Finally the challenge faced by developing countries such as the UAE is in implementing effectively health and safety procedures.

2.2 Health and safety definitions

Before a detailed discussion of health and safety issues can take place, some basic occupational health and safety definitions are required as well as the legal framework for health and safety because it seems important to have a clear understanding of the nature and working conditions in the construction industry and safety organisations to develop an efficient tool for health and safety issue.

Health is the protection of the bodies and minds of people from illness resulting from the materials, processes or procedures used in the workplace.

Safety is the protection of people from physical injury. The borderline between health and safety is ill-defined and the two words are normally used together to indicate concern for the physical and mental well-being of the individual at the place of work.

Welfare is the provision of facilities to maintain the health and well-being of individuals at the workplace.

Environmental protection is the arrangements to cover those activities in the workplace which affect the environment (in the form of flora, fauna, water, air and soil) and, possibly, the health and safety of employees and others. Such activities include waste and effluent disposal and atmospheric pollution.

Accident is defined by the Health and safety Executive (HSE, 2003) as 'any unplanned event that results in injury or ill health of people, or damage or loss to property, plant, materials or the environment or a loss of a business opportunity'. In the UK, the Health and Safety Executive (HSE) is responsible for the enforcement of the Health and Safety at Work (HSW) Act and carrying out the day-to-day work to enable the Health and Safety Commission (HSS) to carry out its functions. The HSC is responsible for the promotion of the HSW and encouraging research, training, providing an information and advisory service. Other authorities define an accident more narrowly by excluding events that do not involve injury or ill-health. However this research will always use the Health and Safety Executive definition.

Hazard and risk (Keng, 2004) is the potential of a substance, activity or process to cause harm. Hazards take many forms including, for example, chemicals, electricity and working from a ladder. A hazard can be ranked relative to other hazards or to a possible level of danger.

A risk is the likelihood of a substance, activity or process to cause harm. A risk can be reduced and the hazard controlled by good management. It is very important to distinguish between a hazard and a risk as the two terms are often confused and activities such as construction work are called high risk when they are high hazard. Although the hazard will continue to be high, the risks will be reduced as controls are implemented. The level of risk remaining when controls have been adopted is known as the residual

risk. There should only be high residual risk where there is poor health and safety management and inadequate control measures.

Thus it can be seen that health and safety is far more than a worker wearing a safety helmet on construction sites. Health and safety is a philosophy that identifies and eliminates job site hazards throughout the lifecycle of a work project. It is a philosophy that discourages work practices that place individuals at risk of injury and the integration of Health and safety into the daily work process. Risk has been defined in a number of ways. The Health and Safety Executive defined risk as the chance high or low that somebody will be harmed by the hazard (HSE, 1998). Hertz and Thomas (1983) stated the definitions of risk which taken from the Random House College Dictionary as exposure to the chance of injury or loss. The Health and Safety Commission (1995) defined risk as the likelihood that harm will occur (Jannadi and Bu-Khamsin, 2002). According to Lim (2003), risk is defined as either, the probability of unwanted event, combination of hazard, unpredictability, and partiality of the actual result differ from expected result, loss uncertainty, or probability of loss. However, risk in this study is defined as the chance or probability, high or low, of harm actually being done. Risk will be apparent at all stages of the life cycle of a construction project at appraisal, sanction, construction and operation (Perry and Hayes, 1985). One of the most severe risks in construction industry is in the safety and health aspect. It is also the promotion of an environment where each person in the project construction hierarchy has a role and responsibility for safety and health.

2.3 Scope of the construction industry and general problem description

The construction industry plays a vital role in the social and economic development of all countries. its scope is very wide from larger civil engineering projects such as road and bridge, building, water supply and sewerage schemes and river and canal work etc. construction works are also needed in agriculture, industry, education, health and other service industries. It is classified into various segments industrial, housing, commercial, utilities and infrastructure work. Thus 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 construction industry's importance has been confirmed by several studies (Coble and Haupt,1999).

The most common activity in construction is general building work which is domestic, commercial or industrial in nature. This work may be new building work, such as a building extension, or, more commonly, the refurbishment, maintenance or repair of existing buildings. The buildings may be occupied or unoccupied. Such projects may begin with a partial or total demolition of a structure which is a particularly hazardous operation. Most construction projects cover a range of activities such as site clearance, the demolition or dismantling of building structures or plant and equipment, the felling of trees and the safe disposal of waste materials. The work could involve hazardous operations, such as roof work or contact with hazardous materials, such as asbestos or lead. The site activities will include the loading, unloading and storage of materials and site movements of vehicles and pedestrians. Finally, the construction processes themselves are often hazardous. These processes include fabrication, decoration, cleaning, installation and the removal and maintenance of services (electricity, water, gas and telecommunications). Construction also includes the use of woodworking workshops together with woodworking machines and their associated hazards, painting and decorating and the use of heavy machinery. It will often require work to take place in confined spaces, such as excavations and underground chambers. At the end of most projects, the site is landscaped which will introduce a new set of hazards. Hence throughout the world, construction is one of the most hazardous industries and it is generally recognised that health and safety on construction on sites is not satisfactory as the level of occupational accidents is high when compared to other industries. 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.

Nearly all construction sites are temporary in nature and, during the construction process, are constantly changing. This always leads to the temptation to compromise on health and safety issues, such as the provision of adequate welfare facilities or the safe re-routing of

site traffic. In addition the construction sector is characterised by a very fragmented structure in the production phase with a large number of independent companies. This type of organisation often makes management assignments in the building sector difficult and complex. It is not unusual that several sub-contractors are involved in a single construction project, often more than one at a time, with varying influence on their own and other sub-contractors' working conditions. A division of decisions and authority between different, legally separate companies have often made placing responsibility diffuse and difficult. The client, the consulting engineers, architects, general contractor and a number of subcontractors carry out the building jointly. Moreover, at any given time, there are many young people receiving training on site in the various construction trades. These trainees need supervision and structured training programmes. A further characteristic of the construction 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.

To summarise, it can be said that the majority of the contractors especially the sub contractors are reluctant to implement occupational health and safety program at construction sites. Thus, hopefully this study results can determine the factors that influences the implementation of occupational health and safety program and it could benefit the contractors, employers and the construction industry as a whole. Besides, there are some other problems that may be stated as follows:

- The construction industry has a poor safety and health record
- There are good reasons to improve the safety and health performance
- Accident causation is complex but important
- It is important to measure safety and health performance
- Existing safety measurement systems are limited in scope and effectiveness

- Concentrating on proactive measures instead of reactive measures should improve safety and health performance

2.4 The construction sector in the UAE

The Middle East and particularly the Gulf States are undergoing a major regeneration and development, creating a competitive atmosphere. These countries are witnessing a huge construction boom that can be attributed to favourable demographics of a growing young population. However the strong economic expansion experienced has created some skilled labour shortfalls in several regions. This, in turn, forced contractors to hire suboptimal workers to fill out the gaps. The UAE like their neighbouring states are investing heavily in public sector and infrastructure projects, to reduce their dependency of ever dwindling reserves of oil and gas. Therefore the clearly articulated UAE government is aiming to encourage the diversification of the national economy from purely oil-based to a multifunctional one. This has resulted in a big boom in the construction sector. Thus the construction industry is an important player in the economy of the UAE. According to The Arab World Competitiveness Report (2007), the UAE is the most competitive economy in the Arab world among the Middle East and particularly the Gulf States countries with a huge mega project announced to reflect a robust and consistent growth. The UAE is bordered by Saudi Arabia to the south and surrounded on all other sides by the Gulf. Nearly 50% of the country's total population, which is less than 1m by most estimates, live in Dubai. Since achieving independence from the UK in 1971, the UAE have become one of the wealthiest nations in the Middle East and currently boasts one of the fastest-growing economies in the world. This prosperity can be attributed almost entirely to hydrocarbons exports, which account for more than 60% of total GDP. The UAE government are investing heavily in human capital. The UAE is aiming to diversify their economy to include healthcare, education, tourism, sports and leisure. Constructions in the UAE are booming with investments worth billions of USD in oil, gas, power, chemicals, transportation, environmental & communication projects, industrial, commercial and residential buildings. The construction sector is one of the most dynamic in the UAE economy servicing the demand for new facilities, infrastructure and buildings. The building and construction sector is vital to the economy, as it is diversified and covers several fields that are interrelated with the various sectors of economy.

The major development projects planned by the public sector in the UAE includes (Arab World Competitiveness Report, 2007):

- Projects under construction in the UAE are estimated to exceed Dh 1.83 trillion ($0.5 trillion), registering a growth rate of 83.4 percent. UAE scoops 39.4 percent of the projects in the whole GCC region.
- The UAE had also earmarked over Dh 454 billion ($124 billion) to develop 325 natural and man-made islands, including Al Saadiyat in Abu Dhabi, the Lagoons in Dubai, Jebel Ali Palm, Deira Palm, Umm Al Shauoom, Sayara, Mangrove and Fujairah Islands.
- In 2006, UAE developers announced 332 projects with a total value of Dh 1.4 trillion ($0.4 trillion). The total value of projects to be built in Abu Dhabi is Dh 715 billion ($195 billion), while projects in Dubai are estimated at Dh 653 billion ($178 billion) and projects in other emirates at Dh 213 billion ($58 billion).
- causeway between Qatar and Dubai (US$3 billion)
- tourism and hotel projects (US$15 billion)

As can be seen, of all the sectors that have benefited from the recent economic boost in the UAE, the construction industry might be the most fortunate. The influx of liquid assets has brought about massive infrastructure, business and luxury projects in all corners of the country. Other government-contracted projects include major highway network expansion and upgrades to sewage and waste removal systems. The private sector is also building like mad, with a number of major projects set for completion in the near future. Over 800 new towers are slated to go up in Dubai (and Doha) over the next 10 years, making the capital cities one of the busiest construction areas in the world. The real estate sector is currently buoyed by the substantial amount of ongoing construction work. High demand for commercial, residential and industrial space is pushing prices up and real estate investors are reaping the benefits. Analysts have questioned whether or not supply can keep up with demand, especially in the residential market. In response, the government has initiated several major housing projects. The UAE's biggest challenge at this point is maintaining a high-quality workforce that will continue to fuel the level of

growth that has become the norm over the past few years (Arab World Competitiveness Report, 2007).

While many countries rely on cheap foreign workers, nowhere else in the world is as dependent on them as the UAE, where there are 2.7 million foreign workers registered with the Ministry of Labour. The total number of the expatriate labour force is much higher as many, such as domestic workers, drivers and those working in the free-zones do not come under the Ministry of Labour. There are also many working without legal status on visit visas (Arab World Competitiveness Report, 2007).

In 2006, the ministry issued 835,000 works permits and issued 1.2 million in 2007. In all, migrant workers constitute a massive 85 percent of the 5.3 million population and 90 percent of the workforce in the private sector, predominantly construction, hospitality and domestic service. A mere 800,000 people are UAE citizens. These young immigrant workers, the majority of whom are from rural areas in India, Pakistan, Bangladesh, Sri Lanka and the Philippines, are for social and economic reasons forced to live for years without their families in labour camps. With immigration sponsorship laws that grant employers enormous powers over the lives of their workers, abuses against migrant workers is a reality in many instances. They include non-payment of wages, extended working hours without overtime rates of pay, unsafe working conditions resulting in deaths and injuries, squalid living conditions in the labour camps (Arab World Competitiveness Report, 2007).

Unfortunately, the enforcement of health and safety regulations within are not widespread. Some may even argue that the framework of existing occupational and health conditions 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 the UAE, could contribute significantly to the cost efficiency, quality assurance and environmental protection of the company and its employees.

2.5 Accidents statistics in the construction

Construction industry accounts for high number of occupational injuries and fatalities every year. The construction industry, when compared with other (labour intensive) industries, has historically experienced a disproportionately high rate of disabling injuries and fatalities for its size (Hinze, 1997). Despite improvements in occupational safety over the last decade, around 5 500 people lose their lives each year through work-related accidents in the European Union. More than 75 000 are so severely disabled that they can no longer work. Moreover, major surveys have found that people experience more physical problems at work than before; dispelling the often fashionable belief that new technology has eradicated difficulties such as manual lifting of heavy objects.

The 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 (Smallwood, 2000). In Japan, construction accidents account for 30 % to 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.

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).

In the United States according to the Bureau of Labor Statistics, 13,502 construction workers died due to work-related injuries from 1992 through 2003 while the construction industry accounts for 19 percent of all workplace injuries and fatalities. Serious work-related injuries cost employers almost $1 billion per week in 2002 in payments to injured workers and their medical care providers, growing to $49.6 billion from $46.1 billion in 2001 (Blotzer, 2005).

In the UK construction, is a large industry which accounts for 8% of the gross domestic product of the United Kingdom. It employs one and a half million people and produces activity worth £65 billion each year. The construction industry has a world reputation for the quality of its work but it remains one of the most dangerous in Britain. The health and safety problem in the construction industry is its poor record when compared to the other parts of British industry. This performance deteriorated in 2000 and certain actions were taken by the HSE. A new Construction Division was launched in April 2002 and a new intervention strategy was developed. Clients and developers as well as construction sites are to be targeted in future. In 2001/02, the fatal injury rate (per 100 000 workers) was 4.2 while the industrial average was 0.88. In response to the 'Revitalising Health and Safety' campaign launched by the Health and Safety Commission and the government in June 2000, the construction industry set itself a target to reduce the rate of fatal and major injury to its workers by 40% in 2004/05 and by 66% in 2009/10.

Rowlinson and Cheung (2004) gathered the statistics of fatal accidents in construction industries in selected countries worldwide from 1991 to 2000 as shown in Figure 2.1 in which is revealed the extent of the problems in construction industries worldwide.

Figure 2.1: Fatal Accidents per 100,000 construction workers per year

(Rowlinson and Cheung, 2004)

As regards to construction safety in the UAE and the Gulf region in general, the record is poor in terms of international standards. In 1999, 923 site accidents of Grade IV 1 and above were recorded at countryside construction, in which 1097 construction workers lost their lives (Qatar Statistical Yearbook of Construction, 2000). The total construction workforce was 24,286,000 in 1999, representing a rate of these Grade I–IV serious site accidents of 3.8 per 100,000 workers. The fatality rate in these serious accidents is 4.5 per 100,000 workers. This seriously underestimates the total fatality rate, as single fatalities are not all reportable. Contractors in the UAE stand to lose an estimated US $5,000 (AED 18,300) per hour if work on site is stopped because of an accident. Fines for flouting standards are currently around $13,000. Good health and safety is not only good for the country and people, it is also good business. According to an Indian safety expert, a lack of proper planning before work and fatigue are the main reasons for casualties on construction sites in the UAE. A proper planning of a construction site by the company is essential before setting up equipment.

In the UAE accidents are often not made public by construction firms. However some cannot be hid such as the one where a crane used to build a high-rise tower on the seaside Corniche road in Abu Dhabi collapsed on April 3/2004, killing the crane's operator. Nine days later, nine workers were crushed to death and two injured in a similar accident in

Sharjah. The two accidents within ten days killed ten people, raising concerns about safety measures at construction sites. More people could have died or been injured in the first accident if efforts had not been made to block the road and move the crane quickly. These were just two construction-site accidents made public. According to sources in the building sector, at least one worker dies or one is injured on nearly every major construction project in the country. Negligence or poor maintenance of machinery is often blamed. As mentioned unfortunately, the construction companies do not keep an official record of the number of construction-site deaths or injuries. As a result, there is no effective way to study construction-site accidents to develop better health and safety practices. In the last five years, less than a dozen accidents have been reported in the media. Alarmed by the growing number of fatal workplace accidents in the UAE, a trade fair and conference were featured by Intersec with the key theme for that edition 'Construction Safety'. held at the Dubai International Convention and Exhibition Centre in January from 18 to 20, 2009. Intersec is the leading event for commercial security, safety and health, fire and rescue, and homeland security and policing in the Middle East, and the largest such event outside Europe, say the organisers. Intersec 2008 featured more than 800 exhibitors, showcasing 2,000 brands from across 53 countries. A highlight of the Intersec 2009 was a special display for safety at height to show the latest practices and techniques in active and passive fall protection, and suitable trainings. The 2009 IOSH Middle East Conference addressed the challenges and feature the successes involved in maintaining best practice. The Intersec trade fair and conference is supported by trade and government organisations, such as Dubai Police, the Institution of Occupational Safety and Health (IOSH), Build Safe Dubai, and Dubai Civil Defence.

Based on anecdotal evidence, however, construction workers argue the number of reported cases is far too low to be accurate. Workers see plenty of accidents, they say, particularly in the summer, when colleagues become tired and either fall or are injured while operating a machine. It is reported by a person who works as a safety manager for a local company that some workers are often afraid to ask for a break if the heat has gotten to them or if they are tired. It has been also noted that labourers continue to work at construction sites even if they are hit by heat stroke and get tired, simply because they are afraid of asking for a rest. Most workers fear they will lose their jobs if they rest. In such cases, the most important thing is that supervisors must be able to determine if a worker has been affected by the heat and if he must rest. This is where supervisors and other

administrative personnel must stress safety. Supervisors must allow their workers to take breaks on those exceptionally hot days to avoid heat stroke. Management often argues that breaks affect the efficiency of the work. Strictly speaking, it will benefit employees more to work when the mind and body have rested, especially on those hot days. A manager at Construction Machinery Centre, reports that there are many reasons for construction-site accidents. Negligence and the poor maintenance of the machines are the main reasons for fatal accidents at work sites. To avoid accidents, construction companies should only hire authorised companies for the installation of cranes and other heavy machinery at work sites. Machines should regularly be checked and maintained for safety. Even old machines can be safe if they are regularly maintained. Well trained operators with good safety records should only be allowed to operate the machinery.

2.6 Factors responsible for site accidents

The Construction industry is a very unique industry and unlike fixed workplace like factory. There are reasons believing construction industry are more dangerous than other industries. Firstly, the construction sites are constantly changing and temporary. Each construction sites involve of many sub-contractors and they perform different types of work in close proximity to each other. Further, several trades and concurrent tasks are present on construction site at the same time, which can bring them the specific hazards of their trade. Certain tasks whereby one trade ends up doing all the tasks usually performed by another trade may result in the workers not being familiar with the hazards involved left by previous trade. The always changing construction site and regular being moved or modified can cause new hazards constantly emerging. Besides, construction workers frequently change worksites and employers over the years. This result in that they might not been trained work in new procedures and equipments. Lastly, due to rush for the dateline and to quickly complete projects, it will increase chances of accident occurs.

The majority of contractors' works at construction sites are sub-contractors who have been hired by main contractor. The uncontrolled of safety and health on construction site may caused hazardous conditions go unchecked, which can cause death or serious injuries and sub-contractors who have bad safety records or perform their work in an unsafe manner are very culpable (Reese and Eidons, 1999). A number of people can be

held accountable for a construction accident, from the subcontractor and contractor to the owners, architects, insurance companies and equipment manufacturers. Although contractors are required to inspect construction sites with safety engineers and to enforce employee compliance with safety precautions, construction accidents still occur because of inadequate safety regulations or lack supervision.

The major causes of accidents are related to the unique nature of the construction industry, human behaviour, difficult work-site conditions, and poor safety management, which result in unsafe work methods, equipment, and procedures. The dynamic nature of construction is one of the major causes for various types of incidents resulting in injuries and fatalities in the construction industry (HSE, 2003). This evidence, together with scores of other statistics and studies, firmly underlines the need for even more rigorous accident prevention regimes. It is a basic human right to return home safely from work; nobody should be killed or harmed in occupational accidents. Until this position is reached, there will still be work to be done in the field of accident prevention. Part of the problem is that people tend to underestimate long established risks, such as falls, and overestimate workplace violence. Both need to be recognised and controlled.

Major socio-economic developments are also changing the scale and pattern of accidents and risks. Transportation, for instance, is expanding tremendously, conveying much larger volumes of people and goods. In addition, all systems are getting bigger and more complicated. Technological advances might have reduced the probability of accidents in these environments, but if one does occur, the potential scale of a catastrophe is markedly higher.

The science of accident prevention started during World War I, focusing both on human safety and the control of various harmful ‘energies’ in the workplace. In the late sixties, the emphasis was on the systematic interaction of people, machines and the work environment. This so-called ‘systems approach’ greatly advanced the understanding of effective prevention. Major accidents have shown that it is not enough to analyse a single person or machine in isolation from the rest of the working community and other elements in the workplace. More recently, researchers have turned their attention to organisational, weather conditions and cultural factors (Reese and Eidons, 1999).

Even if a person or a machine has characteristics that make them more vulnerable to accidents, a variety of factors determine the probability of an accident. Accidents do not necessarily happen where expected. For example, people can walk safely on slippery surfaces, but slip on a small spot of oil on the floor. A false sense of security can prompt people to ignore risks. For example, a recent study showed that trucks very often tilt over on straight roads in good weather conditions and in broad daylight (Reese and Eidons, 1999).

Adverse weather conditions call for better concentration and, consequently, do not produce as many accidents as one could expect. The human element is important since people cannot cope with some conditions, especially the unexpected. Accidents by definition are unexpected and most people find it hard to manage unexpected situations. Usually there is too much information for a given situation and those elements that do not normally affect the situation, based on previous experience, are often ignored. To avoid the risks of these presumptions we need to allow more time for decisions in situations that go against experience.

Another important factor is that people behave differently in different settings. One of the contributing factors is an organisation's culture, more specifically its safety culture. The members of an organisation are governed by a relatively similar set of values. This may be because organisations tend to recruit people who think in a similar way. It may also be a relatively conscious development. A good safety culture is a work environment where all members of the organisation share a high safety ethic. Either fatalism or 'production-first' thinking leads to a negligent attitude towards hazards in a bad safety culture. Top management commitment is essential to promote a safety culture.

2.7 Globalisation and Cultural effect

Globalisation is an inevitable fact as construction health and safety is a global issue in that it is a concern wherever construction activities take place. It is no longer possible for governments to legislate in isolation because changes that once only affected their own population and possibly their nearest neighbours now have more far reaching consequences. This is in some part possible due to cheaper methods of travel and instant world-wide communication through the internet. Workers are able to find out about work through internet agencies and travel to different countries at a relatively low cost.

Therefore with the growing international activity in construction there has been an increasing awareness of the importance of better understanding of cross-cultural management (Torrance, 2004).

Loughborough University carried out research visiting projects in Africa, Asia, India, the Middle East and Eastern Europe to observe the health and safety measures employed and interview management staff. The visits together with a series of interviews and focus groups in the UK and mainland Europe were used to produce a guidance manual (Bust and Gibb, 2006). After the completion of that project, cross-departmental (Social Sciences and Civil and Building Engineering) discussions at the University identified areas for further investigation. First, it was thought that the work in developing countries also raised questions about construction in the UK where there has been an increase in the numbers of migrant workers being employed. Secondly, that this situation called for an assessment of the increasing variety of visual methods being used to communicate about health and safety on and about construction sites was necessary and ultimately, the construction workers being employed around the globe.

The use of migrant workers in construction is a world-wide phenomenon and it is common practice even in a developed country like the UK and not just the UAE. A structurally embedded reliance on cheap and 'flexible' sources of regularly and irregularly employed migrant workers has always been a key feature of the UK construction sector (Balch and Geddes, 2003).

However, a combination of events (expansion of the European Union, a buoyant UK economy and an absence of the traditional Irish migrant workforce due to a boom in Ireland) has led to an increase in the numbers of foreign nationals. This has been recognised by the Construction Industry Training Board (CITB) and the Construction Confederation in the UK. They have worked together to produce the 'A Simple Guide to Clearer Communication' publication outlining methods for clearer verbal communication, recommendations for notices and examples of good and bad communication. Included in this is the recommended use of pictures on signs to convey safety information.

Research on construction safety in Kuwait reported that there was an extensive use of foreign labour; that different labour cultures and traditions reflect on human relations, different work habits, and communication problems; and the workers were emotionally vulnerable and preoccupied with their problems. All of these factors can affect the concentration and attention of the worker and may contribute to mistakes (Kartam et al., 2000).

Although there may be many cultural and religious aspects that need to be understood, the obvious change is having to deal with a workforce with a growing communication barrier. The inability to immediately communicate via the spoken word on construction sites represents one of the major barriers to successful management of health and safety. In the UK and abroad this issue is being dealt with in similar ways for the translation of health and safety information, use of interpreters and a variety of visual methods to communicate essential health and safety information. It is essential that the effectiveness of these methods is assessed as well as the full impact of migrant workers on health and safety in construction.

From investigations on the Global Safety project (Bust and Gibb, 2006) it has been learnt that when multinational consortia work alongside workforces derived from many countries, the opportunity for the message to be lost in translation is increased. When looking at factors contributing to construction accidents it was reported (Haslam et al., 2005) that worker participation in managing health and safety was important to generate ideas and to build ownership and responsibility.

This will be difficult to achieve if the number of different languages spoken on construction sites continues to increase. Acting on responses to the HSE's discussion document 'Revitalising Health and safety in Construction' (HSE, 2003), it was said that, in order to engage the workforce the HSE had to develop proposals for tackling language and literacy issues. This is now taxing health and safety managers throughout the UK.

Therefore it can be concluded that over the past two decades however, culture has emerged as an important factor in health and safety in construction particularly with the increasing internationalisation of procurement project. At the project and organisational level there have been studies looking at such issues "Disputes and Construction Industry Cultures" and comparisons between organisational cultures of contractors and consultants (Rameezdeen and Gunarathna, 2003). This study demonstrated a growing awareness in

the construction industry of the role of culture in project performance outcomes. This awareness notwithstanding, the nature of the implied relationship between organisational culture and performance still remains unclear since few studies exist that provide empirical evidence of this. As a result, it has not been possible to definitively identify cultural orientations that influence the process of delivering the products of the construction industry with its peculiar characteristics, and to strongly advocate and build those cultural orientations that improve performance whilst taking steps to mitigate the effects of those orientations that are incompatible with good performance.

There are many fundamental questions which still remain unanswered or at best have only been addressed piecemeal. For instance what is the culture on the construction project, and does such a thing as 'culture' even exist? Is there any evidence that on different projects different cultural orientations exist, and if they do, do they lead to significantly different performance outcomes? Should culture be considered as something that the temporary project coalition is and therefore not easily changed, or as something that the project coalition has that can be manipulated to bring about change in orientation and performance outcomes (Smirchich, 1983). These are fundamental questions that need to be addressed through research. An appreciation of how culture, in whatever form, affects the profitability and performance of construction projects will help with the process of implementing changes in culture and organisational structures. Such research is however generally lacking as noted by Hall (1999), therefore studies exploring such relationships will undoubtedly be beneficial to the construction industry.

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

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.

2.8 Challenge 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 construction 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 impact 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; Kartam et al. (1998) 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 when they do, they 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 and Sohail, 1999; Hinze *et al*., 1999).

2.9 Health and safety standards on construction sites in the UAE

In the UAE, there is still lack of preventive measures for reduction of occupational safety and illness on construction sites. Taking the example of the crane accident the council called for better control of the use of cranes in residential areas to reduce the threat of accidents to residents. The issue of old cranes had came up at Abu Dhabi's National Consultative Council on several occasions, with members demanding all construction companies replace their old machines for safety's sake. The council had held several discussions with the Civil Defence, Abu Dhabi Municipality and Town Planning Department and the Ministry of Labour and Social Affairs to improve conditions at work sites. Members say more attention must be given to the proper installation of cranes on construction sites to prevent them from extending into residential areas. Though the inspection of a crane at a construction site and its maintenance do not come under the Civil Defence authority, an official told Gulf News the department is coordinating with the Ministry of Labour, which is responsible for safety measures at construction site. The coordination with authorities in order to provide them with their expertise to help guarantee complete safety and preventive measures at work sites. On the safety practices at construction sites, it was noted by the Director of the Labour Safety Section at the Labour Ministry, that article 32 of federal law No. 8 for the year 1980 outlined safety measures to protect workers. This law therefore should be inspected and maintained annually with the knowledge of a specialist. There is a very strong commitment from the Ministry of labour to improve health and safety standards. But the law on its own won't be enough. There is a need to build a capacity for enforcement and the industry needs to improve things. Some sectors like oil and gas have standards that are comparable with the rest of the world. The ministry of labour must take action against those who were in charge of certifying that the two cranes involved in the accidents in question would be blacklisted for failing to secure the safety of workers and pedestrians. the ministry has authorised a number of specialised companies to provide expertise when setting up

machines at construction sites. Only authorised and licensed companies are allowed to install cranes and other machinery at work sites. The authorised companies are responsible for inspecting cranes and have certified inspectors to do the job. The Labour Safety Section at the ministry certifies these inspectors to inspect cranes. The section examines the inspectors annually. They are given an oral and written test to complete to ensure that their work is up to international standards. If they pass the test, they are certified to work as inspectors for a year only after which they are tested again. If after a year, an inspector is reported to have failed to do his job effectively or has made some mistakes, he is not given inspection privileges again. The authorised companies are asked by the ministry to present annual reports on their activities

According to the Director of the Labour Safety Section, the number one reason behind crane accidents is the failure to regularly inspect the cranes. It is these inspections that identify if there is a problem with the crane or if it needs to be repaired. As for the number of crane accidents, the ministry does not have an accurate record for Abu Dhabi. According to the law, construction companies are supposed to inform the ministry if an accident occurs; but, unfortunately, they never do.

In the light of these conclusions the UAE Ministry of Labour will form an independent agency for the sole purpose of inspecting health and safety standards on construction sites. The agency is part of the ministry's plans to upgrade the country's health and safety regulations and is expected to be up and running within the next few months. The Institute of Occupational Safety and Health (IOSH) has been working closely with the ministry to revise health and safety laws, which will also extend to labour accommodation standards. The new regulations will also mean tougher penalties for construction companies violating the rules. They are in the early stages at the moment, but the independent agency will focus on health and safety inspections. There will also be more fines; contractors will be expected to prove good health and safety standards, and it will be up to the industry to assume responsibility. The new law is also expected to address heat-related illnesses, first aid requirements, electrical safety at work and protective equipment to prevent falls from height.

2.10 Summary

The literature review has revealed the existence of dramatic levels of occupational injuries and fatalities occurring throughout the world, thus highlighting the huge importance of managing health and safety performance. The focus needs be on the need to improve the process of health and safety in the construction project taking into account the factors responsible for major causes of sites accidents with the effect of globalisation aspect and cultural issues. The literature has also highlighted the huge challenges faced by developing countries such as the UAE to develop and implementing effectively health and safety procedures in construction.

CHAPTER THREE

3 LEGISLATIVE GOVERNING HEALTH AND SAFETY IN CONSTRUCTION

3.1 Introduction

In this chapter, a review of the legislation governing health and safety in construction is given. The emphasis will be on the UK and the UAE, but other countries will also be covered by the review. Any health and safety legislation requires that good management and common sense would lead employers to look at what the risks are in the workplace and take sensible measures to tackle them.

Risk reduction or control measures rely for their effectiveness on knowledge of risk and a willingness to take action to reduce it. This alone is insufficient, unless it is covered by legal sanctions in the event of negligence leading to injury or illness. Thus, most countries have a framework of health and safety law, backed by a system of enforcement, analogous to those parts of the criminal law seeking to protect citizens from other forms of violence. In addition, people injured as a result of their work generally have the right to sue their employers in the civil courts for negligently causing such injury, the onus being on the injured party to prove negligence.

3.2 Health and safety legislation worldwide level

There are many ways where health and safety in construction industries being controlled in order to reduce the number of accidents subsequently reducing the numbers of fatality and injuries to the workers and damage to the equipments. Governments worldwide have maintained an ongoing 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 generalized performance objectives and provides a system of clearly stated responsibilities to encourage greater self regulation for the construction industry. Some countries depend totally on government in controlling safety at worksite. In spite of the high costs of work accidents, many

construction companies adopt as their only health and safety management strategy the compliance with mandatory regulations. However, only being in compliance with these regulations might not be sufficient to guarantee excellence in health and safety performance, as they cover only minimal preventive measures.

Most countries have now a law regarding Health and Safety at Work that protects their population from personal harm by forcing contractors, installations, equipment, tools, etc. to have a safety level that is at least at the level of the generally accepted technical level corresponding to good engineering practice. The practice of safety in construction in the USA is regulated by governmental agencies such as the Occupational Safety and Health Administration (OSHA), which provides strict rules and regulations to enforce safety and health standards on job site. The (OSHA) defines the safety and health regulations for the construction industry. The regulations apply to all that are involved in construction work including contractors, subcontractors and suppliers. According to general safety and health provisions, it is the responsibility of the employer to initiate and maintain programs for safe working conditions for employees. It further states that any such programs shall provide for frequent and regular inspections of the job sites, materials, and equipment to be made by designated competent persons. The safety training and education regulations create a responsibility for the employer to avail himself of the safety and health training programs and instruct each employee of any unsafe conditions and regulations applicable to employee's work environment to prevent any hazards. Countries such as the United Kingdom, Singapore and Hong Kong have adopted a self regulatory approach to safety, whereby proprietors (including contractors) are required to develop, implement and maintain safety management system (Ng *et al.*, 2005).

As regard to the UK, much of the health and safety law originates in Europe. Proposals from the European Commission may be agreed by member states. The member states are then responsible for making them part of their domestic law. The main role of the EU in health and safety is to harmonize workplace and legal standards and remove barriers to trade across member states. A directive from the EU is legally binding on each member state and must be incorporated into the national law of each member state. Directives set out specific minimum aims which must be covered within the national law. Some states incorporate directives more speedily than others. The HSW Act (Health and Safety at Work Act) is the generic regulation that governs all places of work; all of the regulations

within the Act are applicable to the construction site. The Health and Safety at Work Act 1974 (HSW, 1974) is the basis of British health and safety law. It outlines the lawful requirements of the employers and the other people that many be included. A significant section of the act is the forming of the HSE (Health and Safety Executive) and the (Health and Safety Commission). The purpose of the act was to assure safe and healthful working conditions for working men and women by authorizing enforcement of the standards developed under the act. The act created by both HSE (Health and Safety Executive) and the HSC (Health and Safety Commission) to attain the above objective.

In Singapore, the construction site safety legislation is governed by the requirements stipulated under the Factories Act (Chapter 104) and the Factories (Building Operations and Work of Engineering Construction) Regulation requires all occupiers of construction worksites, which have contract values of S$10 million or more to implement a Safety Management System specified under the 1999 Code of Practice for Safety Management System for Construction Worksites (CP 79) (Teo and Ling 2005).

In Finland, occupational safety is the responsibility of the employer, while the occupational safety and health laws are enforced by the Labour Inspection Service, an organisation of the state (Yränheikki and Savolainen 2000).

In China the ministry of Construction takes the overall responsibility in overseeing the construction industry in which the roles include implementing the new strategies and policies such as preparing development programs, regulating construction markets and construction institutions and monitoring construction safety (Tam, 2004).

In Brazil, the main health and safety regulation related to construction industry is the NR-18 standard (Work Conditions and Environment in the Construction Industry). Health and safety planning appears as a core requirement in this standard: a health and safety plan for the whole project, named PCMAT (Plan of Conditions and Work Environment in the Construction Industry), is required. Since NR-18 was established in 1995, most companies have produced such plan only to avoid fines from governmental inspectors and do not effectively use it as a mechanism for managing site safety.

Most Arab countries have enacted national legislations to protect the worker's safety. Many have set up committees or ministries for health and safety matters. Moreover the Council of Arab Ministers Responsible for the health and safety tries to enhance Arab capacities in this field. However, the implementation of the health and safety legislations is still limited. Furthermore the above committee in collaboration with some Arab federations and regional and international organisations issued several directories to define the health and safety impact of construction activities.

The practice of safety in Kuwait is regulated by two government agencies, Kuwait Municipality (KM) and Ministry of Public Work (MPW) in addition to the High Committee for Safety and Security at the state level (Kartam and Bouz 1998). The practice of safety in Saudi Arabia is not regulated by any government agency but becomes an area of responsibility of the top management of the organisation (Jannadi and Assaf 1998).

In the UAE health and safety are regulated respectively by the ministry of Labour Law No. 8 of 1980 Regulating Labour Relations as amended by Federal Laws No. 24 of 1981, No.15 of 1985 and No.12 of 1986 Law. The Law is federal and is therefore applicable to all the emirates of the federation. It is enforced by the Ministry of Labour.

In Qatar the health and safety in the construction industry is governed by the Ministry of Labour and Social Affairs by the Department of Labour Sector.

Therefore most countries have adopted laws that require that accidents that have led to serious harm to people or the environment shall be reported to the local authorities. Therefore every construction organisation should have a clear policy for the management of health and safety so that everybody associated with the organisation is aware of its health and safety aims and objectives. For a policy to be effective, it must be honoured in the spirit as well as the letter. A good health and safety policy will also enhance the performance of the organisation in areas other than health and safety, help with the personal development of the workforce and reduce financial losses. It is important that each construction site throughout the organisation is aware of the policy. The Health and Safety Commission's (HSC) "Strategy for workplace health and safety in Great Britain to 2010 and beyond" notes that:

"We will find ways to demonstrate the moral, business and economic cases for health and safety. …… We are committed to achieving higher levels of recognition and respect for health and safety as an integral part of a modern, competitive business and public sector and as a contribution to social justice and inclusion."(HSC, 2007)

3.3 Health and safety regulations in the UK

Management of health and safety risk has traditionally been born by the main contractor supervising site activities, as shown in Figure 3.1. In the UK the high number of injuries and fatalities and cost associated to them led to the evolution of the occupational Safety and Health Act. It is found that people were confused about the differences between guidance; Approved Codes of Practice (ACOPs); and regulations and how they relate to each other. The Maze of Health and Safety Law as shown in figure 3.1 indicates the flow and structure of different health and safety legislation that apply to construction project. The Health and Safety at Work Act of 1974 places a duty upon employers to provide information, training, instruction, and supervision needed for the protection and health of employees at work.

- Management of Health and safety at work Act 1974, Regulations 1992.
- The Health and safety Commission (HSC) conducted a review of health and safety regulation in 1994.
- Construction (Health and safety and Welfare) Regulations 1996.
- The Management of Health and safety at Work Regulations 1999 (the Management Regulations) generally make more explicit what employers are required to do to manage health and safety under the Health and safety at Work Act 1974.
- The Construction Design and Management CDM 1994, and CDM 2007. The introduction of The Construction (Design and Management) Regulations 1994 (CDM) explicitly detailed the requirements of those who indirectly influence site health and safety during the pre-construction, or planning stages.

However, the construction (Health, Safety and Welfare) Regulations 1996 are constructed site specific, and in the case of this project are more relevant and are covered in more detail.

Figure 3.1 Evolution of Health & Safety Risk Management (HSE, 2001)

Health and Safety at Work Act 1974

The Health and Safety at Work Act 1974 as mentioned is the foundation of British health and safety law. It describes the general duties that employers have towards their employees and to members of the public, and also the duties that employees have to themselves and to each other.

The term 'so far as is reasonably practicable' qualifies the duties in the HSW Act. In other words, the degree of risk in a particular job or workplace needs to be balanced against the time, trouble, cost and physical difficulty of taking measures to avoid or reduce the risk.

The law simply expects employers to behave in a way that demonstrates good management and common sense. They are required to look at what the hazards are and take sensible measures to tackle them.

Although this act is dated it is still enforced in full today. This act will be described very briefly as the regulations below are more detailed for construction sites. The HSW Act is made from 8 sections:

- ✓ Introduction- structure and objectives of the Act
- ✓ The health and safety Commission and the Health and safety Executive
- ✓ Duties under the act
- ✓ Enforcing authorities and agencies, and inspectors
- ✓ Improvement and prohibition notices
- ✓ Offences, penalties and prosecutions
- ✓ Regulations and Approved Codes of Practice
- ✓ Licensing and appeals against decisions on licensing

Management of Health and Safety at Work Regulations 1992

These regulations have been revised and updated with effect from the 27th December 1999. The approved Code of Practice was published on the 27th March 2000. The MHSW Regs are made up of a total of 17 regulations. The significant regulations are listed below:

- ✓ Risk assessment, regulation 3
- ✓ Health and safety arrangements, regulation 4
- ✓ Health surveillance, regulation 5
- ✓ Health and safety assistance, regulation 6
- ✓ Procedures for serious & imminent danger and for danger areas, regulation 7
- ✓ Information for employees, regulation 8
- ✓ Appointment of health and safety co-ordinator, regulation 9
- ✓ Persons working in host employers' or self employed, regulation 10
- ✓ Capabilities and training, regulation 11
- ✓ Employees' duties, regulation 12
- ✓ Temporary workers, regulation 13

In a significant part of these regulations, the emphasis is placed on the use of the risk assessment (regulation 3). A risk assessment is where the employer will assess any health and safety risks that his employees are exposed to whilst at work. The Employer must also assess any risk to any other person not employed by him, caused any work that he carries out. The approved Code of Practice (ACOP) for the MHSW Regs, states that the "Purpose of the risk assessment is to help the employer to determine what measures should be taken to comply with the employer's duties under the relevant statutory

provisions". In general terms the risk assessment is to be used to highlight risks so that actions can be carried out to conform to all relevant regulations.

Another major aspect to the MHSW Regs is regulation 11, Capabilities and Training. Section 1: Regulation 11 stated that "Every employer shall, in entrusting tasks to his employees, take into account their capabilities as regard to health and safety".

Section 2: it addresses the need for adequate health and safety training. This training must be updated when an employee's role changes, different equipment or new system of work is introduced. Section 3 adds that training should be during working hours, be repeated where appropriate and adapted to take into account new or changed risks to the employee.

The UK Construction Design and Management (CDM) Regulations 1994

These regulations apply to all construction work where:

- ✓ More than 4 people will be on site one time
- ✓ Any demolition or dismantling is part of the work
- ✓ The duration of the construction phase will exceed 500 working days
- ✓ The construction phase is longer than 30 days

The CDM regs govern the health and safety management requirements by all parties during the entire duration of any consideration contract. The regulations introduce statutory duties with regard to health and safety to the significant roles within the construction process. CDM outlines these duties to four individual bodies , these are the client, the planning supervisor, the designer and the principal contractor.

3.4 Existing code of practice in the UAE

The health and safety construction in the UAE is administered by the labour Law No. 8 of 1980 as amended by Federal Laws No. 24 of 1981, No.15 of 1985 and No.12 of 1986. It specifies certain provisions regarding employee safety and health care, which are stipulated under articles 91 to 101 (inclusive). The labour law includes articles on industrial safety and health care for workers. It requires employers to protect workers against the hazards of occupational injuries and diseases by providing appropriate safety

measures. The law requires employers to provide medical professionals to carry out general medical examinations, at regular intervals of not more than 6 months. Employers are also required to provide workers with medical care facilities. The UAE's Labour Law No. 8 of 1980 is a federal law regulating labour relations throughout the country. It is regularly amended by ministerial resolutions, as issued by the Ministry of Labour and approved by the Council of Ministers. Its provisions apply to both UAE nationals and migrant workers. The Ministry of Labour is responsible for implementing the federal labour law, but each emirate can also set up its own agencies to enforce the federal labour law, as is done in the emirate of Dubai. The law sets the terms for workers' compensation in cases of work-related accident, disease or death. As already noted, it requires employers to report instances of work-related injuries and occupational diseases to the police and to the Ministry of Labour. It requires the police to carry out a prompt investigation and issue a report to determine whether the accident was work-related, deliberate, or the result of gross misconduct of the worker. The provisions of the Law require the following measures and procedures to be adhered to (UAE Labour Law, 1980):

1. Every employer should provide his employees with suitable means of protection against: injuries, occupational fire and hazards which may result from the use of machinery and other equipment in the workplace. The employer shall also apply all the other precautionary measures specified by the Ministry of Labour and Social Affairs. The employee, however, must use the safety equipment and clothes given to him for this purpose. He shall also follow his employer's instructions which aim to protect him from danger.
2. Every employer shall display in a permanent and prominent place at the work site detailed instructions regarding the means of preventing fire and the means of protection of employees from hazards to which they may be exposed to during work. These instructions shall be in Arabic and if necessary another language understood by the employees.

3. Every employer shall make available a first aid kit or kits containing medicines, bandages and other first aid material as directed by the Ministry.

4. Every employer must ensure the workplace is kept clean and well ventilated. Each employee should have adequate lighting and rest rooms, and be provided with suitable drinking water.

5. An employer shall assign one or more physicians to examine thoroughly those of his employees who are exposed to the possibility of contracting one of the occupational diseases listed in the schedule attached to the Law (see Schedule 1 below). At least once every 6 months "at risk" employees should be examined and results recorded on their files.

6. The employer shall provide its employees with the means of medical care to the standard determined by the Ministry in consultation with the Ministry of Health.

7. The employer or his deputy shall inform the employee of the dangers of his job and the means of protection that he must take. He shall also display detailed written safety instructions at the work premises.

8. No employer, deputy, or any person with authority over employees shall bring or allow others to bring any kind of alcoholic drinks for consumption on work premises. He shall also prohibit any person to enter or remain in the establishment while intoxicated.

Every employer employing persons in remote areas not served by public transportation shall provide them, at the cost of the employer the following services:

1. Suitable transportation;
2. Suitable accommodation;
3. Suitable drinking water;
4. Suitable food;
5. First aid services; and
6. Means for entertainment and sports activities.

There are also additional health and safety regulations employers must adhere to which are stipulated in various laws. For instance, those involved in the industrial sector or the free zones in the UAE will be subject to such regulation.

Contracting companies are subject to Municipality rules. The Public Safety Unit of the Environmental Protection and Safety Section in the Environment Department of Dubai Municipality provide the procedures for protection and Safety at building construction sites. There is a motivation on updating the existing code of practice, staff supervising safety practices at these sites so that any untoward incident can be averted. It is very important to focus on the health and safety aspect.

With workers having been killed or injured on construction sites in the UAE, no authority is prepared to ensure the safety of workers. The lack of coordination among authorities and the lack of regulations to govern construction sites mean it is up to the worker to ensure his own safety.

The health and safety in the Qatari construction industry is governed by the Ministry of Labour and Social Affairs by the Department of Labour Sector: Administration of Labour and Administration of National Workforce Management (1999). The Departments of Labour Sector aims to provide services in accordance with the highest standards of quality and to promote, maintain the highest degree of physical, mental and social well-being of workers in all occupations with particular emphasis on the booming construction industry. The department's main core functions are (Qatar Department of Labour, 1999):

- Monitoring the implementation of labour legislation
- Settling labour disputes in accordance with the law
- Recommending and supervising the implementation of regulatory rulings regarding occupational health and safety
- Inspecting establishments and taking any necessary measures or actions to control irregularities
- Following up rulings and recommendations issued by regional and international organisations and coordinating with the specialised authorities in the implementation of these rulings
- Preparing international labour agreements and supervising their implementation.
- Planning training programmes and following up their implementation

The Labour Law is the main document of the Qatari legislations that deals with Labour matters. Part Ten (10) of the labour law deals with the Safety, vocational health and social care and Part eleven (11) deals with work injuries, which all together include 15 articles. The opening statement of the Article 99 (Part 10)

"The employer or his representative shall on the commencement of every worker's engagement inform him of the hazards of the work and the hazards which may occur thereafter and shall inform him of the safety measures to be taken for the protection therefrom and shall post up in a conspicuous place his detailed instructions concerning the means of observing vocational health and safety for protecting the workers from the hazards to which they are exposed during performance of their work."

3.5 Summary

The desire by employers to reduce and control risk relies for its effectiveness on the knowledge of risk and a willingness to take action to reduce it. This alone is insufficient, unless it is covered by legal sanctions in the event of negligence leading to injury or illness. Thus, most countries have a framework of health and safety law, backed by a system of enforcement, analogous to those parts of the criminal law seeking to protect citizens from other forms of violence.

A number of legislations were reviewed in this section and it is clear that there are some similarities between these legislations, although some countries, such as the UK, have a far more established culture and history of legislating and enforcing health and safety measures in the workplace.

CHAPTER FOUR

4 RESEARCH METHODOLOGY

4.1 Introduction

This chapter presents the methodology adopted in this research. Construction sites situated in the UAE were selected as research study. Firstly, efforts were carried out in order to identify the existing accident reporting system implemented by the selected construction sites. Secondly, questionnaire survey was carried out in order to identify the causes of construction accident under reporting and to establish a framework of critical causes for successful implementation of accident reporting system. Thirdly, interview sessions were carried out in order to identify obstacles and barriers in the way of implanting health and safety practices in the UAE. Thus in this chapter the hypothesis and the research questions of the thesis are elaborated. Furthermore, the research methodology used to fulfil the stated research aims and objectives is explained and justified.

In order to be able to make an original contribution to knowledge in the research area, the literature review had demonstrated a comprehensive grasp of existing knowledge. The literature review served two purposes. Firstly, the literature review helped in systematic reading of previously published and unpublished information relating to critical causes of accident under reporting in the construction industry. Secondly, it assisted focusing the research and gave some insights into how to design the study more effectively.

4.2 Hypothesis

The main hypothesis underlying this thesis is that, based on the literature review undertaken and the fact that very little work deals with the UAE, an investigation on health and safety could make a substantial contribution and an addition to knowledge in their respective context. Much of the work presented in this thesis is drawn on the author's personal industrial experience and observations, which, unfortunately, is not

covered by any published work. The second hypothesis is that management and health and safety are very closely linked and bear a lot of similarities and could be integrated together into one management system. There are issues associated with health and safety that are particular to the UAE. This is because the socio cultural and political influences have an impact on how health and safety aspects are perceived and applied. As mentioned the workforce is mainly drawn from many different countries, use many languages and have a variety of religious and cultural backgrounds. As the UAE construction industry adjusts to a changing workforce, it needs to be aware of the implications and learn from other countries, such as the UK.

4.3 Qualitative versus Quantitative Research:

A starting point in trying to understand the collection of information for research purposes is that there are two broad approaches: quantitative research and qualitative research. The early form of research originated in the natural sciences such as biology, chemistry, physics, geology, etc. and was concerned with investigating things which we could observe and measure in some way. Such observations and measurements can be made objectively and repeated by other researchers. This process is referred to as "quantitative research". Much later, along came the researchers working in the social sciences such as psychology, sociology, anthropology, etc. They were interested in studying human behaviour and the social world inhabited by human beings (Morgan, 1983). They found increasing difficulty in trying to explain human behaviour in simply measurable terms. Measurements tell us how often or how many people behave in a certain way but they do not adequately answer the question "why?." Research which attempts to increase our understanding of why things are the way they are in our social world and why people act the way they do is called "qualitative research" (Marshall & Rossman, 1999).

Quantitative research is described by the terms 'empiricism' (Leach, 1990) and 'positivism' (Duffy, 1985). It derives from the scientific method used in the physical sciences (Cormack, 1991). This research approach is an objective, formal systematic process in which numerical data findings. It describes, tests, and examines cause and effect relationships (Burns & Grove, 1987), using a deductive process of knowledge attainment (Duffy, 1985). Whereas quantitative methodologies test theory deductively

from existing knowledge, through developing hypothesized relationships and proposed outcomes for study, qualitative researchers are guided by certain ideas, perspectives or hunches regarding the subject to be investigated (Cormack, 1991). Qualitative research differs from qualitative approaches as it develops theory inductively. There is no explicit intention to count or quantify the findings, which are instead describes in the language employed during the research process (Leach, 1990). A qualitative approach is used as a vehicle for studying the empirical world from the perspective of the subject, not the researcher (Duffy, 1987). Benoliel (1985) expanded on this aspect and described qualitative research as 'modes of systematic enquiry concerned with understanding human beings and the nature of their transactions with themselves and with their understandings'.

The aim of qualitative research is to describe certain aspects of a phenomenon, with a view to explaining the subject if study (Cormack, 1991). The methodology itself is also described as phenomenology (Duffy, 1985), or as a humanistic and idealistic approach (Leach, 1990), with itself its origins lying in the disciplines of history, philosophy, anthropology, sociology and psychology (Cormack, 1991).This historical foundation, which is not that of the physical science domain, has been cited as one of the great weaknesses of qualitative research. Historically the use of the true experiments has contributed greatly to the universal knowledge now acquired. The quantitative methods used produced legitimate Qualitative and scientific answers, and as a result of this hard data, action was generated and changes took place (Melia, 1982). The qualitative approaches produced soft data which were, and are still described by some, as being inadequate in providing answers and generating any changes. One can argue that the use of the labels hard and soft data suggests in itself that analysis by numbers is of a superior quality to analysis by words (Corner, 1991).

For sampling, sampling procedures for each methodology are complex and must meet the criteria of the data collection strategy. Both research approaches require a sample to be identified which is representative of a larger population of people or objects. Quantitative research demands random selection of the sample from the study population and the random assignment of the sample to the various study groups (Duffy, 1985). Statistical sampling relies on the study sample to develop general laws which can be generalized to

the larger population. The advantage of results obtained from random sampling is that the findings have an increased likelihood of being generalizable. The disadvantage and a weakness of the quantitative approach, is that random selection is time-consuming, with the result that many studies use more easily obtained opportunistic sample (Duffy, 1985). This inhibits the possibilities of generalization, especially if the sample is too small.

Qualitative research, because of the in-depth nature of studies and the analysis of the data required, usually relates to a small, selective sample (Cormack, 1991). A weakness of this can be suspicion that the researcher could have been influenced by a particular predisposition, affecting the generalizability of the small scale study (Bryman, 1988). This suggests that qualitative research has low population validity. However, the strength of this approach is seen when the sample is well defined, for then it can be generalized to a population at large (Hinton, 1987). Raggucci's (1972) ethnographic organizational study demonstrated the values of this approach in studying the benefits and practices of minority ethnic groups. In quantitative research, the investigators maintain a detached, objective view in order to understand the facts (Duffy, 1986). The use of some methods may require no direct contact with subjects at all, as in postal questionnaire surveys. It can be argued that even interview surveys require the researcher to have little, if any contact with respondents, especially if hired staff carry out most of all the interviews (Bryman, 1988). The strength of such a detached approach is avoidance of researcher involvement, guarding against biasing the study and ensuring objectivity.

Such an approach was successfully used in the West Bershire-based perineal management trials of Sleep et al (1984). For example the midwifery study was indirectly controlled by the researchers whose main involvement, other than randomly allocating mothers to either the controlled or experimental episiotomy group, was to analyze the data, once collected. The findings of this study, through its objectivity, have contributed to knowledge within this field. Spencer (1983) argued that little is derived from such an indirect researcher-subject relationship especially in the health care setting. His major criticism is that the detached approach treats the participants as though they are objects and, as such, places hospitals on par with car repair garages. (Cormack, 1991) also emphasized the weaknesses of such an approach. She argued that the research participants are usually kept in the dark about the study, and are often left untouched by

the research itself but are expected to transfer the findings into practices. These arguments are examples of the criticism that quantitative methods treat people merely as a source of data.

As with quantitative research, qualitative methodologies also have supposed strengths and weaknesses regarding the closeness of the relationship between researcher and respondent. Duffy (1986) argued that strength of such an interactive relationship is that the researcher obtains first-hand experience providing valuable meaningful data. As the researcher and the subject spend more time together the data are more likely to be honest and valid (Bryman, 1988). Supporting this argument is the study by Baruch (1981) which revealed that time and the subsequent relationship built between the researcher and the subjects was crucial for a genuine understanding of the dilemma. This appears to be a major strength of the qualitative approach itself, as Woodhouse & Livingwood (1991) pointed out in their study if a multi-agency substance abuse project. They claimed that the approach, because of the interactive method, far exceeded expected evaluation outcomes, by contributing to empowerment, and enhanced communication and clarification of roles among the partners involved in the project.

The weakness of such a close relationship is the likelihood that it may become pseudotherapeutic, complicating the research process and extending the responsibilities of the researcher (Ramos, 1989). The possibility of becoming enmeshed with subjects could also lead to researchers having difficulty in separating their own experiences from those of their subjects (Sandelowski, 1986) resulting in subjectivity (Cormack, 1991). In its most extreme form this is referred to as ‘going native’, where the researcher loses awareness of being a researcher and becomes a participant (Bryman, 1988). However, this may not be entirely negative in that it facilities a better understanding of the subject, as demonstrated by Oakley (1984).

In term of methodology, the research processes used in the quantitative approach include descriptive, correlational, quasi-experimental and experimental research (Cormack, 1991). The strength of such methods is that both true experiments and quasi-experiments provide sufficient information about the relationship between the variables under investigation to enable prediction and control over future outcomes. This is achieved by

the ability of the researcher to manipulate an independent variable in order to study its effects on the dependent variable. This strength can also be argued to be the weakness of the quantitative method, especially where organizational research is concerned. The methodology dismisses the experiences of the individual as unimportant, which is, demonstrated in the Bockmon & Rieman study (1987), and regards human beings as merely reacting and responding to the environment (Cormack, 1991). This causes difficulties in organizational research, because organization uses an holistic view of people and their environment and, according to Briones & Cecchini (1991), quantitative methods do not permit this approach.

The qualitative approach includes methods such as grounded theory and ethnography research (Denzin, 1978). The strength of the methodology employed lies in the fact that it has as holistic focus, allowing for flexibility and the attainment of a deeper, more valid understanding of the subject than could be achieved through a more rigid approach (Duffy, 1986). It also allows subjects to raise issues and topics which the researcher might not have included in a structured research design, adding to the quality of data collected. The study by Melia (1982) is a good example of these strengths, and its findings have contributed to the knowledge of employees' perspective on organization.

A weakness of qualitative methodology is the possible effect of the researchers' presence on the people they are studying. As previously highlighted, the relationship between the researcher and participants may actually distort findings. Particular to data, the data collected in quantitative research are, as mentioned, hard and numerical. The strength of producing numbers as data is that this demonstrates an ordered system. Such an approach could be views as being necessary in an organization, for as Spencer (1983) suggested, preparing an off-duty rota for 5,000 employees needs quantitative methods and a computer. This argument is also supported by Kileen's (1981) study regarding new employees where there was a need to use numerical data to identify the organization resources needed, number of employees involved, and what difference they made to outcome.

The opposing argument , suggesting the invalidity of numerical finding, is that data not displaying significance are often neglected, or alternatively attention is centered on a minority if the respondents leaving the majority unexplored, in other words, there are

deviant cases (Cormack, 1991). Therefore, this distorts the evaluation of data. In contrast, the soft data collected in qualitative research identify and account for any deviant cases (Cormack, 1991). The rich data produced provide an illuminating picture of the subject, with great attention often given to pointing out intricate details. Evidence of this is seen in the study by Melia (1982) where employees' comments are quoted, enabling the reader to fully understand the subject being investigated. The comparative weakness of qualitative data concerns the likelihood that some researchers can become overwhelmed by the data collected. They may become confused by their inability to limit the scope of the study, concentrating o a few manageable area (Bryman, 1988). In this situation, the research can become poorly focused an ineffective.

For reliability, quantitative research is considered more reliable than qualitative investigation. This is because a quantitative approach aims to control or eliminate extraneous variables within the internal structure of the study, and the data produced can also be assessed by standardized testing (Duffy, 1985). This quantitative strength can be seen in the comparative analysis of employees' and managers' perceptions about organizational activities. However, one can question the reliability of quantitative research, especially when the data have been stripped from the natural context, or there have been random or accidental events which are assumed not to have happened (Corner, 1991). The reliability of qualitative research is weakened by that fact that the process is under-standardized and relies on the insights and the abilities of the observer, thus making an assessment of reliability difficult (Duffy, 1985). The study of Hind et al (1990) examined this issues and demonstrated that reliability could assessed by using independent experts to examine various aspects of the process of developing grounded theory. However, one must question the feasibility of employing such a costly process, both in terms of time and money, to verify the reliability of qualitative study.

For validity, although qualitative methodologies may have greater problems with reliability than quantitative methodologies, the position is reversed when the issue is validity. The weakness in quantitative research is that the more tightly controlled the study, the more difficult it becomes to confirm that the research situation is like real life. The very components of scientific research that demand control of variables can therefore be argued as operating against external validity and subsequent generalizability

(Sandelowski, 1986). Campell & Stanley (1963) maintain that the more similar the research experiment is to the natural setting the greater is the validity and thus generalizability of the findings. The field studies concerning perineal management by Sleep et al (1984) all contribute to the scientific understanding of this aspect of organization. One reason that this can be claimed lies in the fact that the studies took place in a organizational environment, which increased validity.

The strength of qualitative research is proposed in the claim that there are fewer threats to external validity, because subjects are studies in their natural setting and encounter fewer controlling factors compared with quantitative research conditions (Sandelowski, 1986). The researchers also become so immersed in the context and subjective states of the research subjects that they are able to give the assurance that the idea are representative of the subject being studied, as seen as in Oakley's (1984) antenatal organizational study. The closeness of researchers also threatens the validity of the study if they become unable to maintain the distance required to describe or interpret experiences in a meaningful way, as discussed above (Hinton, 1987). It is argued, however, that this is worth risking because of the high level of validity achieved by employing qualitative methodologies (Duffy, 1985)

According to ethical issues, the ethical considerations for both quantitative and qualitative research are the same safety and protection of human rights. These are mainly achieved by using the process of informed consent. The utilization of informed consent is problematic in quantitative research, but practically impossible in qualitative methodologies in which the direction that the research takes is largely unknown (Ramos, 1989). Munhall (1988) argued that informed consent can be achieved in qualitative research by re-negotiation when unexpected events occur, but one can argue in turn that this places greater responsibility on the researchers, as well as requiring them to possess a high level of skill, especially in negotiation. The ethical weakness of quantitative research concerns the formulation of hypotheses. In organization, they are immense ethical considerations, especially for instance when it is explained that improvements will occur in employee ability when a certain approach is adopted, and the eventual findings of the research do not support this. The qualitative approach proved valuable for this particular organizational study.

In summary, for every strength, there appears to be a corresponding weakness in both quantitative and qualitative research. It is this dilemma that has fuelled the debate over which approach is superior (Duffy, 1986), and which method should therefore be adopted for organizational research. Choosing just one methodology narrows a researcher's perspective, and deprives him or her of the benefits of building on the strengths inherent in a variety of research methodology (Duffy, 1986). Atwood (1985) disagreed with this, and argued that it should adopt quantitative approaches to build organizational research into science. He stated that this would provide organizational research with a useful theory base with practice application. The debate could be seen as advantageous to organizational studies. Researchers are being forced to consider the controversial issues of both methodologies, and this required them to have in-depth knowledge of epistemology and methodology and not to be restricted, as in the past, to the tradition of the sciences (Duffy, 1985). Preference for a specific research strategy is not just a technical choice; it is an ethical, moral, ideological and political activity (Moccoa, 1988). This debate unearths these issues in relation to both approaches, allowing appropriates methods to be adopted by researchers in order to answer questions and develop organizational theories.

Considering the facts, it is argued that each approach should be evaluated in terms of its particular merits and limitations, in the light of the particular research question under study (Duffy, 1987). However, this implies that there are only technical differences between the two those of research strategies and data collection procedures (Bryman, 1988). There is a suggested alternative to this, that of combining the approaches, pulling on the strengths of each method and therefore counteracting the limitation posed by both. This research approach is called triangulation.

In terms of triangulation, the main research areas that triangulation is concerned with are issues of data, investigator, theory and methodology (Murphy, 1989). Morse (1991) argued that triangulation not only maximizes the strengths and minimizes those weaknesses of each approach, but strengthens research results and contributes to theory and knowledge development. Silva & Rothbart (1984) hold a different opinion, arguing that a compromise resolution seems to ignore the significance of work presented that

acknowledges various philosophies of science as factors in research and theory development. The literature demonstrates that there is no agreement between researchers about triangulation. This is not surprising when there is no agreement either about quantitative or qualitative methods, employed within the approach.

The triangulation study conducted by Corner (1991) concerning newly registered employees' attitudes to and organizational preparation for working for customers, illustrates both the strengths and weaknesses of the approach. The study revealed a richer and deeper understanding of the subject matter than would otherwise be possible. Quantitative and qualitative approaches were found to complement each other while the inadequacies of each were actually offset. However, it also highlighted the time and cost implications the volume of data produced was immense and an extremely broad knowledge base was required to analyze it, which meant that other researchers were contracted in to work on different parts of the analysis. These findings are similar to those of Murphy (1989) who used the method of triangulation to study organizational events. Considering the evidence, it seems reasonable to suggest that triangulation is not the way forward for all organizational research but that it may help organization to remove itself from the bipolar debate and restrictions, especially in the light of current financial constraints on organizational professions.

Overall, when qualitative and quantitative approaches are combined, the methods are often applied in sequential order. Semi-structured interviews or observational data might, for example, be used to explore hypotheses or variables when planning a large epidemiological study, resulting in enhanced sensitivity and accuracy of survey questions and statistical strategy. In such instances, qualitative studies might be thought of as precursors of "real" science. However, qualitative studies can also be added to quantitative ones, to gain a better understanding of the meaning and implications of the findings. More creative combinations are seen in triangulation (Miles and Huberman, 1994). The idea of triangulation originated from a craft used by land surveyors, who increase the validity of a map by incorporating measures from different angles. Multiple and diverse observations can enrich the description of a phenomenon—such as, an elephant looks very different when seen from above or below. Someone reading a report might gain a better understanding of what goes on if data from various sources. The aim

of triangulation is to increase the understanding of complex phenomena, not criteria-based validation, in which agreement among different sources confirms validity.

Quantification of phenomena or categories can be done to gain an overview of qualitative material, but the application of such numbers should be done with caution. Quasi-statistical analysis of textual material, also termed content analysis, has gained some popularity, and computer programs are available to count the occurrence of specific words or uttering in a text. However, the scientific logic of statistics and transferability is far from accomplished in a non-representative sample in which questions were not asked in a standardized way to all participants. We do not know to whom the findings can be transferred, and we do not know the potential answers from informants who just did not mention the issue. Prevalences, distributions, and differences cannot be inferred from this kind of material. Correspondingly, the search for meaning and experience in responses constructed by the researcher in advance is a risky business.

Accordingly, the principles of meta-analysis should be thoroughly reconsidered when qualitative and quantitative studies are analyzed together. Complete integration is not a realistic objective. In the context of organizational research, integration of methods invariably denotes treating the qualitative study as if it were a quantitative one, recording the material as variables, which are counted and aggregated. Meta-analysis should develop methods for reasonable combination of findings from qualitative and quantitative studies, acknowledging and using the potential of the different nature of these approaches. Interpretation of textual materials and purposeful samples is different to the calculation of numerical materials and random samples. Findings from qualitative and quantitative studies can certainly be aggregated and complemented by secondary analysis, contributing to an extended approach to the phenomenon in question, as well as a mutual validation. However, such meta-analysis should be done on the results, and not by accumulating and mixing quantitative and qualitative data, which require fundamentally different procedures for scientific analysis. When combining qualitative and quantitative studies, the meta-analyst should be prepared to handle contradictory findings, without having to discard one and appoint the other as the gold standard.

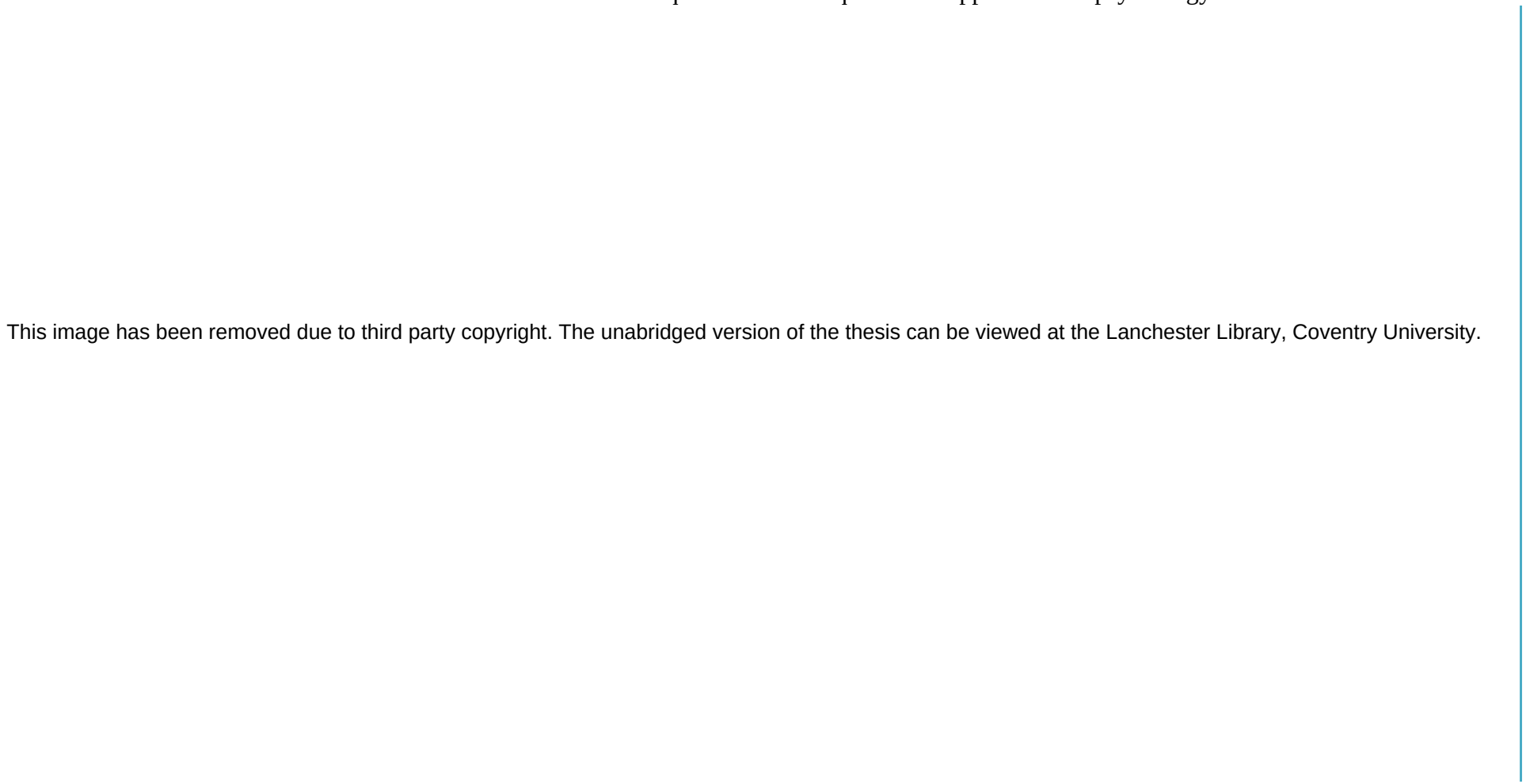
To summarise, although quantitative and qualitative methods are different, one approach is not superior to the other, both have recognized strengths and weaknesses and are used ideally in combination. Therefore, it can be argued that there is no one best method of developing knowledge and that exclusively valuing one method restricts the ability to progress beyond its inherent boundaries. Recognizing the tension between researchers about quantitative and qualitative research, and attempting to understand it, may serve to create relevant and distinctive modes of enquiry in organizational research. It mat also helps the unification rather than the division of organizational scholars.

From examining research in organizational studies, qualitative approaches appear to be invaluable for the exploration of subjective experiences of employees, while quantitative methods facilitate the development of quantifiable information. Combating the strengths of the methods in triangulation, if time and money permits, results in the creation of even richer and deeper research findings. It seems that organizational research has the potential to provide a valuable resource for the organization. As organizational research discovers and uses different methodologies, it will assist in creating the necessary balance in the knowledge required to develop organizational research as both a science and an art.

Table 4.1 below summarises the main features of both methods in terms of their strengths (advantages) and weaknesses (disadvantages). It can be seen that the two methods are best used if combined to maximise information and cover all aspects pertaining to a specific parameter of the study.

For example, the qualitative approach may reveal that cultural barriers are important in implementing health and safety measures, the role of the quantitative approach is then to quantify such a statement in the form of numerical statistical data.

Table 4.1 Distinctive features of quantitative and qualitative approaches to psychology



(adapted from: http://www.snapsurveys.com/techadvqualquant.shtml)

4.4 Justification of the research methodology adopted for current study

It became apparent form the extensive literature review that no such research has been previously conducted on investigating and exploring health and safety in construction practices in UAE organisations. Due to the nature of the research and it aims of obtaining data based on reality, and also gathering more detailed information on why or how to do things better in the field of health and safety management, the current research applies both quantitative and qualitative methods for data collection.

Therefore, the methodology adopted by the author consisted of a triangulation approach whereby qualitative and quantitative research methods are combined, thus taking advantage of the strengths of each of the methods and minimising any weaknesses from each the methods. The two methods also complement one another in providing valuable and useful data and information and one the methods does not provide.

Carvalho and White (1997) explained the three ways used for combining qualitative and quantitative methods in a research as "(i) integrating methodologies; (ii) confirming, refuting, enriching, and explaining the findings of one approach with those of the other; and (iii) merging the findings of the two approaches into one set of policy recommendations". The two methods will be adapted to put health and safety management guidelines in place. The primary method uses the questionnaire and survey (quantitative) and the secondary method uses interviews and face-to-face discussions (qualitative). The methods work as follows:

- Quantitative approach via questionnaires

This method requires going through UAE organisations and collects the relevant data through questionnaires. Martin (2006) mentioned that questionnaires are used to extract reports based on real facts, attitude, and other subjective situations. Two types of questionnaires were designed and distributed to UAE organisations. The first one was a pilot questionnaire intended to investigate the need to develop a UAE health and safety management framework for corporate use that can ensure health and safety procedures are observed in the work place. The second (main) questionnaire intended to look in depth as issues that arose from the pilot questionnaire and interviews.

- Qualitative via Interviews

This method requires the conduct of interviews aimed at understanding issues related to health and safety in construction in the UAE from specialised and in charged personnel working in the field. According to Kvale (1996), the qualitative research interviews aim at gathering information based on actual facts about certain issues, and also looking for the exact meaning or clarifications of answers to standardized questions. In this research, two interviews were conduction. The first one was a pilot interview that gathered general information about the company and its health and safety policies, whereas the second interview was more in-depth looking at issues in more details and covering other aspects that were not covered by the pilot questionnaire or interview. According to McNamara (1999) interviews can be helpful as follow-up to certain respondents to questionnaires for further examining of their responses.

The researcher has also depended on the available literature to emphasise the importance of the research topic, and to support the development of the health and safety management guide produced by this research. The author relied primarily on literature from journal and conference papers, but also on articles from newspapers, government documents, standards, etc.

The questionnaires were carefully designed and distributed to potential construction industry managers from both public and private sectors in the UAE. Interview sessions were conducted with the key person of a construction company such as Safety Officer or Senior Site Engineer. Questionnaires were used to collect the general views of the construction professionals related to the causes of accident under reporting. Literature review and preliminary questionnaire and interviews with the relevant professionals were considered in developing the final questionnaire. These were distributed to the construction professionals in the selected construction sites. A questionnaire was designed with the objective of determining the more important variables that affect site safety; which included factors that help workers to adopt safe work practices. Overall the following questions were asked and required an answer as part of the research investigations:

- Are health and safety practices adequately applied in the UAE?

- How can they be improved and become an essential part of the construction strategy?
- What are the problems faced by the construction industry in the UAE as far as health and safety are involved and how can they address such concerns?
- What is the employer commitment and concern to the implementation of occupational safety and health program?
- How well is the safety and health program implemented?
- How are the obstacles in implementing of safety and health program?
- Are health and safety committees in companies, if they exist, important in implementing the safety and health program and how can this be done?

Table 4.2 below reflects on the advantages/disadvantages of each of the techniques of collecting information, questionnaires and interviews.

Table 4.2 Questionnaires versus interviews comparison

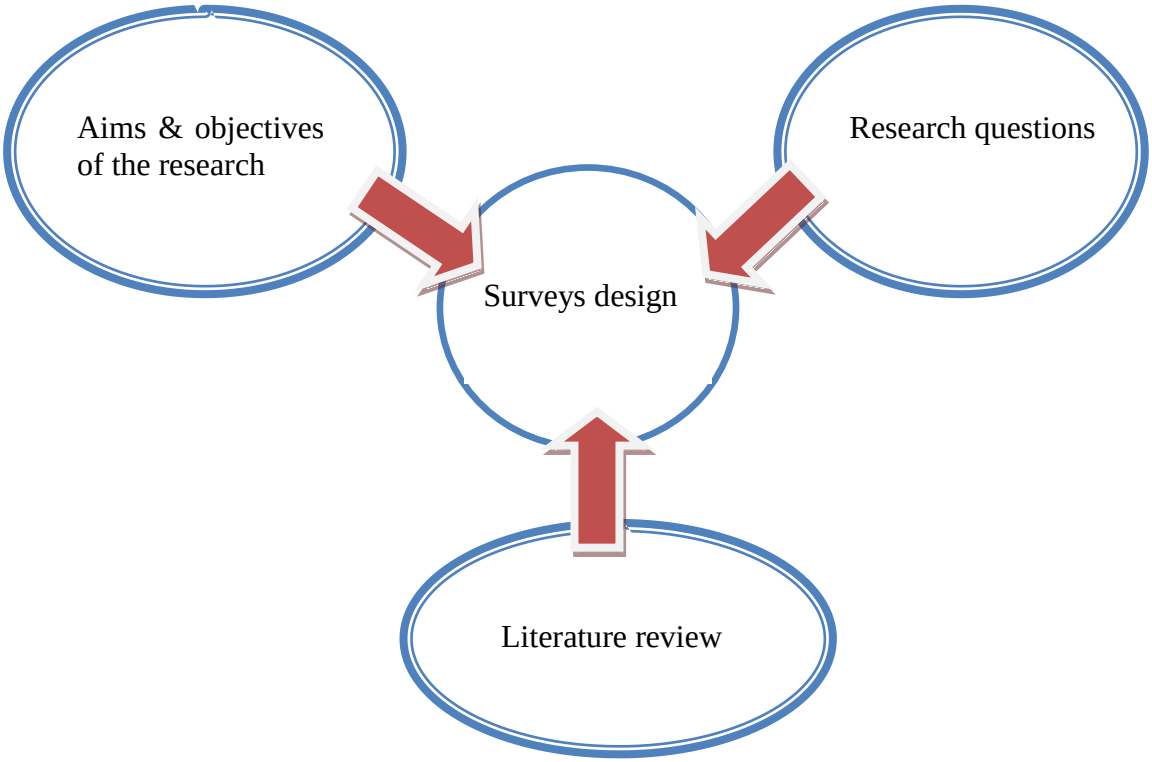
Source http:ncbi.nlm.nih.com

4.5 Planning and design of the surveys

The main aim of the surveys (questionnaires and interviews) was to fulfil the stated aims and objectives of the research and to answer the research question. The planning and design of the surveys was based upon the research objectives guided by the findings from the literature review. The familiarity, firsthand experience and knowledge by the author of the construction industry in the UAE were also important factors that helped the planning and design of the surveys (Figure 4.1).

In general terms, a questionnaire includes all techniques of data collection in which each person is asked to respond to the same set of questions in a predetermined order. Since each respondent is asked to respond to the same set of questions, it proves an efficient way of collecting responses from a large sample prior to quantitative analysis. However, questionnaires are not particularly good for exploratory or other research, which requires large numbers of open-ended questions.

Figure 4.1 Strategy for planning and designing surveys (questionnaires & interviews)



Adopted by author

The questionnaire was designed to collect appropriate and necessary primary data and information for achieving the purpose of this research, a questionnaire technique is the most convenient and efficient techniques to obtain the data needed. Interviews were also used to inform but also to complement the questionnaires. Figure 4.2 shows a diagram of the methodology adopted in fulfilling the aims and objectives of the research.

The following criteria were used in designing the questionnaires:

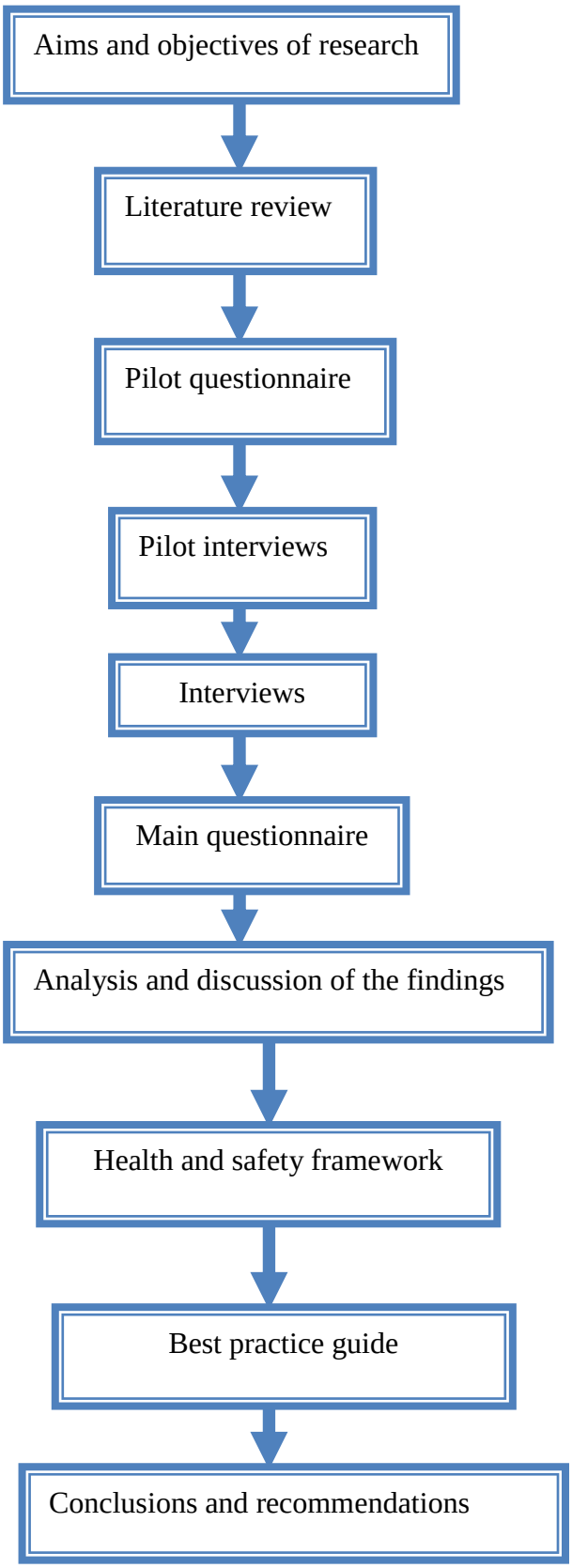
- Length of the questionnaire: as a general rule, long questionnaires get less response than short questionnaires. In this respect, content and quality rather than length are more important. Brief and yet clear and concise questions with a clear aim, are key to a successful questionnaire.

- The questions must be clear and unambiguous: the goal is to eliminate the chance that the questions will mean different things to different people, leading to answers that are of no significance and use to the research aims and objectives.

- The questions asked must meet be objectives. Again, this is important to bear in mind in designing the questionnaire otherwise the desired outcome may not be achieved.

The interviews were planned and designed to cover aspects that were not necessary covered by the questionnaires, and therefore they complement each other in obtaining valuable information and data on health and safety in the United Arab Emirate construction sector. The interviews were focused on contactors because it is believed that health and safety problems exist on site and it was important to find out what these problems were and why they were taking place.

Figure 4.2 Research methodology adopted



CHAPTER FIVE

5 DESIGNING THE RESEARCH QUESTIONNAIRE AND INTERVIEWS

5.1 Introduction

The survey was conducted with a variety of constructions companies in the UAE. It comprised a total of 350 original structured questionnaires that were distributed to over 70 construction workers, contractors, owners, and consultant organisations. A series of interviews with both safety managers and quality managers were held during the same period. The main interviews covered senior site engineers from different companies. The population comprised companies that are operating in UAE. The sampling frame comprised general building contractors registered with the UAE Building and Construction Authority. Of these, questionnaires were sent by post (see cover letter sent with questionnaire in Appendix A), with self-addressed and pre-stamped envelopes, to 350 randomly selected construction firms. In the questionnaire, respondents were requested to provide information relating to safety aspects for achieved projects, recently completed or ongoing projects. Respondents were also asked to rate the extent to which each of the variables helped workers to adopt safe work practices, on a five-point Likert scale, where 1 is not important at all and 5 is very important. Thus the scales that be used in this study were as below:

1 = least important

2 = slightly important

3 = moderate important

4 = important

5 = most important.

The main reasons for using the Likert scale were;

i) The scale is an important and popular tool for measuring a large number of risk factor variables that are very closely associated to each other, where in practice the measurement of risk perception can be very subtle.

ii) It can be used as an ordinal and comparative scale for measuring perceptions.

iii) The scale could be used as an interval scale to allow for data transformation.

iv) It allows finer discriminations to be done between the measured factors.

v) It take minimum participant's time to answer

vi) Data can be transformed for statistical use in a computer programme i.e. SPSS.

Although the Likert scale offered numerous advantages, the researcher was well aware of the limitations this type of scale caused in practice (Cho and Fellows, 2000). These limitations have been summed up by Rees (1997) as follows;

"It is recognised that, while Likert scales have a limited application to statistics, they do at least permit a numerical classification to be attached to an ordered set of variables. However, there is little scope to reflect any weighting between variables"

Although such criticism can be levelled against such a popular rating system, the conclusion from literature sources suggests that, the advantages of using a Likert scale outweighed other scaling techniques (Cho and Fellows, 2000). Furthermore, this technique has been used in numerous research projects such as construction productivity, construction marketing and asset management studies for measuring survey managers perceptions by experienced researchers such as Smith (1999), Rees (1997), Bowers and Akhlaghi (1999) and Green and Price (2000).

5.2 Pilot questionnaire

There are some key considerations the researcher has taken into account while developing the questionnaire for the purpose of the current research. The design of the questionnaire was based upon the research objectives and theoretical directions derived from the literature review as well as a preliminary questionnaire which consisted of a few simple questions about their health and safety awareness. This preliminary questionnaire was sent to a selected small number of companies (six) to get a feeling of a number of health and safety aspects within these construction companies.

The preliminary questionnaire consisted of 5 simple questions addressing different aspects of health and safety in construction sites:

Question 1 Does your company has a Health and Safety policy?: The question aimed to determine if the companies had a health and safety policy which is considered an important document as it outlines main risks and hazards on site and the required preventive actions. Only 20% of respondents stated having a health and safety policy.

Question 2 Does your company provide Health and Safety training to employees?: This question found out if the companies provided their employees with health and safety training as to develop their health and safety awareness. The positive response to the question was only 15%.

Question 3 Does your company carry out risk assessment to determine risks and hazards on site?: This question asked if companies take risk assessments to determine risks and hazards on site and ways to eliminate these hazards. Around 25 % of respondents confirmed taking risks assessments while the remaining 75% did not.

Question 4 Does your company has a Health and Safety department/committee?: This question enquired about the existence of any organisation within the companies, such as health and safety department, which was in charge of health and safety matters of the companies. 69 % of the companies that participated in the questionnaire indicated that they did not have a health and safety committee while only 31% reported as having one.

Question 5 Are your employees covered by medical insurance against accidents?: This asked the respondents if their employees were covered by medical insurance. All respondents confirmed that they are obliged by law to provide medical insurance to their employees.

The responses to the preliminary questionnaire revealed the lack of awareness of most companies with regard to the health and safety areas around which the questionnaire questions were based. Therefore, it was decided to base the main questionnaire questions around the same areas with the exception to the medical insurance topic as the responses suggested that there was no problem in this area.

The type and the style of questions were carefully considered to avoid lengthy questions in order to save the respondent's time while filling the questionnaire and consequently increase the response rate. Selecting closed questions format usually provides the respondents with a set of choices where they can easily tick on the appropriate answer, while open questions give the freedom to the respondents to give their answers with no limitation to the length. Therefore, it was decided to make use of closed questions for the questionnaire. In addition, where additional details are required, some questions were provided with an explanation section.

Questionnaire Structure:

The questionnaire consists of 7 parts, and is intended to explore the current integration of health and safety in the construction companies in the UAE. The content of the questionnaire is presented below.

- Section 1 "Organisation Type & Position of Respondent": This is an introductory part and its main purpose is to make sure that all categories of oil and construction companies in the UAE are covered appropriately in this study as it ask the respondent to about the company size. It also asks the respondents about their positions within the company as to ensure they have sufficient knowledge of the company environment and practice.

- Section 2 "Health and Safety Policy, Organisation and Arrangements": This part asks organizations about the possession of health and safety policy, the person who signed the policy and if this person has received any health and safety

training. Also, this part enquires about the frequency of updating the health and safety policy. Finally, it asks the companies if they consult their employees on health and safety matters.

- Section 3 "Training": This section enquires if the companies undertake formal health and safety induction training for all their new employees as well as asking if they have a formal health and safety training programme for their employees. Finally, the section finds out if the companies belong to any training schemes.

- Section 4 "Health and Safety Management": This section asks about the companies about the possession of procedures for undertaking risk assessments and the types of risks for which they undertake the assessments.

- Section 5 "Health and Safety Monitoring, Audit and Review": This section finds out about the health and safety culture within the companies by requesting them to indicate if they have health and safety departments and committees and whether they employ external health and safety consultants. Furthermore, the section enquires if the companies undertake formal site health and safety inspections and report all accidents to employees. In the end, the section asks if the companies have been issued with improvement notices, prohibition notices or been prosecuted by any Enforcement Agency within the last 3 years.

- Section 6 "Sub-Contractors": This section is concerned with subcontractors as it enquires if the companies employ subcontractors and whether they provide the subcontractor employees with training. In addition, and similar to section 4, this section asks if the companies report all accidents to subcontractors employees and if any of the subcontractors working directly their control has been issued with an improvement notice, a prohibition notice or been prosecuted by any Enforcement Agency within the last 3 years.

- Section 7 "Environmental Policy and Procedures": This section of the questionnaire finds out whether the companies have written Environmental Policy and if, for any reason, the companies or any of their subcontractors under their

direct control have been issued with a formal notice, or have been the subject of legal proceedings by any Environmental Agency or Local Authority within the last 3 year.

To best analyse the health and safety situation in the UAE, it was decided to categorise the construction companies based on their size as this would facilitate precise identification of health and safety issues in the UAE construction industry. Therefore, for the purpose of this study, the participating companies were categorised as follows:

1. Oil Companies
2. Large Construction Companies (>1000 employees)
3. Medium Construction Companies (1000>employees>100)
4. Small Construction Companies (<100 employees)

Prior to designing the final questionnaire, a pilot study was carried out consisting of questionnaires that were distributed randomly to a selection of 6 companies. The pilot questionnaires were conducted to provide comments on the final questionnaire. The piloting also tested whether the questions were intelligible, easy to answer, whether they contained inapplicable or confusing statements, and in addition the research obtained good feedback as to where and when, the questionnaire should be distributed (Sample in Appendix B). The questions asked were short and very close ended to the point, often with only two possible answers: yes or no. The pilot questionnaire consists of 7 sections.

1. Organisation type
2. Health and safety policy, organisation and arrangements
3. Training
4. Health and safety management
5. Health and safety monitoring, audit and review
6. Sub-contractors
7. Environmental policy and procedures

- The first section establishes whether the surveyed companies have a health and safety policy or consult external organisations on health and safety matters.

- The second section determines whether the companies belong to a training scheme and undertake formal health and safety training for new and existing employees.

- The third section deals with health & safety management by ascertaining the categories and procedures for risk assessment.

- The fourth section established whether the companies have internal health and safety department, employ external consultants or have a health and safety committee. In addition to determining whether a site health and safety inspection is conducted, if records of all accidents to employees are kept and has company been issued with an improvement notice, by any Environmental Agency within the last 3 years.

- The fifth section determines whether the companies employ sub-contractors, train and keep records of accidents to sub contractor employees.

- Section 6 enquires if companies have an environmental Policy and whether the companies or sub-contractor been issued with a formal notice, or have been the subject of legal proceedings by any Environmental Agency or Local Authority within the last 3 years.

The main purpose of the pilot study was to identify problems with questions before they were used. It also gave the author valuable experience in the relevant administrative procedures, contacting the respondents, explaining the purpose of the survey and timing each operation. Accordingly, the main result of this work was to make some alterations and adaptations that seemed necessary for the final questionnaire.

5.3 Pilot interviews

The pilot interviews were also carefully designed (structured) with short and simple questions (see Appendix C). A sample of 2 interviews is also given in Appendix C. A total of 7 interviews were conducted with senior people in 3 different construction

companies (project managers, senior engineers, and senior site engineers). The interview form consists of two main parts:

- The First part includes information about company profile such as company name and business activity of the company and also respondent particulars such as field of specialisation and numbers of years of experience.
- The second or final part of the interview form dealt with the risk assessment of health and safety applied on construction sites by the company itself.

In its simplest form, a structured interview involves one person asking another person a list of predetermined questions about a carefully-selected topic. The person asking the questions is allowed to explain things the interviewee does not understand or finds confusing.

Like any other method of collecting data and information, conducting interviews has its own strengths, uses, weaknesses and limitations as shown in Table 5.1 below.

The outcomes from the pilot interviews may be summarised as follows:

- ✓ 45% of the respondents said they were not aware that their company had a health and safety policy. The remaining 55% gave a positive answer but not all did sound sure and used expressions such as “I think so” and “as far as I know, yes”
- ✓ All respondents admitted they did not have a committee solely dedicated to health and safety.
- ✓ A massive 80% of the respondents said that not all accidents are recorded, and only the serious are. The remaining 20% said they record the accidents.
- ✓ All respondents agreed that identifying the critical factors that influence the success of accident reporting system is crucial.

The pilot questionnaire and interviews helped with identifying problems with the questions before they were used. It also gave the author valuable experience in the relevant administrative procedures, contacting the respondents, explaining the purpose of the survey and timing each operation. Accordingly, the main result of this work

was to make some alterations and adaptations that seemed necessary for the final questionnaire and structured interviews.

Table 5.1 Strengths and limitations of structured interviews

(Source: www.sociology.org.uk, accessed 12/01/2009)

5.4 Structured interviews using repertory grid technique

5.4.1 Repertory grid technique

Based on the pilot questionnaire and pilot interviews, structured interviews were planned and executed with the ultimate aim of obtaining as much information as possible about health and safety on the construction sites and what are the barriers to adopting a health and safety strategy in the UAE construction companies.

In order to make the study manageable, companies targeted by the interview were small to medium companies. The reason being, that larger companies were more likely to have health and safety policies and practices in place than small and medium companies. Also, only senior site engineers were interviewed. A total of 14 interviews were carried out, with 6 small size companies and 8 medium size companies. All companies interviewed were construction contractors.

The relatively novel technique of repertory grid is adopted in this study. It is relatively novel in the construction industry context, although the technique itself dates back from the 50s when a clinical psychologist by the name of Kelly developed the Personal Construct Theory (Kelly, 1955).

The use of Repertory Grids offered a number of great opportunities such as:

i) It allowed the selected construction managers to sufficiently respond to the questions asked at their own pace of time thereby increasing the reliability and accuracy of their responses.

ii) The information received from participants was standardised and consistent due to the design structure of the Repertory Grid.

iii) It was a very straightforward yet rigorous way of gathering qualitative information from experienced construction managers about how they view the management of health and safety operations.

iv) It is a fairly cheap and low cost data acquisition method with less interviewer bias and a high degree of anonymity with a wide access to geographically dispersed samples (as such is the case with UAE).

5.4.1.2 Novelty of Repertory Grid interviews

In most construction managers' everyday lives, they continually attempt to understand how they and others view their business environment in order to make strategic business decisions and undertake sensible business solutions. Often they are unaware of this process, and the Repertory Grid is a tool through which they can attempt to uncover and formally represent how individual construction managers construct their service strategies of managing construction site operations effectively. A grid can, at one level, be thought of as a cognitive "map" charting a particular aspect of a person's world (i.e. risk management in construction site operations).

It offers a powerful way of quantifying health and safety managers / construction managers' values, attitudes, feeling and perceptions in greater depth than other psychological techniques (Easterby-Smith *et al.*, 1996). As a technique it focuses on how an individual construction manager understands his or her own construction business environment in their local region. This differs with conventional psychological tests that attempt to classify health and safety managers in the psychologist's world.

5.4.2 Grid design

Kelly also used the RGT as a way of quantifying and making these cognitive map objectives. Since Kelly pioneered the Repertory Grid technique, a great deal of changes and modifications has taken place with regards to its pattern of use and application. Some of the changes that have been modernised in the use of Repertory Grids are as follows:

5.4.2.1 Linking mechanisms

These are various methods that illustrate how elements and constructs are linked. As a result of this, generally there are three main ways of linking constructs to elements:

5.4.2.2 Dichotomising

If the element is closest to the left pole of the construct, place a tick, otherwise a cross.

5.4.2.3 Ratings

Treating the poles of the construct as the extremes of a continuous scale (normally five or seven points are used). This offers flexible approach of analysing qualitative

grid data and transforming it into quantitative statistics such as regression analysis (described in model validation chapter eight of this thesis). In this research a 5-point continuous scale was used by health and safety / construction managers to rate each element against each construct along each row of the grid.

This method allows the participants greater freedom when sorting the constructs and does not force them to make discriminations which do not exist (lopsidedness), which has been one of the problems found with Kelly's original format of dichotomising (Beail, 1985).

This procedure also highlights the functional meaning of the elements and constructs and offers a greater understanding of how they are used by the subjects. It must be remembered here, however, that the rating Figures carry no inherent meaning in themselves, but simply provide a way in which subjects can position the elements in relative terms on each of their construct dimensions thus providing the researcher with a richer picture of the overall structure of their construct system (Stewart and Stewart, 1981).

5.4.2.4 Ranking

All of the elements must be placed in order along each construct. Before the RGT and its methodology are discussed extensively in this thesis, it is important to explain the stages or methodological decisions that were taken into account by the researcher. Having explored the main components of a Repertory Grid, it is important to note that a modern Repertory Grid investigation on one person usually goes generally through five stages. In designing the Repertory Grid, the researcher adopted a more flexible, yet systematic, research process that combines both qualitative and quantitative methods of analysis based on Marsden and Littler (2000) and Okoroh and Torrance's (1999) main principles. These principles are described as follows:

i) Main objective of the Repertory Grid already stated in the above sections
ii) Selection of elements
iii) Elicitation of constructs
iv) Preparing the grid
v) Grading each element on each construct
vi) Analysing the results by computer-based software

5.4.2.5 Elements selection

Representing the focus of inquiry of a study, the first stage in using the RGT is to choose a set of elements which are consistent with the objectives of a study and the targeted (sub)system of constructs (e.g. Health and safety issues) to be elicited from participants (Stewart and Stewart, 1981). In health and safety research, for example, the elements have usually taken the form of various "hard" or "soft" issues (i.e. existent, updated, aware of the issues, procedures adhered to, provided adequate support etc) that are used to front the core business service delivery in organisations. For a detailed explanation and illustration of how health and safety can be used as elements in a grid, the work of Jones and Okoroh (2000) clearly illustrates how elements can be used. Therefore, elements are objects of thought that normally of other people within our physical servicescape (i.e. the health and safety world around us). Elements represent those events or areas in the business environment that are dealt with by a construction managers and health and safety manager's sub-system of bipolar constructs that are the focus of investigation. They can be sometimes events, pictures, situations, facilities, places, people, ideas or inanimate goods and services. Always when eliciting for elements the researcher should first decide on the subject area (domain), he or she wishes to map, then he or she must elicit a sample of objects his "client" thinks about within that subject area. In this research the domain is health and safety in UAE construction industry. As a general rule, elements should be chosen by the participants in the study and not pre-selected by the researcher unless only when the research problem is too complex and the researcher is fully aware of the objectives (Marsden and Littler, 2000).

The eliciting of elements is the foremost crucial stage of a Repertory Grid as it forms the basis of everything else that follows. They could be provided by the researcher or elicited personally from respondents. The choice between elicited and provided elements depends on the researcher and also the purpose of the investigation. However, it is important that adequate preparatory work should is done to ensure that the selected elements are representative of the nature of the problem to be investigated. Normally, this would entail discussions or conversations with the potential subjects so that a common understanding can be comprised between the researcher and the subjects. Thus, in order to determine the risk perception in Health and safety providers and purchasers in construction operations, it is quintessential to

elicit various representative construction operational situations, which will reflect the experience, knowledge and risk attitude of both providers and purchasers. As a result of this, elements may be generated in the following four ways:

5.4.2.6 Supplying them

In this case a list of named individual persons or situations would be provided; for example several particular incidents on a videotape are pinpointed i.e. six objects are displayed and subjects are differentiated and associated in pairs or more.

5.4.2.7 Provide role titles of situation or descriptions

In this case a number of different types of persons or situations are specified. The researcher completing the grid must supply/attach specific names to the people or incidents chosen. The researcher does not need to know these names.

However, when constructs are generated the researcher must be encouraged to think of these specific people or situations rather than of ideal types (unless ideal types are being compared). For example, if you want to understand what the person views as a good manager then it is useful to get the person to think of a bad construction manager and or health and safety manager whom they know, rather than good managers in general.

5.4.2.8 Define a "pool"

The person is asked to write down "the names of five staff members", "three effective health and safety managers", or "five core issues related to health and safety" which he/she can compare and contrast. Again, it is important that the person is asked to assign names to the different elements.

5.4.2.9 Elicit through discussion

Both parties discuss a topic of interest and as a result of this discussion a list of specific elements is drawn up. According to Easterby-Smith *et al.* (1996) it is important that the final list of elements is:

i) **Homogeneous**: are drawn from the same category, so avoid mixing situations and people unless you are seeking to compare them.
ii) **Representative**: They should provide adequate coverage of most aspects of whatever is being examined.
iii) **Unambiguous**: all elements should be specific, simple and readily understood by the subject.

iv) **As short as possible**: Eight to ten elements are quite adequate for most managerial applications although more can be used.

5.4.2.10 Elicit from triads

This method of "triading" is one of the most commonly used techniques for eliciting elements from participants. However, there are a number of different ways in which triads can be used (Marsden, and Littler, 2000). The subject is presented with three elements and asked to consider ways in which two are alike but different or opposite in the third. This process can be quite difficult. The investigator should not be surprised or feel uncomfortable by long periods of silence. The cards are normally drawn randomly from the pack and triads are presented until time runs out or the person "dries up" (minimum context card form). All elements are spread out in front of the subject, who is asked to think of ways in which groups of the elements are alike. When two cards have been selected, the person is asked to describe how they are alike. More cards are added and the person is asked if each card in turn is in the same category. If the card is not added to the group the person is asked why (full context form).

5.4.2.11 Elicitation of constructs

The second stage of using the RGT is to conduct personal interviews with participants in order to elicit the content and hierarchical structure of the subjective meanings, in the form of bipolar constructs that they attach to the set of elements (Dalton and Dunnett, 1992; and Jones and Okoroh, 2000).

Constructs can be regarded special "qualities" which are used by people to describe and differentiate between elements. Constructs can be viewed as bipolar as they normally posses both a positive and negative (bipolar) end. For example, 'good customer' and 'bad customer' are example of the extreme ends that can be applied to a construct. As constructs are frequently expressions of intuition "gut feelings" and perceptions, which are peculiar to individual people's informed judgement as a guide to action without necessarily having verbalised them explicitly prior to the interview. Extra care should be taken when using any method by the researcher to generate relevant constructs that reflect the magnitude of the problem to be investigated.

Normally, the elicitation of constructs is carried out by presenting a random set of three elements at a time to the respondent and inviting him or her to think of similarities and differences between the elements. The standard question normally asked by the researcher is: "In what ways are the two of these alike and different from the

As described by Kelly (1955), there are six principal and distinct approaches to the elicitation of constructs as follows**:**

5.4.2.12.1 Supplying them

This is probably the quickest way to generate constructs whereby the researcher provides predetermined constructs for respondents to assign the necessary ratings.

The uncertainty that is attached to respondents' construing of supplied constructs places the supply of constructs upon distinctively uncertain foundations (Grover, 1983). With this method, there is always a danger that the grid becomes inflexible like an attitude questionnaire, with the researcher's world being imposed on the subject. This situation should be always avoided at all times.

5.4.2.12.2 Triadic construct elicitation

In this method the respondent is represented with three elements at a time from a list of representative elements and asked to distinguish in what ways the two elements are alike or different from the third. The respondent is then requested to name the emergent people and the implicit or contrast pole that discriminate the elements. The two contrasting poles of the elements are then recorded. Whilst triadic elicitation is commonly used (Fransella and Bannister, 1977; Jancowicz, 1996; and Eden and Jones, 1984), it does not always facilitate the production of constructs since, according to Kevill *et al.,* (1982), some respondents appear to find the cognitive demands of the procedure alien to the way they think, or will prefer to respond. Depending on the size of the grid this can be rather time-consuming and may create frustration with the interviewee (sequential form).

5.4.2.12.3 Dyadic construct elicitation

Although triads are the most common method used, the researcher found out that thinking in this way can be sometimes difficult. For some people it may be easier to use dyads (pairs of elements) rather than triads. Therefore, in this method two elements are presented to the respondent each time and, he/she is requested to discriminate the difference or likeness between them.

5.4.2.12.4 Free response construct elicitation

Through conversation, construction managers and health and safety experts or respondents provide their constructs instinctively or using their own knowledge, expertise and perception. Probing can then be used to cluster the most meaningful constructs. Once a set of constructs relevant to a particular person's circumstances is generated, it can be used at regular intervals to measure that person's values over time. A particular set of constructs, though, may have a limited life. As the purpose and mind processes of a person changes, the constructs relevant may need to change with new sets of constructs identified, using the same technique as before.

5.4.2.12.5 Laddering

Laddering is a way of exploring a person understanding in more depth and relates to the notion of constructs having a hierarchical relationship. Laddering helps the researcher gain a better understanding of a person's construct system. Laddering *down* (also called pyramiding) is where you explore the person's understanding of a particular construct. The technique is normally used in conjunction with one of the above methods after some constructs have been elicited. It involves asking the respondent a series of "why" or "how questions so as to solicit more specific constructs which are relevant to the field of knowledge under investigation. Laddering can also be used to move between construct levels. Given a construct, one can either ladder "upwards" towards the central construct by asking which pole of the construct is more important to the individual and why. For example, construct "*keep customers highly satisfied / always dissatisfy customers* is elicited. It is possible to obtain further constructs (for instance, constructs such as "*shows dedication/ no dedication*" may be elicited by Laddering from the "*aims to maximising profits/ aims to enhance service quality*" by asking the "why" question. This process may be repeated until the central

construct of the respondent is revealed. Similarly as stated above, constructs can be laddered downwards the "how" and "why" question to obtain more specific constructs.

5.4.2.12.6 Combination of the above methods

This method is self-explanatory. As the statement above suggests, constructs are elicited using all of the methods described above for the respondents to assign a rating. Another important aspect that needs to be emphasised is that the researcher should ensure that the elicited constructs are appropriate for the purpose of the investigation.

5.4.2.12.7 Dry run knowledge elicitation test

Before the researcher performed the main Health and safety knowledge collection exercise, the researcher performed several trail tests or dry run interviews with fellow researchers, lecturers and other experienced health and safety working with UAE construction organisations. The main objective of these "dummy" tests was to survey for any problems and modification in grid completion that could be made before the main interviews. These trial tests also offered the researcher an opportunity of getting acquainted with various aspects of this otherwise novel technique of knowledge eliciting as suggested by Ruíz (2000). The dummy tests proved to be a very good learning exercise to an otherwise new approach to the researcher. As a result of the experimental knowledge elicitation exercises some vital adjustments were made to the whole structure of the Repertory Grids used. Also during the dummy tests, the researcher observed that some health and safety elements chosen for this exercise tended to load heavily on the research problem overshadowing the constructs that were being used.

In such a situation the researcher noted that there was a high possibility of the designed Grid becoming a postal questionnaire, as a result distorting the overall objective of using a Repertory Grid technique.

The researcher also observed that some of the participants who took part in the trials faced difficulties in innovating new sets of constructs that represented the research problem. Due to these problems, the researcher took a decision that he should use the

'dyads' elicitation technique. The researcher used this method in accordance with the description guidelines mentioned above. In brief, this method allows the choosing and comparing of two elements at a time and participants asked to state whether they are alike or different, and what it is that makes them similar or different from each other? This technique played a major role in providing an interview friendly environment for participants and eased the elicitation process of the constructs.

5.4.2.12.8 Interview framework

The procedure in which the interviews for the Repertory Grid data elicitation were performed is clearly shown in Figure 5.1.

The framework shown in Figure 5.1 was adopted from Okoroh and Torrance's (1999) work on subcontractor selection in facilities refurbishment projects. The initial step in eliciting the necessary Health and safety knowledge from the selected participants started with the researcher clearly stating the main objective of the research problem and the purpose of the Repertory Grid data elicitation exercise.

Before the interviews commenced the researcher assured the participating healthcare facilities managers that all completed Grid data would be kept in confidence.
In addition, participants' names were not included in any analysis. As they were no names used a special coding system was used for further identification purposes. After the conformation of information confidentiality, the researcher proceeded with asking the participating to provide a list of the most critical risk factors they considered affected their rate of success when delivery construction projects. During the elicitation of constructs, a set of randomly selected pair of health and safety elements were displayed and the domain expert asked how they considered the risk exposure. The health and safety experts were also asked to show with reference to constructs that they would use to describe the difference in management strategies. As a result of this process, the researcher was able to select the most popular critical constructs that carefully discriminated between the 'unimportant' and 'very important' risk constructs used by construction managers to manage effectively their health and safety business processes in order to support the delivery of construction projects.

Figure 5.1 Repertory Grid elicitation framework adopted from Okoroh and Torrance (1999)

5.4.2.12.9 Recorded knowledge elicitation

In this research all the health and safety knowledge elicitation was performed at various construction organisations where the selected experienced health and safety managers worked. Furthermore, all the knowledge elicitation interviews were tape-recorded. Tape recording is a procedure that has been recommended and used in most knowledge elicitation interviews (Okoroh and Torrance, 1999; and Ruíz, 2000). A typical knowledge elicitation exercise lasted for about 3 hours. During the interviews most health and safety managers agreed to being recorded only if the researcher would use the recorded tapes for the purposes of this research. The researcher gave them his 100% assurance about information confidentiality and as a result all the participants eventually agreed. In addition, all the responses supplied by the participants were also written down during the interview sessions. Immediately after the collection of the necessary knowledge, the researcher had to cosmetically adjust and fine-tune some of the recordings in order to reflect the decision making process of the selected healthcare facilities managers.

The interviews were in form of brainstorming sessions that allowed a two-way approach of information, but in most cases the interviewed health and safety managers lead the process. This approached allowed the participants to supply the required information in a more business-friendly environment. The researcher also took a lay-back approach that allowed the participants to supply information freely, as a result this approach worked well in eliciting more information that respondents regarded as highly confidential and could lead to the exposure of their competitive strategies. As this research was highly sensitive, the researcher also had to employ some of the techniques that allowed him to elicit health and safety knowledge from the participants by asking indirectly some very important questions which could have not been answered directly by the participants.

5.4.3 Preparing the grid

Generally, the grid is prepared with supplied or free-response elements and constructs arranged as shown in Table 5.2 below**.** During knowledge solicitation 8 key ere used as pre-determined elements. These key elements of health and safety had earlier on been identified in literature review; the pilot and the major survey as being managed under an integrated health and safety approach in the surveyed contractor organisations. Therefore, in this research, the researcher supplied elements for the Repertory Grids to all

health and safety managers who were interviewed. This was done after a careful analysis of various literature (Quah, 1998; Webber, 1994; Rees, 1998) and West, 1999), the case study, pilot and major surveys performed on health and safety managers and experts working in UAE contactor organisations.

During the designing of the grids, it is important to incorporate identification numbers and aids to facilitate data preparation. As a result of this, the provided health and safety elements were centralised at the top of the Repertory Grid as recommended in Senior's (1997) work. The method used in the elicitation of the most meaningful risk constructs for research was the free-response technique.

This involved conducting personal interviews with experienced senior health and safety mangers as participants in order to elicit the bipolar constructs that these managers highly rated as being the critical factors towards the effective management of a chosen set of health and safety factors. The use of this technique is advantageous in the sense that it allowed these health and safety managers to select the most and less meaningful constructs in the management of construction projects using their own business experience. This is contrary to the more familiar approach whereby the researcher normally pre-supplied constructs that are less meaningful to the rest of the managers' everyday business practices. This method was also designed to elicit in more detail of the defining characteristics of a participant's subordinate constructs and involves asking them: "what" defines or constitutes the two poles of a construct? While the questions "what" and "how" tend to produce very concrete, or tangible, constructs, the question "why" generates constructs of far greater generality and intangibility. This thus allows health and safety managers to value those risk constructs that have an everlasting effect on their health and safety business process.

The repertory grid is a way of carrying out an interview in a highly structured manner, using the interviewee's own language and setting out their responses in the form of a grid. A big advantage of the repertory grid technique is that it allows interviewees to articulate their experience in the way they see the world, according to their own personal constructs. In so doing, it avoids interviewer bias (the interviewer allowing their questions to be informed by their own values, even subconsciously). Because it also uses differences and similarities with other examples, it can be easier to tease out the interviewee's views than talking in abstract terms. It can also be good for teasing out

different dimensions of a question (Lee and Egbu, 2005; Mireaux et. al., 2007; Okoroh et. al., 2006).

The issue of supplied versus elicited constructs has been a basic concern for the use of personal constructs in repertory grid. Adams-Webber (1998) has found that elicited constructs are significantly more accurate then supplied constructs; Fansella (2003) however argued that accuracy also depends on the context in which the grid is being used. From a purely Kellyian perspective, the technique would seem to demand that the constructs be elicited; in this research however, the constructs are supplied because the research demands aggregated data and data cannot be aggregated without commonality.
For example, suppose a student is asked about their experience of lectures. The interviewer might ask, "What makes a good lecturer?". If the student struggled to respond, the interviewer might mention a couple of prompts, perhaps based on his or her conception of what qualities a good lecturer should possess. With the repertory grid technique, the student and the interviewer could agree on a range of particular lecturers and then use a technique of comparison and contrast as a way of getting the student to talk.
The repertory grid technique, therefore, can be a rich source of qualitative data and allow people to express things in their own terms or jargon. Because it also uses rating scales, it can also be analysed statistically, hence it combines both qualitative and quantitative methodology. In epistemological terms it represents a subjective view of knowledge, in which meaning is to some extent an individual matter.

The main components of the repertory grid are:

- **The topic** – this defines what the interview is about.
- **Elements** – these define the examples that illustrate the topic. They can be objects, experiences, events or even people. The elements can either be chosen by the interviewee (elicit elements), or they can be preselected (selected elements). If the interview is preceded by questionnaires and pilot interviews as has been the case in this study, then, although it is subject to some bias, it would be possible for the interviewer to preselect the elements in order to fill any gap in the study and complement the questionnaires. The choice of the elements is very important and impact on the study,

and therefore needs careful consideration in light of the stated aims and objectives of the study (this is the planning phase by the interviewer).

- **Constructs and contrasts** – these are the most important components of the repertory grid. This is where the preselected elements are compared and contrasted with one another to produce a series of statements which describe what the interviewee thinks about the topic. The eventual unit analysis will be formed and judged by these statements. Constructs and contrasts are bipolar in nature, in other words, every statement will be presented as opposite ends of a pole. For example, if "health and safety policy" is the element, then the bipolar constructs and contrasts could be "adequate" at one end, and "inadequate" at the opposite end.
- **Ratings** – once the constructs, contrasts and elements are in place, they are entered onto a grid (matrix table) with the elements on top and the constructs and contrasts down the sides (left and right of the grid). The interviewee then rates each element against each construct according to a rating scale. There are different scales being used, 1-10, 1-7, but the usual and most common scale is 1-5 (for example from very strongly disagree to very strongly agree). Rating level from the range of one to five is considered to be appropriate in this research because more or fewer categories appear to be either too many or too few for user friendliness and accuracy for evaluation. Also, these five ratings can mesh readily with the levels of importance attached to each construct. Further, in Bell et al. (2002) testing of mean interclass correlations, supplied constructs and elements with ratings from one to five indicates no significant difference and since in this research both constructs and elements are supplied, a rating level of one to five is adopted.

Analysis of the results

The results of the repertory grid study may be analysed both qualitatively and quantitatively. A qualitative analysis may be enough to develop a good understanding of the constructs that are important to the target audience.

In addition, and in order to identify which constructs are most relevant and most clearly distinguish the selected examples, the researcher may apply factor analysis to the participants' ratings of the examples. This may be achieved through a number of software that are freely available on the internet. The result is a dendrogram or tree

diagram—similar to what you would get during a card sort exercise—that shows which examples are most closely associated with one another and also the selected examples' most differentiating characteristics.

5.4.4 Interview planning and structure

Basically, a repertory grid consists of (a) a series of *elements* that are representative of the content area under study, (b) a set of *personal constructs* that the subject uses to compare and *contrast* these elements, and (c) a *rating system* that evaluates the elements based on the bipolar arrangement of each construct. As a result, the parameters that are to be set in the design phase of a grid assessment are the selection of elements and constructs, the rating system to be used and the number of grids to be administered. These decisions will determine the type of information obtained. Therefore, the aims of the assessment must be closely considered.

Elements and constructs selection

Based on the preliminary questionnaire and interview, the elements and constructs were decided by the author. A rating level established from a Likert scale from the range 1 to 5 is considered to be appropriate in this research because more or fewer categories appear to be either too many or too few for user friendliness and accuracy of the results for evaluation (from strongly agree, rated 1, to strongly disagree, rated 5).

The 14 interviewees were asked the same questions and each of their answer is given a value between 1 and 5. For each individual construct, the participant rates an example on a scale of 1 to 5, where 1 represents one end of the pole (left side) and 5 represents the other (right side).

For example, if the participant identified a construct whose two poles are "updated" and "outdated," the author asks the participant to rate each element on a scale from 1 to 5, where 1 is updated and 5 is outdated (the participant can give any rating between 1 and 5). The results obtained from all participants are then added together for each of the elements.

The results (average values) are summarised in table 5.2 below. It is worth noting that the maximum score any element can get is 5. A score of equal or less than 2 indicate an

inclination towards the 'strongly agree/agree' side, whereas a score of greater than 3 indicates an inclination towards the 'disagree/strongly disagree' side.

For example, on the question of whether a health and safety policy exists, a score of 41 was achieved (total of all responses from the 14 respondents). This is then divided by the number of respondents (14), which gives an average score of 41/14 = 2.93

An examination of the grid reveals that most results (percentages) lean towards the 'strongly disagree' side. For example:

- ✓ 71% (3.57/5) of workers said that there is no training of workers and 74% (3.71/5) believe that such training, when existent, is outdated.
- ✓ 87% strongly agree that there exist cultural barriers to adhesion to H&S procedures, although 91% said they were not made aware of such barriers, which suggests that the issue was not discussed.
- ✓ 86% of respondents admitted that they did not adhered to accident reporting procedures, and a similar percentage (83%) admitted not recording accidents. Interestingly, 71% of respondents said that they were not provided with means of recording accidents which explains why only 54% carry out any follow up action following an accident.

As may be seen, the repertory grid method is very powerful as it gives a lot of valuable information, all presented in a concise and clear manner showing all the possible links between the different elements.

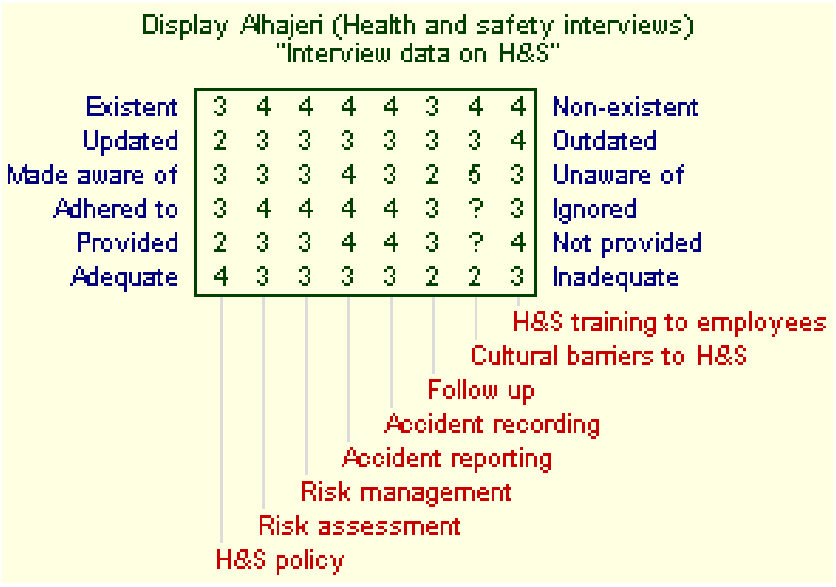
The results were analysed using software called WebGrid. WebGrid is web implementation of Kelly's repertory grid technique for building conceptual models based on his Personal Construct Psychology (PCP) (Kelly, 1955).
The software is user friendly and quite easy to use. The author self-learned it in a very short time. The user is guided to enter the data in a very systematic and logical manner. The software then does the rest to produce output in the form of grids and maps.
The author will not attempt to explain how the software actually works because this readily available on the software's web site together with a help manual that details all the necessary steps in inputting data and interpreting output.

Table 5.2 Repertory grid from results of interviews

	Elements								
Constructs	1. H&S policy	2. Risk assessment	3. Risk management	4. Accident reporting	5. Accident recording	6. Follow-up (actions)	7. Cultural barriers to adhesion to H&S procedures	8. Training of workers in H&S	**Contrasts**
1. Existent	2.93	3.86	3.50	4.43	3.71	2.71	4.36	3.57	1. Non-existent
2. Updated	2.29	3.07	3.43	2.79	2.86	3.21	2.64	3.71	2. Out-dated
3. Made aware of	2.57	2.86	3.00	3.79	3.00	2.36	4.57	3.14	3. Unaware of
4. Adhered to	3.14	3.64	3.57	4.29	4.14	2.71	NA	3.00	4. Ignored
5. Provided	2.43	2.57	2.79	3.71	3.57	3.07	NA	3.86	5. Not provided
6. Adequate	3.93	3.21	3.14	2.79	3.21	2.29	2.43	2.21	6. Inadequate

First, the software produces the actual Grid Data that was generated by the user through the input data (Figure 5.2 below).

Figure 5.2 Grid data generated by the author



It is worth noting that the software allows the use of nearest whole numbers only (integers), which explains why the numbers in Table 5.2 above have been rounded-off to the nearest integer between 1 and 5.

The use of the FOCUS analysis option is to sort the grid so that similar elements and similar constructs are clustered together (hence this called CLUSTER ANALYSIS). WebGrid graphs the data and returns it as a GIF as shown in Figure 5.3 for the current example.

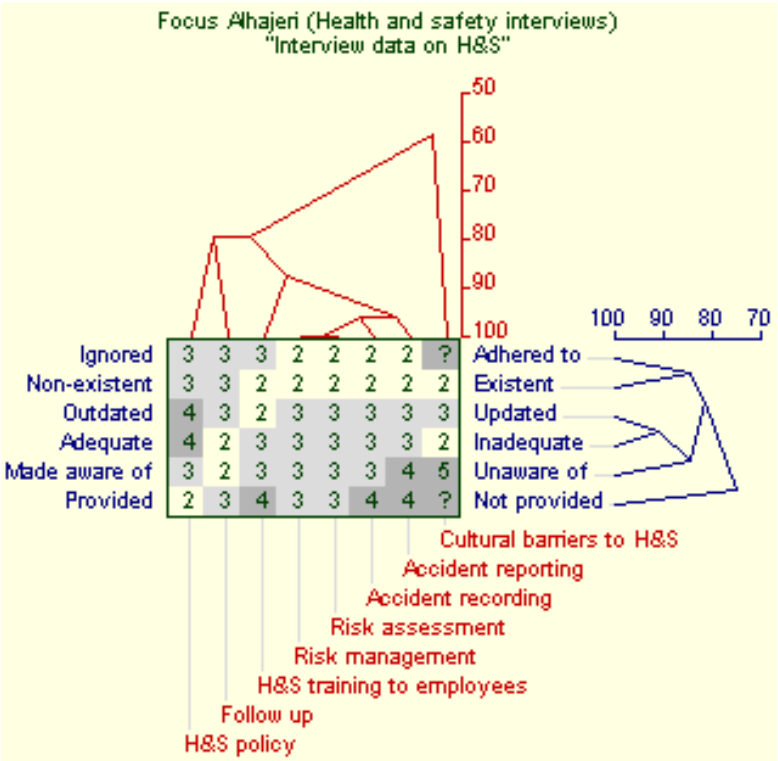
The FOCUS (or CLUSTER) sorting analysis permits to see not only the actual data but also the interaction between the different features of the analysis, to see which ones are similar and which ones different. Typically, two-way clustering (co-clustering or bi-clustering) is carried out, i.e. both elements and constructs are clustered and the sorted according to proximity. Then a dendogram can be drawn on top (elements) and to the right (constructs) of the repertory grid.

The WebGrid cluster analysis algorithm is based on the FOCUS algorithm (Shaw, 1980). It uses distance measures to reorder the grid, placing similarly rated constructs/elements next to each other. This is kind of two-way hierarchical cluster analysis for both elements and constructs. The grid is rearranged to place similarly rated constructs/elements next to each other and a dendogram is shown for each axis.

From Figure 5.3 it may be seen, for example, that the element "H&S policy" is closely related (80%) to the element "Follow up". Similarly, it may be said that construct "adhered to" is closely related (85%) to construct "existent". There is a 90% correlation between updated and inadequate. Also, it may be seen that "risk assessment" and "risk management" are virtually identical (100% correlation) in the current study.

Therefore, the cluster analysis is a very useful tool in detecting close associations and relations between the different elements, constructs and contrasts.

Figure 5.3 Clusters produced by FOCUS sorting analysis



The PrintGrid spatial rotation option shown in Figure 5.4 is a graph whereby the elements are points plotted in an n-dimensional space defined by the constructs as axes centered on the means of the elements. The data has then been rotated through principal components analysis to spread the elements out as much as possible in a 2-dimensional plot. Slater (1976; 1977) is the definitive work on such analysis of grids. Joliffe (1986) is a good general source on principal components analysis. Gower (1966) is the definitive work on the spatial model involved, and Gower and Hand (1995) on the presentation of the analysis as a *biplot*. The title, element names and construct pole names in the PrinGrid plot are nodes in a net that may be dragged to different positions to make the plot more readable. RepGrid places them so they do not overlap one another and connects the text to the locations on the plots with a line that will redraw as one changes the positions of the text so that the spatial data presented is not distorted.

Figure 5.4 PrintGrid spatial rotation analysis

5.5 Questionnaire

Based on the pilot study, the structured interview and the findings from the literature review; the final questionnaire was carefully designed by the writer in order to determine the level of application of health and safety in construction sites. The purpose of the questionnaire is to provide answers and meet the stated aims and objectives of the research. Broadly, the questionnaire grouped into 2 separate sections:

- Background information of the respondent and the company itself
- Identification of causes of construction accident under reporting

In the questionnaire, the respondents were asked to rank the critical causes of accident under reporting. The questionnaire can generally categorized into 4 area, human causes, accident reporting system causes, time causes and organization causes.

Based on all of the information that was gathered, quantitative analysis was carried out and the results are discussed in detail in the following Chapter 6.

5.5 Validity and reliability of the questionnaire

In using questionnaires for this study, the researcher was keen to ask questions that are relevant to the research study. The intention was to ensure that the way the data will be collected should have the maximum validity and reliability. It was born in mind that the feedback which will be obtained from the questionnaire or the chosen answers to each question will indicate a numerical value where the researcher can argue about it and make evidence to support a certain issue or number of issues. Therefore, care has been taken while constructing the questionnaires and interviews for this research to make sure that the result obtained will add value to the research.

The term reliability applied on a measurement tool used to obtain the same result if used repeatedly by other researcher at the same time. In contrast, the term validity applied to say that a measurement tool measures what it plans to measure. If the indicator contains small error percentage, then the indicator is a valid measure of the concept.

To obtain reliability, the questions aim to collect data necessary to the subject matter. Therefore, to cover different issues of health and safety in construction, attention was paid to the contents of the questionnaires. The questions were objectively constructed, without giving the participants any indication of the preferred answers. The questions were arranged from general to specific allowing for adequate order of the questions to the participants. Moreover, to ensure better understanding of the questions, clear and complete instructions were given at the beginning of all questionnaires' parts. The questionnaires were, as much as possible, set free from ambiguous and embarrassing

questions. Also, aspects which may cause misunderstanding, such as poorly phrased questions, misspelled words and typing mistakes, were excluded. An acceptable length of the questionnaires was realised, leading to restrict it only to essential information needed by the research. All the previous percussions were made to ensure the reliability of the two questionnaires, and the validity of the result obtained.

The respondents were assured of the confidentiality aspect of the research and that their answers will remain anonymous and confidential. This has created an atmosphere of trust between the interviewer (the author) and the interviewees.

The author believes that the sampling chosen is representative in quality and quantity since it was arbitrary thus representing a typical cross section of firms operating in the UAE and a workforce also typical in the UAE context.

5.6 Summary

The questionnaires and interviews were carefully planned and executed based on the extensive literature review and the stated aims and objectives, and the research questions.

Every care was taken by the author to ensure the validity and reliability of the questionnaire and interviews. The sampling chosen is representative a typical cross-section of the construction industry in the UAE.

The repertory grid was chosen as the means to analyse the findings from the interviews. It is a very powerful technique that provides both useful qualitative and quantitative information from the interviews. It also provides interaction between that different parameters (elements and constructs).

CHAPTER SIX

6 DATA COLLECTION, RESULTS AND DISCUSSION OF THE FINDINGS

6.1 Introduction

This chapter critically analyses the findings from the interviews and questionnaires on health and safety in the UAE construction industry. The major finding of this research was that health and safety has become an important issue in today's society in terms of economics, moral and legislative considerations. Companies are attempting to remain profitable in an increasingly competitive global market. Those companies that are addressing health and safety issues do so as a good business practice. For many companies robust health and safety regulations and practices may actually mean survival. Accidents and incidents statistics are evidence to the extent of this problem.

6.2 Data collection

As mentioned earlier, interviews and questionnaires were developed to collect data for the study. The written questionnaires were either hand-delivered or post-delivered to participants. The target population of this study included contractor, consultant, client, and safety officers in construction industry in The UAE. A total of 130 usable questionnaires were returned, they were then checked, edited, coded and analysed.

The designation of the respondents was: upper management (20 per cent), middle management (48 per cent): safety personnel (17 per cent): technical staff (15 per cent).

Upper management respondents comprised managing directors, directors, general managers and senior project managers. The middle management respondents were project managers and assistant general managers. Safety personnel consisted of safety managers, safety officers, safety supervisors and safety auditors. Technical staff refers to supervisors, site coordinators and clerk-of-works. The average working experience in the construction industry of the respondents is 12 years. The minimum and maximum

working experience are one and 34 years respectively. In addition, 60 per cent of the respondents have more than ten years of working experience.

The majority of the projects the employees were involved with are building works, with a concentration on residential buildings. Most of the projects are medium sized with good safety records (85 per cent of the projects surveyed noted minor accidents happened or very safe sites).

6.3 Results

From a total of 55 members of staff available to complete the survey, 37 responses were received, a 67 per cent return rate. The reason for failing to complete the questionnaire were mainly related to lack of time, although it was clear that some senior members of staff thought the questionnaire impinged on the management function. The culture was identified using a climate survey questionnaire administered to all staff followed by a serious of meetings to confirm the interpretation of the survey results and to provide them with an opportunity to offer solutions and suggestions for improving the organisation.

6.4 Distribution of Questionnaire

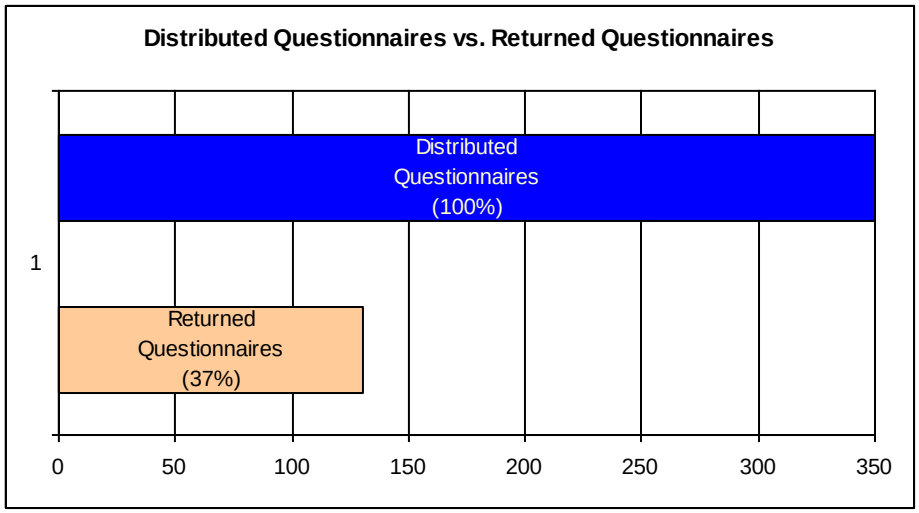
The analysis of the main questionnaire distributed for the purpose of this research is presented in this chapter. The analysis presents statistical results of the collected questionnaire based on quantitative method. The following section explains the number of survey questionnaires distributed to the oil and construction companies in the UAE and provides a general picture of the response rate. Section 6.5 below provides a complete analysis of data collected which aims at examining health and safety in construction sites in the UAE, the factors affecting H&S and whether the existing practice requires improvement. A full discussion of the findings from this questionnaire is presented in chapter 8 which also contains the findings discussions of the literature review.

The questionnaire was designed and distributed to investigate health and safety in oil and construction sites in the UAE. 350 copies were distributed to contractors in the construction and Oil sector in the UAE.

It is estimated that small and medium construction companies make up about 50% and 30% of construction and oil companies in the UAE respectively while large and oil companies constitute the remaining 20% equally. The number of questionnaires distributed to the companies was based on the percentages given above and hence 50 questionnaires were sent to companies which operate in the oil sector. On the other hand, 50 questionnaires were sent to large construction companies, 100 questionnaires were sent to medium construction companies and the remaining 150 questionnaires were sent to small construction companies.

From the 350 questionnaires, only 130 questionnaires were filled out and returned. Figure 6.1 below shows the percentage of both distributed and received questionnaires:

Figure 6.1: Questionnaires distributed vs. Questionnaires returned



6.5 Questionnaire Analysis

As remarked in the previous chapter, the questionnaire consists of 7 parts in total. The responses to each question are analysed as a whole so that an overall view of the situation

in the UAE is presented. Also, in-depth analysis by company type is conducted to determine the extent of those problems in each category.

The purpose of each question is stated while carrying out the analysis and the result is demonstrated using appropriate charts. In some parts, a number of questions are grouped together as some questions are relevant to each other, making the analysis of responses to those questions more sensible.

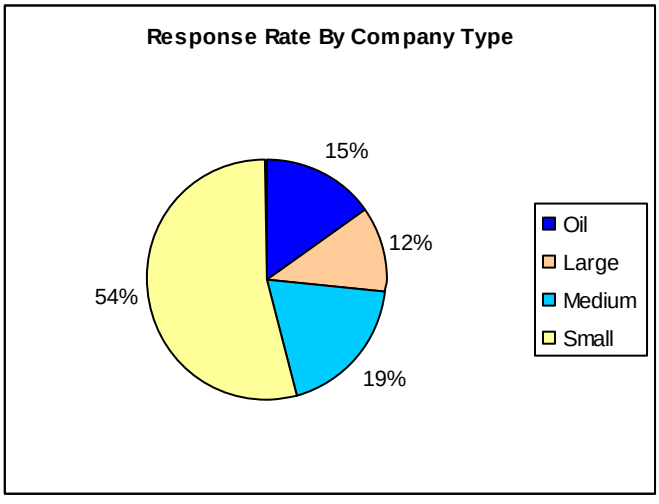
Section 1: Organisation Type

Question 1.1

The question asked organizations about their business size and type. The purpose of this question was to determine the response rate from each category.

Figure 6.2 displays that the received responses were comprised of 54% and 19% from small and medium construction companies respectively. On the other hand, the responses from large construction companies and oil companies were 12% and 15% respectively.

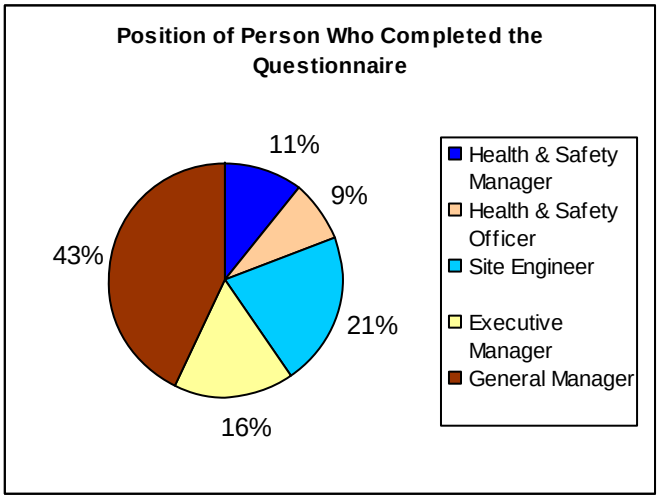
Figure 6.2: Response Rate by Company Type



Question 2 .2

In order to ensure that the responses were reliable and valid, it was important to determine the position of the person who answered the questionnaire within the company. Figure 6.3

Figure 6.3: Position of person who completed the questionnaire.



As figure 6.3 displays, 43% of persons who filled out the questionnaire were general managers of the participating companies and 21% were site engineers. Besides, 16%, 11% and 9% of the questionnaires were completed by executive managers, health and safety managers and health and safety officers respectively.

Section 2: Health and Safety Policy, Organisation and Arrangements

Question 2.1

In some countries, the possession of health and safety policy is a legal requirement since it ensures the health and safety of organisation's employees and other people affected by organisation's activities. Furthermore, poor health and safety leads to illness and accidents as well as significant costs for organisations. This question intended to explore the existence of health and safety policy in construction and oil companies and determine the general content of existing policies in these organisations.

Figure 6.4 below demonstrated that 69 % of the companies participated in the questionnaire indicated they did not have a written health and safety policy while only 31% reported having a health and a safety policy.

Figure 6.4: Overview of Possession of H&S policy In the UAE

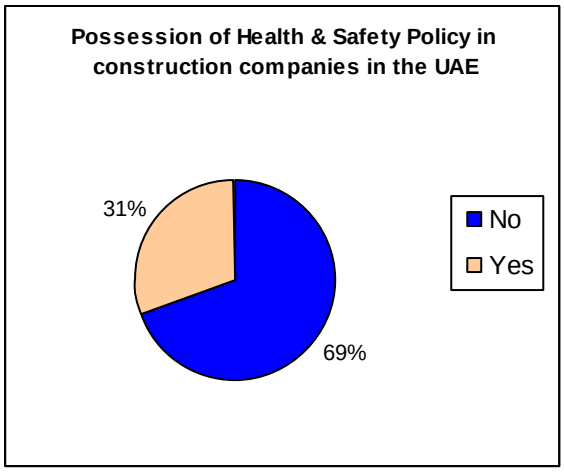
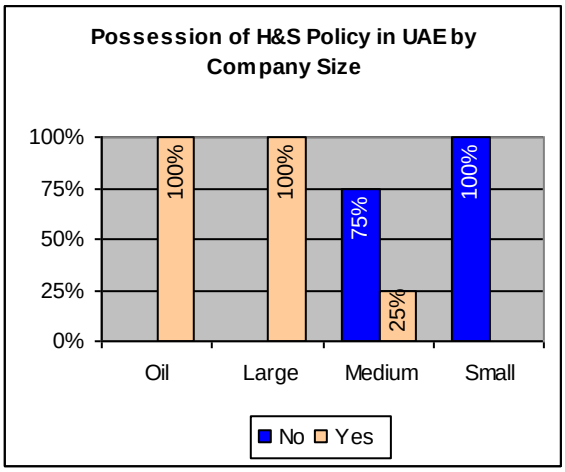


Figure 6.5: Possession of H&S policy in the UAE by Company



Further analysis of the data yielded, as figure 6.5 shows, that all small construction companies together with 80 % of medium construction companies do not have a written health and safety policy. On the other hand, the figure indicates that 20% of medium companies have a written health and safety policy yet their policies are basic and include general information about health and safety matters. Also, figure 6.5 depicts that all oil and large construction companies stated they had a health and safety policy. Generally, both types of companies stated that they had a detailed health and safety policy which contains information about the persons who hold overall responsibilities to health and safety and the day-to-day responsibility for ensuring the application of the policy in addition to the general policy statement and actions to be taken.

According to section 2 of HSW Act 1974, if the organisation employs more than five people, it must have a written H&S policy. The key elements of a clearly defined H&S policy and organisation should include (Hughes and Ferrett, 2005; Lingard and Rowlinson, 2005; HSE, 2007):

- a copy of written H&S policy statement (specifying H&S aims and objectives) dated and signed by the most senior person in the organisation, and
- H&S responsibilities for employees at all levels.

In order to carry out an effective qualitative assessment, the rating indicator concentrates on the clarity, comprehensibility and adaptability of the policy context.

The rating indicator for organisations more than five persons is designated as:

- Acceptable: The health and safety policy contains statements of the organisation's commitment to H&S and is reviewed regularly.
- Good: The health and safety policy contains the organisation's statement to H&S, specifies the H&S principles in which the organisation believes and identifies the general responsibilities of employees.
- Excellent: The health and safety policy contains the organisation's statement and principles to H&S, and clearly sets out the responsibilities for health and safety management at all levels within the organisation.

Question 2.2, 2.3 & 2.4

The purpose of questions 2.2, 2.3 & 2.4 was to identify the person who was responsible for the production of the health and safety policy in the participating companies and whether they received any health and safety training. Question 4 aimed to find out the frequency of updating the H&S policy.

Figure 6.6 indicates that 59 % health and safety polices in the participating companies which stated having a health and safety policy were signed by health and safety managers, 28 % by executive managers and the remaining 13 % by general managers.

By company type, Figure 6.7 displays that the policies the oil companies were signed by health and safety mangers that receive extensive health and safety training and had good experience in this field. On the other hand, only 26% of health and safety policies in large construction companies were signed by health and safety mangers with extensive experience and training in health and safety while the remaining 74% were signed by the executive managers of the companies who had basic health and safety training. Lastly, figure 6.7 also shows that all policies in medium construction companies were signed by their general managers with had no training and depended on site work experience to develop the policies.

Figure 6.6: Person signing the H&S policy

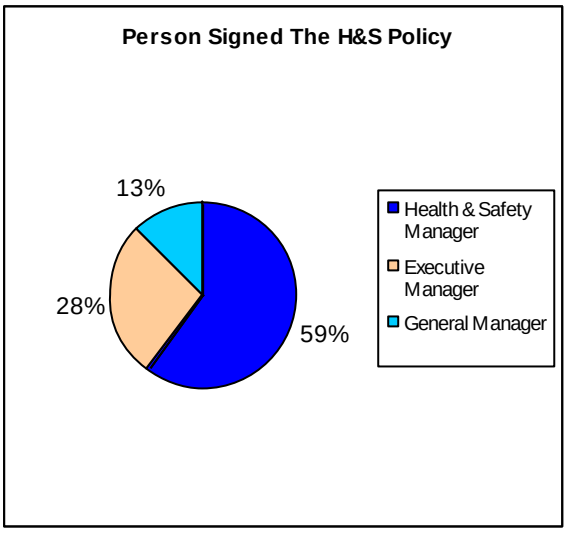
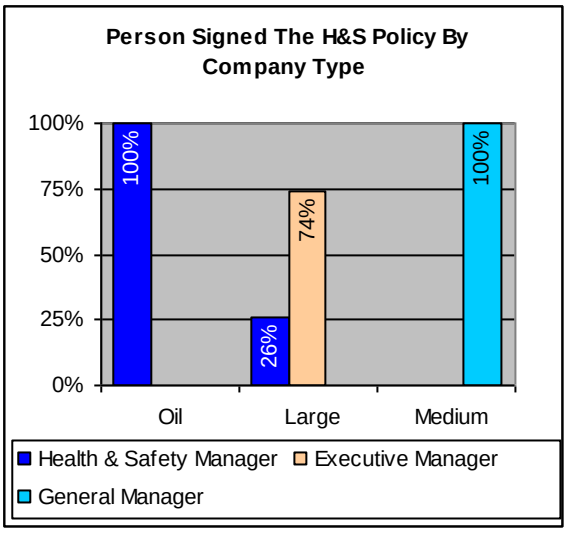


Figure 6.7: Person signing H&S policy by company type



With regard to the frequency of updating the health and safety policies, figure 6.8 illustrates that 41 % of respondents update their H&S policy every 2 years while 30% update their policies when the working conditions change. Additionally, the figure shows that the remaining 17% and 12% of respondents update their policies every 1 year and 6 months respectively.

Figure 6.8: Frequency of H&S policy update

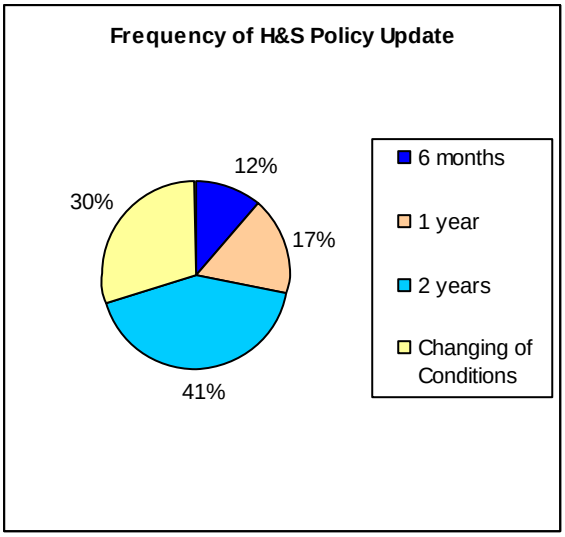
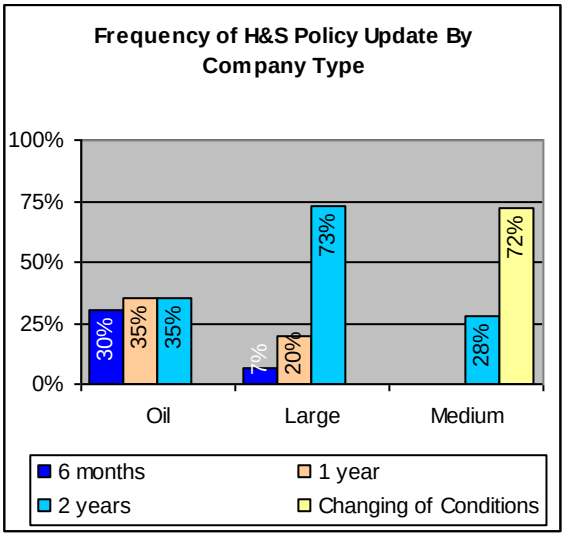


Figure 6.9: Frequency of H&S policy update by company type



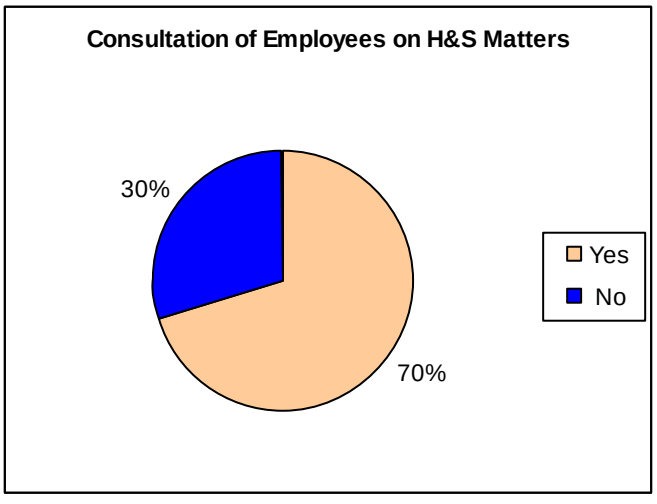
As figure 6.9 indicates, 30% of oil companies update their H&S policy every 6 months whereas 35% update the policy every year and the remaining 35% every 2 years. The situation is quite different in large construction companies where only 7% conduct an update for their H&S policy every 6 months while 20% and 73% carry out the update every 1 year and 2 years respectively. In the medium construction companies, the frequency of updating the policy drops significantly as only about 28% update it every 2 years and 72% update it upon substantial change in work conditions.

Question 2.5

Consultation with employees on health and safety is important to make sure that health and safety within the organisation is effectively managed. This question aimed to determine the attitude of employers toward employee specific health and safety issues by enquiring if the companies in the UAE consult their employees on health and safety matters.

Figure 6.10 shows that 70% of participating companies stated they consulted their employees on health and safety matters while the remaining 30% of respondents, which consists of 80.5% small construction companies and 21.5% medium construction companies, reported that they did not consult their workers. However, the explanations given by the respondents, who claimed to conduct the consultation, on how they consult their employees were not clear and unrelated to the question.

Figure 6.10: Consultation of employees on health and safety matters



Section 3: Training

Question 3.1

Formal H&S induction training are important in construction and oil companies as they help new employees adjust to their jobs and working and hence reduce job related risks. This question intended to find out if formal health and safety training induction to all new employees was undertaken by the participating companies.

As illustrated by figure 6.11, 43% of participating companies confirmed undertaking formal health and safety training induction to their new employees whereas 57% of the companies stated they did not undertake the training.

Figure 6.11: H&S induction training to new employees

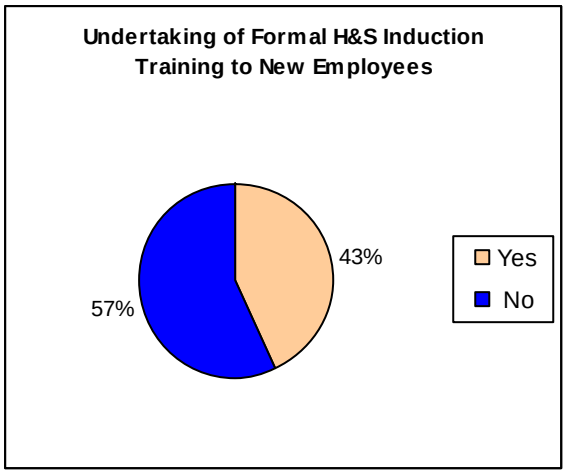


Figure 6.12: H&S induction training to new employees by company Type

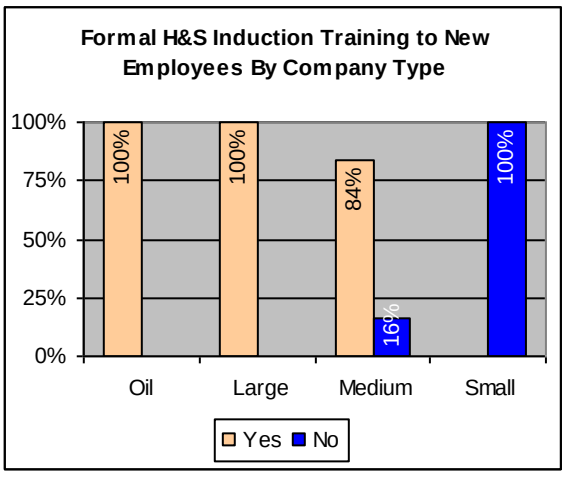
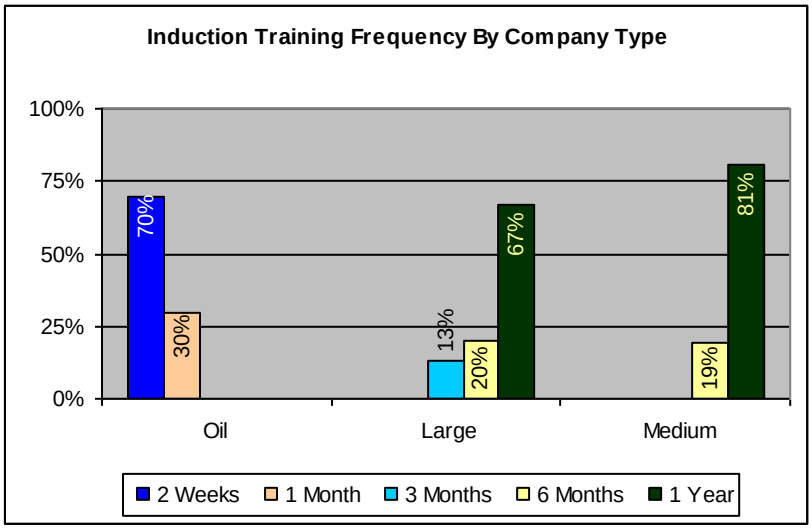


Figure 6.12 shows that along with 84% of medium construction companies, all oil and large construction companies reported undertaking the induction training while all small construction companies as well as the remaining 16% of medium construction companies stated they did not provide the induction training.

Although 84% of medium construction companies confirmed they undertook the training induction to their new employees, figure 6.13 displays that 19% of these companies highlighted that induction training was undertaken every 6 months and remaining 81% provided the training every one year . In contrast, the figure depicts 14% of large construction companies reported providing their induction training every 3 months, 22% every 6 months and 64% every one year. Lastly, 72 % of oil companies stated they provided induction training every 2 weeks with the remaining 28 % undertaking the training every 1 month.

Figure 6.13: H&S induction training Frequency to new employees.



H&S training of employees plays an important role in the management system of H&S and is a significant representation of organisation's H&S culture. A systematic training programme covering all levels in the organisation and containing life-long learning plan can effectively prevent accidents, improve H&S performance and promote a positive

H&S culture (Hughes and Ferrett, 2005). Therefore, the key elements in the minimum satisfaction standard for this criterion should include (HSE, 2007):

- training arrangements to provide employees with knowledge and skills to perform their job safely and understand the necessary information to discharge their duties.

  One or some of following examples can be seen as evidence to satisfy this element:

  - Headline training records
  - Evidence of a H&S training culture including records, certificates of attendance and adequate H&S induction training for site-based workforce.
  - Sample 'toolbox talks'.

- a programme for refresher training. An active Continuing Professional Development (CPD) programme can be seen as an evidence for this element.

As advocated by Lingard and Rowlingson (2005), the effectiveness of a training programme relies on the extent to which learning is put into practice. The rating indicator of this criterion focuses on the extent of practicality and effectiveness of the training programme, which is:

- Acceptable: A general training programme is sent out for all levels of employees from Board to trainees.
- Good: A detailed training programme including induction training, job-specific training and supervisory and management training is adequately sent out for all levels of employees from Board to trainees.
- Excellent: A detailed training programme including induction training, job-specific training and supervisory and management training is adequately sent out for all levels of employees from Board to trainees. There is solid evidence or record showing the effectiveness of the training programme, such as the improvement of H&S performance on site.

Question 3.2:

The importance of health and safety training of employees comes from ensuring that employees are not injured or made ill by the work they do as well as developing a positive health and safety culture among them which results in a safe working

environment. This question intended to find out if formal health and safety training programmes were provided to the employees by the companies.

In response to the question, 82% of the participating companies indicated that they did not have a formal H&S training programme as highlighted by figure 6.14. This percentage consists of all small and medium construction companies and 80% of large construction companies. On the other hand the remaining 18% of respondents, which is comprised of all oil companies and 20% of large construction companies, confirmed having a formal H&S training programme.

Figure 6.14: H&S training programme to new employees

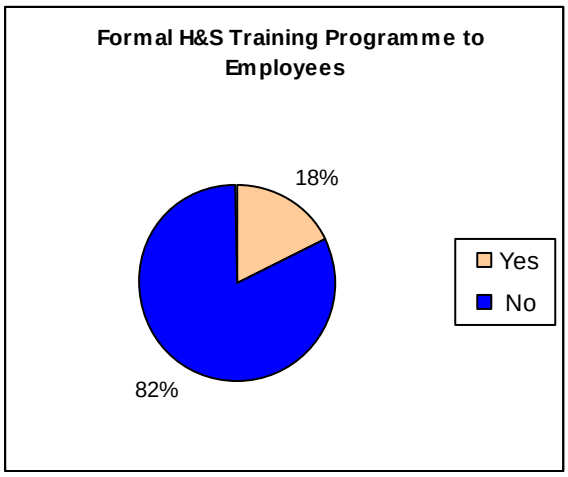
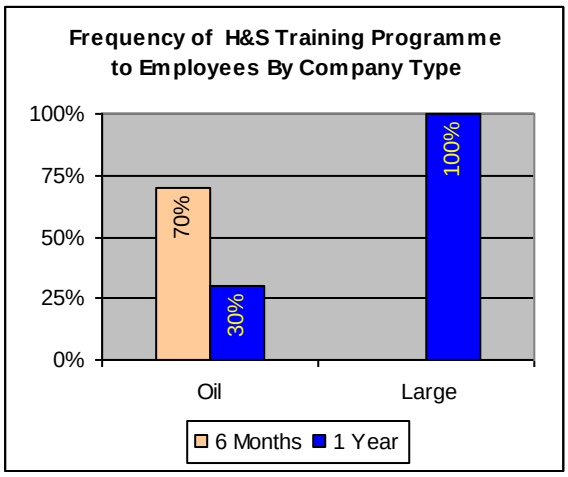


Figure 6.15: H&S training programme to new employees by Company Type



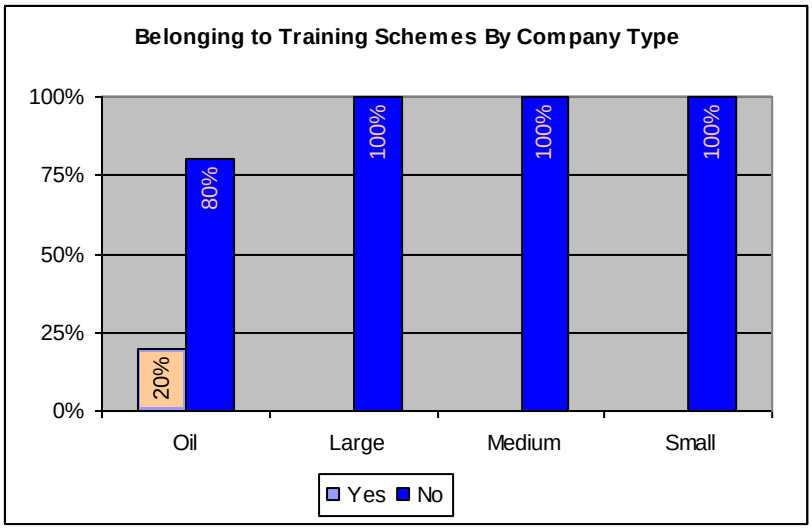
With regard to the frequency of these training programmes, figure 6.15 displays that 70% of oil companies offer training programme to their employees every 6 months while the remaining 30% provide the training programme every 1 year. Moreover, all large construction companies which provide training programme to their employees, do so every 1 year.

Question 3.3:

The purpose of this question was to determine if the participating companies belong to any training schemes provided by external bodies.

As figure 6.16 illustrates, most companies do not belong to any training schemes and this applies to all companies in the small, medium and large construction companies categories together with 78% of oil companies. The remaining 22% of oil companies stated they belonged to training schemes. Nonetheless, most companies did not provide a clear explanation about the training schemes they belong to whilst only a small amount of companies commented that personnel were sent to specific external training as needed with no further explanation.

Figure 6.16: Belonging to external training schemes



Section 4: Health and Safety Management

Question 4.1:

Risk assessment is used to protect the workers by identifying the risks in workplace, controlling them by introducing sensible measures and ensuring they stay under control. This question aimed to determine if the participating companies had procedures for undertaking risk assessments in place.

Figure 6.17 displays that 65% of companies reported not having procedures for undertaking risk assessments whilst 35% confirmed the existence of such procedures in their companies.

Figure 6.17: Procedures for undertaking risk assessment

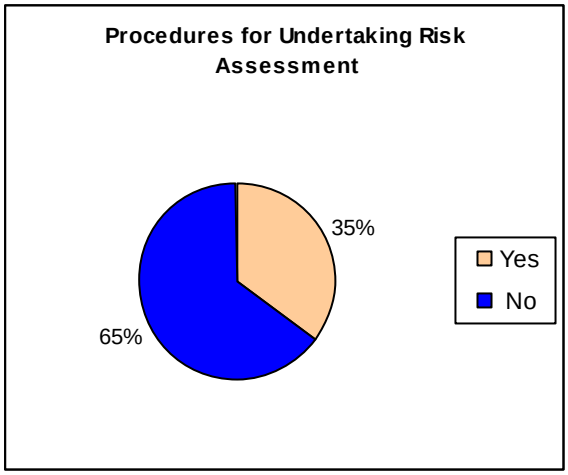
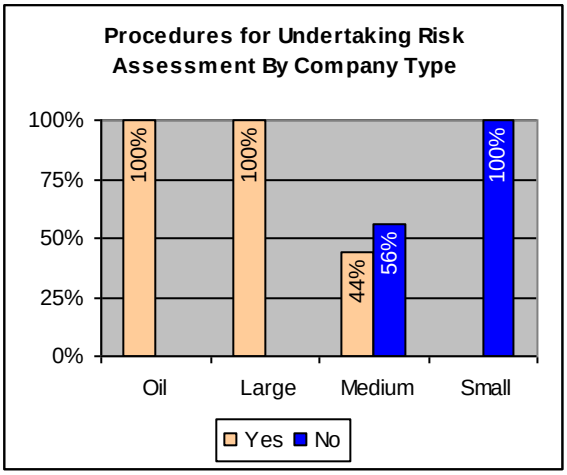


Figure 6.18: Procedures for undertaking risk assessment by company type



By company type, figure 6.18 demonstrates that all small construction companies together with 56% of medium construction companies indicated they did not have the procedures for undertaking risk assessments. On the contrary, 44% of medium construction companies, all oil and large construction companies responded positively to the question. Furthermore, all medium and the majority of large construction companies reported having general and simple risk assessments for common areas across construction sites whilst the remaining large construction companies reported having slightly more detailed risk assessments. Finally, most oil companies highlighted they had detailed risk assessments procedures which involved conducting hazard surveys in all work areas on site and listing the control measures required to eliminate them.

Question 4.2

The purpose of this question was to find out the categories for which risk assessments were undertaken. The categories were: General Risk Assessment, Site Specific Risk Assessment, Manual handling, Noise and Vibration and Hazardous Substances.

As table 6.1 displays, 60% of oil companies reported they undertook risk assessments for all the categories in question whereas the remaining 40% performing all the risk assessments with exception to Noise and Vibration. Furthermore, the table shows that 26% of large construction companies undertake risk assessments in 3 categories only and these are General Risk Assessment Site Specific Risk Assessment and Hazardous Substances. On the other hand, 74% of the large construction companies as well as all medium construction companies undertake take only General Risk Assessment and Site.

Table 6.1: Risk assessments undertaken by companies

	Oil (60%)	**Oil** (40%)	**Large** (26%)	**Large** (74%)	**Medium** (100%)
General Risk Assessment	*	*	*	*	*
Site Specific Risk Assessment	*	*	*		
Manual handling	*	*			
Noise / Vibration	*				
Hazardous Substances	*	*	*		

Section 5: Health and Safety Monitoring, Audit and Review

Question 5.1:

The purpose of this question was to determine the existence of internal H&S department within the participating companies.

Figure 6.19 illustrates that 82% respondents reported there was no H&S department within their companies while 18% confirmed the presence of such department in their companies.

Figure 6.19: Possession of internal H&S department

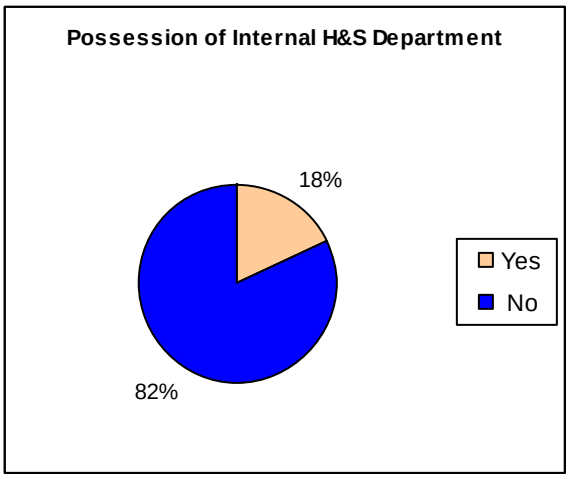
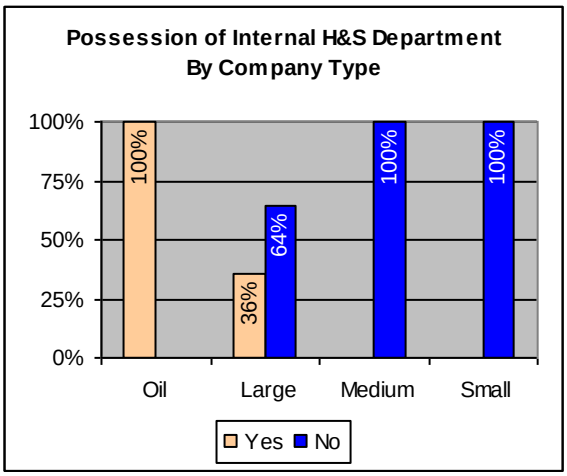


Figure 6.20: Possession of internal H&S department by company type



By company type, figure 6.20 displays that all oil companies together with 26 % of large construction companies reported having an internal H&S department explaining that this department deals with all H&S issues in the company. Also, the figure indicates the 82% of respondents who reported that there was no H&S department within their companies comprises of the remaining 73% of large construction companies in addition to all medium and small construction companies.

Monitoring, audit and review constitutes a systematic process to measure the achievements of H&S policy and objectives; inspect the efficiency, effectiveness and reliability of the H&S management system; and assess the adequacy of performance of the H&S management system (Lingard and Rowlinson, 2005). Monitoring, audit and review are key activities in making sure that the organisation's H&S management system is working properly and collecting practical information for the further improvement.

According to the CDM Approved Code of Practice (2007), an organisation which wants to meet the minimum satisfaction rule of this criterion should have a system that can:

- Monitor the procedures of H&S performance
- Audit the them at periodic intervals, and
- Review them on an ongoing basis.

For the convenience of assessing, the following examples can be seen as the evidence of satisfaction (HSE, 2007):

- Evidence of formal audit or discussions/reports to senior managers.
- Evidence of recent monitoring and management response.
- Copies of site inspection reports.

Since this is a procedure-based criterion, the qualitative assessment is based on the extent of detail and practicality of the system. The rating indicator is demonstrated as:

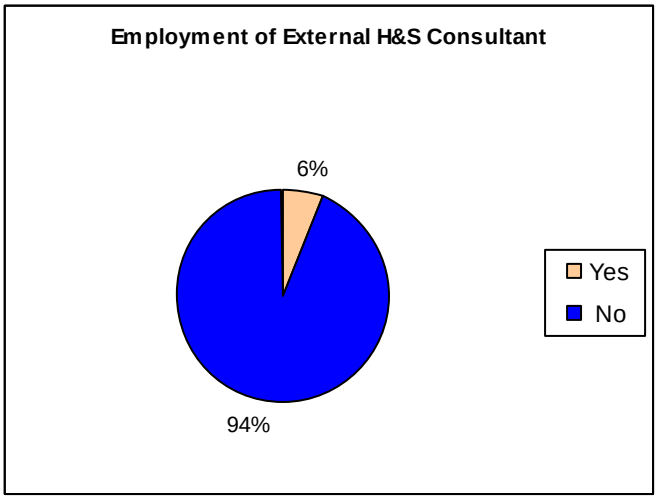
- Acceptable: Documented evidence (at least one type of the above evidence for minimum satisfaction checking) shows that general monitoring, audit and review system has been in place.
- Good: Documented evidence (at least 2 type of the above evidence for minimum satisfaction checking) shows that structured monitoring, audit and review system has been established.
- Excellent: Documented evidence (at least 2 type of the above evidence for minimum satisfaction checking) shows that structured monitoring, audit and review system has been established. Furthermore, evidence shows that the system can identify limitations or drawbacks in the performance of H&S management and develop corrective methods to improve the effectiveness of H&S management.

Question 5.2:

The purpose of this question was to find out if the participating companies seek additional advice and information on Health and Safety matters by employing external H&S consultants.

Figure 6.21 demonstrates that apart from a small number of companies (6%), which are oil companies, all other companies do not employ external H & S consultants.

Figure 6.21 Employment of external H&S consultant in UAE construction companies



Question 5.3:

This questions aims to determine if the companies have H&S committees.

Figure 6.22 demonstrates that while only 6% of respondents confirmed having H&S committee in their companies, 94% stated they did not. Additionally, figure 6.23 displays 30% of oil companies and 13% of large construction companies reported having H&S committee whereas the remaining of 70% of oil companies and 87% of large construction companies together with all medium and small construction companies reported that they did not possess such a committee within in their companies.

Figure 6.22: Possession of H&S committee

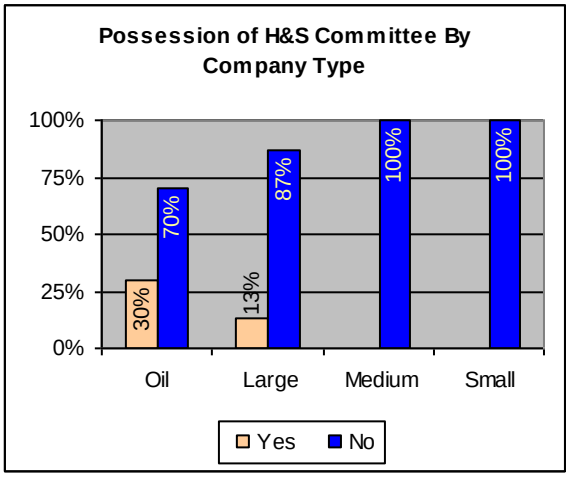
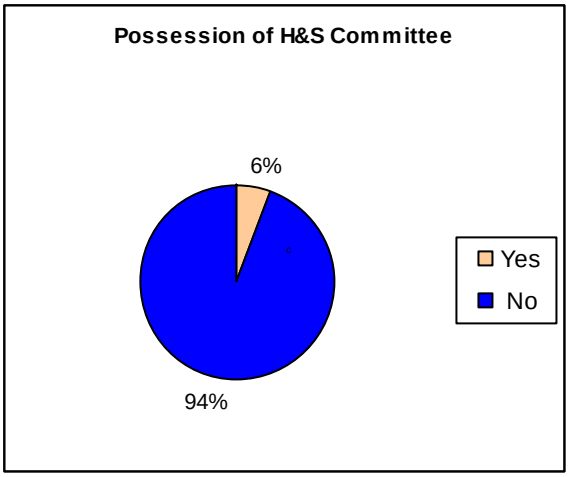
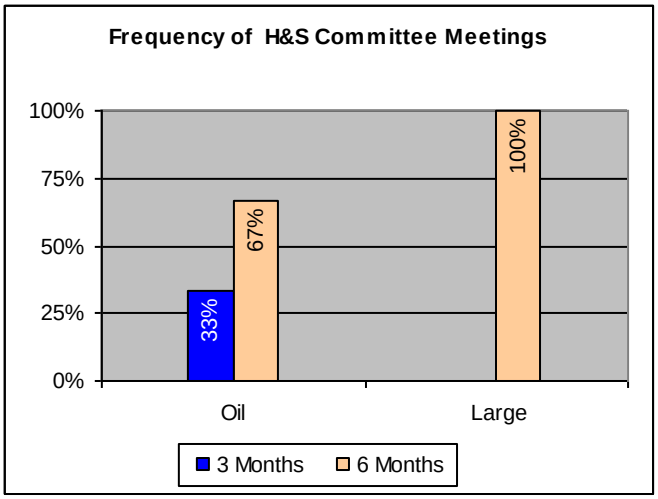


Figure 6.23: Possession of H&S committee by company type



With regard to the frequency of committee meetings, figure 6.24 demonstrates that the committee in 33% of oil companies hold its meetings every 3 months whereas the committee in 67% of oil companies as well as 100% of large construction companies hold its meetings every 6 months.

Figure 6.24: Frequency of H&S committee meetings.



Question 5.4:

With site and work conditions constantly changing in the construction industry in the UAE, new health and safety hazards and risks may appear. This question aimed to

determine the interval at which formal site health and safety inspections were undertaken by the participating companies taking any arising hazards into consideration.

As figure 6.25 depicts; only 19% of participating companies confirmed undertaking formal site health and safety inspections. By category, figure 6.26 highlights that all oil companies as well as 33% of large construction companies carry out formal site H&S inspection while the remaining 57% of large construction companies in addition to all medium and small construction companies do not take carry out the inspection.

Figure 6.25: Undertaking formal site H&S inspection

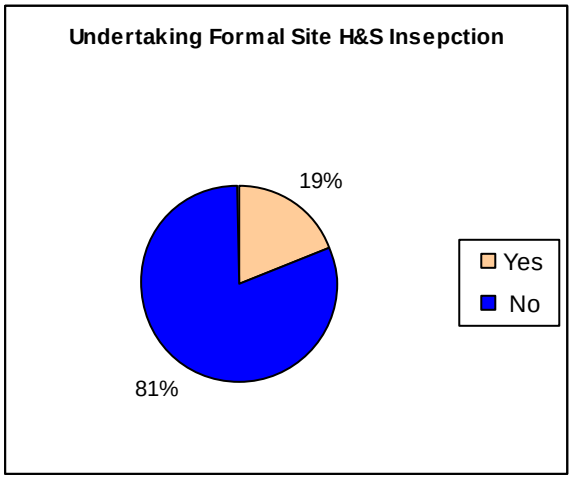
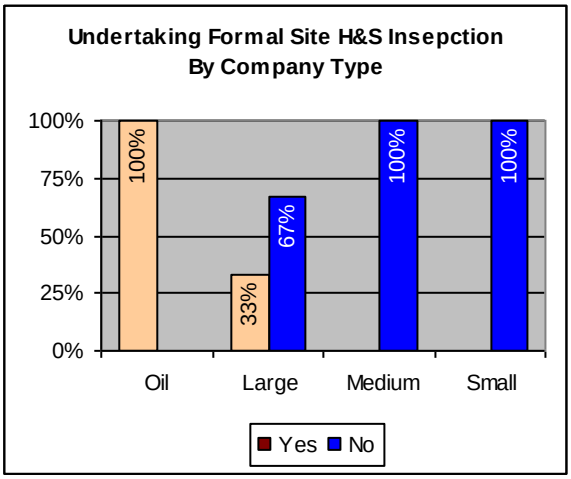
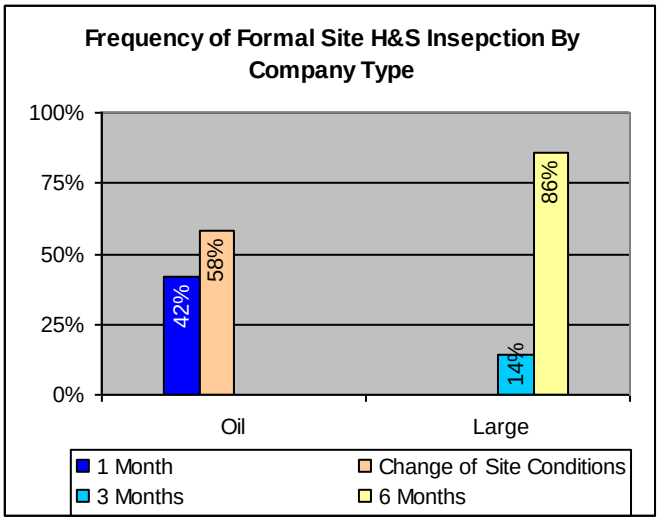


Figure 6.26: Undertaking formal site H&S inspection by company type



With reference to the frequency of inspections, figure 6.27 displays that 42% of oil companies stated they executed the site inspections on a monthly basis and the other 58% undertaking inspections upon changing of site and work conditions with no more than 2 months duration between 2 consecutive inspections. On the other hand, 86% of large construction companies highlighted that they carried out site inspections at 6 months intervals whilst the remaining 14% reported doing the inspection every 3 months.

Figure 6.27: Frequency of formal site H&S inspection



Question 5.5 & 5.6:

The H&S situation in any organisation can always be improved if mistakes within the system are noted and actions are taken to eliminate these mistakes. Question 5.5 aimed to find out if all accidents to employees were recorded by the participating companies while question 5.6 explored if the accidents report was utilised to improve the method statement such that similar accidents did not occur again.

Figure 6.28 shows 78% of participating companies do not record all accidents to employees while 22% of companies record all accidents that occur to their employees.

By category, figure 6.29 displays that all oil companies together with 60% of large construction companies record all accidents to their employees while 40% of large construction companies as well as all medium and small construction companies do not keep a record of accidents to their employees.

Figure 6.28: Recording of accidents to employees

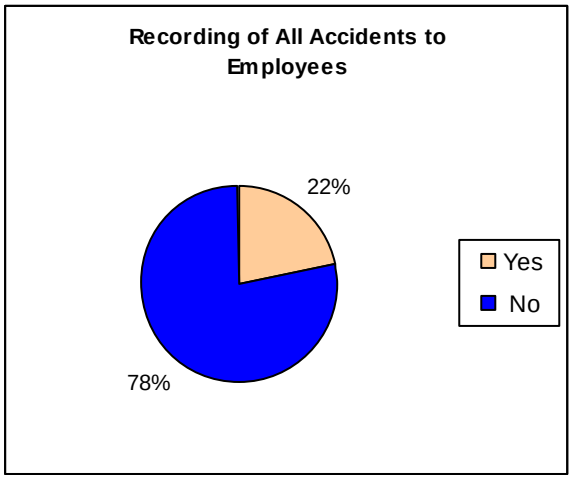
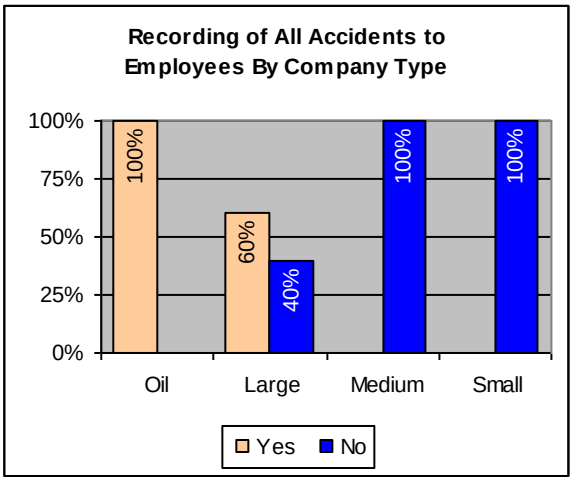
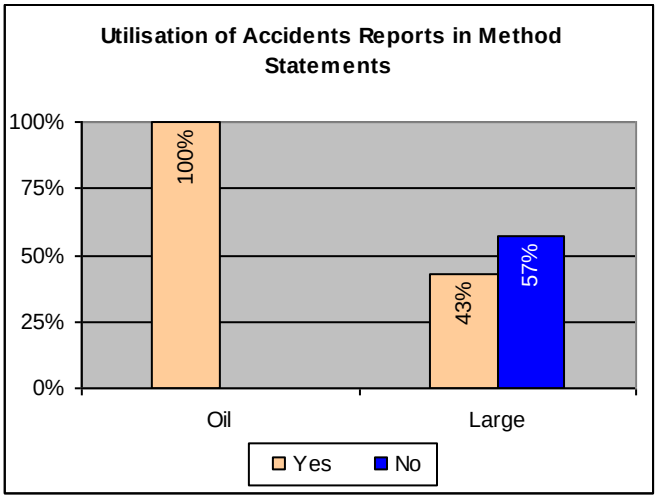


Figure 6.29: Recording of accidents to employees by company type



With regard to the utilisation of accidents reports to prevent similar accidents from taking place in the future, all oil companies as well as 43% of large construction companies, as figure 6.30 highlights, stated they consulted the reports and revised their method statements to include preventive measures. On the other hand, the remaining 57% of large construction companies reported that they did not consult the accidents report.

Figure 6.30: Utilisation of accidents reports



In the UK, according to the Health and Safety Executive's (HSE) RIDDOR (the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995), all employers, no matter has large or small, should report certain more serious accidents and incidents to the HSE or other enforcing authority and to keep a record (*ibid.*). In addition to the compulsory external incident reporting system, the organisation should establish an internal system to report and investigate all incidents including 'lost time' injuries, 'no lost time' injuries and near miss.

The reporting of an incident can help to evaluate the effectiveness of prevention strategies and is an essential first step in future incident prevention (Lingard and Rowlinson, 2005). In order to assess the system for incident reporting, the key elements of minimum satisfaction for this criterion include (HSE, 2007):

- The organisation should provide records of all RIDDOR (the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995) reportable events for at least the last 3 years.
- A system should be established to review all incidents and recording the action taken as a result.
- The organisation should record any enforcement action taken against the organisation over the last five years, and the action which the organisation has taken to remedy matters subjective to enforcement action.

One or some of following examples can be seen as evidence to meet the minimum standard:

- Evidence showing the way in which the organisation record and investigate accidents and incidents.
- Records of last two accidents/incidents and action taken to prevent recurrence.
- Records of any enforcement action taken over the last five years, and what action was taken to put matters right.
- For larger companies, simple statistics showing incidence rates of major injuries, over three-day injuries, reportable cases of ill health and dangerous occurrences for the last 3 years. Records should include any incidents that occurred whilst the company traded under a different name, and any incidents that occur to direct employees or labour-only sub-contractors.

The measurement of an organisation's accident reporting and investigation system could focus on the integrity of its incident track-record and the effectiveness of the investigation system for further accident prevention. The rating indicator for the qualitative assessment of this criterion is presented as:

- Acceptable: All reportable events in the recent 3 years are in the place. The records including last two accidents/incidents and follow-up actions, and any enforcement actions if occurred in last five years are available.
- Good: Besides the evidence listed at acceptable level, other documented evidence is provided to show that the accident investigation system has been established and can work effectively.
- Excellent: Besides the evidence listed at acceptable level, other documented evidence showing that the accident investigation system can work effectively and the corrective or preventative recommendations resulted from the investigation can be implemented and have positive impact on the organisation's H&S performance.

Question 5.7:

This question asked the participants if they had been issued with an improvement notice, a prohibition notice, or been prosecuted by any enforcement agency with the last 3 years. This was to determine if the construction companies in the UAE was being monitored by any H&S agencies which attempted to improve the health and safety situation in construction sites.

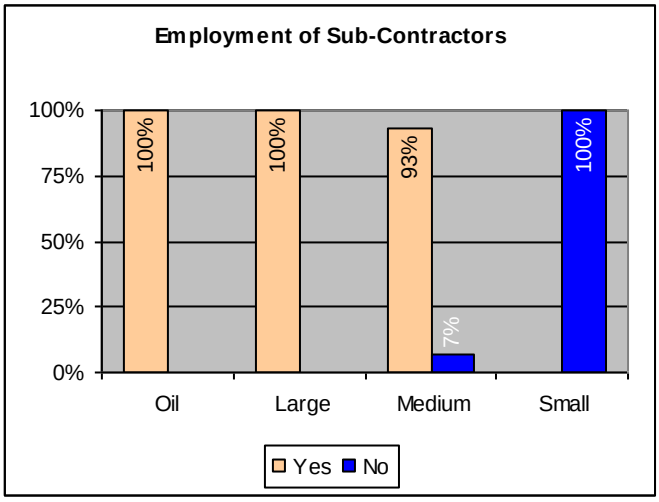
Surprisingly, all participating companies stated that they had not issued any sort notice or been prosecuted by any Enforcement Agency in the UAE.

Question 6.1: Sub-Contractors

This question aimed to find out if the participating companies employed any sub-contractors as the remaining questions in this section were all about H&S of sub-contractors employees.

Figure 6.31 displays that apart from small construction companies and 7% of medium construction companies, all participating companies employ sub-contractors.

Figure 6.31: Employment of sub-contractors



Sub-contracting/consulting is a prevalent and economical method of acquiring expertise, skills, labourers and plants in the modern construction process. In order to maintain a controllable H&S management, the main contractor/consultant must take the responsibility of H&S for the multiple-layer subcontracting/consulting, as it is unreasonable and ineffective to subcontract H&S obligations to those other organisations (Lingard and Rowlionson, 2005). If there are sub-contractors/consultants involved in the project, the main contractor/consultant should make sure the satisfaction of the following elements:

- Arrangements for appointing competent sub-contractors/consultants and ensuring their arrangements for appointing competent sub-contractors/consultants,
- Arrangements for monitoring sub-contractor performance.

The assessment of the above minimum satisfaction standard can be carried out by checking the following examples (HSE, 2007):

- Evidence showing how the lead organisation ensures sub-contractors are competent.
- Examples of sub-contractor assessments the lead organisation has carried out.
- Evidence showing how the lead organisation requires similar standards of competence sub-contractors.
- Evidence showing how the lead organisation monitors sub-contractor performance.

For the measurement of this criterion, it would be reasonable and practicable to evaluate how the organisation is performing sub-contracting/consulting. An organisation with a structured sub-contracting/consulting system would be better than one using casual approaches in selecting H&S competent sub-contractors and consultants and monitoring their H&S performance and further appointment. The rating indicator for sub-contracting/consulting procedures is stated as:

- Acceptable: Some forms of pre-qualification H&S assessment such as questionnaire responses, meeting minutes or audit records, have been applied to select competent sub-contractors/consultants and monitor their work and further appointment.
- Good: A general selection and monitoring system for different layer's sub-contractors/consultants has been in the place with practical evidence (at least 3 samples) showing that sub-contractors/consultants can be appropriately selected and effectively monitored.
- Excellent: A general selecting and monitoring system for different layer's sub-contractors/consultants has been in the place with substantial evidence (a record of projects in recent 3 years) showing that sub-contractors/consultants can be appropriately selected and effectively monitored.

Question 6.2:

Similar to question 5.5, this question aimed to find out if all accidents to sub-contractors' employees were recorded by the participating companies.

As figure 6.32 depicts, 55% of respondents confirmed recording all accidents to sub-contractors employees whilst 45% replied negatively to the question.

Figure 6.32: Recording of accidents to sub-contractors' employees

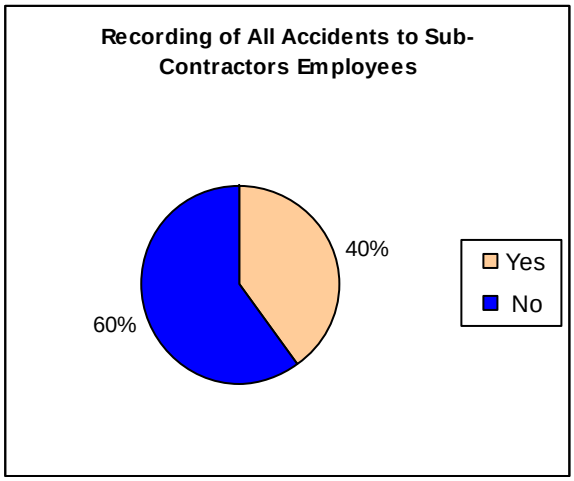
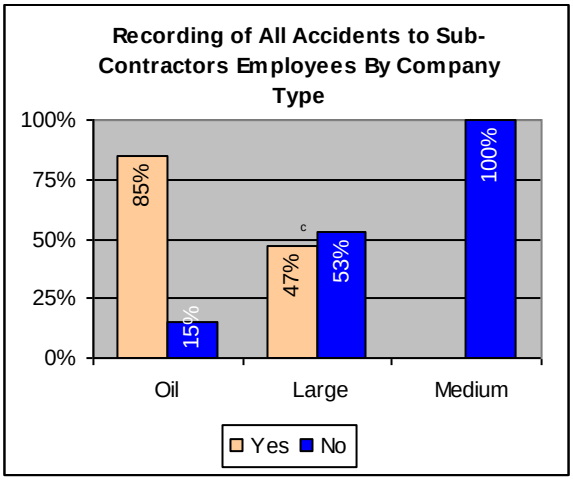


Figure 6.33: Recording of accidents to sub-contractors' employees by company type



Categorically, all medium construction companies as well as 53% of large construction companies and 15% of oil companies stated that they did not record all the accidnets as figure 6.33 illustrates. Then again, 47% of large construction companies together with 85% of oil companies reported recodring accidents to sub-contractors' employees.

Question 6.3:

This question asked participants if any of the sub-contractors directly under their control had been issued with an improvement notice, a prohibition notice, or been prosecuted by any enforcement agency with the last 3 years.

Similar to the response to question 5.7, all participating companies stated that no subcontractors working under their direct control had not issued any sort notice or been prosecuted by any enforcement agency.

Section 6.4:

This question attempted to determine if the participating companies provided H&S training to the employees of sub-contractors.

All respondents reported that they did not provide training to sub-contractors employees as they expected the employees of the subcontractors to be trained by their employer.

Section 7: Environmental Policy & Procedures

Question 7.1:

The question asked the participants if they had a written environmental policy. Figure 6.34 highlights that only 16% of companies had a written environmental policy while the remaining 84% did not have one.

Figure 6.34: Possession of environmental policy

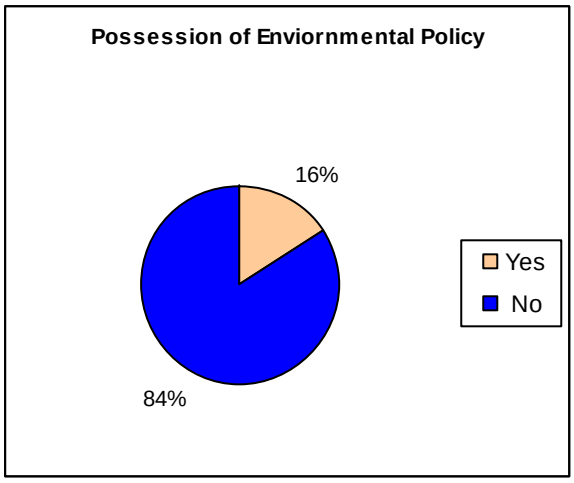
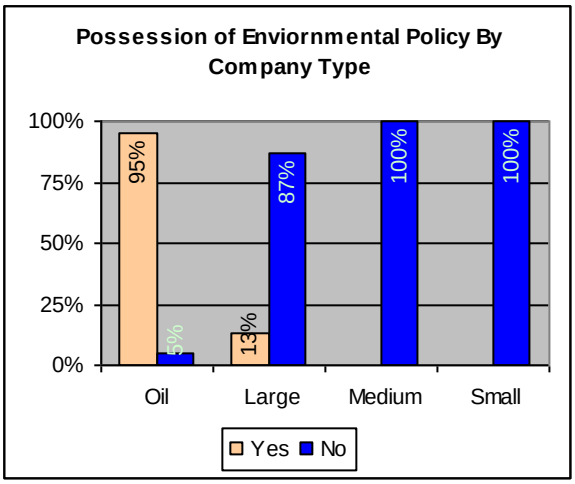


Figure 6.35: Possession of environmental policy by company type



Categorically, figure 6.35 highlights that 95% of oil companies and 13% of large construction companies stated they had an environmental policy whilst the remaining 87% of large construction companies together with all medium and small construction companies do not possess an environmental policy. In general, all oil companies which confirmed possession of policy explained that the policy was mandatory to all seashore operations and business giving no further explanation while the large construction companies did not provide any explanation.

Question 7.2:

This question aimed to determine if the company or any of the sub-contractors had been issued with a formal notice, or had been the subject of legal proceedings by any environmental agency or local authority within the last 3 years.

Once again, all participating companies stated that no subcontractors working under their direct control had not issued any sort notice or been prosecuted by any environmental agency or local authority.

6.6 Summary

6.6.1 Health and Safety Policy

With respect to the health and safety policy in the UAE construction companies, the questionnaire shows 69% of construction companies in the UAE have a serious lack of understanding of H&S policy importance. It specifically shows that this problem is serious in all small and 75% of medium construction companies as they have no awareness of such policy. Although the questionnaire highlights that 25% of medium construction companies possess an H&S policy, it is apparent from their explanation they are not fully aware of what kind of information the policy should contain.

To be able to produce a comprehensive health and safety policy, it is usually required to have extensive health and safety training. The questionnaire reveals a problem in this respect in the UAE as all medium construction companies tend not to have a specialised health and safety officer and hence produce poor health and safety policies. Similarly, the questionnaire demonstrates that the H&S policy in 74% of large construction companies was signed by the executive managers of the companies who had basic training in health and safety. This could be problematic for companies of this size since their health and safety policy must be comprehensive and this is not usually achieved with basic health and safety training. On the other hand, as shown in the questionnaire analysis, in all oil companies and 27% of large construction companies, health and safety policies were

signed by health and safety mangers with extensive experience and training in health and safety which reflects their awareness of its importance and commitment to the safety of their employees.

The frequency of updating the health and safety policy in these companies fluctuates widely, as the analysis displays that only 30% of oil companies along with 7% of large construction companies update their H&S policy every 6 months, which displays their appreciation of such action as to include any new arising health and safety issues in their policies and mitigate them effectively. In contrast, the analysis depicts a problematic situation in the remaining companies as 35% and 20% of oil companies and large construction companies respectively update their policy every one year only which is considered, to some extent, insufficient, as companies of this size are expected to have constant changing working conditions often which render their policy out of date. The situation becomes worse with the remaining 35%, 37% and 28% of oil, large and medium construction companies respectively as they update their policies only once every 2 years. The remaining 72% of medium construction companies update their polices only upon of significant change of working conditions which means, taking their work size into account, may not update their policy for up to 3 years as they do not usually see any major change in their work nature.

With regard to the consultation of employees on health and safety matters by the companies, the analysis of data reveals the situation in the UAE is quite difficult as 70% of companies report they consult their employees, yet their explanation of the consultation is vague. For example, in response to the question, a company stated the following “we are conducting heath safety programs and safety heath campaigns”. This suggests that most of these companies either do not consult their employees in reality, and hence are embarrassed to admit it, or their consultation is poor and do not address any critical health and safety issues.

The analysis of the questionnaire reveals at first sight that all oil, large and 84% of medium construction companies have a healthy attitude toward the formal health and safety induction training to new employees. However, this perspective fades once the analysis of their response to the frequency of their health and safety induction training is consulted as it reveals that 19% and 20% of medium and large construction companies respectively undertake the training induction every 6 months. Additionally, the frequency

analysis demonstrates that 81% and 67% of medium and large construction companies respectively undertake the training once a year only with the remaining 13% of large construction companies undertaking the training every 3 months. As health and safety induction training to new employees is intended to help new employees adjust to their jobs and working and hence reduce job related risks, the practice of providing this training only once every 3 months, 6 months or once a year is considered to be dangerous as it leaves new employees vulnerable to the workplace risks. On the contrary the results from oil companies shows their commitment to the health and safety of their new employees as 70% of them undertake health and safety induction training every 2 weeks and 30% undertake the training on a monthly basis. Also, these companies explains that all new employees must attend this training before commencement of work and hence new employees would be made fully aware of the risks associated with their jobs.

Corresponding to health and safety induction training, the questionnaire reveals the general poor attitude of the UAE construction companies toward the continuous health and safety training of their employees as only 18% of respondents confirmed having such training. This percentage consisted of 86% of oil companies and 14% of large construction companies. These figures clearly show the lack of awareness of small, medium and large construction companies in the UAE with regard to the importance of health and safety training. In contrast, 70% of the oil companies provide formal health and safety training to their employees every 6 months while the remaining 30% along with all large construction companies, which have health and safety training, do so every one year. This indicates the commitment of these companies to the safety of their employees. It is noted that only oil and large construction provide H&S training and this could be due to the fact, owing to the size of their business, they could allocate sufficient budgets for health and safety training while other companies most probably do not have this privilege.

In terms of awareness of training schemes importance, the questionnaire reveals a serious problem across the oil and construction industries as all small, medium and large construction companies as well as 80% of oil companies do not belong to any training schemes. This reflects their ignorance of the benefits of such schemes as most of those training provide updated information on all aspects of work on site which directly and in

directly affect the health and safety in construction sites . Such information, for example, makes managers and supervisors aware of new or unnoticed hazards and risks on site so that they could be mitigated or eliminated resulting in safer and more efficient sites. Although 20% of oil companies reported belonging to health and safety training schemes, most of these companies did not provide clear explanations about the training schemes they belonged to, whilst only a small number of companies commented that personnel were sent to specific external training as needed with no further explanation. It could be argued that either the companies, in the first case, may have falsely reported they belonged to training schemes or, since the question was an open-end one, they were confused as to what sort of explanation was needed or hence left it unanswered. Similarly, the brief explanation provided by the remaining companies may because they did not belong to such schemes, which is not very probable or, once again, owing to the nature of the question as it did not ask for specific information.

6.6.2 Health and Safety Management

In terms of undertaking risk assessments, the questionnaire highlights that there is, to some degree, an appreciation of risks assessments across the UAE construction companies as all oil companies as well as large construction companies and around 44% of medium construction companies have procedures for undertaking risk assessments. Nonetheless, the questionnaire also reveals that 40% of oil companies need to improve their risk assessments procedures as they do not carry out risk assessments for Noise & Vibration which is a major issue in the oil sector. Additionally, it shows both large and medium construction companies that do have risk assessments procedures, need to improve their risk assessments content as 26% of large construction companies do not cover all areas of work in their risk assessments including Manual Handling and Noise & Vibration whilst the remaining 74% of large construction companies along with all medium companies cover only General Risk Assessment for sites leaving a great amount of hazards and risks uncovered by their risk assessments and method statements.

6.6.3 Health and Safety Monitoring, Audit and Review

With regard to the health and safety inspection of sites, the questionnaire indicates that apart from oil companies and 33% of large construction companies, no other construction companies in the UAE take this matter seriously. Bearing in mind work conditions

constantly change in construction sites resulting in new risks and hazards which are unaccounted for in the original risk assessment, the results reflect the poor health and safety situation in these companies as most, if not all, new hazards and risks go unnoticed since no inspections are conducted which compromises the safety of employees on site. In terms of frequency of H&S inspection conduction, the questionnaire highlights the awareness of both oil and large construction companies of such practice as the frequency of inspection ranges between 1 and 6 months. Nevertheless, the 6 month inspection interval, which solely adopted by 86% of large construction companies, may be argued to be too long when considering the size of projects carried out by this sort of companies. This is because risks on site may accumulate dramatically in such a period making the site unsafe for the employees.

In terms of accidents recording, the questionnaire depicts that construction companies in the UAE generally need to improve their practice in this area with exception of oil companies and a small percentage of large construction companies. The questionnaire displays that all medium and small companies as well as 40% of large construction companies do not record all accidents to their employees or any subcontractors' employees. Out of the remaining 60% of large construction companies, only 43% (i.e. 26% of total figure) of them together with all oil companies utilize accidents reports. The importance of recording accidents comes from determining the circumstances under which they took place and applying preventive measures to ensure such accidents do not occur again. Apparently, this practice is not carried out by some 78% of construction companies in the UAE, and accidents on their sites are most likely to occur on a regular basis, exposing employees to a great deal of risk.

The inconsistency in accident reporting and recording was echoed by the findings from the interviews. Indeed, all interviewees admitted that the process of reporting accidents and recording them is not robust and that accidents often go unreported, and even when reported they are not recorded.

With reference to enforcement agencies which deal with H&S issues in the UAE, the questionnaire reveals an untouched problem in this industry as all participating companies stated that they or any subcontractors working directly under their control had not been issued with any kind of improvement notice, prohibition notice or been prosecuted for neither health & safety nor environmental issues. Taking into account the

poor situation of health and safety in the majority of UAE construction companies, this kind of response suggests either companies are embarrassed to admit being issued with notices or prosecuted as this would have an impact on the reputation of the company or it could be that no such enforcement agencies exist to regulate and oversee major health and safety issues in the UAE construction industry.

6.7 Overall findings

In this section, the discussion of the findings is carried out with reference to the literature review, interviews and questionnaires undertaken. The discussion is divided into a number of specific sections dealing with different aspects and issues raised by the survey (questionnaires and interviews).

6.8 Human Causes

Human causes are those human interventions (influence) on accident under reporting such as personal attitude, skill and knowledge in reporting, communication skill, etc.

The results indicate that majority of contractors ranked the employees have insufficient or lack of knowledge and skill in accident reporting system compared to other causes. This is not surprising when in the UAE the vast majority of work force on construction sites is made of foreign labour and with many of them taking the job of construction worker without past experience and proper training.

The structured interviews have also highlighted the existence and influence of cultural barriers that seem to contribute to some employees not adhering to health and safety procedures on site. For instance, 87% of respondents strongly agree that there exist cultural barriers to adhesion to H&S procedures, although 91% said they were not made aware of such barriers, which suggests that the issue was not discussed or was therefore ignored by the employer.

The reasons could be because health and safety is not seen as something important due to lack of awareness or simply because the employer himself is not strict about enforcing health and safety on site.

6.9 Accident Reporting System Causes

In the UK, (DOSH) has given guidelines to companies to ensure that they meet the requirement of Occupational Safety and Health Act 1994.

In the UAE, in response to the accident reporting system, most employees feel that the accident reporting system is confusing and the methodologies are not well explained. This may be due to the low educational level of the workers, lack of training, cultural and language barriers. There may also be fear of reporting because the worker thinks he may lose his job if he complains.

However it is also true senior site engineers fail in their duties to report and record accidents for some of the reasons above.

The questionnaires and interviews from the current study suggest that accident reporting and recording are serious problems that needs addressing by most UAE companies. Again, this could be a cultural issue or simply a lack of awareness of the importance of the issues to the business as well as the well-being of the employees in the workplace.

For instance, the interviews with senior site engineers revealed that 86% of respondents admitted that they did not adhered to accident reporting procedures, and a similar percentage (83%) admitted not recording accidents. This is very worrying and raising questions about a serious lack of awareness of the importance of H&S not just by simple employees but by senior managers as well.

6.10 Organisation Causes

Management and company policy always play an important role in the success of implementing the accident reporting system. In this survey, several questions were asked in terms of company policy, encouragement and management roles when dealing with accident reporting system in a company. Risk assessment and management were highlighted by the interviews as well

Employees in the contractors' firms commented that the company policy does not emphasize the importance of accident reporting systems and procedures in the company, which affects the success in implementing the accident reporting system within the company. Local construction firms which are not always exposed to the latest progress

and updates in accident reporting may found it difficult to follow, and therefore have a biased attitude towards the accident reporting process. Consequently, it is not emphasised in the company policy.

On the questions of risk assessment and risk management, the interviews with senior site engineers revealed that a staggering 77% of respondents admitted that risk assessment did not exist and a similar number (70%) said that risk management did not exist. In both cases it is possible that there were no procedures to carry out risk assessment/management, or simply the site engineers were not aware of their existence.

6.11 Time Causes

In the business world, time causes are always the main concern for the employers and employees. For the accident reporting system, there are a few area to be concerned in which are time consumed to fill in the forms, time consumed to investigate the accident, time consumed to deal with the authority and the time consumed to prevent the accidents in the construction site. Each category of survey participants have different point of view in regard with the time causes which influence the success of implementation of the accident reporting system. Contractors are more concerned about the time needed in order for accident investigations. Overall construction progress on site needs to be followed despite any accidents taking place. Therefore, contractors tend to avoid reporting any accidents which require proper and detailed investigations because of the time it can take. Consultants who responded in this survey commented that in most of the time, the employers are reluctant to report accident cases due to the company reluctant to consume time and manpower to analyze the accident report. Personnel who are responsible in the accident reporting system in a company is normally having other job responsibilities as well. Most of them are not able to pay 100% attention in dealing with the accident happened in their company.

6.12 Company size causes

As was revealed by the questionnaire results from this study, company size had a significant influence on a company's health and safety performance. This result was consistent with research by Hinze (1988), Wilson (2000) and Holmes (1999). The study

shows that there were important differences between the larger and smaller contractors on all CIDA elements.

This is not a surprising finding because smaller companies lack the resources to perform at a high level of health and safety performance. In general, smaller companies have poorer standards. All of the bottom five performing companies had less than ten employees. Monk (1994) stated that a large number of occupational accidents and injuries are mainly due to a breakdown in the existing health and safety management systems. His results were found to be consistent with the current research. When contractors scored highly in the management responsibility and health and safety system elements their total health and safety standards tended to be higher. These two elements have the highest overall average scores, and it is likely that many of the respondents recognised their importance.

Wilson (2000) found that safety training plays a part in the health and safety standard. The results of the research found that smaller companies perform poorer in this element compared to larger companies. However, it does not seem to be a major factor that influences the overall safety standards.

One of the unexpected findings in this research was that all the companies' scores for inspection and testing were the lowest amongst all the other elements. The reason is that there are few regulatory guidelines or mandatory requirements for this element. Hinze (1988) found that injury rate tends to be higher when projects are competitively bid.

Although the majority of the contractors obtain their work from selective tendering, findings in this research do not show that to be the case. Instead, when comparing contractors who obtain their work via competitive tendering with contractors who obtain work from negotiation, there does not seem to be much difference in the standard of health and safety performance. Holmes (1999) suggested that health and safety risk should be identified prior to construction and the costs of health and safety should be included in the tender. Companies that allow health and safety costs in their tenders have a much higher standard in all elements, on average one standard level higher.

It was not surprising to find that the majority of firms that do not allow for health and safety costs in their tenders were the small firms. This seems to suggest that these firms will find it difficult to implement the most effective health and safety during the

construction phase of their projects. It is more likely that these firms have an ad hoc approach to the health and safety; this may lead overtime to greater risks of serious injury, and a lower overall performance.

The results of this research show that when comparing contractors who have allowed health and safety costs in their tenders the two elements with the biggest variances in the average standard level are contract review and design control. The contract review element assesses the procedures of health and safety reviews in tender documents. Therefore, if contractors scored poorly in this element it is likely that they did not allow health and safety cost in their tender. The design control element deals with the risk assessment of the construction site. Poor performance in this element means that inadequate costs and resources have been allocated. The bottom five companies all perform poorly in these two elements compared to the top five companies. This supports the findings of Holmes (1999). Both Nishgaki (1994) and Hinze (1988) and found that regular involvement by the company management improved the safety standards. This research also found that to be true; all the top five contractors have regular health and safety reviews compared to only one of the bottom five contractors.

As previously mentioned, the bottom five companies were smaller firms. It is possible that the company management of those companies perceives that there is less risk associated with small value contracts. As a result there may be an expectation that workers are to cope without further assistance. Nishgaki (1994) showed that safety committees encourage the interaction between the parties on-site which helps promote accident prevention and safe work habits. Although some respondents did not have experience with safety committees (25 per cent), the remainder of the respondents had experience with them and found it to be extremely positive. Again, the results from the questionnaire show that size of the company influences health and safety standards; the majority of the smaller contractors do not have safety committee experience.

Monk (1994) performed a similar questionnaire in New South Wales using the same CIDA matrix system. Her results showed a large difference between the health and safety performance for small contractors (10-19 employees) compared to large companies (150 plus employees). The study concluded that on average, smaller contractors did not perform up to level 2 of the matrix, which is below the minimum level required to meet legislative compliance. The results of this survey did not show such a poor health and

safety performance for small contractors, although the level achieved by these firms was still much lower than larger firms. This was not surprising, and this may have resulted from the significant push by Victoria's Work Cover authority for better health and safety in recent years. The results show that the average for each element in the Lin study was higher than Monk's research, the difference ranges from 0.15 to 1.16. Monk's survey displays some similar patterns in the first few elements, but some larger differences occur in some middle elements.

This may be due to the difference between the health and safety regulations in New South Wales and Victoria. Firstly, the Work Cover authority in Victoria has introduced more regulations and tougher penalties since 1994. They have also increased field inspection hours and standards of compliance. When Monk performed the survey, it was at the end of a construction recession, and it may have been possible that fewer resources were concentrated in health and safety at that time. Secondly, Monk's survey was carried out in person, therefore if a respondent raised a query it could be answered on the spot. This research, on the other hand, was based on a mailed questionnaire which was totally self assessed by each respondent. This may have led to some respondents exaggerating their health and safety performance. It is interesting to note that when respondents were asked to rank the factors that were associated with the project success, client satisfaction was ranked the highest, followed by quality, profit, schedule and lastly safety. This supports research by Jaselskis (1996) that showed the same rank order for project success factors. Jaselskis (1996) speculated that the reason safety was ranked the lowest was that contractors do not make a profit from health and safety and think it does not improve construction time or quality. This was reflected also in Hinze's (1988) statement that employers often believe that implementing health and safety program becomes a necessity.

The current study, as was revealed by the questionnaires and interviews, reached similar results in the UAE. A change in the way H&S is perceived and tackled is necessary, both at local (company) and government level in terms of legislation and policies, but also in implementation, because this is where the problem is. Table 6.2 below summarises the main findings from the questionnaire and interview surveys. Obviously, some of the findings will need proper investigation in any future work to explain the how and the why. The causes outlined were adapted from (Pransky et al., 1999).

Table 6.2 Summary of the findings from questionnaires and interviews.

	What are they?
Human causes	Workers posses insufficient or lack of knowledge and skill in accident reporting system compared to other causes; foreign workers that make up the work force in construction sites in the UAE lack proper training. Situation is made worse by cultural and language barriers that affect effective communication.
Accident reporting system causes	Workers feel that the accident reporting system is confusing and the methodologies are not well explained. This may be due to the low educational level of the workers, lack of training, cultural and language barriers. There may also be fear of reporting because the worker thinks he may lose his job if he complains. However it is also true senior site engineers fail in their duties to report and record accidents for some of the reasons above.
Organisation causes	Lack of health and safety policy; lack of a clear accident reporting and recording system.
Time causes	The time taken to reporting, record and investigate accidents is seen by companies as an unnecessary burden that comes in the way of completing the job. This more of a cultural attitude in the UAE and only firm laws can change it.
Company size causes	Smaller companies lack the resources to perform at a high level of health and safety performance, and have poorer standards. Budgetary constraints tend to deter them from proper accident reporting, recording and investigating.

6.13 SWOT analysis

SWOT Analysis was carried out to analyse the strengths, weaknesses, threats and opportunities that exist in the current operated plans for companies that were questioned and interviewed (see Table 6.3). SWOT analysis is a very useful tool for auditing an organisation and its environment. It is the first stage of planning and helps marketers to focus on key issues. SWOT stands for strengths, weaknesses, opportunities, and threats. Strengths and weaknesses are internal factors. Opportunities and threats are external

factors. Each organisation should carry out its own SWOT analysis. The author has, however, considered all the companies that took part in the research survey and produced a SWOT analysis based on the finding. This analysis is very useful for construction companies (or other) in the UAE to address their weaknesses and exploit any opportunities offered to them.

Table 6.3 SWOT Analysis of companies that have taken part in surveys

	Internal	**External**
Positive	**Strength** - Companies aware of the problem - Companies are willing to tackle the problem and take practical measures	**Opportunity** -Construction is booming in the UAE and companies can take advantage of this to better position themselves on the market. - Profitable companies are is a good position to tackle the problem with very little cost and implement H&S policies - Companies have opportunity to boost their reputation in embracing H&S - Opportunity to train employees which will benefit the company by making employees more safe and secure and therefore more productive
Negative	**Weakness** -Lack of clear H&S policy -Lack of internal structure to deal with H&S issues (committee) - Lack of training of employees in H&S - Accidents not (always) recorded	**Threat** - System failure - Unexpected disasters as result of lack of H&S policies in place - Company vulnerable to legal action by employees - Company vulnerable to additional costs resulting from failures in H&S - Credibility and reputation of company under threat.
Suggestions	**Suggestions for improvement H&S** 1) Establish a Health and safety Committee at company level. 2) Adopt Health and Safety regulations for in and off site work. 3) Appoint Health and Safety officers. 4) Implement health and safety at all stages of the project. 5) Devise training programmes and identify training needs for all staff. 6) Identify and manage health and safety risks and hazards present within any activities of the business. 7) Keep a risk register. 8) Assign appropriate actions for project team members against each risk item. 9) Make a financial allowance for all residual risk items. 10) Keep a register and record of all accidents. 11) Ensure sub-contractors used to carry out jobs on behalf of the company do carry out a risk assessments relevant to the job. 12) Review health and safety practices regularly and share with employees.	

CHAPTER SEVEN

7 FRAMEWORK FOR HEALTH AND SAFETY MANAGEMENT

7.1 Introduction

In this chapter, based on the results from the literature review, interview and questionnaire surveys, the factors contributing to effective health and safety management are identified and a framework for the UAE is proposed. The introduction and use of health and safety management makes good business and commercial sense and is part of the role of management to control the quality and productivity (European Construction Institute, 1992). The main benefit of implementing and using a proactive health and safety management system is the reduction of death and injury at work arising from accidents. The elaborate and extensive UK experience is used in this context.

7.2 Need for enhanced process health and safety management in the construction processes

Appreciation of the causes of occupational accidents has benefited from research attention over many years (Heinrich et al., 1980). Contemporary commentators point to the systemic nature of safety failures and wide reaching contributory factors (Kletz, 2001). Reason (1995) highlighted the pathway from latent, organisational failures (e.g. poor design or planning decisions), to the conditions where active failures (workplace errors and violations) can occur. Rasmussen (1997) presented a review of alternative conceptual approaches to modelling risk, safety and accidents. From this, Rasmussen argued the case for an approach that recognises the complexity of socio-technical work systems, focussing more on the mechanisms generating organisational and individual behaviour in actual, dynamic work contexts, rather than narrow attention to errors in tasks and acts. Implicit in the ideas of Reason and Rasmussen, is the fundamental involvement of human factors/ergonomics in most safety failures.

Modelling of the causal processes of accidents and injuries in the construction industry is less mature, with previous research largely confined to the collection, analysis and interpretation of data derived from regulatory accident reporting schemes (e.g. Hinze and Russell, 1995; Hunting et al., 1994; Kisner and Fosbroke, 1994; Snashall, 1990). This approach is limited by problems with data collection (e.g. under reporting) and the broad classifications used for coding.

Problems of this nature were reported again by Bomel (2001) in a more recent analysis of Riddor data (HSE, 1998) available for Great Britain. Looking at the data collected by construction companies themselves, previous work by Gyi et al. (1999) found the quality of the reporting processes to be poor, coupled with a failure to collate and undertake effective analysis of the data that are collected. HSE (2003) used case study procedures to examine fatal accidents and identified causes such as failure to ensure safe systems of work, poor maintenance, use of defective materials, and poor supervision and training. However, the reports concentrated on fatal accidents and it is probable there are differences in the aetiology of non-fatal accidents (Saloniemi and Oksanen, 1998). Whittington et al. (1 992) is one of the few other studies that has attempted to undertake in-depth analysis of accidents in the industry. Their findings identified a range of headquarter, site and individual factors in accidents examined, approximately in the ratio 1:2:1. Whittington et al. acknowledged limitations of their work due to the relatively small number of accidents investigated (30) and incomplete information in the accident records. In addition, there have been important changes affecting safety management since Whittington et al.'s research, particularly in connection with the implementation of European Directive 92/57/EEC, requiring attention be given to safety within construction design and management processes (HSE, 2003). Examining behaviour modification approaches to improving construction safety, Duff et al. (1993) developed a safety audit checklist, used to monitor safety performance of construction sites.

Further work by Suraji et al. (2001) led to a model of risk factors for accidents in construction operations. The model distinguishes between problems with operator actions, site conditions and construction practices, and linkage of these with project, contractor and process management influences. In recognising that project concept, design and management factors are frequently an origin of site based failures, Suraji and Duff's (2001) approach has been a significant development on other theoretical 'root

cause' models that confine their attention to site personnel, their behaviour and actions (Gibb et al., 2001; Suraji and Duff., 2001). In summary, while there is good understanding of the extent and pattern of accidents in the construction industry, there has only been limited investigation regarding the full range of contributory managerial, site and individual factors. With this background, the research presented here sought to describe the wide range of factors involved in construction accidents. Several attempts were made to study the types of construction accidents and determine their main causes and ways of avoiding them.

7.3 Framework for health and safety management

Determining the extent to which the identified factors contribute to effective health and safety management. This is referenced to the following model of risk management (Hinze and Russell, 1995):

- Knowing what the risks are, and what in general should be done about them
- Planning, prioritizing and implementing risk controls
- Ensuring that risk controls are effective and sustained
- Reviewing and learning

More specifically, the objectives of the exercise were to collate the opinions from a range of experts regarding the evidence supporting the features associated with effective health and safety management.

Most of the key elements required for effective health and safety management are very similar to those required for good quality, finance and general business management. Commercially successful organisations usually have good health and safety management systems in place. The principles of good and effective management provide a sound basis for the improvement of health and safety performance.

Based on the results from the interviews and questionnaires, the framework shown in Figure 7.1 is suggested consisting of five key elements, these are:

- A clear health and safety policy

Evidence shows that a sound, well thought out policy contributes to business efficiency and continuous improvement throughout the operation. The demonstration of senior management involvement is evidence to all stakeholders that responsibilities to people and the environment are taken seriously.

- A well-defined health and safety organisation

The shared understanding of the organisation's values and beliefs, at all levels of the company or concern is an essential component of a positive health and safety culture. An effective 'organisation will be noted for good staff involvement and participation; high quality communications; the promotion of competency; and the empowerment of all employees to make informed contributions.

- A clear health and safety plan

This involves the setting and implementation of performance standards and procedures through an effective health and safety management system. The plan is based on risk assessment methods to decide on priorities and set objectives for controlling or eliminating hazards and reducing risks. Measuring success requires the establishing of performance standards against which achievements can be identified.

- The measurement of health and safety performance

This includes both active and reactive monitoring to see how effectively the health and safety management system is working. Active monitoring involves looking at the premises, plant and substances, the people, procedures and systems. Reactive monitoring discovers through investigation of accidents and incidents why control has failed. It is also important to measure the organisation against its own long term goals and objectives.

- The audit and review of health and safety performance.

The results of monitoring and independent audits should be systematically reviewed to see if the management system is achieving the right results. This must be part of any company's commitment to continuous improvement. Comparisons should be made with internal performance indicators and the external performance of organisations with exemplary practices and high standards.

Including health and safety performance in meaningful annual reports is considered best practice.

The suggested framework is similar to other suggested frameworks in the UK but has been expanded to include other important parameters such as accident reporting and recording, planning needs etc (Phoenix Health and Safety, 2010).

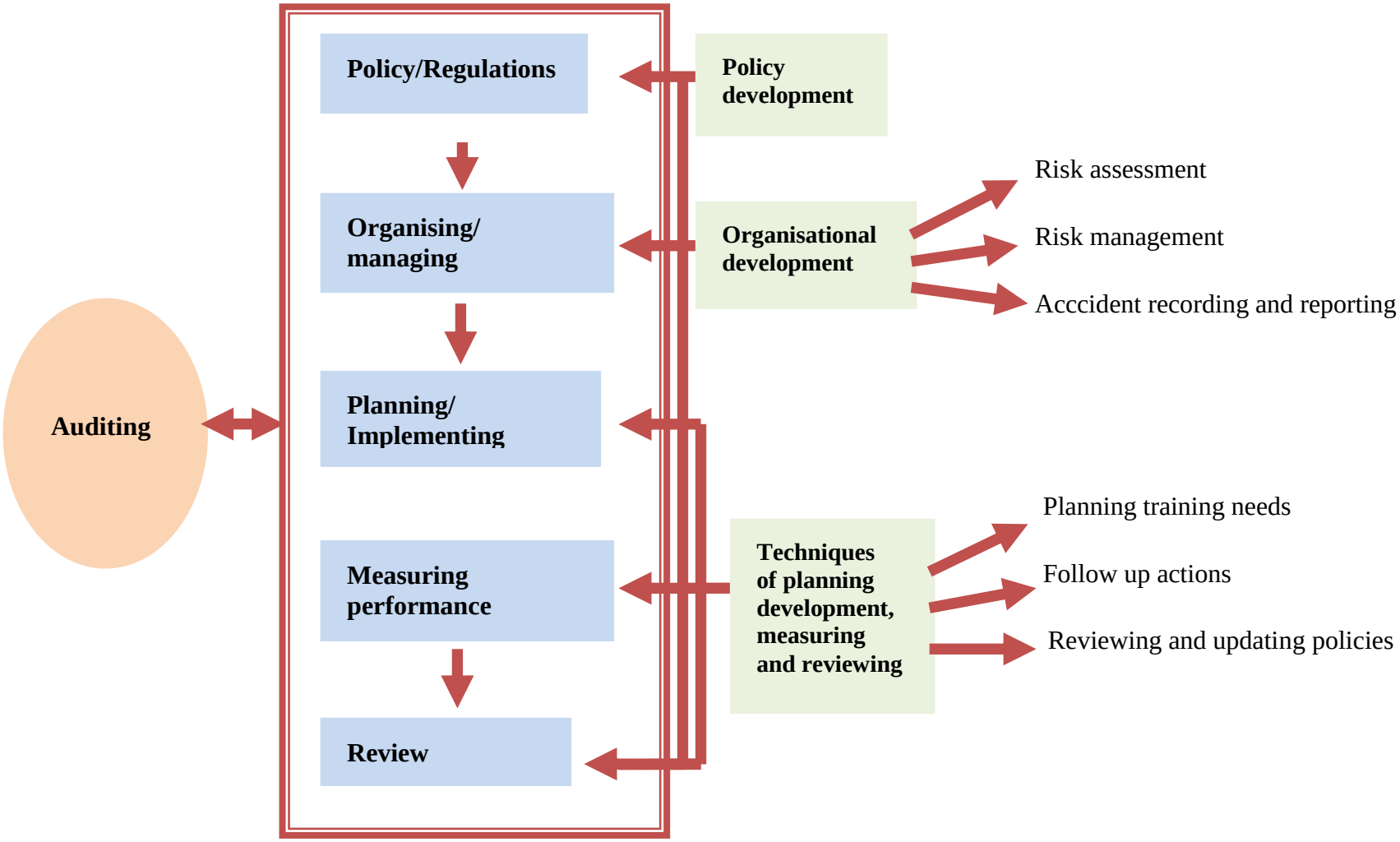


Figure 7.1 Framework for health and safety management

7.4 Improving Health and Safety Construction Program

In spite of the high costs of work accidents, many construction companies adopt as their only health and safety management strategy the compliance with mandatory regulations. However, only being in compliance with these regulations might not be sufficient to guarantee excellence in health and safety performance, as they cover only minimal preventive measures.

Some studies have investigated causes of accidents and good practices to avoid them. Suraji et al. (2001), for example, based on the analysis of five hundred accidents in the UK, found that planning and control failures were related to 45.4 % of the accidents. A similar study carried out by the Construction Industry Institute (Liska et al., 1993) found that, among several preventive actions that had been used by the industry, detailed safety planning was necessary for achieving the zero accident target. However, Agaj (2000) suggests that safety planning is neither organized as a managerial process nor it is consistently linked to the production planning process. As a result, the potential benefits of safety planning are likely to be sub optimized by industry.

In spite of being suggested by a number of authors, such as Hinze (1998) and Mc Collum (1995), few studies have investigated the fully integration of safety into production planning. Ciribini and Rigamonti (1999) and Kartam (1997), for instance, discussed the introduction of safety measures into construction plans, using CPM or line of balance planning techniques. This approach tends to have little impact, since it has been accepted that planning should not be limited to the application of techniques for generating plans.

By contrast, planning should be regarded as a broader managerial process composed by several stages, including data collection, implementation of corrective actions, and information diffusion (Laufer and Tucker 1987). Also, some of the main requirements for effective production planning and control, such as hierarchical decision making, cooperation, continuity and a systemic view (Laufer et al. 1994), are requirements also for safety management.

Thus, there seems to be an opportunity for improving SPC methods based on concepts and principles that have been successfully used in production planning and control (Ballard 2000; Laufer et al. 1994; Laufer and Tucker 1987). This paper presents a Safety

Planning and Control (SPC) model that integrates safety management to the production planning and control process. The model was developed through an empirical study, which is reported in the following sections.

In construction, planning can cover a vast number of activities from pre-project planning, through design, to planning specific site activities. It is estimated that up to 90% of accidents could be prevented through better planning. Recent studies have found that planning and control failures were related to 45.4% of accidents (Duff and Suraji, 2000), and designers could have prevented up to 47% of accidents investigated as part of an HSE research project (HSE, 2003). That is why when the Health and safety Executive (HSE) implemented the Construction Design and Management Regulations (CDM) they intended them to "encourage the integration of health and safety into project management" (HSE, 2003). Almost ten years on these very regulations are under review as the industry still struggles to properly integrate the management of health and safety throughout the lifecycle of construction projects. Effective management will embrace all project management objectives, including health and safety, and deliver construction which satisfies all these objectives and not one at the expense of the others. Effective planning for health and safety is essential if projects are to be delivered on time, without cost overrun, and without experiencing accidents or damaging the health of site personnel (CIOB, 2002). These are not easy objectives as construction sites are busy places where time pressures are always present and the work environment ever changing (HSE, 2002). The construction industry tends to be under resourced and under planned in relation to other industries (Egan, 1998) and this promotes a crisis management approach to all kinds of production risk, a feature of construction culture which can impact on health and safety. However, highly planned works, such as those requiring a temporary rail possession, almost invariably run smoothly. This type of work is managed in a highly focused way and planned in great detail. Even routine work can benefit from more rigorous short-term planning.

Today's thinking seriously challenges the old triangular model of time/cost/quality trade-off, which suggested that an improvement in one must lead to deterioration in at least one of the others. It now extends the total quality management philosophy that 'quality is free' (Crosby, 1979) and embraces the premise that delivery in one area, safety, can

actually lead to benefits in other areas, such as time and cost (Hinze and Parker, 1978). The importance of effective construction planning and control in the communication and avoidance of health and safety risks cannot be overstated but the fundamental premise is that this need not, and should not, be a separate exercise aimed solely at health and safety. Effective management will embrace all production objectives, as an integrated process, and deliver construction which satisfies all these objectives and not one at the expense of the others.

The cost of accident is an important financial consideration to most employers. Most employers rely on the insurance cost as their only positive data for appraising safety accomplishment or deciding how far to go financially and morally in supporting the company's accident prevention efforts. Insurance costs are only a fraction of the total accident related costs. The root of the problem is that the cost of accidents is hidden in accounting records. They are not easily retrievable, and line managers are difficult to ask the accounting systems to produce the accident cost (Cosby, 1979). Profit is the goal of most business. Employer commitment to implement occupational health and safety program tends to relate to the organisations' cost and profit. Therefore, in determining a bid for a construction project safety measures and quality requirements are two important elements that influence the price. The cost dynamics of these two elements are interrelated. Most accidents on construction site are the result of inadequate safety measures or failure to enforce safety programs (Singh et al., 1999). A study by Bust and Gibb (2006) regards the justification for safety investment was explored. The study discovers relationships between safety investments, profit and accidents justify that safety cost money and can increase profit. The literature study has shown that indirect cost of accidents is at least 3 times more than the direct cost. It means that reduction in accident rates will inevitable exponentially increase profit, it can save lives and increase the profit margin (Singh et al., 1999).

According to the European Construction Institute, all management and control are upfront costs associated with the introduction and implementation of health and safety program. These highly visible costs are often seen as a barrier to implementation. However, it has been demonstrated that these costs are more than offset by the hidden benefit of planning and doing things right. The introduction and use of health and safety management makes

good business and commercial sense and is part of the role of management to control the quality and productivity (European Construction Institute, 1992). The major costs associated with health and safety incidents and accidents can be categorised as management and organisation, damage to reputation, loss of productivity, litigation and legal fees, delays, sick pay, damage to property and materials, fines, increased insurance premium and medical costs. Further, the "costs" associated with the implementation of health and safety management can be categorized as establishment of health and safety policy and overall company management systems, health and safety management and organisation for project, project safety & health costs and client administrative costs. The main benefit of implementing and using a proactive health and safety management system is the reduction of death and injury at work arising from accidents. Following from this is the avoidance of costs that would otherwise be incurred when accidents or incidents occur. Benefits to both parties are achieved through avoidance of delays to the project, involvement in litigation and management effort in accident or incident investigations. A large and often unrecognized benefit to both client and contractor comes from enhanced project performance. A safe, tidy site with good access is likely to be an efficient site with high morale, fewer disputes, reduced absenteeism and labour turnover, enhanced team working and better relationships (European Construction Institute, 1992). Furthermore, the benefit of implementing the safety and health program also can increase the productivity in construction site. Productivity is defined as the ratio of output to input, that is the ratio of the amount produced to the amount of any resources used in the course of production. The resources may be land, materials, machinery, tools or manpower. The input is generally a combination of all of them. Productivity increases if a greater output is achieved for the same input, or if the same output is achieved for a smaller input. An increase in production or output does not necessarily indicate an increase in productivity. If input rises in direct proportion to output, then productivity will stay the same. And if input increases by a greater percentage than output, then a higher output will be achieved at the expense of a reduction in productivity (Heap, 1987). Therefore an increase in the productivity of the construction sector should not only raise the earnings and profits of those working in that sector but also contribute to an improvement of the productivity in other sectors and improving general standards of living as a whole.

Implementing health and safety program can increase the productivity at construction site by reducing accident. Any accident happen at site will cause losses to contractor and affect the profit. Accident incidents are occurrences result in decreasing productivity, such as injuries, damage to equipment or property and near misses. In order to understand the productivity at construction site, regards the efficiency and effectiveness of a construction operation have to be taken into consideration. Thus, the cost of accidents or incidents surely can give big impact to the efficiency and effectiveness of the production output. Although the cost of accidents cannot be fully calculated, it can be avoided by implementing occupational safety and health program at construction site.

In the process of implementation health and safety in construction, awareness of few factors will helps in preventing the occurrence of construction accidents (Reese & et al., 1999). These factors are actual physical hazards, environmental hazards, human factors, and lack of poorly designed safety standards, failure to communicate within a single trade and failure to communicate between two or more trades.

Safety and profit have an integral relationship and there is no lack of humanitarian concern if we view safety from a profit standpoint, providing we recognize that it is profitable not only to the employee but it is profitable to the worker as well (Frein, 1980). Hence, accidents and loses involving both people and equipment result in a waste of time and money. An employer often believes that as long as he has provided for insurance to protect himself against direct losses resulting from accidents, he has no longer any concern whether profit or loss once has paid that insurance premium.

7.5 New approaches to accident prevention

All over the world, construction is one of the most hazardous industries due to its unique nature (Jannadi and Bu-Khamsin, 2002). Construction safety is always a grave concern for both practitioners and researchers. A number of causes influencing safety performance in the construction industry have been identified that include workers attitudes (Hinze, 1981); construction company size, safety policy, project coordination, and economic pressure (Hinze and Raboud, 1988); management training (Gun, 1993; Jaselskis and Suazo, 1994); and safety culture (Tam and Fung, 1998; Glendon and Stanton, 2000; Tam et al., 2001). Measures taken to prevent occupational injuries and improve safety performance have been extensively explored.

Some of these studies (Fellner and Sulzer-Azaroff, 1984; Mattila and Hyodynmaa, 1988; Laitinen and Ruohomaki, 1996) reveal that when goals are posted and feedback is given, the safety index is significantly higher than that when no feedback is given. Hakkinen (1995) advocated a training program called one hour for safety management for top management. The application of the program was successful in drawing management's attention to health and safety issues. One study indicates that 83% of projects achieve the zero accident goals after applying the Zero Accident Program (Centre to Protect Workers Rights, 1993; Hinze and Wilson, 2000).

Although significant progress has been made in accident prevention, our thinking needs to evolve to meet the demands of new work practices and settings.
Three interesting new ideas are emerging which practitioners could use (Hinze and Wilson, 2000):

- Zero-accident vision: Eliminating all accidents is not the direct goal here; instead the aim is to encourage people to think that all accidents are preventable. Too often people tolerate hazards and accidents because they believe these are either non-preventable or that a certain number are inevitable. Higher safety goals in organisations are a step towards greater adoption of the zero accident vision. Promoting this vision is an important weapon in the battle against all-too-common fatalism.
- Integrating safety measures across time segments and communities: Safety efforts in society are usually organised separately according to life's time segments, such as work, leisure, home and travel, with different government departments often covering different elements. Yet a safe person at work does not become unsafe in traffic.

A more integrated approach to safety management would be more efficient and make better use of pooled information. The need for this is reinforced by the blurring of the traditional boundaries of where work is conducted, as more people 'telecommute' and work from home. The Safe Community Program, promoted by World Health Organisation, is an interesting new approach to this issue.

The programme, which has produced positive results, is designed to improve safety across all of a community's activities, from travel and leisure to work. Globalisation as a platform for accident prevention: Generally, people tend to expect higher safety and

environmental standards from global corporations than from local enterprises. In fact, many have already achieved lower accident figures, conscious of the need to preserve their global brand reputations. In this context, multinationals could be a valuable channel for exporting good practices to operations in other countries, or for setting common safety standards. They could also demand that their suppliers follow equally rigorous standards. The rise of the Internet and Extranet facilities makes it easier than ever before to rapidly disseminate and update these standards globally. Established safety management systems embrace hazard identification, risk assessment, implementation of prevention measures, monitoring and review. This holistic view of accident prevention has generated a vast reservoir of knowledge and information that is often not recorded and collated, undermining our ability to learn from experience. In the future, more prevention-oriented record keeping is necessary.

The drive to reduce the human and financial costs of work-related accidents was given a major boost by the 2001 European Week for Safety and Health at Work (EW2001), held during October in all 15 Member States and beyond. Under the slogan 'Success is no accident', the campaign placed particular emphasis on the human and commercial advantages of lower accident rates at work in a bid to encourage more businesses to sharpen their OSH practices. Currently, there are over 4.5 million accidents in the EU that lead to 3 or more days off work, costing organisations around 146 million days in lost output. Direct insurance costs add a further €20 to the bill.

The human and economic costs of work-related accidents make a compelling case for accident prevention to remain at the top of the European Community's agenda. Reducing work-related accidents is not just a moral imperative; there is a strong business case for doing so as well. The most successful companies usually have the best accident prevention records. Reducing the risk of accidents at work is one of the principal factors in improving the quality of life

Effective Planning for health and safety is essential if projects are to be delivered on time, without cost overrun, and without experiencing accidents or damaging the health of site personnel (CIOB, 2002). These are not easy objectives as construction sites are busy places where time pressures are always present and the work environment changing

(HSE, 2002). In order to achieve a holistic approach to the management of construction, it is important to view health and safety planning as an integral aspect of production planning from the beginning. This embraces the premise that delivery in one area, safety, can actually lead to benefits in other areas, such as time and cost (Hinze & Parker, 1978). Some conceptual work on integration, done in the 1990's focused on integrating health and safety data with Critical Path Method scheduling software (Kartam, 1997). More recently research was conducted in Brazil where an attempt was undertaken to integrate safety with project long, medium and short term planning (Saurin et al, 2004). Both of these studies embrace the philosophy of integrated planning, but concentrate exclusively on planning after design. With the relatively new, and increasing, focus on the health and safety responsibilities of clients and designers, it is essential that this philosophy of integration is extended to all project planning.

7.6 Accident investigations and reporting

7.6.1 Accident investigations

Each incident should be investigated to the extent necessary to understand its causes and potential consequences, and to determine how future accidents can be avoided. An axiom of incident investigation is that accidents are the result of safety management system (SMS) failure. Invariably some aspect of a SMS can be found that, had it functioned properly, could have prevented an incident. However, experienced incident investigators know that such specific failures are but the immediate causes of an incident, and that underlying each such immediate cause is a management system failure, such as faulty design or inadequate training. Most benefit is gained from identifying the underlying root causes. This is because by addressing the immediate cause, one only prevents the specific accidents from occurring again. By addressing the underlying cause, one prevents numerous other similar accidents from occurring. If the incident is analyzed, the complete scenario of events leading to an accident will be modelled. All the root causes will be identified, their relationship leading to the dangerous event will be revealed, and the resulting consequences will be established. A strong relationship between the various incident scenarios may be observed. A particular initial failure may be the root cause of a number of different hazardous events and may result in many undesired consequences. At the same time, a particular consequence may be the result of various hazardous events, which in their turn may be the result of a number of different initial failures. To control

the ‘spaghetti’ of root causes, intermediate states, hazardous events and related consequences, it is obvious that appropriate management is required.

In light of the important function of incident investigations in identifying and correcting SMS failures, accidents should be looked as opportunities to improve management systems, rather than as opportunities to assign blame (Van der Schaaf, 2005) has demonstrated the added value of using information of ‘near misses’ to improve process safety by systematically analyzing near misses and taking preventive measures.

Incidents and accidents rarely result from a single cause and many turn out to be complex. Most accidents involve multiple, interrelated causal factors. They can occur whenever significant deficiencies, oversights, errors, omissions or unexpected changes occur. Anyone of these can be the precursor for an accident or incident. There is a value on collecting data on all accidents and potential losses as it helps to prevent more serious events. Incidents and accidents, whether they cause damage to property or more seriously injury and/or ill-health to people, should be properly and thoroughly investigated to allow an organisation to take the appropriate action to prevent a recurrence. Good investigation is a key element to making improvements in health and safety performance. Incident investigation is considered to be part of a reactive monitoring system because it is triggered after an event. The range of events includes (Van der Schaaf, 2005):

- injuries and ill-health, including sickness absence
- damage to property, personal effects, work in progress etc.
- incidents which have the potential to cause injury, ill-health or damage
- hazards
- deficiencies in performance standards.

Each type of event gives the opportunity to:

- check performance
- identify underlying deficiencies in management systems and procedures
- learn from mistakes and add to the corporate memory
- reinforce key health and safety messages
- identify trends and priorities for prevention
- provide valuable information if there is a claim for

- compensation
- help to meet legal requirements for reporting certain accidents to the authorities.

Accident investigations should be systematic and should be carried out in a manner which seeks to establish causation rather than to attribute blame. The ten stages of an accident investigation are listed below. They include the important step of planning actions to prevent recurrence.

A safe system of work is a formal procedure which results from systematic examination of a task in order to identify all the hazards. It defines safe methods to ensure that hazards are eliminated or risk minimized (HSE, 2002). The HSE recommend the following five steps in establishing a safe system of work:

1. Assess the risk. Take account of what is used, who does what, where the task is to be carried out and how the task is to be done.
2. Identify the hazards and weigh up the risk from them.
3. Define safe methods.
    - Preparations
    - Authorisation
    - Planning of job sequence
    - Specifying safe methods including the necessary 'permit to work' systems
    - Inclusion of access and escape (if relevant)
    - Consideration of dismantling and disposal at the end of the job
4. Implement the system. A safe system needs to be communicated to all concerned, understood properly and applied correctly:
    - Brief supervisors and ensure the necessary skills are learned and rehearsed
    - Check awareness of potential risks
    - Ensure precautions are understood fully
    - Stop work if an unexpected problem is encountered
    - Restart only when a safe solution is found
    - Avoid the temptation to take short cuts
5. Monitor the system

• Check the planned system is actually operating smoothly

- Check the procedures to see that they are effective
- Make certain any changes in circumstances are noted and that any alterations to the system of work which they call for are actually made.

7.6.2 Reporting systems

Accurate reporting of work-related injuries and illnesses is important in order to help the employers to identify unsafe work environments and work practices; monitor workers' health and well being; and eliminate hazards; or, at least, control the health and safety risks to employees. With a safe working environment, employees are expected to work without worries from time to time.

It is reported that preliminary interviews have been carried out with construction professionals consisting of safety officer, project manager, and engineers in order to understand the existing accident reporting system. The construction professionals claimed that the accident that occurred in their company is more likely to be under reported or not reported at all. The under reporting of accidents and incidents in their company is promoted by the presence of a poor safety culture, with inadequate systems in place for reporting dangerous occurrences. One aspect critical to the unsuccessful implementation of reporting scheme is because inactive management commitment to the scheme.

Construction professionals claimed that under reporting of work-related injuries in their company can also stem from lack of knowledge of reporting requirements, administrative barriers and inadequate reporting mechanisms. More specifically, these unsatisfactory reporting systems are considered by staff to be time-consuming; ineffective in actually stimulating positive change, and often unclear with regards to what classifies as a reportable injury

In view of the above scenario, a study is needed to analyze the existing accident investigations and reporting system which have been implemented by the UAE construction companies. With the understanding of the existing system, critical factors that influence the success of implementing accident reporting system will be able to be identified.

Persuading workers to file critical incident and near miss reports is not an easy task, particularly when it may entail divulging their own errors (Reason, 1997). Even if people

do not mind confessing their mistakes, they cannot always see the value in making reports. This is especially true when they are skeptical about the likelihood of management acting upon the information. Reason (1997) offers five essential factors important in determining both the quantity and quality of incident reports:

- Indemnity against disciplinary proceedings, as far as it is practicable.
- Confidentially or de-identification.
- The separation of the agency or department collecting and analysing the reports from those bodies with the authority to institute disciplinary proceedings and impose sanctions.
- Rapid, useful, accessible and intelligible feedback to the reporting community.
- Ease of making the report.

The first three factors are essential in creating a climate of trust and the others are needed to motivate people to file reports. Apart from lack of trust, the perceived absence of any useful outcome will also stifle incident reporting. If companies, small companies especially, see no return from their reports, they may be reticent to engage in this practice. This would therefore suggest that the fact that reporting is a legal requirement is not a strong enough stimulus to assist the government in uncovering the true extent of reportable injuries.(Glendon, 1982) also identified several criteria as prerequisite for a system that is conducive to reporting and recording accidents. They are as follows:

- Clearly defined system objectives.
- Clearly defined needs of system users.
- System designed to be an important component of a program for controlling accident injuries.
- Providing the system with a capability for supplying data output that will meet legal requirements.
- Ensuring that the system will collect sufficient data for accident analyses, and providing computer links with databases containing sick leave and employment data.

Often, employers and workers do not fully understand the record-keeping definitions. Stated goals communicated to employees about reporting all injuries do not always reflect the actual message received by the workers (Snyder et al. 1991). In many instances,

employers do not educate workers about the correct rules for reporting injuries and accidents, hence employees might not even know how to make a claim (Leigh et al., 2004).

7.7 Employer and employee attitudes towards accident reporting

Both employee and employer attitudes towards reporting are also likely to be highly influential in determining whether an incident is formally reported. For example, numerous research studies in both commercial and industrial organizations have offered reasons to explain why near miss events are often not reported or recorded (see Prosser, 2003). These include the high relative frequency of minor events, which occur regularly and with little consequence, becoming accepted as a trivial occurrence; time and effort consuming safety investigation processes; and staff embarrassment at revealing their own mistakes. (Prosser, 2003) warns that failure to collect near miss data of sufficient quality and quantity will limit any attempt to conduct meaningful analyses and develop robust preventive actions. (Prosser, 2003) also reported on statistics relating to the recording of near miss events in the British Fire Service (BFS). According to the author, evidence of complacency about the importance of near misses has led to significant under reporting and is contributing to the still high level of accidents in the BFS. During 2002/03 there were nearly 2,000 major and over three- day injuries in the BFS. HSE research suggests that there should have been between 200 and 600 times that number of near miss events, yet according to the Fire Service Inspectorate only 20,000 near misses were recorded. Interviews with management representatives revealed administrative and other barriers to reporting, stemming from their desire to attain a goal of no reported injuries, and misconceptions about requirements for record ability.

The corporate and facility safety incentives appeared to have an indirect, but significant negative influence on the proper reporting. Under reporting is likely to continue until managers have carefully evaluated and assessed each potential reason why injuries are not reported properly, and identify incentives for under reporting that continue to exist. Additional educational efforts and demonstration of positive results as a consequence of proper reporting will help to encourage workers and supervisors to participate in this process.

Workers described several reasons for not reporting their injuries, including fear of reprisal, a belief that pain was an ordinary consequence of work activity or aging, lack of management responsiveness after prior reports, and a desire not to lose their usual job. According to interviews, additional reasons for not reporting included a fear of being assigned to lighter jobs that the workers disliked, loss of overtime pay, and separation from co-workers. Workers expressed concern over abandoning their team during heavy workloads. Some older workers attributed their symptoms to age, others assumed that symptoms would go away once seasonal production demands decreased, but many were worried that reporting would lead their supervisors to conclude that they were unable to do the job. Most workers did not want to be labeled as a complainer, which they believed would jeopardize their chances for pay rises and advancement in the company. Some workers felt that having symptoms was a sign of weakness (Pransky et al., 1999).

Consequently, employees may chose not to report, and instead obtain treatment through group health plans (and thus have the condition labeled as non-occupational), or they may arrange light duty and time away from work by taking sick days, or even changing jobs in order to avoid reporting. Under reporting of work-related conditions can also stem from lack of recognition, improper diagnosis or causal attribution, lack of knowledge of reporting requirements, administrative barriers and lack of reporting mechanisms. Managers must realize that suppressing accurate reporting can lead to missed opportunities to identify cases at an early and more reversible stage, causing higher injury costs in the long run. Early reporting and associated interventions could also lead to increased productivity; improved training and better morale (see Pransky et al., 1999; Shaw & Blewett, 1998; Zohar, 2000).

7.8 Summary

The factors contributing to effective health and safety management were identified. It was shown how introducing and using health and safety management makes good business and commercial sense and that part of the role of management is to control the quality and productivity. Implementing and using a proactive health and safety management system has a number of benefits, the main and most obvious one is the reduction of death and injury at work arising from accidents.

CHAPTER EIGHT

BEST PRACTICE HEALTH AND SAFETY GUIDE FOR CONSTRUCTION COMPANIES IN THE UAE

8.1 Introduction

With regards to health and safety in the construction industry, there are 2 key issues to consider. The first one is respecting people's rights to be protected against risks that affect their safety and long-term health. The second one is that construction sites that are effectively planned and managed are more productive and profitable as well as being safe. The starting point for health and safety is effective planning of construction works. This starts at the design stage by providing the appropriate framework. The design process should involve a detailed assessment of the construction process to make sure that no problematic health and safety issues are inherent within the design. Next is the detailed planning and scheduling. This should include clearly identifying processes for the execution of each element of the works. Finally is the organising and controlling of works on site.

In preparation for this it is necessary to ensure that the people who are working on the site are:

- Properly trained and competent to do the work safely
- Have proper supervision and are given clear instructions and guidance
- Provided with the right tools, equipment and protective clothing
- Have and understanding and knowledge of the health and safety issues

It is vital that performance against each of these issues is regularly checked and any shortcomings remedied. Each company in the UAE must have a record of all accidents.

Additionally, in the UAE context as far as construction companies are concerned, the following needs to be considered:

- Health and safety is about preventing people from being harmed by work or becoming ill, by taking the right precautions and providing a satisfactory working environment.

- Employers should look at what the risks are and take sensible measures to tackle them.
- Employers are required to do manage health and safety and apply its principles to every work activity. The main requirement on employers is to carry out a risk assessment.
- Have employers' liability compulsory insurance and should display the certificate.3
- Display the health and safety law poster or provide employees with individual copies of the same information in a leaflet called Health and safety law: What you should know.4
- Provide first-aid equipment, facilities and personnel appropriate for the circumstances in the workplace.
- Employees should co-operate with their employers over safety matters. There is no differentiation between employees and contractors. The employer will still be responsible for safety, though in the case of contractors this may be delegated.
- All injuries and other incidents occurring in the workplace must be reported to the Incident Contact Centre (ICC). 5

It is vital that construction companies (and for that matter, any company employing people) in the UAE must have:

- ✓ Health and safety rules and regulations, in addition to any nation-wide regulations. This is to ensure that health and safety is legislated and duties and responsibilities are very clearly spelled out.
- ✓ A health and safety committee that regularly reviews and discusses health and safety issues. This is very important as without a proper health and safety committee it will be difficult to discuss or record any issues with any actions required.
- ✓ A health and safety manager (or managers as necessary) to oversee the implementation and follow up of any health and safety rules and actions.

- ✓ A clear reporting system of accidents. All accidents that take place either on the construction site or elsewhere, even those perceived as minor, must be properly recorded.
- ✓ A proper training programme for all staff and employees on health and safety issues. Health and safety awareness must be part of the company's culture.

In order to improve health and safety in the UAE construction companies, a set of principles for creating a safety culture are outlined below. The implementation of these principles will greatly enhance health and safety in construction companies. These principles were listed by Fleming et al. (2007) as best practice principles for creating a strong safety culture in construction. They are intended to operate at an industry level as broad values for adoption at both corporate and project levels. The UAE would enormously benefit from implementing such principles.

Principle 1: Demonstration of safety leadership
Principle 2: Promotion of the concept of 'design for safety'
Principle 3: Communicate safety information
Principle 4: Managing safety risks
Principle 5: Continuously improving safety performance
Principle 6: Entrenchment of safety practices.
Each of these principles is described below.

Principle 1: Demonstrate safety leadership

Safety leadership involves communicating the importance of safety in all interactions with subordinates, subcontractors, suppliers and other project stakeholders throughout all processes within the life of the construction project. In any construction project there are many competing objectives, such as quality, cost, time and production. The various stakeholders also have their own objectives. In the context of these pressures, safety messages can become mixed, and organisations do not always do what they commit to in formal policy statements and safety plans. For this reason, it is critical that strong safety leadership is demonstrated from top management down to frontline supervisors. Safety should be enshrined in corporate goals, with strategic objectives and plans for achievement as for other corporate directions.

There is a strong behavioural component to safety leadership. It is important that senior managers, such as chief executive officers, managing directors and board members, lead by example and are consistent in the way they behave in relation to safety. Safety leadership is as much about what is not discussed as what is. When senior managers constantly talk about cost or production and say little about safety, this creates the impression that safety is less important than these other project goals.

Safety leadership also includes the recognition and reward of good safety management and performance, as well as the constructive correction of substandard safety management or performance. Senior managers should 'walk' construction sites and collaborate with site project managers and workforce members alike, to reinforce the corporate commitment to safety and to ensure that all resources are provided to support safety best practices. Within the construction supply chain, safety leadership should also be demonstrated. Clients should demonstrate leadership through establishing clear safety objectives for the projects they procure, and by appointing safety champions for the project.

Principle 2: Promote design for safety

Effective safety management at the design stage can minimise risks to the health and safety of people who subsequently construct, occupy and maintain a facility/structure.

Consequently, the client should ensure that a designer is engaged who has a demonstrated understanding and awareness of safety risk management or other suitable credentials of safety in design, appropriate to the risks of the project. Often during the design stage, a number of organisations or individuals contribute to the final design, with their contributions being coordinated by a prime design manager — usually a principal designer acting for the client (the designer), or the client itself. In such cases, all organisations and individuals should participate in appropriate risk assessments and safety management decisions appropriate to their sphere of control.

Comprehensive and systematic design safety reviews should be conducted at appropriate intervals during the design process. These reviews should be based on appropriate risk management methods. Design safety reviews should be collaborative in nature where possible.

Safety risks arising as a result of the design should be eliminated wherever possible or practicable.

Residual risk, i.e. the identified risks remaining following the design safety risk management process, should be documented and clearly communicated to relevant stakeholders — including the client, the constructor, and the owner/occupier.

Principle 3: Communicate safety information

Communication and consultation are essential to the management of safety. Within construction projects, safety information should be exchanged between the different stakeholders.

Open and honest dialogue regarding safety issues between the client, the designer and the constructor (including subcontractors) should be maintained throughout the life of the project. This may be verbal or non-verbal, formal or informal. It is very important that safety communication and consultation start as early as possible in the project.

Wherever possible, potential constructors should be consulted during the planning and design stages, and given the opportunity to comment on project definition and design.

Throughout construction, safety risk information should be communicated to relevant stakeholders, including (but not limited to) subcontractors, suppliers, workers, trade unions, regulators and members of the public.

Within stakeholder organisations, safety expectations and procedures should be clearly communicated to the workforce.

It is also vital that bottom-up communication of safety issues occurs. Consultative processes should be established to enable timely worker participation in the making of decisions that impact on safety. The views of people engaged to perform construction work in relation to a project, or their representatives, must be properly considered. In the UAE, this is very important as construction workers often come without any proper training or awareness of health and safety issues.

A project safety communication strategy should be formalised and documented as a critical component of the project safety master plan.

Principle 4: Manage safety risks

The systematic management of safety risks through the elimination or reduction of risks is a requisite for improved safety performance within the construction industry.

At all stages in the project process decisions should be made on the basis of careful consideration of the safety implications of available options. Decisions made about project options, design of the permanent facility/structure, design of the construction process, choice of plant, equipment, materials and construction methods, and project organisational arrangements should be made following an assessment of safety risks, using an appropriate and recognised risk assessment method.

Wherever possible, safety risks should be eliminated through design or engineering solutions to create a safe workplace. Where workplace risks cannot be physically removed, they should be reduced as far as possible or practicable. It is always better to make the workplace safer than rely on behavioural controls, because people are fallible and will always make mistakes. When a risk cannot be eliminated, risk control measures must be considered in the following order: substitute the hazard giving rise to the risk with a 'less risky' hazard isolate the hazard from people whose safety could be at risk minimise the risk by engineering apply administrative measures, e.g. the adoption of safe systems of work use personal protective equipment.

Even when a work site has been made as safe as possible, there is an opportunity to reduce the likely hood of incidents further by ensuring that safe work procedures are understood by everyone and consistently followed.

Providing people with equipment that is fit for purpose, and ensuring that they possess the knowledge, skills and abilities they need to work safely, are critical aspects of good safety management.

Safety risk information relating to the project should be recorded and made available to those who must manage or work with a risk, in accordance with the project safety communication strategy. All project decision-making that could have an impact upon safety risk should involve input from those parties that could be affected by that risk.

Principle 5: Continuously improve safety performance

Safety management should strive for continuous improvement by regularly reviewing safety performance, seeking feedback from project stakeholders, and using the lessons learned to improve performance and to share and promote best practices in the construction industry. In order for the industry to maintain sustained improvement in safety, clear targets and appropriate key performance indicators (KPIs) should be

established for safety at an industry, organisation and project level, and safety performance must be rigorously monitored and measured.

This measurement should incorporate traditional 'lagging', as well as proactive 'leading' indicators of safety performance. The continuous improvement of safety also requires industry-wide collaboration in the form of benchmarking and information sharing.

Regular reviews of safety management performance should be undertaken through all stages of the project lifecycle. These should be conducted collaboratively between all project stakeholders, including subcontractors.

On completion of construction projects, a post-project review of safety performance and processes of clients, designers and constructors should be undertaken. This review should also evaluate the extent to which these parties have worked cooperatively to ensure safety in the project. Lessons from these post-project safety reviews should be captured and shared within and between organisations in the industry.

Principle 6: Entrench safety practices

Through the diligent application of the preceding principles, best safety practices should be entrenched as an integral part of an industry-wide safety culture.

The vast majority of firms operating in the construction industry are small to medium-sized enterprises (SMEs). It is essential that larger construction organisations work to disseminate safety knowledge and best practice among the SMEs with whom they do business.

This dissemination can be facilitated by the establishment of clear safety requirements in the selection of SME subcontractors or suppliers, and the inclusion of safety requirements in subcontracts. Construction organisations can also support the development of safety capability in SME firms through the establishment of long term relationships with subcontractors and suppliers (perhaps through preferred provider schemes), and the implementation of safety mentoring schemes for SME subcontractors and suppliers.

Construction organisations should also require SME subcontractors to participate fully in project safety management programs, including safety planning, training, monitoring and reporting.

8.2 Best practice guide

8.2.1 What is best practice?

Best practices is defined as 'the policy, systems and procedures that, at any given time, are generally regarded by peers as the practice that delivers optimal outcome, such that they are worthy of adoption'. Best Practice is the knowledge that underpins examples of excellence.

Best practice means finding - and using - the best ways of working to achieve your business objectives. It involves keeping up to date with the ways that successful businesses operate - in your sector and others - and measuring your ways of working against those used by the market leaders.

Best practice may also be learned through benchmarking, meaning learning from and through the experience of others. One way of doing this is through benchmarking, which allows you to compare your business with other successful businesses to highlight areas where your business could improve (Business Link, 2010).

8.2.2 Best practice guide for H&S in construction in the UAE

Based on the research work undertaken and the findings obtained, the following guide is suggested for UAE construction companies to adopt as a start with the aim of putting health and safety at the hearth of their business.

1) Establish a Health and safety Committee at company level. The committee's constitution and duties need to be properly defined with its main task being to ensure that health and safety issues matters and is an important and vital part of the success of the company and not as something marginal and unimportant.
2) Adopt Health and Safety regulations for in and off site work. The company could adopt existing regulations and add to it or develop its own. However, there is no need to reinvent the wheel as a wealth of documentation on health and safety exists and it may be adopted and adapted to the UAE's construction industry needs.

3) Appoint Health and Safety Officer in charge of overseeing and ensuring health and safety regulations and rules are properly followed through and implemented. The health and safety offices must work very closely with site engineers and other workers on site, ensuring that health and safety is taken very seriously at every stage of the construction phases.
4) Embed and implement health and safety at all stages of the project, from the initial stage of preparing the designs to completion and handover to the client.
5) Devise training programmes and identify train needs as and when arising for all staff, be it office or site employees. Develop their awareness of health and safety issues and how important it is for their well-being but also for the success of projects. In the UAE this is extremely important as large number of workers on construction sites join the company without any prior training in health and safety and are exposed to great and real dangers. Additionally, cultural and language barriers could negatively impact on the workers' awareness of risks and actions needed.
6) Keep employees updated by any changes to health and safety legislation. It is vital that changes are properly and promptly communicated to employees, especially those at the front line exposed to permanent risks. Regular health and safety information is to be posted at Strategic Points.
7) Identify and manage health and safety risks and hazards present within any activities of the business and any actions needed are followed through to completion.
8) Keep a risk register. This is a key planning tool. The register should be started at the inception of a project and actively used through to project completion. It can then be used to assess the way that risk on the project was managed so that lessons can be applied to other projects.
9) Assign appropriate actions for project team members against each risk item. The risks and associated actions should be reviewed on a regular basis throughout the pre-contract and construction phase.
10) Make a financial allowance for all residual risk items. This ensures that it does not get ignored. Instead a decision can be taken as to the best approach in reducing the cost of this item. This could involve paying for more detailed

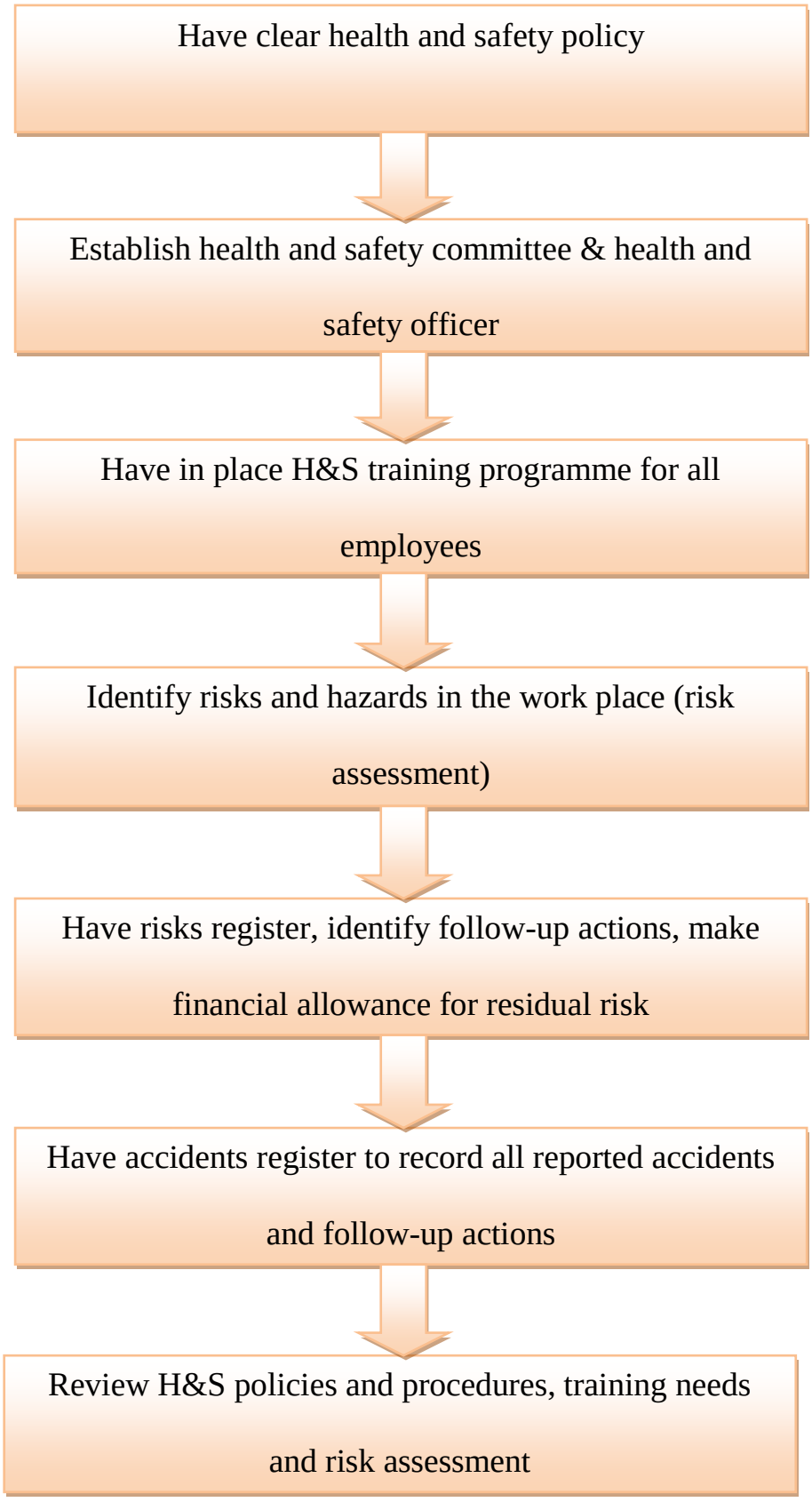
investigation work to be undertaken and so providing better information on which the respective elements of work can be costed.

11) Keep a register and record of all accidents, minor and major and actions taken. It is important to keep a register of minor accidents, as well as major ones, because a minor accident this time round could result in a major accident if no action is taken. For example, a minor fall from the first floor of a building under construction because of faulty scaffolding could result in a fatality if it happens at a higher floor, and hence prompt action is required.
12) If sub-contractors are used to carry out jobs on behalf of the companies, then Prior to any contractor carrying out any work at our business premises or elsewhere on our behalf, the contractor must produce or complete the following:
    - A copy of their current Employer and Public liability insurance.
    - A method statement for the task they are to carry out.
    - Copies of any risk assessments relevant to the job.
    - Any other information that may affect the health and safety of people.
13) Review health and safety practices regularly and share with employees.

Figure 8.1 below summarise all the above steps into a diagram.

The steps indicated in the diagram may not be new (original), but if applied in the UAE context, they would lead to noticeable improvements in health and safety in the workplace. It is based on the findings from the interviews and questionnaires and the issues that were clearly highlighted.

Figure 8.1 Best practice guide for H&S management for construction companies in UAE



CHAPTER NINE

CONCLUSIONS AND RECOMMENDATIONS

9.1 Conclusions

This research through the literature review that was carried out has shown that very little work has been undertaken as concerns health and safety in the UAE, and no data to support the research was available, hence, the importance of the questionnaires and the interviews in shedding some light, however limited, on this new topic as far as the UAE is concerned. It is hoped that this work has made a modest contribution to knowledge and would guide researchers in the future to expand on some of the aspects investigated by this research and look into other aspects.

The importance of health and safety in companies, especially construction ones, not just in the UAE but worldwide is well established. There are some powerful incentives for organisations to strive for high health and safety standards which are moral, legal and economic. In reality since the early sixties of the last century, the construction industry passed through a tremendous growth and development and now it is essential for employers and employees to be aware of the health and safety issues that concern them and demand for qualifications in this area is increasing especially in the emergent or developing countries. Indeed the construction industry is working very hard to improve its health and safety record.

It may seem appropriate to suggest that a health and safety program is in the organisation's effort to help the workers feel better in their jobs. Truly this effort is one crucial component of this safety program and can influence more than any other component in creating the improvement in occupational safety. This effort, when felt by the employees, creates a loyalty towards the organisation. Workers not dedicated to the organisation have a tendency of losing interest in their daily work.

Many accidents in the UAE happen as a direct result of inadequate planning. Thus the planning of various activities can be part of a safety program. If the activities of the work place are carefully planned, the unknowns and risks are minimized. A careful and well thought out long term plan and the preparation of short- term plans lead to improvements

in safety performance, leading to larger profits. A poorly planned system, on the other hand, is characterized by a series of unfortunate ‘accidents’ to be handled and unexpected ‘deadlines.’

As expected of the important factors affecting the health and safety standard was found to be the company's size. This research found that larger contractors tend to perform better compared to smaller companies generally because they have greater resources to do so. Large firms are associated with larger projects containing more risks and so are typically required to implement better health and safety procedures. Small contractors and subcontractors on the other hand, generally perform poorly for similar reasons, their projects are generally smaller and have lesser health and safety risks. Many occupational health and safety professionals believe that the application of effective occupational health and safety management systems will lead to a better health and safety performance. Management commitment plays a major role in health and safety performance. However, small companies seem to lack both the financial resources and management commitment to improve their own health and safety performance.

This research has shown that small contractors tend not to include health and safety costs in their tenders, reducing their ability to deal with potential problems. The industry contains a very large proportion of small firms that may not be in a strong position to implement good health and safety systems. Existing government safety regulations place considerable pressure on all firms, large and small, to protect the construction workforce.

This research has shown that small firms do not seem to have the ability or motivation to achieve high levels of health and safety standards when benchmarked against larger firms. This calls into the question the notion that health and safety performance can be achieved by simply introducing government health and safety regulations. The construction, refurbishment and maintenance of facilities involve many small firms that seem to take large risks. Increasingly, the performance of these firms reflects on the manager of the facility, which may lead to liability. Future research is needed to investigate how best to improve health and safety within small enterprises; risk compensation theory and homoeostasis theory may be useful areas for further investigation.

9.2 Main findings summarised

The main findings from the research investigation may be summarised as follows:

- 69% of construction companies in the UAE have a serious lack of understanding of H&S policy importance.
- In the UAE as all medium construction companies tend not to have a specialised health and safety officer and hence produce poor health and safety policies. Similarly, the questionnaire demonstrates that the H&S policy in 74% of large construction companies was signed by the executive managers of the companies who had basic training in health and safety.
- In all oil companies and 27% of large construction companies, health and safety policies were signed by health and safety mangers with extensive experience and training in health and safety which reflects their awareness of its importance and commitment to the safety of their employees.
- All small construction companies together with 80 % of medium construction companies do not have a written health and safety policy. This result was concurred with findings from the interviews.
- The frequency of updating the health and safety policy construction companies in the UAE fluctuates widely as the analysis displays that only 30% of oil companies along with 7% of large construction companies update their H&S policy every 6 months.
- In contrast, the analysis depicts a problematic situation in the remaining companies as 35% and 20% of oil companies and large construction companies respectively update their policy every one year only which is considered insufficient.
- The situation becomes worse with the remaining 35%, 37% and 28% of oil, large and medium construction companies respectively as they update their policies only once every 2 years.

- The remaining 72% of medium construction companies update their polices only upon significant change of working conditions which means, taking their work size into account, may not update their policy for up to 3 years as they do not usually see any major change in their work nature.

- With regard to the consultation of employees on health and safety matters by the companies, the analysis of data reveals the situation in the UAE is quite difficult as 70% of companies report they consult their employees, yet their explanation of the consultation is vague.

- The analysis of the questionnaire reveals at first look that all oil, large and 84% of medium construction companies have a healthy attitude toward the formal health and safety induction training to new employees.

- However, this perspective fades once the analysis of their response to the frequency of their health and safety induction training is consulted as it reveals that 19% and 20% of medium and large construction companies respectively undertake the training induction every 6 months. Additionally, the frequency analysis demonstrates that 81% and 67% of medium and large construction companies respectively undertake the training once a year only with the remaining 13% of large construction companies undertaking the training every 3 months.

- On the contrary the results from oil companies shows their commitment to the health and safety of their new employees as 70% of them undertake health and safety induction training every 2 weeks and 30% undertake the training on a monthly basis. Also, these companies explains that all new employees must attend this training before commencement of work and hence new employees would be made fully aware of the risks associated with their jobs.

- Concerning the health and safety induction training, the questionnaire reveals the general poor attitude of the UAE construction companies toward the continuous health and safety training of their employees as only 18% of respondents confirmed having such training.

- In contrast, 70% of the oil companies provide formal health and safety training to their employees every 6 months while the remaining 30% along with all large

construction companies, which have health and safety training, do so every one year.

- In terms of awareness of training schemes importance, the questionnaire reveals a serious problem across the oil and construction industries as all small, medium and large construction companies as well as 80% of oil companies do not belong to any training schemes.

- In terms of undertaking risk assessments, the questionnaire highlights there is, to some degree, an appreciation of risks assessments across the UAE construction companies as all oil companies as well as large construction companies and around 44% of medium construction and companies have procedures for undertaking risk assessments.

- With regard to the health and safety inspection of sites, the questionnaire indicates that apart from oil companies and 33% of large construction companies, no other construction companies in the UAE take this matter seriously.

- In terms of accidents recording, the questionnaire as well as the interviews revealed that construction companies in the UAE generally need to improve their practice in this area with exception of oil companies and a small percentage of large construction companies.

- With reference to enforcement agencies which deal with H&S issues in the UAE, the questionnaire reveals an untouched problem in this industry as all participating companies stated that they or any subcontractors working directly under their control had not been issued with any kind of improvement notice, prohibition notice or been prosecuted for neither health & safety nor environmental issues.

- 71% of senior site engineers interviewed said that there is no training of workers and 74% believe that such training, when existent, is outdated.

- 87% strongly of those interviewed agree that there exist cultural barriers to adhesion to H&S procedures, although 91% said they were not made aware of such barriers, which suggests that the issue was not discussed.

- 86% of those interviewed admitted that they did not adhered to accident reporting procedures, and a similar percentage (83%) admitted not recording accidents. Interestingly, 71% of respondents said that they were not provided with means of recording accidents which explains why only 54% carry out any follow up action following an accident.

9.3 Limitations and future Research

Preventive measures mentioned have been implemented for many years by many construction companies worldwide driven by existing regulation, with governmental inspectors having the role of verifying the application of these regulations. The implementing of health and safety programs consists of the following:

- ✓ to examine the status of safety management in the construction industry;
- ✓ to explore the risk-prone activities on construction sites;
- ✓ to identify the factors affecting construction site safety; and
- ✓ to suggest ways of improving safety performance.

There is no reason why health and safety performance in the UAE should not benefit from the same approach and achieve at least as much improvement. This will require a collective and a well planned and executed approach to the problem, with all involved parties, governments, local authorities, auditors, firms and clients all taking an active part.

For future research, the following recommendations are made:

a) Expand questionnaire to cover more construction companies, especially the small to medium size ones as they are the ones more prone to paying less attention to health and safety rules as has been shown by the questionnaires.
b) Organise more interviews with health and safety officers and senior site engineers to obtain more valuable information. This will help devise more focussed questions for the questionnaire. For example, the issues of language and cultural barriers need further investigation given to them.
c) Explore the use of the repertory grid technique to carefully plan, organise and analyse the interviews questions by expanding on the number of elements, constructs and contrasts that may be studied. It would be interesting not to chose the elements but rather to have them elicited by the interviewee to eliminate any bias from the study. It is also possible to explore

other constructs and contrasts so that more valuable information about health and safety in construction in the UAE.

d) Investigate how health and safety issues are dealt with in other Arab/Gulf countries with similar problems and challenges.
e) Explore the transportability of knowledge and advanced awareness of health and safety from developed countries to the UAE and how this may be achieved.

9.4 Contribution to knowledge

The author believes he has made considerable contribution to knowledge which is also novel in the current context of health and safety in construction in the UAE. This may be summarised as follows:

1) The extensive literature review undertaken by the author has shown there was almost no academic work published on the topic of health and safety in construction in the United Arab Emirates. The vast majority of published work was in the form of newspaper and magazine articles or government directives/policies. The author believes this study will be of important value to anyone interested in the topic.
2) The author's own literature search has shown that the concept of repertory grid technique that was used for the interviews was somewhat novel in the context of health of safety in construction. Indeed, this remains an unexplored area by researchers, and very promising for future research. The other importance is that the author himself worked hard to learn this new technique which will open for him new horizons for further research in the field.
3) The framework and best practice guide that culminated from this work are of unique value for the UAE construction sector because very little has been done in this field in the UAE context. The benchmarking approach adopted by the author against existing practices in the UK, means that the UAE can learn from other countries in its pursuit of improving its record in health and safety practices in construction, but also, by extension, in other sectors.
4) The technique of Repertory Grid is a technique that has been used for a number years in other disciplines but hardly in construction topics. The author believes he has made a major contribution in using the technique to understand and analyse data for health and safety in construction.
5) By undertaking this research topic, the author is making a huge contribution to knowledge transfer from the UK to the UAE. Indeed, good practices in health and safety in the UK will be very useful in the UAE.

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APPENDIX A

Cover Letter

1 April 2008

Dear Sir/Madam,

I am Mr. Mohamed Alhajeri, a PhD student at Coventry University UK. As part of my research I am writing to invite you to participate in a questionnaire survey project on health and safety challenges in the UAE construction industry. The main purpose of this survey is related to the causes of construction accident in construction management, particularly in the UAE. The present research is trying to identify the causes of construction accident and to establish a framework of critical factors for successful implementation of health and safety.

The study is to examine how companies can adopt appropriate health and safety for continuous improvement and investigate how employee's level of awareness can influence their performance. I request your cooperation to fill up the attached questionnaire. I believe that your participation is critical for this study and will significantly contribute to better understanding of health and safety performance.

All data compiled are solely for academic purposes. I would really appreciate if you could complete the questionnaire and send back the questionnaire once completed. I already prepared and attached an envelope and stamp. I'm waiting for your reply. Thank you for your cooperation and interest in making this research success.

Your cooperation will be highly appreciated in this regard. Thanking you in advance.

I look forward to your prompt response.

Yours Sincerely,

Mr. Mohamed Alhajeri

APPENDIX B

Main questionnaire

Please answer all the questions by putting '√ ' in the boxes where applicable.

	Yes	No
SECTION 1 – ORGANISATION TYPE & POSITION OF RESPONDENT		
1.1 What type of organisation you work for? ……..		
1.2. What is your job title (position) in the company? ……...		
SECTION 2 – HEALTH AND SAFETY POLICY, ORGANISATION AND ARRANGEMENTS		
2.1 Does your company have a written health and safety policy.		
2.2 Indicate who signed the H&S policy, if any?		
2.3 Indicate the frequency of updating the H&S policy? ☐ ☐ ☐ ☐ 6 months 1 year 2 years changing conditions		
2.4 Does your organisation consult its employees on health and safety matters?		
SECTION 3 – TRAINING		
3.1 Does your company undertake formal health and safety induction training for all new employees?		
3.2 Does your company have a formal health and safety training programme for your employees?		
3.3 Does your company belong to any training schemes?		

SECTION 4 – HEALTH AND SAFETY MANAGEMENT		
4.1 Please identify below your company's procedures for undertaking risk assessments.		
4.2 identify the categories for which risk assessments were undertaken? ☐ General ☐ site specific ☐ Manual handling ☐ Noise/ vibration ☐ Hazardous substances		
SECTION 5 – HEALTH AND SAFETY MONITORING, AUDIT AND REVIEW		
5.1 Does your company have an internal health and safety department?		
5.2 Does your company employ external health and safety consultants?		
5.3 Does your company have a health and safety committee?		
5.4 Does your company undertake formal site health and safety inspections?		
5.5 Does your company keep records of all accidents to employees?		
5.6 Does your company utilise accident reports in preventing similar accidents?		
5.7 Has your company been issued with an improvement notice, a prohibition notice or been prosecuted by any Environmental Agency within the last 3 years.		
SECTION 6 – SUB-CONTRACTORS		
6.1 Does Your Company employ sub-contractors?		
6.2 Does your company keep records of all accidents to sub contractor employees?		
6.3 Has any company working directly under your control been issued with an improvement notice, a prohibition notice or been prosecuted by any Enforcement Agency within the last 3 years?		
6.4 Does your company undertake any training for its sub-contractors?		

SECTION 7 – ENVIRONMENTAL POLICY AND PROCEDURES		
7.1 Does your company have a written Environmental Policy?		
7.2 Has your company or any sub-contractor under your control been issued with a formal notice, or have been the subject of legal proceedings by any Environmental Agency or Local Authority within the last 3 years?		

APPENDIX C

Interview questions

Please answer all the questions by putting '√ ' in the boxes where applicable.

PART A

What is your position in the company?	
How many years experience you have working in the construction industry?	
How long have you been working for the company?	
Are you involved with health and safety decisions/matters and in what capacity?	

PART B

	Yes	No
1) Does your company have a health and safety policy?		
2) Does your company have a health and safety committee?		
3) Are all accidents recorded?		
4) Do you think under-reporting is a critical problem in the UAE?		
5) Do you think that identifying the critical factors that influence the success of accident reporting system is crucial?		

Samples of interviews carried out:

1) Interview with a senior site engineer in a construction company (contractor)

Question: What is your position in the company?

Answer: I am a senior site engineer.

Question: How many years experience you have working in the construction industry?

Answer: This information has been removed for data protection reasons. The unabridged version of the thesis can be viewed at the Lanchester Library, Coventry University.

Question: How long have you been working for the company?

Answer: This information has been removed for data protection reasons. The unabridged version of the thesis can be viewed at the Lanchester Library, Coventry University.

Question: Are you involved with health and safety decisions/matters and in what capacity?

Answer: My job include the following tasks: Liaison with clients and other contractors; Undertake supervision and scheduling of construction works on site; and prepare site progress reports. But I also have a duty that health and safety is observed on site.

Question: Does your company have a health and safety policy?

Answer: I think it has.

Question: Does your company have a health and safety committee?

Answer: I am not aware there is one.

Question: Are all accidents recorded?

Answer: If something happen I report to my boss.

Question: Do you think under-reporting is a critical problem in the UAE?

Answer: Honestly…yes. Accidents are always reported.

Question: Do you think that identifying the critical factors that influence the success of accident reporting system is crucial?

Answer: Yes… because then we can improve the situation.

2) Interview with a project manager in a construction company (contractor)

Question: What is your position in the company?

Answer: I am a project manager.

Question: How many years experience you have working in the construction industry?

Answer: This information has been removed for data protection reasons.

Question: How long have you been working for the company?

Answer: This information has been removed for data protection reasons. The unabridged version of the thesis can be viewed at the Lanchester Library, Coventry University.

Question: Are you involved with health and safety decisions/matters and in what capacity?

Answer: Yes I am. I am responsible that all tasks undertaken on site are safe for the workers. I give instructions to the site engineers that everything is checked.

Question: Does your company have a health and safety policy?

Answer: Yes. We use the Abu-Dhabi's Department of Municipal Affairs Code of Practice for Construction Projects.

Question: Does your company have a health and safety committee?

Answer: Not a formal one. But we do meet and talk about health and safety when needed.

Question: Are all accidents recorded?

Answer: Yes, we do our best to keep a record. But I can't claim that everything is reported or recorded.

Question: Do you think under-reporting is a critical problem in the UAE?

Answer: I think yes. There is a cultural issue here in that people don't take health and safety matters seriously and accidents are seen as some unfortunate thing to happen and don't see it as a failure of the system.

Question: Do you think that identifying the critical factors that influence the success of accidents reporting system is crucial?

Answer: I am not sure I understand correctly your question, but lifting the barriers that stand in the way of accurate accidents reporting is very important.

APPENDIX D

Paper presented at the: Third International World of Construction Project Management 2010 (WCPM 2010) - October 2010

HEALTH AND SAFETY IN THE CONSTRUCTION INDUSTRY CHALLENGES AND SOLUTIONS IN THE UAE

M. Alhajeri and M. Saidani

Coventry University Faculty of Engineering and Computing, Department of Built Environment, Priory Street, Coventry CV1 5FB, email: alhajeri25@hotmail.com, m.saidani@coventry.ac.uk

Abstract. *The traditional performance measurements of time cost and quality are no longer the only benchmarks for construction projects. In recent years there is an additional target of health and safety requirements challenging construction performance to plan more thoroughly. Wherever reliable records are available construction is found to be one of the most dangerous on safety criteria. Efforts have been made to address this problem but the results have been far from satisfactory as construction accidents continue to dominate. Despite the programs implemented by government authorities and measures introduced by companies themselves the number of construction accidents still remains alarmingly high.*

In the developing countries the construction industry continues to lag behind most other industries particularly as a consequence of inadequate organisational issues. From this perspective this research explores the approved methods adopted in the UK in order to improve the existing code of practice in the UAE thus introduce the foundations on which appropriate health and safety systems may be built. An overview of the published materials

and the updated legislation were undertaken. Thereafter a questionnaire was carefully designed and 350 copies were distributed to construction industry companies in the UAE. Interview sessions have been also conducted to meet the first objective of the project which to determine the health and safety currently applied on construction sites. Analysis of the findings from the investigation showed that some safety managers were more concerned about cost than health and safety. There was also evidence that some safety managers were not fully aware of safety practices and procedures in construction projects.