UNIVERSITI PUTRA MALAYSIA

ASSESSMENT OF PERFORMANCE COMPLIANCE WITH CONSTRUCTION SITE SAFETY MANAGEMENT SYSTEM IN KLANG VALLEY, MALAYSIA

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By

YAKUBU DANASABE MOHAMMED

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfillment of the Requirements for Degree of Doctor of Philosophy

February 2015

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DEDICATION

This research work is dedicated to my late parents Alhaji Mohammed Mamman Etsugaie (Turakin Agaie) and Malama Hadiza Mamman Etugaie; my wife Salamatu, children Khadijat, Mohammed and Hauwa; My Family members who's firmly stood by me and to everyone engaged in the battle against poor safety and health performance at workplace, most especially in construction sites.

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for the Degree of Doctor of Philosophy

ASSESSMENT OF PERFORMANCE COMPLIANCE WITH CONSTRUCTION SITE SAFETY MANAGEMENT SYSTEM IN KLANG VALLEY, MALAYSIA

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February 2015

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In most construction sites, poor safety awareness is a major factor affecting workers' performances at the workplace. Safety management is associated with the policies, objectives, procedures, methods, roles and functions that aim at controlling hazards and risk in socio-technical systems. Construction workers accidents and fatalities rate in construction industries is attributed to the non compliance by contractors toward health and safety regulation on construction sites. The regulatory systems and standard are in the form of occupational safety and health laws. The regulatory system and standard are built on the fact that the accidents and fatalities at construction sites may be mitigated by good construction practice, effective site inspection and strict enforcement of high standard of care. The awareness and perception of workers to safety, health and their working environment are an important aspect to enhance the cares of building construction at construction sites. This research examines the effectiveness of safety management system and explored the relationship between safety management aspect and workers' compliance to safety management system. In order to determine the effectiveness or ineffectiveness of the system on site, a comparative cross – sectional study was conducted in 20 construction sites in Klang valley in order to assess the pattern of injuries or accidents among construction workers, contractor's performance regarding safety and health elements in construction site and the level of compliance by the construction firms. Using cluster sampling method 344 construction workers were sampled from the 20 construction sites, using a structured questionnaire with compliance to construction sites safety measures. A descriptive analysis of the comparative cross – sectional study was computed. The results show that poor implementation of safety and health measures on the site is responsible for the occurrence of accidents among workers. The injuries or accidents on site can be reduced to a certain level with precautionary measures as regard to safety

and health is put in place. Effective assessment of contractor's performance regarding safety and health practices in construction sites, OSHA standardized mathematic formula was used. The result of the analysis show that the rate of accidents increases with inadequate number of workers at work place. This situation can be reduced or eliminated with regulatory measure in terms of number of employees on site. In order to determine the level of compliance of the construction sites to safety management system, safety and health assessment system in construction (SHASSIC) was used. The results show that 55%, representing firms within (55 – 69) ranking as 3 – star were all potential and significant workplaces, high risks or hazards are managed and documented. However, there are few low risk work activities that are neglected, due to poor compliance to safety measure on the sites by contractors. The relationship between safety management system and workers' compliance was correlated and the result was found to be significant ($P < 0.005$). This association was modeled using simple linear regression and from those models the results show that the more compliance to safety management system by the workers the better the benefit of safety management system on construction sites. This study provided substantial evidences that laws and regulations alone do not ensure safety and health practices at construction sites. In fact, that what is required is the aspect of adoption and implementation of safety – conscious contractors which supported by experience and trained employees. The findings of this study will provide good guidance to assist contractors in developing effective and efficient health and safety management system in the Klang valley construction industry. The comparative cross – sectional study should help in achieving an improvement on construction site safety performance.

Keywords: Accidents, Compliance, Risk, Negligence, Regulation, Policy.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan ijazah Doktor Falsafah

PENILAIAN PRESTASI PEMATUHAN TERHADAP SISTEM PENGURUSAN KESELAMATAN TAPAK PEMBINAAN DI LEMBAH KLANG, MALAYSIA

Oleh

YAKUBU DANASABE MOHAMMED

Februari 2015

Pengerusi: Profesor Madya Mohd Bakri Bin Ishak, PhD

Fakulti: Pengajian Alam Sekitar

Di kebanyakkan tapak pembinaan, kesedaran keselamatan yag rendah adalah faktor utama yang memberi kesan kepada prestasi pekerja di tempat kerja. Pengurusan keselamatan dikaitkan dengan dasar, objektif, prosedur, kaedah, peranan dan fungsi yang bertujuan mengawal bahaya dan risiko dalam sistem sosio-teknikal. Kadar kemalangan dan kematian pekerja binaan dalam industri pembinaan adalah disebabkan oleh kontraktor tidak patuh pada polisi peraturan kesihatan dan keselamatan di tapak pembinaan. Sistem peraturan dan piawaian adalah dalam bentuk undang-undang keselamatan dan kesihatan pekerjaan. Sistem peraturan dan piawaian yang dibina berdasarkan fakta bahawa kemalangan dan kematian di tapak pembinaan boleh dikurangkan dengan amalan pembinaan yang baik, pemeriksaan tapak berkesan dan penguatkuasaan ketat polisi keselamatan. Kesedaran dan persepsi pekerja terhadap keselamatan, kesihatan dan persekitaran kerja adalah satu aspek penting bagi meningkatkan keselamatan di tapak pembinaan bangunan. Kajian ini menilai keberkesanan sistem pengurusan keselamatan dan menerokai perkaitan antara aspek pengurusan keselamatan dan pematuhan pekerja untuk sistem pengurusan keselamatan. Dalam usaha untuk menentukan keberkesanan atau ketidakberkesanan sistem di tapak pembinaan, kajian perbandingan silang - bahagian telah dijalankan di 20 tapak pembinaan di Lembah Klang untuk menilai tahap kecederaan atau kemalangan di kalangan pekerja-pekerja binaan, prestasi mengenai keselamatan kontraktor dan elemen-elemen kesihatan di tapak pembinaan dan tahap pematuhan oleh firma pembinaan. Dengan menggunakan kaedah persampelan kelompok 344 pekerja binaan menjadi responden daripada 20 tapak pembinaan, menggunakan borang soal selidik berstruktur berkaitan pematuhan kepada langkah-langkah keselamatan tapak pembinaan. Analisis deskriptif perbandingan silang – bahagian telah dijalankan. Keputusan menunjukkan bahawa pelaksanaan langkah-langkah keselamatan dan kesihatan adalah rendah di tapak pembinaan ini

adalah antara penyebab utama berlakunya kemalangan di kalangan pekerja. Kecederaan atau kemalangan di tapak pembinaandapat dikurangkan ke tahap yang terkawal dengan langkah-langkah berjaga-jaga seperti dalam polisi keselamatan dan kesihatan yang ditetapkan. Penilaian prestasi terhadap kontraktor mengenai amalan keselamatan dan kesihatan di tapak pembinaan melalui OSHA diseragamkan dengan formula matematik. Hasil analisis menunjukkan bahawa kadar kemalangan meningkat dengan jumlah pekerja yang tidak mencukupi di tempat kerja. Keadaan ini boleh dikurangkan atau dikawal dengan memantau bilangan pekerja di tapak pembinaan. Bagi menentukan tahap pematuhan terhadap sistem pengurusan keselamatan, keselamatan dan kesihatan daripada tapak pembinaan, sistem penilaian dalam pembinaan (SHASSIC) telah dilaksanakan. Hasil kajian menunjukkan bahawa 55%, yang mewakili firma dalam (55 – 69) kedudukan sebagai 3 - bintang secara keseluruhan adalah tempat kerja yang berpotensi dan risiko tinggi atau bahaya perlu dikawal dan didokumentasikan. Walau bagaimanapun, terdapat beberapa aktiviti kerja berisiko rendah yang diabaikan, kerana tidak memenuhi keperluan langkah keselamatan di tapak pembinaan oleh kontraktor. Perkaitan antara sistem pengurusan keselamatan dan pematuhan pekerja telah dikaji dan hasil yang telah didapati terkait ($P < 0.005$). Perhubungan ini telah dimodelkan menggunakan regresi linear dan hasil dari simulasi model menunjukkan bahawa pematuhan kepada sistem pengurusan keselamatan oleh pekerja memberi manfaat yang tinggi kepada sistem pengurusan keselamatan di tapak pembinaan. Kajian ini menunjukkan bahawa perlaksanaan undang-undang dan peraturan-peraturan sahaja tidak memastikan amalan keselamatan dan kesihatan di tapak pembinaan. Malah, apa yang diperlukan adalah aspek pematuhan dan pelaksanaan keselamatan – dengan sokongan kontraktor yang bertanggungjawab, berpengalaman dan kakitangan terlatih. Hasil kajian ini dapat menjadi panduan yang baik untuk membantu kontraktor dalam membangunkan sistem pengurusan kesihatan dan keselamatan yang cekap dan berkesan di Lembah Klang dalam industri pembinaan. Perbandingan silang – bahagian harus menyumbang dalam mencapai peningkatan prestasi keselamatan di tapak pembinaan.

Kata kunci: Kemalangan, Pematuhan, Risiko, Kecuaian, Peraturan, Dasar.

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This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfillment of the requirement for the degree of Doctor of Philosophy. The members of the Supervisory Committee were as follows:

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LIST OF ABBREVIATIONS

CP:	Company policy
MR:	Management responsibility
SP:	Safety program
FP:	Fall protection
ERP:	Emergency respond plan
HIRARC:	Hazard identification risk assessment risk control
MM:	Material management
MS:	Machine safety
DC:	Disease control
MF:	Medical facilities
WP:	Workplace inspection
AP:	Accident prevention
AR:	Accident reporting
CCB1:	Compliance to company policy
CCB2:	Compliance to management responsibility
CCB3:	Compliance to safety program
CCB4:	Compliance to fall protection
CCB5:	Compliance to ERP
CCB6:	Compliance to HIRARC
CCB7:	Compliance to material management
CCB8:	Compliance to management responsibility1
CCB9:	Compliance to HIRARC1
CCB10:	Compliance to fallprotection1
CCB11:	Compliance to ERP1
CCB12:	Compliance to management responsibility2
CCA1:	Compliance to machine safety
CCA2:	Compliance to disease control
CCA3:	Compliance to medical facilities
CCA4:	Compliance to accident prevention

CCA5:	Compliance to welfare
CCA6:	Compliance to workplace inspection
CCA7:	Compliance to accident reporting
CCA8:	Compliance to welfare1
CCA9:	Compliance to accident reporting1
CCA10:	Compliance to disease control1
CCA11:	Compliance to welfare2
SMS:	Safety management system
SMSC:	Safety management system compliance
MS:	Management safety
CMS:	Compliance to management safety
WS:	Workers safety
AVGTMR:	Average total management responsibility
AVGTWS:	Average total workers safety
AVGTCMR:	Average total compliance to management responsibility
AVGTCWS:	Average total compliance to workers safety
ANOVA:	Analysis of variance
IR:	Incident rate
LTC:	Lost time case
SR:	Severity rate
SHASSIC:	Safety and health assessment system in construction
NIOSH:	National Institute of Occupational Safety and Health
DOSH:	Department of Occupational Safety and Health
CIDB:	Construction Industry Development Board Malaysia
CIS:	Construction Industry Standard
DP:	Permanent Disability
NPD:	Non Permanent Disability

LIST OF SYMBOLS

N:	Population size
n:	Sample size
α:	alpha
β:	beta
ε :	Epsilon

CHAPTER 1

INTRODUCTION

1.1 Introduction

The laws of construction health and safety required actions to protect those at work on sites as well as members of the public who may be affected. Occupational Safety and Health Act (OSHAct) of 1994 obligate employer to provide and maintain a safe and healthful workplace for all employees. According Chang, (2008), there are more than 100 million people in this world that take construction work as a profession and that half of this number are found in Asian countries. Construction is a risky business with 13 workers per 100,000 being killed compared to 5 per 100,000 in other sector average. Construction exposes workers to a wide range of health problem ranging from asbestosis to back pain, hand-arm vibration syndrome to cement burns (Fact, 2004). The injuries and the illness associated with the construction industry showed that the industry is the most hazardous occupation and high-risk workplace in the world due to poor safety performances. Scholars such as Dias, *et al*, (1999), Berger, (2000) and Haupt, (2001) find out that the European construction sector employs about 7.5% of the sector's workforce and accounted for 17.5% of the sectors accident. similarly, Hinze & Huang, (2006), stated that the USA construction industry has an injury rate of 50% higher than other industries, and those of UK and China are similar. In Australia, construction industries experience 3.7 fatalities in 2007 - 2008 (3.6 fatality per 100,000 workers) (ASCC., 2010). In Kuwait 42% of all occupational fatalities are recorded (Kartam & Bouz, 1998). While in Nigeria, construction industries, loose 5 – 7 % of its workforce annually to construction accidents (Olatunji *et al.,* 2007).

Despite the existence of laws related to safety and health at workplace in many nations, the accident rate is high in most nations. The enforcement of the measures to prevent such accidents in those nation is the responsibility of safety and health agencies which have been neglected (Gee & Saito.,1997 and Haupt, 2001). The report of Centre to Protect Worker's Right, (1993) stated that many safety professional and scholars were of the opinion that the existing safety legislations and regulations do not bring about the expected require zero accidents level at a construction site. Complying with the legislations and regulations on safety in construction sites will improve and minimize the rate of accidents as the legislations and regulations provide a platform for a good construction practice. Also, a good code of standard i.e legislations and regulations can improve construction safety at an acceptable cost. Ratay, 1997; Haupt 2001)

1.2 History of Malaysia Construction Industry

A construction industry involves a wide range of economic activities such as housing project, commercial building project such as hotels, office building, and high rise building project and civil engineering works, i.e bridge construction, Airport, Seaport, Jetty, Tunneling construction etc. Malaysia construction sector has its ups and downs in its growth during the period of 1995 to 2008. The industry best growth of 21.1% was in 1995 before the Asian financial crisis, while its worst growth were in 1997 (10.6%) and 1998 (-22.1%) (Abao, 2010). In 2001, the sector improves its growth rate by 3.3%. Also, during the period 2004 – 2006 the sector experienced a slide reduction in its growth but bounced back in 2007. Again in 2008 the sector experienced another negative growth rate of 2.5% due to global financial crisis. Since, then the sector contribution to the GDP has been within 3 – 4.8%. Figure 1.1 shows the contribution of Malaysian construction sector to the country's GDP from 1994 – 2008.

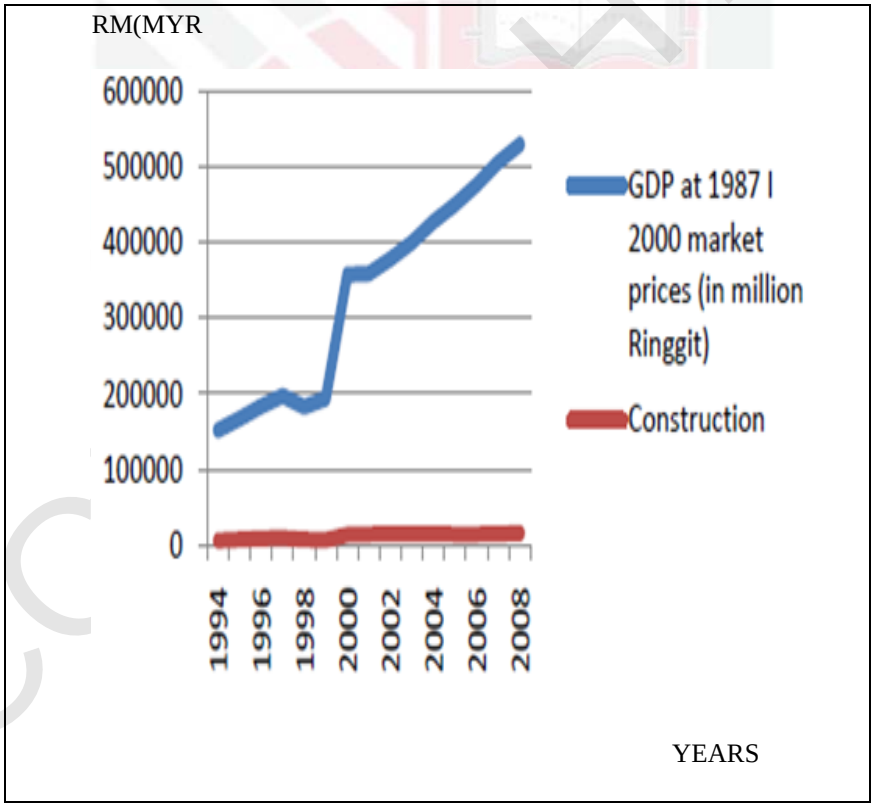

Figure 1.1 Malaysia Share of Construction in GDP (1994—2008)
(Source: Abao, 2010)

According to Abao, (2010), some of the factors that emasculate from an Asia financial crisis that have serious effect on the construction sectors in Malaysia including high rates of rented shops and offices, a proportional number of unsold completed buildings and high rates of some building materials. However, Malaysian government was able to boost the construction sector. The first was through the eight Malaysia plan (2001 – 2005) in which the government earmarked the sum of USD 3.68billion for various construction projects. The second was in the ninth Malaysia plan of 2006, which clearly showed how the government proposed to impact the sector through meeting the demand of its people by meeting their housing and urban services. In addition, the government was able to provide a stimulus package of RM60 billion, i.e 8% of its GDP in response to global financial crisis of 2009, which have great impact on the sector. As at 3rd quarter of 2010 construction industry have contributed 9% to Malaysian GDP. In the last decade economic downturn, the industry suffered tremendously, this is because as the economy had a setback, the booming construction industry had a sudden fall and a major drop in the ever-high flying growth graph. Suddenly, everything was stagnating in the construction industry and no new work done. A lot of projects were delayed due to the economic downfall. The industry had excess capital, but not enough work in production, which caused a gap that brought the growth of the industry down. Learning from the past experiences, the government has undertaken various measures and efforts to push the industry from doldrums, it has shown positive result with construction industry showing positive reaction to economic rebounce in 2009 (CIDB, 2011).

1.3 Malaysia Construction Workers

Abdul Rahim, *et al*., (2011) stated that as of May 2011, Malaysia has approximately 1.9 million foreign workers spread across sectors such as manufacturing (39%), construction (19%), plantation (14%), housemaids (12%), and services (10%), with the rest in agriculture and that the contributing countries by rank are: Indonesia (50.9%), Bangladesh (17.4%), Nepal (9.7%), Myanmar (7.8%), India (6.3%), and the rest from Vietnam. Abao, (2010) highlighted in the report of the Building and Wood Workers International (BWI) that the construction site is increasingly becoming a site where the informal meet global capital that is keeping labor cost low due to pressure to cut down production cost and this deprive the workers of their right at workplace. Depriving workers of their right at workplace, will harpers the cordial relationship existing between the employer and employee at workplace, as the workers are bound to receive low pay, work on an unhealthy condition, and work for longer period of time etc. According to Narayanan, (1992), most workers in construction sector are either employed directly by the main employer or hired on contract through a labor intermediary (contractor or kapala) who takes on the responsibility of recruiting the workers, paying them, and otherwise providing for their needs.

In Malaysia, the process of employing construction workers through an intermediary constitutes a bulk form of employing immigrant construction workers. This means that the contractor may choose not to comply with labor laws and safety and health standards as contained in the OHSMS 18001 and MS1722 (Narayanan, 1992). The construction sector remains unattractive to the young Malaysian due to low level of wages, even for skilled workers. As explained by the Executive Director of the Malaysian Employers Federation (MEF) most Malaysian workers prefer white collar jobs as against working in plantation or construction site due to hard work under the sun associated with the two jobs (Bloomberg News, 2005). The danger posed to personal safety by construction work is one of the reasons why Malaysian are unwilling to take up carrier in it. Statistics from the Social Security Organization (SOCSO) have shown that, an average of five thousand accidents occurred on construction sites annually in Malaysia between 2000 and 2001. This figure represents about 5 to 6.5 percent of the total number of accidents reported over the period. Averages of eighty workers were killed in such accidents (Fong, 2006).

1.4 Legal Obligation

Generally, the fundamental issue facing the construction industry is how to encourage the design team, management and the workers to see health and safety as an issue in achieving a zero accident at the sites. There has been much legislation which governs health and safety laws at construction sites. The poor performances of the construction industries as regard to the health and safety has subjected most of these laws to revision in the past decades (Joyce, 1995; Haupt, 2001).

1.4.1 Construction Design and Management Regulation (CDMR) of 1994

The CDMR was introduced in the United Kingdom in March 1995 in line with the compliance with the European Union Council Directive 92/57/EEC in 1992, and all European Union member states were to implement the terms of the directive into national legislation by 1994 (Shannon *et al*., 1996). Munro, (1996) and Haupt, (2001) stated that the directive is in response to the study carried out between 1981 – 1985 by the Health and Safety Executive (HSE), in which 739 people were killed within the period in the construction sector. Also, the report of Sir, Michael Latham of 1994 advocate a teamwork approach among the construction team, and that violation of the CDMR should carries a criminal sanction of 2years and unlimited fine (Caldwell, 1999). The main objective of CDMR is to safeguard the implementation of safety and health at the design and construction stage of a project. Baxendale & Jones, (2000) outline the fundamental principles on which the CDM Regulation is based:

a. That the safety is to be considered systematically, stage by stage, from the outset of the project.
b. That all members who contribute to the health and safety on the project are to be included.
c. That a proper planning and coordination must be undertaken from the outset of the project.
d. That the provision of health and safety is to be within the control of competent persons.
e. That the communication and the sharing of information between all parties must be included
f. And that a formal record of safety information for future use must be made.

The CDMR fundamental principal outlined above bring all the construction parties into obligatory tasks, which have placed the issue of safety and health in construction site as a responsibility of all, not the contractors alone.

1.4.2 European Union law and Policy in the field of Occupational Health and Safety (OSH)

It has been more than 20years since the adoption of the EU Framework Directive on Occupational Safety and Health (OSH), which sets out the key principles underpinning the prevention of risk and protection of health and safety of workers. A significant body of legislation has been developed as well as a common culture of risk prevention, which has been the hallmark of the EU occupational health and safety policy (Barbarosie, *et al*., 2010). According to Barbarosie *et al.*, (2010), EU initiatives on the health and safety at work enjoyed a more rapid development following the adoption of simple European Act in 1987. Two distinct legislative phases of the EU in the field of safety and health at work are reflected in legal act. The first series of binding legal act were on the Article 100 of the EEC Treaty and started with council directive 77/576/EEC on the safety signs at the place of work (no longer in force) followed by first Framework Directive 80/1107/EEC (OJ L 327, 3 December 1980) on the protection of workers from risk related to exposure to chemical, physical and biological agents at work and four individual directive. Another directive of the EU commission to ensure greater protection of the safety and health of construction workers in the workplace is the Council Directives 92/57/EEC of 24 June 1992.

1.4.3 Framework Directive 92/57/EEC of 24 June 1992

The framework is aim at providing for safety and health of workers on sites in the EU Community wherever building or civil engineering construction works were carried out.

Lorent, (1999) and Haupt, (2001), observed that in many EU communities the Framework Directive have been transformed into national law with some changes in the function of the management structure and together with advancement in safety measures. Furthermore, the EU communities recognized that 50% of the accidents at construction sites were due to unsatisfactory architectural design, ineffective management function and poor planning during the pre planning stage of the construction work. Moreover, The EU communities commission have recognized that quite number of accidents at construction site were due to lack of proper coordination of work at construction sites especially when there are different work trade taken place at the site (Schaefer & Munck, 1999) and Haupt, 2001). The provision of the Framework Directive 92/57/EEC of 24 June, 1992 is to bring together all the people responsible for the construction activities so as to develop a cultural change toward improvement of the poor safety culture within the construction industries.

1.5 PROBLEM STATEMENT

Despite the existence of regulatory system and standard in many construction industries in most countries the accidents occurrences persists. The accidents and fatalities rate in construction industries is attributed to the non compliance by contractors with safety and health regulation on construction sites (Baxendale and Jones, 2000;Warwick, 2011).

In general, compliance means conforming with established guidelines such as specification, policy, legislation, standard laws etc (Sarbanes-Oxley Act, 2002). The regulatory systems and standard are in the form of occupational safety and health laws, rules and regulation. Ratay, (1997) agreed that the regulatory system and standard are built on the fact that the construction accidents and fatalities may be mitigated by good construction practice, effective inspection and strict enforcement of high standard of care.

Construction industries worldwide is associated with high accidents and fatality rates when compare to other industries (Sidumedi, 2009; Ulang, *et al*., 2010). According to Vander, *et al*., (2009) the rapid growth in the construction industries has lead to increases in accidents and fatality rates which threat on the occupational safety and health. Construction workers are six times more likely to be killed than workers in other industries (Odeyinka, *et. al*., 2005).
In Malaysia despite the implementation of safety laws and regulation in the construction industry, accidents rates in the construction industry are truly

proven. According to Zakaria, *et al*., (2010), the NIOSH Chairman, Datuk Lee Lam thye that there are 1,195 confirmed space accidents in which 122 workers suffered permanent disabilities and 7 other killed compared to 1,365 cases in 1997 which recorded 44 permanent disability cases and 6 fatalities. The high rates of construction accidents have been an issue of concern. The problems still exist because there are certain contractors and sub contractors who continued to flout safety rules, one of which unskilled workers are used to erect scaffolding for high-rise construction. The high rates of accidents and fatalities, according to Bakri, *et al*., (2006) are primarily due to inadequate or non-existence of an OSH management system. Many occupational accidents and injuries are due to non compliance of existing OSH management system. In a study conducted in Kuala Lumpur and Selangor by Norfairuz, (2003), it was observed that ignorance and lack of safety compliance from management had caused employees to violate the safety procedure and the outcomes were unsafe acts, hazardous condition, injuries and accidents. It was also found that the awareness on the importance of safety compliance among many construction companies was low. Safety is reflected in good behaviors. Many accidents that occur at construction site are due inadequate adherence of workers to work procedures (Hassan, 2007). The awareness and perception of workers on safety, health and working environment are an important aspect to enhance in construction industries to the better condition of the workers (Hassan, 2007). Workers play an important role in the accomplishment of the building construction. Thus, there is the need to investigate the level of compliance of health and safety measures among workers in the Klang Valley construction industry in Malaysia.

As such this study examined the effectiveness of safety management system on the site. That is the effectiveness of construction workers' compliance with safety and health measures in the construction sites, so as to determine its appropriateness and acceptance as a safety management approach. This study is motivated by the lack of literature on the construction workers' compliance with safety and health measures in the workplace. Also the construction workers compliance approach in Malaysia has not been widely accepted as an acceptable approach to the approach promoted by occupational safety and health act administration (OSHA).

1.6 Research Questions

The main research questions that need to be addressed in this study are:

1. How is the pattern of occurrence of accidents (fatal and nonfatal accidents) to construction workers?
2. Does the construction firm or sites comply with safety and health management systems on the site?
3. Does the construction worker understand the safety and health measures implemented on site?

1.7 Research Hypothesis

Based on the research questions the following research hypothesis were set for the study;

$\mathbf{H_{01}}$ = Construction firms or sites do not comply with OSH management standard on the sites.

$\mathbf{H_{02}}$ = Construction workers have no significant knowledge of safety and health management system practice on sites.

$\mathbf{H_{03}}$ = As the level of compliance to safety management system increases, there is no significant increases in the safety management system on the site.

1.8 Justification Of The Study

This study has discusses the importance of the construction industry to the nation and the extent and effects related to accidents. Considering the importance of the construction industry and the level of occurrence of accidents, there is the need for improvement in the safety and health management system among the Frontline (construction workers). According to Kheni, *et al*., (2005), the HSE has demonstrated that by improving safety and health measures, management can save up to 70% of accidents on sites. As such any efforts aim at improving safety and health measures on the construction site must be undertaken by sound research. In this regard, many research works have been undertaken in order to provide a perfect platform for which safety and health measures can be formulated and implemented. Some research conducted in the construction reveals high rate of accidents in Malaysia construction industries in 2000 (Dayang and Gloria, 2011). Kartam and Bonz (1998) explored the causes of accidents in the Kuwaiti construction industry, a study by Abdulhamid and Everett (2000) in the United States America classified the causes of accident into human and physical factors, Tang, *et al*., (2004) study the investment on social safety in China. A study on the causes of accidents in Uganda conducted by Lubege *et al*., (2000) concluded that the causes of accidents are lack of safety awareness of safety regulations, lack of enforcement of safety regulations etc.

There are few or no studies in Malaysia that has attempted in sequential manners to examine the effectiveness of safety management system by studying the patterns of accidents in the construction industries, assessing the contractor's performance rates, the level of compliance to OSH management standard using SHASSIC method and assessing workers' perceptions of safety management system on the sites. Although there have been different legislative and regulatory attempts to introduce construction workers perception approach, there is the need for a universal and comprehensive model that would assist in implementing the approach in the workplace.

As explained in the previous research stated earlier, efforts to support accidents reduction on the construction site has focused more on the social investment in safety, causes of accidents and classification of accidents as no much effort has been on workers' perception of safety management system implemented on sites, including measuring the performance rates of various contractors and their level of compliance to OSH standard. This dimension which has not been fully utilized in the past researches can be an important contribution of the research to improving safety and health knowledge. The adoption of performance (lagging indicators) provides an opportunity to alert on the contractors, OSHA and other regulatory agencies the benefits that are associated with improving safety management system through proper implementation of appropriate system. The approach will enhance valuable insight leading to better decision-making within a construction firm as related to safety and health measures on construction sites as it will aid in determining where the construction firms may need additional program assistance. The models develop in the proposed research related to safety management system will help in the effective implementation of safety management system on the sites.

1.9 Research Objective

The purpose of the study is to examine the effectiveness of safety and health measures on construction sites through studying the construction sites accidents records and construction workers compliance of safety and health measures practice on the sites.

1.9.1 Specific Objectives

1. To study the pattern of injuries in accidents of construction workers.
2. To determine the incidence rate, lost time case and severity rate of accidents of construction workers.
3. To determine the level of compliance to the safety management standard through SHASSIC method.
4. To determine the relationship between safety management system (management responsibility) and compliance with management responsibility, safety management system (workers' safety) and compliance with worker's safety.
5. To determine the predictors to safety management model in the construction sector.

1.10 Scope of The Study

In all research works there are scopes that need to be highlighted. The location of the study is the Klang Valley; the Klang Valley is described in section 4.3. Also, this research investigation is restricted to building and civil engineering construction sites that meet the research site selection criteria described in section 4.2. The emphasis of the research work is to study:

1. The pattern of accidents to construction workers. In studying the pattern of accidents to construction workers Ten (10) factors were selected for the study as described in chapter 4.1 selection samples.
2. The performance rate of accidents to the construction workers, i.e incident rate, lost time case rate and the severity rate of the accidents were considered for the study.
3. The level of compliance to safety and health management system using the safety and health assessment system in construction (SHASSIC).
4. And the construction workers' perception of safety and health management system practice on sites.

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