

CASE STUDY ON SAFETY MANAGEMENT IN CONSTRUCTION PROJECT

by

Nurhafiza binti Sebi @ Hasbi

Dissertation submitted in partial fulfilment

Of the requirements for the

Bachelor of Engineering (Hons)

(Civil Engineering)

SEPTEMBER 2013

Universiti Teknologi PETRONAS

Bandar Seri Iskandar

31750 Tronoh

Perak Darul Ridzuan

CERTIFICATION OF APPROVAL

**CASE STUDY ON SAFETY MANAGEMENT IN CONSTRUCTION
PROJECT**

By

Nurhafiza binti Sebi @ Hasbi

A project dissertation submitted to the
Civil Engineering Programme
Universiti Teknologi PETRONAS
in partial fulfilment of the requirement for the
BACHELOR OF ENGINEERING (Hons)
(CIVIL ENGINEERING)

Approved by,

(Ir Idris Othman)

UNIVERSITI TEKNOLOGI PETRONAS
TRONOH, PERAK
September 2013

CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.

(NURHAFIZA BINTI SEBI @ HASBI)

ABSTRACT

There have been significant reductions in the number and the rate of injury over the last 20 years or more. Nevertheless, construction remains as the one of the high risk industry. The purpose of this study is to examine safety management in the Malaysian construction industry, as well as to highlight the importance of construction safety management. The industry has contributed significantly to the economic growth of the country. However, when construction safety management is not implemented systematically, accidents will happen and this can affect the economic growth of the country. This study will try to put the safety management in construction project as one of the important elements to project performance and success. The study will focus on construction project in Malaysia and a case study will be done at “Kuala Lumpur International Airport 2 – New Low Cost Terminal Project”. The study will also emphasize on awareness and the importance of safety management in construction project. The data will be collected by doing the questionnaire and a case study. The analysis of the survey will be done by using the Relative Importance Index (RII) and Cronbach's alpha using SPSS software. The scores were then transformed to importance indices based on the formula.

ACKNOWLEDGEMENT

First and foremost, I would like to praise Allah the Almighty, which have helped and guided me in completing this twenty eight (28) weeklong Final Year Project. I would also like to express congratulations and high appreciation to my project supervisor Ir. Idris Othman for his supervision commitment and cooperation in creating this final year project into a successful one for me. I am also grateful to my parents for their love and strong support during my study period.

I would like to extend my sincere gratitude to all my fellow friends and lecturers of Civil Department who have directly or indirectly that have imparted their wisdom and knowledge. With the full cooperation from the various people above, with no doubt and hesitation I must say that I have successfully achieved the objective of the Final Year Project. Thank you to all that have contributed either directly or indirectly in making this study a success.

TABLE OF CONTENTS

CERTIFICATION OF APPROVAL	i
CERTIFICATION OF ORIGINALITY	ii
ABSTRACT	iii
ACKNOWLEDGEMENT	iv
LIST OF FIGURES AND TABLES	vii
CHAPTER 1	1
INTRODUCTION	1
1.1. Background of Study	1
1.2. Problem Statement	3
1.3. Objectives	3
1.4. Scope of Study.....	4
1.5. Feasibility of the Project within the Scope and Time Frame	4
CHAPTER 2	5
LITERATURE REVIEW.....	5
2.1 Introduction	5
2.2 Factors Affecting of Improper Safety Management in Construction Project	6
2.3 The Importance of Safety Management in Construction Project	11
CHAPTER 3	14
METHODOLOGY	14
3.1 Research Methodology	14
3.2 Project Activities	14
3.2.1 Literature Review	16
3.2.2 Pilot Survey.....	16
3.3 Data Collection.....	17
3.4 Analytical Method	17
3.4.1 Relative Importance/difficulty Index.....	18
3.4.2 Cronbach's Alpha using SPSS Software	18
3.5 Key Milestones.....	19
3.6 Study Plan (Gantt-Chart).....	20

CHAPTER 4	21
RESULT AND DISCUSSION	21
4.1 Pilot Survey	21
4.2 Questionnaire Survey	21
4.3 Results of Relative Importance Index	22
4.3.1 Importance of Safety Management in Construction Project.....	22
4.3.2 Factors Affecting of Improper Safety Management in Construction Project	25
4.4 Cronbach's Alpha using SPSS Software.....	27
CHAPTER 5	28
CONCLUSION AND RECOMMENDATION	28
References	30
APPENDIX A	32
QUESTIONNAIRE	32
APPENDIX B	39
SURVEY RESULTS	39

LIST OF FIGURES AND TABLES

Figure 1 : Occupational Accidents Statistic	2
Figure 2 : Project Activities Flow Diagram	15
Figure 3 : Project Milestones	19
Figure 4 : Project Gantt-Chart	20
Figure 5 : Importance of Safety Management in Construction Project (Client Related)	22
Figure 6 : Importance of Safety Management in Construction Project (Consultant Related)	23
Figure 7 : Importance of Safety Management in Construction Project (Contractor Related)	24
Figure 8 : Factors Affecting of Improper Safety Management in Construction Project	26
Table 1 : Factors Affecting of Improper Safety Management	10
Table 2 : Importance of Safety Management	13
Table 3 : Ranking on the Importance of Safety Management in Construction Project (Client Related)	22
Table 4 : Ranking on the Importance of Safety Managemnet in Construction Project (Consultant Related)	23
Table 5 : Ranking on the Importance Safety Management in Construction Project (Contractor Related)	24
Table 6 : Ranking on the Factors Affecting of Improper safety Management in Construction Project	25
Table 7 : Reliability Statistics	27

CHAPTER 1

INTRODUCTION

1.1. Background of Study

Globally, the construction industry is still considered as one of the most hazardous industries (Hinze, 2008). Construction safety as a result continues to represent a problem and pose a challenge for researchers and practitioners. In Malaysia, both the society and economy have suffered human and financial losses as a result of the poor safety performance in the construction industry. Department of Occupational Safety and Health (DOSH) in Malaysia reports that occupational accidents by sector shows that the highest number of deaths was in the construction industry as of for the 2012 incidents (DOSH, 2012).

In a study carried out on Honduras constructions sites, Jaselskis and Suazo (1994) demonstrated a substantial lack of awareness or importance of safety at all levels of the construction industry. Department of Safety and Health (DOSH) have imposed comprehensive safety regulations in the construction industry. However, the level of awareness and practicability of it is generally lower than expected over the last five (5) years (Abdul Hamid *et al*, 2003).

According to Khalid (1996), good safety programs would certainly help in reducing injuries at construction sites. It will also minimise construction costs, increase productivity and profitability and more importantly it could save lives of workers. Thus, these will consequently contribute positively to the construction industry and the nation as a whole. Besides causing delays in operations, accidents also cause directly and indirectly incur costs (Bakri *et al*, 2006). Therefore as required by the Occupational Safety and Health Act 1994 (OSHA), it is mandatory for all construction companies to provide a Health and Safety Officer for project more than RM20 million.

Department of Occupational Safety and Health (DOSH) in Malaysia reports that occupational accidents by sector shows that the highest number of deaths was in the construction industry as of for the 2012 incidents (DOSH, 2012).

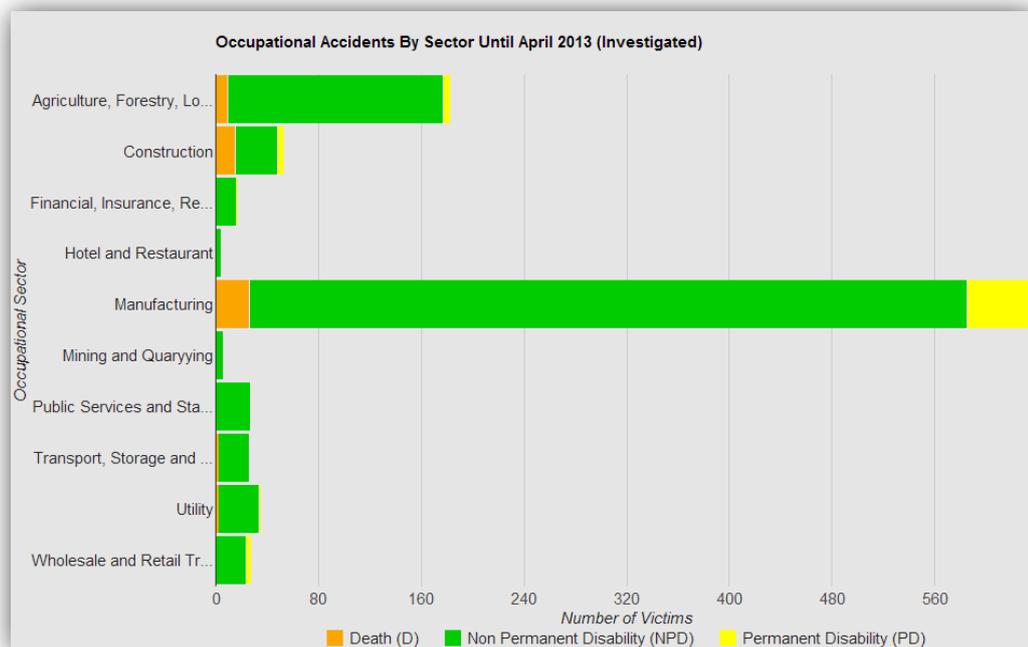


Figure 1 Occupational Accidents Statistic

1.2. Problem Statement

Construction safety management doesn't implement systems in most construction companies. Due to that, accidents in the construction site always been highlighted. In addition to that, statistics from the Social Security Organization (SOCSO) reported that, the construction industry has been the fourth highest ranking in the year 2004 in terms of number of fatality cases.

Abd Hamid and Abd Majid (2006), concluded in their study on 'Construction Safety Benchmarking' that the majority of construction companies surveyed were only at the very beginning stage of safety program implementation. They were not even close to behaving an ultimate safety program driven by a safety culture.

The aim of this study is to examine the safety management in construction industry. In addition, this study will reveal several factors of poor safety management and the level of awareness among the construction workers regarding the importance of construction safety management in construction industry. Thus, this will help to increase the awareness of safety in construction work.

1.3. Objectives

The purpose of this study is:

1. To investigate the factors affecting of improper safety management in construction project.
2. To analyse the importance of safety management in construction project.

1.4. Scope of Study

The scope of this study is on safety management in the construction site. This study will try to put the safety management in construction project as one of the important elements to project performance and success. The study will focus on construction project in Malaysia and a case study will be done at “Kuala Lumpur International Airport 2 – New Low Cost Terminal Project”. The study will also emphasize on awareness and the importance of safety management in construction project.

1.5. Feasibility of the Project within the Scope and Time Frame

The overall scope execution of this project takes two semesters (eight months) for completion. However, the schedule for the implementation of the project is within the scope and time frame of the project period. Consequently, the project can be completed before the end of the final year second semester.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The construction industry has long been considered to have high injury and fatality rates. For example, the US construction industry has a very high fatality rate of workers (Abudayyeh et al., 2006). In the UK construction industry, reported injuries continue to place the safety issue as a prime concern though fatal accidents were seen to fall recently to around 90 deaths per annum (Cameron and Duff, 2007a). Although the accident rate in the construction industry of Hong Kong is argued to decline in recent years due to improved safety measures, it still remains higher than that of other developed countries (Choudhry et al., 2009). Notably, many of these work-related deaths and injuries are preventable. As Williams (2000) advised, site safety should be enhanced since construction projects have become more complicated in recent times. Construction sites are crowded with workers who undertake numerous high risk duties such as operating at height and outdoors and with heavy machinery and equipment (Tam et al., 2004). Owing to the expected positive correlation between poor safety and injuries, it is crucial to promote safe construction.

Human performance is arguably linked with safety (Bottani et al., 2009). Human errors are one of the major underlying causes of industrial accidents, and are perhaps the core component of various safety problems in high risk facilities (Jacobs and Haber, 1994 and Llory, 1992). Hinze's (1996) Distraction Theory suggests that workers who are distracted by physical hazards or mental diversions are at increased risk of accidents. One school of thought has established the Accident Causation Theory, which pinpoints the importance of error identification (human, site

management, project management, or policy errors) in accident prevention (Suraji et al., 2001). Mitropoulos and Cupido (2009) also suggest that production practices can prevent production errors. Therefore, it is believed that safety practices can prevent human errors, thereby reducing the likelihood of accidents if these practices were shaped by the guiding principle and its associated strategies focusing on avoiding construction errors and rework.

The negative impacts of work related accidents call for the necessity to reposition the management role in safety practices. Although accidents caused by the uncertain environment may not be easily avoided, it is however possible to regulate and improve current safety management to safeguard workers from artificial work related hazards by instilling positive employee behaviours (e.g., avoidance of premature acts, awareness of safety work) driven by an effective management system (Bottani et al., 2009 and Krause, 1993). As Wilson and Koehn (2000) underlined, safety management is a method of manipulating on-site safety policies, procedures, and practices relating to a construction project. It entails a dynamic process accommodating small or large adjustments made to site operations in order for workers to work properly without facing unexpected disruptions to a construction project. Emphasis is placed on how accidents in a project can be reduced by effective safety management (Suraji et al., 2001). If safety performance can be enhanced, companies would benefit through improved performance (Jaselskis et al., 1996).

2.2 Factors Affecting of Improper Safety Management in Construction Project

Organizational Safety Policy

Sawacha et al. (1999) argue that the most influential factor driving safety performance in the construction industry is the organizational safety policy. Wong et al. (1999) consider that written safety policies are essential to construction safety. Hinze and Wilson's (1999) study participants recommend a safety system of checks and balances to improve safety performance.

Safety Meetings

Regular safety meetings are necessary to communicate safety information to all parties. Wilson and Koehn (2000) describe a construction company required daily “tool box” safety talks each morning for their employees. To improve safety performance at the project level, Jaseliks et al. (1996) recommend increasing the number of formal safety meetings with supervisors. Jaseliks et al. (1996) indicate that firms with better safety performance held more meetings compared to firms with poor safety performance. Both types of meeting (“tool box” safety talks and safety meetings on the project) are clear indications of the exercises over the importance of safety.

Safety Training

CII (1993) study identifies safety training as one of five high-impacts zero accident technique. Hinze and Wilson (1999) indicate that there is unanimous agreement among the respondents of their study that worker training is vital to improved safety performance.

Availability of Safety Equipment

Toole (2002) argues that some construction accidents results because of the absence of safety equipment necessary to perform the job safety at the location of the work. Duncan and Bennett (1991) reviewed the performance of various fall protection systems and concluded that both active measures (those that prevent workers from falling, for example guard rails) and passive measures (those that protect workers after falling, for example, safety nets) are useful in reducing fall injuries. Chi et al. (2005) analysed contributing factors to 621 occupational fatal falls. Significant linkages were found between causes of falls and accident event. Falls associated with lack of complying scaffolds, unguarded openings, and inappropriate protections, removal of protections and improper use of Personal Protective Equipment (PPE). Chi et al. (2005) suggest prevention measures to prevent falls or to mitigate the consequence of falls.

Safety Inspections

Safety inspections are the usual means used to enforce safety at the jobsite. Hinze and Gambatese (2003) indicate that safety inspections are one of the means by which project managers and site supervisors can become acquainted with the nature of the safety conditions on the site. Toole (2002) argues that to effectively enforce safety on the jobsite, the entity must be able to monitor the work on a frequent basis. Wong et al. (1999) argue that safety performance is affected by monitoring of safety compliance. Jaseliks et al. (1996) recommend increasing site safety inspections. Their analysis showed that firms with better safety performance conducted more site safety inspections compared with firms of poor safety performance.

Safety Incentive and Penalties

Hinze and Wilson (2000) indicate that incentives have the objective of providing a positive reinforcement of a desired behaviour. Safety incentives are designed to influence worker actions so that safer worker performance is encouraged and rewarded. According to CII (1993), Safety incentives are among the top five high-impacts zero techniques. Hinze and Gambatese (2003) indicate that of the various types of safety initiatives that companies utilize to promote worker safety, the most widely implemented types of program involve safety incentives.

Workers' Attitude towards Safety

Aksorn and Hadikusumo (2008) indicate that attitude is a tendency to respond positively and/or negatively to certain persons, objects or situations. Individuals are different in their perception of risks and willingness to the risks. Successful safety programs can be achieved if the positive attitudes of employees towards safety are improved.

Labour Turnover Rates

To improve safety performance, Harper and Kohen (1998) recommend reducing labour turnover rates. Hinze and Gambatese (2003) examine the relationship between labour turnover rates and safety record. Hinze and Gambatese (2003) study results show that higher turnover rates are associated with higher injury rates. Consequently, construction contractors are advised to decrease their labour turnover in order to improve their safety performance.

Compliance with Safety Legislation

In order to improve safety performance, a standard checklist is used to conduct the audit. This checklist included those items which are in compliance with Occupational Safety and Health Act and Factories and Machinery Act and perceived to be important from the safety point of view (Shuratman Z. et al., 2007). These are the Occupational Safety and Health management, safety committee, machinery, scaffolding, working at height, public safety, workers' quarters, storage facilities, formwork, excavation and shoring, personnel protective equipment, platform, floor opening, edge of the open floor, access and egress, electrical safety, cleanliness, health and welfare, piling and demolition.

FACTOR	RESEARCH	KEY STATEMENT
Safety inspections	<ul style="list-style-type: none"> Hinze and Wilson (1999) Jaselisks et al. (1996); Wong et al. (1999) 	<ul style="list-style-type: none"> More jobsite visits are needed to improve safety performance. Safety performance is affected by site safety inspections.
Safety Incentives and Penalties	<ul style="list-style-type: none"> Construction Industry Institute (CII) (1993) Jaselisks et al. (1996) Tam and Fung (1998) 	<ul style="list-style-type: none"> Safety incentives are among the top five high-impact zero accident techniques. There is a need to increase fines to workers with poor safety performance. Safety incentives should be utilized to improve safety performance.
Workers' Attitude towards Safety	<ul style="list-style-type: none"> Abdelahamid and Everett (2000); Akson and Hadikusumo (2008); Hinze (1997); Toole (2002) 	<ul style="list-style-type: none"> Workers' attitude towards safety is one of the root causes of accidents.
Labour Turnover Rates	<ul style="list-style-type: none"> Harper and Kohen (1998); Hinze and Gambatase (2003) Hinze (1981) 	<ul style="list-style-type: none"> Higher turnover rates are associated with higher injury rates. New hires are more subjected to accidents.
Compliance with Safety Legislation	<ul style="list-style-type: none"> Shuratman et al. (2007) 	<ul style="list-style-type: none"> To improve safety performance, a standard checklist is used to conduct the audit.
Organizational Safety Policy	<ul style="list-style-type: none"> Hinze and Wilson (1999); Sawacha et al. (1999); Wong et al. (1999) Jaselisks et al. (1996) 	<ul style="list-style-type: none"> Organizational safety policy is a major driver for better safety performance in the construction industry. Better safety performance involves the development of more detailed written safety programs.
Safety Meetings	<ul style="list-style-type: none"> Jaselisks et al. (1996) 	<ul style="list-style-type: none"> To improve safety performance at the project level, it is recommended to increase the number of formal safety meetings with supervisors.
Safety Training	<ul style="list-style-type: none"> Construction Industry Institute (CII) (1993) Hinze and Wilson (1999) Huang and Hinze (2003) 	<ul style="list-style-type: none"> Safety training is one of five high-impact zero accident techniques. Worker training is vital to improved safety performance. The lack of safety training is often a contributing factor to many falls.
Availability of Safety Equipment	<ul style="list-style-type: none"> Chi et al. (2005) Duncan and Bennett (1991) Toole (2002) 	<ul style="list-style-type: none"> Falls are associated with lack of complying scaffolds, unguarded openings, inappropriate protections, removal of protections and improper use of Personal Protective Equipment (PPE). Both active measures and passive measures are needed to reduce fall injuries. Some construction accidents result because safety equipment necessary to perform the job safety is not present at the location of the work.

Table 1 Factors Affecting of Improper Safety Management

2.3 The Importance of Safety Management in Construction Project

The importance of safety management at construction site certainly needs to be given a serious attention by the site management team and also of all parties who are directly involved in the construction industry.

According to Tey (1999), among the importance of safety is to eliminate or reduce the probability of accident and disease occurrence to the workers. Thus, the workers can perform their works more conducive and be able to complete the project as scheduled. It is also to ensure the smoothness of progress of works on site. If any accident occurs at site, thus the work progress will be hampered due in order to make way for the accident investigation to be carried out by the responsible authorities. Consequently the completion of the whole project will finally be affected.

In addition to that, it certainly could foster the productivity of the workers and cost savings. Once the workers aware that the construction site is safe and comfortable to work in, it will induce the workers' mood to work harder and also improve the construction cost since the works on site can be completed on time as scheduled. There is no loss of skilled workers. With efficient safety management, skilled workers will feel secure and comfortable working on that particular construction site. Finally, it will increase client confident towards the competency of that particular construction company in managing the safety and health effectively and hence completing and delivering the project on time.

Khalid (1996) stressed in his writing that although the construction industry involved a very complex process, it should emphasis on finding a management strategy and resolution in reducing the rate of accident occurrence at a construction site. According to him, good safety programs would certainly help in reducing injuries at construction sites and also minimize construction costs, increase productivity and profitability and more importantly it could save lives of workers and consequently contribute positively to the construction industry and the nation as a whole.

Ahmad *et al* (2000) explained that although sometimes the contractors questioned the importance of spending an amount of money for the purpose of safety aspects in construction, the benefits and returns that they would enjoy from an effective safety management system were much more than the cost spent. Other benefits are avoided in project delay, machines and equipment breakdowns and litigation. Safety system also facilitates the management in conducting any accident investigation at the workplace.

Furthermore, providing a safe and healthy workplace is one of the most effective strategies for holding down the cost of doing construction business. Accidents cause not only delays in operations and project deliverables but also directly and indirectly incur costs (Bakri *et al*, 2006). Therefore as required by the Occupational Safety and Health Act 1994 (OSHA), it is mandatory for all construction companies to provide a safe and conducive working environment for their workers and subcontractors at construction and fabrication sites.

Jaselski *et al* (1996), stressed that the benefits obtained from an effective safety program are much more than the cost of the safety program itself where it can reduce the so-called ‘ Experience Modification Rating – EMR ’, rate of accident at construction sites and the cost of the project. It can also improve productivity and company reputation towards the client.

Hinze and Harrison (1981), have identified that good safety program practiced in a big company can help to reduce the injury rate at a construction site. The success of a big company in tackling safety aspects is due to the fact that there are safety competency certificate holders exist among its workers not withstanding any working level.

With better enforcement of the legislation and commitment from employers and employees, construction safety management has obviously received a greater attention (Ahmad *et al*, 1999). Consequently, the improvement of safety and health management in construction is a very important goal of all construction stakeholders in order to provide a better and safer workplace which will help to improve productivity, reduce construction costs, better time performance and deliverables and also increase in profitability.

Rahim (2001), concluded the study that although there were not so much difference if compared between a safety management system in the conventional civil construction industry and in oil and gas construction industry, but in terms of safety discipline and implementation aspects, it was more ‘tight and stringent’ in the oil and gas construction industry.

IMPORTANCE	RESEARCH	KEY STATEMENT
To reduce the probability of accident and disease occurrence to the workers	<ul style="list-style-type: none"> • Tey (1999) • Khalid (1996) • Hinze and Harrison (1981) 	<ul style="list-style-type: none"> • Among the importance of safety is to eliminate or reduce the probability of accident and disease occurrence to the workers. • Although the construction industry involved a very complex process, it should emphasis on finding a management strategy and resolution in reducing the rate of accident occurrence at a construction site. • A good safety program practiced in a big company can help to reduce the injury rate at a construction site.
Foster the productivity of the workers and cost savings	<ul style="list-style-type: none"> • Khalid (1996) • Ahmad et al. (1999) • Jaselski et al. (1996) 	<ul style="list-style-type: none"> • A good safety programs would certainly help in reducing injuries at construction sites and also minimize construction costs, increase productivity and profitability. • The improvement of safety and health management in construction is a very important goal of all construction stakeholders in order to provide a better and safer workplace which will help to improve productivity, reduce construction costs, better time performance and deliverables and also increase in profitability. • The benefits obtained from an effective safety program also improve productivity and company reputation towards the client.
Avoidance in project delay, machines and equipment breakdown, litigation	Ahmad et al. (2000)	<ul style="list-style-type: none"> • Other benefits are avoided in project delay, machines and equipment breakdowns and litigation.

Table 2 Importance of Safety Management

CHAPTER 3

METHODOLOGY

3.1 Research Methodology

Field Survey is done to study the predominant environment that involves safety management in the execution of various phases of a construction project. This survey is done to have the first hand information, essential to be aware of the safety problems encountered in the construction projects. The objective of doing a field survey in this study is to validate the findings of the literature review.

3.2 Project Activities

The method that had been used for this research is by literature review and followed up by data collection using questionnaires. The research starts first with literature review on the topic of safety management in construction project. The pilot survey had been conducted to identify and making sure the effectiveness of the questionnaire survey. The questionnaire survey commenced right after the questionnaire had been improvised according to the pilot survey. The data from the survey will then be analysed to attain the useful information. For the purpose of strengthening and further elaborate the survey, a case study had been carried out on one of the construction site located in Kuala Lumpur which is KLIA 2. For the case study, there will be some data limitations due to time and money constraints and also confidential information. Figure 2 below shows the work sequence for this project.

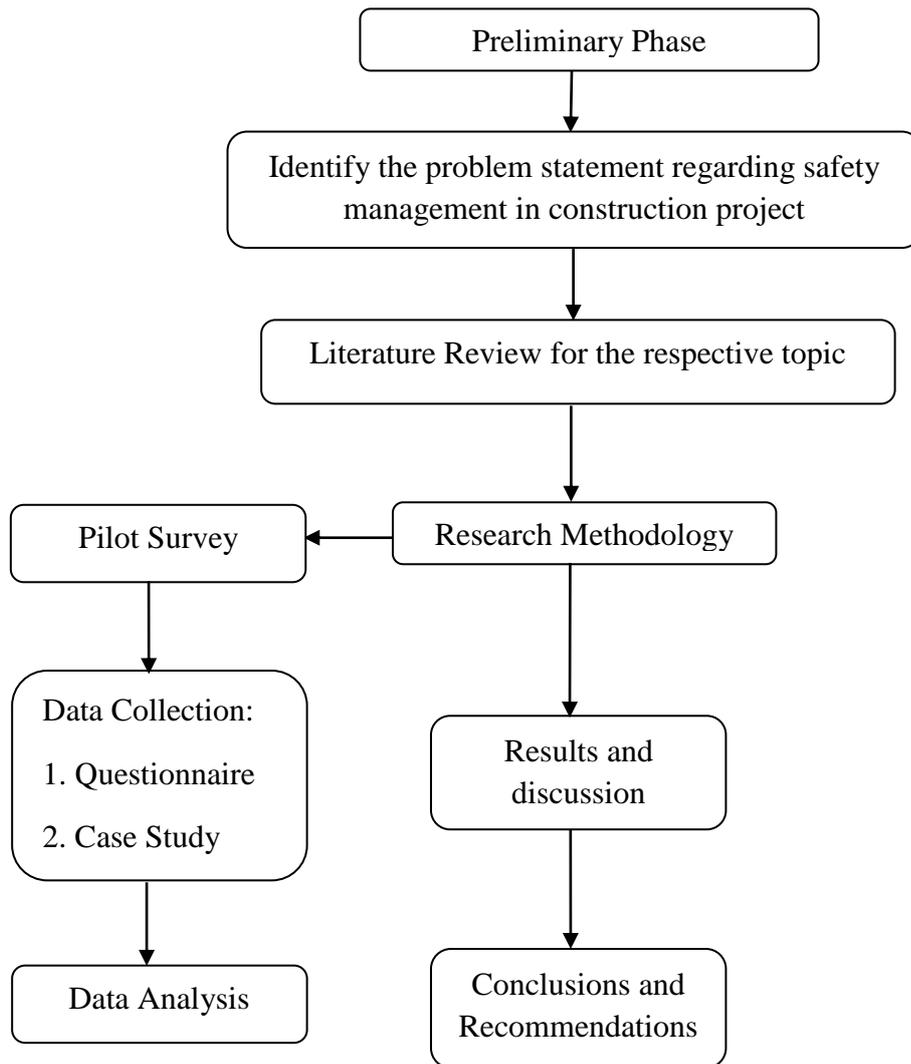


Figure 2 Project Activities Flow Diagram

3.2.1 Literature Review

The literature review is the preliminary stage of research to get the information and knowledge of the topic, safety management in construction project based on the past researches and case studies that had been done by the previous researchers regarding the respective topic. At this stage, the research will be implemented only by documentation research such as books, journals, conference texts, agency bulletin, project papers, internet etc. This stage is very important in order to help to get the general ideas and overviews regarding the scenario of safety management in construction project in the past and in the present and also the development and changes of it in the future. In the literature review, it will be focusing the research on the:

- The factors affecting of improper safety management in construction project.
- The importance of safety management in construction project.

3.2.2 Pilot Survey

Pilot survey or also called exploratory survey is a small scale methodological test intended to ensure that proposed methods and procedures will work in practice before being applied in a large and expensive investigation. It is a survey usually carried out prior to the main survey with the intent to gain information to improve the efficiency of the main survey. Pilot survey provides an opportunity to make adjustments, revisions and to alert the surveyor to any difficulties that were not anticipated in the survey proposal stage for example, to ascertain the time taken to complete the questionnaire or to determine the most effective size of the sampling unit. A pilot test will be administered to the same group of construction professionals to clarify and refine the questionnaire. By incorporating their comments, later a final questionnaire will be devised and take-in response from the respondents by using the questionnaire. The questionnaire might consist of three sections – questions regarding the background of the respondents, Importance of Safety Management in Construction Industry and the current practice of Safety Management in Construction Project.

3.3 Data Collection

The aim of the data collection is to gather information regarding the safety management in construction project. The data collection will be conducted using Qualitative research which is concerned with testing the theory presented with the objective. The data collections are basically done by:

- Questionnaire

This will be the main alternative to gather information. People are more truthful while responding to the questionnaires regarding controversial issues in particular due to the fact that their responses are anonymous. The questionnaire survey will be distributed to the project teams of KLIA 2 construction project and it will be conducted online.

3.4 Analytical Method

The data analysis will be done after the data collection is finished. All the data from the questionnaires will be assembled and analyse and then summarized to obtain the appropriate and suitable result of the safety management in construction project. Data analysis is actually an approach to de-synthesize the data collected. It is a method of putting together facts and figures to solve problems and a systematic process of utilizing data to come up with the answer to the question.

The analysis of the survey is done by the Relative Importance Index (RII) and Cronbach's Alpha (using SPSS Software) method. The scores were then transformed to importance indices based on the following formula.

3.4.1 Relative Importance/difficulty Index

The data which is collected has been processed for carrying out analysis. The collect raw data of the questionnaire survey are entered into an Excel spreadsheet and SPSS (PASW) ver. 18 program to analyse the data. The relative Importance Index (RII) is calculated to get the rank of the factors and the importance of safety in construction project.

$$\text{RII} = \frac{\sum w}{AN}$$

Where:

w is the weighting given to each factor by the respondents

(Ranging from 1 to 5)

A is the highest weight (i.e. 5 in the study)

N is the total number of samples (the respondents)

3.4.2 Cronbach's Alpha using SPSS Software

Cronbach's alpha is the most common measure of internal consistency ("reliability"). The Cronbach's alpha coefficient is an internal consistency reliability test. The Cronbach's alpha coefficient value is ranged between 0.0 and +1.0 and Cronbach's alpha value nearer to 1 show higher internal consistency.

Obtaining Cronbach's alpha:



3.5 Key Milestones

No	Detail/Week	1	2	3	4	5	6	7	MID SEM BREAK								8	9	10	11	12	13	14	15
1	Questionnaire Survey																							
2	Submission of Progress Report																							
3	Data Analysis																							
4	Pre-SEDEX																							
5	Submission of Draft Report																							
6	Submission of Dissertation																							
7	Submission of Technical Paper																							
8	Oral Presentation (VIVA)																							
9	Submission of Project Dissertation																							

Legends:

	Project Activity
	Suggested Milestone

Figure 3 Project Milestones

3.6 Study Plan (Gantt-Chart)

No	Detail/Week	1	2	3	4	5	6	7	MID SEM BREAK								8	9	10	11	12	13	14							
1	Questionnaire Pilot Survey																													
2	Questionnaire Survey																													
3	Submission of Progress Report																													
4	Data Analysis																													
5	Pre-SEDEX																													
6	Submission of Draft Report																													
7	Submission of Dissertation																													
8	Submission of Technical Paper																													
9	Oral Presentation (VIVA)																													

Figure 4 Project Gantt-Chart

CHAPTER 4

RESULT AND DISCUSSION

4.1 Pilot Survey

The pilot survey has been done throughout all of the professional engineers either in the academic, construction or consultancy industry. After obtaining and analysing the results of the pilot survey, logistical, technical and other issues or problems have been addressed. The questionnaire format was revised, or the type of survey had been altered into a more suitable one. After the revision of the survey being made, the large-scale of the survey is executed.

4.2 Questionnaire Survey

The questionnaires had distributed to the project teams of KLIA 2 project, consists of the client, consultant, contractor companies and had received the feedbacks 30 respond all together. Since this study is a qualitative study, the feedbacks obtained are sufficient enough. The questionnaire consists of three (4) sections, General Information, Importance of Safety Management in Construction Project, Factors Affecting of Improper Safety Management in Construction Project and Open ended question. For the questionnaire responds summary, refer to Appendix B.

4.3 Results of Relative Importance Index

4.3.1 Importance of Safety Management in Construction Project.

The ranking on the Importance of safety management in construction project for each parties are shown in the tables/graph below:

Rank	Client Related	Relative Importance Index (RII)
1	Company's financial benefits in order to increase profits (save costs associated with incidents)	0.96
2	Develop a culture of safety on their job sites	0.90
3	Safeguard company's reputation	0.80
4	Ensure employees comfort and safety and confidence	0.80
5	Providing a better service for customers' security	0.80
6	Comply with federal and state worker-safety rules and satisfies authorities	0.77

Table 3 Ranking on the Importance of Safety Management in Construction Project (Client Related)

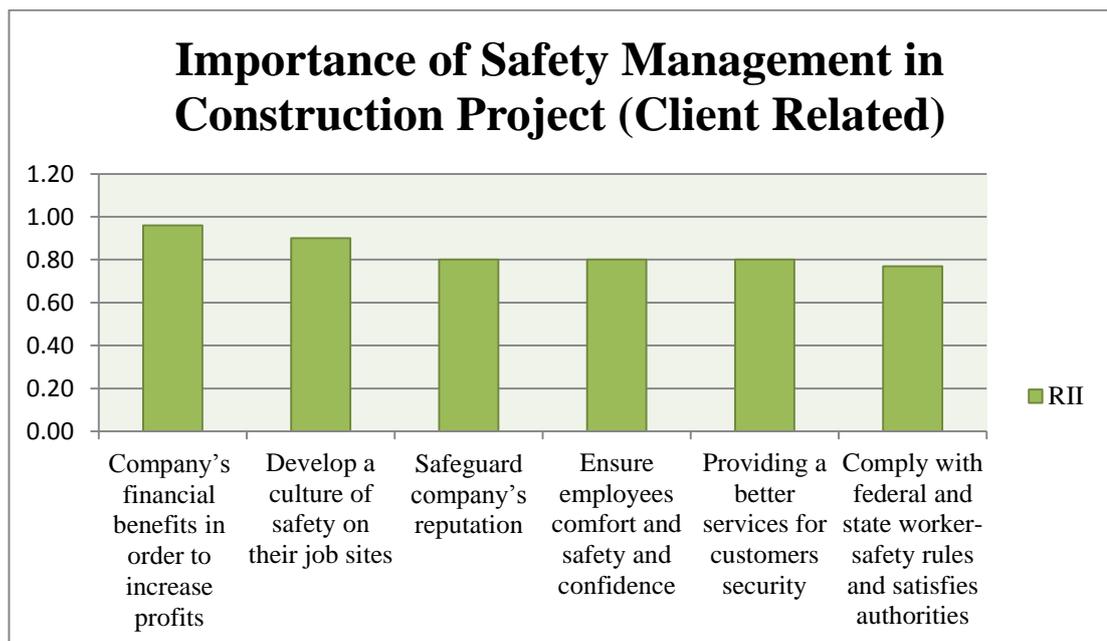


Figure 5 Importance of Safety Management in Construction Project (Client Related)

Rank	Consultant Related	Relative Importance Index (RII)
1	Increase client confidence in the design work	0.90
2	Improve building safety to obtain operation permit	0.87
3	Efficiently supervise and conduct safety inspections on site	0.87
4	Design efficiently in reducing the risks	0.83
5	Comply with authorities' requirement	0.83
6	Maximize the financial profits (save cost)	0.77

Table 4 Ranking on the Importance of Safety Management in Construction Project (Consultant Related)

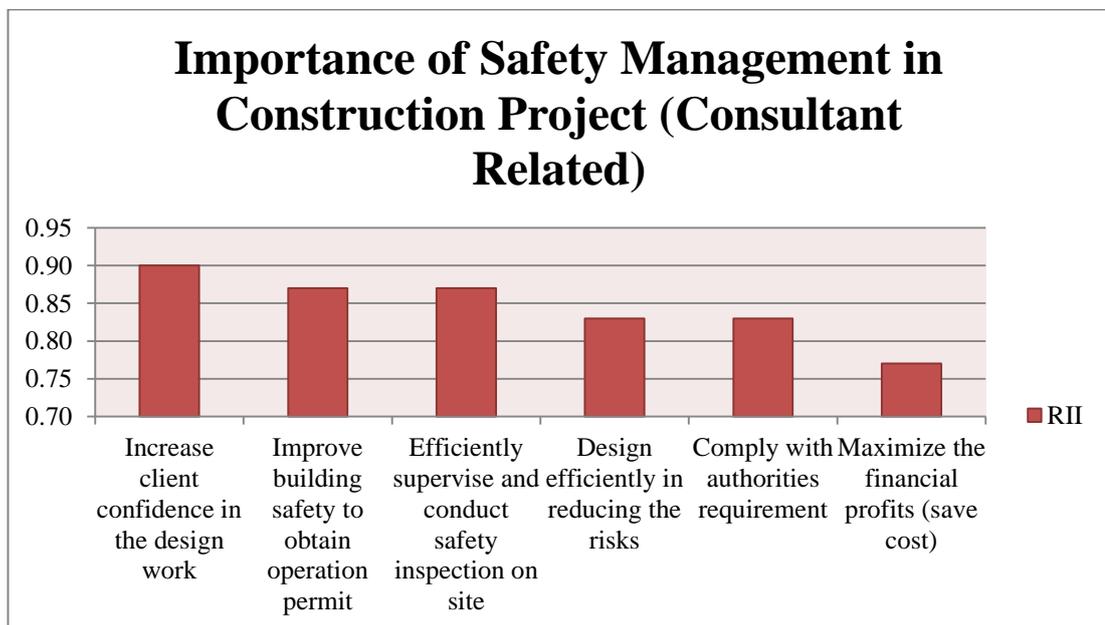


Figure 6 Importance of Safety Management in Construction Project (Consultant Related)

Rank	Contractor Related	Relative Importance Index (RII)
1	Reduce the probability of accident occurrence to the workers	0.93
2	Ensure employees' safety during construction and maintenance period (if any)	0.87
3	Complete the project on schedule without any stop of work on the safety issue.	0.87
4	Helps to improve or enhance the skills of the workers	0.83
5	Ensure the smoothness of progress of works on site	0.77
6	Maintain the productivity of the workers	0.73

Table 5 Ranking on the Importance Safety Management in Construction Project (Contractor Related)

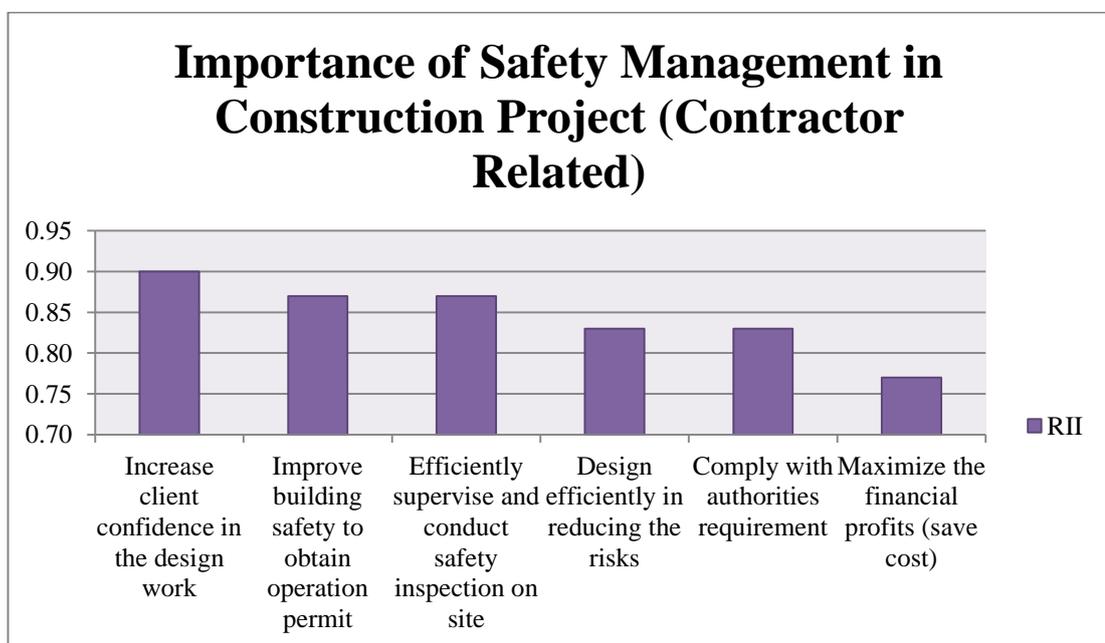


Figure 7 Importance of Safety Management in Construction Project (Contractor Related)

From the results of the respondents, every party has its own importance regarding the importance of safety management in construction project. The implementation of safety management in every party will give a different impact and thus the importance of the implementation of safety management for every parties are different. Based on the results, the importance of the safety management in construction project is being ranking.

4.3.2 Factors Affecting of Improper Safety Management in Construction Project

Rank	Factors	Relative Importance Index (RII)
1	Labour turnover rates	0.92
2	Compliance with safety legislation	0.87
3	Safety incentives and penalties	0.83
4	Workers' attitude towards safety	0.83
5	Safety inspections	0.83
6	Safety training	0.80
7	Availability of safety equipment	0.80
8	Safety meeting	0.80
9	Organizational safety policy	0.80

Table 6 Ranking on the Factors Affecting of Improper safety Management in Construction Project

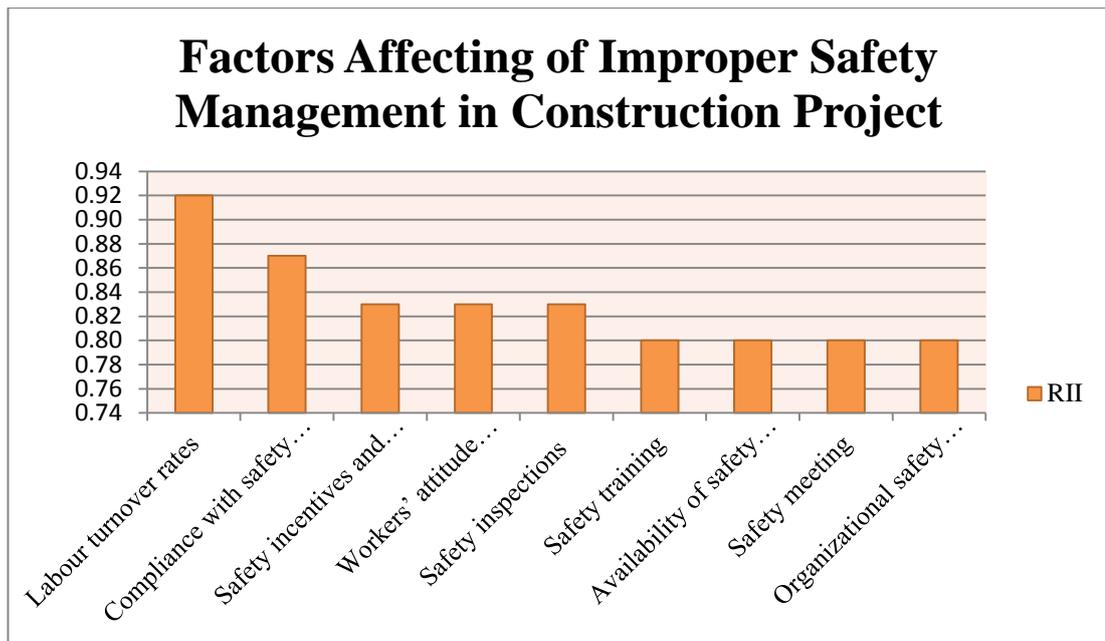


Figure 8 Factors Affecting of Improper Safety Management in Construction Project

In Table 4.4, the respondents rank the first factor affecting of improper safety management in construction is labour turnover rates, with a relative importance index of 0.92. It indicates that labour turnover rates play a very important role in safety management in construction.

‘Compliance with safety legislation’ is graded the second, with a relative importance index of 0.87. The results are a clear indication of poor enforcement of the legislation and poor obedience by construction team project.

The respondent grade safety incentives and penalties, workers’ attitude towards safety and safety inspections is ranked the third, fourth and fifth respectively, with a relative importance index of 0.83.

As for the rest of the factors it is ranked the sixth, seventh, eighth and ninth, with a relative importance index of 0.80.

4.4 Cronbach's Alpha using SPSS Software

Generally, a questionnaire with an α of 0.8 is considered reliable (Field, 2009). Hence, this questionnaire certainly is reliable, since the α is 0.911 (see Table 4.5). The resulted α should yet be interpreted with caution. Since the amount of items in a questionnaire is taken into account in the equation, a huge amount of variables can upgrade the α (Cortina, 1993; Field, 2009). For example, if we the reliability analysis of just the items making up the first factor in our research, we get the same α , but the average correlation is 0.49 instead of 0.43. How huge the alpha should be for a dataset with a particular amount of items is still a point of discussion (Cortina, 1993). Cortina (1993) recommends determining the adequacy of a measure of the level of precision needed. However, since the α of this questionnaire is far higher than 0.8, we can assume that it is reliable.

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.911	0.895	27

Table 7 Reliability Statistics

CHAPTER 5

CONCLUSION AND RECOMMENDATION

The purpose of this study is to analyse the importance of safety management in construction project and to investigate the factor of affecting improper safety management in construction project. The study collected data from the clients, consultant and contractors who are involved in the construction of Kuala Lumpur International Airport 2. The results of the study of the importance of safety management in construction project as per shown in Table 4.1, Table 4.2 and Table 4.3. The study also reveals several factors that affecting the improper of safety management in Table 4.4. From the results, the objectives of the project are achieved.

In order to improve the safety management performance, the construction project team is advised to:

- Have an organizational safety policy for the proper administration of safety
- Provide formal safety training for the workers
- Conduct daily 'tool box' safety talks
- Conduct weekly formal safety meetings at the project level
- Always secure safety protection measures at the job site
- Always provide PPE to the workers
- Always post safety signs and posters at the job site
- Conduct weekly safety inspections
- Rewards workers for their safe behaviour
- Penalize workers for their unsafe behaviour
- Encourage workers to make use of safety equipment
- Reduce labour turnover rates

As the recommendation, the management of the company has to realize the performance of the company in safety management as they play a big role in this matter. One of the ways is by restructuring the safety management team. This is to ensure that safety matters are taken care by a responsible person. Besides that, the government should give the privilege to small construction company in order to set up a systematic construction safety management system. In addition, government should provide free Green Book Training to the workers. Thus, this will enhance the capability of the company to control safety matters in the construction site.

Based on the research done, it can be concluded that safety management in construction project needs to be further improved and monitored frequently for its effectiveness. From the survey conducted on the case study, it is believed that the members of the project team had the awareness about safety management in construction project. However, improvements in many aspects need to be considered in order to ensure the effectiveness.

References

Abdelhamid, T., Everett, J. 2000. Identifying root causes of construction accidents. *Journal of Construction engineering and Management*, 126 (1): 52-60.

Aksorn, T. and Hadikusumo, B. 2008. Critical success factors influencing safety program performance in Thai construction projects. *Safety Science*, 46: 709-727.

Chi, C., Chang, T. and Ting, H. 2005. Accident patterns and prevention measures for fatal occupational falls in the construction industry. *Applied Ergonomics*, 36: 391-400.

Construction Industry Institute (CII). 1993. Zero accident techniques. Source Document 86, Austin, Texas.

Cortina, J.M. (1993). What is coefficient alpha? An examination of theory and applications. *Journal of Applied Psychology*, 78, 98-104.

Duncan, C. and Bennett, R. 1991. Fall protection and debris containment during construction. In: Chang, L., editor. *Preparing for construction in the 21st century*. New York, ASCE, 97-102.

Department Of Safety and Health, DOSH (2012)

Field, A. (2000). *Discovering Statistics using SPSS for Windows*. Sage: London.

Field, A. (2009). *Discovering Statistics using SPSS*. Sage: London.

Hinze, J. 1981. Human aspects of construction safety. *Journal of Construction Division*, 107 (1): 61-72.

Hinze, J. 1997. *Construction Safety*. Prentice –Hall, New Jersey.

Hinze, J. 2008. Construction safety. *Safety Science*, 46: 565.

Hinze, J. and Gambatese, J. 2003. Factors that influence safety performance of specialty contractors. *Journal of Construction Engineering and Management*, 129 (12): 159-164.

Hinze, J. and Wilson, G. 1999. Moving toward a zero injury objective. *Journal of Construction Engineering and Management*, 126(5): 399-403.

Huang, X. and Hinze, J. 2003. Analysis of Construction worker fall accidents. *Journal of Construction Engineering and Management*, 129 (3): 262-271.

Jaselisks, E., Anderson, S. and Russell, J. 1996. Strategies for achieving excellence in construction safety performance. *Journal of Construction Engineering and Management*, 121(1): 61-70.

L. S. Tey (1999). 'Pengurusan Keselamatan dan Kesihatan di Tapak Pembinaan', Masters Project, Faculty of Civil Engineering, UTM, Skudai, Malaysia.

Sawacha, E., Naoum, S. and Fong, D. 1999. Factors affecting performance on construction sites. *International Journal of Project Management*, 17(5): 309-315.

Tam, C. and Fung, I. 1998. Effectiveness of safety management strategies on safety performance in Hong Kong. *Construction Engineering and Management*, 128 (3): 203-2210.

Wong, K., Chan, P. and Lo, K. 1999. Factors affecting the safety performance of contractors and construction sites. *Proceedings of the second international conference of CIB working commission W99*. Honolulu, Hawaii.

APPENDIX A
QUESTIONNAIRE



QUESTIONNAIRES SURVEY

CASE STUDY ON SAFETY MANAGEMENT IN CONSTRUCTION PROJECT

Objectives:

1. To analyse the importance of construction safety management in construction project.
2. To identify the factors affecting of improper safety management in construction project.

Instructions:

1. Please answer ALL the following questions.
2. Please fill in the space available and tick in the respective box.
3. All information's will be treated as CONFIDENTIAL and shall be used for academic purposes only.
4. All the data information will be on aggregated basis and no individual data will be published.
5. For further information and inquiries, please contact Ms. Nurhafiza Binti Sebi@Hasbi (013-8129821) or email to fizahasbi@gmail.com

**SECTION A: GENERAL INFORMATION OF THE AGENCY/
ORGANISATION**

1. Name: _____

2. Type of Organization

- Client
- Consultant
- Contractor
- Others: _____

Name of the Organization:

3. Position in the company

- Owner
- Project Director
- Project Manager
- Design Engineer
- Project Engineer
- Quantity Surveyor
- Others: _____

4. Qualification

5. Years of working experience

Number of working experience years of the respondent isyears.

6. Number of projects involved

- 1-10 projects
- 11-20 projects
- 21-30 projects
- More than 30 projects

SECTION B
IMPORTANCE OF SAFETY MANAGEMENT IN CONSTRUCTION
PROJECT

For each statement below please tick on the appropriate number to indicate whether it is:

- STRONGLY DISAGREE (1)
DISAGREE (2)
MODERATELY (3)
AGREE (4)
STRONGLY AGREE (5)

NO	CLIENT RELATED	1	2	3	4	5
1	Company's financial benefits in order to increase profits (save costs associated with incidents)					
2	Safeguard company's reputation					
3	Comply with federal and state worker-safety rules and satisfies authorities					
4	Develop a culture of safety on their job sites					
5	Ensure employees comfort and safety and confidence					
6	Providing a better services for customers security					

NO	CONSULTANT RELATED	1	2	3	4	5
1	Maximize the financial profits (save cost)					
2	Comply with authorities requirement					
3	Improve building safety to obtain operation permit					
4	Efficiently supervise and conduct safety inspection on site					
5	Design efficiently in reducing the risks					
6	Increase client confidence in the design work					

NO	CONTRACTOR RELATED	1	2	3	4	5
1	Ensure employees safety during construction and maintenance period (if any)					
2	Complete the project on scheduled without any stop of work on safety issue.					
3	Ensure the smoothness of progress of works on site					
4	Maintain the productivity of the workers					
5	Reduce the probability of accident occurrence to the workers					
6	Helps to improving the condition of workers					

SECTION C
FACTORS AFFECTING OF IMPROPER SAFETY MANAGEMENT IN
CONSTRUCTION PROJECT

For each statement below please tick on the appropriate number to indicate whether it is:

- STRONGLY DISAGREE (1)
DISAGREE (2)
MODERATELY (3)
AGREE (4)
STRONGLY AGREE (5)

NO	FACTORS	1	2	3	4	5
1	Organizational safety policy					
2	Safety meeting					
3	Safety training					
4	Availability of safety equipment					
5	Safety inspections					
6	Safety incentives and penalties					
7	Workers' attitude towards safety					
8	Labour turnover rates					
9	Compliance with safety legislation					

SECTION D
OPEN ENDED QUESTIONS

Please add any other factors which you think are important but not listed before.

1. Do you wish to give any suggestions in regard to the importance of safety management in construction project?

2. Do you wish to state any other factors that affecting to the improper safety management in construction project?

THANK YOU FOR YOUR TIME AND COOPERATION IN COMPLETING
THIS QUESTIONNAIRE. YOUR EARLY RESPONSE IS HIGHLY
APPRECIATED.

APPENDIX B
SURVEY RESULTS

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Company's financial benefits in order to increase profits (save cost associated with incidents)	107.83	97.367	.389	.	.910
Safeguard company's reputation	107.67	85.067	.897	.	.899
Comply with federal and state worker- safety rules and satisfies authorities	107.83	87.767	.874	.	.901
Develop a culture of safety on their job sites	107.17	90.567	.940	.	.902
Ensure employees comfort and safety and confidence	107.67	85.467	.871	.	.900
Providing a better services for customers security	107.67	92.667	.624	.	.906
Maximize the financial profits (save cost)	107.83	86.567	.718	.	.903
Comply with authorities requirement	107.50	82.700	.951	.	.897

Improve building safety to obtain operation permit	107.33	93.467	.694	.	.906
Efficiently supervise and conduct safety inspection on site	107.33	93.467	.694	.	.906
Design efficiently in reducing the risks	107.50	88.700	.804	.	.902
Increase client confidence in the design work	107.17	96.567	.353	.	.910
Ensure employees safety during construction and maintenance period (if any)	107.33	91.867	.520	.	.908
Complete the project on scheduled without any stop of work on safety issue.	107.33	87.467	.821	.	.901
Ensure the smoothness of progress of works on site	107.83	87.767	.874	.	.901
Maintain the productivity of the workers	108.00	84.800	.778	.	.902
Reduce the probability of accident occurrence to the workers	107.00	94.000	.639	.	.906

Helps to improving the condition of workers	107.50	95.900	.575	.	.908
Organizational safety policy	107.67	109.467	-.695	.	.927
Safety meeting	107.67	109.467	-.695	.	.927
Safety training	107.83	92.967	.491	.	.908
Availability of safety equipment	106.83	98.967	.189	.	.912
Safety inspections	107.50	97.900	.322	.	.911
Safety incentives and penalties	107.50	104.300	-.456	.	.919
Workers' attitude towards safety	107.50	95.900	.575	.	.908
Labour turnover rates	108.00	102.400	-.191	.	.917
Compliance with safety legislation	107.33	95.467	.489	.	.909