MANAGING PROJECT FEATURES TO MITIGATE CONSTRUCTION HAZARDS

WAHIDA BINTI WAHI

UNIVERSITI TEKNOLOGI MALAYSIA

MANAGING PROJECT FEATURES TO MITIGATE CONSTRUCTION HAZARDS

WAHIDA BINTI WAHI

A project report submitted in partial fulfilment of the
requirements for the award of the degree of
Master of Science (Construction Management)

Faculty of Civil Engineering
Universiti Teknologi Malaysia

JANUARY 2014

To my beloved father and mother:

Wahi B. Mat and Hamidah Hj. Drahman,

My siblings:

Mohd Fardillah Wahi

Noraziah Wahi

Azizah Wahi

Mohd Fikri Wahi

Thank you for never ending support.

ACKNOWLEDGEMENT

I am grateful to Allah S.W.T. the Almighty for making all good things possible and giving me the great opportunity to complete my research report entitled 'Managing Project Features to Mitigate Construction Hazards'.

First of all, I would like to express my greatest gratitude to my respectful Supervisor, Assco. Prof. Aziruddin Ressang for his unfailing supports, advices, guidance, and contribution of ideas in preparing and completes this dissertation. I also appreciate his willingness to motivate, insightful supervision as well as his creative suggestions throughout the process of finishing this master Final Year Project (FYP).

My appreciation also goes to Assoc. Prof. Ir. Dr. Amran bin Ayob who had patiently read through my research report and given the benefits of his knowledge and assistance in making constructive suggestions for the fulfilment of this successful research.

A grateful acknowledgement is also addressed to all the related professionals participants in construction industry especially that located at the state of Johor Bahru area that are able to spend their precious time and generous counsel in dispensing the useful sources for this research. I am also thankful and indebted to all my friends for their moral support and encouragement during the preparation of this dissertation.

Last but not least, I would like to extend my sincere and heartiest thanks to my beloved parents, family, who had never failed to give me their encouragement and moral support, thus enabling me to complete this dissertation with pride and satisfaction.

Thank you.

ABSTRACT

Throughout the world, construction industry is known as one of the most hazardous activities. This research is to study the project features during planning stage in order to reduce the construction hazards. This research was carried out by reviewing published articles, journals, and conference papers. Seventy questionnaires were distributed to the project participants involved in the construction industry, such as Consultants and Contractors. Forty-five people have responded to the questionnaires and data were analysed using Cronbach's Alpha (α) and Relative Importance Index (RII). The results have shown that demolition work, restricted site area and construction at mountain, hilly area and on sea are the highest contributors to hazards. In order to reduce the construction hazards more attention should be given to these types of work by providing trainings, safety measures, and any other safety arrangements.

ABSTRAK

Industri pembinaan dikenali sebagai salah satu aktiviti yang paling berbahaya di seluruh dunia. Tujuan kajian ini dijalankan adalah untuk mengkaji ciri-ciri projek pada peringkat perancangan awal untuk mengurangkan bahaya di tapak pembinaan. Kajian ini telah dijalankan dengan mengkaji semula artikel yang diterbitkan, jurnal, dan kertas persidangan. Tujuh puluh soal selidik telah diedarkan kepada para peserta projek yang terlibat dalam industri pembinaan, seperti Perunding dan Kontraktor. Empat puluh lima orang telah menjawab soal selidik dan data dianalisis dengan menggunakan Alpha Cronbach (α) dan Indeks Kepentingan Relatif (RII). Keputusan telah menunjukkan bahawa kerja-kerja perobohan, kawasan tapak yang terhad, dan pembinaan di kawasan gunung, berbukit, dan di laut merupakan penyumbang tertinggi kepada bahaya. Dalam usaha untuk mengurangkan bahaya di tapak pembinaan perhatian yang lebih perlu diberikan kepada jenis-jenis kerja dengan menyediakan latihan, langkah-langkah keselamatan, dan apa-apa aturan keselamatan yang lain.

TABLE OF CONTENTS

5 RESULTS AND DISCUSSION

LIST OF TABLES

LIST OF TABLES

LIST OF TABLES

LIST OF TABLES

LIST OF FIGURES

LIST OF FIGURES

LIST OF FIGURES

LIST OF FIGURES

LIST OF FIGURES

LIST OF ABBREVIATIONS

ABBREVIATIONS	FULLNAME
DOSH	Department of Occupational Safety and Health
OSH	Occupational Safety and Health
OSHA	Occupational Safety and Health Association
PPE	Personal Protective Equipment
RII	Relative Importance Index
SPSS	Statistical package for social science

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.1 Introduction and Background

The construction industry in Malaysia is a major contributor and aspiration towards realising the government Vision 2020. The gross domestic product (GDP) growth for 2012 shows the construction industry is taking the lead, with growth having doubled from 3.4% to 7% in 2011. The construction sector is expected to grow at a fast pace of 7% in 2012 as large infrastructure projects and housing construction activities begin to pick up as shown in Table 1.1 (Department of Statistics and Ministry of Finance, MOF, 2012).

The construction industry is critical to the creation of national wealth and has multiplying and spin-off effects on other economic sectors including the financial, banking, insurance, transportation and manufacturing services (Lindsay, 2012).

Table 1.1: The Gross Domestic Product (GDP) by Sector (2010 – 2012)

Sector	Gross Domestic Product (GDP) by Sector 2010 – 2012 (at constant 2000 prices)								
	Change (%)			Share of GDP (%)			Contribution to GDP Growth (Percentage Point)		
	2010	2011[1]	2012[2]	2010	2011[1]	2012[2]	2010	2011[1]	2012[2]
Agriculture	2.1	4.7	4.1	7.3	7.3	7.3	0.2	0.3	0.3
Mining	0.2	-2.4	2.5	7.0	6.5	6.3	0.0	-0.2	0.2
Manufacturing	11.4	4.5	4.5	27.6	27.5	27.2	3.0	1.3	1.2
Construction	5.1	3.4	7.0	3.3	3.3	3.2	0.2	0.1	0.2
Services	6.8	6.4	6.5	57.7	57.7	58.9	3.9	3.7	3.8
Less: Undistributed FISIM	5.8	6.4	6.2	4.1	4.1	4.2	0.2	0.3	0.3
Add: Import duties	9.6	13.2	1.6	1.3	1.3	1.3	0.1	0.2	0.0
GDP	7.2	5.9-5.5	5.0-6.0	100.0	100.0	100.0	7.2	5.0-5.5	5.0-6.0
Legend: [1] Estimate [2] Forecast [3] Financial Intermediation Services Indirectly Measured (FISIM)									
Notes: Total may not add up due to rounding.									

S*ource: Department of Statistics and Ministry of Finance, MOF (2012)*

The construction industry plays a significant role in improvement of any country's economic growth. Despite on the massive contributions to economic growth, construction industry has always been blamed for the high rate of accidents and fatalities; this has placed the construction industry among the industries with unreasonable rate of accidents, permanent and non-permanent disabilities and fatalities (Abdul Rahim, *et al.*, 2003).

The latest annual report updated by the Social Security Organization (SOCSO), also known as Pertubuhan Keselamatan Sosial (PERKESO) (2011), reveals that the total reported accidents from year 2010 to 2011 have declined by 515 cases or 1.45% from 35,603 cases in 2010 to 35,088 cases in 2011 as shown in Figure 1.1.

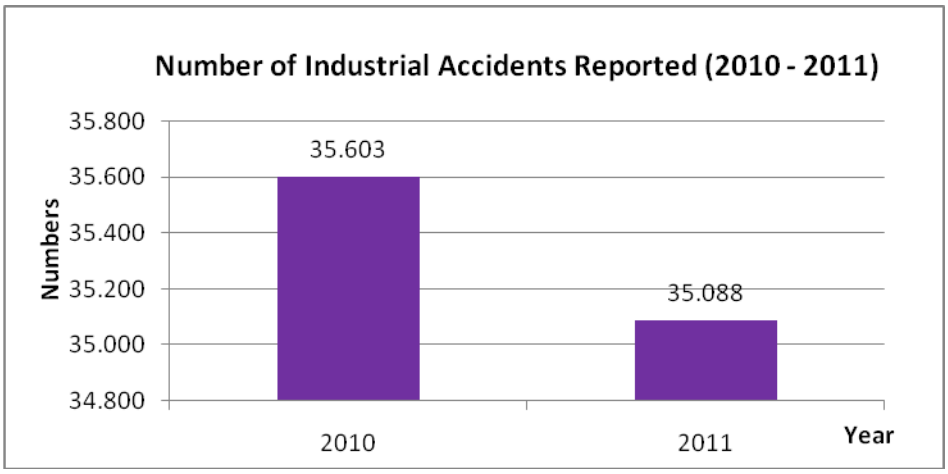

Figure 1.1: Number of Industrial Accidents Reported, (2007-2011)

Source: PERKESO Annual Report (2011)

Based on PERKESO Annual Report (2011), Table 1.2, in 2011 the construction industry was listed at ranking number five (5) for the number of reported accidents on site. It was reported that a higher number (4,330) of male workers were involved with accidents compared to 607 female workers who were involved in accidents. These add up to a total number of 4,937 people who were involved in accidents in the construction industry. The report shows that even the major and high-growth construction industry faces a high risk of accident occurrence.

Table 1.2: Number of Accidents According to Industry and Gender, 2011

RANKING	INDUSTRY	ACCIDENT REPORTED		
		MALE	FEMALE	TOTAL
1.	Manufacturing	13,736	3,370	17,106
2.	Real Estate, Leasing and Business	8,458	1,710	10,168
3.	Public Administration and Defence/ Social Security	4,440	968	5,408
4.	Trading (Wholesale Trade)	4,679	684	5,363
5.	Construction Industry	4,330	607	4,937
6.	Trading (Retail Trade)	3,372	989	4,361
7.	Transportation and Storage	3,525	326	3,851
8.	Agriculture, Forestry, and Fishing	1,914	496	2,410
9.	Accommodation and Food Services Activities	1,534	580	2,114
10.	Health and Social Work	677	484	1,161
11.	Financial and Insurance or Takaful Activities	657	330	987
12.	Electricity, Gas, Water Supply, and Sanitation Services	722	51	773
13.	Mining and Quarrying	396	25	421
14.	Other community, Social and Personal Service Activities	282	65	347
15.	Education	155	132	287
16.	Activities of Extraterritorial Organization and Bodies	182	21	203
	GRAND TOTAL	**49,059**	**10,838**	**59,897**

Source: PERKESO Annual Report (2011)

Nowadays most of the construction project teams concentrate exclusively on completing for projects rather than focusing on safety requirement at construction sites. This had resulted in thousands of construction workers being killed and suffered disabling injuries annually. Jannadi *et al.* (2002) cited that the major causes of accidents are related to the unique nature of the industry, human behavior, difficult work-site conditions and poor safety management, which had resulted in unsafe work methods, equipment and procedures.

Based on the statistic obtained from the Department of Safety and Health (DOSH) Malaysia as shown in Figure 1.2, Sarawak is the state that falls under the highest number of occupational deaths, with a number of 25 victims. However, with 382 incidents, the state of Perak has the highest number of non-permanent disability

(NPD) victims. Meanwhile, the highest number of victims with permanent disability (PD) falls under the state of Johor Bahru, with 28 victims.

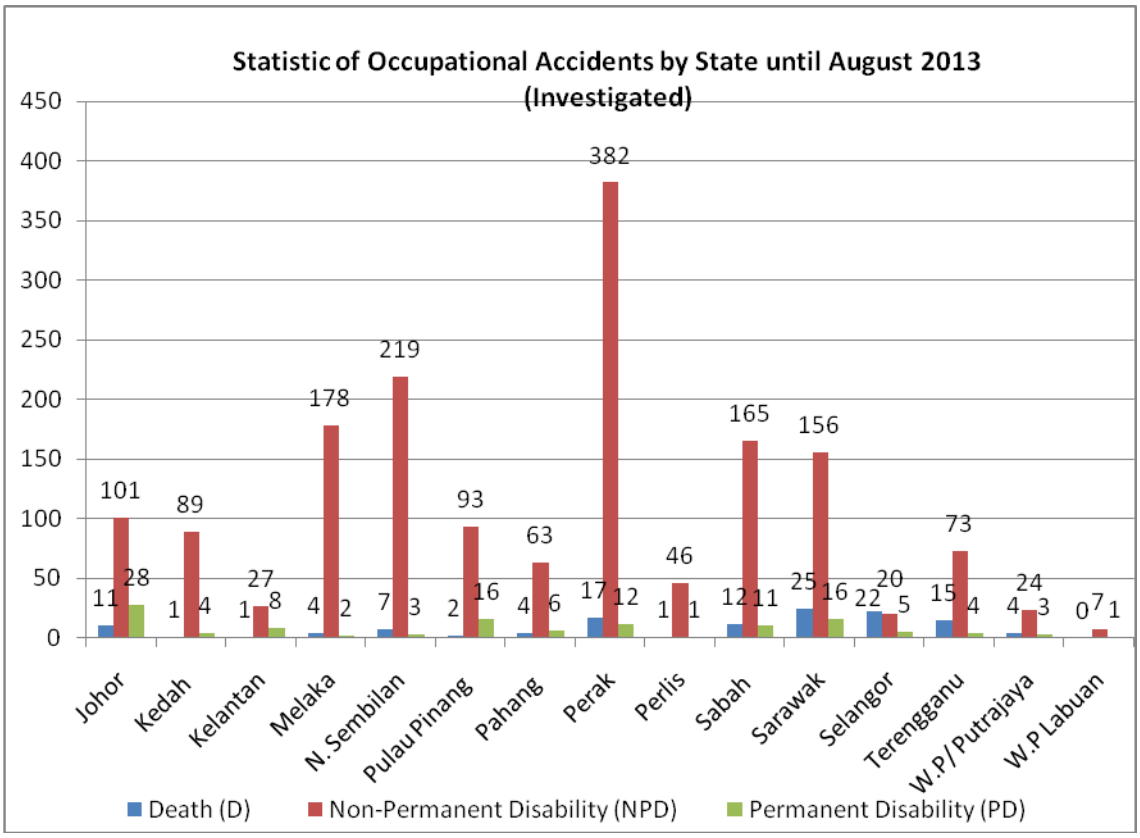

Figure 1.2: Statistic of Occupational Accidents by State until August 2013 (Investigated)

Source: Department of Safety and Health (DOSH) Malaysia (2013)

According to Haslam, R.A. *et al.* (2005), the key factors in the accidents were problems arising from workers or the work team, workplace issues, shortcoming with personnel protective equipment, problems with suitability and condition of materials and deficiencies with risk management.

Many approaches have been proposed and implemented to improve safety in construction industries in order to reduce the number of accidents, fatalities, injuries to workers and damage to equipment. Some countries completely depend on government agencies in providing safety at worksite, such as the Occupational Safety and Health Administration (OSHA) (Jannadi *et al.*, 2002). This is due to the fact that

the responsibility of the management in the construction industry itself is considered to be of high concern (Meredith Armstrong and Charles J., 2003).

As an example, the construction industry safety practice in Saudi Arabia is not regulated by any government agency but becomes an area of responsibility of the top management of the organization (Jannadi *et al.*, 2002). From the study of such practice, Meredith Armstrong and Charles J. (2003) reiterate that the leadership at the top and throughout the organization, from CEO to supervisors, must have commitments to safety and health and set aside resources to accomplish safety and health goals.

1.2 Problem Statement

Although regulations in occupational safety and health in Malaysia are quite comprehensive and reinforced with strict and regular safety inspection and audit by DOSH, the number of accidents at construction sites is still alarmingly high. The number of accidents and fatalities is still at an unacceptable figure.

In 2013, Malaysia Department of Safety and Health (DOSH) recorded a total number of 36 deaths in the construction industry; see Figure 1.3, this makes the construction sector the second highest fatality rate in Malaysia. The manufacturing industry led the table with 47 occupational deaths. Even though the total number of reported accidents and frequency of industrial accidents show downward trends the construction industry is still one of the most hazardous industries in Malaysia.

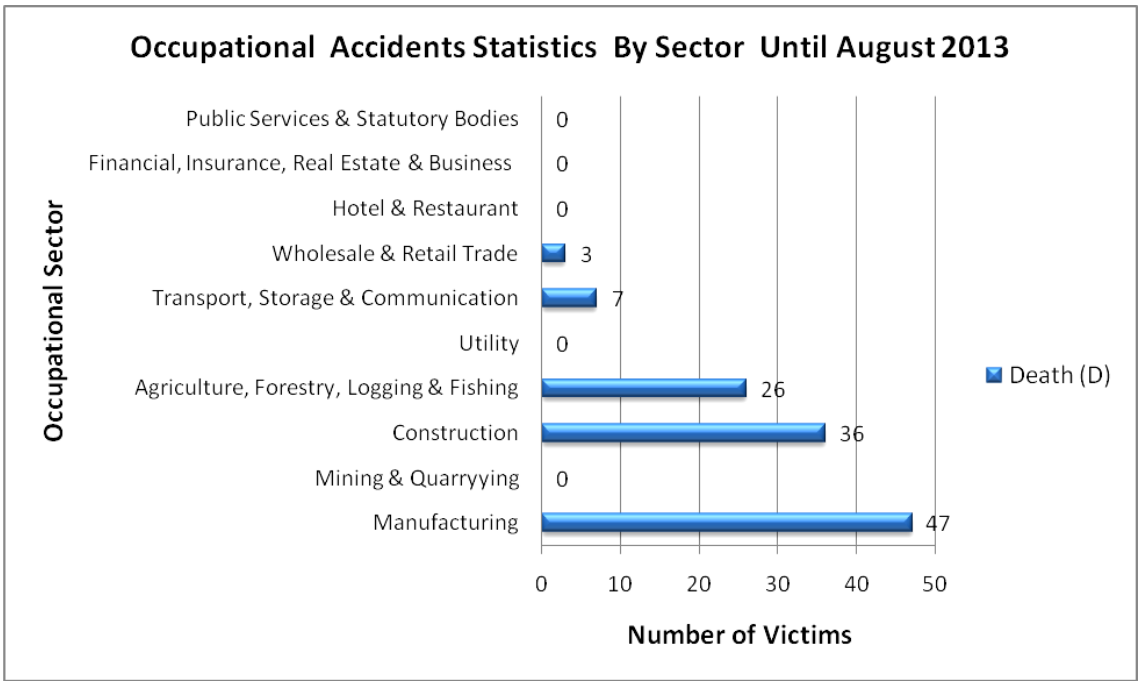

Figure 1.3: Statistic of Occupational Accidents by Sector until August 2013

Source: Department of Safety and Health (DOSH) Malaysia (2013)

Globally, the volume of injury, illness and fatalities in construction sites is alarmingly high with 55,000 persons die due to hazards in workplaces, 294,000 persons falling ill and 3.8 million persons injured. The annual costs are estimated at about $128 billion to $155 billion. Construction accidents lead to delay in project completion and increase the expenses in construction work (Paul A. *et al.*, 2008). The negative impacts and consequences arising from high fatalities are high premium costs of insurance and high medical costs. Therefore it is vital that the players within the industry adopt a serious attitude towards safety at construction sites.

Construction Project Features (CPFs) such as the nature of project, method of construction, site restriction, project duration, procurement system, design complexity, level of construction and subcontracting have contributed to the cause of accidents in construction projects (McKay *et al.*, 2002), (Loughborough University and UMIST, 2003), (Gambatese *et al.*, 2008) and (Health and Safety Executive, 2009).

The number of construction workers fatally injured after being struck by objects or equipment has increased by 7% from 2011 to 2012. This total includes 233 workers struck by falling objects or equipment and 199 struck by powered vehicles or mobile equipment during construction works operation (Bureau of Labor Statistics, 2013). This is due to site with insufficient working space apart from other types of project features (Loughborough University and UMIST, 2003); (Loughborough University, 2009); and (Health and Safety Executive, 2009).

Construction Project Features undeniably contributed to accident causation through the introduction of the proximal factors (Manu P. *et al.*, 2010). Proximal factors are events responsible for causing accidents and can be contributed by human relation, reinforcement, legislation, financial and contractual, environmental and plant and machineries. These related factors affect the project features which in turn contributed to accidents causation (McKay *et al*., 2002); (Loughborough University and UMIST, 2003); (Behm, M., 2005); and (Chockalingam S. and Sornakumar T., 2011).

1.3 Aim of Study

The aim of this research is to study project features to enhance construction safety. To achieve this aim, the following objectives have been outlined.

1.4 Objectives of Study

In order to achieve the above aims, the following objectives have been laid out:

i. To study the project features that contribute to construction hazards.

ii. To investigate causes affecting the project features.

iii. To propose improvements in planning stage to enhance construction safety.

1.5 Scope of the Research

This research is focused on the construction industry. The respondents include selected participants involved in projects in the construction industry, such as Consultants and Contractors. The scope of the study is limited to the area of Johor Bahru, Malaysia. From a large number of Consultants and Class A Contractors actively involved in the construction industry in Johor Bahru, seventy set of questionnaires will be distributed to the respondents. The respondents will be randomly chosen to respond to the questionnaires.

1.6 Significance of Study

The idea of conducting this study is to identify and recognise the project features that are causing construction hazards. To view it in a wider perspective of the construction industry, the investigation will include the causes or factors that are affecting the project features.

The identification of the project features in the construction project will assist the study in obtaining the severities of each project feature in causing hazards. The level of severities of each project feature in creating hazards and the causes affecting the project features will be identified and ranked from the lowest to highest contribution of hazards.

The results from the analysis will enable recommendations on ways to reduce hazards in construction projects. The result of the study is expected to provide

information to avoid or reduce hazards in construction projects, thus improving the working condition in the construction industry to a status of a safe industry.

1.7 Research Methodology

In order to complete the research methodology of this study, there are certain processes that need to be identified and implemented. The methodology of this research is carried out in order to determine the essential steps that will be performed to meet the objectives of this research. The followings are the explanation of processes involved for the completion of this research:

1.7.1 Preliminary Study

The first and foremost step of the study is called preliminary study. This step involves identifying research problems which cover the objectives and scope of study. The problems are identified based on discussion with interested parties, articles, and journals gathered regarding the research topic. The problem statement of the research will be identified in order to determine the research aim, objectives, and scope of the study.

The research area will be determined based on the related topic. The determined research area and topic of this research will be shaped from the feedback obtained from the Consultants and Contractors who are involved in the construction industry.

1.7.2 Literature Review

The preliminary step is followed by exploratory search of the literature. The reviews are gathered from reference books, articles, journals and working papers. Literature reviews are carried out to enhance the understanding and theory regarding the study.

1.7.3 Data Collection

The data and information collected prior to the main study are needed to strengthen the facts that are reviewed in the literature. The data are important in order to obtain the relevant information that is needed in carrying out this research. Two types of research methods are used: the primary data and secondary data.

Method of Data Collection:

a) Primary data

The basic method of collecting data for this research is distribution of questionnaires to the respondents. The questionnaires are distributed to project participants in the construction industry.

b) Secondary data

The step is then followed by exploratory search of the literature. Secondary data sources for literature are gathered from reference books, journals, newspapers and articles. These sources provide a lot of data that can help enrich understanding regarding the theory of the present research.

1.7.4 Data Analysis

From the data collected, they will be analysed to produce a relevant search report. The data for this research will be analysed using Frequency Analysis, Reliability Test (Cronbach's Alpha) and Relative Importance Index (RII).

1.7.5 Conclusion and Recommendation

This last step is used to report all the relevant data when making Conclusions. Specific Recommendations are made available to aid future researchers in carrying out related studies. The list of References which are made available for the research is obtained from true and valid sources.

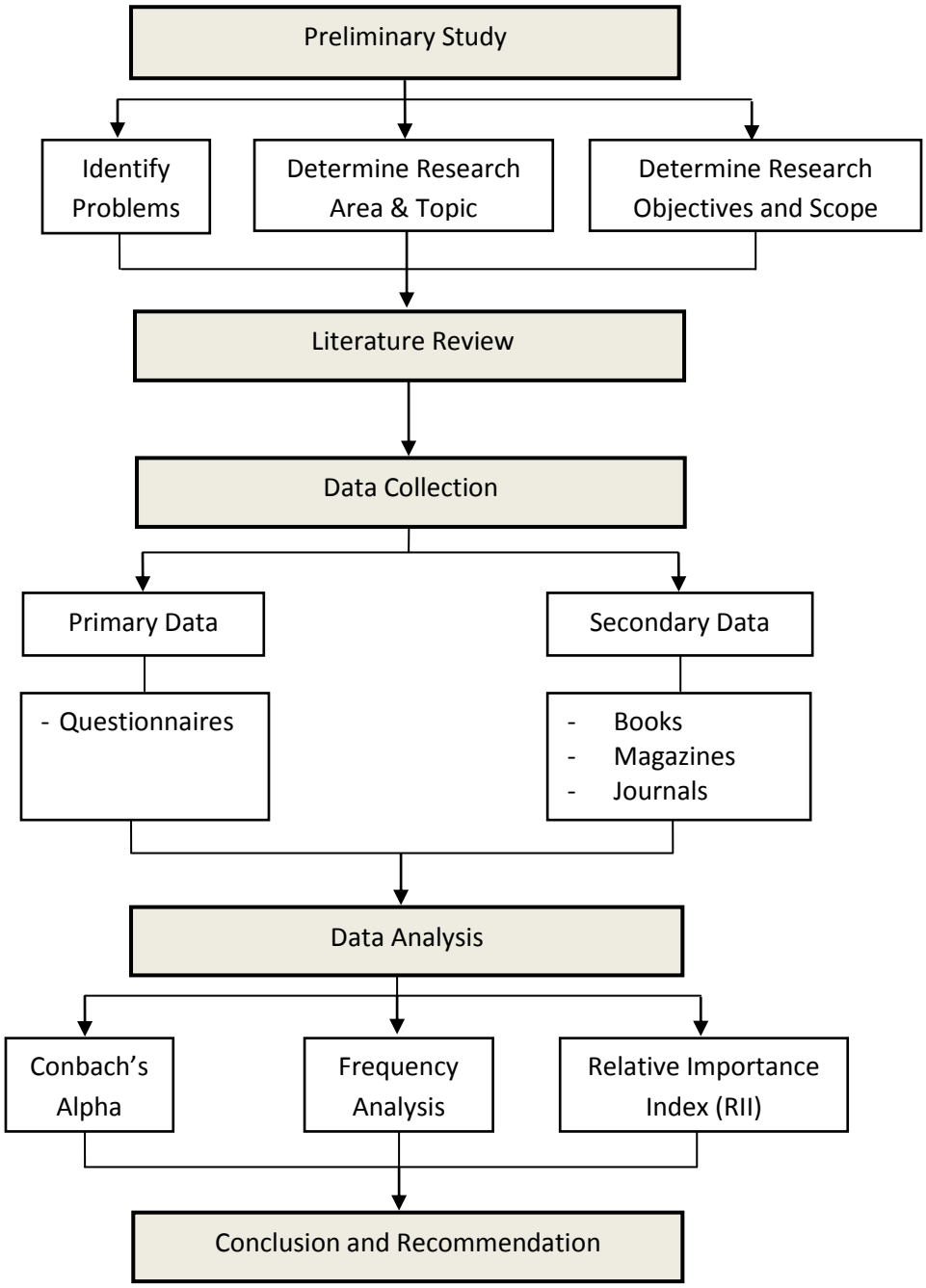

Figure 1.4: Methodology Flowchart of the Research

REFERENCES

Abdul Rahim, Wan Zulkifli, Bachan Singh (2003). Hazards at Construction Sites. *Proceedings of the 5th Asia-Pacific Structural Engineering and Construction Conference (APSEC 2003).* 26-28 August 2003. Johor Bahru, Malaysia.

ACT Government Environment and Sustainable Development (2013). Summary of Site Opportunities and Constraints. Retrieved on November 8, 2013, from www.actpla.act.gov.au.

Adel (2009). Manual Handling. Retrieved on April 26, 2013, from http://www.slideshare.net/Adelyounis/manual-handling.

Adenuga, O.A. and Dosumu, O.S. (2012). Assessment Of Procurement Methods Used For Executing Maintenance Works In Lagos State. *Ethiopian Journal of Environmental Studies and Management EJESM*. 5(4) (Suppl.1).

Alan Baxter (2009). Constraints and Opportunities. *Cinderford Northern Quarter Baseline Report.* Retrieved on November 8, 2013 from www.fdean.gov.uk.

Ankrah, N. A. (2007). *An Investigation Into The Impact Of Culture On Construction Project Performance.* Unpublished PhD thesis, School of Engineering and The Built Environment, University of Wolverhampton.

Archubald Russell D., Di Filippo Ivano, and Di Filippo Daniele (2008). The Six-Phase Comprehensive Project Life Cycle Model Including the Project Incubation/Feasibility Phase and the Post-Project Evaluation Phase. Retrieved on November 8, 2013, from http://www.iil.com.

Ashworth A. (2002). *Pre-Contract Studies: Development Economics, Tendering and Etimating (Second Edition).* Blackwell Publishing, UK.

Baxendale T. and Jones O. (2000). Construction Design and Construction Management Safety Regulations in Practice - Progress on Implementation. *Journal of Project Management*, 18, 33 - 40.

Behm, M. (2005). Linking Construction Fatalities to the Design for Construction Safety Concept. *Safety Science*, 43, 589 - 611.

Bennett and Grice (1990). *Procurement Systems for Building, Quantity Surveying Techniques, New Directions, Brandon, P.S. (ed.).* BSP Professional Books, Oxford.

Bureau of Labor Statistics (2013). Census of Fatal Occupational Injuries Summary, 2012. *National Census of Fatal Occupational Injuries In 2012.* Retrieved on November 8, 2013, from www.bls.gov.

Briney A. (2013). Site and Situation. *Site and Situation Describe a Place's Location.* Retrieved on November 7, 2013 from www.geography.about.com.

Chua and Goh (2005). Poisson Model Of Construction Incident Occurrence. *Journal of Construction Engineering and Management*, 131(6), 715-722.

Cheung, S. O., Suen, H. C. H., and Cheung, K. K. W. (2004). PPMS: A Web-Based Construction Project Performance Monitoring System, Automation in Construction. 13, 361 - 376.

Chockalingam S. and Sornakumar T. (2011). An Effective Total Construction Safety Management In India. *Asian Journal Of Civil Engineering (Building And Housing)*. 13(3), 405 - 416.

CNA Financial Corporation (2010). Incentive Compensation Plan, As Amended and Restated (Exhibit A to Form DEF 14A). Retrieved on November 8, 2013.

Cooper D. (2004). *Improving People Performance in Construction.* Gower Publishing, Aldershot, England.

Davies and Tomasin (1990). *Construction Safety Handbook*. London: Thomas Telford.

Dedobbeleer N. German P. (1987). Safety Practices In Construction Industry. *Journal of Occupational Medicine*. 29, 863 - 8.

Dekker (2002). The Re-Invention Of Human Error, Sweden. Retrieved on November 8, 2013.

Department of Labour (DOL) (2013). Supervisor's Role and Responsibilities. Retrieved on November 15, 2013, from www.dol.gov.

Department of Safety and Health (DOSH) Malaysia (2013). Statistic of Occupational Accidents by Sectors or State until August 2013 (Investigated). Retrieved on November 18, 2013, from http://www.dosh.gov.my.

Department of Statistics and Ministry of Finance, MOF (2012). Economic Performance and Prospects. Retrieved on August 20, 2012, from www.treasury.gov.my.

Donaghy Report (2009). One Death Is Too Many. *Inquiry Into The Underlying Causes Of Construction Fatal Accidents: Report To The Secretary Of State For Work And Pensions.* Norwich.

Egbu (1999). Skills, Knowledge and Competencies for Managing Construction Refurbishment. *Construction Management and Economics*. 17, 29 - 43.

Entec UK Ltd (2000). Construction Health and Safety For The New Millennium. *Contract Research Report 313/2000 HSE.*

Environment Protection Authority (EPA) (1996). Environmental Guidelines for Major Construction Sites. Melbourne, Australia. Retrieved on April 28, 2013.

European Agency for Safety and Health at Work (2010). A Review Of Accidents And Injuries To Road Transport Drivers. *Working Environment Information.* Retrieved on April 27, 2013, from https://Osha.Europa.Eu/En/Publications/Literature_Reviews/Road-Transport-Accidents.Pdf.

Ezekiel Chinyio and Paul O. (2010). Construction Stakeholder Management. Blackwell Publishing, United Kingdom.

Flaxman Law Group (2013). Truck Accidents on Construction Sites in Miami and Other Communities. Retrieved on April 27, 2013, from www.floridatruckingaccidentlawyerblog.com/2013/03/truck_accidents_on_constructio.html.

Gambatese, J.A., Behm, M., Rajendran, S. (2008). Design's Role in Construction Accident Causality and Prevention: Perspectives from an Expert Panel, Safety Science. 46, 675 - 691.

Gibb (2001). Standardization and Pre-Assembly-Distinguishing Myth From Reality Using Case Study Research. *Construction Management and Economics*. 19, 307 - 315.

Gibb, A G F (1999). Principles In Off-Site Fabrication. Caithness: Whittles.

Hampton T. (2004). Congested Site at Chicago's Millennium Park Calls for Delicate Movement of Machinery. Retrieved on April 27, 2013, from http://enr.construction.com/products/equipTrackTrends.

Haslam, R.A. *et al.* (2005). Contributing Factors In Construction Accidents. *Applied Ergonomics*. 36: 401 - 415.

Health and Safety Authority (2013). Project Supervisor Construction Stage (PSCS). Retrieved on November 15, 2013, from http://www.hsa.ie/eng/Your_Industry/Construction/Construction_Duty_Holders/Project_Supervisor_Construction_Stage/.

Health and Safety Executive (HSE) (2009). Offsite Production in the UK Construction Industry - A Brief Overview. Retrieved on April 26, 2013.

Health and Safety Executive (HSE) (2009). Construction Intelligence Report: Analysis of Construction Injury and Ill-health Intelligence. Retrieved on April 24, 2013, from www.hse.gov.uk/construction/pdf/conintreport.pdf.

Helen (2005). Natural Hazards. Retrieved on November 8, 2013, from www.gw.govt.nz .

Hendrickson and Au (2008). Project Management for Construction. McGraw-Hill, Prentice Hall, New York.

Hendrickson C. and Au (2000). Project Management for Construction (Second Edition). McGraw-Hill, Prentice-Hall, New York.

Hinze J. (2005). Early Integration of Safety into Construction Projects. Retrieved on November 8, 2013, from www. tcm-2.org.

Hisham and Khaled (2013). Optimal Utilization Of Interior Building Spaces For Material Procurement and Storage In Congested Construction Sites. *Journal of Automation in Construction*. 31, 292 - 306.

HSL (1999). The Impact of Procurement and Contracting Practices on Health and Safety - A Review of Literature. Report: RAS/99/02, HSL.

Huang, X. and Hinze, J. (2006). Owner's Role in Construction Safety. *Journal of Construction Engineering and Management*. 132(2), 164 - 173.

Hughes and Ferrett (2008). Introduction To Health And Safety In Construction. Third Edition. Oxford: Elsevier Ltd.

Infrastructure Health and Safety Association (2013). The Competent Supervisor. Retrieved on November 15, 2013, from www.ihsa.ca.

Jannadi, M. O. and Assaf, S. (2002). Safety Assessment in the Built Environment of Saudi Arabia. *Journal of Safety Science*. 29, 15 - 24.

James L. (2011). Health and Safety Hazards in the Construction Industry. *Encyclopedia of Occupational Health and Safety, Geneva.* Retrieved on November 7, 2013, from www.ilo.org.

Joanna (2003). Creating Excellent Buildings: A Guide For Client (First Edition). John F. (2001). Stems and Scales. Retrieved on April 27, 2013, from http://www.Coolth.com.

John Wiley and Sons (2010). Webster's New World College Dictionary.

International Software Benchmarking Standards Group (ISBSG), (2013). Project Duration. Retrieved on April 27, 2013, from http://www.isbsg.org.

Kartam N., Flood I., and Koushki P. (2000). Construction Safety In Kuwait: Procedures, Problem, And Recommendation. *Journal of Safety Science*. 36, 163 - 184.

Kevin R. (2013). Summary of Opportunities and Constraints. Retrieved on November 8, 2013, from co.humboldt.ca.us.

Kloppenborg T.J. (2009). Contemporary Project Management. South-Western CENGAGE Learning, Mason. Retrieved on November 9, 2013, from ebiz.uoregon.edu.

Korman, R., (1999). Undeserved Attention. *Designers Say OSHA Is Unfairly Expanding Safety Responsibility Without Clear Legal Basis, Engineering News Record 21 (June)*. 28 – 32.

Larry, R., Thomas, D. and Paul (2001). Physical Hazards of the Workplace. *Occupational Safety and Health Guide Series*. CRC Press; 1 edition.

Liang (2013). Workplace injuries up by almost 1,000. The Straits Times. Retrieved on April 27, 2013, from http://www.asiaone.com.

Lindsay (2012). Construction Industry A Significant Contributor To The Nation's GDP. Retrieved on May 30, 2013, from http://www.theborneopost.com/2012/05/30/construction-industry-a-significant-contributor-to-the-nations-gdp.

Lopes, J. (2012). Construction In The Economy And Its Role In Socio-Economic Development. In Ofori, G. (Editor) *New Perspectives on Construction in Developing Countries. Spon, Abingdon*. 40 - 71.

Loughborough University (2009). Phase 2 Report: Health and Safety in the Construction Industry: Underlying Causes of Construction Fatal Accidents - External Research, HSE.

Loughborough University (2006). Avoiding Structural Collapses in Refurbishment. A Decision Support System. HSE Research Report 204, HSE.

Loughborough University and Milan Polytechnic (2004). Health And Safety In Refurbishment Involving Demolition and Structural Instability. HSE Research Report 204.

Loughborough University and UMIST (2003).Causal Factors in Construction Accidents. HSE Research Report 156, HSE. Retrieved on April 27, 2013.

Manu, P., Ankrah, N., Proverbs D., and Suresh (2010). An Approach For Determining the Extent of Contribution of Construction Project Features to Accident Causation. *Safety Science*. 48, 687 - 692.

Lucia and Miriama (2013). Health and Safety Management System as an Important Part of Integrated Management System in Construction Company. *8th Research or Expert Conference with International Participations "QUALITY 2013", Neum.*

Manu, P., Ankrah, N., Proverbs, D., Suresh, S. and Callaghan, E. (2009). An Approach for Evaluating the Effectiveness Of CDM 2007 In Mitigating The Adverse Health and Safety Implications Of Subcontracting. *Proceedings of CIB W099 2009 Conference, Australia.* 21 - 23.

Masterman (2002). Introduction to Building Procurement Systems. London; New York: Spon Press.

Mayhew and Quinlan (1997). Subcontracting and Occupational Health And Safety In The Residential Building Industry. *Industrial Relations Journal*. 28(3), 192 - 205.

McKay, Gibb, Haslam, R., and Pendlebury, M. (2002). Implications For The Effect Of Standardization And Pre-Assembly On Health, Safety And Accident Causality Preliminary Results. In: Greenwood, D. (Ed.), *18th Annual ARCOM Conference.* University of Northumbria, Association of Researchers in Construction Management.

Meredith Armstrong and Charles J. (2003). Driving Toward '0': Best Practices in Corporate Safety and Health. Retrieved on November 18, 2013, from http://www.nsc.org.

Miller G., Furneaux C., Davis P., Love P., and O'Donnell A. (2009). Built Environment Procurement Practice: Impediments to Innovation and Opportunities for Changes. *Built Environment Industry Innovation Council*.

National Cooperative Highway Research Program, NCHRP (2000). Accident Mitigation Guide For Congested Road Two Lane Highway - Role of Congestion in Accident Experience.

Norlizah (2010). Managing Physical Hazards on Construction Site. Faculty of Civil Engineering and Earth Resources Universiti Malaysia Pahang. Retrieved on November 18, 2013, from http://umpir.ump.edu.my.

Occupational Safety and Health (2009). Accident Investigation Basics: How To Do A Workplace Accident Investigation. Washington.

Occupational Safety and Health Branch (2004). Guidance Notes On Health Hazards in Construction Works. Retrieved on October 18, 2013, from www.labour.gov.hk.

Occupational Safety and Health Administration, OSHA (2003). Underground Construction (Tunneling). Retrieved on April 18, 2013, from www.osha.gov.

Palaneeswaran, E., Kumaraswamy, M., and Ng, T. (2003). Targeting Optimum Value in Public Sector Projects Through Best Value Focused Contractor Selection. *Engineering, Construction and Architectural Management*. 10(6), 418 - 431.

Paul A., Richard, Andrea, Charles L., Donna S. (2008). National Prevention Through Design (PtD) Initiative. *Journal of Safety Research*. 39 115 - 121.

Perttula, P., Merjama, J., Kiurula, M. and Laitinen, H. (2003). Accidents In Materials Handling At Construction Sites. *Construction Management and Economics*. 21(7), 729 - 736.

Pertubuhan Keselamatan Sosial (PERKESO) Annual Report (2011). Protection: Employment Injury Scheme Invalidity Scheme. Retrieved on November 8, 2013, from www.perkeso.gov.my.

Rick Edgeman (2012). Project Management. Customer and Competitive Intelligence for Product, Process, Systems, and Enterprise Excellence. Retrieved on November 18, 2013, from www.imamu.edu.sa.

Richardson, R., Tischler, M., and Coote, B. (2008). Project Management: Participant Guide (Second Edition). National Center For Construction Education and Research, Pearson, New Jersey, Columbus, Ohio.

Shi (2009). Have Government Regulations Improved Workplace Safety - A Test Of The Asynchronous Regulatory Effects In China's Coal Industry. *Journal of Safety Research*. 40, 207 - 213. Retrieved on May 4, 2013, from www.elsevier.com/locate/j s r.

Strassman W.P. (1975). Building Technology and Employment in the Housing Sector of Developing Countries, East Lansing, Michigan State University.

Strategic Forum for Construction (2002). Accelerating Change: A Report By The Strategic Forum For Construction, London.

Suraji, A., Duff, A.R., and Peckitt, S.J. (2001). Development Of A Causal Model Of Construction Accident Causation. *Journal of Construction Engineering and Management*. 127(4), 337- 344.

Sweeney (1997). Construction Safety and Health Into the 21st Century, ASCE Construction Congress Proceedings, ASCE. 1, 5 - 40.

Szymberski (1997). Construction Project Safety Planning. *TAPPI Journal*. 80(11) 69-74. Retrieved on November 8, 2013, from http://www.tappi.org.

Tavakol and Dennic (2011). Reliability Test (Cronbach's Alpha).

Tompkins County Planning Department (2008). Slope and Topography. Retrieved on November 7, 2013.

UNIONSAFE (2002). Hazards In The Workplace: Health Hazards In Construction Sites. Retrieved on September 28, 2013, from Unionsafe.Labor.Net.

Ugwu and Haupt (2007). Key Performance Indicators And Assessment Methods For Infrastructure Sustainability - A South African Construction Industry Perspective, Building And Environment. 42, 665 - 680.

Union of Construction, Allied Trades and Technicians, UCATT (2012). Working at height. Retrieved on April 27, 2013, from www.ucatt.org.uk.

Watt Addrienne (2000). Project Management. Chapter 7: The Project Life Cycle (Phases). Retrieved on November 9, 2013, from bccampus.pressbooks.com.

Woods, D. D., Johannesen, L. J., Cook, R. I., and Sarter, N. B. (1994). Behind Human Error: Cognitive Systems, Computers and Hindsight. Dayton, OH: CSERIAC.

Wright, Bendig, M., Pavitt, T., and Gibb, A., (2003). The Case for CDM: Better Safer Design - A Pilot Study. *HSE Research Report*. 148.