

**RELIABILITY OF SAFETY PERFORMANCE INDICATOR:
COMPLIANCE AND EFFECTIVENESS OF SAFETY PROGRAMS IN
CONSTRUCTION SITE**

RAMES KUMAR SHANMUGAM

A project report is 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

JUNE 2015

DEDICATED TO

My parents,

My bros,

&

Vidhya (the best girl ever)....

LET THIS BE A MOTIVATION TO ALL

Special thanks to those who challenged me and to those who thought I cant do it...

ACKNOWLEDGEMENT

First of all, I would like to express highest appreciation and gratitude to my supervisor Associate Professor Aziruddin Ressang for helping me throughout the process of completing this thesis. I am very grateful for having him as my supervisor despite his recent loss of his loving wife. His dedication to assist me to complete this thesis from the start is indescribable.

I would also like to extend my appreciation to my fellow group mates under the supervision of Associate Professor Aziruddin Ressang, Khairul Adzim, Rosmaini Salleh and Faridah Rakidin for helping me with the suggestions, discussion, sharing ideas to improve and to complete this thesis. Special thanks to Mohd Danial Anuar who thought us how to use SPSS software without expecting anything. And not forgetting, to all my classmates of Master of Science (Construction Management) batch MIA 22, 23, and 24 who supported each other to complete this thesis and Master's course.

Last but not least, to my family members and relatives from K7 Generations for the continuous moral support and understandings for the past 2 years.

ABSTRACT

Construction sector is one of the high risk industries among other industries with regard to its occupational safety and health concern. This study is composed of elements of safety programs and sub-element safety programs, the compliance of each safety program and its relative important index which determines the rank level of importance of each safety program through questionnaire thus ultimately reflect the reliability of safety performance indicator in the construction site. The study concludes Relative Importance Index for compliance of safety program in construction, it is notable from the RII Ranking table above that Comply Safety and Health Program Requirements rank the highest RII of 0.9588 in construction site to be Always Complied from the Subcontractor's Management whereas the least compliance of safety program in construction site is ranked at last RII of 0.8294 to Update with New Information during Safety Task Briefing. Relative Importance Index for effectiveness of safety program in construction, it is notable from the RII Ranking table above that the most highest rank on the RII of 0.9294 indicates that it would be Very Effective if the Safety Committee Involvement in the Safety Inspection process in construction site whereas the last yet important ranking RII of 0.7647 in the effectiveness of safety program in construction site is the Frequency of The Safety Task Briefing in construction site.

Keywords: safety programs, compliance of safety program, effectiveness of safety program. With these elaborated keyword literature review, it is expected to support and explains the process of how this study is preceded.

ABSTRAK

Industri pembinaan adalah antara sector yang paling tinggi risiko dibanding dengan industry-industri lain dalam aspek berkaitan dengan keselamatan dan kesihatan pekerjaan. Kajian ini merangkumi elemen program keselamatan dan program sub-elemen, tahap pemakaian program keselamatan dan *Relative Importance Index (RII)* untuk menentukan kebolehpakaian penunjuk prestasi keselamatan dengan menentukan rank kepentingan untuk setiap program keselamatan melalui kaji-selidik justeru menggambarkan keberkesanan penunjuk prestasi keselamatan in tapak pembinaan. Kajian ini akan menyimpulkan untuk pematuhan program keselamatan di tapak bina, *RII* yang tertinggi adalah untuk pematuhan program keselamatan iaitu 0.9588 dari pihak pengurusan sub-kontraktor dan yang *RII* paling rendah untuk pematuhan adalah *RII* 0.8294 dimana keperluan untuk mengemaskini dengan pengetahuan baru semasa di perjumpaan keselamatan ditapak. Manakala *RII* untuk keberkesanan yang paling tinggi *RII* ialah 0.9294 yang memberi petunjuk bahawa ia adalah sangat berkesan jika penglibatan jawatankuasa keselamatan dalam pemeriksaan keselamatan ditapak, dan yang paling rendah tahap keberkesanan adalah *RII* sebanyak 0.7647 iaitu untuk kekerapan perjumpaan keselamatan ditapak.

Kata kunci: program keselamatan, pematuhan program keselamatan, keberkesanan program keselamatan.

TABLE OF CONTENTS

CHAPTER	TITLE	PAGE
	TITLE	i
	DECLARATION	ii
	DEDICATION	iii
	ACKNOWLEDGEMENT	vi
	ABSTRACT	v
	ABSTRAK	vi
	TABLE OF CONTENTS	vii
	LIST OF TABLES	xii
	LIST OF FIGURES	xxi
	LIST OF SYMBOLS AND ABBREVIATIONS	xxii
	LIST OF APPENDICES	xxiii
1	INTRODUCTION	1
	1.1 Background of Study	1
	1.2 Problem Statement	2
	1.3 Aim and Objective of the Study	3
	1.4 Scope and Limitation	4
	1.5 Significance of the Study	5
	1.6 Methodology	6
2	LITERATURE REVIEW	8

2.1	Positive Safety Performance Indicator	8
2.2	Safety Program Definition	9
2.3	Safety Program	10
2.4	Safety Programs and Sub-Elements	16
2.5	Safety Program Compliance	18
2.6	Safety Program Effectiveness	18
2.7	Practicality	19
2.8	Conclusion	19
3	RESEARCH METHODOLOGY	20
3.1	Introduction	20
3.2	Literature Review	20
3.3	Questionnaire Survey	21
3.3.1	Demography and Location of Study	24
3.3.2	Questionnaire Design	25
3.4	Reliability Test of Survey Response	26
3.4.1	Analysis of Data	26
3.4.2	Calculation of Relative Important Index	27
3.5	Summary	28
4	DATA ANALYSIS AND RESULTS	29
4.1	Introduction	29
4.2	Questionnaire Correspondents	29
4.3	Findings from demography	30
4.4	Reliability Analysis	34
	Findings from Survey Questionnaires Using IBM SPSS	
4.5	v20 Tool	34
4.5.1	Frequency Table of Compliance	35
4.5.2	Frequency Table of Effectiveness	69

4.6	Respondent's Frequency	102
4.7	Findings	117
4.7.1	Relative Importance Index	117
4.8	Summary	119
5	DISCUSSION OF RESULT	120
5.1	Introduction	120
5.2	Level of Compliance of Safety Program	120
5.2.1	Identifying Frequency	121
5.2.1.1	Safety Task Briefing	121
5.2.1.2	Job Hazard Analysis	121
5.2.1.3	Pre-Project and Pre-Task Planning	122
5.2.1.4	Safety Auditing	122
5.2.1.5	Safety Records Management	122
5.2.1.6	Accident/Incident Investigations	123
5.2.1.7	Subcontractor Management	123
5.2.1.8	Personal Protection Programs	123
5.2.1.9	Safety Inspections	124
5.2.1.10	Safety Policies	124
5.2.1.11	Safety Committees	124
5.2.1.12	Safety Award	125
5.2.1.13	Staffing for Safety	125
5.2.1.14	Emergency Preparedness and Response	125
5.2.1.15	Selection of Employee	126
5.2.1.16	Employee Involvement	126
5.2.1.17	Safety Induction	127
5.2.1.18	Safety Training	127
5.2.1.19	Safety Meeting	127
5.3	Level of Effectiveness of Safety Program	137
5.3.1	Identifying Frequency	137
5.3.1.1	Safety Task Briefing	137

5.3.1.2	Job Hazard Analysis	138
5.3.1.3	Pre-Project and Pre-Task Planning	138
5.3.1.4	Safety Auditing	138
5.3.1.5	Safety Records Management	139
5.3.1.6	Accident/Incident Investigations	139
5.3.1.7	Subcontractor Management	139
5.3.1.8	Personal Protection Programs	140
5.3.1.9	Safety Inspections	140
5.3.1.10	Safety Policies	140
5.3.1.11	Safety Committees	141
5.3.1.12	Safety Award	141
5.3.1.13	Staffing for Safety	141
	Emergency Preparedness and	
5.3.1.14	Response	142
5.3.1.15	Selection of Employee	142
5.3.1.16	Employee Involvement	142
5.3.1.17	Safety Induction	143
5.3.1.18	Safety Training	143
5.3.1.19	Safety Meeting	143
5.3.2	Summary of Compliance	153
5.3.3	Summary of Effectiveness	153
6	CONCLUSIONS	154
6.1	Introduction	154
6.2	Achieving the Aims and Objective	154
6.3	Compliance and Effectiveness of Safety Program	155
6.4	Improvement Proposal	155
	Reliability of Safety Programs Compliance as Part of Component of Safety Performance Indicator in	
6.5	Malaysian Construction	156

REFERENCES	157
APPENDICES	
A List of International Literature Review on Safety Programs	162
B Questionnaire	166

LIST OF TABLES

TABLE NO	TITLE	PAGE
2.1	Safety Programs and Sub-Elements	17
3.1	List of Safety Programs and Sub Program in Questionnaire	22
3.2	Reliability Range	26
3.3	RII on -Point Likert scale for level of compliance	28
3.4	RII on -Point Likert scale for level of effectiveness	27
4.4.1	Reliability Statistics for Compliance	34
4.4.2	Reliability Statistics for Effectiveness	34
4.4.3	Reliability of Respondent	34
4.5.1	Frequency of the safety task briefing for compliance	35
4.5.2	Always updated with new information for compliance	35
4.5.3	Trains workers safety sense for compliance	36
4.5.4	Involves all workers and site managements for compliance	36
4.5.5	Both ways communication for compliance	37
4.5.6	Workers concern and questions are heard for compliance	37
4.5.7	Identify potential hazards for compliance	37
4.5.8	Recommend the safest way to work for compliance	38
4.5.9	All type of works are analysed for compliance	39

4.5.10	Pre-construction hazard identification for compliance	39
4.5.11	Proper means, methods, site layout design for compliance	39
4.5.12	Hazards recognized, communicated to all for compliance	40
4.5.13	Safety procedure followed for compliance	40
4.5.14	Identify deviations from general standards for compliance	41
4.5.15	Analyse events leading to deviations for compliance	41
4.5.16	Highlight good practices for compliance	42
4.5.17	Improves existing safety system for compliance	42
4.5.18	Feedback company with corrective actions for compliance	43
4.5.19	Eliminates accidents and injuries for compliance	43
4.5.20	Analyses of accident data to reveal trends for compliance	44
4.5.21	Points weakness in safety program for compliance	44
4.5.22	Identify poor execution of program element for compliance	44
4.5.23	Identify root causes for compliance	45
4.5.24	Develop methods to future incidents for compliance	45
4.5.25	Near misses investigations for compliance	46
4.5.26	Learn without injury occurrence for compliance	46
4.5.27	Maintain good safety records on site for compliance	46
4.5.28	Subcontractors implements safety programs for compliance	47
4.5.29	Assigned full-time safety staff for compliance	47
4.5.30	Comply S&H program requirement for compliance	47
4.5.31	Mandatory wearing of hard hats for compliance	48

4.5.32	Mandatory wearing of safety glasses for compliance	48
4.5.33	Mandatory tying off working at elevation for compliance	48
4.5.34	Personal protective equipment (PPE) for compliance	49
4.5.35	Manager involvement for compliance	49
4.5.36	Safety committee involvement for compliance	49
4.5.37	Insurance provider representative for compliance	50
4.5.38	OSHA consultant involvement for compliance	50
4.5.39	Identify uncontrolled hazardous exposures for compliance	50
4.5.40	Identify safety standards/OSHA violations for compliance	51
4.5.41	Identify the unsafe behaviour of workers for compliance	51
4.5.42	Corrective measures taken immediately for compliance	52
4.5.43	Documenting of project's S&H objectives for compliance	52
4.5.44	Clear company goals for compliance	52
4.5.45	Proper methods for achieving objective for compliance	53
4.5.46	Review and update workplace safety rules for compliance	53
4.5.47	Initiate preventive control measure for compliance	53
4.5.48	Inspection findings report for compliance	54
4.5.49	Assist employees of unsafe practices report for compliance	54
4.5.50	Accept, address complaints and suggestions for compliance	54
4.5.51	Rewards for compliance	55
4.5.52	Raise safety awareness for compliance	55
4.5.53	Reinforce safe behaviours for compliance	56

4.5.54	Counter act unsafe worker behaviours for compliance	56
4.5.55	Provide full-time safety managers for compliance	57
4.5.56	Facilitate preventive and corrective guides for compliance	57
4.5.57	Emergency resources allocation for compliance	57
4.5.58	Communication system for compliance	58
4.5.59	Administration of emergency plan for compliance	58
4.5.60	Emergency response procedure for compliance	58
4.5.61	Communication of procedure for compliance	59
4.5.62	Debriefing post-traumatic stress procedure for compliance	59
4.5.63	Emergency trainings for compliance	59
4.5.64	Employee selected with safety knowledge for compliance	60
4.5.65	Employees involvement in S&H activities for compliance	60
4.5.66	Performing job hazard analyses for compliance	61
4.5.67	Participating in toolbox talks for compliance	61
4.5.68	Performing inspections for compliance	62
4.5.69	All new worker participant provided safety induction for compliance	62
4.5.70	Comprehensive and simple content for compliance	63
4.5.71	Visually aided for easy understanding for compliance	63
4.5.72	Post induction understanding evaluation for compliance	63
4.5.73	Frequency of training for compliance	64
4.5.74	All employee and employers involvement for compliance	64
4.5.75	Comprehensive and simple content for compliance	65
4.5.76	Visually aided for better understanding for compliance	65

4.5.77	Post induction understanding evaluation for compliance	66
4.5.78	Frequency of meeting for compliance	66
4.5.79	All employee involvements for compliance	67
4.5.80	Employer involvements for compliance	67
4.5.81	All safety issues with be discussed with all for compliance	67
4.5.82	Employee problem is heard for compliance	68
4.5.83	Good two way communication discussions for compliance	68
4.5.84	Frequency of the safety task briefing for effectiveness	69
4.5.85	Always updated with new information for effectiveness	69
4.5.86	Trains workers safety sense for effectiveness	70
4.5.87	Involves all workers and site managements for effectiveness	70
4.5.88	Both ways communication for effectiveness	71
4.5.89	Workers concern and questions are heard for effectiveness	71
4.5.90	Identify potential hazards for effectiveness	72
4.5.91	Recommend the safest way to work for effectiveness	72
4.5.92	All type of works are analysed for effectiveness	73
4.5.93	Pre-construction hazard identification	73
4.5.94	Proper means, methods, site layout design	74
4.5.95	Hazards recognized, communicated to all for effectiveness	74
4.5.96	Safety procedure followed for effectiveness	75
4.5.97	Identify deviations from general standards for effectiveness	75
4.5.98	Analyse events leading to deviations for effectiveness	76
4.5.99	Highlight good practices for effectiveness	76

4.5.100	Improves existing safety system for effectiveness	77
4.5.101	Feedback company with corrective actions for effectiveness	77
4.5.102	Eliminates accidents and injuries for effectiveness	78
4.5.103	Analyses of accident data to reveal trends for effectiveness	78
4.5.104	Points weakness in safety program for effectiveness	78
4.5.105	Identify poor execution of program element for effectiveness	79
4.5.106	Identify root causes for effectiveness	79
4.5.107	Develop methods to future incidents for effectiveness	79
4.5.108	Near misses investigations for effectiveness	80
4.5.109	Learn without injury occurrence for effectiveness	80
4.5.110	Maintain good safety records on site for effectiveness	80
4.5.111	Subcontractors implements safety programs for effectiveness	81
4.5.112	Assigned full-time safety staff for effectiveness	81
4.5.113	Comply S&H program requirement for effectiveness	82
4.5.114	Mandatory wearing of hard hats for effectiveness	82
4.5.115	Mandatory wearing of safety glasses for effectiveness	82
4.5.116	Mandatory tying off working at elevation for effectiveness	83
4.5.117	Personal protective equipment (PPE) for effectiveness	83
4.5.118	Manager involvement for effectiveness	83
4.5.119	Safety committee involvement for effectiveness	84
4.5.120	Insurance provider representative for effectiveness	84
4.5.121	OSHA consultant involvement for effectiveness	85

4.5.122	Identify uncontrolled hazardous exposures for effectiveness	85
4.5.123	Identify safety standards/OSHA violations for effectiveness	86
4.5.124	Identify the unsafe behaviour of workers for effectiveness	86
4.5.125	Corrective measures taken immediately for effectiveness	86
4.5.126	Documenting of project's S&H objectives for effectiveness	87
4.5.127	Clear company goals for effectiveness	87
4.5.128	Proper methods for achieving objective for effectiveness	87
4.5.129	Review and update workplace safety rules for effectiveness	88
4.5.130	Initiate preventive control measure for effectiveness	88
4.5.131	Inspection findings report for effectiveness	88
4.5.132	Assist employees of unsafe practices report for effectiveness	89
4.5.133	Accept, address complaints and suggestions for effectiveness	89
4.5.134	Rewards for effectiveness	90
4.5.135	Raise safety awareness for effectiveness	90
4.5.136	Reinforce safe behaviours for effectiveness	91
4.5.137	Counter act unsafe worker behaviours for effectiveness	91
4.5.138	Provide full-time safety managers for effectiveness	91
4.5.139	Facilitate preventive and corrective guides for effectiveness	92
4.5.140	Emergency resources allocation for effectiveness	92
4.5.141	Communication system for effectiveness	92
4.5.142	Administration of emergency plan for effectiveness	93

4.5.143	Emergency response procedure for effectiveness	93
4.5.144	Communication of procedure for effectiveness	93
4.5.145	Debriefing post-traumatic stress procedure for effectiveness	94
4.5.146	Emergency trainings for effectiveness	94
4.5.147	Employee selected with safety knowledge for effectiveness	94
4.5.148	Employees involvement in S&H activities for effectiveness	95
4.5.149	Performing job hazard analyses for effectiveness	95
4.5.150	Participating in toolbox talks for effectiveness	95
4.5.151	Performing inspections for effectiveness	96
4.5.152	All new worker participant provided safety induction for effectiveness	96
4.5.153	Comprehensive and simple content for effectiveness	96
4.5.154	Visually aided for easy understanding for effectiveness	97
4.5.155	Post induction understanding evaluation for effectiveness	97
4.5.156	Frequency of training for effectiveness	97
4.5.157	All employee and employers involvement for effectiveness	98
4.5.158	Comprehensive and simple content for effectiveness	98
4.5.159	Visually aided for better understanding for effectiveness	98
4.5.160	Post induction understanding evaluation for effectiveness	99
4.5.161	Frequency of meeting for effectiveness	99
4.5.162	All employee involvements for effectiveness	100
4.5.163	Employer involvements for effectiveness	100
4.5.164	All safety issues with be discussed with all for effectiveness	101

4.5.165	Employee problem is heard for effectiveness	101
4.5.166	Good two way communication discussions for effectiveness	101
4.6.1	Summary statistics of respondent frequency on compliance	102
4.6.2	Summary statistics of respondent frequency on effectiveness	108
5.1	Relative Importance Index of Compliance by Category in Safety Program	128
5.2	Ranking of Relative Importance Index of Compliance by Highest to Lowest in Safety Program	133
5.3	Relative Importance Index of Effectiveness by Category in Safety Program	144
5.4	Ranking of Relative Importance Index of Effectiveness by Highest to Lowest in Safety Program	149

LIST OF FIGURES

FIGURE NO	TITLE	PAGE
1.1	DOSH Construction Occupational Accidents Statistic for 2013	2
1.2	Methodology Requirement to achieve aims and objectives of study	6
1.3	Process of Methodology	7
3.1	Relative Importance Index Equation	27
4.3.1	Gender of the Respondents	30
4.3.2	Age of Respondents	31
4.3.3	Marital Status of Respondent	31
4.3.4	Respondents Working Experience	31
4.3.5	Respondent's Working Status in Company	32
4.3.6	Respondent's Background.	32
4.3.7	Respondent's Academic Qualification	32
4.3.8	Respondent's Position.	33
4.3.9	Percentage of Respondents Category	33
4.7.1.1	Compliance Relative Importance Index	117
4.7.1.2	Effectiveness Relative Importance Index	118
4.7.1.3	Highest and Lowest RII for Compliance Frequency	118
4.7.1.4	Highest and Lowest RII for Effectiveness Frequency	119

LIST OF SYMBOLS AND ABBREVIATIONS

<i>I</i>	-	Relative Importance Index, RII
Wi	-	The weight assigned to with response (1, 2, 3, 4, 5 respectively)
Xi	-	Frequency of the response given as percentage of the total responses for each factors.
RII	-	Relative Importance Index
SPSS	-	Statistical Package for the Social Science
<i>et al.</i>	-	et alia; and others
α	-	Cronbach's Alpha Coefficient
\geq	-	More than or equal
$>$	-	More than
$<$	-	Less Than
\leq	-	Less than or equal
(M)	-	Malaysia
DOSH	-	Department of Occupational Safety and Health
RM	-	Ringgit Malaysia
G7	-	Class of Contractor
N	-	Number of item
%	-	Percentage
Comcare	-	Worker's compensation insurer for the Australia Commonwealth Government

LIST OF APPENDICES

APPENDIX	TITLE	PAGE
A	List of International Literature Review for Safety Programs	159
B	Questionnaire	163

CHAPTER 1

INTRODUCTION

1.1 Background of Study

The construction industry is one of the largest and most dangerous industries in Malaysia. It is ranked third highest in the number of work-related injuries and fatality, following behind mining industries and agriculture industries. Statistics by DOSH (2013) shows Occupational Accidents Statistics for Construction Sector on 2013 was 69 deaths which is the highest fatality rate among other industries. Hui-Nee A (2014) says improvement in occupational safety and health requires actions from all parties namely employees, employers and the departments from the government. Accidents at the workplace can be prevented with the cooperation from both management and employees on top of regular enforcement from the relevant government agencies.

In year 2012, DOSH indicated that number of death in construction sector show an increase of 51 cases in 2011 as compared to 67 cases in 2012 which is the highest for the occupational accident by category of fatality.

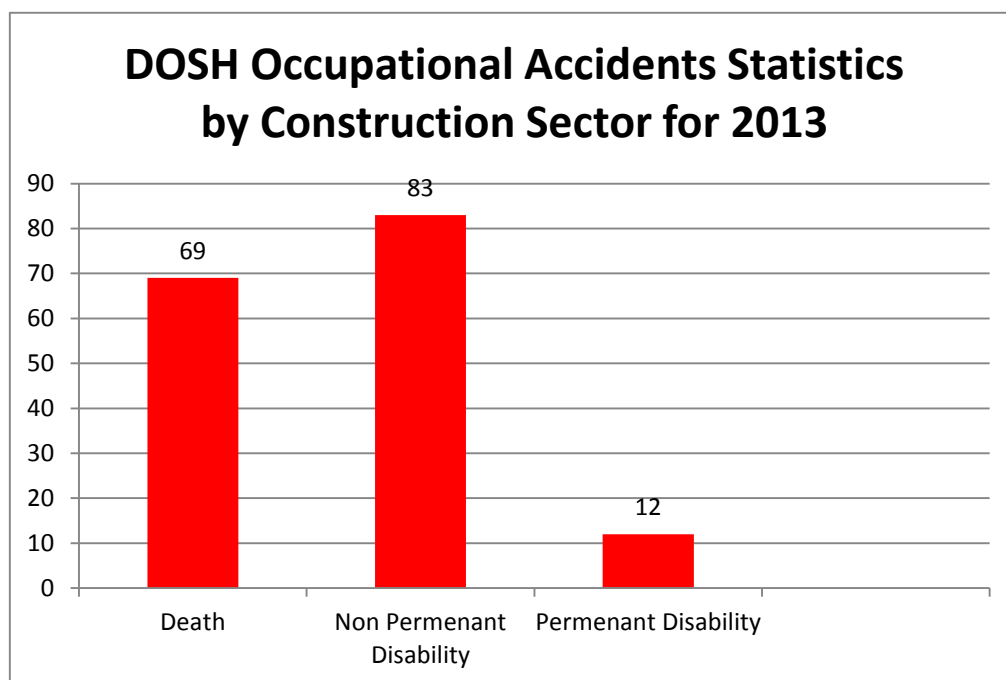


Figure 1.1: DOSH Construction Occupational Accidents Statistic for 2013

According to Findley *et al.*(2004), they noted effective safety program development and compliance can reduce site accidents. Effective safety programs can substantially reduce accidents as it helps the management to create safer working environment of operations and create safe working method for the workers (Rowlinson, 2003). However, it is uncertain as to which policies are the most effective program in achieving improved safety performance. The query of how to successfully the development safety programs put into actual actions has gained considerable attention in the modern-day workplace.

1.2 Problem Statement

In Malaysia, most of the construction sites frequently reported their construction site has positive safety performance indicator. But does it truly indicative that the construction site will not have any accidents at all and the all potential hazards

are being controlled to acceptable conditions. Even with positive safety performance indicator as reported, accident still does occur. For example Mass Rapid Transit (MRT), a mega project that concerns the public interest with a good safety policies and many safety programs introduced to provide a safe working environment to the workers and to the public which always closely monitored directly by CIDB but yet since the project started, more than 4 deaths have been reported for the year 2014 and most recently on 2 deaths on 27th February 2015 and on 24th May 2015. Does this equate the safety performance indicator as reported is not reliable. A good safety performance indicator is a construction site with good safe working environment with low or zero rate of accident.

The last thing we need is reactive measures instead proactive measures. When we mean proactive measures is to avoid it from occurring, one way to measure the reliability of the safety performance indicator. A good indicator means all the safety program introduced must be educated and being enforced on site. The level of compliance reflects the effectiveness of the safety performance indicator to conclude that a construction site is safe to work instead just presenting in paper the site is good and in safe condition. No matter how good the safety programs are, but if it was not complied, the construction site is exposed to safety complications.

1.3 Aim and Objective of the Study

The aim of this report is to study the reliability of safety performance indicator in Malaysian construction by reviewing the safety programs in order to propose improvement. To achieve this, several objectives are summarized as follows:

- i. To review the safety programs available through published literature reviews.

- ii. To determine the compliance and effectiveness of safety programs on Malaysian construction site.
- iii. To propose improvement of safety programs to enhance the reliability safety performance indicator.

1.4 Scope and Limitation

This study was conducted to seek outlined objectives based on responses from construction companies which are currently working on several projects in Kuala Lumpur and Selangor. As such, this study is limited and only focused in Klang Valley.

The selected construction companies in Klang Valley were Class A contractors, with current project of RM20 million or above, or certified CIBG grade G7.

The targeted respondents are classified into few respondent, namely Engineer or Architect, Managers, Safety Committee, Supervisor and correspondents that has safety knowledge in construction site in their current company. The respondents are then categorized into two groups, namely project managers and safety representatives. A construction project manager is defined as a person with the highest authority in handling day-to-day activities and delivering the project, and who is responsible for managing the implementation of the safety program. A construction safety representative is defined as any individual, including any safety director, a safety manager, a safety officer or a safety supervisor, who is in-charge of arranging safety and monitoring for the construction companies.

1.5 Significance of the Study

Construction developers and clients face a variety of risks when they develop a construction project. Not only must developer be concerned with potential risks to their employees, residents, or its property, but they must also be concerned about the risks the contractor commits to. Safety is a critical item on all construction projects for multiple reasons including protecting the welfare of employees, providing a safe work environment and controlling construction costs.

Nevertheless, the importance of safety as a budget controlling measure is often disregarded by developer and contractors. As a means of reducing the risks connected with construction, safety can significantly impact the overall cost. A dedicated commitment to safety by both the developer and contractor helps ensure project success without delays and can impact the delivery of the project.

Clients should understand that all of the contractor's risks or in the event of threat will directly affect the construction progress. Any unwanted accident especially fatality during construction will only delay the work and tarnish the image of both the client and contractor for not having a proper work standard for safety. This will either add considerable cost to the contract or decrease the potential profit client and contractor.

Consequently, completion of this study perhaps will provide client or contractor the elements that needs to be more focused and prioritize the safety programs that needs enforcement in complying the safety programs for better effectiveness.

1.6 Methodology

The methodology is a work structure in describing the way a study is carried out. The summary of the overall study aim, objectives and adopts methodologies to achieve the objectives in this study is as shown in Figure 1.2 and Figure 1.3.

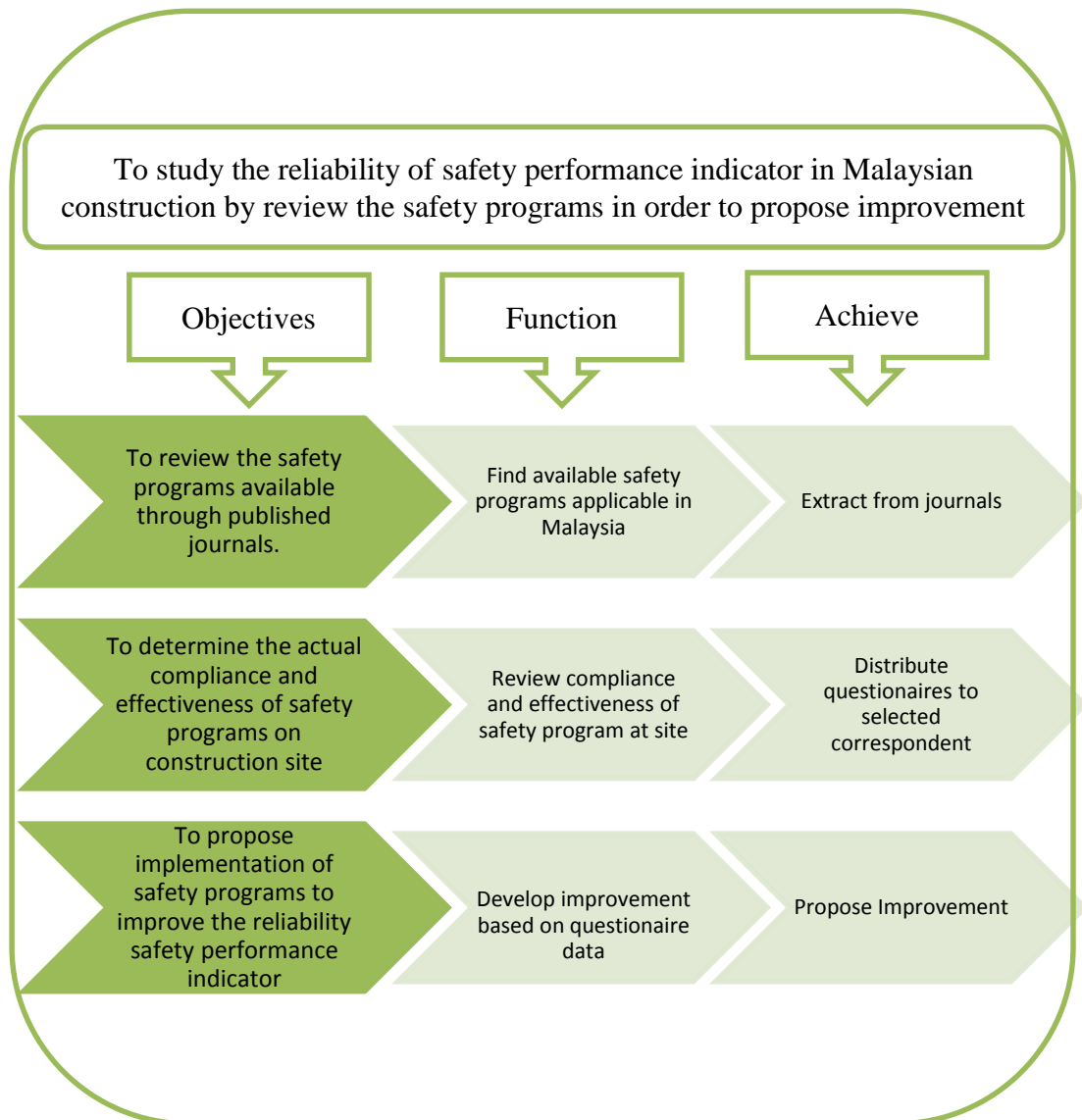


Figure 1.2: Methodology Requirement to achieve aims and objectives of study

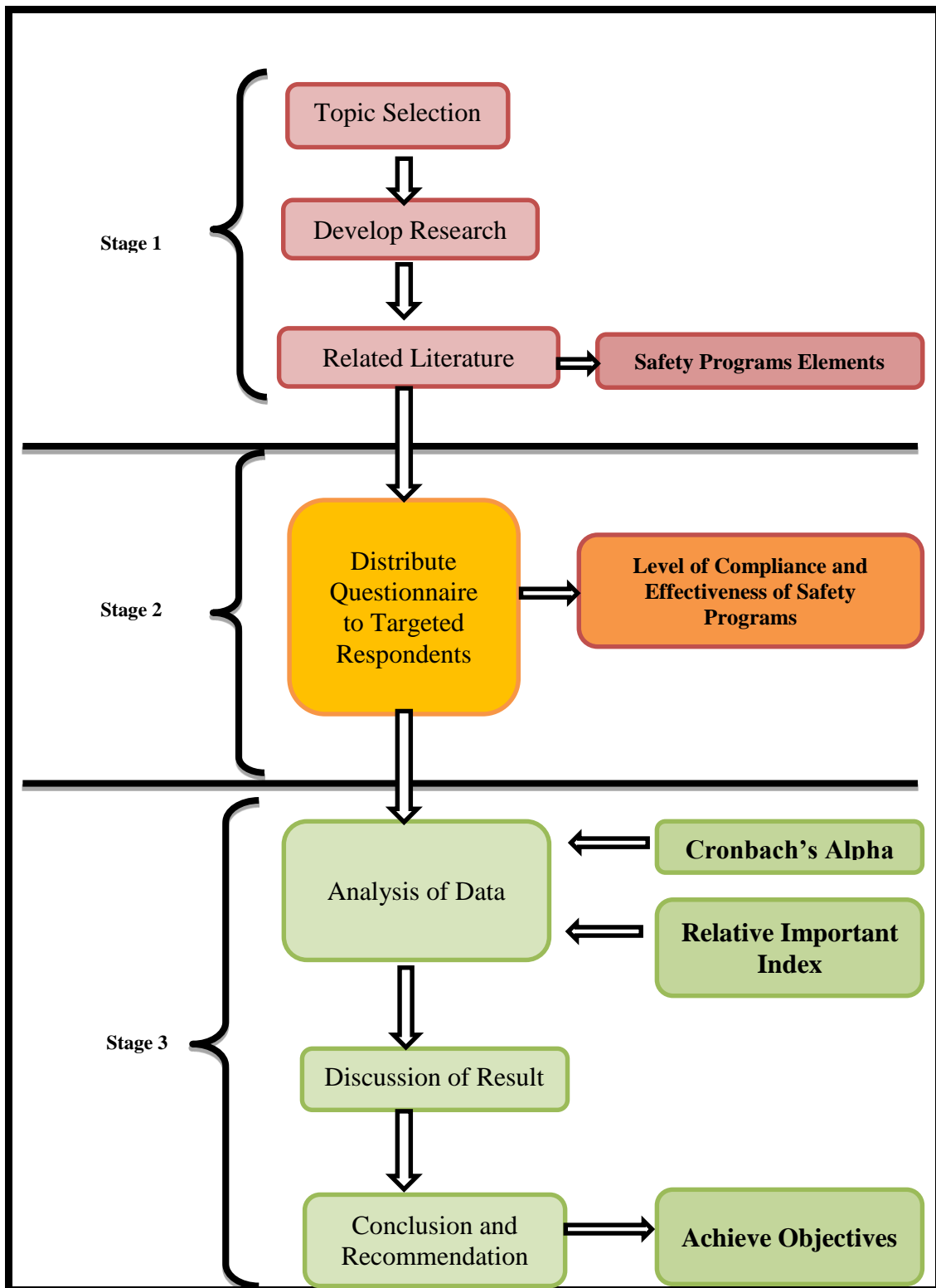


Figure 1.3: Process of Methodology

REFERENCES

- A, H.-N. (2014). Safety Culture in Malaysian Workplace: An Analysis of Occupational Accidents. *Health and the Environment Journal*, 2014, Vol. 5, No. 3, 32-43.
- Abdelhamid, T. S. (2000). Identifying Root Causes of Construction. *Journal of Construction Engineering and Management*, 52 – 60.
- Ahmad, K. (2000). SPMT – MEASURING SAFETY PERFORMANCE. XXVI *International symposium of the ISSA Construction System*, 1-5.
- Akson T, H. B. (2008). Measuring effectiveness of safety programmes in Thai construction industry. *Construction Management and Economics*, 409- 420.
- Anton, T.J. (1989). *Occupational Safety and Health Management, Second Edition*. . New York: McGraw-Hill.
- Comcare, A. G. (2010). Positive Performance Indicators. *Measuring Safety, Rehabilitation and Compensation Performance*, 5.
- Cooper, D. (1998). *Improving Safety Culture*. Chichester: Wiley. 205.
- Dean Calhoun. (2012, June 3). *Compliance Definition*. Retrieved 14, 2015, from Potent Compound Safety: <http://potentcompoundsafety.com/2012/06/compliance-definition.html>
- Department of Occupational Safety and Health. (2015, March 31). *OCCUPATIONAL ACCIDENTS STATISTICS BY SECTOR UNTIL MARCH 2015*. Retrieved April 3, 2015, from The official portal of DOSH, Ministry of Human Resource, Malaysia: http://www.dosh.gov.my/index.php?option=com_content&view=article&id=1563&Itemid=545&lang=en
- Erlendsson, J. (2002, January 04). Retrieved January 6, 2015, from VALUE FOR MONEY STUDIES in HIGHER EDUCATION : https://notendur.hi.is/~jonereapswh_vfmhe.htm

- Fang, D. P., H. X. (2004). Benchmarking Studies on Construction Safety Management in China. *Journal of Construction Engineering and Management*, Vol. 130, No. 3, 424-432.
- Fang, D. P., X. F. (2004). Factor Analysis-Based Studies on Construction Workplace Safety Management in China. *International Journal of Project Management*, Vol. 22, No.1, 43-49.
- Flin, R. M. (2000). Measuring safety climate: identifying the common features. *Safety Science* 34, 177-192.
- Fung, I. W. (2005). Safety Cultural Divergences among Management, Supervisory and Worker Groups in Hong Kong Construction Industry. *International Journal of Project Management*, Vol. 23, No. 7, 504-512.
- Gambatese, J. H. (2003, MARCH/APRIL). Factors That Influence Safety Performance of Specialty Contractor. *ASCE JOURNAL OF CONSTRUCTION ENGINEERING AND MANAGEMENT*, 159-164.
- Gambatese, M. R. (2009). Construction Safety Risk Mitigation. *Journal of Construction Engineering and Management* Volume 135, Issue 12, 1316–1323.
- Hallowell, M. R. (2007). A formal model of construction safety risk management. *Proc., 2007 Construction and Building Research Conf. (COBRA)*. Atlanta: Royal Institution of Chartered Surveyors Georgia Tech University.
- Health, D. o. (2015, March). *OCCUPATIONAL ACCIDENTS STATISTICS BY SECTOR UNTIL MARCH 2015*. Retrieved April 03, 2015, from Department of Occupational Safety and Health: http://www.dosh.gov.my/index.php?option=com_content&view=article&id=1563&Itemid=545&lang=en
- Hinze, J. a. (1981). Safety Programs in Large Construction Firms. *Journal of the Construction Division*, Vol. 107, No. CO3, 455-467.
- Hinze, J. a. (2003). Factors that Influence Safety Performance of Specialty Contractors. *Journal of Construction Engineering and Management*, Vol.129, No. 2, 159-164.
- Jaselskis, E. J. (1996). Strategies for Achieving Excellence in Construction Safety Performance. *Journal of Construction Engineering and Management*, Vol. 122, No. 1, 61-70.
- Lee, T. &. (2000). Assessing safety culture in nuclear power stations. *Safety Science*, 30, 61-97.

- Liska, G. (1993). *Construction Industry Institute*. Seattle: University of Washington.
- M.D. Cooper, R. P. (2004). Exploratory analysis of the safety climate and safety behaviour relationship. *Journal of Safety Research* 35, 497 – 512.
- Mike Findley, V. R. (2004). Safety program elements in construction: which ones best prevent injuries and control related workers' compensation costs? *Professional Safety* 49, 14-21.
- Ng, S. T. (2005). A Framework for Evaluating the Safety Performance of Construction Contractors. *Building and Environment, Vol. 40, No. 10*, 1347-1355.
- Odeh, A. a. (2002). Causes of construction delay: traditional contracts. *International Journal of Project Management*, 20, 67-73.
- OSHA. (1994). *Occupational Safety and Health, Act 514*. Malaysia: OSHA.
- Oxford Advanced Learner's Dictionary of Effectiveness*. Retrieved January 7, 2015, from Oxford Dictionary: <http://www.oxforddictionaries.com/definition/learnereffectiveness>
- Pallant., J. (2007). *SPSS Survival Manual : a step by step guide to data analysis using SPSS, 4th Edition*. Crows Nest, New South Wales.
- Rajendran, S. a. (2009). Development and Initial ation of Sustainable. *Journal of Construction Engineering and*, 1067-1075.
- Rowlinson, S. (2003). Hong Kong Construction: Safety Management and Law. *Sweet and Maxwell Asia, Second Edition*.
- Rundmo, T. H. (1998). Organisational factors, safety attitudes and. *Safety Science, Vol.29*, 75-87.
- Sawacha, E. N. (1999). Factors Affecting Safety Performance on Construction Sites. *International Journal of Project Management*, 309-315.
- Shenhar, A. J. (2001). Project Success: A Multidimensional Strategic Concept. *Long Range Planning, vol. 34, no. 6*, 699–725.
- Soon, T. W. (2015, February 10). *Migrant Workers: Malaysia's 'Invisible' Workforce*. Retrieved March 17, 2015, from malaysiandigest.com: <http://www.malaysiandigest.com/features/541277-migrant-workers-malaysia-s-invisible-workforce.html>
- Tam, C. M. (2002). Non-Structural Fuzzy Decision Support System for Evaluation of Construction Safety Management System. *International Journal of Project Management, Vol. 20, No. 4*, 303- 313.

- Tam, C. M. (2004). Identifying Elements of Poor Construction Safety Management in China. *Safety Science*, Vol. 42, No. 7, 569-586.
- Teo, A. L. (2005). Framework For Project Managers To Manage Construction Safety. *International Journal of Project Management*, 23, 329-341.
- Thanet Aksorn, B. H. (2007). Critical success factors influencing safety program performance in Thai construction projects. *Science Direct Safety Science*, 709-727.
- Year One Malaysia. (2014, August 20). *MRT Construction Accident: Kota Damansara*. Retrieved May 24, 2015, from Year One Malaysia: <http://year1malaysia.blogspot.com/2014/08/mrt-construction-accident-kota-damansara.html>
- Zohar, D. (1980). Safety Climate in Industrial Organizations: Theoretical and Applied Implications. *Journal of Applied Psychology* 65(1), 96-102.