UNIVERSITI PUTRA MALAYSIA

EFFECTIVENESS OF INTERVENTION TRAINING PROGRAM ON FIRE EMERGENCY RESPONSE TEAM KNOWLEDGE AND SKILL IN SELECTED VEHICLE SERVICE CENTRES

MUHAMMAD SHAWAL BIN MOHAMMAD SHARIF

FPSK(m) 2019 40

EFFECTIVENESS OF INTERVENTION TRAINING PROGRAM ON FIRE EMERGENCY RESPONSE TEAM KNOWLEDGE AND SKILL IN SELECTED VEHICLE SERVICE CENTRES

By

MUHAMMAD SHAWAL BIN MOHAMMAD SHARIF

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Master of Science

April 2019

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Master of Science

EFFECTIVENESS OF INTERVENTION TRAINING PROGRAM ON FIRE EMERGENCY RESPONSE TEAM KNOWLEDGE AND SKILL IN SELECTED VEHICLE SERVICE CENTRES

By

MUHAMMAD SHAWAL MOHAMMAD SHARIF

April 2019

Chair : Prof. Shamsul Bahri Mohd Tamrin, PhD
Faculty : Medicine and Health Sciences

Emergency response may be provided by a local government organization such as fire department, but an in-house Emergency Response Team (ERT) is the first responder to ensure the safety of the occupants. ERT training and response plans enable organization to respond timely in case of any emergency, however many firms are still unprepared. There is an effort by local authority, Fire and Rescue Department Malaysia to conduct the ERT training and execute the fire evacuation drill exercise. However there were no specific code of practice and guidelines have yet been developed on the ERT knowledge and skill requirement. The aim of this study was to develop a training module and gauge the effectiveness of intervention training program on ERT knowledge and skill.

This was a quasi-experimental two group pre-post study to determine the effectiveness between before and after the intervention program. A total of 91 respondents were reported for each experimental and control group was selected from the ERT at thirteen vehicle service centers in Malaysia. Questionnaire was carried out to determine the socio-demographic. In addition to that, pre-posttest was conducted to gauge the knowledge on ERT roles and skill on command and control, rescue method and firefighting technique. ANCOVA was used to control the pretest scores and their differences in the group as the covariate. The results after the intervention shows there was a significant improvement of the ERT knowledge through training on their roles. While intervention through the practical training significantly improved the ERT skills in command and control, rescue method and firefighting technique. Finally the results shows that there was a significant improvement of the ERT knowledge and skill after the intervention program through the developed training module.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

KEBERKESANAN PROGRAM LATIHAN INTERVENSI TERHADAP PENGETAHUAN DAN KEMAHIRAN PASUKAN TINDAKAN KECEMASAN KEBAKARAN DI PUSAT PERKHIDMATAN KENDERAAN YANG TERPILIH

Oleh

MUHAMMAD SHAWAL MOHAMMAD SHARIF

April 2019

Pengerusi : Prof. Shamsul Bahri Mohd Tamrin, PhD
Fakulti : Perubatan dan Sains Kesihatan

Respons terhadap kecemasan boleh disediakan oleh organisasi kerajaan tempatan seperti Jabatan Bomba, tetapi Pasukan Tindakan Kecemasan (ERT) di tempat kerja merupakan responder pertama untuk memastikan keselamatan para penghuni. Latihan dan pelan tindakans ERT membolehkan organisasi memberi respons yang tepat pada masanya ketika kecemasan, namun banyak syarikat masih belum bersedia. Terdapat usaha oleh pihak berkuasa tempatan, Jabatan Bomba dan Penyelamat Malaysia untuk menjalankan latihan ERT dan melaksanakan latihan pengungsian kebakaran. Walau bagaimanapun, tiada garis panduan yang spesifik telah diwujudkan bagi pengetahuan dan kemahiran ERT. Tujuan kajian ini adalah untuk membangunkan satu modul latihan yang khusus dan menggukur keberkesanan program latihan terhadap pengetahuan dan kemahiran para ERT.

Kajian ini merupakan quasi-eksperimen pra-pos dua kumpulan untuk menentukan keberkesanan antara sebelum dan selepas program intervensi. Seramai 91 responden telah dilaporkan untuk setiap kumpulan yang telah dipilih dari Pasukan Tindakan Kecemasan di tiga belas pusat perkhidmatan kenderaan di Malaysia. Borang soal selidik telah dijalankan bagi menentukan status sosio-demografi. Di samping itu, ujian pra-pos telah dijalankan untuk mengukur tahap pengetahuan terhadap peranan ERT dan kemahiran dalam memberi arahan dan kawalan, teknik menyelamat dan teknik memadam kebakaran. Keputusan selepas intervensi menunjukkan terdapat peningkatan yang signifikan terhadap pengetahuan ERT melalui latihan mengenai peranan mereka. Sementara itu melalui intervensi latihan praktikal, terdapat peningkatan yang ketara terhadap kemahiran ERT dalam arahan dan kawalan, kaedah penyelamatan dan teknik pemadam kebakaran. Konklusinya terdapat peningkatan yang ketara dalam pengetahuan dan kemahiran ERT melalui program intervensi menggunakan modul latihan yang khusus.

ACKNOWLEDGEMENT

In the name of Allah, the Most Gracious and Merciful, Alhamdulillah. First and foremost, I would like to thank Allah for giving me ability, strength and knowledge to preserve and complete my study satisfactorily.

My utmost gratitude and an infinite honor to Prof. Dr. Shamsul Bahri Hj.Mohd Tamrin, my supervisor, for his continuous supervision, encouragement and guidance that cannot be repaid until the end of my life. A special thanks to him as he always willing to sacrifice his own personal time to coach a part time student like me until all uncertainties is resolved.

Special acknowledgement is also extended to Dr. Vivien How as my co-supervisor for her outstanding commitment, knowledge sharing and endless support throughout my research study.

My heartiest gratitude is with all the officers at Balai BOMBA dan Penyelamat, Shah Alam for their cooperation, credible ideas and coaching that enhanced my knowledge in the completion of the study.

I would also like to express my gratitude to all the respondents and their management for giving me the opportunity to conduct my research. Furthermore, they voluntarily participate and willing to spend almost hours of their precious time in the research study.

My acknowledgement would be incomplete without thanking my biggest supporter and source of strength, my loving family, my special colleague at Universiti Putra Malaysia and to all my friends.

Finally, may Allah bless all individuals that have assisted me directly and indirectly in making this study comes true, kindly accept my heartiest gratitude.

Thank you.

I certify that a Thesis Examination Committee has met on 30 April 2019 to conduct the final examination of Muhammad Shawal bin Mohammad Sharif on his thesis entitled "Effectiveness of Intervention Training Program on Fire Emergency Response Team Knowledge and Skill in Selected Vehicle Service Centres" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Master of Science.

Members of the Thesis Examination Committee were as follows:

Karmegam Karuppiah, PhD
Senior Lecturer
Faculty of Medicine and Health Sciences
Universiti Putra Malaysia
(Chairman)

Huda Binti Zainuddin, PhD
Senior Lecturer
Faculty of Medicine and Health Sciences
Universiti Putra Malaysia
(Internal Examiner)

Siti Zawiah Md Dawal, PhD
Senior Lecturer
Faculty of Engineering
University of Malaya
Malaysia
(External Examiner)

_____
RUSLI HAJI ABDULLAH, PhD
Professor and Deputy Dean
School of Graduate Studies
Universiti Putra Malaysia

Date: 23 July 2019

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

Shamsul Bahri Mohd Tamrin, PhD
Professor
Faculty of Medicine and Health Sciences
Universiti Putra Malaysia
(Chairman)

Vivien How, PhD
Senior Lecturer
Faculty of Medicine and Health Sciences
Universiti Putra Malaysia
(Member)

_____
ROBIAH BINTI YUNUS, PhD
Professor and Dean
School of Graduate Studies
Universiti Putra Malaysia

Date:

Declaration by graduate student

I hereby confirm that:

- this thesis is my original work;
- quotations, illustrations and citations have been duly referenced;
- this thesis has not been submitted previously or concurrently for any other degree at any other institutions;
- intellectual property from the thesis and copyright of thesis are fully-owned by Universiti Putra Malaysia, as according to the Universiti Putra Malaysia (Research) Rules 2012;
- written permission must be obtained from supervisor and the office of Deputy Vice-Chancellor (Research and Innovation) before thesis is published (in the form of written, printed or in electronic form) including books, journals, modules, proceedings, popular writings, seminar papers, manuscripts, posters, reports, lecture notes, learning modules or any other materials as stated in the Universiti Putra Malaysia (Research) Rules 2012;
- there is no plagiarism or data falsification/fabrication in the thesis, and scholarly integrity is upheld as according to the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) and the Universiti Putra Malaysia (Research) Rules 2012. The thesis has undergone plagiarism detection software.

Signature: _____ Date: _____

Name and Matric No.: Muhammad Shawal Bin Mohammad Sharif (GS46045)

Declaration by Members of Supervisory Committee

This is to confirm that:

- the research conducted and the writing of this thesis was under our supervision;
- supervision responsibilities as stated in the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) are adhered to.

Signature: _____
Name of Chairman of Supervisory Committee: Prof. Dr. Shamsul Bahri Mohd Tamrin

Signature: _____
Name of Member of Supervisory Committee: Dr. Vivien How

TABLE OF CONTENTS

		Page
ABSTRACT		i
ABSTRAK		ii
ACKNOWLEDGEMENTS		iii
APPROVAL		iv
DECLARATION		vi
LIST OF TABLES		xi
LIST OF FIGURES		xiv
LIST OF APPENDICES		xvii
LIST OF ABBREVIATIONS		xviii
CHAPTER		
1	**INTRODUCTION**	1
	1.1 Background	1
	1.2 Problem Statement	4
	1.3 Study Justification	5
	1.4 Conceptual Framework	5
	1.5 Research Questions	7
	1.6 Research Objectives	7
	1.6.1 General Objective	7
	1.6.2 Specific Objectives	7
	1.7 Hypothesis	7
	1.8 Terminology	8
	1.8.1 Training Effectiveness	8
2	**LITERATURE REVIEW**	9
	2.1 Triangle of Fire	9
	2.2 Fire Hazards in Vehicle Service Centre	9
	2.3 Fire Emergency Preparedness	11
	2.4 Emergency Response Plan	13
	2.5 Rescue Method of Injured or Unconscious Victim	13
	2.5.1 Two-man Saddleback Carry	13
	2.5.2 Fireman's Carry	14
	2.5.3 Neck Drag	16
	2.6 Firefighting Technique	16
	2.7 Training Effectiveness	17
3	**METHODOLOGY**	23
	3.1 Study Background	23
	3.2 Study Design	24
	3.2.1 Quasi-Experimental Study : Two groups, Pre-Post Design	24
	3.3 Study Location	25
	3.4 Study Flow	26

3.5	Study Population		30
3.6	Sampling Frame		30
3.7	Sampling Unit		31
	3.7.1	Inclusion Criteria	31
	3.7.2	Exclusion Criteria	31
3.8	Sample Size Calculation		32
3.9	Sampling Method		33
3.10	Research Tools/Instruments		34
	3.10.1	Interview Sheet	34
	3.10.2	ERT Training Module and Training Delivery	34
	3.10.3	Questionnaires	38
	3.10.4	Knowledge and Skill Pretest Sheet	38
	3.10.5	Knowledge and Skill Posttest Sheet	38
3.11	Data Analysis		39
	3.11.1	Univariate Analysis	42
	3.11.2	Bivariate Analysis	43
3.12	Quality Control		43
	3.12.1	Training Module Validation	43
	3.12.2	Content Validity on the Knowledge Pretest Sheet and Skill Observation Sheet	43
	3.12.3	Reliability Test for Questionnaire and Knowledge Pretest Sheet	44
	3.12.4	Internal Validity	44
	3.12.5	External Validity	45
3.13	Ethical Consideration		45
4	**RESULTS AND DISCUSSION**		46
4.1	Background Information		46
	4.1.1	Socio-Demographic of the Respondents	46
	4.1.2	Working Information of vehicle Service centre's ERT	48
4.2	Comparison of Distribution of Knowledge Level between Experimental and Control Group before the Intervention		49
4.3	ERT Roles Knowledge Pretest and Posttest		49
4.4	ERT Command and Control Skill Pretest and Posttest		60
4.5	ERT Rescue Method Skill Pretest and Posttest		69
4.6	ERT Firefighting Technique Pretest and Posttest		79
5	**CONCLUSION AND RECOMMENDATIONS**		89
5.1	Conclusion		89
5.2	Study Limitations		89
	5.2.1	Lack of Studies in Similar Industry	89
	5.2.2	Study Design Limitation	90
	5.2.3	One time Evaluation	90

5.3 Recommendations 90

REFERENCES 92
APPENDICES 98
BIODATA OF STUDENT 154

LIST OF TABLES

Table		Page
1.1	Average number of fires per year in countries in 2010-2014	1
2.1	Descriptions of ERT Organization Roles and Responsibilities	12
2.2	Summary of Related Studies	19
3.1	Knowledge and Skill Assessment Method	28
3.2	Distribution of ERT Members in All Thirteen-Vehicle Service Centres	30
3.3	Stratified Random Sampling Design for the Research	33
3.4	Analysis Method	40
3.5	Content Validity Testing on Knowledge and Skill Pretest Sheet	43
3.6	Reliability Testing on Questionnaire and Knowledge Pretest Sheet	44
4.1	Demographic Data and Background Information of Vehicle Service Centres Emergency Response Team	47
4.2	Distribution of Work Information among Vehicle Service Centres Emergency Response Team	48
4.3	Independent t-test To Compare Distribution of Knowledge Level between Experimental and Control Group	49
4.4	Descriptive Statistics for the Respondents' ERT Roles Pretest and Posttest Knowledge Scores	50
4.5	Paired Samples Test for the Group's Pretest Posttest of ERT Roles	50
4.6	Correlations Analysis for Group's Pretest of ERT Roles	52
4.7	d'Agostino-Pearson Test of Group's Pretest Posttest on ERT Roles	52
4.8	Homogeneity of Variance Test Across Group's Pretest on ERT Roles	57

4.9	ANCOVA Analysis Containing Test for Equal Slopes (Knowledge Pretest-posttest on ERT roles)	57
4.10	Results of Analysis of Covariance for Group's Pretest and Posttest on ERT Knowledge Assessment	58
4.11	Descriptive Statistics for the Respondents' ERT Command and Control Pretest and Posttest Skill Scores	60
4.12	Paired Samples Test for the Group's Pretest Posttest of ERT Command and Control Skill	61
4.13	Correlations Analysis for Group's Pretest of ERT Command and Control	62
4.14	d'Agostino-Pearson Test of Group's Pretest Posttest on ERT Command and Control	63
4.15	Homogeneity of Variance Test Across Group's Pretest on ERT Command and Control	67
4.16	ANCOVA Analysis Containing Test for Equal Slopes (Skill pretest-posttest on ERT Command and Control)	68
4.17	Results of Analysis of Covariance for Group's Skill Pretest and Posttest on ERT Command and Control	68
4.18	Descriptive Statistics for the Respondents' ERT Rescue Method Pretest and Posttest Scores	70
4.19	Paired Samples Test for the group's Pretest Posttest of ERT Rescue Method Skill	70
4.20	Correlations Analysis for Group's Pretest of ERT Rescue Method	72
4.21	d'Agostino-Pearson Test of Group's Pretest Posttest on ERT Rescue Method	72
4.22	Homogeneity of Variance Test Across Group's Pretest on ERT Rescue Method	77
4.23	ANCOVA Analysis Containing Test for Equal Slopes (Skill Pretest-posttest on ERT Rescue Method)	77
4.24	Results of Analysis of Covariance for Group's Skill Pretest and Posttest on ERT Rescue Method	78
4.25	Descriptive Statistics for the Respondents' ERT Firefighting Pretest and Posttest Scores	79

4.26	Paired Samples Test for the Group's Pretest Posttest of ERT Firefighting	80
4.27	Correlations Analysis for Group's Pretest of ERT Firefighting	81
4.28	d'Agostino-Pearson Test of Group's Pretest Posttest on ERT Firefighting	82
4.29	Homogeneity of Variance Test Across Group's ERT Firefighting Skill Scores	86
4.30	ANCOVA Analysis Containing Test for Equal Slopes (Skill Pretest-posttest on ERT Firefighting Technique)	87
4.31	Results of Analysis of Covariance for Group's Pretest and Posttest on ERT Firefighting Skill	87

LIST OF FIGURES

Figure		Page
1.1	Statistics on Fire Breakouts in Malaysia, 2012 – 2015	2
1.2	Estimated Losses due to Fire in Malaysia, 2012-2015	3
1.3	Malaysia's Building Fire Percentage by UBBL Category in Year 2015	3
1.4	Conceptual Frameworks of Factors Contributing to Emergency Response Team Knowledge and Skill	6
2.1	Triangle of Fire	9
2.2	Emergency Response Team Organization	11
2.3	Two-man saddleback Carry Method	14
2.4	Fireman's Carry Method	15
2.5	Neck Drag Method	16
2.6	P.A.S.S Technique in Extinguishing Fire	17
3.1	Quasi-experimental Study Design for ERT Training Intervention	24
3.2	Customer Service Index Ranking	25
3.3	Vehicle Services Centre Outlet Locations	26
3.4	Study Flow and Instruments for Experimental and Control Group	29
3.5	ADDIE Model Flow	35
3.6	ADDIE Descriptions for ERT Training Module Development	37
4.1	Comparison Plot for Groups' Pretest Posttest on ERT Roles	51
4.2	Histogram of Experimental Group Pretest on Respondents' Knowledge (ERT Roles)	53
4.3	Histogram of Control Group Pretest on Respondents' Knowledge (ERT Roles)	53

4.4	Histogram of Experimental Group Posttest on Respondents' Knowledge (ERT Roles)	54
4.5	Histogram of Control Group Posttest on Respondents' Knowledge (ERT Roles)	54
4.6	Normal Q-Q Plot of Experimental Group Pretest on Respondents' Knowledge (ERT Roles)	55
4.7	Normal Q-Q Plot of Control Group Pretest on Respondents' Knowledge (ERT Roles)	55
4.8	Normal Q-Q Plot of Experimental Group Posttest on Respondents' Knowledge (ERT Roles)	56
4.9	Normal Q-Q Plot of Control Group Posttest on Respondents' Knowledge (ERT Roles)	56
4.10	Comparison Plot for Groups' Pretest Posttest on ERT Command and Control	62
4.11	Histogram of Experimental Group Pretest on Respondents' Skill (ERT Command and Control)	63
4.12	Histogram of Control Group Pretest on Respondent Skill (ERT Command and Control)	64
4.13	Histogram of Experimental Group Posttest on Respondents' Skill (ERT Command and Control)	64
4.14	Histogram of Control Group Posttest on Respondents' Skill (ERT Command and Control)	65
4.15	Normal Q-Q Plot of Experimental Group Pretest on Respondents' Skill (ERT Command and Control)	65
4.16	Normal Q-Q Plot of Control Group Pretest on Respondents' Skill (ERT Command and Control)	66
4.17	Normal Q-Q Plot of Experimental Group Posttest on Respondent's Skill (ERT Command and Control)	66
4.18	Normal Q-Q Plot of Control Group Posttest on Respondent's Skill (ERT Command and Control)	67
4.19	Comparison Plot for Groups' Pretest Posttest on ERT Rescue Method	71
4.20	Histogram of Experimental Group Pretest on Respondent's Skill (ERT Rescue Method)	73

4.21	Histogram of Control Group Pretest on Respondent Skill (ERT Rescue Method)	73
4.22	Histogram of Experimental Group Posttest on Respondents' Skill (ERT Rescue Method)	74
4.23	Histogram of Control Group Posttest on Respondents' Skill (ERT Rescue Method)	74
4.24	Normal Q-Q Plot of Experimental Group Pretest on Respondent's Skill (ERT Rescue Method)	75
4.25	Normal Q-Q Plot of Control Group Pretest on Respondent's Skill (ERT Rescue Method)	75
4.26	Normal Q-Q Plot of Experimental Group Posttest on Respondent's Skill (ERT Rescue Method)	76
4.27	Normal Q-Q Plot of Control Group Posttest on Respondent's Skill (ERT Rescue Method)	76
4.28	Comparison Plot for Groups' Pretest Posttest on ERT Firefighting Skill Scores	81
4.29	Histogram of Experimental Group Pretest on Respondent's Skill (ERT Firefighting Technique)	82
4.30	Histogram of Control Group Pretest on Respondents' Skill (ERT Firefighting Technique)	83
4.31	Histogram of Experimental Group Posttest on Respondents' Skill (ERT Firefighting Technique)	83
4.32	Histogram of Control Group Posttest on Respondents' Skill (ERT Firefighting Technique)	84
4.33	Normal Q-Q Plot of Experimental Group Pretest on Respondents' Skill (ERT Firefighting Technique)	84
4.34	Normal Q-Q Plot of Control Group Pretest on Respondents' Skill (ERT Firefighting Technique)	85
4.35	Normal Q-Q Plot of Experimental Group Posttest on Respondents' Skill (ERT Firefighting Technique)	85
4.36	Normal Q-Q Plot of Control Group Posttest on Respondents' Skill (ERT Firefighting Technique)	86

LIST OF APPENDICES

Appendix		Page
1	Interview Questionnaire	98
2	Emergency Response Team Training Module	102
3	Questionnaire	103
4	Pre Test Assessment Sheet	107
5	Post Test Assessment Sheet	120
6	Respondent's Information Sheet and Consent	134
7	Ethics' Letter	140
8	Company Approval Letter	141
9	Research Data	142

LIST OF ABBREVIATIONS

ADDIE	:	Analyze, Design, Develop, Implement, Evaluate (Module development model)
ANCOVA	:	Analysis of covariance
C	:	Checker
CO	:	Incident Commander
CTIF	:	Center of Fire Statistics (CFS) of International Association of Fire and Rescue Services
CVR	:	Content validity ratio
CVI	:	Content validity index
ERT	:	Fire Emergency Response Team
EM	:	Emergency Manager
FA	:	First Aider
FR	:	Fire Responder
FRDM	:	Fire and Rescue Department Malaysia
H	:	Historian
MOT	:	Ministry of Transport, Malaysia
P.A.S.S	:	Pull, Aim, Squeeze, Sweep (Firefighting technique)
SC	:	Security Controller
SPSS	:	Statistical Package for Social Science
UBBL	:	Uniform Building by Law, 1984
W	:	Warden

CHAPTER 1

INTRODUCTION

1.1 Background

Disasters are a major disruption to a society progress, causing widespread of environmental, material and even human life losses (Khanna, 2005). As disasters do occur frequently and their intensity has been increasing in recent years, these disasters may arise due to wide range of potential causes ranging from mechanical problems to even a human related factor (Pilone et al., 2016).

Fire is the common disasters that occurred throughout the world. Fire can be define as a chemical reaction where the combustible fuel combines with the presence of oxygen from the air that emits smoke, light and heat (Wambugu et al., 2016). According to Tonui (2009), "fire is the byproduct of a chemical reaction in which heat stored in a combustible fuel is converted to a heat and accompanied by light". Based on Center of Fire Statistics (CFS) of International Association of Fire and Rescue Services (CTIF), (2016), Malaysia was ranked in top 35 countries with high fire cases as shown in Table 1.1.

Table 1.1: Average number of fires per year in countries in 2010-2014

No.	Number of fires per year	No of countries	Countries
1.	600,000 – 1,500,000	1	USA
2.	100,000 – 600,000	13	UK, France, Germany, Russia, Poland, China, India, Brazil, Italy, Mexico, Australia, Argentina, Pakistan
3.	20,000 – 100,000	21	Japan, Indonesia, Turkey, Canada, South Africa, **Malaysia**, Netherlands, Ukraine, Spain, Iran and others

(Source: Brushlinsky et al., 2016)

Fire Emergency is an unexpected fire incident requiring prompt action which is beyond normal activity (FRDM, 2015). The fire emergency requires quick response from authority bodies such as Fire and Rescue Department Malaysia. According to Fire and Rescue Department Malaysia annual report 2015, 44.46% of emergency calls were successfully attended by within 10 minutes. While waiting for Fire and Rescue Department Malaysia arrival and response it is crucial for the first responder to ensure the safety of the building occupants. First

responder also known as ERT is a group of qualified and authorized personnel who have been trained to provide immediate assistance. (Disaster Recovery Journal, 2019).

According to Fire and Rescue Department Malaysia 2015 annual report, Emergency Response Team (ERT) as in year 2015 was having a number of 5,082 teams with a membership of 154,891 people. The team acted as first responders to address early stage of emergency or fire in the premises. Building evacuation exercise was carried out as many as 1,739 times with the participation of over 684,572 participants. It was aimed to provide knowledge and regularized the building occupants to act in case of fire emergency.

Many researchers have studies the data of fire incidents from various agencies, both government and private sectors from Malaysia and abroad. Studies by (Abdul, 2015) concluded that the Fire and Rescue Department of Malaysia (FRDM) attended to 33,640 fires in 2013 over the country with an average of 92 cases per day. In 2014, Fire and Rescue Department of Malaysia recorded the highest number of 54,540 fire cases attended while the following year shows a decrease of 13,675 cases with total of 40,865 cases recorded in 2015 as shown in Figure 1.1 below. Total estimated losses also show upwards trend within similar period with an estimated RM4.4 billion losses recorded in 2015 as shown in Figure 1.2.

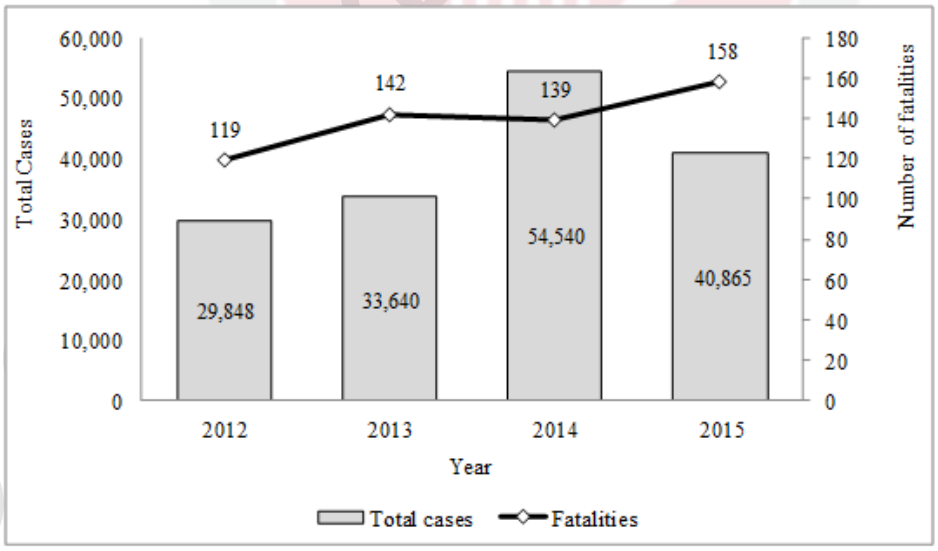

Figure 1.1: Statistics on Fire Breakouts in Malaysia, 2012 – 2015

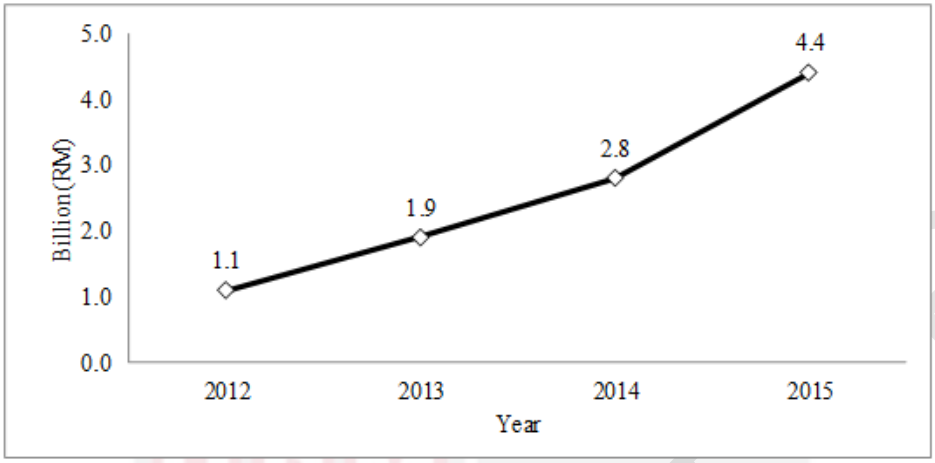

Figure 1.2: Estimated Losses due to Fire in Malaysia, 2012-2015

Fire and Rescue Department of Malaysia has recorded 5,609 fires on building across the country in 2015. The affected buildings are categorized according to Uniform Building by Law, 1984 (UBBL, 1984) category as shown in the following Figure 1.3.

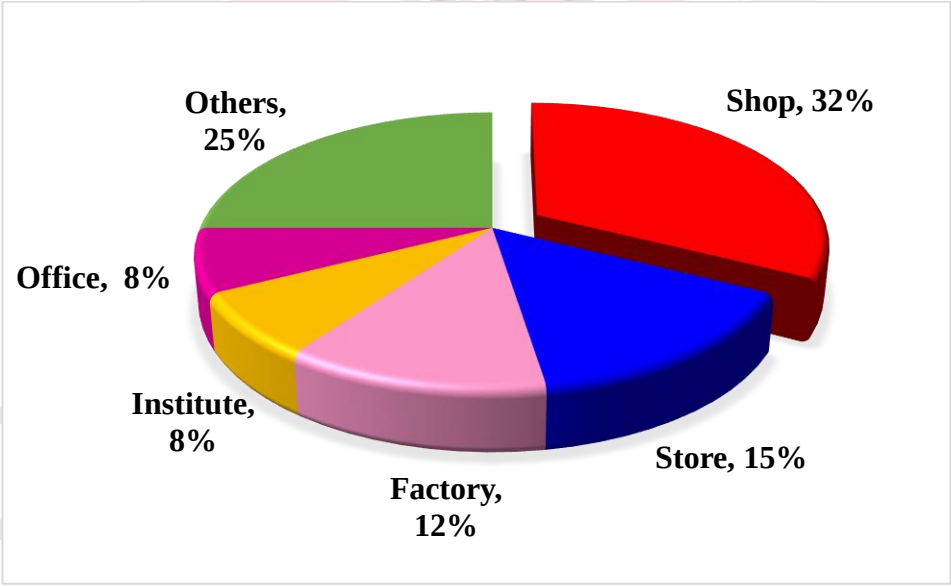

Figure 1.3: Malaysia's Building Fire Percentage by UBBL Category in Year 2015

Statistics as shown above recorded that shop category was the highest fire cases reported with total of 743 cases and contributed 32% for industrial category. There were many industries categorized as “Shop”, one of the main industry is vehicle servicing. Vehicle service center is the provision of services, support and spare parts after making an initial sale (Brock, 2009). Wholesale and retail trade, repair of motor vehicles and motorcycles industry makes 17% (2.42mil) out of the total employment in Malaysia. (Ministry of Human Resource Malaysia, 2016). Approximately there were 26 million vehicles in Malaysia in 2015 (Ministry of Transport Malaysia , 2016). Nearly 18,000 service centers operate throughout Malaysia with estimated of 209,835 employees are recoded by the Department of Statistics Malaysia (DOSM, 2008)

1.2 Problem Statement

Emergency response may be provided by a local government organization such as fire department, but an in-house Emergency Response Team (ERT) is the first responder to ensure the safety of the occupants while waiting for assistance from the fire department. Most of the time, the local response teams were closest to the emergency (Dymon & Winter, 1991). ERT knowledge and skill are important in order to response to fire emergency. Emergency preparedness training and response plans enable the organization to respond timely in case of any emergency, however many firms are still unprepared (Renschler et al., 2015). Furthermore, as mentioned in Fire and Rescue Department 2015 annual report that among the factors that have contributed to the increasing number of victims were higher number of fire cases throughout the year 2015 and the second factor was due to lack of awareness on the fire hazards among the building occupants.

There was an effort by the local authority, Fire and Rescue Department Malaysia to conduct the ERT training and execute the fire evacuation drill exercise. Whereas Malaysian Fire Protection Association (MFPA) inculcate awareness and proper fire maintenance for the industrial sector. However there were no specific code of practice and guidelines have yet been developed on the ERT knowledge and skillsets required. Moreover some of the organizations were not familiar with the Standard Operating Procedure in handling disaster management in Malaysia called the Malaysia National Security Council (MNSC) Directive 20 (Roosli & O’Brien, 2011).

There were many research done on fire causes and trends but lack of studies conducted on ERT knowledge and skills for vehicle service industry in Malaysia. Vehicle service centers were known as a service provider to customers, therefore it is important to ensure the all ERT is well-trained with a training module according to their operation to ensure the safety of all occupants. As the current emergency preparedness at vehicle service centers were self-regulated according according to Occupational Safety and Health Act, 1994, (Act 514), Section 15, general duty of employer to ensure the safety, health and welfare at

work as far as practicable, there was no specific guideline to ensure the preparedness of the Emergency Response Team.
Therefore, this study was conducted with the objective to determine the baseline of the knowledge and skill among Emergency Response Team (ERT) at the selected vehicle service centre, develop a training module and gauge the effect after an interventions program through training.

1.3 Study Justification

It was acknowledged that although there were many vehicle service centers in Malaysia, the knowledge and skill level of the Emergency Response Team has not been highlighted due to lack of studies in similar industry.

This study shall provide the data based on the current knowledge and skill of Fire Emergency Response Team at one of the vehicle servicing industries in Malaysia that can be used as reference by other researchers and the authority bodies such as Fire and Rescue Department Malaysia to continuously facilitate and enhance the Emergency Response Team knowledge and skill.

1.4 Conceptual framework

It was important to determine the contribution factors towards the Emergency Response Team knowledge and skill. Figure 1.4 in the next page shows the summary of all the study factors and confounding variables.

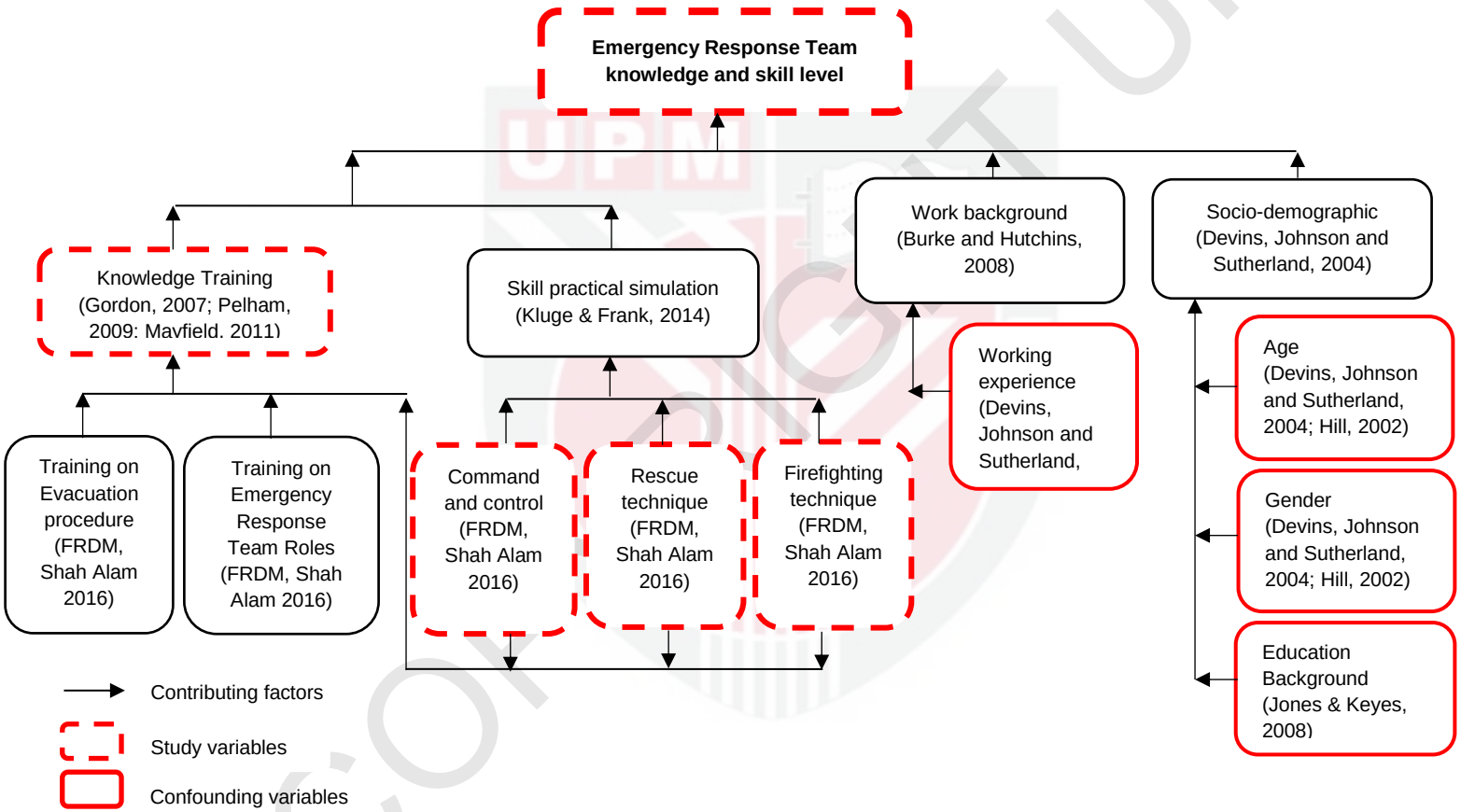

Figure 1.4: Conceptual Frameworks of Factors Contributing to Emergency Response Team Knowledge and Skill

1.5 Research Questions

1) What is the socio-demographic and work information proportion of the Emergency Response Team?
2) What is the distribution of knowledge level between experimental and control group before the intervention?
3) Is there any significant improvement on the ERT knowledge, ERT command and control skill, ERT rescue skill and ERT firefighting skill after the practical training?

1.6 Research Objectives

1.6.1 General objective

To implement an intervention training program to improve the Fire Emergency Response Team (ERT) knowledge and skill at the selected 13 vehicle service center in Malaysia.

1.6.2 Specific Objectives

1) To determine the socio-demographic and work information of the Emergency Response Team.
2) To compare the distribution of knowledge level between experimental and control group before the intervention.
3) To design and develop a module on Emergency Response Team Training.
4) To evaluate the effectiveness of training of ERT roles towards the ERT knowledge
5) To evaluate the effectiveness of practical training on the ERT command and control skill, rescue method and firefighting technique.

1.7 Hypothesis

1) There is no significant difference in distribution of knowledge level between experimental and control group before the training.
2) There is significant improvement of the ERT knowledge through training on their roles.
3) There is significant improvement on the ERT command and control skill, rescue method and firefighting technique after the intervention through practical training.

1.8 Terminology

1.8.1 Training Effectiveness

Conceptual definition

Evaluation of training effectiveness is the measurement of improvement in the employee's knowledge, skill and behavioral pattern within the organization as a result of training program (AlYahya & Norsiah, 2013).

Operational Definition

The training effect can be measure through pretest and posttest methods to produce a result which are comparable to a benchmark. The benchmark will enable to show whether knowledge and skill has been gained from the training experience. Therefore the measurement to evaluate the effect will be the knowledge and skill score to identify the gain.

Pretest = Data collected on Dependent Variable before exposure to Independent Variable

Posttest = Data collected on Dependent Variable after exposure to Independent Variable

Posttest - Pretest = Change attribute to Independent Variable

REFERENCES

Abdul Rahim, S. N. (2015). The current trends and challenging situations of fire incident statistics. *Malaysian Journal of Forensic Sciences*, *6*(1), 63–78.

Agrawal, N., Kumar, S., Balasubramaniam, S. M., Bhargava, S., Sinha, P., Bakshi, B., & Sood, B. (2016). Nurse Education Today Effectiveness of virtual classroom training in improving the knowledge and key maternal neonatal health skills of general nurse midwifery students in Bihar , India : A pre- and post-intervention study. *YNEDT*, *36*, 293–297. https://doi.org/10.1016/j.nedt.2015.07.022

AlYahya, M. S., & Norsiah, B. M. (2013). Evaluation of effectiveness of training and development : The Kirkpatrick model. *Asian Journal of Business and Management Sciences*, *2*(11), 14–24.

Azeredo, R., & Stephens-Stidham, S. (2003). Design and implementation of injury prevention curricula for elementary schools: Lessons learned. *Injury Prevention*, *9*(3), 274–278. https://doi.org/10.1136/ip.9.3.274

Babrauskas, V., & Peacock, R. D. (1992). *Heat Release Rate : The Single Most Important Variable in Fire Hazard *. 18*, 255–272.

Blazquez, E., & Thorn, C. (2010). Fires and explosions. *Anaesthesia and Intensive Care Medicine*, *11*(11), 455–457. https://doi.org/10.1016/j.mpaic.2010.08.007

Blume, B. D., Ford, J. K., Baldwin, T. T., & Huang, J. L. (2010). Transfer of training: A meta-analytic review. *Journal of Management*, *36*(4), 1065–1105. https://doi.org/10.1177/0149206309352880

Bowers, C., Kreutzer, C., Cannon-bowers, J., Lamb, J., & Bowers, C. (2017). *Team Resilience as a Second-Order Emergent State : A Theoretical Model and Research Directions*. *8*(August), 1–14. https://doi.org/10.3389/fpsyg.2017.01360

Briceño, S. (2002). *Gender mainstreaming in disaster reduction*. Geneva: United Nations-International Strategy for Disaster Reduction.

Brock, D. (2009). *Aftersales management: Creating a successful aftersales strategy to reduce*. London and Philadelphia: Kogan Page.

Broomfield, R., Rgn, H., & Ed, C. (1996). *A_quasi-experimental_research_to_investi*. 1016–1023.

Brushlinsky, N. N., Ahrens, M., Sokolov, S. V, & Wagner, P. (2016). *World fire statistics (No. 21)*.

Bruton, A, Conway, J H and Holgate, S. T. (2000). *Bruton_Reliability(1)*. *86*(2), 94–99. https://doi.org/10.1016/S0031-9406(05)61211-4

Buchari, Nazaruddin, M., & Nurhayati, S. (2018). *Work Environment Engineering Using HIRARC and 5S Method*. *020008*. https://doi.org/10.1063/1.5042864

Burke, L. A., & Hutchins, H. M. (1997). *A study of best practices in training transfer and proposed model of transfer*. *19*(2). https://doi.org/10.1002/hrdq

Chien, W. T., Chiu, Y. L., Lam, L. W., & Ip, W. Y. (2006). Effects of a needs-based education programme for family carers with a relative in an intensive care unit: A quasi-experimental study. *International Journal of Nursing Studies*, *43*(1), 39–50. https://doi.org/10.1016/j.ijnurstu.2005.01.006

Cook, D. A., & Hatala, R. (2015). Got power? A systematic review of sample size adequacy in health professions education research. *Advances in Health Sciences Education : Theory and Practice*, *20*(1), 73–83. https://doi.org/10.1007/s10459-014-9509-5

Das, K. R., & Imon, A. H. M. R. (2016). *A Brief Review of Tests for Normality*. *5*(1), 5–12. https://doi.org/10.11648/j.ajtas.20160501.12

Devins, D., Johnson, S., & Sutherland, J. (2004). Employer characteristics and employee training outcomes in UK SMEs : a multivariate analysis. *Journal of Small Business and Enterprise Development*, *11*(4), 449–457. https://doi.org/10.1108/14626000410567099

Dimitrov, D. M., & Rumrill, P. D. (2003). Pretest-posttest designs and measurement of change. *Work*, *20*, 159–165.

Disaster Recovery Journal. (2019). *Emergency Response Team (ERT) - Disaster Recovery Journal*. Retrieved from https://www.drj.com/emergency-response-team-ert.html

Department of Statistics Malaysia Official portal (DOSM). (2008). Malaysia: DOSM

Dymon, U. J., & Winter, N. L. (1991). Emergency mapping in grassroots America : a derailment evacuation case study. *Geoforum*, *22*(4), 377–389.

Environ, E., Ribi, P., & Marlair, G. (2012). *Environmental Science Investigation on the fire-induced hazards of Li-ion battery cells by fire calorimetry*. 5271–5280. https://doi.org/10.1039/c1ee02218k

Fancher, E. L. (2013). *Comparison of methods of analysis for pretest and posttest data (Master's thesis)*.

Field, A. (2012). Analysis of Covariance (ANCOVA) Some background ANCOVA on SPSS. *Discovering Statistics*, 1–14. Retrieved from www.discoveringstatistics.com

FIRE SERVICES ACT. (1988). Malaysia : In *Fire Services Act*.

Fire Rescue Department Malaysia : *Laporan tahunan bomba* (2015). Putrajaya, Malaysia : FRDM

Gordon, W. (2007). The ‘ design ’ phase of the ADDIE model. *Journal of GXP Compliance*, *11*(4), 40–48.

Hart, P., Eaton, L., Buckner, M., Morrow, B. N., & Barrett, D. T. (2008). *Effectiveness of a Computer-Based Educational Program on Nurses ’ Knowledge , Attitude , and Skill Level Related to Evidence-Based Practice*. (January).

Hauschild, V. D., Degroot, D. W., Hall, S. M., Grier, T. L., Deaver, K. D., Hauret, K. G., & Jones, B. H. (2017). *Fitness tests and occupational tasks of military interest : a systematic review of correlations*. 144–153. https://doi.org/10.1136/oemed-2016-103684

Henderson, A., Heel, A., Twentyman, M., & Lloyd, B. (2006). Pre-test and post-test evaluation of students’ perceptions of a collaborative clinical education model on the learning environment. *Australian Journal of Advanced Nursing*, *23*(4), 8–13. https://doi.org/10.1016/j.nedt.2006.01.012

How to Use a Portable Fire Extinguisher : *Portable Fire Extinguisher.* (2006). Cleveland : Fire Equipment Manufacturers' Association (FEMA)

J.D.Power. (2016). *CSI Malaysia*. (November). Retrieved from http://www.jdpower.com/sites/default/files/2016138malaysiacsi.pdf

Johnson, O. E., & Bassey, E. A. (2016). *Work Habits and Health Problems of Automobile Technicians at Mechanic Village , Uyo , Nigeria*. *5*(5), 136–142.

Johnson, T. R. (2016). Violation of the homogeneity of regression slopes assumption in ANCOVA for two-group pre-post designs: Tutorial on a modi fi ed Johnson-Neyman procedure. *The Quantitative Methods for Psychology*, *12*(3), 253–263.

Jones, V. A., & Keyes, K. E. (2008). How to develop an emergency management plan. *The Information Management Journal*, *42*(2).

Khanna, B. . (2005). *All you wanted to know about disasters*. Pitam Pura, New Delhi: New India Publishing Agency.

Kim, J. W., Ritter, F. E., & Koubek, R. J. (2013). An integrated theory for improved skill acquisition and retention in the three stages of learning. *Theoretical Issues in Ergonomics Science*, *14*(1), 22–37. https://doi.org/10.1080/1464536X.2011.573008

Kluge, A., & Frank, B. (2014). Counteracting skill decay: Four refresher interventions and their effect on skill and knowledge retention in a simulated process control task. *Ergonomics*, *57*(2), 175–190. https://doi.org/10.1080/00140139.2013.869357

Krathwohl, D. R. (2002). A revision of Bloom's taxonomy: An overview. *Theory Into Practice*, *41*(4), 212–218.

Lawani, K., Hare, B., & Cameron, I. (2018). Integrating early refresher practice in height safety and rescue training. *Safety Science*, (July 2017), 0–1. https://doi.org/10.1016/j.ssci.2018.03.029

Lawshe, C. H. (1975). *A QUANTITATIVE APPROACH TO CONTENT VALIDITY* ^. (1), 563–575.

Lemeshow, S., Jr, D. W. H., Klar, J., & Lwanga, S. K. (1990). *Adequacy of Sample Size in Health Studies*.

Mayfield, M. (2011). Creating training and development programs : using the ADDIE method. *Development and Learning in Organizations: An International Journal*, *25*(3), 19–22. https://doi.org/10.1108/14777281111125363

Melvin L. S, Biech, E. (2015). *Active Training A Handbook of Techniques, Designs, Case Examples and Tips*. Wiley & Sons.

Ministry of Human Resource Malaysia (MOHR) : *Malaysia's Labour Force Statistics. (2016)*. Malaysia: Ministry of Human Resource Malaysia

Ministry of Transport (MOT) : *Transport statistics Malaysia*. (2016). Malaysia: Ministry of Transport Malaysia

Navedtra. (1993). *Seabee Combat Handbook, Volume 1* (Vol. 1).

Nichols, D., & Nichols, T. M. (1992). Accountability , Not Liability : Planning for Emergencies. *NASSP Bulletin*, *76*(546), 111–115.

Occupational Health and Safety Act 1994 (Act 514) : Use and Standard of Exposure of Chemicals Hazardous to Health. (2000). Malaysia.

Occupational Safety and Health Administration U.S. Department of Labor : Training Requirements in OSHA Standards. (2015). United States : OSHA

Ostiguy, C., Boutin, M., & Lesage, J. (2006). *Determination of Airborne Isocyanates Generated During the Thermal Degradation of Car Paint in Body Repair Shops*. *50*(4), 385–393. https://doi.org/10.1093/annhyg/mei075

Overmeer T. MS, Boersma, K., Main, C. J., & Linton, S. J. (2009). *Do physical therapists change their beliefs , attitudes , knowledge , skills and behaviour after a biopsychosocially orientated university course ? 15*(2), 724–732. https://doi.org/10.1111/j.1365-2753.2008.01089.x

Pelham, A. (2009). The impact of industry and training influences on salesforce consulting time and consulting effectiveness. *Journal of Business &*

Industrial Marketing, *24*(8), 575–584. https://doi.org/10.1108/08858620910999448

Pilone, E., Mussini, P., Demichela, M., & Camuncoli, G. (2016). Municipal Emergency Plans in Italy: Requirements and drawbacks. *Safety Science*, *85*, 163–170. https://doi.org/10.1016/j.ssci.2015.12.029

Pratt, C., McGuigan, W., & Katzev, A. (2000). Measuring Program Outcomes : Using. *American Journal of Evaluation*, *21*(3), 341–349. https://doi.org/10.1177/109821400002100305

Reece, I., Walker, S. (2007). *Teaching, Training and Learning: A Practical Guide* (7th ed.). Business Education Publishers Ltd.

Renschler, L. A., Terrigino, E. A., Azim, S., Snider, E., Rhodes, D. L., & Cox, C. C. (2015). Employee perceptions of their organization's level of emergency preparedness following a brief workplace emergency planning educational presentation. *Safety and Health at Work*, 1–5. https://doi.org/10.1016/j.shaw.2015.10.001

Roosli, R., & O'Brien, G. (2011). Social learning in managing disasters in Malaysia. *Disaster Prevention and Management*, *20*(4), 386–397. https://doi.org/10.1108/09653561111161716

Rutter, P. A., Estrada, D., Ba, K. F., & Diggs, G. A. (2008). Journal of LGBT Issues in Counseling Sexual Orientation and Counselor Competency : The Impact of Training on Enhancing Awareness , Knowledge and Skills. *Journal of LGBT Issues in Counseling*, (December 2014), 37–41. https://doi.org/10.1080/15538600802125472

Shivaraju, P. T., Manu, G., Vinaya, M., & Savkar, M. K. (2017). *Evaluating the effectiveness of pre- and post-test model of learning in a medical school*. *7*(9), 947–951. https://doi.org/10.5455/njppp.2017.7.0412802052017

Stark, C. M., Graham-kiefer, M. L., Devine, C. M., Dollahite, J. S., & Olson, C. M. (2011). Online Course Increases Nutrition Professionals ' Knowledge , Skills , and Self-Efficacy in Using an Ecological Approach to Prevent Childhood Obesity. *Journal of Nutrition Education and Behavior*, *43*(5), 316–322. https://doi.org/10.1016/j.jneb.2011.01.010

Steyerberg, E. W., & Harrell, F. E. (2015). Prediction models need appropriate internal, internaleexternal, and external validation. *Journal of Clinical Epidemiology*. https://doi.org/10.1016/j.jclinepi.2015.04.005

Tang, P., & Shen, G. Q. (2015). Decision-making model to generate novel emergency response plans for improving coordination during large-scale emergencies. *Knowledge-Based Systems*, *90*, 111–128. https://doi.org/10.1016/j.knosys.2015.09.027

Tolsgaard, M. G., Gustafsson, A., Rasmussen, M. B., Høiby, P., Ringsted, C., &

Mu, C. G. (2007). *Student teachers can be as good as associate professors in teaching clinical skills*. 553–557. https://doi.org/10.1080/01421590701682550

Tonui, W. (2009). *Basic fire safety and prevention guide*. Nairobi: Masola Publishers.

UBBL. (1984). *Uniform Building By-Laws 1984*. Malaysia: International Law Book Services (ILBS).

Wambugu, F., Mburu, C., & Gatebe, E. (2016). Assessment of fire safety preparedness at Jomo Kenyatta International Airport. *The Journal of Agriculture, Science and Technology*, *17*(2).

Zhang, X., Li, X., & Hadjisophocleous, G. (2014). A probabilistic occupant response model for fire emergencies. *Fire Safety Journal*, *68*, 41–51. https://doi.org/10.1016/j.firesaf.2014.05.017

BIODATA OF STUDENT

The student, Muhammad Shawal was born in Singapore. In 2004, he successfully graduated in Bachelor Degree of Chemical Engineering majoring in Process from Universiti Putra Malaysia, Malaysia. Then he started to work in industry as Sr. Supervisor in Epson Toyocom (M) Sdn Bhd.

In 2011, he attended the Safety and Health Officer Course and passed the examination from NIOSH, Malaysia in 2012.

In 2012, he joined UMW Toyota Motor Sdn Bhd as an Executive of Environment Safety and Health. In 2016, he registered as a Safety and Health Officer with Department of Occupational Safety and Health (DOSH), Malaysia.

In 2017, he joined Automotive Industries Sdn. Bhd. as Safety and Health Officer till present.

UNIVERSITI PUTRA MALAYSIA

STATUS CONFIRMATION FOR THESIS / PROJECT REPORT AND COPYRIGHT

ACADEMIC SESSION : Second Sem 2018/2019

TITLE OF THESIS / PROJECT REPORT :

Effectiveness of Intervention Training Program on Fire Emergency Response Team Knowledge and Skill in Selected Vehicle Service Centres

NAME OF STUDENT :

Muhammad Shawal Bin Mohammad Sharif

I acknowledge that the copyright and other intellectual property in the thesis/project report belonged to Universiti Putra Malaysia and I agree to allow this thesis/project report to be placed at the library under the following terms:

1. This thesis/project report is the property of Universiti Putra Malaysia.
2. The library of Universiti Putra Malaysia has the right to make copies for educational purposes only.
3. The library of Universiti Putra Malaysia is allowed to make copies of this thesis for academic exchange.

I declare that this thesis is classified as:

*Please tick (√)

☐	**CONFIDENTIAL**	(Contain confidential information under Official Secret Act 1972).
☐	**RESTRICTED**	(Contains restricted information as specified by the organization/institution where research was done).
☐	**OPEN ACCESS**	I agree that my thesis/project report to be published as hard copy or online open access.

This thesis is submitted for:

☐ **PATENT** Embargo from _____ until _____ (date) (date)

Approved by:

_____ _____

(Signature of Student)
IC No.:810802-71-5003

Date :

(Signature of Chairman of Supervisory Committee)
Name: Prof. Dr. Shamsul Bahri Hj. Mohd Tamrin
Date :

[Note : If the thesis is CONFIDENTIAL or RESTRICTED, please attach with the letter from the organization/institution with period and reasons for confidentially or restricted.]