



**UNIVERSITI PUTRA MALAYSIA**

***OCCUPATIONAL HAZARD SELF-EVALUATION MODULE  
INTERVENTION FOR SAFETY LEADERSHIP AND SAFETY  
KNOWLEDGE-ATTITUDE-BEHAVIOUR AMONG SMALL  
AND MEDIUM MANUFACTURING WORKERS***

**SYAZWAN SYAH BIN ZULKIFLY**

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By

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

**January 2022**

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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Doctor of Philosophy

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**January 2022**

**Chairman : Associate Professor Mohd Rafee bin Baharudin, PhD**  
**Faculty : Medicine and Health Science**

Small and Medium Enterprises (SMEs) contribute to at least 70% of workplace accidents in Malaysia. Financial and human resource limitations have been found to be the main causes and a tailored approach is needed to overcome the problem. Previous literature has revealed that unsatisfactory safety behaviour is the leading cause of workplace accidents and safety leadership has been identified as the most effective solution. Besides, safety knowledge and safety attitude have been found to have substantial influence on workers' safety behaviour. This research aims to develop an intervention module, known as the Occupational Hazard Self-Evaluation Module (OHSEM), focusing on the supervisor's safety leadership roles, namely safety coaching, safety concern, and safety monitoring, in nurturing safety KAB. The contents particularly focus on improving the ability of self-evaluating occupational hazards by workers. Subsequently, the intervention module was tested on the small manufacturing firms to evaluate its effectiveness in improving safety knowledge-attitude-behaviour (KAB) among manufacturing workers of SME. The phase one of the research applied a cross-sectional design involving 300 SME manufacturing workers in the Northern Corridor Economic Region (NCER) of Malaysia. The level of safety KAB was determined according to the mean values. Moreover, the nature of relationship between safety leadership variables and safety KAB was explored by using Partial Least Squares-Structural Equation Modelling (PLS-SEM) - Higher-Order Construct Analysis. In the second phase, the design and development of OHSEM was carried out and its usability and validity evaluation were performed via Modified *Fuzzy Delphi* (FDM) method, involving 15 experts. For the third phase, a quasi-experimental study with a control group was conducted involving a total of 200 workers. A pre- and post-test was undertaken and descriptive and inferential analyses (t-test, ANCOVA, and regression) were applied for this phase to evaluate the module's effectiveness. The results of Phase 1 show a moderate level of safety KAB, confirming the necessity of developing the intervention module. Moreover, safety leadership directly influences safety behaviour,

with safety knowledge and safety attitude mediating the relationship. In Phase 2, the FDM results show the average threshold values for the importance and appropriateness of OHSEM contents are below 0.2 and the overall percentages of each item evaluated by the panellists is greater than 75%, indicating a fair degree of OHSEM's usability and validity. Lastly, in Phase 3, a significant difference in terms of safety KAB between the intervention group and the control group ( $p < 0.05$ ) is revealed. Furthermore, the regression results indicate the  $R^2$  value of 0.721 for post-test compared to 0.149 for pre-test in terms of the relationship between safety leadership and safety KAB. Moreover, the effect size of the intervention group for safety KAB is vast ( $d > 1.4$ ), compared to the control group, which is small ( $d < 0.2$ ). This research proves the effectiveness of OHSEM when the level of safety KAB significantly increases with the effect size of  $d = 3.54$  for post-intervention compared to  $d = 0.18$  for pre-intervention. Moreover, the significant difference of mean values between the intervention and control group for safety KAB ( $p < 0.05$ ) affirm the effectiveness of OHSEM.

Keywords: safety leadership, safety behaviour, safety knowledge, safety attitude, safety intervention, occupational safety and health (OSH), small & medium enterprises (SMEs).

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

**INTERVENSI MODUL PENILAIAN KENDIRI HAZARD PEKERJAAN BAGI  
KEPIMPINAN KESELAMATAN DAN PENGETAHUAN – SIKAP-PERILAKU  
KESELAMATAN DALAM KALANGAN PEKERJA-PEKERJA PEMBUATAN  
DI PERUSAHAAN KECIL DAN SEDERHANA**

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Perusahaan Kecil dan Sederhana (PKS) menyumbang kepada sekurang-kurangnya 70% kemalangan tempat kerja di Malaysia. Sumber kewangan dan sumber manusia yang terhad dilihat menjadi punca utama dan pendekatan spesifik yang sesuai diperlukan untuk mengatasi permasalahan tersebut. Kajian-kajian sebelum ini mendedahkan bahawa Perilaku Keselamatan yang tidak memuaskan ialah penyebab utama kemalangan di tempat kerja dan Kepimpinan Keselamatan telah dikenal pasti sebagai penyelesaian yang paling berkesan. Selain itu, Pengetahuan Keselamatan dan Sikap Keselamatan didapati memberi pengaruh yang besar kepada Perilaku Keselamatan pekerja. Kajian ini bertujuan untuk membangunkan modul intervensi bernama Modul Penilaian Kendiri Hazard Pekerjaan (*OHSEM*), yang memfokuskan peranan Kepimpinan Keselamatan penyelia, iaitu Bimbingan Keselamatan, Kepedulian Keselamatan, dan Pemantauan Keselamatan, dalam memupuk Pengetahuan-Sikap-Perilaku Keselamatan pekerja PKS. Kandungannya memberi tumpuan khusus kepada mempertingkatkan keupayaan para pekerja dalam menilai sendiri hazard pekerjaan mereka. Seterusnya, modul intervensi tersebut akan diuji pada firma pembuatan bersaiz kecil untuk menilai keberkesanannya dalam penambahbaikan Pengetahuan-Sikap-Perilaku Keselamatan. Fasa pertama kajian menerapkan reka bentuk keratan rentas yang melibatkan 300 orang pekerja PKS pembuatan di Koridor Ekonomi Zon Utara (*NCER*) Malaysia. Tahap Pengetahuan-Sikap-Perilaku Keselamatan ditentukan mengikut nilai min data. Seterusnya, sifat hubungan antara pembolehubah-pembolehubah bagi Kepimpinan Keselamatan dan Pengetahuan-Sikap-Perilaku Keselamatan diterokai melalui Analisis Konstruk Peringkat Kedua bagi Permodelan Persamaan Kuasa Dua Terkecil Separa Berstruktur (*PLS-SEM*). Pada fasa kedua, proses reka bentuk dan pembangunan *OHSEM* telah dilaksanakan dan kesahan serta kebolegunaan module ditentukan dengan kaedah *Modified Fuzzy Delphi* (FDM), yang melibatkan 15 orang pakar bidang. Untuk fasa ketiga, kajian kuasi-eksperimen dengan kumpulan kawalan telah dilaksanakan, melibatkan seramai sejumlah 200 orang pekerja. Untuk fasa ini juga, ujian pra dan pasca dijalankan dengan

menggunakan analisis deskriptif dan inferensi (ujian-t, ANCOVA, dan regresi) bagi menguji keberkesanan *OHSEM*. Keputusan Fasa 1 menunjukkan tahap Pengetahuan-Sikap-Perilaku Keselamatan yang sederhana, yang mengesahkan terdapat keperluan untuk membangunkan modul intervensi. Tambahan pula, Kepimpinan Keselamatan secara langsung mempengaruhi Perilaku Keselamatan, dengan Pengetahuan Keselamatan dan Sikap Keselamatan yang menjadi pembolehubah perantara. Dalam Fasa 2, keputusan *FDM* menunjukkan nilai ambang purata kepentingan, kesesuaian dan kebolehgunaan kandungan *OHSEM* berada di bawah 0.2 dan peratusan keseluruhan bagi setiap perkara yang telah dinilai oleh ahli panel adalah lebih besar daripada 75%. Ini menunjukkan bahawa kesahan dan kebolehgunaan modul adalah di tahap yang wajar. Akhir sekali, dalam Fasa 3, perbezaan yang signifikan dari segi Pengetahuan-Sikap-Perilaku Keselamatan antara kumpulan intervensi dan kumpulan kawalan ( $p < 0.05$ ) telah ditemukan. Tambahan lagi, keputusan regresi menunjukkan 0.721 bagi nilai  $R^2$  untuk ujian pasca dibandingkan dengan 0.149 untuk ujian pra bagi maksud hubungkait antara Kepimpinan Keselamatan dengan Pengetahuan-Sikap-Perilaku Keselamatan. Tambahan lagi, kesan saiz bagi kumpulan intervensi untuk Pengetahuan-Sikap-Perilaku Keselamatan adalah sangat besar ( $d > 1.4$ ), berbanding dengan kumpulan kawalan yang nilainya kecil ( $d < 0.2$ ). Kajian ini membuktikan keberkesanan *OHSEM* apabila tahap Pengetahuan-Sikap-Perilaku Keselamatan meningkat dengan ketara dengan kesan saiz,  $d = 3.54$  untuk pasca intervensi berbanding  $d = 0.18$  untuk pra-intervensi. Selain itu, perbezaan nilai min yang signifikan antara kumpulan intervensi dan kumpulan kawalan untuk Pengetahuan-Sikap-Perilaku Keselamatan ( $p < 0.05$ ), mengukuhkan keberkesanan *OHSEM*.

Kata kunci: Kepimpinan Keselamatan, Perilaku Keselamatan, Pengetahuan Keselamatan, Sikap Keselamatan, Intervensi Keselamatan, Keselamatan dan Kesihatan Pekerjaan (KKP), Perusahaan Kecil & Sederhana (PKS)

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

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## TABLE OF CONTENTS

	<b>Page</b>
<b>ABSTRACT</b>	i
<b>ABSTRAK</b>	iii
<b>ACKNOWLEDGEMENTS</b>	v
<b>APPROVAL</b>	vi
<b>DECLARATION</b>	viii
<b>LIST OF TABLES</b>	xv
<b>LIST OF FIGURES</b>	xix
<b>LIST OF APPENDICES</b>	xx
<b>LIST OF ABBREVIATIONS</b>	xxi
<b>CHAPTER</b>	
<b>1 INTRODUCTION</b>	<b>1</b>
1.1 Background of study	1
1.2 Problem Statement	4
1.3 Research Questions	8
1.3.1 Research Questions Phase 1	8
1.3.2 Research Questions Phase 2	8
1.3.3 Research Questions Phase 3	8
1.4 General Objectives of the Study	9
1.4.1 Research Objectives Phase 1	9
1.4.2 Research Objectives Phase 2	9
1.4.3 Research Objectives Phase 3	9
1.5 Significance of Study	9
1.6 Scope of Study	10
1.7 Definition of Terms	12
1.8 Summary	13
<b>2 LITERATURE REVIEW</b>	<b>15</b>
2.1 Introduction	15
2.2 Occupational Safety and Health in Malaysia	15
2.3 Industrial Accident Statistics in Malaysia	16
2.4 Characteristics of Malaysia's SME	17
2.5 Occupational Safety Issues in SME	18
2.6 Strategic Planning of OSH for Small and Medium Industries, 2016-2020 (SMIs 2020)	20
2.7 Safety (OSH) Culture, Climate and Self- Regulation	21
2.7.1 Safety Culture	21
2.7.2 Safety Climate	23
2.7.3 Safety Self-Regulation	24
2.8 Safety Performance	25
2.9 Empirical Studies on Safety Performance (Behaviour)	26
2.10 Safety Knowledge and Safety Behaviour	27
2.11 Safety Attitude and Safety Behaviour	29
2.12 Overview of Leadership	30

2.12.1	Leadership and Performance	31
2.12.2	Leadership and Behaviour	32
2.13	Overview of Safety Leadership	32
2.14	Dimensions of Safety Leadership	33
2.14.1	Safety Coaching	35
2.14.2	Safety Concern	35
2.14.3	Safety Monitoring	36
2.15	Safety Leadership and Safety Performance (Behaviour)	37
2.16	Intervention Research for Safety Behaviour Modification	38
2.16.1	Behaviour-Based Safety (BBS) Intervention	39
2.16.2	Leadership-Based Safety Intervention	40
2.17	Safety Intervention for SMEs	41
2.18	Knowledge-Attitude-Behaviour (KAB) Approach	42
2.18.1	Empirical Research on Safety KAB	43
2.18.2	Confounding Factors for Safety KAB	44
2.19	Underpinning Theory	44
2.19.1	Theory of Planned Behaviour (TPB)	45
2.19.2	Social Learning Theory (SLT), Social Cognitive Theory, and Self-Efficacy Theory	46
2.19.3	Theoretical Framework	48
2.20	Design and Development Research (DDR)	50
2.21	Fuzzy Delphi Method (FDM)	51
2.22	Conceptual Framework	55
2.23	Summary of literature	57
<b>3</b>	<b>METHODOLOGY</b>	<b>58</b>
3.1	Overall Research Design	58
3.2	DDR Phase 1 – Need Analysis	59
3.2.1	Research Design	59
3.2.2	Research Framework and Hypothesis Development	59
3.2.3	Study Population	61
3.2.4	Sampling Frame	62
3.2.5	Sampling Unit	62
3.2.6	Sample Size Estimation	63
3.2.7	Sampling Method	66
3.2.8	Study Instrument	67
3.2.8.1	Questionnaire Development	67
3.2.8.2	Scaling of Measurement	70
3.2.8.3	Questionnaire Pre-Test for Face and Content Validity	70
3.2.8.4	Pilot Test	74
3.2.9	Data Analysis Technique	78
3.2.9.1	Descriptive Analysis	78
3.2.9.2	Assessment of Measurement and Structural Model	79
3.3	DDR Phase 2 – Design and Development	81
3.3.1	Research Design	81

3.3.2	Research Framework and Hypothesis Development	82
3.3.3	Sampling Method (The Panel of Experts)	83
3.3.4	Research Instrument Design	85
3.3.5	Process of Module Design and Development	86
3.3.6	Module Validity and Usability Evaluation	86
3.3.7	The module designing and developing processes are outlined in Ethics of Study	87
3.3.8	Finalisation of Module	88
3.4	DDR Phase 3 – Implementation and Evaluation	88
3.4.1	Research Design	88
3.4.2	Research Framework and Hypothesis Development	90
3.4.3	Sampling Method and Sample Size	91
3.4.4	OHSEM Implementation	92
3.4.5	Research Instrument	94
3.4.6	Validity of QED	94
3.4.7	Data Analysis Technique	95
3.4.7.1	Descriptive Analysis	95
3.4.7.2	Inferential Analysis	96
3.5	Summary	97
<b>4</b>	<b>RESULTS AND FINDINGS</b>	<b>98</b>
4.1	Results of Phase 1	98
4.1.1	Demographic Background of the Respondents	98
4.1.2	Descriptive Analysis	99
4.1.3	Normality Test	100
4.1.4	Common Method Bias	100
4.1.5	Assessment of the Measurement Model for Lower-Order Construct	102
4.1.5.1	Reliability and Construct Validity	103
4.1.5.2	Discriminant Validity	106
4.1.6	The Establishment of Higher-Order Construct Model	107
4.1.6.1	Assessment of Measurement Model	109
4.1.6.2	Assessment of Structural Model (Higher-Order)	110
4.1.7	Hypotheses Testing	111
4.1.8	Summary of Results for Phase 1	111
4.2	Results of Phase 2	112
4.2.1	Validity Evaluation of OSHEM (Results of FDM)	112
4.2.2	Usability Evaluation of OHSEM	116
4.2.3	Summary Results for Phase 2	118
4.3	Results of Phase 3	119
4.3.1	Demographic Profile of the Responde	119
4.3.2	The Results of Descriptive Analysis of Phase 3	120
4.3.3	Preliminary Data Analyses	121
4.3.3.1	The Normality Test for Phase 3	121

	4.3.3.2	Reliability Test for Phase 3	122
	4.3.3.3	Homogeneity Test for Phase 3	123
	4.3.4	Independent Sample <i>T</i> -Test	123
	4.3.5	Effect Size Analysis	126
	4.3.6	Linear Regression Analysis	126
	4.3.7	Analysis of Co-variance for Confounding Factors	130
	4.3.8	Summary of Results -Phase 3	135
4.4		Summary of Overall Research Findings	135
<b>5</b>		<b>DISCUSSION, RECOMMENDATIONS AND CONCLUSION</b>	<b>137</b>
	5.1	Introduction	137
	5.2	Recapitulation of the Findings	137
	5.3	Discussion	138
	5.3.1	Phase 1-RO1: To determine the level of perceived supervisor’s safety leadership and workers’ self-reported safety knowledge-attitude behaviour” in the SME manufacturing sector	139
	5.3.2	Phase 1 – RO2: To Investigate the inter-variable effect of supervisors’ safety leadership and workers’ safety knowledge, safety attitude and safety behaviour in the SME manufacturing sector	140
	5.3.3	Phase 2 – RO3: To determine the mediating effect of safety knowledge and safety attitude on the relationship between safety leadership and safety behaviour among workers in manufacturing SMEs	140
	5.3.4	Phase 2 – RO1: To design, develop a valid Occupational Hazard Self Evaluation Module (OHSEM)	141
	5.3.5	Phase 2 – RO2: To determine the usability Occupational Hazard Self Evaluation Module (OHSEM)	141
	5.3.6	Phase 3 – RO1: To implement the Occupational Hazard Self-Evaluation Module (OHSEM) intervention	142
	5.3.7	Phase 3-RO2: To evaluate the effectiveness of the Occupational Hazard Self Evaluation Module (OHSEM) intervention	143
	5.4	Contributions of the Study	144
	5.4.1	Theoretical Contributions	144
	5.4.2	Empirical Contributions	146
	5.4.3	Practical Contributions	148
	5.4.4	Methodological Implications	148
	5.5	Recommendations for future research	149
	5.6	Conclusion	149

<b>REFERENCES</b>	151
<b>APPENDICES</b>	189
<b>BIODATA OF STUDENT</b>	205
<b>LIST OF PUBLICATIONS</b>	206



## LIST OF TABLES

<b>Table</b>		<b>Page</b>
2.1	Industrial Accident Statistics (2013-2019)	17
2.2	Definition of SMEs	18
2.3	Definition of Safety Culture	22
2.4	Safety Leadership	33
2.5	Likert Scale and Fuzzy Scoring	53
3.1	Research Hypothesis – Phase 1	61
3.2	Sampling Frame Breakdown	62
3.3	Inclusion and Exclusion Criteria for Sampling	63
3.4	Sample Size Adjustment	65
3.5	Items for Safety Leadership	68
3.6	Items for Safety Knowledge	68
3.7	Items for Safety Attitude	69
3.8	Items for Safety Behaviour	69
3.9	List of Experts for Questionnaire Validity	71
3.10	FDM Outcome for Safety Coaching	72
3.11	FDM Outcome for Safety Concern	72
3.12	FDM Outcome for Safety Monitoring	72
3.13	FDM Outcome for Safety Knowledge	73
3.14	FDM Outcome for Safety Attitude	73
3.15	FDM Outcome for Safety Behaviour	73
3.16	Demographic Profiles of Respondents (Pilot Test)	75
3.17	Cronbach's Alpha (Pilot)	75

3.18	Safety Coaching (Factor Loading)	76
3.19	Safety Concern (Factor Loading)	76
3.20	Safety Monitoring (Factor Loading)	77
3.21	Safety Knowledge (Factor Loading)	77
3.22	Safety Attitude (Factor Loading)	77
3.23	Safety Behaviour (Factor Loading)	78
3.24	Level of Measured Variables	78
3.25	Level of $R^2$	80
3.26	Level of Effect Size ( $f^2$ )	80
3.27	Hypothesis for Phase 2	83
3.28	List of Experts	84
3.29	Likert Scale and Fuzzy Scoring –Agreement	85
3.30	Likert Scale and Fuzzy Scoring – Importance	85
3.31	Hypothesis for Phase 3	91
4.1	Demographic Background of the Respondents	99
4.2	Descriptive Results	100
4.3	Normality Test (Kolmogorov-Smirnov and Shapiro-Wilks Tests)	100
4.4	Results of Harman’s Single Factor	102
4.5	Reliability and Construct Validity	103
4.6	Outer-Loadings	105
4.7	Fornell-Lacker Criterion	106
4.8	HTMT Ratio	107
4.9	Reliability and Construct Validity (Higher Order)	109
4.10	Fornell-Lacker Criterion (Higher-Order)	109
4.11	HTMT Ration (Higher-Order)	109



4.12	$R^2$ Values (Higher-Order)	110
4.13	Effect Size, $f^2$ Values (Higher-Order)	110
4.14	Path Coefficient (Direct Effect)	111
4.15	Path Coefficient (Indirect Effect)	111
4.16	Output of FDM for Topic 1	112
4.17	Output of FDM for Topic 2	113
4.18	Output of FDM for Topic 3	113
4.19	Output of FDM for Topic 4	114
4.20	Output of FDM for Topic 5	115
4.21	Output of FDM for Overall Content (Importance)	115
4.22	Output of FDM for Usability Evaluation	117
4.23	Demographic Profiles of the Respondents	120
4.24	Descriptive Analysis	121
4.25	Test of Normality for Intervention Group (Pre-test)	121
4.26	Test of Normality for Intervention Group (Post-test)	121
4.27	Test of Normality for Control Group (Pre-test)	122
4.28	Test of Normality for Control Group (Post-test)	122
4.29	Cronbach's alpha for Phase 3	122
4.30	Levene's Test for Homogeneity of Variances	123
4.31	Independent Samples $T$ -Test (Post-Test)	124
4.32	Independent Samples $T$ -Test (Pre-Test)	125
4.33	Effect Size (Independent Sample $T$ -Test)	126
4.34	Linear Regression Results for Intervention Group ( $R^2$ )	127
4.35	Linear Regression Results for Intervention Group (ANOVA)	128
4.36	Linear Regression Results for Control Group ( $R^2$ )	129

4.37	Linear Regression Results for Control Group (ANOVA)	130
4.38	Levene's Test of Equality of Variances	130
4.39	Results for Tenure Range	131
4.40	Results of Gender	131
4.41	Results of Education Background	132
4.42	Results of Marital Status	132
4.43	Results of Race	133
4.44	Results of Age Group	133
4.45	Results of Training Experience	134
4.46	Results of Accident Experience	134
5.1	Summary of Hypothesis Testing	138

## LIST OF FIGURES

Figure		Page
1.1	Accident Statistics	1
1.2	Industrial Accident Trend 2016-2020	12
2.1	TPB	45
2.2	Social Cognitive Theory	47
2.3	Self-Efficacy Theory	48
2.4	Theoretical Framework	49
2.5	Conceptual Framework	56
3.1	DDR Procedure	59
3.2	Research Framework	61
3.3	Sample Size Table	64
3.4	Stages of PLS-SEM Analysis	81
3.5	Outline for Research Framework – Phase 2	82
3.6	Research Framework for QED	90
3.7	OHSEM Implementation Outline	93
4.1	Output Diagram of Measurement (First-Order) Diagram	104
4.2	Higher-Order Model for Safety Leadership-Safety KAB	108

## LIST OF APPENDICES

Appendix		Page
A	Layout of Ohsem Contents	189
B	Questionnaire	190
C	List of Osh Experts for Questionnaire Content Validity	196
D	Experts' Validation Questionnaire for Ohsem	197
E	List of Osh Experts for Ohsem Validation	200
F	Experts' Validation Questionnaire for Research Instrument	201
G	Approval of Ethics Committee	204

## LIST OF ABBREVIATIONS

ANCOVA	Analysis of Covariance
AVE	Average Variance Extracted
BBS	Behaviour-Based Safety
CIDB	Construction Industry Development Board
DOSH	Department of Occupational Safety and Health
DOSM	Department of Statistics Malaysia
DV	Dependent Variable
DDR	Design and Development Research
FMA	Factories and Machinery Act
FDM	Fuzzy Delphi Method
GDP	Gross Domestic Product
HTMT	Heterotrait-monotrait Ratio of Correlations
IV	Independent Variable
ILO	International Labour Organization
KAB	Knowledge, Attitude, and Behaviour
KAP	Knowledge, Attitude, and Practice
LMX	Leader-member Exchange
NCER	Northern Corridor Economic Region
NIOSH	National Institute of Occupational Safety and Health
OSH	Occupational Safety and Health
OSHA	Occupational Safety and Health Act
OSHMP	Occupational Safety and Health Master Plan
OHSEM	Occupational Hazard Self-Evaluation Module

PLS-SEM	Partial-Lease Square Structural Equation Modeling
PPE	Personal Protective Equipment
QED	Quasi-Experimental Design
SCT	Social Cognitive Theory
SET	Self-Efficacy Theory
SLT	Social Learning Theory
SME/SMEs	Small and Medium Entrepreneurships
SMECorp	SME Corporation Malaysia
SOSCSO	Social Security Organisation
SPSS	Social Packages for Social Sciences
TPB	Theory of Planned Behaviour
VIF	Variance Inflation Factor

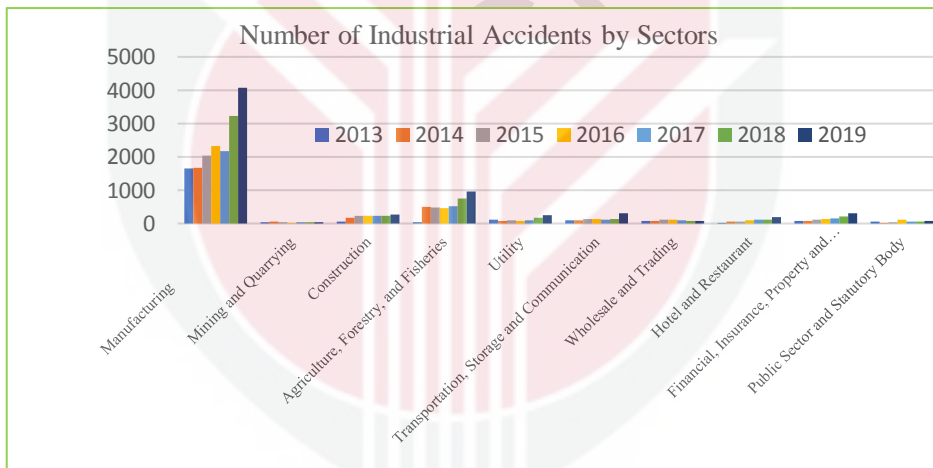
# CHAPTER 1

## INTRODUCTION

This chapter briefly describes the background of the study. The research problems that motivated the study are presented, in addition to the research objectives, and research questions. Also, this chapter presents the scope and significant of study. Finally, the chapter provides conceptual and operational definitions for the key terms.

### 1.1 Background of study

Recently, workplace accidents have become a matter of grave concern in Malaysia. This fact could be proven by the recorded accident cases in the recent seven years as illustrated in Figure 1.1 (Department of Occupational Safety and Health, 2020).



**Figure 1.1 :Accident Statistics**

(Department of Occupational Safety and Health Malaysia, 2019)

Based on the showed statistics, it could be stated that the total number of accidents of each sector was in the increasing trend since 2013, with manufacturing contributed the highest.

In the world, every year over 2.3 million women and men die at work from an occupational injury or disease. Over 350,000 deaths are due to fatal accidents and almost 2 million deaths are due to fatal work-related diseases. In addition, over 313 million

workers are involved in non-fatal occupational accidents causing serious injuries and absences from work. The International Labour Organisation (ILO) also estimates that 160 million cases of non-fatal work-related diseases occur annually. These estimates imply that that every day approximately 6,400 people die from occupational accidents or diseases and that 860,000 people are injured during performing their jobs (ILO, 2015). Based on the latest systematic review study, 50% of the accident cases in the world come from the SMEs with an eight time likelihood of fatality (Nowrouzi-Kia et al., 2019; Tremblay & Badri, 2018). In the Southeast Asia, it is estimated that 97.2% from the total enterprises are the SMEs. The majority of SMEs are engaged in services, especially wholesale and retail trade which is 61%–89% of the total numbers of SMEs. In terms of employment, SMEs hold 69.4% of the total workforce in Southeast Asia with manufacturing accounted for 10%–26% (Asian Development Bank, 2020). SMEs in Malaysia employed 66.2% of total employment, majority of SME employment was generated by services sector (62.3%), followed by manufacturing (16.4%), agriculture (10.7%), construction (10.3%) and mining & quarrying (0.3%) (SME Corporation Malaysia, 2019). In terms of number, SMEs employment accounted for 7.25 million persons in 2020 (DOSM, 2021). Based on the estimation of the occupational accident trend in Malaysia, 14,756 cases came from the small enterprises, 13,649 cases are from medium enterprises, and 8484 cases are from medium enterprises (Nor Azma et al., 2016).

In Malaysia, it is also reported that 80% - 90% of the accident cases came from Small and Medium Enterprises or renowned as the SMEs (Aziz et al., 2015; Nor Azma et al., 2016). Other scholars also affirmed that SMEs in Malaysia have a 30% to 50% higher workplace accident rate compared to the big industries (Khoo et al., 2011a; Surlenty, 2012). Moreover, Nor Azma et al. (2016) revealed that 77 % of the occupational accidents occur in the SMEs came for its small and micro segment with 40 % and 37% respectively.

SMEs serve as the backbone of the country's industrial development in Malaysia (Tahir et al., 2018), specifically in terms of providing relevant employment opportunities (Yusoff, Nejati, et al., 2020). The latest statistics show that SMEs contribute 48.8% to employment in Malaysia as reported by the SME Corp., constituting 16 million workers, which is above the national employment rate (Department of Statistic Malaysia, 2020). Recording the highest industrial accident cases in Malaysia every year (Hassan et al., 2019; Khoo et al., 2011a; Mat Saat et al., 2016; Nor Azma et al., 2016; Zulkifly et al., 2017) at about 60-70% (Aziz et al., 2015; Surlenty et al., 2011) puts SMEs in a vulnerable situation as accidents impose adverse impacts on their businesses in terms of financial and non-financial loss (Hussin et al., 2009; Mansur et al., 2011). As 98% of Malaysia's total business establishments are SMEs which contribute 36.6% to the national gross domestic product (GDP) (Che Omar et al., 2020), high accident rates could also impact their business performances and sustainabilities, thereby disrupting Malaysia's economic ecosystem (Rhaffor & Jamian, 2020). Hence, workplace accident issue within the SMEs is crucial to be tackled.



Financial constraints, lack of expertise and staffing capabilities (Surienty, 2019), lack of knowledgeable staff, the perceived difficulties to implement occupational safety and health (OSH) measures, perceived low workplace accident risks (Md Deros et al., 2014), and low level of safety awareness among employees (Surienty et al., 2011), are the main reasons for poor safety management in SMEs which have led to the occurrence of accidents. Beside that, poor safety behaviour has also been found to be the leading cause of accidents in SME manufacturing firms. Disobeying the safety procedures and failing to wear personal protective equipment properly (Hussin et al., 2009; Mansur et al., 2011; Zakaria et al., 2012), are among the unsafe behaviour that cause workplace accidents in manufacturing SMEs. On the other hand, Kidam et al. (2014) concluded that the human factor (i.e., poor safety attitude, lack of safety skills), and organisational failure (lack of safety knowledge, limited hazards/risk understanding), are among the safety issues existing in Malaysian manufacturing SMEs that have led to workplace accidents. Moreover, Shahlan et al. (2015) advocated that having safe working procedures and performing hazards identification and risk assessment, are the most crucial elements in OSH management of SMEs to improve safety behaviour. All these situations are due to the lack of safety management measures undertaken by the owner of the SMEs (N. Mohamed et al., 2016).

Studies on workplace accidents have been undertaken since the 1940s and scholars have concluded that it is mainly caused by unsafe behaviour and unsafe conditions (Bowonder, 1987; Gyekye, 2010; Heinrich, 1941) and Malaysia is not the exception (Abas et al., 2011; Ayob et al., 2018; Rampal et al., 2010; Zakaria et al., 2012). Hence, factors that influence safety behaviour of workers have been exhaustively investigated by previous researchers. It has been found that safety climate (Clarke, 2006b; M. D. Cooper & Phillips, 2004; Flin et al., 2000; C.-S. Lu & Tsai, 2010; C. S. Lu & Tsai, 2008; N. Mohamed et al., 2016; Andrew Neal & Griffin, 2006; Singh & Verma, 2019); safety management (Khoo et al., 2011b; Shang et al., 2011; Subramaniam et al., 2016a; Vinodkumar & Bhasi, 2010); and safety leadership (K. H. Abdullah & Aziz, 2020; S.-C. Chen, 2015; C.-S. Lu & Yang, 2010; Zulkifly et al., 2017) are the leading factors of safety behaviour. Besides, safety training has also been found as one of the substantial factors that influences safety behaviour (Choudry, 2014; Khoo et al., 2016; Mashi et al., 2018; von Thiele Schwarz et al., 2016). On other hand, Zerguine et al. (2016) revealed that workers' influence, work environment and conditions, contractors, supervisor's role, project managers, the organisation, and the community, are variables which have the potential to affect the safety behaviour of Malaysian employees. Apart from the variables, previous scholars have also identified that safety knowledge (K. H. Abdullah & Aziz, 2020; M. A. Griffin & Neal, 2000; Laurent et al., 2020; A. Neal et al., 2000; Vinodkumar & Bhasi, 2010); and safety attitude (Gharibi et al., 2017; Goh & Sa'adon, 2015; Hashim et al., 2020; Rau et al., 2018; Sugumaran et al., 2017), significantly influence the safety behaviour of workers.

The solutions to improve safety behaviour recommended by previous scholars are more appropriate for large firms (Legg et al., 2015). Given the limitations of SMEs as elaborated earlier, present research has suggested that an alternative approach which is tailored to their unique characteristics (Hasle et al., 2012) is crucial to enhance safety behaviour and furthermore reduce the number of accidents. Local scholars

(Subramaniam et al., 2016; Surlenty, 2019a; Zulkifly et al., 2018) has also highlighted the same idea. The alternative approach needs to be inexpensive, on-the-job, and practical without incurring a lot of resources (Hasle et al., 2012). Hence, a behavioural modification intervention programme is proposed by this research as the most appropriate approach for SMEs in Malaysia. Researchers have evinced that interventions focusing on behavioural safety have been implemented extensively, and verified that the behaviour-based safety (BBS) intervention has successfully prevented injuries in various industries (Abd Aziz et al., 2021; Duff et al., 1994; Komaki et al., 1978). Under this approach, the unsafe behaviour of workers, such as lack of adherence to safe working procedures, failure to wear personal protective equipment, and failure to comply with the safe operating procedures of using tools, vehicles, and machines (Ayob et al., 2018) can be handled and accidents in the workplace can be reduced.

In order to assist the SMEs in elevating their OSH level, the government, through the Department of Occupational Safety and Health (DOSH), has conducted a compliance support intervention programme to improve OSH performance (Zulkifly et al., 2018). The contents of the program consist of all modules related to OSH legal compliance. However, an intervention program to foster safety knowledge-attitude-behaviour (KAB) is advocated by this research to also be focussed on to ensure continuously good safety performance and to reduce the dependence on government assistance among the SMEs. As the main principle of the Occupational Safety and Health Act (OSHA) 1994 is to establish OSH self-regulations among the industries, this research proposed that establishing self-regulation practice among the supervisors through their safety leadership roles within the SMEs, as safety leadership has been as the most appropriate element to influence safety behaviour. The safety leadership approach is proposed because such an effective approach can be financially beneficial to the SMEs, whereby it positively affects employees' safety behaviour and attitude, reduces injury rates, and increases productivity (D. Cooper, 2015). Moreover, safety leadership approach utilises internal resource (leaders) to manage OSH through self-regulation and it would turn out to be inexpensive and sustainable which is deemed to be appropriate for SMEs (Zulkifly et al., 2017). Previously, Zulkifly et al., (2017) have conducted a study examining safety leadership roles of the owner-manager of SME manufacturing in Negeri Sembilan, Malaysia; whereby the results revealed that safety policy, safety concern, and safety motivation of safety leadership have significantly influenced safety behaviour of workers. Present study proposed to the significant role of supervisors' safety leadership, namely safety coaching, safety, concern, and safety monitoring towards safety knowledge-attitude-behaviour (KAB) among workers in SME manufacturing firms in the northern region of Malaysia. Furthermore, the results obtained would lead to the development of an intervention module specifically to cater the limitations of SME firms in improving their safety performance. Lastly the empirically and theoretically driven module would be tested in the SME manufacturing to determine its effectiveness.

## **1.2 Problem Statement**

As elaborated in the previous section, manufacturing sector has become the workplace with the highest accident cases in Malaysia for decades. Furthermore, almost 80% of the accidents are coming from the SMEs (Rhaffor & Jamian, 2020), henceforth, main causes

of accident need to be determined and factors towards it must be seriously addressed to reduce the number of accidents. Accident has been renewed to impose negative adverse impact towards SMEs including Malaysia (Hussin et al., 2009; Khoo et al., 2011a; Mansur et al., 2011; Zakaria et al., 2012) in terms of financial and non-financial and furthermore affect the sustainability of their business. Therefore, tackling workplace accident in the SMEs is crucial as the sector has a substantial contribution towards the country's economy (Nor Azma et al., 2016; Tahir et al., 2018; Yusoff, Abdullah, et al., 2020).

Previous scholars affirmed that unsafe behaviours such as not following safety procedures and fail to wear personal protective equipment (PPE) is the main cause of accidents in Malaysia's SMEs, specifically the manufacturing sectors (Mansur et al., 2011; Zakaria et al., 2012). For example, Zakaria et al., (2012) revealed that individual factors namely unsafe acts and work-related stress are the main causes of accidents in SME manufacturing in Malaysia. Moreover, lack of awareness and safety knowledge have been reviewed as the substantial factors of unsafe behaviour among manufacturing workers Klang Valley and Johor, Malaysia (Yeow et al., 2020). Similar situation was also found among the SMEs in the northern region in Malaysia (Surienty, 2019).

Thus, scholars have advocated that safety behaviour should be seriously addressed and prompt actions need to be taken towards SME manufacturing workers (Khoo et al., 2016; Subramaniam et al., 2016a) in order to reduce accident cases in Malaysia. In addressing safety behaviour, previous studies have found the association of safety management practices (Subramaniam et al., 2016; Surienty, 2012a, 2019b); safety training (Khoo et al., 2016) safety communication & safety procedure (Hassan et al., 2019); and safety behaviour within Malaysia's manufacturing SMEs. Safety leadership of the owner managers has also been found to predict safety behaviour among manufacturing SMEs workers in a state in Malaysia (Zulkifly et al., 2017).

Beside those factors, Kidam et al. (2014) revealed that the human factor (i.e., poor safety attitude, lack of safety skills), and organisational failure (lack of safety knowledge, limited hazards/risk understanding), are the main causes towards workplace accidents in Malaysia's manufacturing SMEs. This finding is in congruent with the statement of Mohammadfam et al. (2017), concluding that safety knowledge in terms of hazard identification, following safe working procedures, and wearing personal protective equipment immensely influence safety behaviour. In addition, safety knowledge in combined with safety attitude is concluded to result in the highest possible proportion of safety behavior among employees (Mohammadfam et al., 2017; Stranks, 2007).

The constraints faced specifically in terms of financial muscle and human resources refrain the SMEs from having insufficient and non-effective safety programs (Wang et al., 2018). Moreover, the owner-managers and their management team need to possess adequate knowledge in OSH to ensure good safety management of SMEs. The employers manage workplace safety by themselves without having in-house safety experts or safety personnel. These facts lead the scholars and practitioner to advocate

that unique approach need to be established for SMEs. Moreover, the solutions to improve safety behaviour recommended by previous scholars are more appropriate for large firms (Legg et al., 2015) and do not cater to the limitations of SMEs. Therefore, given the limitations of SMEs as elaborated earlier, present research has suggested that an alternative approach which is tailored to their unique characteristics (Hasle et al., 2012) is crucial to enhance safety behaviour and furthermore reduce the number of accidents. local scholars (Subramaniam et al., 2016; Surlenty, 2019a; Zulkifly et al., 2017) has also highlighted the same idea and furthermore the alternative approach needs to be inexpensive, on-the-job, and practical without incurring a lot of resources (Hasle et al., 2012). A lot of studies have identified that employees in SMEs are more frequently exposed to workplace hazards. They also suffer more work-related injuries and illnesses that employees in larger enterprises (Hasle & Limborg, 2006). Moreover, SME manufacturing was selected to be focused on this study was particularly chosen because of the high occupational accidents and injuries reported (Khoo et al., 2011a; Subramaniam et al., 2016b).

The role of the safety leadership in fostering workers' safety behaviour has been found to be crucial (Khoo et al., 2016), including in Malaysia's SME manufacturing (Zulkifly et al., 2017). Thus, improving safety leadership among supervisor is needed to overcome other limitations faced by SMEs that hinder them to perform safety behaviour modification program. The simple organisational structure of SMEs can enable supervisors to exert control over their subordinates more easily using safety rules and procedures (Khoo et al., 2011a) and this situation would make transformation of safety behaviour within the SMEs possible without involving high cost as well as a lot of resources. In addition, Krause (2005) affirmed that safety leadership is the key factor in succeeding any safety program organised by the organisations.

Based on the conclusion made by Geller et al., (2012), an injury-free workplace requires attention to three domains: the environment (including tools, equipment and climate of the work setting), the person (including knowledge, attitudes, beliefs and personality) and behavior (including safe and at-risk work practices, as well as interpersonal conversation). The factors in these three domains are interactive, dynamic and reciprocal, and determine an organization's culture. Therefore, present research proposed that an improved safety knowledge and safety attitude could increase safety behaviour in the SMEs.

Supporting the proposal, the owner of Theory of Planned Behaviour (TPB) Ajzen (1991) postulated three variables, namely attitude toward behaviour, subjective norms, and perceived behavioural control could directly influence the intention to perform actual behaviour. Besides, Bandura (1977) who established Social Learning Theory stated that people could learn from their interactions with others in a social context, by observing the behaviour of others and developing similar behaviour. Bandura (1999) further focused on how people manoeuvre cognitively their social experiences which influence their behaviour and established the Social Cognitive Theory. Bandura (1978) also elaborated on the concept of self-efficacy, stating that every behavioural change is formed by the influence of performance accomplishment, vicarious experience, verbal

persuasion, and emotional arousal, which are categorised as stimuli. These stimuli would cause cognitive appraisal in terms of predicting the consequences of behaviour, hence driving a person to commit or refrain from the particular behaviour.

Besides those literature and theories, a mediation safety climate model developed by Fugas et al. (2012) proposes that safety behaviour of workers is influenced by proximal situational factors (i.e., supervisor/co-workers' descriptive norms), and mediated by proximal person-related factors (i.e., attitude towards behaviour and perceived behavioural control). Specifically, injunctive norms refer to the perceived approval of safety behaviour (Fugas et al., 2011) where supervisors prescribe the dos and don'ts of any behaviour related to safety (Harith & Mahmud, 2020). On another hand, Christian et al. (2009) established an integrated safety management model whereby safety leadership is proposed to predict safety behaviour, mediated by safety knowledge and safety motivation, and this is recently proved by a study conducted among staff laboratory in Malaysia (K. H. Abdullah & Aziz, 2020). On the other hand, safety leadership was also found to influence safety attitude and safety behaviour (Li et al., 2020). Based on these empirical evidences, safety knowledge and safety attitude should be instilled by the management of SMEs, as these factors could boost safety behaviour.

Based on those theoretical and practical arguments also, this research develops a safety behaviour intervention approach for manufacturing SMEs. The intervention approach includes the role of the supervisor's safety leadership to improve safety knowledge and safety attitude, as well as safety behaviour among workers. This approach is still novel but has the potential to be effective as safety leadership is considered as the most effective approach towards controlling industrial injuries (Beus et al., 2016). Mullan et al. (2015) affirmed that a theoretically and empirically driven intervention module development is lacking in the OSH research area. Previous scholars have revealed that safety behaviour intervention programmes could reduce industrial accidents (Anwar Siddiqui, 2015; Choudry, 2014; Ismail & Hashim, 2012; Luria et al., 2008; Oostakhan et al., 2012; Sivanathan et al., 2005; Zin & Ismail, 2012; Zohar & Luria, 2003). Besides a few cross-sectional studies, only one intervention study has been undertaken on SME manufacturing in Malaysia by Zulkifly et al. (2018). Moreover, most of the safety behaviour intervention studies were found lacked in validity as they were conducted without control groups for comparison purposes (M. D. Cooper, 2009).

In conclusion, studies on the relationship between safety leadership and safety behaviour, involving safety attitude and safety knowledge, are still not widely available. Thus, present research could fill the knowledge gap. Moreover, a safety behaviour intervention module tailored to SMEs, which is theoretically and empirically driven, has yet to be found. Thus, a design and develop research (Richey & Klein, 2014) must be performed where the intervention process would determine the causal effect to solve the problems (Hasle & Limborg, 2006). As stated by Legg et al. (2010), safety intervention programmes for small enterprises need to designed theoretically and the effects must be evaluated. Moreover, the intervention models/modules for small enterprises could be more successful if they appear to be tailored, action and participatory-oriented, low-cost, and based on feedback (Hasle et al., 2012; Hasle & Limborg, 2006; Masi et al., 2014).

The module is proposed to utilise the safety leadership roles of supervisors to improve safety knowledge and safety attitude of SME workers through their social learning process, in which the contents have been identified and validated through the consensus of experts. This module must also cover SME limitations as well as their over-dependence on the government and its enforcement agencies. Such an intervention module is crucial as the safety behaviour approach is believed to be more sustainable in reducing accidents in SMEs; it has a greater focus on self-regulations and the improvement of cognitive factors of workers (Bandura, 2010, 2013). Therefore, this research took the initiative to conduct an intervention study to ensure the usability and effectiveness of the developed module to be applied by the SME manufacturing in Malaysia to fulfil the practical gap elaborated by previous scholars.

### **1.3 Research Questions**

Considering the problem statement elaborated in previous section, several pertinent research questions are listed as follows:

#### **1.3.1 Research Questions Phase 1**

- 1) What is the existing level of safety leadership, safety knowledge, safety attitude, and safety behaviour among SME manufacturing workers?
- 2) Does safety leadership of supervisors affect safety knowledge, safety attitude, and safety behaviour of SME manufacturing workers?
- 3) Does safety knowledge and safety attitude mediate the effects of safety leadership on safety behaviour among SME manufacturing workers?

#### **1.3.2 Research Questions Phase 2**

- 1) Are the contents of Occupational Hazard Self Evaluation Module (OHSEM) appropriate for the research context?
- 2) Are the contents of OHSEM valid for the research context?
- 3) Are the contents of OHSEM usable for the research context?

#### **1.3.3 Research Questions Phase 3**

- 1) Is there any difference in the level of safety knowledge, safety attitude, and safety behaviour (safety KAB) among SME manufacturing workers between the intervention group and control group post-OHSEM intervention?
- 2) Is there any difference in the relationship between safety leadership and safety knowledge, safety attitude, and safety behaviour (safety KAB) among SME manufacturing workers post-intervention compared to pre-intervention?

## **1.4 General Objectives of the Study**

The main objective of this research is to design and develop an intervention module to foster safety KAB among SME manufacturing workers through the roles of safety leadership by the supervisors. Specifically, this research outlined specific objectives, which are described according to the phases of study, as follows:

### **1.4.1 Research Objectives Phase 1**

- 1) To determine the level of supervisors' safety leadership and workers' self-reported safety knowledge-attitude behaviour (safety KAB) in the SME manufacturing sector.
- 2) To investigate the inter-variable effect of supervisors' safety leadership and workers' safety knowledge, safety attitude, and safety behaviour (safety KAB) on the SME manufacturing sector.

### **1.4.2 Research Objectives Phase 2**

- 1) To design and develop a valid Occupational Hazard Self Evaluation Module (OHSEM).
- 2) To determine the usability of Occupational Hazard Self Evaluation Module (OHSEM).

### **1.4.3 Research Objectives Phase 3**

- 1) To implement OHSEM intervention for SME manufacturing workers.
- 2) To evaluate the effectiveness of the OHSEM intervention.

## **1.5 Significance of Study**

First, this research contributes by establishing an empirical model of safety behaviour involving safety leadership, safety knowledge, and safety attitude. It is hoped that the results of this study can serve as empirical reference for the relationship between the safety leadership and safety behaviour. Specifically, this study offers empirical evidence on the mediating role of safety knowledge as well as safety attitude in the relationship between safety leadership and safety behaviour. Additionally, this research results would pave the way towards the understanding of the direct impact of the safety leadership on safety knowledge as well as safety attitude, which has not been fully investigated by previous researchers. The valid and reliable instrumentation established in this research could also be replicated or adapted by other researchers in the future.

Second, the present study contributes to the body of knowledge by empirically determine the level of safety leadership, safety knowledge, safety attitude and safety behaviour among the SMEs in Malaysia. Previous studies have also determined the level of safety leadership and safety behaviour (Khoo et al., 2011b; Zulkifly et al., 2017). Whereas the level of safety knowledge and safety attitude have not yet studied. Moreover, this study has simultaneously tested the impact of safety leadership together with safety knowledge as well as safety attitude on safety behaviour in a higher-order approach which has minimally been explored by previous researchers.

Third, this research addresses the problems in manufacturing SMEs in Malaysia by developing a safety KAB intervention module to enhance their safety performance through the role of safety leadership among supervisors. The module is empirically developed and theoretically driven, whereby such a module is not available in the country. The developed module has taken into consideration all limitations of the SMEs and is deemed to be one of the inexpensive yet effective approaches to fill the gaps in OSH performance of SME manufacturing.

This research commenced the DDR methodology, and developed the module based on the empirical results obtained in the needs analysis phase. The developed module was tested in the manufacturing SMEs context by conducting a quasi-experimental design. The module was also validated by applying the modified *Fuzzy Delphi Methodology* (FDM) together with its usability for the research context. Previously, very few studies have applied the DDR approach to develop a safety intervention module, specifically in terms of safety KAB. Therefore, this research outputs contributes methodologically to the body of knowledge.

Furthermore, the findings and output of this research could serve as a preliminary reference to related agencies, such as the DOSH, National Institute of Occupational Safety and Health (NIOSH), and the Social Security Organisation (SOCSO), for the purpose of policymaking. In addition, the developed module could be included as a supporting module for future compliance support programmes conducted by DOSH for manufacturing SMEs as the existing modules are lacking in terms of inculcating safety behaviour elements.

Lastly, the study contributes by extending existing behaviour modification theories, namely Theory of Planned Behaviour, Social Learning Theory, Social Cognitive Theory, and Self-Efficacy Theory.

## **1.6 Scope of Study**

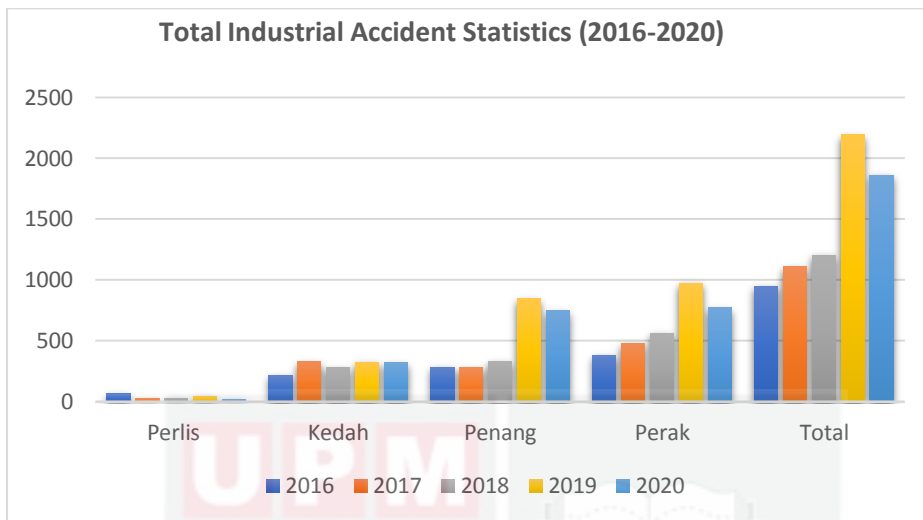
The main scope of this study is to assess the relationship between safety leadership roles of supervisors and safety knowledge, safety attitude, and safety behaviour (safety KAB)



of workers. The measured variables of this research are safety leadership and safety KAB using a reliable and valid questionnaire.

Though this study involves the SME population throughout three main northern states of Malaysia (Perlis, Kedah, and Pulau Pinang) and the northern region of Perak, the sampling frame is limited to small and micro-manufacturing firms registered with “OSH Compliance Support” programme organised by DOSH. As explained in the previous section, statistics show that the manufacturing sector is the largest contributor to workplace accidents in Malaysia (Abas et al., 2008, 2011). Moreover, the SME sector contributes to the largest percentage of industrial accidents in Malaysia (Hassan et al., 2019; Subramaniam et al., 2016; Surlenty, 2019b; Zulkifly et al., 2017). Thus, the study context of this research is SME manufacturing workers. The details of the research samples, as well as the inclusion and exclusion criteria are discussed in Chapter 3.

In terms of study location, the present research was carried out in the northern region of Malaysia, specifically among the SMEs operating in the Northern Corridor Economic Region (NCER). In the Mid-term Review of the Ninth Malaysia Plan, five corridors were announced: the NCER in northern Peninsular Malaysia, Iskandar Malaysia (IM) in the south with; East Coast Economic Region (ECER) on the east coast of the peninsula, Sarawak Corridor of Renewable Energy (SCORE), and Sabah Development Corridor (SDC). According to Athukorala and Narayanan (2017), of the five corridors, only NCER and ECER focus on the development across several states; while SCORE and SDC only represent one state each, and IM covers only part of the Johor state. Comparing NCER to ECER, the former is at a relatively advanced stage in implementation, where in terms of the manufacturing sector, the average contribution to the GDP of the NCER is 31.6%, higher than the national GDP (23.2%). For 2021, the NCER has forecasted a robust development led by the manufacturing sector, which could also boost the development of SMEs (Northern Corridor Implementation Authority, 2021). In terms of OSH, industrial accidents in Perlis, Kedah, Penang, and Perak, have been showing an increasing trend since 2016 to 2020 (Department of Occupational Safety and Health, 2020; Department of Occupational Safety and Health Malaysia, 2016). Figure 1.2 illustrates the trend of industrial accidents in the northern region of Malaysia.



**Figure 1.2 : Industrial Accident Trend 2016-2020**

Based on these facts, the present research was conducted on SME manufacturing workers in the NCER.

## 1.7 Definition of Terms

### Safety Leadership

Conceptual Definition : Safety leadership refers to behaviour of interaction between leaders and followers, where the former could influence the latter to react or behave toward achieving organisational safety goals (D. Cooper, 2015).

Operational Definition: A process where leaders at the workplace exert their leadership attributes to influence the workers to increase their safety performance at work in order to prevent workplace accidents. Safety leadership is measured by the workers' perception of their supervisors, or managers' leadership attributes towards workplace safety practices. The dimensions are safety concern, safety coaching and safety monitoring.

### Safety Behaviour

Conceptual Definition: Safety behaviour is the action committed by the employees during work to avoid accidents or injury (Khdaier et al., 2011; C. S. Lu & Yang, 2010; Zulkifly et al., 2017)

Operational Definition: Safety behaviour is action committed or taken by the employees to ensure their work safety. The actions are namely complying with safety related rules and procedures as well as wearing appropriate personal protective equipment. Furthermore, it refers to the participation of workers in improving workplace safety, such as correcting/reporting unsafe acts, unsafe conditions as well as encouraging co-workers to work safely.

### **Safety Knowledge**

Conceptual Definition: Knowledge can be divided into explicit and tacit where the former refers to the academic knowledge obtained from formal education, while the latter refers to subjective knowledge earned from experience (Huang & Yang, 2019). The ability to identify workplace hazards is one of the examples of tacit knowledge (Hadikusumo & Rowlinson, 2004). Kulkarni et al. (2016) summarised that safety knowledge is the capability of workers to recognise the risks that they are exposed to while working and performing the work according to safe working procedures.

Operational Definition: Safety knowledge is the awareness, conscientiousness, or cognisance among the employees towards hazards related to their work and the ability to identify such hazards and determining the suitable countermeasures in order to avoid or prevent themselves and other people from accidents at the workplace.

### **Safety Attitude**

Conceptual Definition: Safety attitude refers to the workers' positive or negative tendency to act or behave towards a safety goal, procedure and all matters related to accident prevention, including their self-control ability to maintain safety behaviour (Kao et al., 2019; Rau et al., 2018; Sawhney & Cigularov, 2019)

Operational Definition: Safety attitude is the belief in the importance of controlling unsafe acts and unsafe conditions so as to prevent workplace accidents.

## **1.8 Summary**

Occupational accidents are serious in Malaysia, whereby the manufacturing sector is the largest contributor. Moreover, manufacturing SMEs constitute the largest percentage of the accidents. The different characteristics of SMEs, especially in terms of financial constraints, as well as limited resources, hinder the firms from implementing an effective OSH management. Thus, this situation causes more accidents as compared to large firms. Accidents in workplaces are mainly caused by unsafe acts committed by the workers and safety leaders' attributes are found to be the most effective predictors that influence safety behaviour among the workers. Beside safety leadership, safety behaviour is also predicted by safety knowledge and safety attitude. Therefore, this study empirically

developed an intervention module specifically to increase workers' safety knowledge, attitude, and behaviour, which could reduce workplace accidents within the SME manufacturing sector. This research tested the newly developed module to determine the efficacy of the intervention module in increasing safety KAB among the workers.

In addition, this study offers an intervention module for the SME manufacturing sector. Thus, it contributes to DOSH as the policymaker in their formulation of strategies and effective modules towards self-regulation, specifically in terms of safety leadership and safety behaviour to achieve a "preventive culture". The results of this study could be used as the basis for designing appropriate programmes towards the fulfilment of the next Strategic Plan of Occupational Safety and Health for Small and Medium Enterprises. Furthermore, this OHSEM module could be offered as a complementary module for DOSH to be included in the OSH "compliance support" programme for SMEs.

## REFERENCES

- Ab Hamid, M. R., Sami, W., & Mohmad Sidek, M. H. (2017). Discriminant validity assessment: Use of fornell & larcker criterion versus HTMT criterion. *Journal of Physics: Conference Series*. <https://doi.org/10.1088/1742-6596/890/1/012163>
- Abas, A. B. L., Said, A. R. B. M., Mohammed, M. A. B. A., & Sathiakumar, N. (2008). Occupational disease among non-governmental employees in Malaysia: 2002-2006. *International Journal of Occupational and Environmental Health*, 14(4), 263–271. <https://doi.org/10.1179/oeh.2008.14.4.263>
- Abas, A. B. L., Said, A. R. B. M., Mohammed, M. A. B. A., & Sathiakumar, N. (2011). Non-fatal occupational injuries among non-governmental employees in Malaysia. *International Journal of Occupational and Environmental Health*, 17(1), 38–48. <https://doi.org/10.1179/107735211799031095>
- Abd-mutalib, H., Zuriana, C., Jamil, M., Mohammad, R., Norfatin, S., & Ismail, A. (2017). Attitude, subjective norms, perceived behavioral control and intention to share environmental knowledge: accounting students' perspective. *International Journal of Business and Management*, 1(2), 189–196. <https://doi.org/10.26666/rmp.ijbm.2017.2.29>
- Abd Aziz, F. S., Abdullah, K. H., & Samsudin, S. (2021). Bibliometric analysis of behavior-based safety (BBS): Three decades publication trends. *Webology*, 18(Special Issue), 278–293. <https://doi.org/10.14704/WEB/V18SI02/WEB18072>
- Abdul-Mutalib, N. A., Abdul-Rashid, M. F., Mustafa, S., Amin-Nordin, S., Hamat, R. A., & Osman, M. (2012). Knowledge, attitude and practices regarding food hygiene and sanitation of food handlers in Kuala Pilah, Malaysia. *Food Control*, 27(2), 289–293. <https://doi.org/10.1016/j.foodcont.2012.04.001>
- Abdullah, I. H. T., Mat Zin, S., Che Mat, R., & Wan Alias, W. N. I. (2022). Role of health and safety management practices in safety performance of Malaysian bumiputera SMEs. *International Journal of Academic Research in Business and Social Sciences*, 12(1). <https://doi.org/10.6007/ijarbss/v12-i1/11854>
- Abdullah, K. H., & Aziz, F. S. A. (2020). Safety behavior in the laboratory among university students. *Journal of Behavioral Science*, 15(3), 51–65.
- Abdullah, M. S., Othman, Y. H., Osman, A., & Salahudin, S. N. (2016). Safety culture behaviour in electronics manufacturing sector (EMS) in malaysia: The case of flextronics. *Procedia Economics and Finance*, 35(March), 454–461. [https://doi.org/10.1016/s2212-5671\(16\)00056-3](https://doi.org/10.1016/s2212-5671(16)00056-3)
- Abdullah, N. H., Hassan, H., Ali, M. H., & Karim, M. S. A. (2014). Cultural values (power distance) impact on the stakeholders' engagement in organizing the monsoon cup international sailing event. *Procedia - Social and Behavioral*

*Sciences*, 144, 118–126. <https://doi.org/10.1016/j.sbspro.2014.07.280>

- Abdullahi, A., Hassan, A., Kadarman, N., Saleh, A., Baraya, Y. S., & Lua, P. L. (2016). Food safety knowledge, attitude, and practice toward compliance with abattoir laws among the abattoir workers in Malaysia. *International Journal of General Medicine*, 9, 79–87. <https://doi.org/10.2147/IJGM.S98436>
- Abere, B. W., Nwaogazie, I. L., & Akaranta, O. (2017). Effect of behaviour-based safety intervention in pipeline operation sites in Nigeria. *International Journal of Health, Safety and Environments (IJHSE)*, 3(6), 111–127. [www.academiascholarlyjournal.org/ijhse/index\\_ijhse.htm](http://www.academiascholarlyjournal.org/ijhse/index_ijhse.htm)<http://www.drji.org> Also Available @ [https://archive.org/details/Abere\\_et\\_al\\_201709](https://archive.org/details/Abere_et_al_201709)
- Adler, M., & Ziglio, E. (1986). *Gazing into the oracle: the Delphi method and its application to social policy and public health*. Jessica Kingsley Publishers.
- Ahn, K. (2013). The mediating effect of safety motivation on the relationship between transformational leadership and safety participation. *J.Korea Saf.Manag.Sci*, 15(4), 217–224. <https://doi.org/10.12812/ksms.2013.15.4.217>
- Ajzen, I. (1991). The theory of planned behavior. *Organisational Behaviour and Human Decision Process*, 50, 179–211. <https://doi.org/10.1080/10410236.2018.1493416>
- Ajzen, I. (2020). The theory of planned behavior: Frequently asked questions. *Human Behavior and Emerging Technologies*, 2(4), 314–324. <https://doi.org/10.1002/hbe2.195>
- Ajzen, I., Joyce, N., Sheikh, S., & Cote, N. G. (2011). Knowledge and the prediction of behavior: The role of information accuracy in the theory of planned behavior. *Basic and Applied Social Psychology*, 33(2), 101–117. <https://doi.org/10.1080/01973533.2011.568834>
- Akker, J. van den, Bannan, B., Kelly, A. E., Nieveen, N., & Plomp, T. (2007). An introduction to educational design research. In N. Nieveen & T. Plomp (Eds.), *Proceedings of the seminar conducted at the East China Normal University, Shanghai (PR China), November 23-26, 2007*. Netzodruk, Enschede.
- Aksorn, T., & Hadikusumo, B. H. W. (2008). Critical success factors influencing safety program performance in Thai construction projects. *Safety Science*, 46(4), 709–727. <https://doi.org/10.1016/j.ssci.2007.06.006>
- Alavi, S. S., Taghizadeh Dabbagh, S., Abbasi, M., & Mehrdad, R. (2016). Radiation protection knowledge, attitude and practice (RP-KAP) as predictors of job stress among radiationworkers in Tehran Province, Iran. *Iranian Red Crescent Medical Journal*, 18(10). <https://doi.org/10.5812/ircmj.29394>
- Alias, N. A. (2012). Design of a motivational scaffold for the malaysian e-learning environment. *Educational Technology and Society*, 15(1), 137–151.

- Alidrisi, H. M., & Mohamed, S. (2018). Systematic review of safety leadership: A fresh perspective. *8th International Conference on Engineering, Project, and Product Management (EPPM 2017)*, 0, 215–223. [https://doi.org/10.1007/978-3-319-74123-9\\_23](https://doi.org/10.1007/978-3-319-74123-9_23)
- Aliyu, A. A., Bello, M. U., Kasim, R., & Martin, D. (2014). Positivist and non-positivist paradigm in social science research: conflicting paradigms or perfect partners? *Journal of Management and Sustainability*, 4(3). <https://doi.org/10.5539/jms.v4n3p79>
- Alli, B. O. (2008). *Fundamental principles of occupational safety and health* (2nd ed.). International Labour Office.
- Aluko, O. O., Adebayo, A. E., Adebisi, T. F., Ewegbemi, M. K., Abidoye, A. T., & Popoola, B. F. (2016). Knowledge, attitudes and perceptions of occupational hazards and safety practices in Nigerian healthcare workers. *BMC Research Notes*, 9(1). <https://doi.org/10.1186/s13104-016-1880-2>
- Aminuddin, M. (2013). *Malaysian industrial relations & employment law* (8th ed.). McGraw-Hill (Malaysia) Sdn. Bhd.
- Anwar Siddiqui, N. (2015). A study on behavior based safety in refinery. *International Journal on Occupational Health & Safety, Fire & Environment. – Allied Science Int J OHSFE-Allied Sci*, 6(1). [www.ohsfejournal.com](http://www.ohsfejournal.com)
- Arezes, P. M., & Sérgio Miguel, A. (2003). The role of safety culture in safety performance measurement. *Measuring Business Excellence*, 7(4), 20–28. <https://doi.org/10.1108/13683040310509287>
- Arocena, P., & Núñez, I. (2010). An empirical analysis of the effectiveness of occupational health and safety management systems in SMEs. *International Small Business Journal*, 28(4), 398–419. <https://doi.org/10.1177/0266242610363521>
- Asian Development Bank. (2020). *Asia small and medium-sized enterprise monitor 2020: Volume 1-country and regional reviews* (Vol. 1, Issue October). <https://www.adb.org/publications/asia-sme-monitor-2020-country-regional-reviews%0Ahttps://www.adb.org/sites/default/files/publication/646146/asia-sme-monitor-2020-volume-1.pdf%0Ahttps://www.adb.org/publications/asia-sme-monitor-2020-country-regional-revie>
- Athukorala, P. C., & Narayanan, S. (2017). *Economic corridors and regional development: The Malaysian experience* (No. 520; ADB Economics Working Paper Series).
- Awang, N., Zamzani, N. M. N., & Baharudin, M. R. (2017). Awareness of safety management and safety behaviour among Malaysian small and medium enterprise workers. *Journal Occupational Safety & Health*, 14(1), 9–16. <http://www.ghbook.ir/index.php?name=مجموعه مقالات دومین هم اندیشی سراسری و تلویزیون رسانه>

- Awang, Z., Rahlin, N. A., & Afthanorhan, A. (2019). Conceptual framework for the best practices of behavior-based safety performance evaluation in small and medium enterprises (SMES). *Journal of Applied Engineering Science*, 17(4), 504–513. <https://doi.org/10.5937/jaes17-19962>
- Ayob, A., Shaari, A. A., Zaki, M. F. M., & Munaaim, M. A. C. (2018). Fatal occupational injuries in the Malaysian construction sector-causes and accidental agents. *IOP Conference Series: Earth and Environmental Science*, 140(1). <https://doi.org/10.1088/1755-1315/140/1/012095>
- Aziz, A. A., Baruji, M. E., Abdullah, M. S., Him, N. F. N., & Yusof, N. M. (2015). An initial study on accident rate in the workplace through occupational safety and health management in sewerage services. *International Journal of Business and Social Science*, 6(2), 249–255.
- Bahari, I. (2002). *Pengaturan sendiri di dalam pengurusan keselamatan dan kesihatan pekerjaan*. McGraw-Hill (Malaysia) Sdn. Bhd.
- Bahari, I. (2006). *Pengurusan keselamatan dan kesihatan pekerjaan*. McGraw-Hill (Malaysia) Sdn. Bhd.
- Bakri, A., Zin, R. M., Misnan, M., & Mohammed, A. (2006). Occupational safety and health (OSH) management systems: Towards development of safety and health culture. *6th Asia-Pacific Structural Engineering and Construction Conference, September*, 5–6. <http://eprints.utm.my/520/>
- Bandura, A. (1971). Social learning: theory. in *general learning press*. General Learning Press. <https://doi.org/10.1016/B978-0-12-813251-7.00057-2>
- Bandura, A. (1977a). Bandura - Social learning theory. In *Prentice-Hall*. Prentice-Hall. [https://doi.org/10.1016/s0005-7894\(70\)80095-8](https://doi.org/10.1016/s0005-7894(70)80095-8)
- Bandura, A. (1977b). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*. <https://doi.org/10.1037/0033-295X.84.2.191>
- Bandura, A. (1978). Self-efficacy: Toward a unifying theory of behavioral change. *Advances in Behaviour Research and Therapy*, 1, 139–161. <https://doi.org/10.1017/S0003055400259303>
- Bandura, A. (1986). Social foundations of thought and action : a social cognitive theory / Albert Bandura. *New Jersey: Prentice-Hall, 1986*.
- Bandura, A. (1989). *Human agency in social cognitive theory*. Prentice-Hall. <https://doi.org/10.1037/0003-066X.44.9.1175>
- Bandura, A. (1991). Social cognitive theory of self-regulation. *Organizational Behavior and Human Decision Processes*, 50(2), 248–287. [154](https://doi.org/10.1016/0749-</a></p></div><div data-bbox=)



- Bandura, A. (1997). Self-Efficacy: the exercise of control. *Springer Reference*.
- Bandura, A. (2001). Social cognitive theory of mass communication. In *Media Psychology*. [https://doi.org/10.1207/S1532785XMEP0303\\_03](https://doi.org/10.1207/S1532785XMEP0303_03)
- Bandura, A. (2010). Self-efficacy -Bandura. *The Corsini Encyclopedia of Psychology*. <https://doi.org/10.9780470479216>.
- Bandura, A. (2013). *Self-efficacy and social cognitive theories*. PennState.
- Bartlett, J. E., Kotrlík, J. W., & Higgins, C. C. (2001). Organizational research: determining appropriate sample size in survey research. *Information Technology, Learning, and Performance Journal*, 19(1), 43–50. <https://doi.org/10.1007/BF00471876>
- Basiran, A., Baharudin, M. R., & Anwar, F. (2015). *Occupational safety & health management system –Practical guide for implementation*. McGraw Hill.
- Basit, A., Sebastian, V., & Hassan, Z. (2018). Impact of training on employee performance : A case study of private organization in Sri Lanka. *IOSR Journal of Business and Management*, 4(6), 646–661.
- Bass, B. M. (1990). From transactional to transformational leadership: Learning to share the vision. *Organisational Dynamics*, 18(3), 19–31.
- Bass, B. M., & Avolio, B. J. (1994). *Improving organizational effectiveness through transformational leadership*. Sage Publication Inc.
- Bass, B. M., & Riggio, R. . (2006). *Transformational leadership (2nd ed)*. Lawrence Erlbaum Associates.
- Behery, M. H. (2012). Leadership behaviors that really count in an organization's performance in the Middle East. *Journal of Leadership Studies*, 2(2), 6–21. <https://doi.org/10.1002/jls>
- Best, J. W., & Kahn, J. V. (2006). *Research in education* (10th ed.). Pearson Education Inc. [www.ablongman.com/researchnavigator.com](http://www.ablongman.com/researchnavigator.com).
- Bettinghaus, E. P. (1986). Health promotion and the knowledge-attitude-behavior continuum. *Preventive Medicine*, 15(5), 475–491. [https://doi.org/10.1016/0091-7435\(86\)90025-3](https://doi.org/10.1016/0091-7435(86)90025-3)
- Beus, J. M., McCord, M. A., & Zohar, D. (2016). Workplace safety: A review and research synthesis. *Organizational Psychology Review*, 1–30. <https://doi.org/10.1177/2041386615626243>
- Bhagawati, B. (2015). Basics of occupational safety and health. *IOSR Journal of Environmental Science Ver. I*, 9(8), 2319–2399. <https://doi.org/10.9790/2402->

- Bilgiç, R., Bulazer, M. B., Bürümlü, E., Öztürk, İ., & Taşçıoğlu, C. (2018). The effects of leadership on safety outcomes: The mediating roles of trust and safety climate. *International Journal of Occupational Safety and Health*, 6(1), 8–17. <https://doi.org/10.3126/ijosh.v1i1.13812>
- Bloom, B. J. (1976). *Human characteristics and school learning*. McGraw Hill.
- Bloom, B. J., Englehart, M. D., Frost, E. J., Hill, W. H., & Krathwol, D. . (1956). Taxonomy of educational objectives : The classification of educational goals. In B. S. Bloom (Ed.), *Longman*. [https://doi.org/10.1300/J104v03n01\\_03](https://doi.org/10.1300/J104v03n01_03)
- Bloom, B. J., Hastings, J. T., & Madaus, G. . (1971). *Handbook on formative and summative evaluation of student learning*. McGraw Hill.
- Boateng, G. O., Neilands, T. B., Frongillo, E. A., Melgar-Quiñonez, H. R., & Young, S. L. (2018). Best practices for developing and validating scales for health, social, and behavioral research: A Primer. *Frontiers in Public Health*, 6(June), 1–18. <https://doi.org/10.3389/fpubh.2018.00149>
- Bojadziev, G., & Bojadziev, M. (2007). Fuzzy logic for business, finance, and management (advances in fuzzy systems - applications and theory). In *Journal of Materials Processing Technology* (Vol. 1, Issue 1). World Science Publishing.  
<http://dx.doi.org/10.1016/j.cirp.2016.06.001>  
<http://dx.doi.org/10.1016/j.pwtrec.2016.12.055>  
<https://doi.org/10.1016/j.ijfatigue.2019.02.006>  
<https://doi.org/10.1016/j.matlet.2019.04.024>  
<https://doi.org/10.1016/j.matlet.2019.127252>  
<http://dx.doi.org/10.1016/j.pwtrec.2016.12.055>
- Bolarinwa, O. A. (2020). Sample size estimation for health and social science researchers: The principles and considerations for different study designs. *Niger Postgrad Med J*, 27, 67–75. <https://doi.org/10.4103/npmj.npmj>
- Boone, H. N., & Boone, D. (2012). Analyzing likert data. *Journal of Extension*, 50(2). <https://doi.org/10.1007/s11172-017-1908-3>
- Bowonder, B. (1987). Industrial hazard management an analysis of the Bhopal accident. *Project Appraisal*, 2(3), 157–167.
- Brown, M. E., Treviño, L. K., & Harrison, D. A. (2005). Ethical leadership: A social learning perspective for construct development and testing. *Organizational Behavior and Human Decision Processes*, 97(2), 117–134. <https://doi.org/10.1016/j.obhdp.2005.03.002>
- Burke, M. J., Salvador, R. O., Smith-Crowe, K., Chan-Serafin, S., Smith, A., & Sonesh, S. (2011). The dread factor: How hazards and safety training influence learning and performance. *Journal of Applied Psychology*, 96(1), 46–70. <https://doi.org/10.1037/a0021838>

- Burke, M. J., Sarpy, A. S., Tesluk, P. E., & Smith-Crowe, K. (2002). General safety performance: A test of a grounded theoretical model. *Personnel Psychology*, 55(2), 429–457. <https://doi.org/10.1111/j.1744-6570.2002.tb00116.x>
- Burns, J. . (1978). *Leadership*. Harper & Row.
- Campbell, D. T., & Stanley, J. C. (1963). *Experimental and quasi-experimental designs for research in information science*. Houghton Mifflin Company.
- Chadwick, P. M. (2018). Safety and behaviour change. In C. Bieder, C. Gilbert, B. Journé, & L. Hervé (Eds.), *Beyond Safety Training* (pp. 127–137). Springer International Publishing. [https://doi.org/10.1007/978-3-319-65527-7\\_14](https://doi.org/10.1007/978-3-319-65527-7_14)
- Chandrakantan Subramaniam, Faridahwati Mohd Shamsudin, Md Lazim Mohd Zin, Subramaniam Sri Ramalu, Z. H. (2014). Safety management practices and safety compliance in small medium enterprise: mediating role safety participation. *Asia-Pacific Journal of Business Administration*, 8(3).
- Chang, P. L., Hsu, C. W., & Chang, P. C. (2011). Fuzzy Delphi method for evaluating hydrogen production technologies. *International Journal of Hydrogen Energy*, 36(21), 14172–14179. <https://doi.org/10.1016/j.ijhydene.2011.05.045>
- Chang, S. J., Van Witteloostuijn, A., & Eden, L. (2010). From the editors: Common method variance in international business research. *Journal of International Business Studies*, 41(2), 178–184. <https://doi.org/10.1057/jibs.2009.88>
- Chang, Y. H., & Yeh, C. H. (2004). A new airline safety index. *Transportation Research Part B: Methodological*, 38(4), 369–383. [https://doi.org/10.1016/S0191-2615\(03\)00047-X](https://doi.org/10.1016/S0191-2615(03)00047-X)
- Che Omar, A. R., Ishak, S., & Jusoh, M. A. (2020). The impact of Covid-19 movement control order on SMEs' businesses and survival strategies. *Malaysian Journal of Society and Space*, 16(2), 139–150. <https://doi.org/10.17576/geo-2020-1602-11>
- Chen, C. F., & Chen, S. C. (2014). Measuring the effects of Safety Management System practices, morality leadership and self-efficacy on pilots' safety behaviors: Safety motivation as a mediator. *Safety Science*. <https://doi.org/10.1016/j.ssci.2013.09.013>
- Chen, D., & Tian, H. (2012). Behavior based safety for accidents prevention and positive study in China construction project. *Procedia Engineering*, 43, 528–534. <https://doi.org/10.1016/j.proeng.2012.08.092>
- Chen, Q., & Jin, R. (2012). Safety4Site commitment to enhance jobsite safety management and performance. *Journal of Construction Engineering and Management*, 138(4), 509–519. [https://doi.org/10.1061/\(asce\)co.1943-7862.0000453](https://doi.org/10.1061/(asce)co.1943-7862.0000453)

- Chen, S.-C. (2015). How authoritarian leadership affects pilots' safety behavior? An exploratory study on self-efficacy's moderating effects. *Journal of Aeronautics, Astronautics and Aviation, Series A*. <https://doi.org/10.6125/15-0731-856>
- Chen, T. C. (2000). Extensions of the TOPSIS for group decision-making under fuzzy environment Chen-Tung. *Fuzzy Sets and Systems* 114, 114, 1–9. <https://doi.org/10.1016/j.asoc.2014.10.013>
- Cheng, C.-H., & Lin, Y. (2002). Evaluating the best main battle tank using fuzzy decision theory. *European Journal of Operational Research*, 142(2002), 174–186. [https://doi.org/10.1016/S0377-2217\(01\)00280-6](https://doi.org/10.1016/S0377-2217(01)00280-6)
- Chengcheng, L., & Naiwen, L. (2010a). The relation among coalminer's self-efficacy, safety attitude and risk-taking behavior. *Procedia Engineering*, 7, 352–355. <https://doi.org/10.1016/j.proeng.2010.11.056>
- Chengcheng, L., & Naiwen, L. (2010b). The relation among coalminer's self-efficacy, safety attitude and risk-taking behavior. *Procedia Engineering*. <https://doi.org/10.1016/j.proeng.2010.11.056>
- Cheung, C. K., & Chan, C. ming. (2000). Learning to work safely with reference to a social-cognitive model. *Social Behavior and Personality*, 28(3), 293–308. <https://doi.org/10.2224/sbp.2000.28.3.293>
- Cheyne, A., Cox, S., Oliver, A., & Tomás, J. M. (1998). Modelling safety climate in the prediction of levels of safety activity. *Work & Stress*, 12(3), 255–271. <https://doi.org/10.1080/02678379808256865>
- Chin, Y.-W., & Lim, E.-S. (2018). SME policies and performance in Malaysia. In *ISEAS Yusof Ishak Institute* (Vol. 3). [https://www.iseas.edu.sg/images/pdf/ISEAS\\_EWP\\_2018-3\\_ChinLim.pdf](https://www.iseas.edu.sg/images/pdf/ISEAS_EWP_2018-3_ChinLim.pdf)
- Choudhry, R. M., & Fang, D. (2008). Why operatives engage in unsafe work behavior: Investigating factors on construction sites. *Safety Science*, 46, 566–584. <https://doi.org/10.1016/j.ssci.2007.06.027>
- Choudry, R. M. (2014). Behavior-based safety on construction sites: A case study. *Accident Analysis and Prevention* 70 (2014) 14–23. file:///C:/Users/User-Asus/Downloads/AAP-Sep 2014 BBS on Construction Sites-1-s2.0-S0001457514000736-main (2).pdf
- Christian, M. S., Bradley, J. C., Wallace, J. C., & Burke, M. J. (2009). Workplace safety: a meta-analysis of the roles of person and situation factors. *The Journal of Applied Psychology*, 94(5), 1103–1127.
- Chu, H. C., & Hwang, G. J. (2008). A Delphi-based approach to developing expert systems with the cooperation of multiple experts. *Expert Systems with Applications*, 34(4), 2826–2840. <https://doi.org/10.1016/j.eswa.2007.05.034>

- Chua, J., Basit, A., & Hassan, Z. (2018). Leadership Style and its Impact on Employee Performance. *International Journal of Accounting & Business Management*, 6(1), 80–94. <https://doi.org/10.24924/ijabm/2018.04/v6.iss1.80.94>
- Chua, J. L. (2018). *The influences of safety training practice, safety leadership and safety climate on safety performance. chua jin g lun universiti teknologi malaysia*. Universiti Teknologi Malaysia.
- Chua, J. L., & Wahab, S. R. A. (2017). The effects of safety leadership on safety performance in Malaysia . *Saudi Journal of Business and Management Studies*, 2(12–18). <https://doi.org/10.21276/sjbms.2017.2.1.3>
- Clark, L. A., & Watson, D. (1995). Constructing validity: Basic issues in objective scale development. In *Psychological assessment* (Vol. 7, Issue 3, pp. 309–319). <https://doi.org/10.1037/1040-3590.7.3.309>
- Clark, N. M., & Dodge, J. A. (1999). Exploring self-efficacy as a predictor of disease management. *Health Education and Behavior*. <https://doi.org/10.1177/109019819902600107>
- Clarke, S. (2006a). Safety climate in an automobile manufacturing plant: The effects of work environment, job communication and safety attitudes on accidents and unsafe behaviour. *Personnel Review*, 35(4), 413–430. <https://doi.org/10.1108/00483480610670580>
- Clarke, S. (2006b). The relationship between safety climate and safety performance: A meta-analytic review. *Journal of Occupational Health Psychology*. <https://doi.org/10.1037/1076-8998.11.4.315>
- Clarke, S. (2013). Safety leadership: A meta-analytic review of transformational and transactional leadership styles as antecedents of safety behaviours. *Journal of Occupational and Organizational Psychology*, 86(1), 22–49. <https://doi.org/10.1111/j.2044-8325.2012.02064.x>
- Cohen, J. (1998). *Statistical power analysis for the behavioral sciences* (Second). Lawrence Erlbaum Associates Publishers.
- Cooper, D. (2015). Effective Safety Leadership. *Professional Safety*, 60(2), 49–53. <http://proxy1.ncu.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=ofs&AN=100811471&site=ehost-live%5Cnhttp://content.ebscohost.com.proxy1.ncu.edu/ContentServer.asp?T=P&P=AN&K=100811471&S=R&D=ofs&EbscoContent=dGJyMNLr40SeqLY4yOvqOLCmr02>
- Cooper, D. R., & Schindler, P. S. (2014). Business research methods. In *McGraw-Hill* (12th ed.). McGraw-Hill Irwin.
- Cooper, M. D. (2009). Behavioral safety interventions. *Professional Safety*, 54(2), 36–45. <http://search.ebscohost.com/login.aspx?direct=true&db=afh&AN=36616708&site=ehost-live>

- Cooper, M. D. (2006). The impact of management's commitment on employee behavior : A field study. *American Society of Safety Engineer : Proceedings of the 7th Professional Development Conference & Exhibition*, 1(317), 1–8.
- Cooper, M. D., & Phillips, R. A. (2004). Exploratory analysis of the safety climate and safety behavior relationship. *Journal of Safety Research*. <https://doi.org/10.1016/j.jsr.2004.08.004>
- Cox, S., & Cox, T. (1991). The structure of employee attitudes to safety: A european example. *Work and Stress*, 5(2), 93–106. <https://doi.org/10.1080/02678379108257007>
- Cox, S., & Flin, R. (1998). Safety culture: Philosopher's stone or man of straw? *Work and Stress*, 12(3), 189–201. <https://doi.org/10.1080/02678379808256861>
- Craighead, W. E. (2010). The Corsini encyclopedia of psychology. In *Choice Reviews Online* (Vol. 47, Issue 11). <https://doi.org/10.5860/choice.47-6008>
- Creswell, J. W., & Creswell, J. D. (2017). Research design: Qualitative, quantitative, and mixed methods approaches. In *Sage Publication* (5th ed.).
- da Vitória, A. G., de Souza Couto Oliveira, J., de Almeida Pereira, L. C., de Faria, C. P., & de São José, J. F. B. (2021). Food safety knowledge, attitudes and practices of food handlers: A cross-sectional study in school kitchens in Espírito Santo, Brazil. *BMC Public Health*, 21(1), 1–10. <https://doi.org/10.1186/s12889-021-10282-1>
- Daniel, D. W., & Cross, C. L. (2013). *Biostatistics : A foundation for analysis in the health science*. John Wiley & Sons, Inc.
- Davis, J. A. (1971). *Elementary survey analysis*. Prentice-Hall.
- De Merich, D., Gnoni, M. G., Malorgio, B., Micheli, G. J. L., Piga, G., Sala, G., & Tornese, F. (2020). A cloud-based tool for integrating occupational risk Assessment within management systems for SMEs. *Safety*, 6(4), 47. <https://doi.org/10.3390/safety6040047>
- Department of Occupational Safety and Health. (2020). *Industrial accident statistics*. [www.dosh.gov.my](http://www.dosh.gov.my)
- Department of Occupational Safety and Health Malaysia. (2016). *Keselamatan dan Kesehatan Pekerjaan untuk Kesejahteraan Kita - Laporan Tahunan 2016*. 5–10.
- Department of Occupational Safety and Health Malaysia. (2019). *Industrial accident statistics*. <http://www.dosh.gov.my>
- Department of Statistic Malaysia. (2020). *Small and medium enterprises (SMEs) performance 2019*. <https://www.dosm.gov.my/v1/index.php?r=column/cthemeByCat&cat=159&b>

ul\_id=VjM1enZ2RmlVRDVTNFAwRWZiZUs3QT09&menu\_id=TE5CRUZ  
Cblh4ZTZMODZlbnk2aWRRQT09

DOSM. (2021). *Press Release: Small and medium enterprises (SMEs) performance 2020*.

[https://www.dosm.gov.my/v1/index.php?r=column/cthemByCat&cat=159&bul\\_id=KzdrS25pRTZ1VGFkcTINY0FEczBYUT09&menu\\_id=TE5CRUZCblh4ZTZMODZlbnk2aWRRQT09#:~:text=PERFORMANCE OF SMEs EMPLOYMENT 2020&text=In terms of number%2C SMEs,2019 \(7.32 million persons\).](https://www.dosm.gov.my/v1/index.php?r=column/cthemByCat&cat=159&bul_id=KzdrS25pRTZ1VGFkcTINY0FEczBYUT09&menu_id=TE5CRUZCblh4ZTZMODZlbnk2aWRRQT09#:~:text=PERFORMANCE OF SMEs EMPLOYMENT 2020&text=In terms of number%2C SMEs,2019 (7.32 million persons).)

Du, X., & Sun, W. (2012). Research on the relationship between safety leadership and safety climate in coalmines. *Procedia Engineering*, 45, 214–219. <https://doi.org/10.1016/j.proeng.2012.08.146>

Duff, A. R., Robertson, I. T., Phillips, R. A., & Cooper, M. D. (1994). Improving safety by the modification of behaviour. *Construction Management and Economics*, 12(1), 67–78. <https://doi.org/10.1080/01446199400000008>

Dugolli, M. (2021). Occupational, health and safety situation at small and medium enterprises in Kosovo, contextual factors, barriers, drivers and intervention process. *International Review of Applied Sciences and Engineering*, 12(1), 19–28. <https://doi.org/10.1556/1848.2020.00110>

Duru, O., Bulut, E., & Yoshida, S. (2012). A fuzzy extended DELPHI method for adjustment of statistical time series prediction: An empirical study on dry bulk freight market case. *Expert Systems with Applications*, 39(1), 840–848. <https://doi.org/10.1016/j.eswa.2011.07.082>

Ellis, T. J., & Levy, Y. (2009). Towards a guide for novice researchers on research methodology: Review and proposed methods. *Issues in Informing Science and Information Technology*, 6(January), 323–337. <https://doi.org/10.28945/1062>

Ellis, T. J., & Levy, Y. (2010). A Guide for Novice Researchers: Design and Development Research Methods. *Proceedings of the 2010 InSITE Conference*, 107–118. <https://doi.org/10.28945/1237>

Es-haghi, M., & Sepehr, P. (2016). Effect of training interventions on the reduction of unsafe behaviors using Deming model. *International Journal of Occupational Hygiene*, 8(2), 69–77.

Eshak, Z., Zain, A., Malim, T., Manusia, F. P., Pendidikan, U., Idris, S., & Malim, T. (2020). *Fuzzy delphi method: Design of self defense training module for preschool sex education*. 9(2), 12–22.

Farahnak, L. R., Ehrhart, M. G., Torres, E. M., & Aarons, G. A. (2020). The influence of transformational leadership and leader attitudes on subordinate attitudes and implementation success. *Journal of Leadership and Organizational Studies*, 27(1), 98–111. <https://doi.org/10.1177/1548051818824529>

- Fincham, J. E. (2008). Response rates and responsiveness for surveys, standards, and the Journal. *American Journal of Pharmaceutical Education*, 72(2), 43. <https://doi.org/10.5688/aj720243>
- Flannelly, K. J., Flannelly, L. T., & Jankowski, K. R. B. (2018). Threats to the internal validity of experimental and quasi-experimental research in healthcare. *Journal of Health Care Chaplaincy*, 24(3), 107–130. <https://doi.org/10.1080/08854726.2017.1421019>
- Flin, R., Mearns, K., O'Connor, P., & Bryden, R. (2000). Measuring safety climate: Identifying the common features. *Safety Science*, 34(1–3), 177–192. [https://doi.org/10.1016/S0925-7535\(00\)00012-6](https://doi.org/10.1016/S0925-7535(00)00012-6)
- Flin, R., & Yule, S. (2004). Leadership for safety: Industrial experience. *Quality and Safety in Health Care*, 13(2), 45–51. <https://doi.org/10.1136/qshc.2003.009555>
- Ford, M. T., & Tetrick, L. E. (2011). Relations Among Occupational Hazards, Attitudes, and Safety Performance. *Journal of Occupational Health Psychology*, 16(1), 48–66. <https://doi.org/10.1037/a0021296>
- Friedrich, D. (2019). Effectiveness of peer review as cooperative web-based learning method applied out-of-class in a role playing game: A case study by quasi-experimental approach. *Smart Learning Environments*, 6(1), 2–22. <https://doi.org/10.1186/s40561-019-0102-5>
- Fuad, R. A., Arip, M. A. S. M., & Saad, F. (2019). Validity and reliability of the HM-learning module among high school students in Malaysia. *International Journal of Academic Research in Business and Social Sciences*, 9(1). <https://doi.org/10.6007/ijarbss/v9-i1/5480>
- Fugas, C. S., Silva, S. A., & Meliá, J. L. (2012). Another look at safety climate and safety behavior: Deepening the cognitive and social mediator mechanisms. *Accident Analysis and Prevention*, 45(2012), 468–477. <https://doi.org/10.1016/j.aap.2011.08.013>
- Gastwirth, J. L., Gel, Y. R., & Miao, W. (2009). The impact of Levene's Test of equality of variances on statistical theory and practice. *Statistical Science*, 24(3), 343–360. <https://doi.org/10.1214/09-STS301>
- Geller, E. S., Bolduc, E. J., Foy, J. M., & Dean, C. J. (2012). Actively caring for safety: practical methods, empirical results & provocative implications. *Professional Safety*, 57(01), 44–50.
- Geller, S., Perdue, S. R., & French, A. (2004). Behavior-based safety coaching. *Professional Safety*, July, 42–49.
- Gerpott, F. H., Fasbender, U., & Burmeister, A. (2020). Respectful leadership and followers' knowledge sharing: A social mindfulness lens. *Human Relations*, 73(6), 789–810. <https://doi.org/10.1177/0018726719844813>



- Gharibi, V., Bagher Mortazavi, S., Jonaidi Jafari, A., Malakouti, J., Bagheri, M., & Abadi, H. (2017). The relationship between workers' attitude towards safety and occupational accidents experience. *International Journal of Occupational Hygiene*, 8, 145–150. <http://ijoh.tums.ac.ir>
- Glass, G. V., & Cohen, J. (2012). Using effect size—or Why the P value is not enough. *Journal of Graduate Medical Education*, September, 279–282.
- Goh, Y. M., & Chua, S. (2016). Knowledge, attitude and practices for design for safety: A study on civil & structural engineers. *Accident Analysis and Prevention*, 93, 260–266. <https://doi.org/10.1016/j.aap.2015.09.023>
- Goh, Y. M., & Sa'adon, N. F. (2015). Cognitive factors influencing safety behavior at height: A multimethod exploratory study. *Journal of Construction Engineering and Management*, 141(6), 1–8. [https://doi.org/10.1061/\(asce\)co.1943-7862.0000972](https://doi.org/10.1061/(asce)co.1943-7862.0000972)
- Gonçalves, S. M. P., da Silva, S. A., Lima, M. L., & Meliá, J. L. (2008). The impact of work accidents experience on causal attributions and worker behaviour. *Safety Science*, 46(6), 992–1001. <https://doi.org/10.1016/j.ssci.2007.11.002>
- Griffin, M. A., & Neal, A. (2000). Perceptions of safety at work: a framework for linking safety climate to safety performance, knowledge, and motivation. *Journal of Occupational Health Psychology*. <https://doi.org/10.1037/1076-8998.5.3.347>
- Griffin, Mark A., & Hu, X. (2013). How leaders differentially motivate safety compliance and safety participation: The role of monitoring, inspiring, and learning. *Safety Science*, 60(2013), 196–202. <https://doi.org/10.1016/j.ssci.2013.07.019>
- Griffin, Mark A., & Hu, X. (2018). Transformational and passive leadership as cross-level moderators of the relationships between safety knowledge, safety motivation, and safety participation. *Journal of Safety Research*, 4(1), 1–11. <https://doi.org/10.1016/j.jsr.2016.03.002>
- Griffin, Mark A., & Neal, A. (2000). Perceptions of safety at work: A framework for linking safety climate to safety performance, knowledge, and motivation. *Journal of Occupational Health Psychology*, 5(3), 347–358. <https://doi.org/10.1037//1076-8998.5.3.347>
- Guldenmund, F. . (2000). The nature of safety culture: a review of theory and research. *Safety Science*, 34(1–3), 215–257. [www.elsevier.com/locate/ssci](http://www.elsevier.com/locate/ssci)
- Gupta, R., Sachdeva, A., & Bhardwaj, A. (2010). Selection of 3pl Service Provider using Integrated Fuzzy Delphi and Fuzzy TOPSIS. *Proceedings of the World Congress on Engineering and Computer Science 2010 Vol II, 11*, 1092–1097.
- Gustafson, K. ., & Branch, R. M. (2002). *Survey of instructional development models* (4th ed.). ERIC Clearinghouse & Technology, Syracuse University.

- Gyekye, S. A. (2010). Occupational safety management: The role of causal attribution. *International Journal of Psychology*, 45(6), 405–416. <https://doi.org/10.1080/00207594.2010.501337>
- Gyllensten, K. (2005). Can Coaching Reduce Workplace Stress ? A Quasi-Experimental Study. *International Journal of Evidence Based Coaching and Mentoring*, 3(2), 75–85. <http://www.business.brookes.ac.uk/research/areas/coaching&mentoring/>
- Hadianto, N., Hobri, & Irvan, M. (2020). The implementation of lesson study as a tool to improve the students' higher order thinking skill on trigonometric material regarding creative thinking skill. *Journal of Physics: Conference Series*, 1563(1), 1–10. <https://doi.org/10.1088/1742-6596/1563/1/012071>
- Hadikusumo, B. H. W., & Rowlinson, S. (2004). Capturing safety knowledge using design-for-safety-process tool. *Journal of Construction Engineering and Management*, 130(2), 281–289. [https://doi.org/10.1061/\(asce\)0733-9364\(2004\)130:2\(281\)](https://doi.org/10.1061/(asce)0733-9364(2004)130:2(281))
- Hair, Jr, J. F. (2015). Essentials of business research methods. In *Essentials of Business Research Methods* (Fourth). Routledge. <https://doi.org/10.4324/9781315704562>
- Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2017). A Primer on Partial Least Squares structural equation modeling (PLS-SEM). In *Sage* (2nd Revise).
- Hair, J. F., Sarstedt, M., Hopkins, L., & Kuppelwieser, V. G. (2014). Partial least squares structural equation modeling (PLS-SEM): An emerging tool in business research. *European Business Review*, 26(2), 106–121. <https://doi.org/10.1108/EBR-10-2013-0128>
- Hair, Joseph F., Black, W. C., Babin, B. J., & Anderson, R. E. (2014). *Multivariate data analysis* (7th ed.). Pearson Education Limited.
- Hale, A. R. (2000). Culture's confusions. *Safety Science*, 34, 1–14. [https://doi.org/10.1016/S0925-7535\(00\)00003-5](https://doi.org/10.1016/S0925-7535(00)00003-5)
- Hamid, R. A. (2017). *Faktor kejayaan kritikal bagi program keusahawanan di kolej komuniti malaysia*. Universiti Tun Hussein Onn Malaysia.
- Handley, M. A., Lyles, C. R., McCulloch, C., & Cattamanchi, A. (2018). Selecting and improving quasi-experimental designs in effectiveness and implementation research. *Annual Review of Public Health*, 39(January), 5–25. <https://doi.org/10.1146/annurev-publhealth-040617-014128>
- Harith, S. H., & Mahmud, N. (2020). The relationship between norms and risky driving behavior: A systematic review. *Iranian Journal of Public Health*, 49(2), 211–220. <https://doi.org/10.18502/ijph.v49i2.3082>

- Harris, A. D., McGregor, J. C., Perencevich, E. N., Furuno, J. P., Zhu, J., Peterson, D. E., & Finkelstein, J. (2006). The use and interpretation of quasi-experimental studies in medical informatics. *Journal of the American Medical Informatics Association*, 13(1), 16–23. <https://doi.org/10.1197/jamia.M1749>
- Hashim, N. N. H. N., Salleh, R. M., Osman, S., & Jusoh, Z. M. (2020). Factors influencing group farmers' behaviour towards safe pesticide use in Malaysia. *Malaysian Journal of Consumer and Family Economics*, 25(S1), 135–147.
- Hasle, P., Kvorning, L. V., Rasmussen, C. D., Smith, L. H., & Flyvholm, M. A. (2012). A model for design of tailored working environment intervention programmes for small enterprises. *Safety and Health at Work*, 3(3), 181–191. <https://doi.org/10.5491/SHAW.2012.3.3.181>
- Hasle, P., & Limborg, H. J. (2006). A review of the literature on preventive occupational health and safety activities in small enterprises. *Industrial Health*, 44(1), 6–12. <https://doi.org/10.2486/indhealth.44.6>
- Hassan, Z., & Rahim, R. (2019). The relationship between supervisor safety, safety management practices, and safety compliance behaviour among employees. *Sains Humanika*, 11(2–2), 31–36. <https://doi.org/10.11113/sh.v11n2-2.1652>
- Hassan, Z., Subramaniam, C., Zin, M. L. M., Shamsudin, F. M., & Ramalu, S. S. (2019). The connection between safety compliance behaviour, safety communication and safety standard and procedure: An investigation among workers in Malaysian SME'S. *Academy of Entrepreneurship Journal*, 25(Special Issue 2), 1–11.
- Haynes, A. B., Weiser, T. G., Berry, W. R., Lipsitz, S. R., Breizat, A. H. S., Dellinger, E. P., Dziekan, G., Herbosa, T., Kibatala, P. L., Lapitan, M. C. M., Merry, A. F., Reznick, R. K., Taylor, B., Vats, A., & Gawande, A. A. (2011). Changes in safety attitude and relationship to decreased postoperative morbidity and mortality following implementation of a checklist-based surgical safety intervention. *BMJ Quality and Safety*, 20(1), 102–107. <https://doi.org/10.1136/bmjqs.2009.040022>
- Heinrich, H. W. (1941). *Industrial accident prevention : a scientific approach* (2nd ed.). McGraw-Hill Book of Company.
- Henseler, J., Ringle, C. M., & Sarstedt, M. (2014). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, 43(1), 115–135. <https://doi.org/10.1007/s11747-014-0403-8>
- Henseler, J., Ringle, C. M., & Sinkovics, R. R. (2009). The use of partial least squares path modeling in international marketing. *Advances in International Marketing*, 20(January), 277–319. [https://doi.org/10.1108/S1474-7979\(2009\)0000020014](https://doi.org/10.1108/S1474-7979(2009)0000020014)
- Herold, D. M., Fedor, D. B., Caldwell, S., & Liu, Y. (2008). The effects of transformational and change leadership on employees' commitment to a

- change: a multilevel study. *Journal of Applied Psychology*, 93(2), 346–357. <https://doi.org/10.1037/0021-9010.93.2.346>
- Hidayatul Fariha, S., Ismail, R., Mohd Yusoff, H., Anuar, N., Mohd Jamil, M. R., & Daud, F. (2019). Validation of occupational zoonotic disease questionnaire using fuzzy delphi method. *Journal of Agromedicine*, 25(2), 166–172. <https://doi.org/10.1080/1059924X.2019.1666763>
- Hoffmeister, K., Gibbons, A. M., Johnson, S. K., Cigularov, K. P., Chen, P. Y., & Rosecrance, J. C. (2014). The differential effects of transformational leadership facets on employee safety. *Safety Science*. <https://doi.org/10.1016/j.ssci.2013.07.004>
- Hofmann, D. A., Jacobs, R., & Landy, F. (2013). High reliability process industries: Individual, micro, and macro organizational influences on safety performance. *Journal of Safety Research*, 26(3), 131–149. <https://doi.org/10.1016/j.jsr.2013.07.008>
- Hong, C. C., Ramayah, T., & Subramaniam, C. (2018). The relationship between critical success factors, internal control and safety performance in the Malaysian manufacturing sector. *Safety Science*, 104(January), 179–188. <https://doi.org/10.1016/j.ssci.2018.01.002>
- Hopkins, A. (2006). What are we to make of safe behaviour programs? *Safety Science*, 44(7), 583–597. <https://doi.org/10.1016/j.ssci.2006.01.001>
- Hsu, C. C., & Sandford, B. A. (2007). The Delphi technique: Making sense of consensus. *Practical Assessment, Research and Evaluation*, 12(10), 1–8.
- Hsu, Y. L., Lee, C. H., & Kreng, V. B. (2010). The application of Fuzzy Delphi Method and Fuzzy AHP in lubricant regenerative technology selection. *Expert Systems with Applications*, 37(1), 419–425. <https://doi.org/10.1016/j.eswa.2009.05.068>
- Huang, Y. H., & Yang, T. R. (2019). Exploring on-site safety knowledge transfer in the construction industry. *Sustainability (Switzerland)*, 11(22), 1–16. <https://doi.org/10.3390/su11226426>
- Hussin, Z. H., Jusoff, K., Ju, S. Y., & Kong, L. K. (2009). Accidents in the food-manufacturing small and medium sized malaysian industries. *Asian Social Science*, 4(8), 27–31. <https://doi.org/10.5539/ass.v4n8p27>
- IAEA. (1991). Safety culture: A report by the International Nuclear Safety Advisory Group. In *Safety Series* (Issue 75).
- ILO. (2015). Global trends on occupational accidents and diseases. *World Day for Safety and Health At Work, April*, 1–7. [http://www.ilo.org/legacy/english/osh/en/story\\_content/external\\_files/fs\\_st\\_1-ILO\\_5\\_en.pdf](http://www.ilo.org/legacy/english/osh/en/story_content/external_files/fs_st_1-ILO_5_en.pdf)

- ILO. (2020). *Improving safety and health in micro-, small and medium-sized enterprises: An overview of initiatives and delivery mechanisms.*
- Inness, M., Turner, N., Barling, J., & Stride, C. B. (2010). Transformational leadership and employee safety performance: A within-person, between-jobs design. *Journal of Occupational Health Psychology*. <https://doi.org/10.1037/a0019380>
- İşcan, Ö. F., Ersarı, G., & Naktiyok, A. (2014). Effect of leadership style on perceived organizational performance and innovation: The role of transformational leadership beyond the impact of transactional leadership – An application among Turkish SME's. *Procedia - Social and Behavioral Sciences*, *150*, 881–889. <https://doi.org/10.1016/j.sbspro.2014.09.097>
- Ismail, F., & Hashim, A. E. (2012). steps for the behavioural based safety: A case study approach. *International Journal of Engineering and Technology*, *4*(5), 594–596. <https://doi.org/10.7763/ijet.2012.v4.440>
- Ismail, F., Hashim, A. E., Zuriea, W., Ismail, W., Kamarudin, H., & Baharom, Z. A. (2012). Behaviour based approach for quality and safety environment improvement: Malaysian experience in the oil and gas industry. *Procedia - Social and Behavioral Sciences*, *35*(December 2011), 586–594. <https://doi.org/10.1016/j.sbspro.2012.02.125>
- Jabatan Keselamatan dan Kesihatan Pekerjaan. (2008). *132 tahun penguatkuasaan keselamatan dan kesihatan pekerjaan di Malaysia*. Jabatan Keselamatan dan Kesihatan Pekerjaan.
- Jain, S., Dubey, S., & Jain, S. (2016). Designing and validation of questionnaire. *International Dental & Medical Journal of Advanced Research - VOLUME 2015*, *2*(1), 1 – 3. <https://doi.org/10.15713/ins.idmjar.39>
- Jambari, N. S. A., Samad, N. I. A., Anua, S. M., Ruslan, R., & Hamzah, N. A. (2020). Knowledge, attitude and practice (KAP) on pesticide exposure among farmers in Kota Bharu, Kelantan. *Malaysian Journal of Medicine and Health Sciences*, *16*(November), 56–62.
- Jasiulewicz-Kaczmarek, M., Szwedzka, K., & Szczuka, M. (2015). Behaviour based intervention for occupational safety – case study. *Procedia Manufacturing*, *3*(Ahfe), 4876–4883. <https://doi.org/10.1016/j.promfg.2015.07.615>
- Jasmi, B. A. T., Zakaria, M., & Norwaliza, A. W. (2015). Validity and reliability of career exploration module. *Middle-East Journal of Scientific Research*, *23*(11), 2639–2644. <https://doi.org/10.5829/idosi.mejsr.2015.23.11.22758>
- Ji, H. J. (2014). A study on safety culture construction for coal mine. *Applied Mechanics and Materials*, *644–650*, 5949–5952. <https://doi.org/10.4028/www.scientific.net/AMM.644-650.5949>
- Ji, M., Liu, B., Li, H., Yang, S., & Li, Y. (2019). The effects of safety attitude and safety climate on flight attendants' proactive personality with regard to safety

- behaviors. *Journal of Air Transport Management*, 78(199), 80–86. <https://doi.org/10.1016/j.jairtraman.2019.05.003>
- Jiang, L., & Probst, T. M. (2016). Transformational and passive leadership as cross-level moderators of the relationships between safety knowledge, safety motivation, and safety participation. *Journal of Safety Research*, 57, 27–32. <https://doi.org/10.1016/j.jsr.2016.03.002>
- Joseph, C., Reddy, S., & Kashore Sharma, K. (2013). Locus of control, safety attitudes and involvement in hazardous events in indian army aviators. *Aviation Psychology and Applied Human Factors*, 3(1), 9–18. <https://doi.org/10.1027/2192-0923/a000036>
- Judge, T. A., & Piccol, R. F. (2004). Transformational and transactional leadership: A meta-analytic test of their relative validity. *Journal of Applied Psychology*, 89(5), 755–768. <https://doi.org/10.1037/0021-9010.89.5.755>
- Kaila, H. L. (2011). Organizational cases on behaviour-based safety (BBS) in india. *International Journal of Human Resource Management*, 22(10), 2135–2146. <https://doi.org/10.1080/09585192.2011.580180>
- Kamis, A. S., Ahmad Fuad, A. F., Saadon, M. S. I., & Fadzil, M. N. (2020). The impact of basic training on seafarers' safety knowledge, attitude and behaviour. *Journal of Sustainability Science and Management*, 15(6), 137–158. <https://doi.org/10.46754/jbsd.2020.08.012>
- Kampen, J. van, Lammers, M., Steijn, W., Guldenmund, F., & Groeneweg, J. (2019). The effectiveness of 48 safety interventions according to safety professionals. *Chemical Engineering Transactions*, 77(January), 307–312. <https://doi.org/10.3303/CET1977052>
- Kanu, S., James, P. B., Bah, A. J., Kabba, J. A., Kamara, M. S., Elleanor, C. E., & Kanu, W. J. S. (2021). Healthcare workers' knowledge, attitude, practice and perceived health facility preparedness regarding covid-19 in Sierra Leone. *Journal of Multidisciplinary Healthcare*, 14, 67–80. <https://doi.org/10.2147/JMDH.S287156>
- Kao, K. Y., Spitzmueller, C., Cigularov, K., & Thomas, C. L. (2019). Linking safety knowledge to safety behaviours: a moderated mediation of supervisor and worker safety attitudes. *European Journal of Work and Organizational Psychology*, 28(2), 206–220. <https://doi.org/10.1080/1359432X.2019.1567492>
- Kardaras, D. K., Karakostas, B., & Mamakou, X. J. (2013). Content presentation personalisation and media adaptation in tourism web sites using Fuzzy Delphi Method and Fuzzy Cognitive Maps. *Expert Systems with Applications*, 40(6), 2331–2342. <https://doi.org/10.1016/j.eswa.2012.10.031>
- Karimiazari, A., Mousavi, N., Mousavi, S. F., & Hosseini, S. (2011). Risk assessment model selection in construction industry. *Expert Systems with Applications*, 38(8), 9105–9111. <https://doi.org/10.1016/j.eswa.2010.12.110>

- Karthege, S. (2018). Examining the influence of lecturer's safety leadership towards student's lab safety behaviour in Polytechnic Port Dickson. *Politeknik & Kolej Komuniti Journal of Social Sciences and Humanities*, 3, 81–97.
- Katz-Navon, T., Naveh, E., & Stern, Z. (2007). Safety self-efficacy and safety performance: Potential antecedents and the moderation effect of standardization. *International Journal of Health Care Quality Assurance*, 20(7), 572–584. <https://doi.org/10.1108/09526860710822716>
- Kee, D. M. H., Yusoff, Y. M., & Khin, S. (2019). The role of support on start-up success: A pls-sem approach. *Asian Academy of Management Journal*, 24(January), 43–59. <https://doi.org/10.21315/AAMJ2019.24.S1.4>
- Kelloway, E. K., & Barling, J. (2010). Leadership development as an intervention in occupational health psychology. *Work and Stress*, 24(3), 260–279. <https://doi.org/10.1080/02678373.2010.518441>
- Khan, M. S., Khan, I., Qureshi, Q. A., Ismail, M. H., Rauf, H., Latif, A., & Tahir, M. (2015). The styles of leadership: A critical review. *Public Policy and Administration Research*, 5(3), 87–92. <https://doi.org/10.2307/2372326>
- Khan, W. A., Mustaq, T., & Tabassum, A. (2014). Occupational health, safety and risk analysis. *International Journal of Science Technology*, 3(4), 2278–3687. [www.ijset.net](http://www.ijset.net)
- Khdair, W. a, Shamsudin, F. M., & Subramanim, C. (2011). A proposed relationship between management practices and safety performance in the oil and gas industry in Iraq. *World Review of Business Research*.
- Khoo, T. H., Surlenty, L., & Daisy Kee, M. H. (2011a). Occupational safety and health ( OSH ) in malaysian small and medium enterprise and effective safety management. *International Journal of Business and Technopreneurship*, 1(November), 321–338.
- Khoo, T. H., Surlenty, L., & Daisy Kee, M. H. (2011b). Safety management practices and safety behaviour : A preliminary investigation in malaysian small and medium enterprises in northern corridor economic region ( NCER ). *Journal Occupational Safety & Health*, 8(July), 1–11.
- Khoo, T. H., Surlenty, L., & Selamat, M. N. (2016). Safety training and safety behaviour in the malaysian SME. *Journal of Occupational Safety and Health*, 13(2), 55–62.
- Khor, L. K., & Surlenty, L. (2018). Safety capital and safety participation of OSHMS in malaysian manufacturing companies : the mediation effect of safety. *Perintis EJournal*, 8(November), 10–24.
- Kidam, K., Zainal, Z., Sulaiman, Z., & Haryani, M. (2014). Statistical analysis of metalworking accidents within small and medium enterprises ( SMEs ) in malaysia. *3rd Scientific Conference on Occupational Safety and Health- Sci-*

Cosh 2014.

- Kim, T. E., & Gausdal, A. H. (2020). Leaders' influence tactics for safety: An exploratory study in the maritime context. *Safety*, 6(1). <https://doi.org/10.3390/safety6010008>
- Kim, T. eun, & Gausdal, A. H. (2017). Leading for safety: A weighted safety leadership model in shipping. *Reliability Engineering and System Safety*, 165(May), 458–466. <https://doi.org/10.1016/j.ress.2017.05.002>
- Kline, R. B. (2011). Principles and practice of structural equation modeling. In *Structural Equation Modeling* (Vol. 156). <https://doi.org/10.1038/156278a0>
- Komaki, J., Barwick, K. D., & Scott, L. R. (1978). A behavioral approach to occupational safety: Pinpointing and reinforcing safe performance in a food manufacturing plant. *Journal of Applied Psychology*, 63(4), 434–445. <https://doi.org/10.1037/0021-9010.63.4.434>
- Komaki, J., Heinzmann, A. T., & Lawson, L. (1980). Effect of training and feedback: Component analysis of a behavioral safety program. *Journal of Applied Psychology*, 65(3), 261–270. <https://doi.org/10.1037/0021-9010.65.3.261>
- Krauesslar, V., Avery, R. E., & Passmore, J. (2015). Taking ownership of safety. What are the active ingredients of safety coaching and how do they impact safety outcomes in critical offshore working environments? *International Journal of Occupational Safety and Ergonomics*, 21(1), 39–46. <https://doi.org/10.1080/10803548.2015.1017941>
- Krause, D. E. (2004). Influence-based leadership as a determinant of the inclination to innovate and of innovation-related behaviors. An empirical investigation. *Leadership Quarterly*, 15(1), 79–102. <https://doi.org/10.1016/j.leaqua.2003.12.006>
- Krause, T. R. (2005). Leading with safety. In *Leading with Safety*. John Wiley & Sons, Inc. <https://doi.org/10.1002/047178527X>
- Krecjie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement*, 30(8), 607–610.
- Kulkarni, R. S., Giri, P. A., & Gangwal, P. R. (2016). Knowledge and practices regarding fire safety amongst health care workers in tertiary care teaching hospital in Marathwada region of Maharashtra, India. 3(7), 1900–1904.
- Kurgat, A., Chebet, W. T., & Rotich, J. (2015). Behaviour modification and organizational development: Revisiting the theories of learning. *European Journal of Psychological Research*, 2(1), 34–42.
- Lakens, D. (2013). Calculating and reporting effect sizes to facilitate cumulative science: A practical primer for t-tests and ANOVAs. *Frontiers in Psychology*, 4(NOV), 1–12. <https://doi.org/10.3389/fpsyg.2013.00863>



- Laurent, J., Chmiel, N., & Hansez, I. (2020). Personality and safety citizenship: the role of safety motivation and safety knowledge. *Heliyon*, 6(1), e03201. <https://doi.org/10.1016/j.heliyon.2020.e03201>
- Lees, H., & Austin, J. (2011). The case for behaviour-based safety in construction. *Proceedings of Institution of Civil Engineers: Management, Procurement and Law*, 164(1), 3–8. <https://doi.org/10.1680/mpal900074>
- Legg, S. J., Olsen, K. B., Laird, I. S., & Hasle, P. (2015). Managing safety in small and medium enterprises. *Safety Science*, 71, 189–196. <https://doi.org/10.1016/j.ssci.2014.11.007>
- Legg, S. J., Olsen, K., Lamm, F., Laird, I., Harris, L.-A., & Hasle, P. (2010). Understanding the programme theories underlying national strategies to improve the working environment in small businesses. *Policy and Practice in Health and Safety*, 8(2), 5–35. <https://doi.org/10.1080/14774003.2010.11667746>
- Levy, Y., & Ellis, T. J. (2011). Interdisciplinary Journal of information, knowledge, and management a guide for novice researchers on experimental and quasi-experimental studies in information systems research. *A Guide for Novice Researchers on Experimental and Quasi-Experimental Studies in Information Systems Research Yair*, 6, 1–11. <https://core.ac.uk/download/pdf/51072279.pdf>
- Li, M., Zhai, H., Zhang, J., & Meng, X. (2020). Research on the relationship between safety leadership, safety attitude and safety citizenship behavior of railway employees. *International Journal of Environmental Research and Public Health*, 17(6), 1–17. <https://doi.org/10.3390/ijerph17061864>
- Liao, E. Y., & Chun, H. (2015). Supervisor monitoring and subordinate innovation. *Journal of Organizational Behavior*, 30(2), 168–192. <https://doi.org/10.1002/job>
- Likert, R. (1932). A technique for the measurement of attitudes. *Archives of Psychology*.
- Lim, C. S., Mohd Rafee, B. B., Anita, A. R., Shamsul, A. S., & Mohd Noor, S. B. (2018). Effectiveness of a participatory ergonomics intervention to improve musculoskeletal health: A solomon four-group study among manufacturing industry workers in Selangor, Malaysia. In *Ergonomics in Caring for People* (pp. 169–179). Springer Nature Singapore Pte Ltd. [https://doi.org/10.1007/978-981-10-4980-4\\_22](https://doi.org/10.1007/978-981-10-4980-4_22)
- Lim, T. P., Chye, F. Y., Sulaiman, M. R., Suki, N. M., & Lee, J. S. (2016). A structural modeling on food safety knowledge, attitude, and behaviour among Bum Bum Island community of Semporna, Sabah. *Food Control*, 60, 241–246. <https://doi.org/10.1016/j.foodcont.2015.07.042>
- Lingard, H., & Rowlinson, S. (1997). Behavior-based safety management in Hong Kong's construction industry. *Journal of Safety Research*, 28(4), 243–256. [https://doi.org/10.1016/S0022-4375\(97\)00010-8](https://doi.org/10.1016/S0022-4375(97)00010-8)

- Liu, Q., Ye, G., & Feng, Y. (2020). Workers' safety behaviors in the off-site manufacturing plant. *Engineering, Construction and Architectural Management*, 27(3), 765–784. <https://doi.org/10.1108/ECAM-03-2019-0136>
- Liu, X., Huang, G., Huang, H., Wang, S., Xiao, Y., & Chen, W. (2015). Safety climate, safety behavior, and worker injuries in the Chinese manufacturing industry. *Safety Science*, 78, 173–178. <https://doi.org/10.1016/j.ssci.2015.04.023>
- Liu, Y., Kee, S. W., Feng, L., & Ahmad, M. H. (2017). The Relationship between Leadership Styles and Employee Engagement: Evidences from Construction Companies in Malaysia. In *The Social Sciences* (Vol. 12, Issue 6, pp. 984–988). <https://doi.org/10.3923/sscience.2017.984.988>
- Loewenthal, K. (2001). *An introduction to psychological tests and scales* (2nd ed.). Psychology Press.
- Lorenzo, O., Kawalek, P., & Ramdani, B. (2012). Enterprise applications diffusion within organizations: A social learning perspective. *Information and Management*, 49(1), 47–57. <https://doi.org/10.1016/j.im.2011.10.005>
- Lu, C.-S., & Tsai, C.-L. (2010). The effect of safety climate on seafarers safety behaviors in container shipping. *Accident Analysis and Prevention*, 42, 1999–2006. <https://doi.org/10.1016/j.aap.2010.06.008>
- Lu, C.-S., & Yang, C.-S. (2010). Safety leadership and safety behavior in container terminal operations. *Safety Science*, 48(2), 123–134. <https://doi.org/10.1016/j.ssci.2009.05.003>
- Lu, C. S., & Tsai, C. L. (2008). The effects of safety climate on vessel accidents in the container shipping context. *Accident Analysis and Prevention*, 7(2), 1–5. <https://doi.org/10.1016/j.aap.2007.08.015>
- Lu, C. S., & Yang, C. S. (2010). Safety leadership and safety behavior in container terminal operations. *Safety Science*, 48(2), 123–134. <https://doi.org/10.1016/j.ssci.2009.05.003>
- Luria, G., & Morag, I. (2012). Safety management by walking around (SMBWA): A safety intervention program based on both peer and manager participation. *Accident Analysis and Prevention*, 45, 248–257. <https://doi.org/10.1016/j.aap.2011.07.010>
- Luria, G., Zohar, D., & Erev, I. (2008). The effect of workers' visibility on effectiveness of intervention programs: Supervisory-based safety interventions. *Journal of Safety Research*, 39(3), 273–280. <https://doi.org/10.1016/j.jsr.2007.12.003>
- Lussier, R. N., & Achua, C. F. (2010). *Leadership theory, application, & Skill development*. South-Western Cengage Learning.
- Lwanga, S. K., & Lemeshow, S. (1991). *Sample size determination in health study: A practical manual*. World Health Organization.

- Ma, Z., Shao, C., Ma, S., & Ye, Z. (2011). Constructing road safety performance indicators using fuzzy delphi method and grey delphi method. *Expert Systems with Applications*, 38(3), 1509–1514. <https://doi.org/10.1016/j.eswa.2010.07.062>
- Manakandan, S. K., Ismai, R., Jamil, M. R. M., & Ragnath, P. (2017). Pesticide applicators questionnaire content validation: A fuzzy delphi method. *Medical Journal of Malaysia*, 72(4), 228–235.
- Mansur, N., Zakaria, N. H., & Abdullah, Z. (2011). Understanding common dimensions of accident in malaysia. *Business and Management Review*, 1(6), 22–33.
- Marina Mior, S. N., Leman, A. M., Baharudin, M. R., Masripan, R., Faazir, T. M., & Ifwat, A. M. (2016). A preliminary study of knowledge, attitude and practices of pesticide use among oil palm workers in Johor. *MATEC Web of Conferences*, 78, 1–7. <https://doi.org/10.1051/mateconf/20167801055>
- Martínez-Córcoles, M., Gracia, F., Tomás, I., & Peiró, J. M. (2011). Leadership and employees' perceived safety behaviours in a nuclear power plant: A structural equation model. *Safety Science*, 49, 1118–1129. <https://doi.org/10.1016/j.ssci.2011.03.002>
- Mashi, M. S., Subramaniam, C., & Johari, J. (2018). The effect of management commitment to safety, and safety communication and feedback on safety behavior of nurses: the moderating role of consideration of future safety consequences. *International Journal of Human Resource Management*. <https://doi.org/10.1080/09585192.2018.1454491>
- Masi, D., Cagno, E., Micheli, G. J. L., Cagno, E., & Micheli, G. J. L. (2015). Developing, implementing and evaluating OSH interventions in SMEs: A pilot, exploratory study. *International Journal of Occupational Safety and Ergonomics*, 20(3), 385–405. <https://doi.org/10.1080/10803548.2014.11077059>
- Mat Saat, M. Z., Subramaniam, C., & Mohd Shamsudin, F. (2016). A proposed relationship between organizational safety practices and safety performance in the manufacturing of small and medium enterprises in Malaysia. *Sains Humanika*, 8(4–2), 91–97. <https://doi.org/10.11113/sh.v8n4-2.1066>
- Matanluk, O., Mohammad, B., Kiflee, D. N. A., & Imbug, M. (2013). The effectiveness of using teaching module based on radical constructivism toward students learning process. *Procedia - Social and Behavioral Sciences*, 90(InCULT 2012), 607–615. <https://doi.org/10.1016/j.sbspro.2013.07.132>
- Mazlina Zaira, M., & Hadikusumo, B. H. W. (2017). Structural equation model of integrated safety intervention practices affecting the safety behaviour of workers in the construction industry. *Safety Science*, 98, 124–135. <https://doi.org/10.1016/j.ssci.2017.06.007>
- McDonald, N., Corrigan, S., Daly, C., & Cromie, S. (2000). Safety management systems and safety culture in aircraft maintenance organisations. *Safety Science*, 34(1–

- 3), 151–176. [https://doi.org/10.1016/S0925-7535\(00\)00011-4](https://doi.org/10.1016/S0925-7535(00)00011-4)
- Md Deros, B., Rasdan Ismail, A., Ghani, J. A., & Mohd Yusof, M. Y. (2014). Conformity to occupational safety and health regulations in Malaysian small and medium enterprises. *American Journal of Applied Sciences*, *11*(3), 499–504. <https://doi.org/10.3844/ajassp.2014.499.504>
- Mearns, K., & Flin, R. (1995). Risk perception and attitudes to safety by personnel in the offshore oil and gas industry: a review. *Journal of Loss Prevention in the Process Industries*, *8*(5), 299–305. [https://doi.org/10.1016/0950-4230\(95\)00032-V](https://doi.org/10.1016/0950-4230(95)00032-V)
- Mearns, K., Whitaker, S. M., & Flin, R. (2003). Safety climate, safety management practice and safety performance in offshore environments. *Safety Science*, *41*, 641–680. [https://doi.org/10.1016/S0925-7535\(02\)00011-5](https://doi.org/10.1016/S0925-7535(02)00011-5)
- Mester, C., Visser, D., Roodt, G., & Kellerman, R. (2003). Leadership style and its relation to employee attitudes and behaviour. *SA Journal of Industrial Psychology*, *29*(2), 72–82. <https://doi.org/10.4102/sajip.v29i2.100>
- Mitonga-Monga, J., Coetzee, M., & Cilliers, F. V. N. (2012). Perceived leadership style and employee participation in a manufacturing company in the democratic republic of Congo. *African Journal of Business Management*, *6*(15), 5389–5398. <https://doi.org/10.5897/ajbm11.2443>
- Mohamed, N., Bahri, S., & Tamrin, M. (2016). Relationship between safety climate perception and safety and health management system with occupational accident at small medium industries in selangor. *Journal of Occupational Safety and Health*, *13*(2), 63–69.
- Mohamed, Y., Abu Bakar, B., Behak, F. P., & Darmi, R. (2018). *Asas metodologi penyelidikan praktikal*. Penerbit USIM.
- Mohammadfam, I., Ghasemi, F., Kalatpour, O., & Moghimbeigi, A. (2017). Constructing a Bayesian network model for improving safety behavior of employees at workplaces. *Applied Ergonomics*, *58*(October), 35–47. <https://doi.org/10.1016/j.apergo.2016.05.006>
- Mohd Jamil, M. R. (2016). Pembangunan model kurikulum latihan skives bagi program pengajian kejuruteraan pembelajaran berasaskan kerja. *Thesis Ijazah Doktor Falsafah*.
- Mohd Jamil, M. R., & Nurulrabihah, M. N. (2020). *Kepelbagaian metodologi dalam penyelidikan reka bentuk dan pembangunan*. Qaisar Prestige Resources.
- Mohd Jamil, M. R., Siraj, S., Hussin, Z., Nurulrabihah, M. N., & Ahmad Arifin, S. (2017). *Pengenalan asas kaedah Fuzzy Delphi dalam penyelidikan rekabentuk dan pembangunan*. Minda Intelek Agency.

- Mohd Jamil, M., Siraj, S., Hussin, Z., Mat Noh, N., & Sapar, A. (2014). *Pengenalan asas keadah fuzzy delphi dalam penyelidikan rekabentuk pembangunan*. Minda Inteltek Agency.
- Mohd Ridhuan, M. J., Saedah, S., Farazila, Y., Nurulrabihah, M. N., Zaharah, H., & Ahmad Arifin, S. (2015). Aplikasi teknik Fuzzy Delphi terhadap keperluan elemen keusahawanan bagi pensyarah kejuruteraan Politeknik Malaysia. *International Journal of Business and Technopreneurship*, 5(1), 135–150.
- Mokhtar, S., & Yasin, R. M. (2018). Design of teaching influences the training transfer amongst tvet's instructors: Fuzzy Delphi technique. *International Journal of Academic Research in Business and Social Sciences*, 8(6), 1083–1097. <https://doi.org/10.6007/ijarbss/v8-i6/4303>
- Moore, D. S., Notz, W. I., & Flinger, M. A. (2013). *The basic practice of statistics* (6th ed.). W. H. Freeman and Company.
- Morales, J., Montes, R., & Zerme, N. (2018). The use of fuzzy linguistic information and fuzzy delphi method to validate by consensus a questionnaire in a blended-learning environment. *IPMU*, 2(2018), 137–149. [https://doi.org/10.1007/978-3-319-91479-4\\_12](https://doi.org/10.1007/978-3-319-91479-4_12)
- Moses, L. N., & Savage, I. (1994). The effect of firm characteristics on truck accidents. *Accident Analysis and Prevention*, 26(2), 173–179. [https://doi.org/10.1016/0001-4575\(94\)90087-6](https://doi.org/10.1016/0001-4575(94)90087-6)
- Moses, M. M. (1994). Caring incidents: a Gift to the present. *Journal of Holistics Nursing*, 12(2), 193–203. <https://doi.org/0803973233>
- Moynihan, D. P., Pandey, S. K., & Wright, B. E. (2012). Setting the table: How transformational leadership fosters performance information use. *Journal of Public Administration Research and Theory*, 22(1), 143–164. <https://doi.org/10.1093/jopart/mur024>
- Muhammad Fariduddin Wajdi Anthony, A. A. Z. (2019). Teknik fuzzy delphi: Reka bentuk dan pembangunan model penerimaan GeSVa dalam m-pembelajaran institut pendidikan guru. *Jurnal Ipda*, 26(1), 251–267.
- Mukhtar, M. Y. M., Yusof, A. M., & Isa, M. L. M. (2020). Knowledge, attitude and practice on occupational safety and health among workers in petrochemical companies. *IOP Conference Series: Earth and Environmental Science*, 436(1), 1–7. <https://doi.org/10.1088/1755-1315/436/1/012029>
- Mullan, B., Smith, L., Sainsbury, K., Allom, V., Paterson, H., & Lopez, A. L. (2015). Active behaviour change safety interventions in the construction industry: A systematic review. *Safety Science*, 79(2015), 139–148. <https://doi.org/10.1016/j.ssci.2015.06.004>

- Mullen, J. E., Kelloway, E. K., & Teed, M. (2011). Inconsistent style of leadership as a predictor of safety behaviour. *Work & Stress*, 25(1), 41–54. <https://doi.org/10.1080/02678373.2011.569200>
- Mumford, M. D., Marks, M. A., Connelly, M. S., Zaccaro, S. J., & Reiter-Palmon, R. (2000). Development of leadership Skills: Experience and timing. *Leadership Quarterly*, 11(1), 88–114. <https://doi.org/10.1002/jgt.3190080308>
- Mustaffa, N. A., Rahman, R. A., Hassim, M. H., & Ngadi, N. (2017). Evaluation of knowledge, attitude and practices of food handlers in campus cafeterias. *Chemical Engineering Transactions*, 56, 1297–1302. <https://doi.org/10.3303/CET1756217>
- Mustapha, R., & Darussalam, G. (2018). *Aplikasi kaedah Fuzzy Delphi dalam penyelidikan sains sosial*. Penerbitan Universiti Malaya.
- Myzabella, N., Fritschi, L., Merdith, N., El-Zaemey, S., Chih, H., & Reid, A. (2019). Occupational health and safety in the palm oil industry: A systematic review. *International Journal of Occupational and Environmental Medicine*, 10(4), 159–173. <https://doi.org/10.15171/ijoem.2019.1576>
- Nascimento, C. F., & Frutuoso e Melo, P. F. F. (2010). A behavior and observation-based monitoring process for safety management. *International Journal of Occupational Safety and Ergonomics*, 16(4), 407–420. <https://doi.org/10.1080/10803548.2010.11076855>
- Ncube, F., Kanda, A., Chijokwe, M., Mabaya, G., & Nyamugure, T. (2020). Food safety knowledge, attitudes and practices of restaurant food handlers in a lower-middle-income country. *Food Science and Nutrition*, 8(3), 1677–1687. <https://doi.org/10.1002/fsn3.1454>
- Neal, A., Griffin, M. A., & Hart, P. M. (2000). The impact of organizational climate on safety climate and individual behavior. *Safety Science*. [https://doi.org/10.1016/S0925-7535\(00\)00008-4](https://doi.org/10.1016/S0925-7535(00)00008-4)
- Neal, Andrew, & Griffin, M. A. (2006). A study of the lagged relationships among safety climate, safety motivation, safety behavior, and accidents at the individual and group levels. *Journal of Applied Psychology*. <https://doi.org/10.1037/0021-9010.91.4.946>
- Nee, S. O., & Sani, N. A. (2011). Assessment of knowledge, attitudes and practices (KAP) among food handlers at residential colleges and canteen regarding food safety. *Sains Malaysiana*, 40(4), 403–410.
- Ng, S. F., Azlan, M. A. K., Kamal, A. N. A., & Manion, A. (2020). A quasi-experiment on using guided mobile learning interventions in ESL classrooms: Time use and academic performance. *Education and Information Technologies*. <https://doi.org/10.1007/s10639-020-10191-7>

- Ngueutsa, R., & Kouabenan, D. R. (2017). Accident history, risk perception and traffic safe behaviour. *Ergonomics*, 60(9), 1273–1282. <https://doi.org/10.1080/00140139.2016.1259508>
- Nielsen, K. J., Kines, P., Pedersen, L. M., Andersen, L. P., & Andersen, D. R. (2015). A multi-case study of the implementation of an integrated approach to safety in small enterprises. *Safety Science*, 71(January), 142–150. <https://doi.org/10.1016/j.ssci.2013.11.015>
- Noh, N. M., Razak, S. H. A., Alias, N., Siraj, S., Jamil, M. R. M., & Hussin, Z. (2013). Usage of Facebook: The future impact of curriculum implementation on students in Malaysia. *Procedia - Social and Behavioral Sciences*, 103, 1261–1270. <https://doi.org/10.1016/j.sbspro.2013.10.455>
- Noh, N. M., Siraj, S., Halili, S. H., Jamil, M. R. M., & Husin, Z. (2019). Application of fuzzy delphi method as a vital element in technology as a tool in design thinking based learning. *Asia Pacific Journal of Educators and Education*, 34(d), 129–151. <https://doi.org/10.21315/apjee2019.34.7>
- Nor Azma, R., Mustafa, M., & Abdul Majid, A. H. (2016). The estimation trend of Malaysian SME occupational safety and health statistic. *International Journal of Occupational Safety and Health*, 6(1), 18–25.
- Northouse, P. G. (2016). *Leadership theory and practice* (7th ed.). Sage Publication Inc.
- Nowrouzi-Kia, B., Nadesar, N., & Casole, J. (2019). Systematic review: Factors related to injuries in small- and medium-sized enterprises. *International Journal of Critical Illness and Injury Science*, 9(2), 57–63.
- Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric theory*. McGraw-Hill.
- Nunnally, J. (1978). *Psychometric theory*. In *New York: McGraw-Hill*. <https://doi.org/10.1037/018882>
- Nunu, W. N., Kativhu, T., & Moyo, P. (2018). An evaluation of the effectiveness of the behaviour based safety initiative card system at a cement manufacturing company in Zimbabwe. *Safety and Health at Work*, 9(3), 308–313. <https://doi.org/10.1016/j.shaw.2017.09.002>
- Nur Izyan, F. R., Zuraini, M. I., Maria, M. S., Lovelyna, B. J., Maimunah, M., & Saidatul Afzan, A. A. (2019). A preliminary study on food safety knowledge, attitude and practices among home-based food providers in klang valley, malaysia. *Malaysian Applied Biology*, 48(2), 157–160.
- O'Fallon, M. J., & Butterfield, K. D. (2012). The influence of unethical peer behavior on observers' unethical behavior: A social cognitive perspective. *Journal of Business Ethics*, 109(2), 117–131. <https://doi.org/10.1007/s10551-011-1111-7>

- O'Kelly, K. (2019). New employees and safety culture: A social cognitive theory perspective. *Safety Culture*, 37–40.
- Oah, S., Na, R., & Moon, K. (2018). The influence of safety climate, safety leadership, workload, and accident experiences on risk reception: A study of Korean manufacturing workers. *Safety and Health at Work*, 9, 427–433. <https://doi.org/10.1016/j.shaw.2018.01.008>
- Olson, R., & Winchester, J. (2008). Behavioral self-monitoring of safety and productivity in the workplace: A methodological primer and quantitative literature review. *Journal of Organizational Behavior Management*, 28(1), 9–75. <https://doi.org/10.1080/01608060802006823>
- Onowhakpor, A., Abusu, G., Adebayo, B., Esene, H., & Okojie, O. (2017). Determinants of occupational health and safety: knowledge, attitude, and safety practices toward occupational hazards of sawmill workers in Egor Local Government Area, Edo State. *African Journal of Medical and Health Sciences*, 16(1), 58. <https://doi.org/10.4103/2384-5589.209487>
- Oostakhan, M., Mofidi, A., & Talab, A. D. (2012). Behavior-based safety approach at a large construction site in Iran. *Iranian Rehabilitation Journal*, 10. <http://irj.uswr.ac.ir/article-1-221-en.pdf>
- Oppenheim, A. N. (2000). *Questionnaire design, interviewing and attitude measurement* (2nd ed.). Pinter Publishers.
- Oswald, D., Sherratt, F., & Smith, S. (2013). Exploring factors affecting unsafe behaviours in construction. *Proceedings 29th Annual Association of Researchers in Construction Management Conference, ARCOM 2013, September*, 335–344.
- Pajares, F. (2002). Gender and perceived self-efficacy in self-regulated learning. *Theory into Practice*. [https://doi.org/10.1207/s15430421tip4102\\_8](https://doi.org/10.1207/s15430421tip4102_8)
- Pallant, J. (2010). *SPSS Survival Manual: A step by step guide to data analysis using SPSS* (4th ed.). Allen & Unwin. <https://doi.org/10.1046/j.1365-2648.2001.2027c.x>
- Passmore, J., Kraessler, V., & Avery, R. (2015). Safety coaching: A literature review of coaching in high hazard industries. *Industrial and Commercial Training*, 47(4), 195–200. <https://doi.org/10.1108/ICT-12-2014-0080>
- Patino, C. M., & Ferreira, J. C. (2018). Inclusion and exclusion criteria in research studies: definitions and why they matter. *Jornal Brasileiro de Pneumologia*, 44(2), 84–84. [http://www.scielo.br/scielo.php?script=sci\\_arttext&pid=S1806-37132018000200084&lng=en&tlng=en](http://www.scielo.br/scielo.php?script=sci_arttext&pid=S1806-37132018000200084&lng=en&tlng=en)
- Petrie, H., & Bevan, N. (2009). The evaluation of accessibility, usability, and user experience. In C. Stephanidis (Ed.), *The Universal Access Handbook*. <https://doi.org/10.1201/9781420064995-c20>



- Piaw, C. Y. (2012). Mastering research methods. *Journal*.
- Pidgeon, N. (1998). Safety culture: Key theoretical issues. *Work and Stress*, 12(3), 202–216. <https://doi.org/10.1080/02678379808256862>
- Podsakoff, P. M., MacKenzie, S. B., & Podsakoff, N. P. (2012). Sources of method bias in social science research and recommendations on how to control it. *Annual Review of Psychology*, 63, 539–569. <https://doi.org/10.1146/annurev-psych-120710-100452>
- Poosanthanasarn, N., Lohachit, C., Fungladda, W., Sriboorapa, S., & Pulkate, C. (2005). An ergonomics intervention program to prevent worker injuries in a metal autoparts factory. *Southeast Asian Journal of Tropical Medicine and Public Health*, 36(2), 512–522.
- Pourhoseingholi, M. A., Baghestani, A. R., & Vahedi, M. (2012). How to control confounding effects by statistical analysis. *Gastroenterology and Hepatology from Bed to Bench*, 5(2), 79–83. <https://doi.org/10.22037/ghfbb.v5i2.246>
- Preskorn, S. H., Macaluso, M., & Trivedi, M. (2015). How commonly used inclusion and exclusion criteria in antidepressant registration trials affect study enrollment. *Journal of Psychiatric Practice*, 21(4), 267–274. <https://doi.org/10.1097/PRA.0000000000000082>
- Rahlin, N. A., Awang, Z., Afthanorhan, A., & Aimran, N. (2019). The art of covariance based analysis in behaviour-based safety performance study using confirmatory factor analysis: Evidence from SMES. *International Journal of Innovation, Creativity and Change*, 7(10), 351–370.
- Ramayah, T., Cheah, J., Chuah, F., Ting, H., & Memon, M. . (2018). Partial least squares structural equation modeling (PLS-SEM) using SmartPLS 3.0: An updated guide and practical guide to statistical analysis. In *Practical Assessment, Research and Evaluation*.
- Rampal, L., Rosidah, Z., Leong, W., & Azhar, M. Z. (2010). Needle stick and sharps injuries and factors associated among health care workers in a Malaysian hospital. *European Journal of Social Sciences*, 13(3), 354–362. [file:///C:/Users/User-Asus/Downloads/Needle Stick and Sharps Injuries ejss\\_13\\_3\\_03 \(1\).pdf](file:///C:/Users/User-Asus/Downloads/Needle%20Stick%20and%20Sharps%20Injuries%20ejss_13_3_03%20(1).pdf)
- Ranjan, M. Z., Baharudin, M. R., & Baharudin, B. T. H. T. (2020). Application of Fuzzy Delphi Method ( FDM ) to reach The experts consensus on the construction OSH modifying risk factor. *International Journal of Advanced Science and Technology*, 29(9), 1574–1590.
- Rau, P. L. P., Liao, P. C., Guo, Z., Zheng, J., & Jing, B. (2018). Personality factors and safety attitudes predict safety behaviour and accidents in elevator workers. *International Journal of Occupational Safety and Ergonomics*, 0(0), 1–21. <https://doi.org/10.1080/10803548.2018.1493259>

- Reason, J. (2000). Human error: models and management. *Journal Digest*, 172(June), 393–396. <https://doi.org/10.1136/bmj.320.7237.768>
- Reisinger, H. (1997). The impact of research designs on  $R^2$  in linear regression models: An exploratory meta-analysis. *Journal of Empirical Generalisations in Marketing Science*, 2, 1–12.
- Reitz, O. E., & Anderson, M. A. (2013). A comparison of survey methods in studies of the nurse workforce. *Nurse Researcher*, 20(4), 22–27. <https://doi.org/10.7748/nr2013.03.20.4.22.e286>
- Rejab, M. M., Chuprat, S., & Azmi, N. huda F. M. (2018). Proposed methodology using design development research (DDR) improving traceability model with test effort estimation. *International Journal of Academic Research in Business and Social Sciences*, 8(8), 686–699. <https://doi.org/10.6007/ijarbss/v8-i8/4625>
- Rhaffor, K. A., & Jamian, R. (2020). The role of 5S in improving occupational safety and health management in small and medium enterprises ( SMEs ). *Journal of Safety, Health and Ergonomics*, 2(1), 1–6.
- Riaz, A., & Haider, M. H. (2010). Role of transformational and transactional leadership on job satisfaction and career satisfaction. *Business and Economic Horizons*, 1(April), 29–38. <https://doi.org/10.15208/beh.2010.05>
- Richey, R. C., & Klein, J. D. (2014). *Design and development research*. Routledge.
- Richey, R. C., Klein, J. D., & Nelson, W. A. (2004). Developmental research: Studies of instructional design development. In D. H. Jonassen (Ed.), *Handbook of Research on Educational Communications and Technology: Fourth Edition* (pp. 1099–1130). Lawrence Erlbaum Associates Publishers. [https://doi.org/10.1007/978-1-4614-3185-5\\_12](https://doi.org/10.1007/978-1-4614-3185-5_12)
- Ridhuan, M., Jamil, Shariza Said, & K. Azeez, M. I. (2014). Kompetensi guru terhadap penguruan PdP - Suatu pendekatan teknik Fuzzy Delphi. *Jurnal Kepimpinan Pendidikan*, 1(3), 77–88.
- Rindfuss, R. R., Choe, M. K., Tsuya, N. O., Bumpass, L. L., & Tamaki, E. (2015). Do low survey response rates bias results? Evidence from Japan. *Demographic Research*, 32(1), 797–828. <https://doi.org/10.4054/DemRes.2015.32.26>
- Ringle, C. M., Da Silva, D., & Bido, D. D. S. (2014). Structural equation model with smartpls. *Revista Brasileira de Marketing*, 13(2), 56–73. <https://doi.org/10.5585/remark.v13i2.2717>
- Robbins, S. P., & Judge, T. A. (2013). *Organizational behavior*. Pearson Education Inc.
- Saari, J. (1994). When does behaviour modification prevent accidents? *Leadership & Organization Development Journal*, 15(5), 11–15. <https://doi.org/10.1108/01437739410059926>

- Salameh, K. A. (2019). The effectiveness of a cognitive-behavioral counseling program in modifying the negative behavior among students of Aqabat Jaber school camp in the governorate of Jericho. *World Journal of Education*, 9(3), 105. <https://doi.org/10.5430/wje.v9n3p105>
- Sari, J. (1988). Successful accident prevention. An intervention study in the nordic countries. *Scand .J .Work Environ. Health* 14, 1, 121–123.
- Sari, N. S., Dewi, R. S., & Sudiano, A. (2018). Development of fatigue, accident experiences and safety culture relationships to the risk of fishing perception on the accidents of fishing vessel small and medium. *MATEC Web of Conferences*, 204, 1–7. <https://doi.org/10.1051/matecconf/201820403010>
- Sarstedt, M., Hair, J. F., Cheah, J. H., Becker, J. M., & Ringle, C. M. (2019). How to specify, estimate, and validate higher-order constructs in PLS-SEM. *Australasian Marketing Journal*, 27(3), 197–211. <https://doi.org/10.1016/j.ausmj.2019.05.003>
- Sawacha, E., Naoum, S., & Fong, D. (1999). Factors affecting safety performance on construction sites. *International Journal of Project Management*, 17(5), 309–315. [https://doi.org/10.1016/S0263-7863\(98\)00042-8](https://doi.org/10.1016/S0263-7863(98)00042-8)
- Sawhney, G. (2016). Examining attitudes, norms, and control toward safety behaviors as mediators in the leadership-safety motivation relationship. In *Journal of Business and Psychology*. <https://doi.org/10.25777/x3wg-7d76>
- Sawhney, G., & Cigularov, K. P. (2019). Examining attitudes, norms, and control toward safety behaviors as mediators in the leadership-safety motivation relationship. *Journal of Business and Psychology*, 34(2), 237–256. <https://doi.org/10.1007/s10869-018-9538-9>
- Schneider, B., & Cheslock, N. (2003). Measuring results: Gaining insight on behavior change strategies and evaluation ethods from environmental education, museum, health, and social marketing programs. In *Coevolution Institute* (Issue April).
- Schrader, P. G., & Lawless, K. A. (2004). The knowledge, attitudes, & behaviors approach how to evaluate performance and learning in complex environments. *Performance Improvement*, 43(9), 8–15. <https://doi.org/10.1002/pfi.4140430905>
- Schwatka, N. V., Goldenhar, L. M., Johnson, S. K., Beldon, M. A., Tessler, J., Dennerlein, J. T., Fullen, M., & Trieu, H. (2019). A training intervention to improve frontline construction leaders' safety leadership practices and overall jobsite safety climate. *Journal of Safety Research*, 70, 253–262. <https://doi.org/10.1016/j.jsr.2019.04.010>
- Scott Geller, E. (1994). Ten principles for achieving a total safety culture. *Professional Safety*, Sept. 1994, 18–24. <https://doi.org/10.7748/nm.17.6.13.s18>

- Sekaran, U., & Bougie, R. (2012). *Research methods for business research methods for business*. Research methods for business. <https://doi.org/10.13140/RG.2.1.1419.3126>
- Sekaran, U., & Bougie, R. (2013). *Research methods for business: A skill-building approach*. (6th ed.). Wiley.
- Sekaran, U., & Bougie, R. (2016). *Research methods for business: A skill building approach*. In *John Wiley & Sons Ltd* (7th ed.). [https://doi.org/10.1007/978-94-007-0753-5\\_102084](https://doi.org/10.1007/978-94-007-0753-5_102084)
- Seo, D.-C. (2005). An explicative model of unsafe work behavior. *Safety Science*, *43*, 187–211. <https://doi.org/10.1016/j.ssci.2005.05.001>
- Sergiovanni, T. J. (1990). Adding value to leadership gets extraordinary results. *Educational Leadership*, *47*, 23–27.
- Shadish, W. R., Cook, T. D., & Campbell, D. T. (2004). Review of experimental and Quasi-experimental designs for generalized causal inference. In *Evaluation and Program Planning* (Vol. 27, Issue 2). <https://doi.org/10.1016/j.evalprogplan.2004.01.006>
- Shahlan, S. S., Hassim, M. H., Kidam, K., Safuan, H. M., Othman, N., Ripin, A., Ali, M. W., Zakaria, Z. Y., Haron, S., Ahmad, A., Mat Ali, N., Syed Hassan, S. A. H., Asri, H., Sulaiman, Z., & Masri, M. F. (2015). Occupational safety and health assessment in metal industry within small and medium enterprise. *Journal Occupational Safety & Health*, *12*(1), 81–84.
- Shang, K. C., Yang, C. S., & Lu, C. S. (2011). The effect of safety management on perceived safety performance in container stevedoring operations. *International Journal of Shipping and Transport Logistics*, *3*(3), 323–341. <https://doi.org/10.1504/IJSTL.2011.040801>
- Shannon, H. S., Robson, L. S., & Guastello, S. J. (1999). Methodological criteria for evaluating occupational safety intervention research. *Safety Science*, *31*(2), 161–179. [https://doi.org/10.1016/S0925-7535\(98\)00063-0](https://doi.org/10.1016/S0925-7535(98)00063-0)
- Shariza Said, Loh Sau Cheong, Jamil, M. R. M., Yusni Mohamad Yusop, Mohd Ibrahim K. Azeez, & Ng Poi Ni. (2014). Analisis masalah dan keperluan guru pendidikan khas integrasi (masalah pembelajaran) peringkat sekolah rendah tentang pendidikan seksualiti. *JPBU Edisi Khas*, *7*, 77–85.
- Shen, Y., Ju, C., Koh, T. Y., Rowlinson, S., & Bridge, A. J. (2017). The impact of transformational leadership on safety climate and individual safety behavior on construction sites. *International Journal of Environmental Research and Public Health*, *14*(1), 1–17. <https://doi.org/10.3390/ijerph14010045>
- Shima, N., Rani, A., Pa'wan, F., Musa, N. C., & Tajudin, M. M. (2008). Malaysian employees' preference of their managers leadership style. *International Review of Business Research Papers*, *4*(5), 97–108.

<http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.505.2901&rep=rep1&type=pdf>

- Singh, V., & Verma, A. (2019). Influence of respondent type on relationships between safety climate and safety performance in manufacturing firm. *Proceedings of the Institution of Mechanical Engineers, Part O: Journal of Risk and Reliability*, 233(2), 268–284. <https://doi.org/10.1177/1748006X18780773>
- Siraj, S., Abdullah, M. R. T. L., & Mohammad Rozkee, R. (2020). *Pendekatan penyelidikan rekabentuk dan pembangunan: Aplikasi kepada penyelidikan pendidikan*. Universiti Pendidikan Sultan Idris.
- Siu, O. L., Phillips, D. R., & Leung, T. W. (2003). Age differences in safety attitudes and safety performance in Hong Kong construction workers. *Journal of Safety Research*, 34(2), 199–205. [https://doi.org/10.1016/S0022-4375\(02\)00072-5](https://doi.org/10.1016/S0022-4375(02)00072-5)
- Sivanathan, N., Turner, N., & Barling, J. (2005). Effects of transformational leadership training on employee safety performance: A quasi-experiment study. *Academy of Management Conference 2005*, 1–5. <https://doi.org/10.5465/ambpp.2005.18780756>
- Skeepers, N. C., & Mbohwa, C. (2015). A Study on the Leadership Behaviour, Safety Leadership and Safety Performance in the Construction Industry in South Africa. *Procedia Manufacturing*, 4(less), 10–16. <https://doi.org/10.1016/j.promfg.2015.11.008>
- Skinner, B. F. (1938). *The behavior of organisms: an experimental analysis*. Appleton-Century.
- SME Corporation Malaysia. (2015). *SME Annual Report 2013/14*.
- SME Corporation Malaysia. (2019). SME annual report 2018/2019: Entrepreneurship driving SMEs. In *Official Website SMEcorp Malaysia*.
- Smith, G. S., Huang, Y. H., Ho, M., & Chen, P. Y. (2006). The relationship between safety climate and injury rates across industries: The need to adjust for injury hazards. *Accident Analysis and Prevention*, 38(3), 556–562. <https://doi.org/10.1016/j.aap.2005.11.013>
- Social Security Organisation (SOCISO). (2018). *Annual report*. [https://www.perkeso.gov.my/images/laporan\\_tahunan/LAPORAN\\_TAHUNAN\\_ANNUAL\\_REPORT\\_2018.pdf](https://www.perkeso.gov.my/images/laporan_tahunan/LAPORAN_TAHUNAN_ANNUAL_REPORT_2018.pdf)
- Song, K., Ahn, B., & Rhim, J. (2019). The effect of safety culture on the safety awareness and safety behavior of manufacturing workers. *Journal of the Korean Society of Safety*, 34(6), 65–75. <https://doi.org/10.5392/JKCA.2019.19.12.151>
- Stevens, S. C., Hemmings, L., Scott, C., Lawler, A., & White, C. (2014). Clinical leadership style and hand hygiene compliance. *Leadership in Health Services*, 27(1), 20–30. <https://doi.org/10.1108/LHS-09-2012-0029>

- Stranks, J. (2007). Human factors and behavioural safety. In *Human Factors and Behavioural Safety*. Elsevier Ltd. <https://doi.org/10.4324/9780080489001>
- Subramaniam, C., Mohd Shamsudin, F., Mohd Zin, M. L., Sri Ramalu, S., & Hassan, Z. (2016a). Safety management practices and safety compliance in small medium enterprises. *Asia-Pacific Journal of Business Administration*. <https://doi.org/10.1108/APJBA-02-2016-0029>
- Subramaniam, C., Mohd Shamsudin, F., Mohd Zin, M. L., Sri Ramalu, S., & Hassan, Z. (2016b). The influence of safety management practices on safety behavior: A study among manufacturing smes in Malaysia. *International Journal of Supply Chain Management*, 5(4), 148–160.
- Sugumaran, B., Abdullah, M. S., Hadi, A., & Manaf, A. (2017). Safety compliance behaviour in manufacturing industry: A malaysian perspective. *Saudi Journal of Humanities and Social Sciences*, 2(1), 66–73. <https://doi.org/10.21276/sjhss.2017.2.1.11>
- Surienty, L. (2012). Management practices and osh implementation in SMEs in malaysia. *School of Management, USM Minden, Pulau Pinang, February*, 1–13.
- Surienty, L. (2019). OSH implementation in SMEs in malaysia: The role of management practices and legislation. *Advances in Intelligent Systems and Computing*, 819(November 2018), 650–671. [https://doi.org/10.1007/978-3-319-96089-0\\_72](https://doi.org/10.1007/978-3-319-96089-0_72)
- Surienty, L., Hong, K. T., Kee, D., & Hung, M. (2011). Occupational safety and health (OSH) in SMEs in malaysia : A preliminary investigation. *Journal of Global Entrepreneurship*, 1(1), 65–75.
- Suryanto, Heryanto, Candra, A., & Akhyarul, A. (2018). The effect of safety behavior training on knowledge and ttitude of small medium enterprises group. *International Journal of Public Health & Safety*, 3(3), 1–4. <https://www.hilarispublisher.com/open-access/the-effect-of-safety-behavior-training-on-knowledge-and-attitude-of-small-medium-enterprises-group.pdf>
- Syed Ismail, S. N., Ranga, J. U., Rasdi, I., Abd Rahman, U. R., & Abu Samah, M. A. (2018). Mobile apps application to improve safety and health knowledge, attitude and practice among university students. *Malaysian Journal of Medicine and Health Sciences*, 14(5), 47–55.
- Tabachnick, B. G., & Fidell, L. S. (2007). Using Multivariate Statistics 5. In *Boston: Pearson Allyn and Bacon*. <https://doi.org/10.1037/022267>
- Tabachnick, B. G., & Fidell, L. S. (2014). *Using multivariate statistics* (6th ed.). Pearson Education Limited.
- Taber, K. S. (2017). The use of Cronbach’s Alpha when developing and reporting research instruments in science education. *Research in Science Education*,

48(6), 1273–1296. <https://doi.org/10.1007/s11165-016-9602-2>

- Tahir, H. M., Razak, N. A., & Rentah, F. (2018). The contributions of small and medium enterprises (SME's) On Malaysian economic growth: A sectoral analysis. *Advances in Intelligent Systems and Computing*, 739, 704–711. [https://doi.org/10.1007/978-981-10-8612-0\\_73](https://doi.org/10.1007/978-981-10-8612-0_73)
- Tajaddini, R., & Mujtaba, B. G. (2009). Stress perceptions and leadership orientation of Malaysians: Exploring their similarities and differences with Americans. *Chinese Business Review*, 08(08), 26–42. <https://doi.org/10.17265/1537-1506/2009.08.003>
- Tam, C. M., & Fung, I. W. H. (1998). Effectiveness of safety management strategies on safety performance in hong kong. *Construction Management and Economics*, 16(1), 49–55. <https://doi.org/10.1080/014461998372583>
- Tehseen, S., Ramayah, T., & Sajilan, S. (2017). Testing and controlling for common method variance: A review of available methods. *Journal of Management Sciences*, 4(2), 142–168. <https://doi.org/10.20547/jms.2014.1704202>
- Tong, D. Y. K., Rasiah, D., Tong, X. F., & Lai, K. P. (2015). Leadership empowerment behaviour on safety officer and safety teamwork in manufacturing industry. *Safety Science*, 72, 190–198. <https://doi.org/10.1016/j.ssci.2014.09.009>
- Tremblay, A., & Badri, A. (2018). Assessment of occupational health and safety performance evaluation tools: State of the art and challenges for small and medium-sized enterprises. *Safety Science*, 101(August 2017), 260–267. <https://doi.org/10.1016/j.ssci.2017.09.016>
- Tuncel, S., Lotlikar, H., Salem, S., & Daraiseh, N. (2006). Effectiveness of behaviour based safety interventions to reduce accidents and injuries in workplaces: Critical appraisal and meta-analysis. *Theoretical Issues in Ergonomics Science*, 7(3), 191–209. <https://doi.org/10.1080/14639220500090273>
- Turner, D. P. (2020). Sampling methods in research design. *Headache*, 60(1), 8–12. <https://doi.org/10.1111/head.13707>
- Tyrer, S., & Heyman, B. (2016). Sampling in epidemiological research: Issues, hazards and pitfalls. *BJP Sych Bulletin*, 40(2), 57–60. <https://doi.org/10.1192/pb.bp.114.050203>
- Ugur-Erdogmus, F., & Cagiltay, K. (2019). Making novice instructional designers expert: Design and development of an electronic performance support system. *Innovations in Education and Teaching International*, 56(4), 470–480. <https://doi.org/10.1080/14703297.2018.1453853>
- Varonen, U., & Mattila, M. (2002). Effects of the work environment and safety activities on occupational accidents in eight wood-processing companies. *Human Factors and Ergonomics In Manufacturing*, 12(1), 1–15. <https://doi.org/10.1002/hfm.10002>

- Velicer, W. F., & Jackson, D. N. (1990). Component Analysis versus Common Factor Analysis: Some Issues in Selecting an Appropriate Procedure. *Multivariate Behavioral Research*, 25(1), 1–28. [https://doi.org/10.1207/s15327906mbr2501\\_1](https://doi.org/10.1207/s15327906mbr2501_1)
- Vinodkumar, M. N., & Bhasi, M. (2010). Safety management practices and safety behaviour: Assessing the mediating role of safety knowledge and motivation. *Accident Analysis and Prevention*, 42, 2082–2093. <https://doi.org/10.1016/j.aap.2010.06.021>
- von Thiele Schwarz, U., Hasson, H., & Tafvelin, S. (2016). Leadership training as an occupational health intervention: Improved safety and sustained productivity. *Safety Science*, 81, 35–45. <https://doi.org/10.1016/j.ssci.2015.07.020>
- Waldman, D. A., Bass, B. M., & Einstein, W. O. (1987). Leadership and outcomes of performance appraisal processes. *Journal of Occupational Psychology*, 60(3), 177–186. <https://doi.org/10.1111/j.2044-8325.1987.tb00251.x>
- Wang, F., & Hannafin, M. J. (2005). Design-based research and technology-enhanced learning environments. *Educational Technology Research and Development*, 53(4), 5–23. <https://doi.org/10.1007/BF02504682>
- Wang, Q., Mei, Q., Liu, S., & Zhang, J. (2018). Analysis of managing safety in small enterprises: Dual-effects of employee prosocial safety behavior and government inspection. *BioMed Research International*, 2018, 1–12. <https://doi.org/10.1155/2018/6482507>
- Warmerdam, A., Newnam, S., Wang, Y., Sheppard, D., Griffin, M., & Stevenson, M. (2018). High performance workplace systems' influence on safety attitudes and occupational driver behaviour. *Safety Science*, 106(March), 146–153. <https://doi.org/10.1016/j.ssci.2018.03.016>
- Wu, T. C. (2008). Safety leadership in the teaching laboratories of electrical and electronic engineering departments at Taiwanese Universities. *Journal of Safety Research*, 39(6), 599–607. <https://doi.org/10.1016/j.jsr.2008.10.003>
- Wu, T. C., Chen, C. H., & Li, C. C. (2008). A correlation among safety leadership, safety climate and safety performance. *Journal of Loss Prevention in the Process Industries*, 21(3), 307–318. <https://doi.org/10.1016/j.jlp.2007.11.001>
- Yaacob, N. A., Rasdi, I., Zainal Abidin, E., Abdul Rahman, A., & Ismail, S. (2016). Kiken yochi training (KYT) in reducing accidents at workplaces: A systematic review. *International Journal of Public Health and Clinical Sciences*, 3(4), 123–132. <http://publichealthmy.org/ejournal/ojs2/index.php/ijphcs/article/view/331>
- Yaakub, M. Y., Mohd Hamzah, M. I., & Mohd Nor, M. Y. (2014). Pengesahan instrumen soal selidik kepimpinan distributif menggunakan kaedah fuzzy delphi. *Jurnal Kepimpinan Pendidikan*, 1(April), 53–64. [http://umrefjournal.um.edu.my/filebank/published\\_article/6255/Template](http://umrefjournal.um.edu.my/filebank/published_article/6255/Template)



- Yammarino, F. J., Spangler, W. D., & Bass, B. M. (1993). Transformational leadership and performance: A longitudinal investigation. *The Leadership Quarterly*, 4(1), 81–102. [https://doi.org/10.1016/1048-9843\(93\)90005-E](https://doi.org/10.1016/1048-9843(93)90005-E)
- Yang, C.-C., Wang, Y.-S., Chang, S.-T., Guo, S.-E., & Huang, M.-F. (2009). A study on the leadership behavior, safety culture, and safety performance of the healthcare industry. *World Academy of Science, Engineering and Technology*, 53(1), 1148–1155.
- Yeow, J. A., Ng, P. K., Tai, H. T., & Chow, M. M. (2020). a Review on Human Error in Malaysia Manufacturing Industries. *Journal of Information System and Technology Management*, 5(19), 01–13. <https://doi.org/10.35631/jistm.519001>
- Yukl, G. (2012). Effective leadership behavior: What we know and what questions need more attention. *Academy of Management Perspectives*, 26(4), 66–85. <https://doi.org/10.5465/amp.2012.0088>
- Yusoff, Y. M., Abdullah, H. H., & Hafinaz, H. (2020). Establishing the green human resource management practices model of SMEs in malaysia. *European Academic ...*, VIII(2), 493–504. <http://euacademic.com/earj/article/view/88>
- Yusoff, Y. M., Nejati, M., Kee, D. M. H., & Amran, A. (2020). Linking Green Human Resource Management Practices to Environmental Performance in Hotel Industry. *Global Business Review*, 21(3), 663–680. <https://doi.org/10.1177/0972150918779294>
- Yusop, Y. M., Sumari, M., Mohamed, F., Said, S., K. Azeez, M. I., & Jamil, M. R. M. (2013). The needs analysis in self-concept module development. *The Malaysian Online Journal of Educational Science*, 3(1), 44–55. [www.moj-es.net](http://www.moj-es.net)
- Zainuddin, N., Che, R., Yusuff, M., & Samy, G. N. (2018). Adapting design and development research (DDR) approach in developing cloud risk assessment method for Malaysian healthcare. *Open International Journal of Informatics (OIJI)*, 6(2), 33–42.
- Zainuddin, S., Ismail, K., & Sapiei, S. (2013). The influence of cultural value in Malaysian firms: A research note. *Journal of Business and Economics*, 4(12), 1276–1285. <http://www.academicstar.us>
- Zakaria, N. H., Mansor, N., & Abdullah, Z. (2012). Workplace accident in malaysia: Most Common causes and solutions. *Business and Management Review*, 2(5), 75–88.
- Zerguine, H., Jalaludin, J., & Tamrin, S. B. M. (2016). Behaviour based safety approach and factors affecting unsafe behaviour in construction sector: A review. *Asia Pacific Environmental and Occupational Health Journal*, 2(2), 1–12.

- Zhang, J., Xie, C., Wang, J., Morrison, A. M., & Coca-Stefaniak, J. A. (2020). Responding to a major global crisis: The effects of hotel safety leadership on employee safety behavior during COVID-19. *International Journal of Contemporary Hospitality Management*, 32(11), 3365–3389. <https://doi.org/10.1108/IJCHM-04-2020-0335>
- Zhou, F., & Jiang, C. (2015). Leader-member exchange and employees' safety behavior: The moderating effect of safety climate. *Procedia Manufacturing*. <https://doi.org/10.1016/j.promfg.2015.07.671>
- Zhou, Q., & Pan, W. (2015). A cross-level examination of the process linking transformational leadership and creativity: The role of psychological safety climate. *Human Performance*, 28(5), 405–424. <https://doi.org/10.1080/08959285.2015.1021050>
- Zikmund, W., Babin, B., Carr, J., & Griffin, M. (2010). *Business research methods* (8th ed.). South-Western Cengage Learning.
- Zin, S. M., & Ismail, F. (2012). Employers' behavioural safety compliance factors toward occupational, safety and health improvement in the construction industry. *Procedia -Social and Behavioral Sciences Savoy Homann Bidakara Bandung Hotel*, 36, 742–751. <https://doi.org/10.1016/j.sbspro.2012.03.081>
- Zohar, D. (1980). Safety climate in industrial organizations: Theoretical and applied implications. *Journal of Applied Psychology*. <https://doi.org/10.1037/0021-9010.65.1.96>
- Zohar, D., & Luria, G. (2003). The use of supervisory practices as leverage to improve safety behavior: A cross-level intervention model. *Journal of Safety Research*, 34, 567–577. <https://doi.org/10.1016/j.jsr.2003.05.006>
- Zulkifly, S. S. (2020). Safety Leadership and its effect on safety knowledge-attitude-behaviour (KAB) of malaysia manufacturing workers. *International Journal of Solid State Technology*, 63(3), 218–229.
- Zulkifly, S. S., Ismail Syed, S. N., Hasan, N. H., Mahadi, M. R., & Baharudin, M. R. (2020). Assessing the level of safety knowledge-attitude-behaviour (Safety KAB): A case study in a public cleansing firm. *Journal of Safety, Health and Ergonomics*, 2(1), 1–7.
- Zulkifly, S. S., Subramaniam, C., & Hasan, N. H. (2017). Examining the influence of safety leadership towards safety behaviour in SME manufacturing. *Occupational Safety and Health*, 14(1), 17–23. <https://doi.org/10.1201/9781315269603-7>
- Zulkifly, S. S., Zain, I. M., Hasan, N. H., & Baharudin, M. R. (2018). Workplace safety improvement in sme manufacturing: A government intervention. *International Journal of Science and Technology*, 4(2), 29–39. <https://doi.org/10.20319/mijst.2018.42.2939>