

The copyright © of this thesis belongs to its rightful author and/or other copyright owner. Copies can be accessed and downloaded for non-commercial or learning purposes without any charge and permission. The thesis cannot be reproduced or quoted as a whole without the permission from its rightful owner. No alteration or changes in format is allowed without permission from its rightful owner.



**SAFETY MANAGEMENT PRACTICES AND SAFETY
PERFORMANCE AMONG PESTICIDES INDUSTRY
WORKERS IN PORT KLANG**



**MASTER OF SCIENCE
(OCCUPATIONAL SAFETY AND HEALTH MANAGEMENT)
UNIVERSITI UTARA MALAYSIA
JANUARY 2026**

**SAFETY MANAGEMENT PRACTICES AND SAFETY
PERFORMANCE AMONG PESTICIDES INDUSTRY
WORKERS IN PORT KLANG**

BY

VINOD A/L MUNIANDY



UUM
Universiti Utara Malaysia

**Thesis Submitted to
College of Business,
Universiti Utara Malaysia,
in Partial Fulfilment of the Requirement for the Master of Science
(Occupational Safety and Health Management)**



**Pusat Pengajian Pengurusan
Perniagaan**

SCHOOL OF BUSINESS MANAGEMENT

Universiti Utara Malaysia

PERAKUAN KERJA KERTAS PENYELIDIKAN
(Certification of Research Paper)

Saya, mengaku bertandatangan, memperakukan bahawa
(I, the undersigned, certified that)
VINOD A/L MUNIANDY (833656)

Calon untuk Ijazah Sarjana
(Candidate for the degree of)
MASTER OF SCIENCE (OCCUPATIONAL SAFETY AND HEALTH MANAGEMENT)


telah mengemukakan kertas penyelidikan yang bertajuk
(has presented his/her research paper of the following title)

**SAFETY MANAGEMENT PRACTICES AND SAFETY PERFORMANCE AMONG PESTICIDES
INDUSTRY WORKERS IN PORT KLANG**

Seperti yang tercatat di muka surat tajuk dan kulit kertas penyelidikan
(as it appears on the title page and front cover of the research paper)

Bahawa kertas penyelidikan tersebut boleh diterima dari segi bentuk serta kandungan dan meliputi
bidang ilmu dengan memuaskan.
*(that the research paper acceptable in the form and content and that a satisfactory knowledge of
the field is covered by the research paper).*

Nama Penyelia : **DR. NORWAHIDA BINTI YAKUB @YAAKUB**
Pertama
*(Name of
Supervisor)*

Tandatangan : 
DR. NORWAHIDA BINTI YAKUB @YAAKUB
Senior Lecturer
Occupational Safety and Health Management (OSHM)
Universiti Utara Malaysia
Kuala Lumpur Campus
(UUMKL)

Tarikh : **26 JANUARY 2026**
(Date)

PERMISSION TO USE

In presenting this dissertation in partial fulfillment of the requirements for a Post Graduate degree from the Universiti Utara Malaysia (UUM), I agree that the Library of this university may make it freely available for inspection. I further agree that permission for copying this dissertation in any manner, in whole or in part, for scholarly purposes may be granted by my supervisor(s) or in their absence, by the Director of Postgraduate Studies Unit, College of Business where I did my dissertation. It is understood that any copying or publication or use of this dissertation parts of it for financial gain shall not be allowed without my written permission. It is also understood that due recognition shall be given to me and to the UUM in any scholarly use which may be made of any material in my dissertation/project paper.

Request for permission to copy or to make other use of materials in this dissertation in whole or in part should be addressed to:

Dean of Othman Yeop Abdullah Graduate School of Business
Universiti Utara Malaysia
06010 UUM Sintok
Kedah Darul Aman

ABSTRACT

The pesticide manufacturing industry is a high-risk sector due to workers' frequent exposure to hazardous chemicals, which increases the likelihood of occupational injuries, poisoning, and long-term health effects. Despite the presence of occupational safety regulations in Malaysia, chemical-related incidents continue to occur, indicating weaknesses in workplace safety management. This study aimed to examine the relationship between safety management practices, specifically management commitment and safety training (independent variables), and safety performance, measured through safety knowledge, safety motivation, and safety compliance (dependent variables), among pesticide manufacturing workers in Port Klang, Malaysia. A quantitative cross-sectional research design was employed. Data were collected using a structured questionnaire administered to 55 pesticide manufacturing workers involved in chemical handling, production, packaging, and related operations. The data were analyzed using the Statistical Package for the Social Sciences (SPSS), including descriptive statistics, Spearman's rho correlation analysis, and multiple linear regression to determine the relationships between the independent and dependent variables. The findings revealed that both management commitment and safety training had significant positive relationships with safety knowledge, safety motivation, and safety compliance. Management commitment emerged as the strongest predictor of safety performance, indicating that leadership involvement, enforcement of safety policies, and provision of safety resources strongly influence workers' safe behavior. Safety training was also found to significantly improve workers' hazard awareness, motivation to work safely, and adherence to safety procedures. These findings highlight the importance of strengthening safety leadership and training programmes to improve safety performance and reduce chemical-related risks in pesticide manufacturing workplaces.

Keywords: Management Commitment, Safety Training, Safety Knowledge, Safety Motivation, Safety Compliance

ABSTRAK

Industri pembuatan racun makhluk perosak merupakan sektor berisiko tinggi kerana pekerja sering terdedah kepada bahan kimia berbahaya, yang meningkatkan kemungkinan kecederaan pekerjaan, keracunan dan kesan kesihatan jangka panjang. Walaupun peraturan keselamatan dan kesihatan pekerjaan telah diwujudkan di Malaysia, insiden berkaitan bahan kimia masih berlaku, menunjukkan kelemahan dalam pengurusan keselamatan di tempat kerja. Kajian ini bertujuan untuk menilai hubungan antara amalan pengurusan keselamatan, khususnya komitmen pengurusan dan latihan keselamatan (pembolehubah bebas), dengan prestasi keselamatan yang diukur melalui pengetahuan keselamatan, motivasi keselamatan dan pematuhan keselamatan (pembolehubah bersandar), dalam kalangan pekerja pembuatan racun perosak di Port Klang, Malaysia. Reka bentuk kajian keratan lintang kuantitatif telah digunakan. Data dikumpul menggunakan soal selidik berstruktur yang diedarkan kepada 55 pekerja yang terlibat dalam pengendalian bahan kimia, pengeluaran, pembungkusan dan operasi berkaitan. Data dianalisis menggunakan Statistical Package for the Social Sciences (SPSS) yang merangkumi statistik deskriptif, analisis korelasi Spearman's rho dan regresi linear berganda bagi menentukan hubungan antara pembolehubah bebas dan pembolehubah bersandar. Dapatan kajian menunjukkan bahawa komitmen pengurusan dan latihan keselamatan mempunyai hubungan positif yang signifikan dengan pengetahuan keselamatan, motivasi keselamatan dan pematuhan keselamatan. Komitmen pengurusan dikenal pasti sebagai peramal paling kuat terhadap prestasi keselamatan, menunjukkan bahawa penglibatan kepimpinan, penguatkuasaan dasar keselamatan dan penyediaan sumber keselamatan sangat mempengaruhi tingkah laku selamat pekerja. Latihan keselamatan juga didapati meningkatkan kesedaran bahaya, motivasi untuk bekerja dengan selamat dan pematuhan terhadap prosedur keselamatan. Dapatan ini menunjukkan bahawa pengukuhan kepimpinan keselamatan dan pelaksanaan program latihan yang berkesan adalah penting bagi meningkatkan prestasi keselamatan dan mengurangkan risiko berkaitan bahan kimia di tempat kerja pembuatan racun perosak.

Kata kunci: Komitmen Pengurusan, Latihan Keselamatan, Pengetahuan Keselamatan, Motivasi Keselamatan, Pematuhan Keselamatan.

DECLARATION

I certify that except where due acknowledgement has been made, the work is that of the author alone; the work has not been submitted previously, in whole or in part, to qualify for any other academic award; the content of the thesis is the result of work which has been carried out since the official commencement date of the approved research program; and any editorial work, paid or unpaid, carried out by a third party is acknowledged.



ACKNOWLEDGEMENT

I wish to extend my gratitude to Lord Shiva for His abundant blessings, which have enabled the successful completion of this Master thesis, fulfilling the requirements for the Master of Science (Occupational Safety and Health Management) conferred by University Utara Malaysia.

My utmost gratitude and appreciation to my supervisor, Dr. Norwahida Binti Yakub @ Yaakub, for unwavering support, motivation, guidance, and invaluable constructive criticism during the entire process of completing this thesis.

This thesis holds a special dedication to my dear father, Mr. Muniandy Arumugam, my beloved mother, Mrs. Darshni Muniandy, and my siblings, Dr. Rubini Devi Muniandy, EUR ING.Ts.Dr. Thiwagar Muniandy, and Kugendran Muniandy for their mental and financial supports. I wish to express my boundless gratitude for their prayers, encouragement, and unwavering patience during the extensive refinement process of this thesis, despite the considerable time it demanded throughout my studies.

Apart from that, I wish to convey my gratitude to my fiancé, Vinosyah and my friend Sreenivasa Rao Supramaniam for unwavering support, and motivation throughout this journey. Lastly, I wish to extend my heartfelt gratitude to all individuals, whether directly or indirectly involved in my completion of the Master.

TABLE OF CONTENT

CERTIFICATION OF THESIS WORK.....	i
PERMISSION TO USE.....	ii
ABSTRACT.....	iii
ABSTRAK.....	iv
DECLARATION.....	v
ACKNOWLEDGEMENT.....	vi
TABLE OF CONTENT.....	vii
LIST OF TABLES.....	xiii
LIST OF FIGURES.....	xiv
LIST OF ABBREVIATIONS.....	xv
CHAPTER 1 INTRODUCTION.....	1
1.1 Background of the Study	1
1.2 Problem Statement.....	3
1.3 Research Questions.....	5
1.4 Research Objectives.....	5
1.5 Scope and Limitation of the Study.....	6
1.6 Definition of Key Terms.....	7
1.7 Organization of the Thesis	8

CHAPTER 2 LITERATURE REVIEW.....	10
2.1 Safety in Pesticide Manufacturing.....	11
2.1.1 Chemical Hazards in Pesticide Production.....	11
2.1.2 Overview of Malaysian Regulations.....	13
2.1.3 Incidents Continue Despite Regulations.....	14
2.1.4 Worker Groups at Higher Risk.....	16
2.1.5 Link to the Problem Statement.....	17
2.2 Safety Performance (SP).....	18
2.2.1 Definition of Safety Performance.....	18
2.2.2 Safety Knowledge.....	18
2.2.5 Link to the Problem Statement.....	23
2.3 Safety Management Practices (SMP).....	25
2.3.1 Definition of Safety Management Practices.....	25
2.3.2 Management Commitment.....	25
2.3.4 Previous Studies Showing SMP Improves Safety Performance.....	29
2.3.5 Highlighting Gaps in SMP Research.....	30
2.3.6 Link to the Problem Statement.....	31
2.4 Theoretical Perspectives.....	33
2.4.1 Safety Climate Theory.....	33
2.4.2 Behavioural Safety Theory.....	34

2.4.3 Relevance to This Study	35
2.5 Empirical Studies	37
2.5.1 Empirical Findings Across Different Industries	37
2.5.2 Evidence from Chemical and Pesticide-Related Studies	39
2.5.3 Patterns Observed in the Literature.....	40
2.5.4 Research Gap Identified from Empirical Studies	40
2.6 Research Gaps.....	41
2.7 Summary of Chapter	42
CHAPTER 3 METHODOLOGY.....	44
3.1 Research Framework	45
3.2 Hypotheses Development	47
3.3 Research Design.....	47
3.4 Operational Definition	48
3.5 Measurement of Variables/Instrumentation.....	49
3.5.1 Section 1: Demographic Information.....	50
3.5.2 Section 2: Management Commitment	51
3.5.3 Section 3: Safety Training	51
3.5.4 Section 4: Safety Knowledge.....	51
3.5.5 Section 5: Safety Motivation	52
3.5.6 Section 6: Safety Compliance.....	52

3.6 Data Collection	52
3.7 Sampling	53
3.7.1 Study Population.....	53
3.7.2 Inclusion Criteria	54
3.7.3 Exclusion Criteria	54
3.7.4 Sampling Strategy.....	54
3.7.5 Study Population.....	55
3.7.6 Sampling Unit	55
3.7.7 Sample Size.....	56
3.8 Data Collection Procedure	57
3.9 Technique of Data Analysis.....	59
3.9.1 Univariate Analysis.....	59
3.9.2 Bivariate Analysis	59
3.9.3 Multivariate Analysis.....	60
3.10 Summary of Chapter	60
CHAPTER 4 RESULTS AND DISCUSSION.....	61
4.1 Pilot Testing	62
4.1.1 Pilot Sample and Administration.....	62
4.1.2 Constructs and Questionnaire Structure.....	62
4.1.3 Pilot Testing Result.....	63

4.1.4 Reliability Analysis Procedure	63
4.1.5 Results of Reliability Analysis.....	64
4.1.6 Interpretation and Final Decision.....	65
4.2 Response Rate.....	66
4.3 Socio-Demographic Profile of Respondents.....	67
4.4 Level of Safety Performance	69
4.4.1 Safety Knowledge Descriptive Analysis	70
4.4.2 Safety Motivation Descriptive Analysis	72
4.4.3 Safety Compliance Descriptive Analysis.....	75
4.4.4 Summary of Level of Safety Performance.....	77
4.5 Relationship Between Management Commitment and Safety Performances	77
4.5.1 Summary of Objective 2	80
4.6 Relationship Between Safety Training and Safety Performances	80
4.6.1 Summary of Objective 3	83
4.7 Most Significant Safety Management Practice Influences Safety Performance	84
4.7.1 Descriptive Statistics of Regression Variables	84
4.7.2 Correlation Analysis Between Safety Performance and Independent Variables	85
4.7.3 Model Summary of Multiple Linear Regression	86
4.7.4 Analysis of Variance (ANOVA) for the Regression Model.....	87

4.7.5 Regression Coefficients and Predictor Contributions.....	88
4.7.6 Summary of Objective 4	89
CHAPTER 5 CONCLUSION AND RECOMMENDATION.....	91
5.1 Hypothesis Testing.....	92
5.2 Recommendations for Future Research	94
5.3 Implications of Findings	95
5.3.1 Theoretical Implications	95
5.3.2 Practical Implications.....	96
5.4 Contributions of the Study	96
5.4.1 Theoretical Contribution	96
5.4.2 Practical Contribution	97
5.5 Summary of Chapter	98
REFERENCES.....	99
Appendix A: Questionnaire.....	103
Appendix B: SPSS Result.....	111

LIST OF TABLES

Table 2.1 Summary of empirical findings across different industries	38
Table 2.2 Summary of observe pattern in the literature.....	40
Table 4.1 Reliability analysis result for pilot testing (N = 6)	64
Table 4.2 Questionnaire Response Rate (N = 55)	66
Table 4.3 Frequency and percentage of respondents' socio demographic (N = 55).....	67
Table 4.4 Mean and standard deviation of respondents on safety knowledge (N = 55)...	70
Table 4.5 Frequency distribution of respondents on safety knowledge (N = 55).....	71
Table 4.6 Mean and standard deviation of respondents on safety motivation (N = 55)...	72
Table 4.7 Frequency distribution of respondents on safety motivation (N = 55).....	73
Table 4.8 Mean and standard deviation of respondents on safety compliance (N = 55)..	75
Table 4.9 Frequency distribution of respondents on safety compliance (N = 55).....	76
Table 4.10 Mean and standard deviation management commitment and safety performances (N = 55).....	78
Table 4.11 Spearman's rho analysis on management commitment and safety performance (N = 55).....	78
Table 4.12 Mean and standard deviation safety training and performance (N = 55)	81
Table 4.13Spearman's rho analysis on safety training and safety performance (N = 55).	82
Table 4.14 Mean and standard deviation dependent variable and independent variables (N = 55).....	84
Table 4.15 Pearson correlation analysis on safety performances with two independent variables (N = 55)	85
Table 4.16 Regression model summary table (N = 55)	86
Table 4.17 ANOVA table (N = 55)	87
Table 4.18 Regression coefficients table (N = 55)	90
Table 5.1 Summary of hypothesis result.....	94

LIST OF FIGURES

Figure 3.1 Conceptual Framework	45
Figure 3. 2 Krejcie & Morgan Sample Size Table.....	57



LIST OF ABBREVIATIONS

ANOVA	Analysis of Variance
CHRA	Chemical Health Risk Assessment
DOSH	Department of Occupational Safety and Health (Malaysia)
ILO	International Labour Organization
LOTO	Lockout–Tagout
MC	Management Commitment
OSHA	Occupational Safety and Health Act 1994
PPE	Personal Protective Equipment
SDS	Safety Data Sheet
SK	Safety Knowledge
SM	Safety Motivation
SMP	Safety Management Practices
SC	Safety Compliance
SOP	Standard Operating Procedure
SP	Safety Performance
ST	Safety Training
USECHH	Use and Standards of Exposure of Chemicals Hazardous to Health Regulations 2000
WHO	World Health Organization

CHAPTER 1

INTRODUCTION

1.1 Background of the Study

The pesticide manufacturing sector constitutes a significant element in a globally-integrated agricultural economy and agrochemical ecosystem, as it produces the chemical products necessary to protect crops and ensure fresh food supply. The industry has been identified as high-risk due to workers' exposure to toxic agents, which has been the cause of a significant number of occupational diseases and deaths globally (World Health Organization, 2021; International Labour Organization, 2021). In Malaysia, and more specifically in the industrial areas such as Port Klang, the production of pesticides is still considered a high-risk subsector of the chemical and manufacturing industries. The national occupational injury statistics reflect this issue as well with 38,950 cases of workplace injuries being recorded in 2023 (a rise of 13.8% compared to the previous year) and the manufacturing sector alone being responsible for 10,335 of the cases, thus pointing out the ongoing safety problems related to chemical handling and industrial processes (DOSM, 2024).

Malaysia has made significant progress in the enforcement of key legislation which relates directly to the safety and management of chemicals in high-risk industries including pesticide manufacturing. The Occupational Safety and Health Act 1994 provide the statutory framework which governs the establishment of safe workplaces in Malaysia. The Pesticides Act 1974 facilitates the registration, import and use of pesticide substances under

the Ministry of Agriculture. In addition to the OSHA provisions, the USECHH Regulations 2000 requires a legal obligation for the employer to undertake chemical risk assessments to the relevant chemicals, implement and maintain adequate control measures and for the employer to provide necessary training for workers with potential exposure to the actual or potential hazardous chemical environment. Collectively the laws aim to mitigate the risk of chemical exposure and chemical related incidents, through ensuring principles of safety management and appropriate exposure monitoring and surveillance (DOSH, 2021).

Although Malaysia has necessary laws and regulations for chemicals handling, pesticides poisoning and chemical exposure related incidents continue to occur. The data from the National Poison Centre indicates that paraquat was responsible for 31.6% of all pesticide poisoning cases and 66.7% of pesticide poisoning deaths between 2006 and 2015 (Kamaruzaman et al., 2022). Moreover, the data by DOSH reveal that the manufacturing sector, which includes pesticide production, has been the major contributor of workplace fatalities by around 28% in 2021 (Ayob et al., 2023). Besides, these events point out loopholes in safety implementation and indicate that the existence of regulations alone is not sufficient to stop the occurrence of unsafe practices. As a result, management commitment and safety training have been identified contributed to positive effects on safety knowledge, motivation, and compliance of workers, which in turn result in higher safety levels (Vinodkumar & Bhasi, 2010). Thus, safety outcomes in pesticide manufacturing rely primarily on the quality of safety management practices. The safety outcomes in pesticide manufacturing largely depend on managerial safety practices, especially management commitment and safety training. When these practices are deficient, workers generally have insufficient safety knowledge, low safety motivation, and

poor safety compliance, all of which contribute to the occurrence of chemical-related incidents.

There are solid legal frameworks and safety management principles, but studies in Malaysia have not sufficiently explored the impact of safety management practices on safety performance in the pesticide manufacturing industry. The majority of the existing studies have been concentrated on the general manufacturing or construction industries, with a very few considering the chemical-intensive environments such as pesticide production. This has created a gap in how management commitment and safety training resulted in workers' safety knowledge, safety motivation, and safety compliance. This study will investigate relationship between safety management practices (SMP) and safety performance (SP) among in pesticide manufacturing in Port Klang, Malaysia.

1.2 Problem Statement

The pesticide manufacturing industry majorly contribute in agricultural production however; there is a concern on workers as they expose to highly toxic chemicals that pose serious health risks. The chemical exposure and poisoning situation in Malaysia reflect that workers working in environments pertaining to pesticides were at significant risk for safety issues (Kamaruzaman et al., 2022), particularly in industrial areas such as Port Klang.

Inadequate safety measures in the workplace have been headed with acute poisoning episodes, respiratory illnesses, long-term health effects, and preventable industrial accidents (Department of Occupational Safety and Health Malaysia, 2021). Along with these, the incidents result in decreased productivity, increased medical and compensation

costs, absenteeism, and legal as well as reputational risks for the employers (WHO, 2021; ILO, 2021).

Root causes of poor safety performance (SP) in pesticide manufacturing are mainly related to the fundamental gap in safety management practices (SMP) (Vinodkumar & Bhasi, 2010). Among these are invisible management commitment to safety, inadequate safety training, unclear safety communication, less employee involvement in safety matters, weak enforcement of safety rules and procedures, and insufficient safety supervision (Amirah et al., 2024). In the case of a poor implementation of these factors, workers usually have low safety knowledge, weak safety motivation, and poor compliance with safety procedures that contribute most to the presence of unsafe behaviours in hazardous work environments (Vinodkumar & Bhasi, 2010). This research looks at the effects of safety management practices (SMP), namely management commitment and safety training, on safety performance (SP) that is evaluated through safety knowledge, safety motivation, and safety compliance of the workers in pesticide manufacturing facilities in Port Klang.

Extensive research has been done on safety management practices (SMP) and safety performance (SP) in various high-risk industries, however, very few studies have been conducted within Malaysia's pesticide manufacturing sector. More specifically, the relationship between management commitment and safety training with safety knowledge, motivation, and compliance has not been sufficiently addressed. So, this research will be conducted on high-risk pesticide industry workers which aims to fill the gap on how safety management practices (SMP) influence safety performance (SP).

1.3 Research Questions

- i. What is the level of safety performance among pesticide manufacturing workers in Port Klang?
- ii. Is there any significant relationship between management commitment and safety performance among pesticide manufacturing workers?
- iii. Is there any significant relationship between safety training and safety performance among pesticide manufacturing workers?
- iv. Which safety management practices is the strongest predictor of safety performance among pesticide manufacturing workers?

1.4 Research Objectives

- i. To determine the level of safety performance (safety knowledge, safety motivation, safety compliance) among respondents.
- ii. To examine the relationship between management commitment and safety performance (safety knowledge, safety motivation, safety compliance) among respondents.
- iii. To examine the relationship between safety training and safety performance (safety knowledge, safety motivation, safety compliance) among respondents.
- iv. To investigate the most significant safety management practice influences safety performance among respondents.

1.5 Scope and Limitation of the Study

This study focuses on safety performance within the pesticide manufacturing sector in Port Klang, Malaysia. It specifically investigates the effects of two safety management practices elements management commitment and safety training on three behavioural dimensions of safety performance, which are safety knowledge, safety motivation, and safety compliance. The geographic scope refers only to the pesticide manufacturing plants located in Port Klang due to its concentration of chemical industries and significance as an industrial centre. Inclusion in the study population are workers who have a direct involvement in fundamental working activities such as chemical formulation, production of pesticides, operation of machinery, quality control, storage handling, packaging and labelling in the operations of pesticide manufacturing plants.

This research has few limitations which need to be highlighted. First, it only involves one pesticide manufacturing company in Port Klang, Malaysia. Thus, the results of this study cannot apply directly to other industries with different operational outline. Second, this study used a cross-sectional research design, restrict the resources to bridge safety management practices to safety performance. The findings represent from single period. Lastly, the information was collected through self, administered questionnaires, which may be influenced by respondent and social desirability bias. Even though all questionnaires were completed, respondents might have over stated their positive safety perceptions. Such limitations should be understood when analyzing the findings. Moreover, previous studies advised to associate longitudinal research designs.

1.6 Definition of Key Terms

- i. Safety Management Practices (SMP) refer to the company's level actions that aim at changing the work environment always to safer places and also promoting better health among the workers. Various aspects of such practices are that they revolve around safety policies, guidelines, methods of communication, and monitoring mechanisms which all together help to keep a check on the safety of workers and thus support the prevention of accidents and work, related injuries (Vinodkumar & Bhasi, 2010).
- ii. Management commitment is the degree to which the top leaders of the organization visibly support and give higher priority to the safety in the workplace. Among the ways by which management support safety includes management participation in safety activities, making available adequate resources, enforcing safety policies, and motivating employees to adopt safe work behaviour (Vinodkumar & Bhasi, 2010).
- iii. Safety training can be considered the planned instruction that an organization provides to its workers with the aim of not only making them aware of the dangers existing in the workplace but also giving them the knowledge and skills necessary for the safe execution of work tasks. Thus, it encompasses teaching how to use personal protective equipment (PPE), how to act in emergencies, and how to recognize hazards (Hafiz et al., 2023).
- iv. Safety performance corresponds to the employees' behaviors and attitudes towards safety play a role in positive outcomes at work. One of this study describes safety

performance as safety knowledge, safety motivation, and safety compliance (Amirah et al., 2024).

- v. Safety knowledge is a term used to refer how well employees are aware of the risks involved in their jobs and the correct safety measures that shall be taken to avoid accidents. It refers to knowing what to do during emergency, correctly using safety equipment, and knowing unsafe situations (Amirah et al., 2024).
- vi. Safety motivation means willingness of workers to put safety as priority despite their work. Studies related to Amirah shows how internal and external factors together drive the worker's dedication to doing their work safely (Amirah et al., 2024).
- vii. Safety compliance means how well employees follow to created safety rules, procedures, and regulations. This includes practices such as always wearing personal protective equipment, obey to safety rules, and raise report on unsafe conditions (Amirah et al., 2024).

1.7 Organization of the Thesis

This thesis is organized into five chapters. Chapter 1 presents the introduction, which includes the background of the study, problem statement, research questions, research objectives, scope and limitations of the study, definitions of key terms, and the overall organization of the thesis. Chapter 2 provides a comprehensive review of relevant literature and underlying theories related to safety management practices and safety performance, serving as the foundation for the development of the research framework and guiding the analytical aspects of the study. Chapter 3 describes the research methodology, detailing the research framework, hypotheses development, research design, operational definitions,

measurement of variables and instrumentation, sampling technique, data collection procedures, and techniques of data analysis employed in the study. Chapter 4 presents the results and discussion, where the data analyses and research findings are reported using tables, figures, and textual explanations, followed by an in-depth discussion of the results in relation to the research objectives and existing literature. Finally, Chapter 5 concludes the thesis by summarizing the key findings, highlighting the theoretical, practical, and policy implications of the study, and providing recommendations for future research.



CHAPTER 2

LITERATURE REVIEW

This chapter reviews the literature on safety management practices (SMP) and safety performance (SP) in pesticide manufacturing. It synthesizes theoretical and empirical studies, identifies research gaps, and situates the current study within existing safety literature (Snyder, 2019). The review emphasizes management commitment and safety training as key safety management practices influencing workers' safety performance in managing occupational health and safety risks in pesticide manufacturing environments.

Aligned with the research problem in Chapter 1, this chapter addresses the continued occurrence of chemical exposure, poisoning, injuries, and unsafe behaviours among pesticide workers in Malaysia despite existing safety legislation. It examines conceptual and empirical evidence on management commitment, safety training, and safety performance indicators safety knowledge, safety motivation, and safety compliance supported by relevant theories, hazard profiles, and regulatory frameworks. The chapter concludes by identifying research gaps that justify the present study and support the proposed conceptual framework.

2.1 Safety in Pesticide Manufacturing

2.1.1 Chemical Hazards in Pesticide Production

Pesticide production workers are routinely exposed to hazardous chemicals, including herbicides, insecticides, fungicides, and industrial solvents, which pose serious risks to human health. Previous studies have consistently documented that occupational exposure to these substances in pesticide manufacturing environments is associated with a wide range of adverse health outcomes.

One of the most immediate health risks faced by pesticide production workers is acute toxicity. Exposure to extremely high concentrations of pesticides or solvents can lead to rapid onset of symptoms such as chemical burns, vomiting, dizziness, and chest tightness. These acute health effects commonly occur during activities involving chemical mixing, formulation, or accidental spillage, where direct exposure to hazardous substances is more likely (Kamaruzaman et al., 2022).

In addition to acute effects, long-term or chronic exposure to pesticide chemicals has been linked to more severe health consequences. Scientific evidence indicates that prolonged exposure significantly increases the risk of neurological disorders, endocrine disruption, and various forms of cancer. Chronic exposure often results from inadequate engineering controls, poor ventilation systems, or prolonged handling of toxic substances without proper or consistent use of personal protective equipment (PPE) (Ayob et al., 2023).

Another critical occupational health concern in pesticide manufacturing is paraquat-related fatalities. Paraquat is an extremely toxic pesticide, and inhalation or ingestion can result in

death within a short period. Studies have identified paraquat poisoning as one of the leading causes of severe occupational health incidents, largely due to its rapid absorption into the body and its ability to cause extensive damage to vital organs (Chen & Li, 2022; Kamaruzaman et al., 2022).

Occupational exposure to pesticides also frequently results in skin and eye-related health problems. Direct contact with pesticide liquids, aerosols, or contaminated surfaces can cause dermatitis, chemical burns, and eye irritation. These conditions are particularly prevalent when PPE is not used correctly or consistently during chemical handling and processing activities (Hafiz et al., 2023).

Furthermore, repeated or high-dose exposure to pesticides and industrial solvents can lead to long-term damage to vital organs, particularly the liver and kidneys. These organs play a crucial role in the metabolism and detoxification of chemical substances, making them especially vulnerable to sustained occupational exposure in pesticide production environments (Amirah et al., 2024).

Consistent with these documented health risks, existing literature indicates that workers involved in chemical formulation, mixing, packaging, filling, and storage activities face the highest likelihood of exposure. This increased risk is primarily due to the nature of their tasks, which require frequent handling of concentrated pesticide ingredients throughout the production process.

2.1.2 Overview of Malaysian Regulations

Malaysia has established a comprehensive regulatory framework to govern chemical safety and pesticide management, with the primary aim of safeguarding workers' safety and health in chemical-intensive industries. This framework clearly defines employers' legal responsibilities, regulates the handling and use of hazardous substances, and mandates the implementation of systematic safety measures to minimize occupational risks (Department of Occupational Safety and Health, 2023; Ministry of Human Resources, 2022).

The Occupational Safety and Health Act (OSHA) 1994 serves as the cornerstone of occupational safety and health legislation in Malaysia. The Act imposes a general duty on employers to ensure, as far as practicable, the safety, health, and welfare of employees at the workplace. This includes the responsibility to identify hazards, assess associated risks, and implement appropriate control measures to ensure that work processes, machinery, equipment, and the working environment do not pose risks to workers. OSHA 1994 therefore provides the fundamental legal basis for the management of workplace safety across all sectors, including pesticide manufacturing (DOSH, 2023).

Pesticide-related activities are further regulated under the Pesticides Act 1974, which governs the registration, manufacture, importation, distribution, sale, and use of pesticide products in Malaysia. The Act ensures that only approved pesticides are manufactured and used, and that handlers comply with prescribed legal requirements. In addition, it regulates pesticide formulation, labelling, and storage practices to prevent misuse and reduce the risk of accidental exposure among workers and the public (MOHR, 2022).

Chemical safety management at the workplace level is strengthened through the Use and Standards of Exposure of Chemicals Hazardous to Health (USECHH) Regulations 2000. These regulations require employers to conduct Chemical Hazard Risk Assessments (CHRA) in workplaces using hazardous chemicals, carry out exposure monitoring to ensure compliance with permissible exposure limits, and ensure proper labelling and availability of Safety Data Sheets (SDS). Employers are also mandated to provide health surveillance for workers at risk of chemical-related illnesses and to ensure that employees receive adequate training on safe chemical handling practices (DOSH, 2023).

Collectively, these legislative instruments promote a structured and preventive approach to chemical safety management by emphasizing hazard identification, risk assessment, effective control measures, and hazard communication. Through consistent enforcement and employer compliance, Malaysia's regulatory framework plays a critical role in reducing chemical-related accidents and occupational diseases, particularly in high-risk industries such as pesticide manufacturing.

2.1.3 Incidents Continue Despite Regulations

Despite the presence of detailed legislation, several studies indicate that significant safety issues persist in pesticide manufacturing facilities in Malaysia (Ayob et al., 2023; Kamaruzaman et al., 2022). These findings suggest that the existence of laws alone does not guarantee safe work practices, highlighting gaps in the implementation of safety regulations at the operational level.

Pesticide poisoning remains a persistent concern in workplaces that handle toxic chemicals. Previous studies report that poisoning incidents continue to occur, indicating deficiencies

in hazard recognition, emergency response, and the consistent application of safe work practices (Kamaruzaman et al., 2022). Such cases underscore the need for improved monitoring and stricter adherence to chemical handling procedures.

Workplace injuries in the manufacturing sector, including pesticide production, continue to be recorded at high rates. These incidents reflect weaknesses in daily operational safety controls and supervision, which contribute to preventable accidents despite the regulatory framework in place (Ayob et al., 2023).

Chemical-related illnesses are often underreported in Malaysian pesticide facilities. Underreporting may result from workers' inability to recognize early symptoms of chemical exposure or a lack of trust in reporting mechanisms, thereby limiting the accuracy and usefulness of national occupational health data (WHO, 2021; ILO, 2021).

Furthermore, studies reveal that many workers are unaware of essential hazard control measures, such as correct use of personal protective equipment, proper ventilation, and adherence to exposure limits. This indicates gaps in safety training, communication, and overall awareness of chemical hazards (Amirah et al., 2024; Hafiz et al., 2023).

Collectively, these findings demonstrate that the main challenge in pesticide manufacturing is not the absence of legal frameworks but the ineffective implementation of safety regulations at the operational level. The persistence of accidents, poisonings, and occupational illnesses largely stems from insufficient safety management practices (SMP), highlighting the need for stronger management commitment, training, and enforcement mechanisms.

2.1.4 Worker Groups at Higher Risk

In pesticide production plants, certain groups of employees are exposed to higher levels of hazardous substances due to the nature of their work and the frequency of direct interaction with chemicals. These high-risk groups require special attention in terms of safety knowledge, motivation, and adherence to safety practices to minimize occupational exposure.

Chemical formulation operators are among the most vulnerable workers in pesticide plants. They are directly involved in the preparation and mixing of chemical agents, frequently handling concentrated substances that, if not properly contained, can cause immediate and severe health effects (Kamaruzaman et al., 2022).

Mixing and blending workers also face substantial risks. These employees work with large volumes of hazardous substances, which increases the likelihood of inhalation, skin contact, or accidental spills during routine operations (Ayob et al., 2023).

Packaging and filling staff are responsible for transferring pesticides into containers and sealing products. They are often exposed to fumes, aerosols, and accidental splashes, particularly when ventilation systems are insufficient or personal protective equipment (PPE) is not properly used (Chen & Li, 2022).

Storage handlers manage large quantities of chemicals and face risks associated with leaks, vapour accumulation, and the deterioration of containers over time. Proper handling, monitoring, and storage procedures are critical to prevent chemical incidents in these areas (Amirah et al., 2024).

Quality control laboratory technicians are frequently exposed to high-concentration chemical samples during analysis. Their work requires strict adherence to laboratory safety procedures to prevent exposure and maintain a safe working environment (Hafiz et al., 2023).

Maintenance workers who clean and service chemical equipment are also at risk. Residual chemicals, contaminated surfaces, and waste products during cleaning operations can expose them to harmful substances if proper safety precautions are not followed (Kamaruzaman et al., 2022).

Overall, these groups experience long-term or repeated exposure to hazardous chemicals. Ensuring that they possess strong safety knowledge, motivation, and compliance with established safety rules is essential to preventing chemical exposure and maintaining safe operations in pesticide production facilities.

2.1.5 Link to the Problem Statement

The ongoing incidents and exposure risks highlight that weak management commitment and inadequate safety training may contribute to reduced safety performance in pesticide manufacturing settings. The literature strongly supports the need to examine these two safety management practices (SMP) variables to better understand safety outcomes in pesticide manufacturing facilities.

2.2 Safety Performance (SP)

2.2.1 Definition of Safety Performance

Safety performance indicates the behaviours, outcomes, and attitudes that demonstrate how well workers are adhering to the safety behaviours established by the organization. Safety Performance (SP) cannot only be evaluated on accident rates but is also evaluated on the behaviour side, such as safety motivation, safety knowledge, and safety compliance (Clarke, 2021; Wu et al., 2022). Currently, safety research focuses on proactive markers that have the ability to provide measurement of behaviours that can proactively lead to the prevention of incidents instead of simply measuring the outcome once an incident has occurred.

2.2.2 Safety Knowledge

Safety knowledge is a critical component in pesticide production, as workers routinely handle highly concentrated and toxic chemicals, where even a single mistake can result in serious or fatal exposure. It encompasses the worker's understanding of hazards, protective measures, operational procedures, and regulatory requirements, all of which are essential to maintaining a safe working environment.

Knowledge of hazard characteristics is fundamental to safety awareness. Workers should be familiar with the properties, toxicity levels, and potential health effects of the chemicals used in pesticide production. This understanding enables them to anticipate risks before performing tasks and to take appropriate preventive actions (Amirah et al., 2024).

Correct use of personal protective equipment (PPE) is another vital aspect of safety knowledge. Employees must be aware of the types of PPE required for their specific roles and understand how to properly wear, maintain, and remove this equipment to minimise exposure to hazardous substances (Vinodkumar & Bhasi, 2010).

Chemical handling procedures form a core part of safety knowledge. Workers need to understand proper methods for mixing, transferring, storing, and disposing of chemicals to control spills, leaks, and accidental exposure effectively (Amirah et al., 2024).

Emergency response knowledge is also essential. Employees must be familiar with the correct steps to take in the event of a chemical spill, fire, leak, or accidental exposure, including evacuation procedures and first aid measures, to reduce the severity of incidents (Vinodkumar & Bhasi, 2010).

Understanding safe operating procedures is equally important. Workers should comprehend standard operating procedures related to machinery use, cleaning processes, and routine handling tasks to ensure that daily activities are conducted safely and correctly (Amirah et al., 2024).

Finally, knowledge of regulatory requirements, such as those specified in the USECHH Regulations 2000, is necessary. Workers must be aware of hazard communication protocols, labelling standards, exposure limits, and mandatory control measures under Malaysian law to ensure compliance and reinforce safety practices (Vinodkumar & Bhasi, 2010).

In summary, safety knowledge is indispensable in pesticide production. Given the high toxicity of chemicals handled, comprehensive understanding of hazards, procedures, and regulations is essential to prevent exposure, safeguard health, and maintain operational safety.

2.2.3 Safety Motivation

Safety motivation refers to an employee's willingness and internal drive to perform work safely and to prioritise safe behaviour during daily tasks (Neal & Griffin, 2020). Workers who are highly motivated are more likely to comply with safety procedures, report hazards, and take proactive steps to protect themselves and their colleagues. Several factors have been identified as influencing safety motivation in the workplace.

Perceived management support plays a crucial role in enhancing safety motivation. Employees are more likely to adopt safe behaviours when they observe management actively supporting safety, communicating expectations, and enforcing procedures fairly and consistently. Such visible commitment signals to employees that the organisation genuinely values safety, which increases their intrinsic motivation to work safely (Clarke, 2021; Neal & Griffin, 2020).

Training quality is another significant factor affecting safety motivation. High-quality training that is clear, relevant, and practical helps workers understand the importance of correct procedures and builds confidence in their ability to perform tasks safely. Effective training increases employees' intrinsic motivation to apply learned safety practices in their daily work (Hafiz et al., 2023; Amirah et al., 2024).

Personal risk perception also influences safety motivation. Employees who are aware of the hazards associated with chemical exposure and understand the potential consequences of unsafe behaviour are more likely to take preventive measures and adhere to safety regulations to protect themselves (Neal & Griffin, 2020).

Peer influence contributes to creating a positive safety climate within the workplace. When co-workers consistently demonstrate safe behaviours, they can motivate others to follow suit, fostering social norms that reinforce safety and increase overall safety motivation among team members (Clarke, 2021).

Finally, organisational rewards and penalties play an important role in motivating safe behaviour. Reinforcing safety requirements through recognition or rewards for safe practices, combined with fair and reasonable consequences for violations, encourages workers to prioritise safety and comply with established procedures (Vinodkumar & Bhasi, 2010).

In conclusion, safety motivation is shaped by a combination of management support, effective training, individual risk awareness, peer influence, and organisational reinforcement. Employees who are motivated by these factors are more likely to engage in safe behaviours, which contributes to a safer work environment in high-risk settings such as pesticide production.

2.2.4 Safety Compliance

Safety compliance refers to employees' adherence to safety regulations and organisational rules designed to minimise risks in hazardous working environments. It

represents the observable behavioural aspect of safety performance and is strongly influenced by workers' safety knowledge and motivation. Several key aspects characterise safety compliance in high-risk settings such as pesticide production.

The consistent use of personal protective equipment (PPE) is a fundamental component of safety compliance. Employees are required to wear appropriate PPE, including gloves, goggles, respirators, and protective clothing, whenever necessary. Proper application of PPE limits exposure to toxic chemicals and prevents injuries, thereby safeguarding the worker and the surrounding workplace environment (Vinodkumar & Bhasi, 2010; Hafiz et al., 2023).

Following the Lockout-Tagout (LOTO) procedure is another critical aspect of safety compliance. Workers must correctly implement LOTO protocols when servicing or maintaining equipment to prevent accidental energisation, chemical release, or mechanical hazards during repair operations (Chen & Li, 2022). Compliance with these procedures ensures that machinery and processes are safely controlled during potentially dangerous activities.

Correct chemical storage practices also reflect safety compliance. Employees are required to follow approved storage guidelines, including the segregation of incompatible substances, proper sealing of containers, and maintenance of appropriate temperature conditions. These measures prevent leaks, unwanted chemical reactions, and contamination, thus reducing the likelihood of occupational incidents (Amirah et al., 2024).

Adhering to labelling and handling procedures is equally important. Safety compliance entails correctly labelling chemical containers, consulting safety data sheets (SDS), and

handling substances according to established protocols. Following these practices minimises human error and reduces the risk of accidental exposure to hazardous chemicals (Vinodkumar & Bhasi, 2010).

Finally, reporting unsafe conditions is a critical behavioural component of safety compliance. Workers are expected to promptly report hazards, chemical spills, near-miss incidents, equipment faults, or any unusual situations. Timely reporting allows for corrective actions to be implemented, thereby preventing accidents and reinforcing a culture of safety (Hafiz et al., 2023).

Overall, safety compliance is typically the final behavioural outcome of effective safety performance. Workers who possess strong safety knowledge and motivation are more likely to consistently adhere to these safety practices, demonstrating the interdependent relationship between knowledge, motivation, and compliance in maintaining a safe working environment.

2.2.5 Link to the Problem Statement

The problem statement in Chapter 1 highlighted several persistent safety issues in pesticide manufacturing environments, all of which indicate low levels of safety performance among workers. These issues pose significant risks to employees' health and safety and underline the need for effective safety management practices.

High rates of chemical exposure remain a primary concern. Frequent exposure incidents suggest that workers may not consistently follow safe handling procedures or may lack

sufficient knowledge of chemical hazards, thereby increasing unnecessary health risks. Such exposure highlights gaps in both training and supervision.

Pesticide poisoning incidents further illustrate the severity of safety deficiencies. These cases often result from failures in hazard recognition, incorrect emergency responses, and non-compliance with safety rules, particularly when handling highly toxic substances. The recurrence of such events demonstrates the critical need for improved worker safety awareness and preparedness.

Unsafe chemical-handling practices are also prevalent. Improper mixing, transferring, or storage of chemicals reflects inadequate employee training and insufficient supervisory oversight, increasing the likelihood of spills, leaks, and accidental exposure. These practices underscore the operational weaknesses that compromise workplace safety.

Poor PPE compliance contributes significantly to low safety performance. Inconsistent or incorrect use of safety equipment indicates that employees may not fully understand PPE requirements, or that they lack the motivation, supervision, and guidance necessary to apply these protections consistently. This behaviour directly elevates the risk of chemical exposure and injury.

Finally, insufficient safety awareness among workers indicates that safety expectations are not effectively communicated and that training may be inadequate. Low consciousness of hazards and safety measures reduces the likelihood of safe behaviour implementation, thereby weakening overall safety performance in the workplace.

2.3 Safety Management Practices (SMP)

2.3.1 Definition of Safety Management Practices

Safety Management Practices (SMP) related to the structured management system created to avoid workplace injuries and optimize safety outcomes. Authors systematically outline SMP as structured ways involving management support, hazard control, safety communication, and workers engagement which aimed at minimizing risk effect and strengthening safe behaviour (Clarke, 2021; Masi & Cagno, 2019). SMP support underlying role for an organisation's safety climate that patterns employees' safety opinions.

Base on Malaysia, SMP are important in chemical high-risk industries, where the result of insufficient safety management systems can be severe. SMP act as a connection between regulations such as OSHA 1994 and USECHH Regulation, especially important in high-risk industries such as pesticides manufacturing.

2.3.2 Management Commitment

Management commitment is widely recognised as one of the most influential factors affecting safety performance. It refers to the proactive efforts of organisational leaders to prioritise safety as a core aspect of operations (Clarke, 2021). The commitment of management is reflected in their allocation of resources, enforcement of procedures, personal involvement, and support for safety initiatives, all of which signal to employees the importance of safe work practices.

One key indicator of management commitment is the allocation of funds and human resources for safety. Providing adequate resources for safety equipment, training, and supervision demonstrates that management regards safety as a serious organisational priority rather than a mere procedural requirement. When employees observe such investment, they are more likely to adopt safe practices and take safety seriously in their daily work (Clarke, 2021; Vinodkumar & Bhasi, 2010).

Implementation of safety rules and procedures is another critical aspect. Systematic enforcement ensures that standard operating procedures (SOPs) are consistently followed and prevents the development of unsafe habits. Effective implementation also provides clear feedback on safe and unsafe behaviours, reinforcing organisational expectations (Clarke, 2021).

Leading by example is a further demonstration of management commitment. When managers follow established rules and SOPs, actively chair safety meetings, conduct regular site walk-throughs, and wear appropriate PPE, they visibly signal the importance of safety to employees. Such involvement increases workers' confidence in the organization's safety standards and encourages them to comply with required procedures (Clarke, 2021; Vinodkumar & Bhasi, 2010).

Supporting hazard reporting and root-cause investigations is also indicative of committed leadership. Management that fosters an environment where employees can report hazards or concerns without fear of reprisal encourages active participation in safety initiatives. Engaging with employees during root-cause analyses and ensuring corrective actions are implemented contributes to a culture of continuous safety improvement (Hafiz et al., 2023).

Finally, recognising compliance and addressing safety violations are essential for reinforcing a safety-oriented culture. Rewarding safe behaviour promotes positive practices, while fair disciplinary measures for violations maintain accountability. These actions collectively signal that safety is valued and expected throughout the organisation (Clarke, 2021; Amirah et al., 2024).

According to Vinodkumar and Bhasi's (2010) model of Safety Management Practices (SMP), management commitment lies at the core of SMP, as employees routinely interpret managerial behaviours as a direct indicator of how seriously safety is prioritized within the organisation. This central role underscores the importance of proactive and visible management involvement in driving effective safety performance.

2.3.3 Safety Training

Safety training refers to structured educational programs designed to enhance workers' awareness of hazards, regulatory requirements, proper use of personal protective equipment (PPE), emergency response, and safe operating procedures. In chemical-intensive industries, such as pesticide production, safety training is a legal requirement for employees handling hazardous substances (DOSH, 2021).

Effective safety training improves workers' safety knowledge by providing practical experience and instruction on workplace hazards, correct operating procedures, chemical handling, and emergency response. Well-designed training programmes enhance employees' ability to identify and control risks, equipping them with the necessary skills to operate safely in high-risk environments. This is particularly critical in industries where

chemicals are heavily used, such as pesticide manufacturing, where exposure to toxic substances can have serious consequences (Amirah et al., 2024).

Safety training also strengthens employees' motivation to work safely. Beyond imparting knowledge, training fosters an internal drive to prioritise safety during daily tasks. When training is clear, relevant, and engaging, employees develop greater confidence and a stronger commitment to adhere to safety requirements, as they better understand the importance of safe behaviour (Hafiz et al., 2023).

In addition, training promotes better compliance with standard operating procedures (SOPs) and proper use of PPE. When workers understand the rationale behind procedures and equipment standards, they are more likely to follow SOPs consistently and use PPE correctly. Training clarifies management expectations regarding safety practices and encourages workers to integrate these practices into routine activities (Chen & Li, 2022; Hafiz et al., 2023).

Finally, effective safety training contributes to the reduction of workplace accidents and near-miss incidents. Organisations that provide consistent, high-quality training report fewer injuries and safety incidents. By equipping employees with practical skills to avoid mistakes, respond correctly to hazards, and maintain heightened situational awareness, training plays a crucial role in preventing workplace accidents and ensuring safe operations (Chen & Li, 2022).

2.3.4 Previous Studies Showing SMP Improves Safety Performance

Various empirical studies provide robust evidence that safety management practices (SMP) play a critical role in determining safety performance across industries. These studies consistently show that management commitment and safety training are essential components of effective organisational safety systems (Vinodkumar & Bhasi, 2010; Clarke, 2021; Amirah et al., 2024; Hafiz et al., 2023; WHO, 2021; ILO, 2021).

Management commitment and safety training significantly influence workers' safety compliance and safety motivation. Research shows that employees who experience strong managerial support and receive high-quality training are more likely to understand safety requirements and follow procedures voluntarily, thereby improving overall safety performance (Vinodkumar & Bhasi, 2010).

Leadership behaviour has a major impact on organisational safety culture. Leaders who actively engage in safety initiatives and demonstrate genuine concern for the work environment cultivate a positive safety climate. This climate directly encourages employees to adopt safer behaviours and increases adherence to safety practices (Clarke, 2021).

In the Malaysian manufacturing sector, safety training is a critical factor in hazard recognition and the implementation of safe work practices. Well-structured training equips workers with the necessary skills and knowledge to identify, assess, and control risks effectively, enhancing their hazard awareness and overall safety performance (Amirah et al., 2024).

High-quality training programs substantially improve workers' understanding of chemical hazards, particularly among employees handling hazardous substances. Training programmes that are practical, clear, and directly applicable to workplace tasks lead to significant increases in both knowledge and the willingness to implement safety measures (Hafiz et al., 2023).

On a global scale, studies by WHO and ILO confirm the importance of SMP in reducing occupational health risks. Organisations with strong leadership and well-organised training initiatives consistently experience fewer chemical exposure-related injuries and a lower incidence of occupational accidents, highlighting the critical role of management commitment and safety training in promoting workplace safety worldwide (WHO, 2021; ILO, 2021).

Collectively, these studies reveal a consistent pattern: organisations that prioritise safety management practices achieve higher safety performance, reduce accidents and near misses, and foster greater employee engagement in safety behaviours. This body of evidence underscores the necessity of examining management commitment and safety training as key determinants of safety performance in high-risk environments, such as pesticide manufacturing.

2.3.5 Highlighting Gaps in SMP Research

Despite extensive research on safety management practices (SMP) in manufacturing and construction, several gaps remain, particularly in the context of pesticide manufacturing.

First, there is limited research specifically focused on pesticide manufacturing. Most SMP studies concentrate on general manufacturing, construction, or the oil and gas sectors, while

pesticide production despite being highly chemical-intensive with significant exposure risks has received minimal research attention (Kamaruzaman et al., 2022).

Second, the behavioural dimensions of safety remain underexplored. Few studies have examined how SMP influences safety knowledge, safety motivation, and safety compliance collectively, even though these behavioural outcomes are consistently recognised as critical in understanding the effectiveness of safety management practices (Vinodkumar & Bhasi, 2010). This limits a comprehensive understanding of the behavioural impact of SMP.

Third, there is a lack of locally relevant evidence from the Malaysian chemical sector. Empirical research on safety conditions in Malaysian pesticide facilities is scarce, despite national data indicating high rates of chemical-related injuries and poisoning (Kamaruzaman et al., 2022). The absence of local studies creates a gap in knowledge that is essential for developing context-specific safety interventions.

Finally, insufficient attention has been paid to management commitment. Many studies emphasise systems, procedures, and technical controls but give limited consideration to leadership behaviour, even though evidence shows that committed management is central to shaping a positive safety climate and influencing worker safety behaviour (Clarke, 2021; Vinodkumar & Bhasi, 2010).

2.3.6 Link to the Problem Statement

Chapter 1 described the safety concerns of pesticide workers in Port Klang, highlighting low safety knowledge, weak safety motivation, and inconsistent safety compliance.

Incidents of pesticide poisoning, respiratory illness, and contact exposure were used to illustrate deficiencies in existing safety systems and to emphasize the need for stronger organisational safety practices.

One critical consequence of weak safety management practices is the inconsistent or incorrect use of personal protective equipment (PPE). When top management fails to implement safety procedures or provide adequate training, workers may use PPE incorrectly or neglect it entirely, exposing themselves to chemical hazards (Hafiz et al., 2023; Chen & Li, 2022).

Low hazard awareness is another outcome of insufficient safety management. Workers who do not receive proper training may be unable to identify risks, recognize warning signs, or accurately assess chemical-related hazards, which can lead to unsafe judgments during routine operations (Amirah et al., 2024; Kamaruzaman et al., 2022).

Weak management support also reduces workers' enthusiasm for safe behaviour. Research indicates that employees are less motivated to comply with safety procedures when they perceive that management does not prioritise safety. In such contexts, workers are less likely to adopt safe practices consistently (Clarke, 2021; Neal & Griffin, 2020).

Non-compliance with standard operating procedures (SOPs) is a further manifestation of inadequate safety management. The absence of supervision, unrealistic expectations, and insufficient reinforcement may lead employees to skip or neglect SOPs, resulting in unsafe work practices and an increased risk of accidents and chemical exposure incidents (Vinodkumar & Bhasi, 2010; Chen & Li, 2022).

Thus, examining safety management practices, specifically management commitment and safety training, is vital for understanding safety performance in pesticide manufacturing.

2.4 Theoretical Perspectives

Theories provide the foundation for the study by illustrating the interconnections of the research variables and by giving rational backing to the proposal of hypotheses. In safety-related research, the theoretical framework serves as a guide to understand how changes in the organisation, mainly management commitment and safety training, influence the behaviour of employees in safety performance (Zohar, 2010). This study adopts two major theoretical perspectives, namely Safety Climate Theory and Behavioural Safety Theory, which together provide strong justification for examining how management commitment and safety training influence safety knowledge, safety motivation, and safety compliance among pesticide manufacturing workers (Geller, 2021).

2.4.1 Safety Climate Theory

One of the most prominent frameworks in employee safety research is the Safety Climate Theory, which reflects the shared perceptions of workers regarding the priority given to safety within an organisation (Zohar, 2010). Employees' perceptions are strongly shaped by management behaviours, including how leaders communicate about safety, allocate resources, enforce rules, and participate in safety activities (Clarke, 2021).

The theory proposes that management commitment significantly influences workers' beliefs about organisational priorities. When employees observe managers consistently following safety rules, wearing PPE during site visits, or actively supporting safety

programs, they perceive that the organisation genuinely values safety. These perceptions shape workers' attitudes and their willingness to engage in safe work practices.

Employees' safety perceptions, in turn, affect their safety motivation and compliance. Workers who believe that leadership prioritises safety are more likely to feel motivated to follow procedures, use PPE correctly, and adhere to safe work practices consistently.

Furthermore, safety climate acts as a mediator between safety management practices (SMP) and safety performance (SP). Strong SMP, demonstrated through effective leadership and training, enhances the safety climate, which then positively influences workers' safety knowledge, motivation, and compliance.

In high-risk environments such as pesticide manufacturing, where chemical exposure is a significant concern, maintaining a positive safety climate is particularly critical. If workers perceive lapses in safety enforcement or inconsistent application of protocols, they may become less vigilant in PPE use or chemical-handling practices, increasing the likelihood of accidents, poisoning, and other occupational hazards.

2.4.2 Behavioural Safety Theory

Behavioural Safety Theory is based on the premise that most workplace accidents result from unsafe behaviours rather than unsafe conditions. The theory emphasises the importance of knowledge, motivation, and reinforcement in shaping and sustaining safe worker actions (Geller, 2021).

According to the theory, behaviour is heavily influenced by workers' knowledge. Employees' actions are determined by their understanding of hazards, correct use of

protective equipment, and safe operating procedures. When workers possess adequate and accurate knowledge, they are better equipped to recognise risks and perform their tasks safely.

Workers' motivation also plays a critical role in determining behaviour. Employees are more likely to follow safety practices when they feel encouraged, supported, and aware of the importance of working safely. Motivation increases when safe behaviour is valued and recognised within the workplace, leading employees to consistently prioritise safety in routine activities.

Finally, behaviour changes are reinforced through training and continuous feedback. Training provides employees with the skills necessary to perform tasks safely, while reinforcement through coaching, supervision, and feedback ensures that these behaviours are maintained over time. Continuous reinforcement helps safe behaviour become habitual rather than temporary.

Behavioural Safety Theory supports the integration of safety training as a key predictor of safety performance. By enhancing workers' knowledge and motivation, training increases the likelihood that employees will act safely and comply with established procedures, ultimately improving overall workplace safety.

2.4.3 Relevance to This Study

Theories such as Safety Climate Theory and Behavioural Safety Theory provide strong justification for the inclusion of the key variables examined in this study. Their underlying assumptions explain how organisational practices influence workers' cognitive and behavioural outcomes in hazardous environments (Zohar, 2010; Geller, 2021).

Management commitment is a central determinant of workers' safety perceptions and motivation. Safety Climate Theory explains that when managers consistently monitor procedure compliance, discuss safety rules, and demonstrate safe behaviour, employees perceive safety as a priority. This perception enhances workers' motivation and readiness to comply with safety procedures (Zohar, 2010; Clarke, 2021).

Safety training is essential for shaping workers' behaviour. Behavioural Safety Theory emphasises that employees' actions depend on their knowledge, skills, and reinforcement. Training increases awareness of hazards, develops the behavioural capability of workers, and equips them with the proficiency necessary to perform tasks safely (Geller, 2021; Hafiz et al., 2023).

Safety knowledge is critical for safe performance. Both Safety Climate Theory and Behavioural Safety Theory highlight that employees must have a comprehensive understanding of hazards and the correct procedures to act safely. When management demonstrates strong commitment and provides appropriate guidance, workers are more likely to develop the knowledge required to manage hazardous tasks effectively (Zohar, 2010; Amirah et al., 2024).

Safety motivation is influenced by organisational priorities and leadership support. Theories suggest that workers are more motivated to adopt safe behaviours when they perceive that the organisation prioritises safety. Clear communication, supportive leadership, and continuous encouragement enhance workers' intrinsic motivation to follow safety practices consistently (Clarke, 2021; Neal & Griffin, 2020).

Safety compliance represents the behavioural outcome of effective SMP. Theories indicate that strong management commitment combined with effective safety training results in employees who are knowledgeable and motivated, leading to higher adherence to safety rules and procedures in their daily work activities (Vinodkumar & Bhasi, 2010; Chen & Li, 2022).

Thus, the conceptual framework presented in Chapter 1 is theoretically grounded in the understanding that organisational safety management practices influence workers' safety knowledge, safety motivation, and safety compliance, particularly in high-risk environments such as pesticide manufacturing.

2.5 Empirical Studies

The following section presents the research findings that analysed factory safety management and the impact these measures have on safety performances in various fields such as chemical production, general manufacturing, oil and gas industries, and environments related to pesticides. Comparing findings from these sectors helps establish how management commitment and safety training influence workers' safety knowledge, safety motivation, and safety compliance (Vinodkumar & Bhasi, 2010; Clarke, 2021; Amirah et al., 2024). The analysis also highlights consistent behavioural patterns and identifies gaps that are relevant to the pesticide manufacturing context in Malaysia.

2.5.1 Empirical Findings Across Different Industries

Table 2.1 summarises key empirical studies from various high-risk sectors. The studies consistently demonstrate that strong safety management practices (SMP), particularly management commitment and safety training, contribute to higher levels of safety

performance (SP). Conversely, weak enforcement, insufficient training, and inconsistent leadership involvement are associated with unsafe behaviours, non-compliance, and accident occurrence.

Table 2.1 Summary of empirical findings across different industries

No	Sector & Study	Focus of Study (SMP Component)	Key Findings on Safety Performance (Safety Knowledge, Motivation, Compliance)	Patterns & Implications
1	General Manufacturing (Clarke, 2021; Masi & Cagno, 2019)	Management commitment	Strong leadership improves safety motivation and compliance. Workers are more willing to follow safety rules when leadership is visible and supportive.	Strong SMP increases SP; leadership reduces unsafe behaviour.
2	Malaysian Manufacturing (Amirah et al., 2024)	Management commitment and training	Leadership support increases compliance. Training improves safety knowledge and hazard recognition.	Strong SMP enhances knowledge and performance.
3	Chemical Manufacturing (Ayob et al., 2023)	Safety controls, training, enforcement	High accident rates are linked to weak enforcement, insufficient training, and poor supervision.	Weak SMP leads to accidents and unsafe practices.
4	Chemical Handling / Process Industries (Chen & Li, 2022)	Safety training	Training improves SOP compliance and emergency reaction. Better procedural behaviour under chemical exposure conditions.	Quality training strengthens compliance.
5	Hazardous Chemical Workplaces (Hafiz et al., 2023)	Safety training	Training increases workers' safety knowledge and improves hazard awareness.	Training supports higher motivation and knowledge.
6	Pesticide Exposure and Poisoning (Kamaruzaman et al., 2022)	Hazard handling and awareness	Poisoning incidents linked to poor hazard recognition and weak compliance in pesticide handling.	Weak SMP causes unsafe behaviour; training gaps evident.
7	High-Risk Industries (Oil & Gas, etc.) (Clarke, 2021)	Management commitment	Workers report higher motivation and compliance when leadership models safe behaviour.	Leadership directly shapes worker safety behaviour.

2.5.2 Evidence from Chemical and Pesticide-Related Studies

Although very few studies focus on the issue of pesticide production, chemical industries and poison data on chemicals and poisons from different countries reveal the situation of the workers who are directly exposed to toxic agents in the industrial sector.

Ayob et al. (2023) place the chemical industry as the number one contributor in workplace injury and death in Malaysia, mainly due to the lack of enforcement of safety regulations coupled with inadequate training and supervision. The results of this study provide evidence of significant issues related to the management of safety in the use of chemicals. The study findings confirm substantial safety management issues associated with chemical use.

Correspondingly, Kamaruzaman et al. (2022) identified that cases of pesticide exposure in Malaysia can be primarily attributed to inadequate hazard identification or improper exposure management. Workers who are engaged in formulating, mixing, packaging and storing products became highly exposed as the concentrated chemicals came into direct contact with their bodies. The results from this study indicated that lack of knowledge related to safety and protocols continue to impede appropriate safety management in pesticide-related settings. The research explored in this study identified management commitment and safety training as predictors of safety performance in pesticide manufacturing departments. Across the reviewed studies, several consistent patterns emerge, as summarised in Table 2.2.

2.5.3 Patterns Observed in the Literature

Table 2.2 Summary of observe pattern in the literature

No	Observed Pattern	Explanation	Implication for This Study
1	Strong management commitment increases safety motivation and compliance	Workers behave more safely when they see leadership prioritizing safety (Clarke, 2021; Vinodkumar & Bhasi, 2010).	Supports inclusion of management commitment as an independent variable.
2	Good quality safety training increases safety knowledge and compliance	Workers understand hazards better and follow procedures more consistently (Hafiz et al., 2023; Amirah et al., 2024).	Supports inclusion of safety training as an independent variable.
3	Weak or inconsistent SMP leads to accidents and unsafe practices	Poor enforcement and insufficient training increase exposure risks (Ayob et al., 2023).	Supports the problem statement regarding ongoing incidents.
4	Chemical-intensive sectors show the highest consequences of weak SMP	Toxic chemical handling requires strong behavioural and procedural control (Kamaruzaman et al., 2022).	Reinforces the need for a pesticide-specific study.

2.5.4 Research Gap Identified from Empirical Studies

The review of empirical studies highlights several research gaps that justify the current study. There is limited research on the Malaysian pesticide manufacturing sector, despite its high chemical exposure risks (Kamaruzaman et al., 2022; Ayob et al., 2023). Existing studies focus mainly on construction or general manufacturing, with few examining chemical-intensive industries. Safety knowledge, motivation, and compliance have rarely been studied together, even though they collectively influence safety performance (Vinodkumar & Bhasi, 2010). Moreover, management commitment and safety training are often considered separately rather than as integrated safety management practices (Clarke, 2021). Finally, the role of behavioural safety variables in chemical-intensive environments, particularly their effect on compliance, remains underexplored (Hafiz et al., 2023). These

gaps, coupled with repeated chemical exposure incidents in Malaysian pesticide facilities, underscore the need to investigate how management commitment and safety training influence workers' safety knowledge, motivation, and compliance in Port Klang.

2.6 Research Gaps

There is a lack of studies specific to pesticide manufacturing, despite the sector involving frequent exposure to toxic chemicals and well-documented occupational health risks. Research examining safety performance within this industry is extremely limited, particularly in Malaysia, as most existing studies focus on broader manufacturing sectors, leaving a clear gap in sector-specific understanding (Kamaruzaman et al., 2022; Ayob et al., 2023).

Management commitment and safety training have been underexplored as distinct components in existing research. Many studies do not isolate these elements as individual predictors of safety performance, with some examining only one aspect. This limitation reduces understanding of how these two core factors jointly influence workers' safety behaviour (Clarke, 2021; Vinodkumar & Bhasi, 2010).

Behavioural safety dimensions have received limited attention in the literature. Very few studies examine safety knowledge, safety motivation, and safety compliance collectively within a single behavioural framework. As these three aspects are central to safety performance, their fragmented consideration restricts the development of comprehensive models (Amirah et al., 2024).

There is insufficient empirical evidence from Malaysian chemical-intensive environments. While international studies provide useful insights, the lack of locally focused research constrains the applicability of global findings to Malaysian pesticide manufacturing settings (Hafiz et al., 2023).

Finally, existing research demonstrates limited theoretical integration. Few studies apply frameworks such as Safety Climate Theory and Behavioural Safety Theory to explain how safety management practices influence workers' ability to behave safely. Without a clear theoretical foundation linking management commitment, safety training, and safety performance, the causal pathways underpinning these relationships remain unclear (Zohar, 2010; Geller, 2021).

Addressing these gaps reinforces the rationale for the current study. The shortage of research highlights the need to investigate management commitment and safety training as key factors affecting safety knowledge, safety motivation, and safety compliance among pesticide manufacturing workers in Malaysia.

2.7 Summary of Chapter

Chapter 2 reviewed literature on safety management practices (SMP) and safety performance (SP). It showed that management commitment and safety training are key factors that affect workers' safety knowledge, motivation, and compliance. Pesticide production is a high-risk industry with risks of chemical exposure, poisoning, and health problems. Although Malaysia has regulations like OSHA 1994, the Pesticides Act 1974, and USECHH 2000, frequent incidents show gaps in training, enforcement, and leadership.

Safety Climate Theory and Behavioural Safety Theory explain how management and training influence workers' safe behaviours in hazardous environments.

Research in manufacturing and high-risk industries shows that strong safety management improves safety outcomes, while weak management leads to accidents and unsafe practices. However, studies in Malaysia's pesticide sector are limited, especially those looking at all three behavioural aspects of safety performance together. This chapter also highlighted gaps, such as the lack of sector-specific studies, limited use of theory, and little research on behavioural safety in chemical-intensive environments. These gaps justify the current study on how management commitment and safety training affect workers' safety knowledge, motivation, and compliance in Port Klang.



CHAPTER 3

METHODOLOGY

This chapter explains the research methodology used to examine the effects of management commitment and safety training on the safety performance of workers in pesticide manufacturing facilities in Port Klang, Malaysia. Safety performance (SP) in this study refers to employees' safety knowledge, safety motivation, and safety compliance. The study adopts a quantitative approach with a cross-sectional design to collect data from workers at a single point in time. The chapter also describes the study location, highlighting Port Klang as a hub for chemical-intensive industries, making it relevant for the research. The chapter further outlines the sampling method, including the study population, sampling frame, sampling unit, and sample size, to ensure representativeness and reduce bias. It also covers quality control measures, validity and reliability testing of research instruments, and ethical considerations during data collection. The independent and dependent variables are defined and aligned with the conceptual framework. Finally, the chapter explains the statistical analysis methods used for univariate, bivariate, and multivariate analyses and how these methods address the research objectives and support the presentation of findings in the next chapter.

3.1 Research Framework

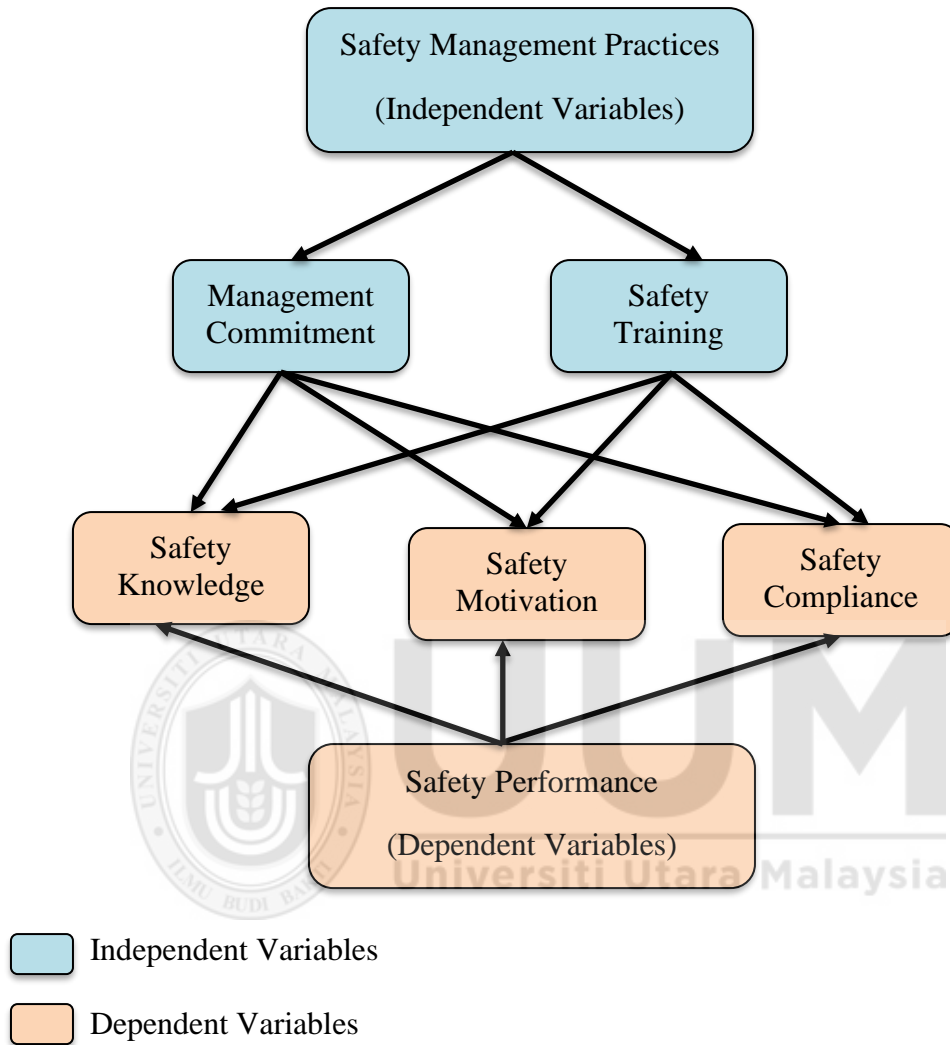


Figure 3.1 Conceptual Framework

This study uses a conceptual framework to assess on safety management practices (SMP) effect safety performance (SP) in the focus group of workers at pesticide manufacturing. The framework we developed is a result of theoretical approaches in occupational safety and captures the probable causal mechanisms of how organizational level actions may produce safety outcomes at the individual level.

According to framework, safety management practices (SMP) act as the independent variable and consist of two main part such as management commitment and safety training. Management commitment refers to how well top management of organization focus on safety through resources, policies, and active involvement, while safety training means provide necessary training to workers gain understanding and ability to identify workplace hazards and working by practising safety.

The dependent variable, safety performance (SP), is evaluate through three main branches safety knowledge, safety motivation, and safety compliance. These dimensions will show workers understanding of safety procedures, their willingness to follow safe attitude and safety regulations (Vinodkumar & Bhasi, 2010).

The framework suggests that safety management practices will affect safety performance directly and indirectly. The indirect effects of management practices are through three mediating variables introduced in the framework such as safety knowledge, safety motivation, and safety compliance which are informational mechanisms through which organizational practices may become enacted within safety behaviours. Strong management commitment and effective training systems, we anticipate that workers will acquire more safety knowledge, enhance safety motivation, and comply with regulations leading to a workers' overall, improved safety performance.

This conceptual framework provides the structural basis for formulating the research objectives and hypotheses. It also supports the examination of causal relationships between variables and clarifies the mechanisms through which management led interventions

contribute to improved safety outcomes in high-risk environments such as pesticide manufacturing.

3.2 Hypotheses Development

i. Management Commitment

H0₁: There is no significant relationship between management commitment and safety performance (safety knowledge, safety motivation, safety compliance) among respondents.

H1₁: There is significant relationship between management commitment and safety performance (safety knowledge, safety motivation, safety compliance) among respondents.

ii. Safety Training

H0₂: There is no significant relationship between safety training and safety performance (safety knowledge, safety motivation, safety compliance) among respondents.

H1₂: There is significant relationship between safety training and safety performance (safety knowledge, safety motivation, safety compliance) among respondents.

3.3 Research Design

This study uses a cross-sectional research design (Snyder, 2019), in which data are collected at a single point in time to examine the relationships between management commitment, safety training, and safety performance among pesticide manufacturing workers. A cross-sectional design is appropriate because it provides a current snapshot of workers' perceptions and behaviours without requiring long-term follow up. A quantitative (Joshi et al., 2015) approach is used to support this design, as it allows objective

measurement of variables and statistical analysis of the relationships between safety management practices (SMP) and the three dimensions of safety performance (SP).

3.4 Operational Definition

Safety management practices in this study were assessed using a structured, self-administered questionnaire that asked respondents to express their perceptions of how well safety practices were implemented in their organization. These practices included safety procedures, communication, supervision, and enforcement of safety rules, with responses measured on a Likert scale, where higher scores indicated better-perceived implementation of safety management practices.

Management commitment was evaluated through questionnaire items reflecting workers' perceptions of management's involvement and concern for safety. The items assessed actions such as providing safety resources, addressing safety issues, and emphasizing safety as a priority. Responses were recorded on a Likert scale, with higher scores representing stronger perceived management commitment to safety.

Safety training was measured using questionnaire items that captured employees' perceptions of the sufficiency, frequency, and appropriateness of training provided by management. The items included training on personal protective equipment (PPE) usage, emergency response, and hazard awareness. Responses were recorded on a Likert scale, where higher scores indicated more effective safety training.

Safety performance was assessed using questionnaire items covering safety knowledge, safety motivation, and safety compliance. Respondents rated their level of agreement with

each statement using a Likert scale, and individual scores were combined to form a composite score representing overall safety performance, with higher scores reflecting better safety performance.

Safety knowledge was evaluated through questionnaire items examining employees' awareness of workplace hazards, emergency measures, and safety practices. Responses were measured on a Likert scale, with higher scores indicating higher levels of safety knowledge.

Safety motivation was assessed using questionnaire items that referred to the extent to which workers were willing to follow safety standard operating procedures, take responsibility for their own safety and that of their colleagues, and avoid unsafe behaviors. Likert-scale responses were used, with higher scores indicating stronger safety motivation.

Safety compliance was measured through questionnaire items that evaluated how frequently workers adhered to established rules and standard procedures during their work. Responses were recorded on a Likert scale, with higher mean scores indicating higher safety compliance.

3.5 Measurement of Variables/Instrumentation

Content validity was established through expert review by academician and industry experts to ensure that items measuring management commitment, safety training, safety knowledge, safety motivation, and safety compliance adequately represented their intended constructs and were appropriate for chemical-handling work environments. Construct validity was assessed using factor analysis during the data analysis stage, with items

expected to load onto their respective constructs. Reliability was evaluated using Cronbach's alpha, with values of 0.70 or above indicating acceptable internal consistency, consistent with prior Malaysian safety behaviour studies (Hafiz et al., 2023; Amirah et al., 2024).

As the primary research instrument, the study utilizes a structured questionnaire. The questionnaire is designed to measure the independent variables management commitment and safety training, as well as the dependent variables safety knowledge, safety motivation, and safety compliance. All items are presented using a five-point Likert scale, which is widely used for measuring attitudes, perceptions, and behavioural responses in safety-related research (Joshi et al., 2015). The questionnaire is organised into six sections, each addressing a specific construct relevant to understanding safety performance in pesticide manufacturing environments.

3.5.1 Section 1: Demographic Information

The first section gathers demographic data such as the age, gender, job role, years of experience, and previous safety training of the respondents. Demographic characteristics, being background factors and not the core of the study. However, they help to understand the findings better. Some demographic attributes may affect safety knowledge, motivation, or compliance (Vinodkumar & Bhasi, 2010), thus it is necessary to identify possible differences among the workers (Venkatraman, 2020).

3.5.2 Section 2: Management Commitment

This part is to figure out the workers perception towards management commitment on safety. Questions in this section will evaluate management through communication priorities in safety, giving required resources, obeying safety rules and involvement of management in social leadership. Management support is one of the main factors leading to a better safety level, as it has been shown that a more pronounced safety motivation and compliance among workers result from leadership support (Clarke, 2021). Hence, this segment serves to determine how leadership behaviour affects safety in pesticide manufacturing settings.

3.5.3 Section 3: Safety Training

The third section deals with the employees' perception of the safety training programme provided by the organisation. The questions assess whether the training is easily understood, relevant, workable, effective and sufficient for handling dangerous chemicals. Safety training is extremely important for workers to gain safety knowledge and to develop right safety behaviour (Hafiz et al., 2023). This section is an instrument to signify that organizational training efforts may lead to the operational staff gaining safety knowledge, becoming motivated and compliant.

3.5.4 Section 4: Safety Knowledge

This section measures understanding of safety knowledge of workers on chemical hazards, emergency procedures, safe operating practices, and proper application of personal protective equipment should be the focus of workers. Safety knowledge is the

basis of safe behaviour as workers are required to understand risks and procedures before they can comply appropriately (Vinodkumar & Bhasi, 2010). Consequently, this section surveys the extent to which management commitment and safety training have led to higher workers' awareness and understanding of safety practices.

3.5.5 Section 5: Safety Motivation

Safety motivation is measured in this section, which assesses workers' willingness and internal drive to perform their tasks safely. Motivation influences the likelihood that workers will apply safety knowledge and follow safety procedures consistently (Vinodkumar & Bhasi, 2010). This section provides insight into how management practices and training may shape workers' readiness to engage in safe behaviour.

3.5.6 Section 6: Safety Compliance

The final section evaluates safety compliance, which represents the behavioural expression of safety performance. Items measure adherence to personal protective equipment requirements, standard operating procedures, and reporting of unsafe conditions. Safety compliance is widely regarded as a direct indicator of the effectiveness of safety management practices (Amirah et al., 2024). This section assesses whether safety initiatives translate into actual safe behaviours in daily operations.

3.6 Data Collection

This study adopted a quantitative research approach to examine the influence of safety management practices on safety performance among workers in the pesticide manufacturing industry. The data collection strategy aimed to obtain objective and

measurable data suitable for statistical analysis of relationships between key study variables. Primary quantitative data were collected using a structured questionnaire developed based on established literature on safety management and safety performance. The questionnaire consisted of closed-ended Likert-scale items measuring safety management practices, namely management commitment and safety training, as well as safety performance dimensions, including safety knowledge, safety motivation, and safety compliance.

The unit of analysis was individual operational workers in the pesticide manufacturing sector. At a general level, respondents comprised full-time employees involved in operational, production, chemical handling, or chemical storage activities, as these workers are directly exposed to workplace hazards. Data were collected from pesticide manufacturing facilities in Port Klang, Malaysia. The study employed a cross-sectional design, with data collected at a single point in time to capture a snapshot of prevailing safety management practices and safety performance among workers.

3.7 Sampling

3.7.1 Study Population

The study population consists of sixty full-time operational workers employed in a pesticide manufacturing facility in Port Klang. These workers perform chemical-handling activities such as formulation, mixing, packaging, machine operation, and storage management. Because their daily tasks expose them to hazardous substances, they are the most suitable respondents for examining how management commitment and safety training influence safety knowledge, safety motivation, and safety compliance.

3.7.2 Inclusion Criteria

Workers included in the study were required to meet several specific criteria. They had to be full-time operational employees who were directly involved in chemical handling, production activities, or chemical storage processes. In addition, only workers with a minimum of six months of work experience in the organisation were eligible to participate. These criteria ensured that the selected respondents possessed adequate exposure and practical knowledge of workplace safety, enabling them to provide reliable and informed insights regarding management commitment and safety training practices.

3.7.3 Exclusion Criteria

Workers were excluded from the study if they held administrative or clerical positions, did not perform operational or chemical-handling duties, or had less than six months of service in the organisation. These groups were excluded because they are not exposed to the same level of occupational hazards and do not routinely engage with the safety procedures applicable to operational workers, which could limit the relevance and accuracy of their responses.

3.7.4 Sampling Strategy

A purposive sampling strategy is adopted because only specific groups of workers within the organisation are directly exposed to pesticide-related hazards and are therefore suitable for inclusion in this study. The selected pesticide manufacturing facility in Port Klang employs approximately sixty operational workers who are involved in activities such as chemical formulation, mixing, packaging, machine operation, and storage handling. These

sixty workers, in total, satisfy the inclusion criteria and represent the pool from which participants will be drawn.

The study intends to collect at least fifty-five completed questionnaires from this group as indicated in section 3.3.5 sample size, figure 3.1 Krejcie & Morgan sample size table with margin of error plus 5%. This figure leaves room for the possibility of non-response or incomplete responses and, at the same time, ensures a sufficient number of the operational workforce are represented. Purposive sampling is commonly recommended in occupational safety research when the objective is to obtain information from workers who have direct experience with the safety issues being investigated (Taherdoost, 2022).

3.7.5 Study Population

The study population is full-time operational employees who are directly involved in the production of pesticides in the factory area of Port Klang. They are engaged in activities such as chemical formulation, mixing, blending, machine operation, packaging, storage handling, and quality control testing. Since they are the most exposed to hazardous chemicals, these workers should be well-versed in safety, motivated and willing to comply in order to maintain safe work practices. By focusing on operational workers, the research is assured of getting the inputs of those who are directly exposed to chemical hazards.

3.7.6 Sampling Unit

The sampling unit in this study is each individual operational worker within the selected pesticide manufacturing facility who meets the inclusion criteria. Each worker is treated as a single unit of analysis because safety performance is assessed at the individual level. The

study examines how each worker perceives management commitment and safety training and how these perceptions influence personal safety knowledge, safety motivation, and safety compliance. This individual level focus is appropriate because the dependent variables represent personal attitudes and behaviours that cannot be accurately measured at group or organisational levels alone.

3.7.7 Sample Size

The selected factory has a total of sixty eligible operational workers who satisfy the inclusion criteria. The study aims to collect at least fifty-five completed and usable questionnaires from this group. This sample size is appropriate for a focused occupational study in a single facility and is sufficient for conducting descriptive, correlation, and regression analyses within a cross-sectional design. Similar empirical studies in Malaysian manufacturing settings have successfully used sample sizes within this range when examining safety behaviour among specific operational groups (Hafiz et al., 2023; Amirah et al., 2024). Obtaining responses from at least fifty-five workers ensures that the study has adequate statistical power while still representing the majority of the eligible operational workforce.

<i>N</i>	<i>S</i>	<i>N</i>	<i>S</i>	<i>N</i>	<i>S</i>
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	100000	384

Note.—*N* is population size. *S* is sample size.

Source: Krejcie & Morgan, 1970

Figure 3. 2Krejcie & Morgan Sample Size Table

3.8 Data Collection Procedure

Data were collected using an online structured questionnaire administered via Google Forms. Eligible operational workers were contacted through the organisation's management, which distributed the questionnaire link to potential participants who met the study's inclusion criteria.

Prior to participation, respondents were provided with an information sheet explaining the purpose of the study, the voluntary nature of participation, and assurances of anonymity and confidentiality. Informed consent was obtained electronically before respondents accessed the questionnaire. Participants were informed that they could refuse or withdraw at any time without providing a reason and without any negative consequences, and no form of pressure was applied.

The questionnaire was pilot tested among a small group of operational workers with characteristics similar to the target population to assess clarity and language suitability. Based on the pilot findings, necessary refinements were made prior to full distribution. To accommodate language preferences and minimise misinterpretation, the final questionnaire was made available in English and Malay.

The refined questionnaire was distributed online, with all required items set as mandatory to reduce missing data. After data collection, responses were screened for completeness and consistency, and incomplete, patterned, or abnormal responses were excluded to ensure data quality. Several measures, including anonymity assurance and clear instructions, were implemented to minimise common method bias (Podsakoff et al., 2012).

Ethical principles guided all stages of data collection to protect participants' rights and wellbeing. No identifiable personal information was collected, and all responses were gathered anonymously and reported only in aggregate form. Data were used solely for academic purposes, stored securely, and accessed only by the researcher, in accordance with university research ethics guidelines and the organisation's code of honesty and integrity.

3.9 Technique of Data Analysis

Data analysis will be conducted using the Statistical Package for the Social Sciences (SPSS). The techniques selected are aligned with the research objectives and the cross-sectional quantitative design of the study.

3.9.1 Univariate Analysis

Univariate analysis will be used to summarise the demographic characteristics of respondents and provide descriptive statistics for all study variables. Frequency distributions, means, standard deviations, and percentages will be reported for demographic data such as age, gender, job role, and length of service. Descriptive statistics for management commitment, safety training, safety knowledge, safety motivation, and safety compliance will provide an account for overall trends in the safety performance of the workers in the study.

3.9.2 Bivariate Analysis

Bivariate analysis will be conducted to explore the relationships between the independent variables and the dependent variables. Spearman's rho correlation analysis will be used to ascertain the extent and nature of the relationships between management commitment and the three safety performance dimensions, as well as between safety training and the three safety performance dimensions. Spearman's rho is an apt choice for this study as the variables are measured by Likert, scale responses that produce ordinal data, and the analysis does not necessitate the assumption of normality. Besides, Spearman's rho is good

for investigating monotonic relationships between variables in cross, sectional survey research.

3.9.3 Multivariate Analysis

Multivariate analysis will be conducted to examine the predictive influence of management commitment and safety training on safety performance. Multiple linear regression analysis will be used for this purpose. This method is appropriate because the research objectives require determining how strongly each independent variable predicts overall dependent variable after controlling for other variables. Regression analysis aligns with the study's aim of identifying the most influential safety management practice contributing to safety performance among pesticide manufacturing workers in Port Klang.

3.10 Summary of Chapter

This chapter presents the methodology used to examine the effects of management commitment and safety training on safety performance comprising safety knowledge, motivation, and compliance among pesticide manufacturing workers in Port Klang, Malaysia. A quantitative, cross-sectional design was employed, with data collected via a structured Likert-scale questionnaire. Validity and reliability were ensured through expert review, factor analysis, and Cronbach's alpha (≥ 0.70). Purposive sampling targeted operational workers exposed to chemical hazards, while ethical principles, informed consent, anonymity, and confidentiality were strictly maintained. Data quality was reinforced through pilot testing, multilingual instruments, and response checks, and analyses were conducted using SPSS for descriptive, correlational, and regression tests, providing a rigorous framework for reliable and meaningful findings.

CHAPTER 4

RESULTS AND DISCUSSION

This chapter reports the results and discussions of a study on the influence of safety management practices on safety performance among pesticide manufacturing workers in Port Klang, Malaysia. The results address four research objectives: determining the levels of safety knowledge, motivation, and compliance; examining the relationships between management commitment and safety performance, and between safety training and safety performance; and identifying the most significant safety management practice influencing safety performance. Data were collected from operational workers using a structured questionnaire and analysed using descriptive and inferential statistical methods appropriate for a cross-sectional quantitative design.

The chapter also presents pilot study results on instrument reliability. Apart from it, participants' socio-demographic profiles, and descriptive statistics on safety performance dimensions. Correlation analysis using Spearman's rho assessed relationships between safety management practices and safety performance, while multiple regression analysis evaluated their predictive strength after controlling for demographic factors. Findings are presented objectively through tables and text with interpretation, providing a clear empirical basis for testing the study hypotheses and understanding the role of safety management practices in pesticide manufacturing settings.

4.1 Pilot Testing

4.1.1 Pilot Sample and Administration

Prior to the main data collection, a pilot test was conducted involving six contract based operational workers, representing approximately 10% of the total population which was 60 sample size. The use of contract workers for the pilot phase was intentional in order to prevent response contamination, learning effects, or survey fatigue among the full-time workers who constituted the actual study sample. The contract workers selected for the pilot performed similar job functions, were exposed to comparable chemical hazards, and were subject to the same safety rules, procedures, and training requirements as full-time employees.

The pilot questionnaire administration involved the use of google forms, as utilized in the data collection method in the full study. Additionally, all six respondents were able to finish the whole questionnaire without missing data or any technological problems. The preliminary comments from the pilot respondents indicated that the questions on the questionnaire were clear and relevant to the working environment of the respondents without requiring modification before administration.

4.1.2 Constructs and Questionnaire Structure

The research instrument consisted of two main constructs which was Safety Management Practices (SMP) as the independent variable and Safety Performance (SP) as the dependent variable. Safety management practices were divided into two sub-constructs such as management commitment (7 items) and safety training (8 items). Safety performance was divided into three sub-constructs such as safety knowledge (6 items), safety motivation (6

items), and safety compliance (6 items). Each item was measured using a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

4.1.3 Pilot Testing Result

The pilot testing (n=6) was conducted exclusively via Google Forms to maintain the quality and completeness of data collected. All 40 survey questions were on google forms set as mandatory to answer, consisting of 33 items measuring the construct and seven demographic items. By having all questions mandatory on the survey, no responses could be omitted, resulting in no missing data. Data integrity was partially ensured through the Google Forms platform, which required all survey items to be completed before submission. Therefore, no data cleaning or imputation was needed to support the dataset for the analysis.

Using contract workers to conduct the pilot testing eliminated any potential biases introduced from the workers selected for the main study and permitted each of the pilot testing responses to accurately reflect real work conditions. Additionally, every response submitted in the pilot test (n=6) has been verified, and the effectiveness of the measurement instrument and the clarity of the questions have been confirmed. Because of this validation, all conceptual constructs and demographic profiles contained within this survey are now accurately measured, enabling the reality of the data collected to be analysed with a high level of confidence due to the elimination of data gaps.

4.1.4 Reliability Analysis Procedure

Following data collection, the pilot responses were exported from Google Forms into Microsoft Excel for data screening and coding. The cleaned dataset was then imported into

IBM SPSS Statistics (Version 25) for reliability analysis. Internal consistency reliability was assessed using Cronbach’s Alpha, which evaluates the extent to which items within a construct measure the same underlying concept. Cronbach’s Alpha values of 0.70 or higher are generally considered acceptable, values above 0.80 indicate good reliability, and values exceeding 0.90 indicate excellent internal consistency (Hair et al., 2019; Ahmed et al., 2023). Reliability analysis was conducted separately for each sub-construct rather than combining items at the main construct level. This approach was adopted to preserve the conceptual distinctions embedded in the study’s framework, which examines the specific effects of management commitment and safety training on individual dimensions of safety performance.

4.1.5 Results of Reliability Analysis

Table 4.1 Reliability analysis result for pilot testing (N = 6)

No	Construct / Sub-construct	Number of Items	Cronbach’s Alpha
1	Safety Management Practices	15	0.969
a)	Management Commitment	7	0.910
b)	Safety Training	8	0.956
2	Safety Performance	18	0.980
a)	Safety Knowledge	6	0.907
b)	Safety Motivation	6	0.971
c)	Safety Compliance	6	0.934

The findings of the reliability analysis carried out on pilot study data from 6 participants are displayed in Table 4.1. The analysis shows that the overall construct of Safety Management Practices (SMP), measured using 15 items, recorded a Cronbach’s alpha value of 0.969. Within this construct, the sub-construct management commitment,

consisting of seven items, obtained a Cronbach's alpha value of 0.910, while safety training, measured using eight items, recorded a Cronbach's alpha value of 0.956.

Safety Performance construct, which comprised 18 items, the overall Cronbach's alpha value was 0.980. The sub-constructs of safety knowledge, safety motivation, and safety compliance, each measured using six items, recorded Cronbach's alpha values of 0.907, 0.971, and 0.934, respectively. The internal consistency values for all constructs and sub-constructs established through the pilot study, as shown in Table 4.1, will continue to serve as the basis for the analysis carried out in the main study.

4.1.6 Interpretation and Final Decision

Pilot reliability testing has shown that the research tool is internally consistent for all constructs and sub-constructs tested. the overall construct of safety management practices received a high level of internal reliability as shown by the Cronbach's alpha of 0.969, while the corresponding sub-constructs management commitment (0.910) and safety training (0.956) received high scores (greater than 0.90) as well, providing evidence of excellent internal consistency. The overall safety performance construct received a very high Cronbach's alpha score of 0.980, indicating that it was also highly accurate and reliable. the corresponding sub-constructs for safety knowledge (0.907), safety motivation (0.971), and safety compliance (0.934) were also above the 0.90 level indicating that they had excellent consistency between items measuring each dimension.

The results of the pilot testing confirm that the primary purpose of this phase of the testing was to establish reliability for the research tool prior to collecting data for the main study. The consistently large size of the Cronbach's alpha statistics for all constructs confirms

that the items in the questionnaire were correctly organized, clearly understood by the respondents, and correctly grouped together to measure the constructs of interest the safety management practices constructs and the safety performance constructs. As a result of the interpretations of the results of this portion of the studies, all items for the research tool were retained and not modified for use in the main study.

4.2 Response Rate

Table 4.2 Questionnaire Response Rate (N = 55)

Item	Total	Percentage (%)
Questionnaire distributed	55	100
Questionnaire collected	55	100
Questionnaire not returned	0	0
Total questionnaires completed	55	100

A total of 55 questionnaires were distributed to pesticide manufacturing workers. All 55 questionnaires were returned and found to be complete and usable for analysis. Therefore, the response rate for this study was 100 percent, with no missing data recorded.

4.3 Socio-Demographic Profile of Respondents

Table 4.3 Frequency and percentage of respondents' socio demographic (N = 55)

Characteristics	Frequency	Percentage (%)
Gender:		
Male	17	30.9
Female	38	69.1
Age Group		
18–25 years	4	7.3
26–35 years	14	25.5
36–45 years	32	58.2
46–55 years	5	9.1
Above 55 years	0	0
Highest Education Level		
Primary School	0	0
Secondary School	37	67.3
Certificate / Diploma	16	29.1
Bachelor Degree	2	3.6
Postgraduate Degree	0	0
Current job role / Position		
Production / process worker	26	47.3
Machine operator / technician	13	23.6
Supervisor / line leader	4	7.3
Quality control / laboratory staff	5	9.1
Foreman / maintenance staff	2	3.6
Chemical storage / warehouse staff	5	9.1
Years of work experience in this company		
Less than 1 year	4	7.3
1–3 years	12	21.8
4–6 years	10	18.2
7–10 years	17	30.9
More than 10 years	12	21.8

Main work area		
Raw material handling / weighing	6	10.9
Chemical formulation / mixing / blending	8	14.5
Filling / packing / labelling	20	36.4
Machine operation	9	16.4
Storage / warehouse / logistics	5	9.1
Quality control / laboratory	5	9.1
Maintenance	2	3.6
Have you ever attended formal safety training related to pesticide?		
Yes	55	100
No	0	0

Socio-demographic characteristics of respondents were calculated using frequency and percentage of distributions. According to gender there were 17 (30.9%) male and 38 (69.1%) female respondents. Regard to age group, the majority of respondents were in the age bracket of 36 to 45 years with 32 (58.2%) respondents, followed by those aged between 26 to 35 years with 14 (25.5%) respondents, then aged between 18 to 25 years with 4 (7.3%) respondents, while the least was 46 to 55 years with 5 (9.1%) respondents.

The majority of respondents received a Secondary School education, with 37 (67.3%), followed by those with Certificate or Diploma (16 respondents, 29.1%), and the remaining number were 2 respondents (3.6%) with Bachelor's Degree. In terms of current job role, 26 respondents (47.3%) were production or process workers, 13 respondents (23.6%) were machine operators or technicians, 4 respondents (7.3%) were supervisors or line leaders, 5 respondents (9.1%) were quality control or laboratory staff, 2 respondents (3.6%) were foremen or maintenance staff, and 5 respondents (9.1%) were chemical storage or warehouse staff.

Regarding years of work experience in the company, 4 respondents (7.3%) had less than one year of experience, 12 respondents (21.8%) had 1–3 years of experience, 10 respondents (18.2%) had 4–6 years of experience, 17 respondents (30.9%) had 7–10 years of experience, and 12 respondents (21.8%) had more than 10 years of experience. In terms of main work area, 6 respondents (10.9%) worked in raw material handling or weighing, 8 respondents (14.5%) in chemical formulation or mixing, 20 respondents (36.4%) in filling, packing, or labelling, 9 respondents (16.4%) in machine operation, 5 respondents (9.1%) in storage or warehouse logistics, 5 respondents (9.1%) in quality control or laboratory work, and 2 respondents (3.6%) in maintenance. All respondents (100%) reported having attended formal safety training related to pesticide or chemical handling in the company.

4.4 Level of Safety Performance

Objective 1 purpose to determine the level of safety performance (safety knowledge, safety motivation, safety compliance) among respondents. Safety performance consisted of an evaluation of three areas such as safety knowledge, safety motivation, and safety compliance. The level of performance was assessed using mean score, standard deviation and frequency distribution.

4.4.1 Safety Knowledge Descriptive Analysis

Table 4.4 Mean and standard deviation of respondents on safety knowledge (N = 55)

No	Questions	Mean	Standard Deviation
4a	I understand the types of chemical hazards present in my work	3.05	1.044
4b	I know which PPE is required for each task involving pesticides/chemicals	3.20	0.869
4c	I know the correct procedure to follow in case of a chemical spill or leak in my area	3.05	0.981
4d	I know where to find Safety Data Sheets (SDS) or chemical safety information	3.15	0.731
4e	I know the emergency procedures for chemical incidents	3.02	0.892
4f	I understand the safe storage, labelling, and disposal requirements for chemicals	3.09	0.888

Table 4.4 shows mean scores and standard deviations for safety knowledge among pesticide operational workers. The mean value for the six safety knowledge questions ranged from 3.02 to 3.20. The question “I know which PPE is required for each task involving pesticides/chemicals” presents the highest mean score of 3.20 with a standard deviation of 0.869. This was followed by the item “I know where to find Safety Data Sheets (SDS) or chemical safety information”, which recorded a mean score of 3.15 (SD = 0.731).

The remaining items recorded mean scores of 3.09 (SD = 0.888) for understanding safe storage, labelling, and disposal requirements, 3.05 (SD = 1.044) for understanding the types of chemical hazards present at work, 3.05 (SD = 0.981) for knowing the correct procedures in the event of a chemical spill or leak, and 3.02 (SD = 0.892) for knowledge of emergency procedures for chemical incidents. Safety knowledge Mean scores and SDs were moderate weighted mean and variability.

Table 4.5 Frequency distribution of respondents on safety knowledge (N = 55)

No	Questions	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)
4a	I understand the types of chemical hazards present in my work	7.3	23.6	30.9	32.7	5.5
4b	I know which PPE is required for each task involving pesticides/chemicals	1.8	20.0	38.2	36.4	3.6
4c	I know the correct procedure to follow in case of a chemical spill or leak in my area	1.8	29.1	32.7	34.5	1.8
4d	I know where to find Safety Data Sheets (SDS) or chemical safety information	0.0	16.4	56.4	23.6	3.6
4e	I know the emergency procedures for chemical incidents	3.6	23.6	43.6	25.5	3.6
4f	I understand the safe storage, labelling and disposal requirements	1.8	23.6	43.6	25.5	5.5

The percentages of respondents agreeing or strongly agreeing were fairly consistent, ranging from 27.2% to 40.0%. The highest percentage response was for question number 4b, and it overall had a combined percentage of the most responses with an "agree" or "strongly agree" which was at 40.0%. This question asked if respondents knew which personal protective equipment (PPE) was needed for each task involving pesticides or chemicals. The next highest responding question was number 4a with 38.2% responding in agreement, followed by question 4c at 36.3%. The lowest response for agreement among respondents was for question 4d which was "I know where to locate Safety Data Sheets (SDS) or chemical safety information," where only 27.2% indicated they agreed or strongly

agreed with this statement. Throughout all these questions posed to the respondents the number of neutral responses (not selecting either "agree" or "strongly agree" or "disagree") was the largest, with between 30.9%-56.4% of respondents indicating neutral responses. In these cases, the highest number of neutral responses was for question 4d (56.4%) and the lowest neutral response was for question 4a (30.9%).

Overall, when looking at the frequency distributions for the safety knowledge questions, there were respondents throughout each of the possible response categories. Therefore, the largest portion of respondents choose a neutral response and an agree option for safety knowledge questions. In comparison to national chemical safety guidelines published by DOSH Malaysia (2021), which require that all SDS are readily accessible and there should be plans for emergency response, the moderate means and high levels of neutral responses shown in this study indicate the respondents' safety-related knowledge is below the desired levels compared to other research conducted in Malaysia's manufacturing industry (Ayob et al., 2023).

4.4.2 Safety Motivation Descriptive Analysis

Table 4.6 Mean and standard deviation of respondents on safety motivation (N = 55)

No	Questions	Mean	Standard Deviation
5a	I feel personally responsible for keeping my workplace safe	3.18	1.038
5b	I am willing to put extra effort into improving safety in my work area	3.11	1.066
5c	I follow safety procedures even when no one is supervising me	3.22	1.150
5d	I believe it is very important to minimize safety risks even if it takes more time	3.18	1.038

5e	I am motivated to report unsafe conditions or incidents to my supervisor	3.13	1.019
5f	Working safely is important to me because it protects my health, co-workers and family	3.27	1.027

Mean safety motivation scores for study participants (N=55) as shown in Table 4.6 were within the range of 3.11 to 3.27 with the highest response being item 5f, " working safely is important to me because it protects my health, co-workers and family," with the mean of 3.27 (SD=1.027) followed by item 5c, "I always follow safety procedures even if no one is watching," that had a mean position of 3.22 (SD=1.150). Items 5a and 5d, both of which had a mean score of 3.18 each measured with 1.038 SD. For item 5e, there was a mean score of 3.13 (SD=1.019). The lowest mean score was found in item 5b, "I am willing to make an extra effort to improve safety at my work area," with a rating of 3.11 (SD=1.066). Safety motivation recorded mean scores ranging from 3.11 to 3.27, with standard deviations from 1.019 to 1.150, indicating moderate motivation levels and some dispersion of individual attitudes.

Table 4.7 Frequency distribution of respondents on safety motivation (N = 55)

No	Questions	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)
5a	I feel personally responsible for keeping my workplace safe	1.8	27.3	34.5	23.6	12.7
5b	I am willing to put extra effort into improving safety in my work area	3.6	29.1	30.9	25.5	10.9
5c	I follow safety procedures even when no one is supervising me	7.3	20.0	30.9	27.3	14.5

5d	I believe it is very important to minimize safety risks even if it takes more time	5.5	20.0	34.5	30.9	9.1
5e	I am motivated to report unsafe conditions or incidents to my supervisor	3.6	27.3	29.1	32.7	7.3
5f	Working safely is important to me because it protects my health, co-workers and family	5.5	16.4	32.7	36.4	9.1

Table 4.7 shows the frequency distribution of respondents' safety motivation. Of all the participants in the survey, 36.4% to 45.5% indicated that they agreed/strongly agreed. The participant group with the largest percentage of respondents that indicated agree/strongly agree was Item 5f, with 45.5% of all participants indicating this answer. The next highest percentage of respondents was Item 5c, with 41.8% and Item 5e, with 40.0%. Item 5b had the lowest percentage of respondents who indicated agree/strongly agree, with a percentage of 36.4%. neutral responses were between 29.1% to 34.5%, with the highest neutral response rate for item 5a and item 5d, at 34.5%, while the lowest neutral response rate was for item 5e, which had a neutral response rate of 29.1%.

Overall, survey responses for safety motivation regarding each item are found across the response options, where neutral and agree had the highest number of respondents for both of these two response options. Across the world, Vinodkumar and Bhasi (2010) found higher motivation levels in organizations with stronger safety climates. Compared to those standards, the motivation levels in this research are moderate, thus indicating that the organization has room for improvement.

4.4.3 Safety Compliance Descriptive Analysis

Table 4.8 Mean and standard deviation of respondents on safety compliance (N = 55)

No	Questions	Mean	Standard Deviation
6a	I always wear the required PPE when handling pesticides/chemicals	3.13	1.055
6b	I follow SOPs even when I am busy or under time pressure	3.05	1.026
6c	I keep my work area clean and free from tripping hazards	3.29	0.936
6d	I handle, mix, and transfer chemicals according to safe work procedures	3.15	0.989
6e	I do not take shortcuts that could compromise safety	3.25	0.985
6f	I obey safety signs and warnings	3.18	1.056

Table 4.8 shows the mean scores and standard deviations for safety compliance among respondents. In terms of safety compliance mean scores, the range was between 3.05 and 3.29. The highest mean score was Item 6c, (I keep my work area clean and free from tripping hazards; Mean 3.29, SD 0.936) followed by Item 6e, (Mean 3.25, SD 0.985). The next highest was Item 6f (I obey safety signs/warnings; Mean 3.18, SD 1.056), and Item 6d (I safely handle/mix/transfer chemicals; Mean 3.15, SD 0.989), with Item 6a (I always wear required PPE when handling pesticides/chemicals), having a mean score of 3.13 (SD 1.055). The lowest mean score was Item 6b (I follow SOP under busy time constraints), which scored 3.05 (SD 1.026).

Table 4.9 Frequency distribution of respondents on safety compliance (N = 55)

No	Questions	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)
6a	I always wear the required PPE when handling pesticides/chemicals	5.5	21.8	38.2	23.6	10.9
6b	I follow SOPs even when I am busy or under time pressure	5.5	27.3	29.1	32.7	5.5
6c	I keep my work area clean and free from tripping hazards	1.8	16.4	43.6	27.3	10.9
6d	I handle, mix, and transfer chemicals according to safe work procedures	1.8	27.3	34.5	27.3	9.1
6e	I do not take shortcuts that could compromise safety	3.6	18.2	36.4	32.7	9.1
6f	I obey safety signs and warnings	3.6	23.6	36.4	23.6	12.7

According to the data reported in Table 4.9, the distribution of respondents' safety compliance represented respondents' compliance with safety practice items by the number of agree or strongly agree responses. The percentage of respondents who selected agree or strongly agree ranged from 33.6% to 38.2%. The greatest combined percentage of agreement was recorded for Item 6e, (41.8%). The next highest percentage of combined agreement was for Item 6c (38.2%), and Item 6b (38.2%). The combined agreement percentage was lowest for Item 6a (34.5%). The percent of neutral responses ranged from 29.1% to 43.6%, with the highest neutral response reported for Item 6c and the lowest neutral response reported for Item 6b.

In conclusion, the overall distribution of respondents to safety compliance was evenly distributed across all response categories whereas neutral and agree responses represented

the largest proportion. These results indicate that compliance behaviours which are habitual and publicly visible are more regularly performed, while compliance under operational pressure is still a problem. This trend is consistent with the results of Chen and Li (2022) in the chemical industries.

4.4.4 Summary of Level of Safety Performance

Conclusion, the level of safety performance analysis reveals that safety knowledge, motivation, and compliance of pesticide manufacturing workers are at somewhat moderate levels, and quite large proportions of the responses have been neutral in all dimensions. These results attest to the partial realization of safety performance expectations and at the same time, shows the rest of the safety domain that needs to be developed by comparing it to national and international benchmarks.

4.5 Relationship Between Management Commitment and Safety Performances

Objective 2 examined the relationship between management commitment and safety performance (safety knowledge, safety motivation, safety compliance) among respondents. Descriptive statistics were first used to summarise the central tendency and variability of the variables. Subsequently, Spearman's rho correlation analysis was conducted to assess the strength, direction, and statistical significance of the relationships between management commitment and the dimensions of safety performance. Spearman's rho was selected as it is appropriate for ordinal data derived from Likert-scale measurements and does not require the assumption of normality.

Table 4.10 Mean and standard deviation management commitment and safety performances (N = 55)

Variables	Mean	Standard Deviation
Management Commitment	3.0883	.76512
Safety Knowledge	3.0939	.75955
Safety Motivation	3.1818	.96293
Safety Compliance	3.1758	.88855

Table 4.10 presents the mean scores and standard deviations for management commitment and safety performance variables. The mean for management commitment was 3.0883 (SD = 0.76512). The mean score for safety knowledge was 3.0939 (SD = 0.75955). Safety motivation recorded a mean score of 3.1818 with a standard deviation of 0.96293, while safety compliance recorded a mean score of 3.1758 (SD = 0.88855). The descriptive statistics indicated that on average, management perceived their commitment to the safety of workers at a moderate level which also indicated that management commitments were directly reflected in worker safety behaviours.

Table 4.11 Spearman's rho analysis on management commitment and safety performance (N = 55)

	Management Commitment	Safety Knowledge	Safety Motivation	Safety Compliance
Management Commitment	1.000	.825**	.811**	.758**
Safety Knowledge	.825**	1.000	.814**	.728**
Safety Motivation	.811**	.814**	1.000	.811**
Safety Compliance	.758**	.728**	.811**	1.000

** . Correlation is significant at the 0.01 level (2-tailed).

Table 4.11 shows output of Spearman's rho correlation analysis examining the associations between management commitment and safety performance three components namely safety knowledge, safety motivation, and safety compliance. The table reports the Spearman's rho correlation coefficients (ρ) and corresponding significance values for each pair of variables.

The correlation coefficient between management commitment and safety knowledge was $\rho = 0.825$ with a significance value of $p = 0.000$ (2-tailed). This result suggests that workers who perceived more management commitment also had higher safety knowledge levels. The strong correlation implies that management commitment may be instrumental in not only setting safety expectations but also in facilitating hazard communication and assuring access to safety information. The results resonate with the safety leadership and the safety climate research which point out that the direct involvement of management in safety activities makes workers more aware of workplace hazards and safety procedures (Zohar, 2002; Clarke, 2021).

The relationship between management commitment and safety motivation recorded a Spearman's rho coefficient of $\rho = 0.811$ with a significance value of $p = 0.000$ (2-tailed). The finding signifies that management commitment is fundamental in influencing workers' safety motivation. Singularly, Vinodkumar and Bhasi (2010) found that one of the most significant factors by which management commitment influences safety motivation was through employee reinforcement, communication, and leadership behaviour.

In addition, the correlation coefficient between management commitment and safety compliance was $\rho = 0.758$ with a significance value of $p = 0.000$ (2-tailed). Although the

correlations with safety knowledge and motivation were stronger, this one shouldn't be dismissed as it is still considerable. Previous studies by Zohar (2002) and Zohar (2010) have shown that strong management enforcement and visible leadership are effective in reducing unsafe shortcuts and improving adherence to safety rules in high-risk industries. Similar findings were reported by Vinodkumar and Bhasi (2010) and Clarke (2021), who emphasized that management commitment and leadership behaviour play a critical role in strengthening rule compliance in chemical and manufacturing settings.

The table also displays the inter-correlations among the safety performance dimensions. Safety knowledge correlated with safety motivation ($\rho = 0.814$, $p = 0.000$) and safety compliance ($\rho = 0.728$, $p = 0.000$). Safety motivation showed a correlation coefficient of $\rho = 0.811$ with safety compliance, with a significance value of $p = 0.000$. All correlations were tested at the 0.01 significance level (2-tailed) using a sample size of $N = 55$.

4.5.1 Summary of Objective 2

In summary, Objective 2 findings demonstrate that management commitment is strongly and positive in relation to all dimensions of safety performance. The consistency between descriptive statistics and strong Spearman's rho correlation coefficients confirms that management commitment is a critical organizational factor influencing workers' safety knowledge, motivation, and compliance within pesticide manufacturing environments.

4.6 Relationship Between Safety Training and Safety Performances

Objective 3 examined the relationship between safety training and safety performance (safety knowledge, safety motivation, safety compliance) among respondents. Descriptive statistics were used to summarise the variables, followed by Spearman's rho correlation

analysis to examine the strength, direction, and statistical significance of the relationships between safety training and the dimensions of safety performance. Spearman's rho was employed due to the ordinal nature of the Likert-scale data.

Table 4.12 Mean and standard deviation safety training and performance (N = 55)

Variables	Mean	Standard Deviation
Safety Training	3.0750	.62017
Safety Knowledge	3.0939	.75955
Safety Motivation	3.1818	.96293
Safety Compliance	3.1758	.88855

Table 4.12 present safety training had a mean score of 3.0750 with a standard deviation of 0.62017, which reflects a moderate level of training effectiveness as perceived by the respondents. This mean score was almost identical to the mean scores of safety knowledge (M = 3.0939, SD = 0.75955), safety motivation (M = 3.1818, SD = 0.96293), and safety compliance (M = 3.1758, SD = 0.88855).

Nevertheless, the frequency analysis of safety knowledge revealed that the respondents had a high level of neutral responses, especially for access to Safety Data Sheets (SDS) where 56.4% of respondents chose the neutral option. This indicates that the training intervention will certainly enhance safety knowledge, but it seems that at the moment reinforcement through practical application is necessary if workers are to become more confident in the safety facts.

These findings of safety motivation suggest that safety training may function not only as a mechanism for knowledge transfer but also as a motivational tool that reinforces the personal and social importance of safe behavior. These results of safety compliance

indicate that safety training can support compliance behaviors but also indicate that operational issues will affect worker's ability to consistently engage in safe behaviors.

Table 4.13 Spearman's rho analysis on safety training and safety performance (N = 55)

	Safety Training	Safety Knowledge	Safety Motivation	Safety Compliance
Safety Training	1.000	.701**	.825**	.727**
Safety Knowledge	.701**	1.000	.814**	.728**
Safety Motivation	.825**	.814**	1.000	.811**
Safety Compliance	.727**	.728**	.811**	1.000

** . Correlation is significant at the 0.01 level (2-tailed).

Table 4. 13 displays the outcome of Spearman's rho correlation test which checked for associations between safety training and three components of safety performance, safety knowledge, safety motivation, and safety compliance. The table shows the Spearman's rho correlation coefficients (ρ) and also the significance values for each variable pair.

The correlation coefficient between safety training and safety knowledge was $\rho = 0.701$ with a significance value of $p = 0.000$ (2-tailed). This finding indicates that increased exposure to safety training is associated with higher levels of safety knowledge related to chemical hazards, PPE use, and emergency procedures. Similar results have been found in the chemical industry where the effectiveness of the training was dependent on continuous reinforcement and more practice (Chen & Li, 2022).

The relationship between safety training and safety motivation recorded a Spearman's rho coefficient of $\rho = 0.825$ with a significance value of $p = 0.000$ (2-tailed). Therefore, this

shows that safety training is the key driver in determining workers' attitudes, values, and their readiness to work safely. This interpretation is consistent with findings by Hafiz et al. (2023), who reported that effective safety training strengthens worker engagement and motivation in manufacturing settings.

In addition, the correlation coefficient between safety training and safety compliance was $\rho = 0.727$ with a significance value of $p = 0.000$ (2-tailed). This indicates that workers who perceived safety training as effective were more likely to comply with safety rules, including SOP adherence, PPE usage, and compliance with safety signage. Previous studies by Vinodkumar and Bhasi (2010) and subsequent research by Chen and Li (2022) and Hafiz et al. (2023) similarly found that well-structured safety training enhances rule adherence and PPE usage in chemical and manufacturing industries.

The table also reports the inter-correlations among the safety performance dimensions. Safety knowledge was significantly associated with safety motivation ($\rho = 0.814$, $p = 0.000$) and safety compliance ($\rho = 0.728$, $p = 0.000$). Safety motivation showed a correlation coefficient of $\rho = 0.811$ with safety compliance, with a significance value of $p = 0.000$. All correlations were tested at the 0.01 significance level (2-tailed) using a sample size of $N = 55$.

4.6.1 Summary of Objective 3

In conclusion, the findings for Objective 3 indicate that safety training is highly correlated with all three dimensions of safety performance. Among these, the association with safety motivation was the strongest, followed by safety compliance and safety knowledge. The combined descriptive and inferential results suggest that safety training is

a critical determinant of workers' safety attitudes and behaviors in the pesticide manufacturing industry.

4.7 Most Significant Safety Management Practice Influences Safety Performance

The purpose of Objective 4 was to investigate the most significant safety management practice influences the safety performance among respondents. Therefore, the two independent variables used to study these relationships were management commitment and safety training. By combining both factors in conjunction with multiple linear regression, investigated the independent effects as well as the interaction between both independent variables in their relationship to the dependent variable of worker safety performance. To establish the usefulness of performing regression analysis, completed descriptive statistics, correlation analysis, and assumption tests for the data to ensure its appropriateness for regression modelling.

4.7.1 Descriptive Statistics of Regression Variables

Table 4.14 Mean and standard deviation dependent variable and independent variables (N = 55)

Variables	Mean	Standard Deviation
Safety Performances	3.1505	.80306
Management Commitment	3.0883	.76512
Safety Training	3.0750	.62017

Table 4.14 displays the mean and standard deviations of dependent variable and each of the independent variables included in the regression model. For safety performance, the mean was 3.1505 with a standard deviation of 0.80306. The mean for management commitment was 3.0883 with a standard deviation of 0.76512, and the mean for safety training was 3.0750 with a standard deviation of 0.62017. As a group these numbers

provide an overview of the mean and standard deviation of the scores for all variables used in the regression analysis. These values provide context for interpreting the strength of the regression relationships observed.

4.7.2 Correlation Analysis Between Safety Performance and Independent Variables

Table 4.15 Pearson correlation analysis on safety performances with two independent variables (N = 55)

		Safety Performance	Management Commitment	Safety Training
Pearson Correlation	Safety Performance	1.000	.857	.824
	Management Commitment	.857	1.000	.722
	Safety Training	.824	.722	1.000
Sig. (1-tailed)	Safety Performance	.	.000	.000
	Management Commitment	.000	.	.000
	Safety Training	.000	.000	.

Table 4.15 illustrates the correlation analyses between safety performance with management commitment and safety training. According to the Pearson correlation analysis, safety performance correlates highly with management commitment ($r = 0.857$, $p = 0.000$, 1-tailed). Moreover, the regression results indicate that management commitment was still the main factor affecting safety performance outcomes, even if the effect of safety training was taken into account. Previous studies by Zohar (2002, 2010) and Vinodkumar and Bhasi (2010) similarly reported that visible leadership, consistent enforcement of safety rules, and managerial involvement play a critical role in shaping safety behaviour. These findings reinforce the importance of leadership-driven safety management practices in high-risk industries, including chemical and manufacturing sectors.

Based on table 4.15 Pearson correlation analysis, safety performance correlates strongly with safety training ($r = 0.824$, $p = 0.000$, 1-tailed). The regression results reveal that safety training is a potent instrument for achieving safety outcomes, but its effect can be sustained and even expanded if management commitment is strong. Previous studies by Chen and Li (2022) and Hafiz et al. (2023) found that safety training programs are more effective when strengthened by organizational top management and continuous supervision, particularly in chemical and manufacturing environments.

There was also a positive correlation between management commitment and safety training ($r = 0.722$, $p = 0.000$, 1-tailed). The results of the study demonstrate that all of the variables have a significant correlation, and therefore can be included in the Multiple Regression Model.

4.7.3 Model Summary of Multiple Linear Regression

Table 4.16 Regression model summary table (N = 55)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.907 ^a	.822	.815	.34507

In Table 4.16, the summary for the regression is presented. The Multiple Correlation Coefficient (R) = 0.907, indicating a very strong correlation between the independent variables and safety performance. The R-Square value = 0.822, indicating that 82.2% of the variance in safety performance is explained by management commitment and safety training. The adjusted R-Square value = 0.815, indicating a high degree of accuracy of the model to explain the variance, after adjusting for the number of predictors used in the analysis. The standard error of the estimate = 0.34507.

This represents the mean deviation of the observed values from the regression line. As conclusion the regression model demonstrates strong explanatory power and high predictive accuracy for safety performance. Previous studies by Neal & Griffin (2006) high R^2 values in safety studies indicate strong predictive relationships between safety management practices and safety outcomes.

4.7.4 Analysis of Variance (ANOVA) for the Regression Model

Table 4.17 ANOVA table (N = 55)

	Model	Sum of Squares	df	Mean Square	F	Sig.
	Regression	28.633	2	14.317	120.231	.000 ^b
1	Residual	6.192	52	.119		
	Total	34.825	54			

a. Dependent Variable: Safety Performance Total Mean

b. Predictors: (Constant), Safety Training Total Mean, Management Commitment Total Mean

An analysis of variance was conducted on the predicted model, and the results of the analysis are found in Table 4,17. The results indicate the predicted model by a test statistic (F-value) of 120,231 and a significant P-value (P=0,000). Thus, predicting safety performance significantly. The total sum of squares for safety performance is 34,825. Of this total sum, the regression predicted 28,633. In addition, the regression left 6,192 unaccounted for (not accounted for by the model).

The regression model is statistically significant and can reliably predict safety performance using management commitment and safety training as predictors. Previous studies by Vinodkumar & Bhasi (2010) stated management commitment and safety training jointly predict safety knowledge, motivation, and compliance, supporting the use of both variables

in regression models of safety performance. Apart from that, studies from Clarke (2021) stated integrated safety leadership and structured training significantly improve safety performance, validating multivariate models with high explanatory power.

4.7.5 Regression Coefficients and Predictor Contributions

Table 4.18 presents the regression coefficients for management commitment and safety training. Management commitment recorded an unstandardized coefficient (B) of 0.576 with a standard error of 0.089, a standardized beta coefficient (β) of 0.549, and a t value of 6.487, which was statistically significant ($p = 0.000$). Safety training recorded an unstandardized coefficient (B) of 0.553 with a standard error of 0.110, a standardized beta coefficient (β) of 0.427, and a t value of 5.053, also statistically significant ($p = 0.000$).

The regression model positioned management commitment as the most significant predictor of safety performance, indicating a large direct effect, with the standardized beta coefficient of = 0.549 and a significance value of $p = 0.000$. This indicates that management commitment made the largest unique contribution to explaining variations in safety performance among the respondents. These findings reinforce the importance of leadership-driven safety management practices in high-risk industries, including chemical and manufacturing sectors. Previous studies by Zohar (2002, 2010) and Vinodkumar and Bhasi (2010) similarly reported that visible leadership, consistent enforcement of safety rules, and managerial involvement play a critical role in shaping safety behaviour.

Safety training also made a statistically significant contribution to safety performance, as evidenced by a standardized beta coefficient of = 0.427 and a significance value of $p = 0.000$. This confirms that safety training is an independent factor that influences safety

performance, although its contribution was relatively weaker than that of management commitment. Previous studies by Chen and Li (2022) and Hafiz et al. (2023) found that safety training programs are more effective when strengthened by organizational top management and continuous supervision, particularly in chemical and manufacturing environments.

The finding that the standardized beta value for management commitment was stronger than that for safety training suggests that leadership commitment is what actually provides the basis for the effectiveness of training. The different pieces of evidence presented here in an integrated manner confirm the theoretical framework of the study, which regards safety management practices as the main factors leading to safety knowledge, motivation, and compliance.

Collinearity diagnostics showed tolerance values of 0.478 and VIF values of 2.092 for both predictors, indicating that multicollinearity was not a concern in the regression model.

4.7.6 Summary of Objective 4

The data collected for Objective 4 shows that management commitment and safety training are important factors in improving the safety performance of workers within the chemical industry. Although management commitment was found to be the most influential factor, safety training was still a significant contributor to safety performance. These findings highlight the need for leaders to be engaged in safety management and

provide safe work practices through training programs in hazardous chemical manufacturing.

Table 4.18 Regression coefficients table (N = 55)

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
	B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
(Constant)	-.329	.239		-1.375	.175					
1 Management Commitment	.576	.089	.549	6.487	.000	.857	.669	.379	.478	2.092
Safety Training	.553	.110	.427	5.053	.000	.824	.574	.295	.478	2.092

a. Dependent Variable: Safety Performance

4.8 Summary of Chapter

Results and discussion from data analysis including respondent characteristics, descriptive safety practices, and analytical test such as Spearman’s rho correlation analysis and multiple linear regression were presented in Chapter 4 and established as part of the research objectives and provided a statistical overview demonstrating relationships between study variables.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

This chapter consist of hypothesis testing, recommendation, implication of findings, limitation of study and contribution of study. The objective of this analysis was to ascertain how safety management practices affect the overall safety performance of pesticide manufacturers in Port Klang, Malaysia. Results showed that safety management practices have a very close relationship with safety performance (safety knowledge, safety motivation and safety compliance). This research shows that there is a moderate awareness, attitude and behavioral compliance towards safety performance from employees, which means that although the there is an adequate base in safety management practices, and there is still room for improvement and further enhancement.

Results of the analyzed data showed both management commitment and safety training significantly relate to improved workplace safety performance. Results also indicated that management commitment plays a major role in developing employees' knowledge of safety as well as in motivating them to be responsible for their own safety and compliance with established safety procedures. Safety training was also shown to influence an individual's motivation to be safe and to influence the behaviours of individuals through training, thereby contributing to a significant increase in workplace safety performance. In conclusion, all study objectives were met. Safety management practices within an organization play an integral part in improving safety in high-risk industries.

5.1 Hypothesis Testing

In this study, two main research hypotheses were tested to examine the associations between safety management practices specifically management commitment and safety training and safety performance, which comprised safety knowledge, safety motivation, and safety compliance among pesticide manufacturing workers.

In order to evaluate the hypotheses in this study, Spearman's rho correlation analysis and multiple linear regression analysis were utilized. Spearman's rho correlation was utilized to explore the strength, directionality and significance of how independent and dependent variables interacted with one another as the data were measured using Likert-scale responses. Multiple linear regression analysis was performed to determine which factors were the most important to safety performance. The results and their findings provided in table 5.1.

5.1.1 Overall Hypothesis Testing Summary

The findings of the Spearman's rho correlation analysis were consistent with the two hypotheses formulated in this research. Management commitment and safety training, as two main dimensions, were significantly positively correlated with each dimension of the safety performance construct. These findings were confirmed by the multiple linear regression analysis, which demonstrated that both management commitment and safety training significantly predicted safety performance, with management commitment being the more significant predictor. Overall, the outcomes of the hypothesis tests substantiate the study's conceptual framework and point to the role of safety management practices in determining workers' safety knowledge, motivation, and compliance.

Table 5.1 Summary of hypothesis result

Hypothesis	Null Hypothesis (H ₀)	Alternative Hypothesis (H ₁)	Statistical Test Used	Decision	Conclusion
Hypothesis 1	There is no significant association between management commitment and safety performance (safety knowledge, safety motivation, safety compliance) among respondents.	There is a significant association between management commitment and safety performance (safety knowledge, safety motivation, safety compliance) among respondents.	Spearman's rho correlation analysis	Reject H ₀	Management commitment shows a strong, positive, and statistically significant association with all dimensions of safety performance.
Hypothesis 2	There is no significant association between safety training and safety performance (safety knowledge, safety motivation, safety compliance) among respondents.	There is a significant association between safety training and safety performance (safety knowledge, safety motivation, safety compliance) among respondents.	Spearman's rho correlation analysis	Reject H ₀	Safety training is positively and significantly associated with safety knowledge, safety motivation, and safety compliance.
Overall Hypothesis (Predictive Test)	Management commitment and safety training do not significantly predict safety performance.	Management commitment and safety training significantly predict safety performance.	Multiple Linear Regression Analysis	Reject H ₀	Both predictors significantly influence safety performance, with management commitment as the strongest predictor.

5.2 Recommendations for Future Research

Based on the findings of this study, several recommendations are proposed for future research. First, future studies are recommended to examine additional organizational and individual factors that were not included in this research but may also influence safety performance among pesticide manufacturing workers. Such factors may include safety leadership styles, safety communication effectiveness, workload, job stress, and organizational culture.

Second, future research may extend the scope of this study by involving pesticide manufacturing facilities in other regions of Malaysia. Expanding the geographical coverage and increasing the sample size would allow for more diverse data and enhance the reliability and generalizability of the findings. In the future, it will be beneficial to conduct research with a wide range of samples from many locations. This way, many different types of companies and their corresponding operational environments can be compared against each other.

In addition, using both qualitative and quantitative approaches together will allow researchers to gather more detailed information about workers' views on and attitude toward safety management practices as well as how those practices impact safety performance. Future studies could also concentrate on investigating the relationship between a variety of safety-related outcomes that represent good or poor safety performance to better understand how high-risk chemical manufacturers manage their safety performance, including conducting research into near miss reports, unsafe acts, and accident records.

5.3 Implications of Findings

5.3.1 Theoretical Implications

This study highlights the need to strengthen occupational safety and health theories by placing greater emphasis on chemical-intensive, high-risk industries such as pesticide manufacturing. Many existing safety management and safety performance models are developed from generalized industrial settings and may not fully capture the complexities associated with hazardous chemical exposure. Sector-specific research can therefore refine existing theories by incorporating industry-specific risks, operational conditions, and regulatory requirements, enhancing their contextual relevance and explanatory power.

The findings also underscore the importance of advancing safety theory through longitudinal research designs. The widespread use of cross-sectional studies limits the ability to explain causal relationships between safety management practices and safety performance. Longitudinal studies would allow researchers to examine how management commitment and safety training influence safety knowledge, motivation, and compliance over time, supporting the development of dynamic models of safety behavior.

In addition, theoretical frameworks can be strengthened by incorporating additional variables such as safety climate, risk perception, work stress, and the physical work environment. Including these factors would provide a more comprehensive understanding of the mechanisms through which safety management practices influence safety performance. Cross-sector comparative studies involving other high-risk industries could further validate and refine existing theories by assessing their generalizability across different industrial contexts.

5.3.2 Practical Implications

From a practical perspective, the study emphasizes the importance of adopting worker-centric approaches in safety research and practice. Qualitative methods such as interviews, focus groups, and workplace observations can offer deeper insights into workers' experiences, perceptions, and daily safety practices that may not be fully captured through quantitative surveys. These insights can help organizations identify practical barriers and unsafe norms, enabling the design of more effective and context-appropriate safety interventions.

Overall, the findings highlight opportunities to improve safety outcomes in the pesticide manufacturing sector through evidence-based and context-specific strategies. Research that is longitudinal and grounded in workers' experiences can support organizations in strengthening safety training, reinforcing management commitment, and promoting sustained safe work behaviors, ultimately leading to improved safety performance in high-risk chemical environments.

5.4 Contributions of the Study

5.4.1 Theoretical Contribution

This study advances the theoretical understanding of safety management and safety behaviour within the context of Malaysia's pesticide manufacturing sector, a high-risk and under-researched industry. By examining safety performance as a multidimensional construct comprising safety knowledge, safety motivation, and safety compliance, the study extends existing theoretical models that often focus on single behavioural outcomes.

This integrated approach provides a more comprehensive explanation of how organization-specific safety management practices influence overall safety performance.

Furthermore, the findings offer empirical support for established theories related to safety leadership and safety climate. The results reinforce theoretical assumptions that management commitment and structured safety training play a central role in shaping employees' safety-related behaviours. By demonstrating these relationships within a chemical-intensive environment, the study strengthens the applicability and relevance of safety behaviour theories in high-risk industrial settings.

5.4.2 Practical Contribution

From a practical standpoint, this study provides valuable insights for industry practitioners, safety managers, and policymakers involved in the pesticide manufacturing and broader chemical sectors. The findings highlight the critical role of leadership involvement in promoting a strong safety culture and improving overall safety performance. Active management commitment is shown to be essential in reinforcing safe work practices and encouraging positive safety behaviours among employees.

In addition, the study underscores the importance of structured and effective safety training programs in enhancing workers' safety knowledge, motivation, and compliance. The empirical evidence generated can assist organizations in developing, reviewing, and strengthening workplace safety policies and training initiatives. These contributions support evidence-based decision-making and can guide the implementation of more effective safety management strategies aimed at reducing workplace accidents and improving safety outcomes in chemical and manufacturing industries.

5.5 Summary of Chapter

This research looked at the relationship between safety management practices and worker safety performance within the pesticide manufacturing industry located in Port Klang, Malaysia. The results showed that both management commitment and safety training were associated with improved employee knowledge of safe work practices, an increase in motivation for working safely and better adherence to established policies related to working safely. Results from the multiple regression analysis indicated that management commitment was the strongest predictor of worker performance when compared to management commitment, training had a smaller effect on performance.

In conclusion, these results demonstrate that organizations need to have a commitment to maintaining safe workplaces through their commitment to developing strong support systems for their employees and offering effective training programs. These findings provide valuable information for both researchers studying this area of research as well as industry representatives who may be involved in or affected by the pesticide manufacturing industry. Research findings will serve as a foundation for further investigation into safety improvement within the pesticide manufacturing sector and to develop effective training programs within the pesticide industry.

REFERENCES

- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179–211. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T)
- Amirah, N. A., Hassan, Z., & Abdullah, M. (2024). Safety practices and compliance among chemical industry workers. *Journal of Occupational Safety and Health*, 21(1), 33–45.
- Amirah, N. A., Rahman, S. A., & Ghazali, N. M. (2024). Fostering a safety culture in manufacturing: Linking safety behaviour and safety knowledge. *Safety Science*.
- Amirah, N. A., Wan Izatul Asma, W. I., & Muda, S. (2013). Operationalisation of safety culture to foster safety and health in the Malaysian manufacturing industries. *Asian Social Science*, 9(7), 23–33.
- Ansori, N., Rahman, N. S. A., & Karim, N. A. (2021). The influence of safety climate, motivation and knowledge on safety behaviour. *International Journal of Occupational Safety and Ergonomics*, 27(4), 1–12.
- Ayob, N., Rani, N. A., Jaafar, M. H., Mohd Noor, S., & Samsudin, S. (2023). Investigating patterns of workplace fatal injuries: A Malaysian case analysis. *Journal of Occupational Safety*, 14(2), 45–61.
- Becker, G. S. (1964). *Human capital: A theoretical and empirical analysis, with special reference to education*. University of Chicago Press.
- Blau, P. M. (1964). *Exchange and power in social life*. John Wiley & Sons.
- Brondino, M., Pasini, M., & Silva, S. A. (2025). Safety climate, safety behaviours and workplace accidents: A longitudinal study. *Journal of Safety Research*.
- Brunetto, Y., Xerri, M., Shriberg, A., Farr-Wharton, R., & Shacklock, K. (2022). Enhancing safety compliance in hazardous industries: The role of organizational support. *Safety Science*, 151, 105749. <https://doi.org/10.1016/j.ssci.2022.105749>
- Chen, Q., & Li, Y. (2022). Effectiveness of safety training on workers' compliance and hazard management in chemical industries. *Journal of Safety Research*, 81, 231–242.
- 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. *Journal of Applied Psychology*, 94(5), 1103–1127. <https://doi.org/10.1037/a0016172>
- Clarke, S. (2010). An integrative model of safety climate: Linking psychological climate and work environment to safety outcomes. *Journal of Occupational and Organizational Psychology*, 83(3), 553–578.

- 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.
- Clarke, S. (2021). Safety leadership: A review and future directions. *Journal of Safety Research*, 77, 322–338.
- Department of Occupational Safety and Health Malaysia. (2021). Guidelines on occupational safety and health in the use of chemicals hazardous to health. DOSH.
- Fernández-Muñiz, B., Montes-Peón, J. M., & Vázquez-Ordás, C. J. (2007). Safety management system: Development and validation of a multidimensional scale. *Journal of Loss Prevention in the Process Industries*, 20(1), 52–68.
- Geller, E. S. (2021). Behavioral safety theory and applications in industrial environments. *Professional Safety*, 66(4), 48–56.
- 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*, 5(3), 347–358.
- Hafiz, M. I. M., Abdullah, M. S., Rahman, N. S. A., & Karim, N. A. (2023). Assessing safety training and workers' participation in manufacturing settings. *Journal of Manufacturing Safety*, 12(1), 55–68.
- Hale, A. R., & Hovden, J. (1998). Management and culture: The third age of safety. In *Occupational injury: Risk, prevention and intervention* (pp. 129–165). Taylor & Francis.
- Hair, J. F., Celsi, M., Ortinau, D., & Bush, R. (2021). *Marketing research*. McGraw-Hill.
- Jaselskis, E. J., & Ashley, D. B. (1991). Optimal allocation of project management resources for achieving success. *Journal of Construction Engineering and Management*, 117(2), 321–340.
- Joshi, A., Kale, S., Chandel, S., & Pal, D. (2015). Likert scale: Explored and explained. *British Journal of Applied Science & Technology*, 7(4), 396–403.
- Kamaruzaman, N. A., Samsudin, S., Abdul Rani, N. A., Jaafar, M. H., & Mohideen, M. (2022). Epidemiological analysis of occupational poisoning in Malaysia (2006–2019). *Songklanakarin Journal of Science & Technology*, 44(5), 1264–1271.
- Kassim, M. A. M., Rahman, N. S. A., & Karim, N. A. (2021). A conceptual framework for safety performance: Training and safety communication in Malaysian manufacturing industry.
- Kines, P., Andersen, L. P. S., Spangenberg, S., Mikkelsen, K. L., Dyreborg, J., & Zohar,

- D. (2010). Improving construction site safety through leader-based verbal safety communication. *Journal of Safety Research*, 41(5), 399–406.
- Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement*, 30(3), 607–610.
- Lukman Arif Sidek. (2015). The relationship between safety management practice and safety behaviour among employees of one automotive company in Malaysia (Master's thesis). Universiti Utara Malaysia.
- Masi, D., & Cagno, E. (2019). Barriers to OHS interventions in SMEs. *Safety Science*, 113, 111–121.
- Mirza, N. M., Mahmood, A., & Shahzad, A. (2022). Occupational health risk and safety behavior among pesticide workers. *International Journal of Occupational Safety and Health*, 12(1), 11–19.
- Mullen, J. (2004). Investigating factors that influence individual safety behavior at work. *Journal of Safety Research*, 35(3), 275–285.
- Nahrgang, J. D., Morgeson, F. P., & Hofmann, D. A. (2011). Safety at work: A meta-analytic investigation. *Journal of Applied Psychology*, 96(1), 71–94.
- Neal, A., & Griffin, M. A. (2020). Managing safety motivation. *Accident Analysis & Prevention*, 142, 105118.
- Neal, A., Griffin, M. A., & Hart, P. M. (2000). The impact of organizational climate on safety climate and behaviour. *Safety Science*, 34(1–3), 99–109.
- Omid, L., Rahman, N. S. A., & Karim, N. A. (2023). Exploring the relationships among safety leadership, safety climate, psychological contract of safety and risk perception.
- Podsakoff, P. M., MacKenzie, S. B., & Podsakoff, N. P. (2012). Sources of method bias in social science research. *Annual Review of Psychology*, 63, 539–569.
- Snyder, H. (2019). Literature review as a research methodology. *Journal of Business Research*, 104, 333–339.
- Taherdoost, H. (2022). Sampling methods in research methodology. *International Journal of Academic Research*, 1(5), 10–18.
- Vinodkumar, M. N., & Bhasi, M. (2010). Safety management practices and safety behaviour. *Accident Analysis & Prevention*, 42(6), 2082–2093.
<https://doi.org/10.1016/j.aap.2010.06.021>
- World Health Organization, & International Labour Organization. (2021). WHO/ILO joint estimates of the work-related burden of disease and injury, 2000–2016. WHO.

Wu, C. H., Lin, C. H., & Shiau, S. Y. (2016). Enhancing safety climate and safety performance. *International Journal of Occupational Safety and Ergonomics*, 22(1), 46–58.

Wu, X., Zhang, L., & Chen, H. (2022). Measuring proactive safety performance in high-risk industries. *Safety Science*, 148, 105129.

Zohar, D. (2002). Modifying supervisory practices to improve subunit safety. *Journal of Applied Psychology*, 87(1), 156–163.

Zohar, D. (2010). Thirty years of safety climate research. *Accident Analysis & Prevention*, 42(5), 1517–1522.



Appendix A: Questionnaire



Bilingual Questionnaire (English – Bahasa Melayu)

*SAFETY MANAGEMENT PRACTICES AND SAFETY PERFORMANCE AMONG
PESTICIDE MANUFACTURING WORKERS
IN PORT KLANG
AMALAN PENGURUSAN KESELAMATAN DAN PRESTASI KESELAMATAN DALAM
KALANGAN PEKERJA PEMBUATAN RACUN MAKHLUK PEROSAK
DI PORT KLANG*

You are invited to participate in a research study conducted as part of a Master's programme at University Utara Malaysia (UUM).

Anda dijemput untuk menyertai satu kajian penyelidikan yang dijalankan sebagai sebahagian daripada program Sarjana di Universiti Utara Malaysia (UUM).

Purpose of study / Tujuan kajian:

- The purpose of this study is to examine the effects of management commitment and safety training on safety performance. / Tujuan kajian ini adalah untuk mengkaji kesan komitmen pengurusan dan latihan keselamatan terhadap prestasi keselamatan.
- There are no right or wrong answers. / Tiada jawapan betul atau salah.
- Participation is voluntary. / Penyertaan adalah sukarela.
- All responses are confidential. / Semua jawapan adalah sulit.

SECTION 1: DEMOGRAPHIC INFORMATION

SEKSYEN 1: MAKLUMAT DEMOGRAFI

1a. Gender

1a. Jantina

Male

Lelaki

Female

Perempuan

1b. Age Group

1b. Kumpulan Umur

18–25 years

18–25 tahun

26–35 years

26–35 tahun

36–45 years

36–45 tahun

46–55 years

46–55 tahun

Above 55 years

Melebihi 55 tahun

1c. Highest Education Level

1c. Tahap Pendidikan Tertinggi

Primary School

Sekolah Rendah

Secondary School

Sekolah Menengah

Certificate / Diploma

Sijil / Diploma

Bachelor Degree

Ijazah Sarjana Muda

Postgraduate Degree

Ijazah Pascasiswazah

1d. Current job role / Position

1d. Jawatan / Peranan kerja semasa

Production / process worker

Pekerja pengeluaran / proses

Machine operator / technician

Operator mesin / juruteknik

Supervisor / line leader

Penyelia / ketua barisan

Quality control / laboratory staff

Kawalan kualiti / kakitangan makmal

- Foreman / maintenance staff
Foreman / kakitangan penyelenggaraan
- Chemical storage / warehouse staff
Stor bahan kimia / kakitangan Gudang

1e. Years of work experience in this company
1e. Tempoh pengalaman bekerja di syarikat ini

- Less than 1 year
Kurang daripada 1 tahun
- 1–3 years
1–3 tahun
- 4–6 years
4–6 tahun
- 7–10 years
7–10 tahun
- More than 10 years
Lebih daripada 10 tahun

1f. Main work area

1f. Kawasan kerja utama

- Raw material handling / weighing
Pengendalian bahan mentah / penimbangan
- Chemical formulation / mixing / blending
Formulasi bahan kimia / pencampuran / pengadunan
- Filling / packing / labelling
Pemisahan / pembungkusan / pelabelan
- Machine operation
Operasi mesin
- Storage / warehouse / logistics
Stor / gudang / logistik
- Quality control / laboratory
Kawalan kualiti / makmal
- Maintenance
Penyelenggaraan

1g. Have you ever attended formal safety training related to pesticide / chemical handling in this company?

1g. Pernahkah anda menghadiri latihan keselamatan formal berkaitan pengendalian racun makhluk perosak / bahan kimia di syarikat ini?

- Yes / Ya
- No / Tidak

SECTION 2: MANAGEMENT COMMITMENT**SEKSYEN 2: KOMITMEN PENGURUSAN**

Please indicate your level of agreement with each statement.

Sila nyatakan tahap persetujuan anda terhadap setiap pernyataan berikut.

(1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree)

(1 = Sangat Tidak Setuju, 2 = Tidak Setuju, 3 = Neutral, 4 = Setuju, 5 = Sangat Setuju)

No	Statement (English / Bahasa Melayu)	1	2	3	4	5
2a	Top management in this company always treats safety as a high priority in decision-making. Pihak pengurusan tertinggi di syarikat ini sentiasa mengutamakan keselamatan dalam pembuatan keputusan.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2b	My supervisor will stop work immediately if he/she observes unsafe practices or conditions. Penyelia saya akan menghentikan kerja serta-merta jika beliau mendapati amalan atau keadaan tidak selamat.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2c	When workers report safety problems, management responds quickly to correct them. Apabila pekerja melaporkan masalah keselamatan, pihak pengurusan bertindak balas dengan segera untuk membetulkannya.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2d	The company provides adequate resources (e.g., PPE, equipment, signage) to ensure safe work. Syarikat menyediakan sumber yang mencukupi (contohnya PPE, peralatan, papan tanda) untuk memastikan kerja selamat.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2e	Management regularly communicates about safety (e.g., safety talks, meetings, notices). Pihak pengurusan sentiasa berkomunikasi mengenai keselamatan (contohnya ceramah keselamatan, mesyuarat, notis).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2f	Production or output targets are never allowed to override safety requirements. Sasaran pengeluaran atau hasil tidak pernah mengatasi keperluan keselamatan.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2g	Managers and supervisors set a good example by consistently following safety rules. Pengurus dan penyelia menunjukkan contoh yang baik dengan sentiasa mematuhi peraturan keselamatan.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

SECTION 3: SAFETY TRAINING**SEKSYEN 3: LATIHAN KESELAMATAN**

Please indicate your level of agreement with each statement.

Sila nyatakan tahap persetujuan anda terhadap setiap pernyataan berikut.

(1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree)

(1 = Sangat Tidak Setuju, 2 = Tidak Setuju, 3 = Neutral, 4 = Setuju, 5 = Sangat Setuju)

No	Statement (English / Bahasa Melayu)	1	2	3	4	5
3a	I have received adequate training on the hazards of the pesticides / chemicals I handle. Saya telah menerima latihan yang mencukupi mengenai bahaya racun makhluk perosak / bahan kimia yang saya kendalikan.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3b	Safety training in this company clearly explains the health effects of exposure to chemicals. Latihan keselamatan di syarikat ini menerangkan dengan jelas kesan kesihatan akibat pendedahan kepada bahan kimia.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3c	Safety training has taught me the correct way to use personal protective equipment (PPE). Latihan keselamatan telah mengajar saya cara yang betul untuk menggunakan peralatan perlindungan diri (PPE).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3d	Safety training provided is clear, and useful for performing my work safely. Latihan keselamatan yang diberikan adalah jelas, dan berguna untuk menjalankan kerja dengan selamat.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3e	The safety training provides sufficient depth and detail for me to fully understand workplace hazards and control measures. Latihan keselamatan memberikan tahap kedalaman dan perincian yang mencukupi untuk saya memahami sepenuhnya bahaya di tempat kerja serta langkah kawalan.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3f	The safety training effectively improves my ability and confidence to perform my work safely. Latihan keselamatan berkesan dalam meningkatkan keupayaan dan keyakinan saya untuk melaksanakan kerja dengan selamat.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3g	When new chemicals, processes or equipment are introduced, additional safety training is provided. Apabila bahan kimia, proses atau peralatan baharu diperkenalkan, latihan keselamatan tambahan akan diberikan.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3h	Overall, the safety training effectively improves how I manage safety risks in my work. Secara keseluruhan, latihan keselamatan berkesan dalam meningkatkan cara saya menguruskan risiko keselamatan dalam kerja saya.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

SECTION 4: SAFETY KNOWLEDGE**SEKSYEN 4: PENGETAHUAN KESELAMATAN**

Please indicate your level of agreement with each statement.

Sila nyatakan tahap persetujuan anda terhadap setiap pernyataan berikut.

(1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree)

(1 = Sangat Tidak Setuju, 2 = Tidak Setuju, 3 = Neutral, 4 = Setuju, 5 = Sangat Setuju)

No	Statement (English / Bahasa Melayu)	1	2	3	4	5
4a	I understand the types of chemical hazards present in my work. Saya memahami jenis bahaya kimia yang terdapat di tempat kerja saya.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4b	I know which PPE is required for each task involving pesticides / chemicals. Saya tahu PPE yang diperlukan bagi setiap tugas yang melibatkan racun makhluk perosak / bahan kimia.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4c	I know the correct procedure to follow in case of a chemical spill or leak in my area. Saya tahu prosedur yang betul untuk diikuti sekiranya berlaku tumpahan atau kebocoran bahan kimia di kawasan saya.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4d	I know where to find Safety Data Sheets (SDS) or chemical safety information. Saya tahu di mana untuk mendapatkan Lembaran Data Keselamatan (SDS) atau maklumat keselamatan bahan kimia.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4e	I know the emergency procedures for chemical incidents. Saya tahu prosedur kecemasan bagi insiden kimia.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4f	I understand the safe storage, labelling and disposal requirements for chemicals. Saya memahami keperluan penyimpanan selamat, pelabelan dan pelupusan bahan kimia.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

SECTION 5: SAFETY MOTIVATION**SEKSYEN 5: MOTIVASI KESELAMATAN**

Please indicate your level of agreement with each statement.

Sila nyatakan tahap persetujuan anda terhadap setiap pernyataan berikut.

(1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree)

(1 = Sangat Tidak Setuju, 2 = Tidak Setuju, 3 = Neutral, 4 = Setuju, 5 = Sangat Setuju)

No	Statement (English / Bahasa Melayu)	1	2	3	4	5
5a	I feel personally responsible for keeping my workplace safe. Saya berasa bertanggungjawab secara peribadi untuk memastikan tempat kerja saya selamat.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5b	I am willing to put extra effort into improving safety in my work area. Saya sanggup memberikan usaha tambahan untuk meningkatkan keselamatan di kawasan kerja saya.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5c	I follow safety procedures even when no one is supervising me. Saya mematuhi prosedur keselamatan walaupun tiada siapa yang memantau saya.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5d	I believe it is very important to minimize safety risks even if it takes more time. Saya percaya sangat penting untuk meminimumkan risiko keselamatan walaupun ia mengambil masa yang lebih lama.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5e	I am motivated to report unsafe conditions or incidents to my supervisor. Saya bermotivasi untuk melaporkan keadaan tidak selamat atau insiden kepada penyelia saya.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5f	Working safely is important to me because it protects my health, co-workers and family. Bekerja dengan selamat adalah penting bagi saya kerana ia melindungi kesihatan, rakan sekerja dan keluarga saya.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

SECTION 6: SAFETY COMPLIANCE**SEKSYEN 6: PEMATUHAN KESELAMATAN**

Please indicate your level of agreement with each statement.

Sila nyatakan tahap persetujuan anda terhadap setiap pernyataan berikut.

(1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree)

(1 = Sangat Tidak Setuju, 2 = Tidak Setuju, 3 = Neutral, 4 = Setuju, 5 = Sangat Setuju)

No	Statement (English / Bahasa Melayu)	1	2	3	4	5
6a	I always wear the required PPE when handling pesticides / chemicals. Saya sentiasa memakai PPE yang diperlukan semasa mengendalikan racun makhluk perosak / bahan kimia.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6b	I follow SOPs even when I am busy or under time pressure. Saya mematuhi SOP walaupun ketika sibuk atau berada di bawah tekanan masa.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6c	I keep my work area clean and free from tripping hazard. Saya memastikan kawasan kerja sentiasa bersih dan bebas daripada halangan tersandung.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6d	I handle, mix and transfer chemicals according to safe work procedures. Saya mengendalikan, mencampur dan memindahkan bahan kimia mengikut prosedur kerja selamat.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6e	I do not take shortcuts that could compromise safety. Saya tidak mengambil jalan pintas yang boleh menjejaskan keselamatan.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6f	I obey safety signs and warnings. Saya mematuhi papan tanda dan amaran keselamatan.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Appendix B: SPSS Result

Statistics

		1a. Gender (1Male, 2Female)	1b. Age Group	1c. Highest Education Level	1d. Current job role	1e. Years of work experience in this company
N	Valid	55	55	55	55	55
	Missing	0	0	0	0	0

Statistics

		1f. Main work area	1g. Have you ever attended formal safety training related to pesticide / chemical handling in this company
N	Valid	55	55
	Missing	0	0

Frequency Table

1a. Gender (1Male,2Female)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	17	30.9	30.9	30.9
	Female	38	69.1	69.1	100.0
	Total	55	100.0	100.0	

1b. Age Group

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18–25 years	4	7.3	7.3	7.3
	26–35 years	14	25.5	25.5	32.7
	36–45 years	32	58.2	58.2	90.9
	46–55 years	5	9.1	9.1	100.0
	Total	55	100.0	100.0	