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KNOWLEDGE, BEHAVIOUR, AWARENESS AND POLICY TOWARDS E-WASTE MANAGEMENT PERFORMANCE AMONG SMES IN NORTHERN REGION OF MALAYSIA

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MASTER OF SCIENCE (SUPPLY CHAIN MANAGEMENT)

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KNOWLEDGE, BEHAVIOUR, AWARENESS AND POLICY TOWARDS E-WASTE MANAGEMENT PERFORMANCE AMONG SMES IN NORTHERN REGION OF MALAYSIA

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Abstract

Electrical and electronic waste (e-waste) is made up of abandoned gadgets that pose health and environmental risks because of their toxic contents which emphasises the urgent need for appropriate treatment procedures on a worldwide scale. The issues are urbanisation, population growth, and technological advancements, along with a lack of knowledge, behaviour, awareness, policy and appropriate e-waste management practices, increase the risks to human health and the environment, especially Small and Medium-sized Enterprises (SMEs) with limited resources and recycling programmes. The purpose of this study is to conduct a detailed investigation and analysis of the knowledge, behaviour, awareness, and policy elements that affect the performance of SMEs in managing e-waste performance in the northern region of Malaysia. Utilising a quantitative study methodology, data gathered from 400 SMEs in Pulau Pinang, Kedah, and Perlis is analysed. Perak is not included in this because it is far from the researcher place which is in UUM, Kedah and due budget and time limitation. The analysis is based on the diffusion of innovation and behavioural reasoning theories. The results show a substantial positive link between e-waste management performance and knowledge, behaviour, awareness, and policy. According to analysis, these variables account for about half of the variation in e-waste management performance, with policy having the largest impact. The study emphasises the significance of all-encompassing approaches that promote sustainable e-waste management practices. These approaches should include information distribution, behavioural modification, increased awareness, and supporting policy frameworks. Through the clarification of the complex nature of efficacious strategies and the resolution of SMEs' obstacles, this study advances environmental sustainability and regulatory adherence within the e-waste ecosystem. Businesses, scholars, and governments looking to enhance e-waste management in northern region of Malaysia and comparable settings throughout the globe might benefit greatly from its insights.

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Keywords: *E-waste, knowledge, behaviour, awareness, policy*

Abstrak

Sisa elektrik dan elektronik (e-sisa) terdiri daripada peranti terbuang yang membawa risiko kesihatan dan alam sekitar kerana kandungan toksik mereka yang menekankan keperluan mendesak untuk prosedur rawatan yang sesuai di peringkat global. Isu-isu seperti urbanisasi, pertumbuhan penduduk, dan kemajuan teknologi, berserta kurangnya pengetahuan, tingkah laku, kesedaran, dasar dan amalan pengurusan e-sisa yang sesuai, meningkatkan risiko terhadap kesihatan manusia dan alam sekitar, terutamanya di negara membangun yang mempunyai sumber yang terhad dan program kitar semula yang terhad. Tujuan kajian ini adalah untuk menjalankan penyelidikan dan analisis terperinci mengenai pengetahuan, tingkah laku, kesedaran, dan unsur dasar yang mempengaruhi prestasi perusahaan kecil dan sederhana (PKS) dalam mengurus prestasi e-sisa di Utara Malaysia. Menggunakan metodologi kajian kuantitatif, data yang dikumpul daripada 400 PKS di Pulau Pinang, Kedah dan Perlis dianalisis. Perak tidak termasuk dalam kajian ini kerana ia jauh dari tempat penyelidik yang terletak di UUM, Kedah dan disebabkan oleh had bajet dan masa. Analisis adalah berdasarkan penyebaran inovasi dan teori penaakulan tingkah laku. Keputusan menunjukkan hubungan positif yang besar antara prestasi pengurusan e-sisa dan pengetahuan, tingkah laku, kesedaran dan dasar. Menurut penyelidikan regresi berbilang, pembolehubah ini menyumbang kira-kira separuh daripada variasi dalam prestasi pengurusan e-sisa, dengan dasar yang mempunyai kesan terbesar. Kajian ini menekankan kepentingan pendekatan menyeluruh yang menggalakkan amalan pengurusan e-sisa yang mampan. Pendekatan ini harus merangkumi pengedaran maklumat, pengubahsuaian tingkah laku, peningkatan kesedaran, dan rangka kerja dasar sokongan. Melalui penjelasan tentang sifat kompleks strategi berkesan dan penyelesaian halangan PKS, kajian ini memajukan kemampanan alam sekitar dan pematuhan peraturan dalam ekosistem e-sisa. Perniagaan, cendekiawan dan kerajaan yang ingin meningkatkan pengurusan e-sisa di Utara Malaysia dan tetapan setanding di seluruh dunia mungkin mendapat manfaat yang besar daripada cerapannya.

Kata kunci: *E-sisa, pengetahuan, tingkah laku, kesedaran, dasar*

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Table of Contents

Permission To Use i
Abstract ii
Abstrak iii
Acknowledgement iv
Table of Contents v
List of Tables viii
List of Figures ix
List of Appendices x
List of Abbreviations xi
CHAPTER 1 1
1.1 Introduction 1
1.2 Background of Study 1
1.3 Problem Statement 6
1.4 Research Objectives 15
1.5 Research Questions 15
1.6 Scope of Research 16
1.7 Limitation of Research 18
1.8 Significance of Research 18
1.9 Definition of Key Terms 20
1.10 Organization of Thesis 21
CHAPTER 2 23
2.1 Introduction 23
2.2 Definition and Concept Variables 23
2.2.1 Knowledge 24
2.2.2 Knowledge and E-Waste Management Performance 25
2.2.3 Behaviour 27
2.2.4 Behaviour and E-Waste Management Performance 28
2.2.5 Awareness 30
2.2.6 Awareness and E-Waste Management Performance 31
2.2.7 Policy 33
2.2.8 Policy and E-Waste Management Performance 34
2.2.9 E-Waste Management Performance 36
2.3 Hypotheses Development 38

Universiti Utara Malaysia

2.4 Conceptual Framework 39
2.5 Underpinning Theory 44
2.5.1 Behavioural Reasoning Theory (BRT) 45
2.5.2 Diffusion of Innovations Theory (DOI) 46
2.6 Chapter Summary 47
CHAPTER 3 48
3.1 Introduction 48
3.2 Research Framework and Summary of Research Hypotheses 48
3.3 Research Design 49
3.4 Population, Sample and Sampling Technique 51
3.4.1 Population 51
3.4.2 Sample 54
3.4.3 Sampling Technique 55
3.5 Questionnaire Design Development 57
3.6 Research Measurement 62
3.7 Data Collection 63
3.7.1 Primary Data 64
3.7.2 Secondary Data 65
3.8 Data Analysis Technique 66
3.9 Pilot Test 68
3.9.1 Face Validity 69
3.9.2 Reliability 72
3.10 Chapter Summary 73
CHAPTER 4 74
4.1 Introduction 74
4.2 Response Rate of Survey 74
4.3 Demographic Analysis 75
4.3.1 Gender 76
4.3.2 Race 77
4.3.3 Age 78
4.3.4 Marital Status 79
4.3.5 Education 81
4.3.6 Organization Established Year 82
4.3.7 Organization Variety 83

Universiti Utara Malaysia

4.3.8 Demographic Summary 84
4.4 Data Screening and Cleaning 85
4.4.1 Normality Analysis 86
4.4.2 Reliability Analysis 88
4.5 Descriptive Statistics 89
4.6 Hypothesis Development Test 90
4.6.1 Pearson Correlations (r) 91
4.6.2 Multiple Regression 92
4.6.3 The Result of Analysis Hypothesis Testing 94
4.6.4 Multiple Regression Formula 96
4.7 Summary Hypothesis 99
4.8 Chapter Summary 101
CHAPTER 5 102
5.1 Introduction 102
5.2 Summary Research 102
5.3 Discussion Analysis Result 104
5.4 Major Finding Study 107
5.5 Contribution of the Study 109
5.6 Limitation of Study 111
5.7 Future Recommendation 112
5.8 Summary Chapter 113
REFERENCES 114
APPENDICES 133
APPENDIX A 133
APPENDIX B 139
APPENDIX C 151
APPENDIX D 152

Universiti Utara Malaysia

List of Tables

CHAPTER 2 INTRODUCTION

Table 2.1: Research Hypotheses Development 39
Table 2.2: Literature Review for Independent Variables 43
Table 2.3: Literature Review for Dependent Variable 44

CHAPTER 3 RESEARCH METHODOLOGY

Table 3.1: Research Hypotheses Development 49
Table 3.2: Total Number of SMEs in Malaysia (Profile of Small and Medium Enterprises (reference year 2015) 53
Table 3.3: Total Number of SMEs in Pulau Pinang, Kedah and Perlis 54
Table 3.4: Krejcie and Morgan Table, 1970 55
Table 3.5: Independent Variables Questionnaires (Knowledge and Behaviour) 59
Table 3.6: Independent Variables Questionnaires (Awareness and Policy) 60
Table 3.7: Dependent Variables Questionnaires 61
Table 3.8: Pearson Correlation Coefficient (r) Value 68
Table 3.9: Respondents' Comments 71
Table 3.10: Cronbach's Alpha 72

Universiti Utara Malaysia

CHAPTER 4 DATA ANALYSIS AND FINDINGS

Table 4.1: Demographic Summary 85
Table 4.2: Skewness and Kurtosis Value 87
Table 4.3: Cronbach's Alpha Value 88
Table 4.4: Descriptive Statistics 90
Table 4.5: Hypothesis Development 91
Table 4.6: Pearson Correlation 92
Table 4.7: Multiple Regression (r) 93
Table 4.8: Result Analysis Hypothesis 1 to Hypothesis 3 95
Table 4.9: Result Analysis Hypothesis 4 to Hypothesis 5 96
Table 4.10: Coefficient Table 97
Table 4.11: Summary Hypothesis Significant Table 100

List of Figures

CHAPTER 2 INTRODUCTION

Figure 1.1: E-Waste Generation 2023 – 2029 2
Figure 1.2: Percentage of Each Type of E-Waste 2022 4
Figure 1.3: Production index for electronic and electrical products in Malaysia from 2015 to 2022 13

CHAPTER 2 LITERATURE REVIEW

Figure 2.1: Conceptual Framework 40
Figure 2.2: Independent Variables Diagram/Mapping 41

CHAPTER 3 RESEARCH METHODOLOGY

Figure 3.1: Conceptual Framework 48

CHAPTER 4 DATA ANALYSIS AND FINDINGS

Figure 4.1: Response Rate of Survey 74
Figure 4.2: Gender 76
Figure 4.3: Race 77
Figure 4.4: Age 78
Figure 4.5: Marital Status 79
Figure 4.6: Education 81
Figure 4.7: Organization Established Year 82
Figure 4.8: Organization Variety 83

Universiti Utara Malaysia

List of Appendices

APPENDIX A Physical Questionnaires 133
APPENDIX B Online Questionnaires 139
APPENDIX C Formal Letter 151
APPENDIX D All SPSS Results 152

Universiti Utara Malaysia

List of Abbreviations

E-Waste	Electrical and Electronic Waste
EEE	Electrical and Electronic Equipment
EPR	Extended Producer Responsibility
SPSS	Statistical Package for Social Science
UUM	Universiti Utara Malaysia
IV	Independent Variable
DV	Dependent Variable
SMES	Small and Medium-sized Enterprises
BRT	Behavioural Reasoning Theory
DOI	Diffusion of Innovation

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CHAPTER 1
INTRODUCTION

1.1 Introduction

This chapter provides an overview of the study. Through an examination of issue statements, research objectives, and research questions, it provides justification for carrying out this study. There is also discussion on the study's importance and contribution. Additionally, this chapter offers a brief summary of important terms and ideas associated with the subject of study. Finally, it describes the study's organisational framework.

1.2 Background of Study

Electrical and electronic waste (E-waste) is an informal term used to describe abandoned or unusable devices. When a device is no longer in use, it becomes e-waste. Once it ceased to function or be used, it was discarded (Garg & Gauba, 2022). Another meaning is electrical and electronic equipment (EEE) that are damaged or no longer needed by their owner and need to be thrown away are referred to as e-waste. A number of factors, including economic growth, rising populations, and the shorter lifespan of EEE, are behind the increase in volume on a worldwide scale. E-waste exposes the environment to heavy metals, flame retardants, chemicals, and hazardous contaminants that may directly affect organisms at all levels of the food chain. The ecosystem and human health may be impacted by e-waste (Hamzah et al., 2020). According to Bagwan (2023), modern human behaviour has had a huge influence on waste management, with new advances presenting both environmental and health impacts. E-waste from getting rid of old products is quickly becoming one of the fastest-growing types of household

waste. E-waste must be managed and monitored properly to ensure using resources as efficiently as possible and minimise negative effects.

EEE has developed into a foundational element of contemporary human society. In developing nations, they are viewed as a representation of a contemporary way of life, comfort, effectiveness, and even affluence. However, every EEE eventually degrades into e-waste. E-waste is a rapidly expanding industry in the contemporary world economy. This acceleration is influenced by a number of variables, including rapid economic expansion, urbanisation, industrialisation, and rising consumer demand (Ghimire & Ariya, 2020). EEE is increasingly needed in society, which is driving up the amount of obsolete EEE that ends up in landfills. Due to its unsustainable methods of collection, treatment, and disposal of e-waste, this has produced significant risks to our environment and the health of living things. The official waste management systems lack of necessary tools, technology, or expertise to handle the increasing volume of e-waste in an environmentally friendly manner. (Murthy & Ramakrishna, 2022).

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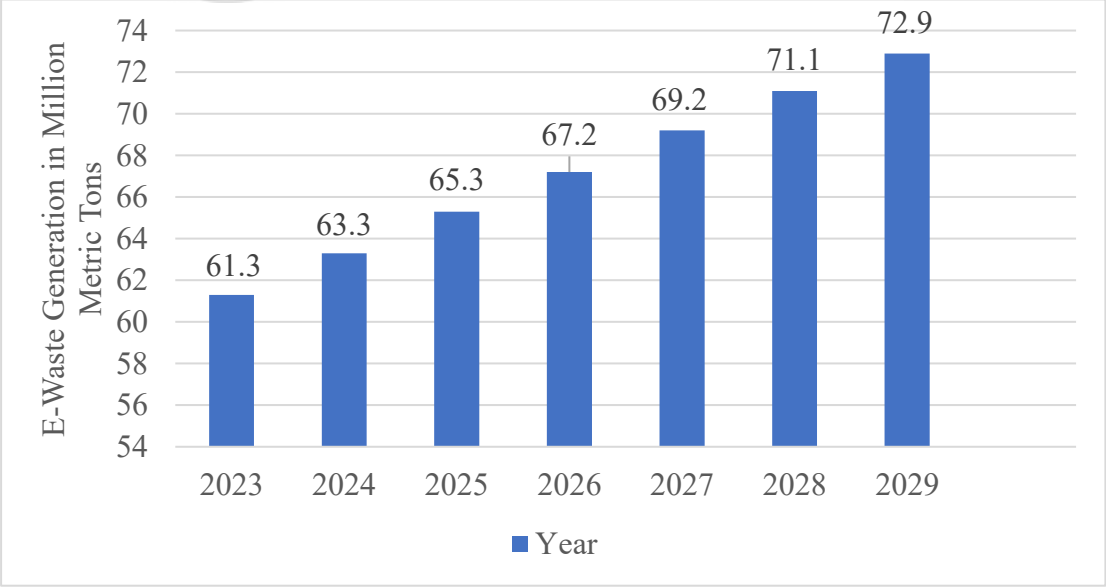

Figure 1.1: E-Waste Generation 2023 – 2029

Source: From Statista, by Tiseo, 2023 (https://www.statista.com/statistics/1067081/generation-electronic-waste-globally-forecast/)

Based on Tiseo (2023) in Figure 1.1, the world produced roughly 61.3 million metric tonnes of e-waste in 2023. The fastest-growing waste stream in the world is e-waste, which has increased in volume over the past few decades for a variety of reasons, including increased purchasing power and easier access to gadgets (Statista, 2023a). Researchers also stated that if the current trend continues, the yearly worldwide output of e-waste would have increased by over 30 percent by 2029.

In Malaysia, technological advancements are being produced that improve human lives, especially with the development of EEE. A major issue, though, is what to do with EEE that are no longer needed or able to be used. Malaysia is still in the early stages of e-waste management, including the infrastructure for recycling it. Malaysians' negative attitude towards recycling e-waste is the biggest issue with e-waste in that country (Mahat et al., 2019). Nations all throughout the world have taken action by enacting new laws, rules, and policies. Malaysia is equally impacted by the rising e-waste volume. A thorough e-waste management strategy should be put into place to restrict the unlawful export of e-waste across borders and ensure Malaysian recycling laws are official. Additionally, Malaysia will consider putting Extended Producer Responsibility (EPR) into practice initiatives like Canada's for transferring accountability, whether for the administration of end-of-life products and/or financial both consumers and manufacturers. Shad et al. (2020) highlighted that actions must start to appear in order to apply the 3Rs properly. a strategy for manufacturing e-waste in Malaysia.

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Based on Figure 1.2, it illustrates the percentage for each type of e-waste in 2022. It shows that computer/laptop has the most e-waste while air conditioner has the least e-waste. Ilankoon (2023) stated that one of the solid waste categories in Malaysia with the greatest growth is e-waste. Malaysia produced 364,000 tonnes of e-waste in

2019, according to the United Nations University's 2020 Global E-Waste Monitor Report. Both domestic and industrial e-waste are included in this. According to data from the Environment Department, Malaysia produced 2,459 tonnes of home e-waste in 2021.

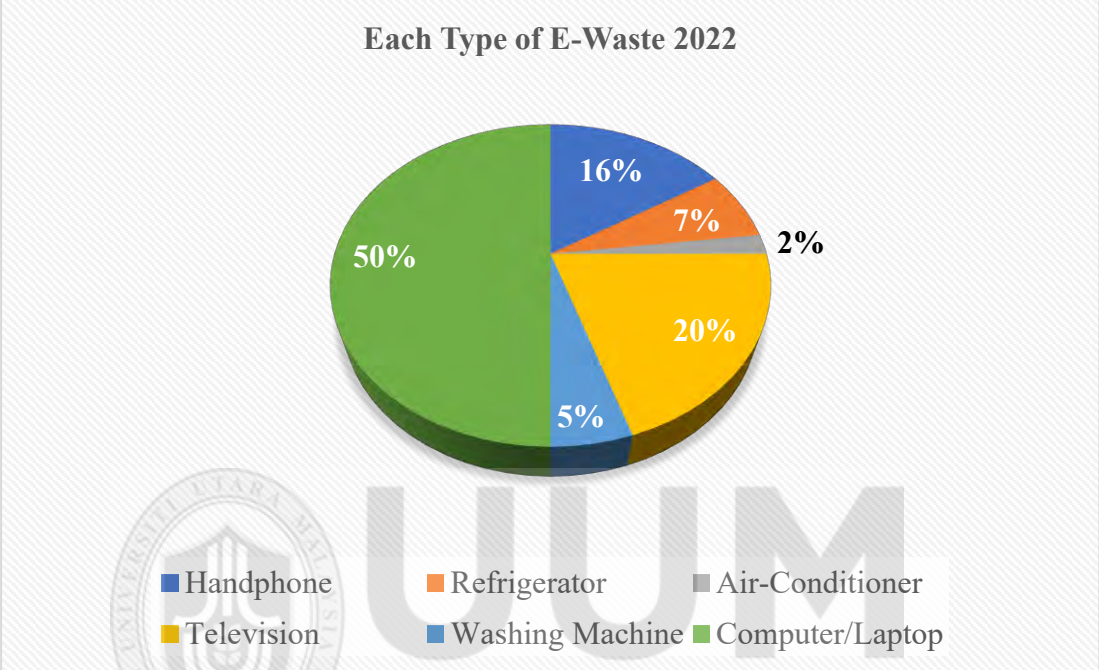

Figure 1.2: Percentage of Each Type of E-Waste 2022

Source: From E-Waste Management in Malaysia, by Jabatan Alam Sekitar, 2022. (https://ewaste.doe.gov.my/index.php/infographic/)

According to Jabatan Alam Sekitar (2022), Figure 1.2 illustrated the most e-waste generated by the citizens are computer/laptop which is 50 percent. In other words, half of the type of e-waste is computer/laptop. Second is television which is 20 percent. A wide range of electronic devices, including computers, laptops, printers, monitors, servers, phones, mobile phones, tablets, networking equipment, and other EEE utilised in their operations, can be included in the e-waste produced by SMEs.

Manufacturing SMEs may produce e-waste from old or broken machinery, production tools, control panels, sensors, and other electronic parts utilised in their operations. They could also generate e-waste from workplace gadgets. On the other

hand, office electronics such computers, printers, scanners, networking devices, and other electronic equipment used for administrative reasons may be the main source of e-waste for service-based SMEs, such as IT companies, consulting firms, or retail shops. Depending on the nature of their operation, service SMEs may also gather e-waste from equipment used in providing their services, out-of-date office technology, or client returns.

Based on Azlan et al. (2021), in order to achieve the 2030 global sustainable development objectives, which include lowering the risk of health issues and fatalities from e-waste's hazardous and toxic composition and exposure to the environment, e-waste management is required. Therefore, determining Malaysian consumers' knowledge, attitudes, and practices towards EEE is crucial to creating the country's e-waste policy. Enforcing regulations requiring manufacturers to provide consumers with thorough product information about things like composition, risks associated with incorrect disposal, reuse, repair, refurbishment techniques, product life span, etc., can have a big impact on how consumers perceive their contributions to a greener world. Additionally, consumer education about the consequences of unlawful e-waste dumping must be done (Murthy & Ramakrishna, 2022). Since managing e-waste is such a big issue, it is important to create eco-designed devices, collect e-waste properly, recover and recycle it using safe methods, dispose of it, and most importantly, raise awareness of the enormous impact e-waste has on the environment and human health. Even if a lot of wealthy nations are actively pursuing to handle e-waste, convincing local communities to create such tactics remains challenging (Saran & Yadav, 2019).

The purpose of this study is to conduct a detailed investigation and analysis of the behaviour, awareness, knowledge, and policy elements that affect the performance of SMEs in managing e-waste performance in the setting of northern region of Malaysia.

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This study explores the ways in which these components can benefit SMEs by closely analysing these characteristics. This paper's immediate relevance to SMEs makes it noteworthy. Gaining insight into and improving northern region of Malaysia's e-waste management performance may have a significant impact on the sector, particularly SMEs.

The researcher chose SMEs because they play a major role in employment, innovation, and general economic growth. Even though they play a crucial role, SMEs generate a significant amount of e-waste since they frequently use less regulated e-waste management techniques than larger companies (Derhab & Elkhwesky, 2022). SMEs encounter difficulties implementing efficient e-waste management methods due to resource limitations, including inadequate funding, technology, and experienced labour. A thorough understanding of SMEs' e-waste management performance has a direct impact on policy, influencing actions to create capacity and improve regulatory frameworks, support systems, and e-waste management practices. In order to promote specialised and effective interventions for sustainable e-waste management in northern region of Malaysia, this research focuses on SMEs in an effort to address the particular possibilities and difficulties related to e-waste management within this sector.

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1.3 Problem Statement

According to Halim and Suharyanti (2019), e-waste is produced as a result of population growth and rising purchasing power, which are aided by technological advancements. Concerns about e-waste are raised by its dangerous contents and growing manufacturing rate. Concern over e-waste is increasing in direct proportion to its generation since it includes hazardous substances that may have an impact on human health and the environment. Based on Jain et al. (2023), the rise in population and

spending power, along with technological advancements, leads to the production of e-waste. E-waste is a growing problem due to its dangerous contents and rising pace of creation. Because e-waste contains hazardous substances that may have an impact on environmental and health issues, the amount of e-waste produced is correspondingly increasing the cause for worry. Ankit et al. (2021) stated that humans can be impacted by e-waste in a variety of ways. These include altered thyroid function, negative effects on newborns, modifications to cellular expression and function, behavioural and temperamental changes brought on by exposure, and a decline in lung function. Researchers also highlighted that resident living in a town with e-waste recycling facilities shows significantly higher levels of healthy lifestyle compared to residents in towns without such facilities.

The first is knowledge. Researchers have shown that knowledge may raise arousal of interest to a somewhat desirable degree. Knowledge is a situational and conditional component that regulates environmentally friendly sentiments. Researchers have shown that recycling practices are significantly impacted by understanding of e-waste and its destructive nature (Juma & Kagoya, 2022). When handling or reusing old devices in particular, people may be at risk for health issues if they lack knowledge of proper and effective e-waste disposal practices. From an environmental standpoint, treating e-waste is costly, dangerous, and complicated (Jahan & Mim, 2023). The knowledge of reuse extends the life of an EEE and is an essential waste management practice. Furthermore, it aids in the reduction of e-waste volume, possible long-term environmental effect, and potential health risks to humans (Juma & Kagoya, 2022).

The second is behaviour. The capacity to execute the conduct and overcome obstacles. It suggests how people act based on their past experiences, the resources at their disposal, and the possibilities or challenges they are experiencing (Garg et al.,

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2023). E-waste disposal and recycling practices are shaped by beliefs that these practices are beneficial to both the environment and human health. Among the factors influencing the desire to recycle or dispose of, a good attitude towards recycling or disposal sticks out the most (Juma & Kagoya, 2022). Many developing countries struggle with waste management due to factors including population growth, rapid urbanisation, little awareness of and acceptance of recycling schemes, and limited resources if lack of behaviour. In order to successfully promote sustainable recycling behaviours, a predictive model that integrates accessibility, routine behaviours, and demographic variables is developed to estimate customers' recycling decisions by combining convenience and habitual habits (Vijayan et al., 2023)

The third is awareness. According to Mahat et al. (2019), determining an individual's understanding and knowledge of e-waste management involves examining their awareness of the practices involved in e-waste management. Understanding other people's activities in relation to one's own is known as awareness. The capacity to make forced choices beyond a chance level of performance is what the researcher claimed to be the objective definition of awareness. Based on Azlan et al. (2021), one barrier to carrying out an appropriate e-waste recycling is a lack of awareness regarding hazardous e-waste and safe disposal methods. Lack of awareness about proper disposal of e-waste is the cause of low awareness of e-waste management. E-waste includes hazardous chemicals that pose a risk to human health and can result in severe illnesses including lung cancer, thyroid, and kidney damage. For this reason, appropriate handling of e-waste is essential. E-waste can worsen environmental contamination if it is not recycled properly and ends up in a landfill. Based on study by Nazree (2022), one of the most important first steps in lessening the effects of e-waste emissions on the environment is raising awareness of the recycling process. As awareness grows, so too

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will people's understanding of efficient e-waste management, enabling them to create and preserve a healthy environment. People who understand the social repercussions of e-waste are less likely to pollute the environment or have detrimental effects on public health. Through its impacts on social quality of life, individual well-being, reduced economic health, aesthetic appeal, and public awareness, visual pollution will enhance mental and physical health.

The fourth is policy. Based on Shad et al. (2020), countries all throughout the world have taken the initiative to introduce new laws, rules, and policies regarding e-waste. Researchers describe "policy" as the rules and regulations that SMEs and bigger organisations have in place for the handling, recycling, disposal, and management of e-waste. These policies prioritise environmental responsibility and regulatory compliance. Inadequately developed micro and macro-scale plans for managing e-waste might cause major problems in the near future for both local and global communities. In many places of the world, e-waste disposal is done in a very chaotic and unregulated way. The two main causes of e-waste mishandling are inadequate policy rules and standards and a lack of experience managing e-waste (Askari et al., 2014). E-waste is not garbage, rather, it is seen as a health and environmental danger. However, when recycled, these e-waste materials provide some priceless resources like noble metals (copper, gold, silver, lead, etc.). The potential for profit that comes with recovering metals and the strategies for enhancing waste management. The United Kingdom, Germany, United States of America, and France have all adopted a standardised approach to managing e-waste, which has allowed them to efficiently source and collect waste, as well as extract and dispose of it, turning this massive pile of waste into a valuable commercial opportunity. Recycling e-waste is significantly impacted by the various parties and policy makers involved in those commercial prospects (Gomathi et al., 2018).

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Research on the effectiveness of e-waste management in organizations advances theoretical understanding by expanding the comprehension of how organisations manage e-waste (Ahirwar & Tripathi, 2021). It may result in the creation of new theories or models that more effectively describe the relationships between e-waste management-related behaviour, knowledge, awareness, and corporate policy. Such study has the potential to either question and improve existing beliefs about environmentally responsible behaviour and sustainable practices. This ensures the applicability and correctness of existing information in the context of managing e-waste. The results of studies on the effectiveness of e-waste management might inspire the development of fresh theories and probing questions, fostering more research and study in the area. For instance, it could lead theories on how awareness affects e-waste management practices or the function of corporate policy in the spread of information.

Research on the effectiveness of e-waste management provides useful advice, suggestions, or insights that may be used to address issues in the real world. By offering SMEs advice on how to improve their e-waste management procedures, it encourages sustainability and environmental responsibility. The study provides evidence-based information for decision-making to decision-makers in SMEs, government agencies, and other pertinent stakeholders (Rousseau, 2020). It can direct the creation of more efficient corporate policies, awareness campaigns, information-dissemination plans, and behaviour modification activities. The practical application of the findings may directly influence SMEs' economic development, the generation of jobs, and social well-being. SMEs may achieve financial savings, lessen environmental impact, and contribute to a more sustainable and ethical corporate environment by optimising e-waste management performance.

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One of the gaps is the context gap. A context gap is the absence of crucial details or prior knowledge required to completely comprehend a particular scenario, idea, or communication. Most research was conducted outside of the Malaysia context. For example, a study conducted in the Saudi Arabian context by Almulhim (2022) that e-waste was handled by research participants in the same way as regular municipal solid waste. The researcher also stated that e-waste was disposed of either in-home storage (45 percent) or in combination with regular domestic rubbish (32 percent). This resulted from, among other things, a lack of recycling choices and a lack of knowledge about the advantages and possibilities of recycling e-waste. Furthermore, it draws the conclusion that minimizing environmental issues will need careful waste disposal, reuse, and recycling. Based on a study in Australia Islam et al. (2021), it was examined at how long EEE lasted in the hands of young customers. The study discovered that although consumers know about e-waste, they lack crucial information about where to recycle it. Additionally, the majority of respondents demonstrated a tendency towards responsible e-waste disposal, underscoring the need for awareness initiatives to stop the incorrect disposal of waste from EEE. Similar to several other developing nations, Pakistan produces a substantial amount of e-waste and furthermore imports it for processing, even though it lacks the requisite infrastructure. While the precious elements that may be recovered from e-waste present a financial opportunity, the usage of informal practices raises serious concerns for the ecosystem (Adeel et al., 2023; Shaikh, 2021). Besides that, there are no context for northern region of Malaysia location.

Another gap is the theoretical gap. The term "theoretical gap" highlights the necessity of applying theoretical underpinnings to particular research problems in order to provide fresh insights. According to Greenway et al. (2019), a notion in the literature

may not have a common definition or interpretation, which is referred to as a theoretical gap. Because there is no classification based on theoretical grounds, it indicates a conceptual gap. The theoretical gap for this research can be seen in Leng and Muhammad Arif (2022) which two of the independent variables are awareness and perceived behaviour control. The dependent variable is e-waste recycling. Another research by Maphosa et al. (2022) which two of the independent variables are lack of knowledge and policy. The dependent variable is e-waste management. Both of these studies seem to be lacking of independent variables from each other. Thus, the researcher will combine these independent variables and adapt them into this research. The four independent variables for this research are knowledge, behaviour, awareness and policy.

According to Shuhidan et al. (2017), 88.79 percent of Malaysia's total population uses smartphones, and the Department of Statistics Malaysia produced a study indicating that 96.85 percent of the population has internet connection. The Department of Environment Malaysia defines e-waste is defined as EEE, such as televisions, desktop or laptop computers, air conditioners, washing machines, refrigerators, and air conditioners, that are malfunctioning, outdated, or damaged.

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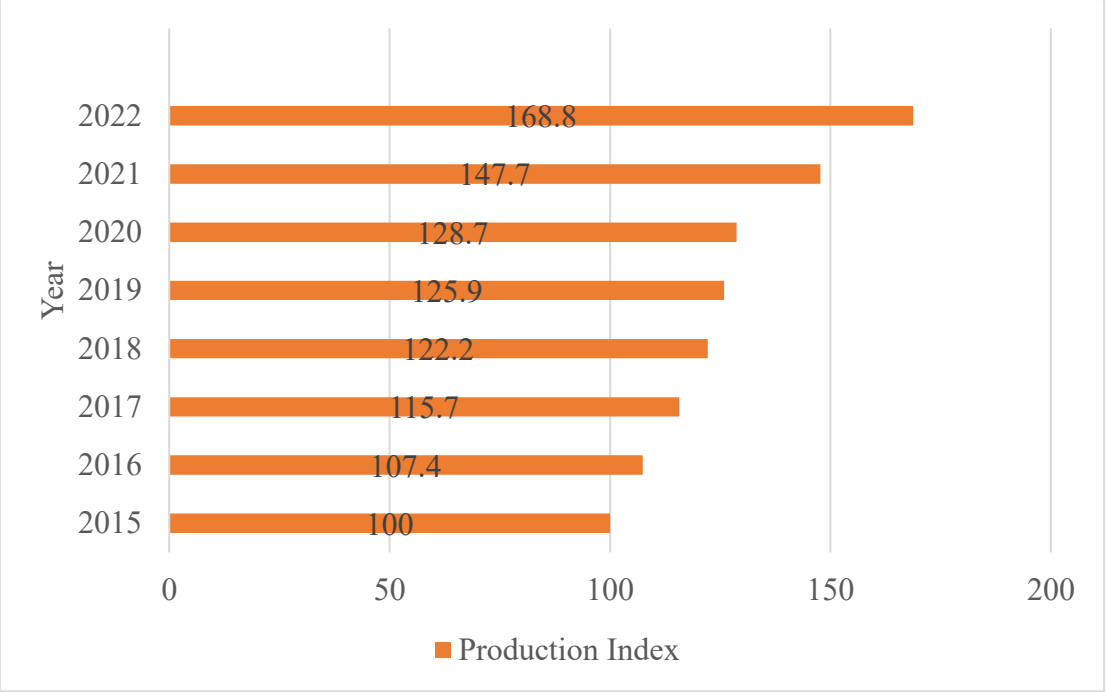

Figure 1.3: Production index for electronic and electrical products in Malaysia from 2015 to 2022

Source: From Statista, by Statista Research Department, 2023. (https://www.statista.com/statistics/869243/malaysia-production-index-electronics-and-electrical-products/)

According to Statista (2023b), the production index for EEE increased to 168.8 in 2022 from 147.7 the year before. The Malaysian electrical and electronic sector is growing positively, as seen by the annual increase in the production index EEE based in Figure 1.3.

Solid waste management refers to the regulation of waste creation, storage, collection, transport, and disposal of solid wastes in line with best practices for environmental protection, economic development, and administration of justice (Syifaa et al., 2023). Based on study by Zulkipli et al. (2022), only 37.91 percent of respondents, according to the findings, were aware of solid waste management and environmental concerns. In actuality, fewer than half of respondents still have a limited understanding of environmental and solid waste management issues. This demonstrates that the majority of Malaysian communities were not aware of the value of waste management

Universiti Utara Malaysia

and environmental protection. According to Ahmed (2020), technology nowadays has undergone a revolutionary transition that has aided human development and allowed for time and money savings. However, despite the advantages of technology, it has produced a significant amount of e-waste that is negatively impacting both the environment and human lives.

Another gap is the methodology gap. A methodological research gap is the absence of knowledge about an appropriate underlying approach or methods that may be employed in research instead of the one that is now being used (Garg, 2016). Most of the studies are focused on younger generation conducted by Mohamad et al. (2021) and Kumari et al. (2019). Since the study was carried out among medical students, it cannot be applied to the broader population. Given that researchers utilised a non-probability sampling approach, selection bias could be present. Another is focused on community conducted by Hamdan and Saidan (2020) in Jordan. Jordan has created a basic legislative and regulatory framework that is effective for waste management in general, although it is still somewhat fragmented, has gaps, and is constrained in practice by deficiencies in the enforcement ability.

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By examining the crucial factors that affect SMEs performance in northern region of Malaysian e-waste management, this research aimed to close these gaps. This includes employee awareness of e-waste, their e-waste behaviours, knowledge, and the company's e-waste management policy. These elements have a critical role in determining how well SMEs manage their e-waste. Rautela et al. (2021) stated that to minimise negative effects and preserve a sustainable environment, effective management of e-waste necessitates an inventory of end-of-life EEE, environmentally friendly regulatory frameworks, and community participation.

1.4 Research Objectives

The primary objective of this research is to evaluate SMEs' e-waste management capabilities with an emphasis on awareness, behaviour, knowledge and policy. The research specifically intends to assess existing e-waste management practices, identify obstacles and possibilities, and create suggestions for SMEs to implement more effective and environmentally friendly e-waste disposal methods.

a) To examine the influence of knowledge towards e-waste management performance among SMEs in the northern region of Malaysia.
b) To examine the influence of behaviour towards e-waste management performance among SMEs in the northern region of Malaysia.
c) To examine the influence of awareness towards e-waste management performance among SMEs in the northern region of Malaysia.
d) To examine the influence of policy towards e-waste management performance among SMEs in the Northern Malaysia.
e) To investigate the influence of knowledge, behaviour, awareness and policy towards e-waste management performance among SMEs in the northern region of Malaysia.

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1.5 Research Questions

These questions cover present e-waste management performance, knowledge, awareness, behaviour and policy in the company. This study aims to contribute to the responsible management of e-waste inside SMEs by looking at these elements and offering useful insights into sustainable e-waste practices.

a) Does knowledge influence e-waste management performance among SMEs in the northern region of Malaysia?

b) Does behaviour influence e-waste management performance among SMEs in the northern region of Malaysia?
c) Does awareness influence e-waste management performance among SMEs in the northern region of Malaysia?
d) Does policy influence e-waste management performance among SMEs in the northern region of Malaysia?
e) Do knowledge, behaviour, awareness and policy influence towards e-waste management performance among SMEs in the northern region of Malaysia?

1.6 Scope of Research

This study will focus on SMEs in the northern region of Malaysia states which are, Kedah, Perlis, and Penang. Perak is also in northern region of Malaysia but it will be excluded in this research due to researcher financial and time constraints, as well as the fact that it is distant from the researcher's location in UUM, Kedah. Computers, laptops, printers, monitors, servers, phones, mobile phones, tablets, networking equipment, and other EEE required in their operations can all be considered pieces of e-waste produced by SMEs. SMEs play a crucial role in the country's economy by fostering innovation, employment, and economic growth. SMEs still play a big part in the economy, but they also produce a lot of e-waste, and their management techniques are frequently less controlled and inspected than those of bigger businesses (Derhab & Elkhwesky, 2022).

SMEs in northern region of Malaysia form the study's focus due to their pivotal role in every aspect of the e-waste ecosystem, from generation to recycling and disposal. Given their significant influence on resource recovery and environmental sustainability, SMEs engaged in e-waste operations, including recycling, refurbishing, and repair, play essential roles that necessitate tailored solutions to mitigate the environmental impact

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of e-waste effectively. The importance of these businesses in the production and handling of e-waste is the driving force behind this study. For example, Anjum (2019) stated the performance of Indian SMEs' manufacturing processes is enhanced by their adoption of new technology, which also has an impact on their business success. Thus, take on a significant role in the e-waste lifecycle as stakeholders. By encouraging responsible e-waste management practices among SMEs, this research aims to contribute to the larger discussion on sustainable development and create a more environmentally conscious business climate in northern region of Malaysia.

The first independent variable is knowledge. Assessing the present level of knowledge among staff members and management in SMEs about e-waste management practices and environmental repercussions is a key component of the knowledge research. An individual with superior status above regular employees and familiarity with the organization they work for would be an ideal representative. They are considered as the decision makers in SMEs. The second independent variable is behaviour. The investigation of the breadth of information held by SMEs regarding the procedures, rules, and best practices related to e-waste management will be included in the research for behaviour. The third independent variable is awareness. This will assess how SMEs now manage their e-waste and how well they adhere to established standards and regulatory obligations. It examines the factors and obstacles affecting changes in awareness about e-waste management and provides recommendations for promoting ethical awareness. The fourth independent variable is policy. The research will analyse the current e-waste management policies and practices inside SMEs, concentrating on their efficacy and compliance, for the corporate policy component. In order to better support sustainability goals and regulatory compliance, it will seek to pinpoint areas where policies may require adjustment or improvement.

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1.7 Limitation of Research

The first limitation is lack of time. The researcher has 3-4 months to complete this research paper. The breadth and depth of research might be restricted by time limitations, which are common in research initiatives. It is possible that researcher will not have enough time to gather a substantial amount of data or to carry out extensive observations or experiments. Short timelines might make it difficult to monitor long-term effects or developments brought about by the research, which could lead to the loss of important insights that can emerge over time.

The second limitation is lack of cost. The researcher is a full-time student and do not have income except for allowance from guardians. The range of research operations can be considerably impacted by the availability of financial resources. The capacity to recruit professionals, purchase essential equipment, and gain access to databases and research materials may be hampered by a lack of funding. Cost limitations may prevent the employment of cutting-edge research techniques or technologies, as well as limit the sample size, making it difficult to acquire a statistically meaningful dataset.

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1.8 Significance of Research

Industry

Given it can assist SMEs in the sector enhance their e-waste management procedures, this research is important. Businesses will be able to adopt more sustainable and successful e-waste management plans if they have a better understanding of the knowledge, behaviour, awareness, and policy components. In the end, this may boost their competitiveness and reputation in the market by resulting in cost savings,

regulatory compliance, increased environmental sustainability, and greater corporate social responsibility.

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Universities can gain from this study by using it to further their educational and scientific goals. It presents chances for cooperation with SMEs and gives academics and students a venue to conduct useful, real-world research. In addition, the research results may inspire the creation of fresh modules or modules on sustainability and e-waste management, bringing academic curricula into line with business demands and international environmental issues.

Researchers

This study presents a chance for scholars to further the expanding fields of environmental management and sustainability. It can improve the researcher's proficiency with data analysis, empirical study, and deriving insightful findings. Furthermore, the study may lead to publications, conference presentations, and possible industry stakeholder engagement, providing avenues for additional research and professional growth.

Respondents

The study is significant for respondents, especially high-ranking are considered as decision-makers at SMEs. They are provided with an opportunity to share their opinions and enhance their companies' e-waste management practices through active participation in this study. Their opinions have the potential to influence business policies and procedures, creating a more sustainable and ecologically conscious workplace. Furthermore, the research's awareness-raising efforts could make respondents more socially responsible and environmentally conscientious.

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1.9 Definition of Key Terms

Electrical and Electronic Waste (E-Waste)

E-waste is unwanted, abandoned, or outdated electrical or electronic equipment that are reaching the end of their useful lives (Kema et al., 2022).

Small and Medium-sized Enterprise (SMES)

SMEs is short for small and medium-sized enterprise are companies with less than a specific number of employees, often known as SMBs (Small and Medium-sized Business) (Al-Awlaqi et al., 2021).

E-Waste Management Performance

E-waste management performance comprises the systematic gathering of e-waste and processing it to recover recyclable elements. It serves as a helpful instrument to lessen the amount of e-waste that is increasing, compensate for the loss of some primary resources, and stimulate the economy (Ahirwar & Tripathi, 2021).

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Knowledge

In the context of e-waste, knowledge is a lasting competitive advantage that an individual should possess. Inadequate understanding of e-waste might be dangerous for both human health and the environment (Juma & Kagoya, 2022).

Behaviour

Behaviour is the capacity to regularly react positively or negatively to a certain item. It describes how people act based on their past experiences, the resources at their disposal, and the possibilities or challenges they are experiencing (Garg et al., 2023).

Awareness

The comprehension of other people's activities within the framework of one's own is known as awareness. Determining whether or not an individual comprehends and is knowledgeable about e-waste management involves examining their understanding of e-waste management practices (Mahat et al., 2019).

Policy

Describes to the established set of guidelines, directives, and rules SMEs adhere to when managing their e-waste. These policies cover e-waste collection, recycling, disposal, and compliance with environmental laws and sustainability standards. With the onset of digitalization, business sectors must deal with e-waste produced by outdated EEE (Abd-Mutalib et al., 2021).

1.10 Organization of Thesis

Chapter 1 provides the study subject and specify the research problem(s) or questions in the introductory part. This chapter covers introduction, background of study, problem statement, research objective, research question, scope of research, significance of research and definition of key terms. Chapter 2 which is the literature review section, current studies on knowledge, behaviour, awareness, policy and e-waste management performance are analysed. This chapter covers definition and concept variables, previous study on variables, hypotheses development, theoretical framework, underpinning theory and chapter summary. Chapter 3 is the thorough explanation of the research method is given in this section. This chapter covers research framework and summary of research hypotheses, research design, population, sample and sampling technique, questionnaire design, research measurement, data collection, data analysis technique and chapter summary. Chapter 4 refers to the methodical interpretation and

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examination of collected data in order to identify trends, patterns, and insights that aid in the comprehension of phenomena or provide answers to research questions. This chapter covers response rate of questionnaires, demographic analysis, data screening and cleaning, normality analysis, reliability analysis, pearson correlation, multiple regression, result analysis hypothesis, summary hypothesis and chapter summary. Chapter 5 highlights the important discoveries and makes practical recommendations based on the study's findings in an effort to guide future studies. This chapter covers summary research, discussion analysis result, major finding study, contribution, limitation of study, future recommendation and chapter summary.

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CHAPTER 2
LITERATURE REVIEW

2.1 Introduction

In this chapter, the focus will be on discussing the definition and concept of the variables, along with conducting a comprehensive review of previous studies related to these variables. Furthermore, hypotheses will be developed, and a conceptual framework and underlying theory will be introduced to measure knowledge, behaviour, awareness, and policy concerning e-waste management performance.

2.2 Definition and Concept Variables

Literature review is a review of a body of work offers a special chance to offer a theoretical insight. Review articles have the power to alter readers' theoretical perspectives on a particular subject or occurrence (Post et al., 2020). When used independently, literature reviews can help researchers better comprehend earlier studies in their area, which will make it easier for them to spot gaps in the body of knowledge and possible directions for further investigation. More significantly, review papers have the potential to identify crucial issues and factual inaccuracies, question accepted beliefs and conventions in a field or topic, and trigger additional scholarly discussion on the subject (Kraus et al., 2022). An overview of the fields where the study is multidisciplinary and varied might also be helpful. A literature review is also an excellent technique for synthesising results from studies to offer data at the meta-level and pinpoint areas that need more investigation, both of which are critical for creating conceptual models and theoretical frameworks (Snyder, 2019).

According to Lim et al., (2022), a literature review is an essential component of academic research. Even if there are a lot of literature review guides accessible, their

usefulness is still restricted since they do not fully take into consideration the many kinds of literature reviews. Notably, literature reviews can appear as standalone studies that may be curated in different ways, or they can appear as an element of conceptual or empirical investigations. Furthermore, despite their widespread use and significance, literature reviews—especially those conducted independently—continue to face unjustified criticism and are still rare in the field of service research. A discipline's literature often reflects the development of knowledge and a deeper understanding of related phenomena, variables, and context. Unplanned literature expansion, however, might obstruct growth by raising the view of convoluted, conflicting, and sometimes illogical influences in the ongoing discussion among scholars (Kraus et al., 2023).

2.2.1 Knowledge

Since making educated decisions and taking appropriate action is essential to minimising the harmful impacts that e-waste has on the environment and human health, SMEs' level of knowledge in these areas may have a substantial impact on how well they manage e-waste. Inadequate understanding of e-waste may be dangerous for human health and the environment, particularly when managing, reusing, or recycling e-waste (Juma & Kagoya, 2022). Based on study by Hamzah et al. (2020), facts, descriptions, information, and abilities about a subject that may be acquired by education and experience are all considered to be parts of knowledge. Understanding of the various e-waste recycling and disposal systems available, as well as their advantages, drawbacks, and affordability. Recognising the relationship between information and appropriate e-waste management practices, such as collection, recycling, and disposal methods is important in order to promote sustainability practices.

There are two types of knowledge: domain knowledge and generic knowledge. A generic knowledge of the learning process, human brains, and how to apply it.

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Experts in certain domains are primarily responsible for discovering, possessing, and summarising domain knowledge. It might be difficult to incorporate domain information into a machine learning framework in some subject areas because it is empirical or abstract (Deng et al., 2020). These days, knowledge is seen as an asset and a valuable resource. Without effectively using and managing knowledge, it is difficult, if not impossible, to provide affordable, high-quality goods and services. According to this perspective, knowledge is considered an essential resource for the organisation, valued alongside resources like labour, land, and money (Rezaei et al., 2020). According to Linda et al. (2020), it is believed that humans are intangible resources with the capacity to advance knowledge. Because they integrate fresh and pertinent information into an organisation, radical innovation and continuous improvement both employ knowledge to inform and modify the business environment in a positive way. The process of learning and comprehending objects, problems, and phenomena is called knowledge (Mwangi & Oluoch, 2022). Knowledge is the most precious resource in every organisation. It describes personal understanding drawn from experience as general information that need to be disseminated (Imanina et al., 2022).

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2.2.2 Knowledge and E-Waste Management Performance

The information, facts, abilities, and comprehension that people or organisations possess on a certain subject or sector are referred to as knowledge concept. Knowledge in the context of managing e-waste includes a broad variety of facts on how e-waste is handled, disposed of, and how it affects the environment. This information might include being aware of laws, recommended procedures, and any risks related to improper treatment of e-waste. According to Juma and Kagoya (2022), knowledge helps to lessen the volume of e-waste, the possible long-term environmental effect, and any potential health risks to humans. Discovered that the majority of people were

unaware of the growing danger posed by e-waste and suggested that awareness and education programmes be launched. Based on Fatin et al., (2021), to ascertain whether or not a person comprehends and is aware of these issues, their knowledge of e-waste disposal management practices is examined. Understanding other people's behaviours in light of one's own is referred to as knowledge.

According to this study by Hamzah et al. (2020) , which was carried out among the Port Dickson local population, education level is a major predictor when assessing the various levels of knowledge, attitudes, and practices of the local community about recycling e-waste. According to other research, Malaysians are reasonably knowledgeable about e-waste, but they still need to improve their understanding and implementation of e-waste management (Mahat et al., 2019). Based on study by Azlan et al. (2021), the study examined and determined the knowledge, attitudes, and practices of students at a single public institution in Malaysia about the management of e-waste. It is noted that although the business students at the aforementioned public institution possess solid knowledge of e-waste, there is still a deficiency in their understanding of e-waste management. Study in Lucknow City, India by Kariwala et al. (2023), concluded that the majority of respondents were ignorant of the harm that incorrect disposal of e-waste does to the environment and human health.

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Additionally, researchers saw that the participants knew the least about the government's e-waste disposal requirements. Therefore, it is imperative that people get teaching on the negative impacts of e-waste, and that they become aware of the right disposal of e-waste. Study conducted in Selangor, Malaysia which the respondents are the community by Mahat et al. (2019), the findings proved that while the respondents' e-waste disposal practices were at a medium level, their e-waste disposal knowledge and attitudes were at a high level. Mohamad et al. (2021) stated that public and private

universities students in Malaysia of the respondents, only 39.4 percent were aware that certain manufacturers provide their customers with a free global recycling programme. Additionally, 77.6 percent of respondents said they would be prepared to spend money on environmentally friendly technology to lessen the undesirable effects of e-waste on the environment. This research shows that additional initiatives and activities are required to educate people about the dangers of e-waste and how to properly dispose of their old EEE.

Hypothesis 1 (H1): Knowledge significantly influenced e-waste management performance among SMEs in the northern region of Malaysia.

2.2.3 Behaviour

An individual's attitude refers to their thoughts and feelings towards a certain topic. It is a psychological emotion that can have a good or bad impact on their actions (Hamzah et al., 2020). E-waste management behaviour describes the particular policies and procedures that SMEs have implemented around e-waste. E-waste may need to be gathered, stored, sorted, recycled, or disposed of in an ecologically friendly and ethical way. According to Leng and Muhammad Arif (2022), to ensure that e-waste is disposed of appropriately, customers can recycle or return EEE to the appropriate manufacturers or organisations for additional recovery, treatment, or recycling. Therefore, it is important for customers to dispose of their e-waste correctly so that they may recycle it properly and through the appropriate channels. Improper disposal might jeopardise the health of people and the environment.

According to Taylor (2021), contends that the human experience is distinct from that of other animals because humans possess the rare capacity to comprehend, consider, and communicate their own intentions and actions to others. Furthermore, a basic aspect

of the understanding of the social and moral world is the notion that human beings are purpose-driven. Approaches towards sustainability are greatly influenced by behaviour among people (Schill et al., 2019). Due to the sensitivity of human behaviour to natural disasters and crises, efforts to avert them are hindered (Hamilton et al., 2020). Effective social and behaviour change interventions can benefit greatly from the use of predictive models of behaviour change (Monroe et al., 2021). The main goal of conservation is to alter behaviour among people, whether it is that of land managers removing natural habitats, consumers whose decisions lead to the unsustainable use of resources, or legislators who fall short of their environmental pledges (Balmford et al., 2021). Social-ecological systems provide the setting for conservation, and a major goal of many conservation interventions is to change people's behaviour to move these systems closer to sustainability (Dobson et al., 2019). People are constantly exposed to a wide range of stimuli, including signals from their bodies, minds, and social networks (Kopsov, 2021)

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2.2.4 Behaviour and E-Waste Management Performance

Consumer behaviour in the context of managing e-waste has recently become a fascinating area of study. This is due to the fact that several nations are looking for sustainable e-waste treatment that takes into environmental, social, and economic aspects. It is noteworthy that studies on consumer behaviour started in rich nations and have now moved to poor nations since most of them deal with similar problems, such the involvement of both the formal and informal sectors in the discarding of e-waste (Sofian et al., 2023). A shift in perspective is necessary for managing the related negative effects on the environment and public health in order to minimise and control them. Attitude influences EEE purchases. As long as EEE are being imported and used, they cannot be disregarded. Researchers found that pro-environment behavioural

intentions are influenced by attitudes (Juma & Kagoya, 2022). Concerning the handling, disposal, and management of e-waste, behaviour in the context of e-waste management states to the acts, practices, and decisions made by people or organisations, such as SMEs. This relates to the frame of mind, convictions, and perspectives that shape these choices and behaviours.

Based on research by Thukral et al. (2023), because of the exponential rise in the use of electrical and electronic developments, governments, stakeholders, researchers, and industry professionals globally are becoming increasingly concerned about responsible handling and recycling of e-waste. Creating methods for sustainable management requires careful consideration of customer understanding, disposal behaviour, and perception. According to research by Gilal et al. (2022) , the great majority of customers would rather retain outdated devices at home than send them back to the producers to be recycled when it comes to e-waste. Notwithstanding the obvious significance of this field of study, no comprehensive evaluation of e-waste disposal behaviour exists that summaries the connections between various variables as choices, antecedents, and consequences from the viewpoint of consumer behaviour.

Universiti Utara Malaysia

Aboelmaged (2021) investigated the factors influencing young consumers' intentions to recycle e-waste in the context of an emerging economy by including habits into the theory of planned behaviour, a well-known model that forecasts behaviour. Young individuals' propensity to recycle their e-waste is demonstrated to be highly correlated with their recycling habits and mindsets. Kumar (2019) highlighted that the primary risk to the effectiveness of reverse supply chain management is customer unwillingness to being involved in the recycling process. Given that customers' desire and active engagement in the recycling process serve as the foundation of any reverse supply chain, it is imperative to comprehend the elements influencing this behaviour.

Study conducted in US by Arain et al. (2020) stated that one cause for the low percentage of e-waste recycling behaviours among consumers is the absence of a consistent set of rules regarding the recycling of e-waste. It is unclear whether specific consumer characteristics contribute to the low recycling rates.

Hypothesis 2 (H2): Behaviour significantly influenced e-waste management performance among SMEs in the northern region of Malaysia.

2.2.5 Awareness

Understanding customer preferences and market expectations for environmentally friendly and ethical e-waste management, since these factors might impact small and medium-sized enterprises' ability to compete. Understanding the negative effects inappropriate e-waste disposal has on the environment, such as pollution, resource depletion, and the discharge of dangerous materials. People's routines and perspectives on the environment and society have changed as a result of the fast advancement of new creations and technology. These days, individuals live incredibly self-centred lifestyles and make snap judgements that primarily serve to profit themselves (Ahmed, 2020). Determining whether or not an individual comprehends and is knowledgeable about e-waste management involves examining their understanding of e-waste management practices. The comprehension of other actions within the framework of one's own activity is known as awareness (Mahat et al., 2019).

A person's capacity to reflect, imagine, feel emotions, and daydream is known as self-awareness, which is a basic metacognitive skill. Similarly, an individual's ability to perceive the outside world through their five senses is known as external awareness (Drigas & Karyotaki, 2019). According to Ehret and Romand (2022), the process of

being aware is nonlocal and nondual. Nonlocal awareness may be defined as the continuous subject-object division, reasoning conscious contents, and self-awareness that is ever-present, ever-fresh, and emotional. This type of awareness is distinct and cannot be sufficiently described by their mental representations or by the two-dimensional model of consciousness, which consists of the phenomenal content plus the arousal level (Josipovic & Miskovic, 2020). Affective states are made up of conscious, behavioural, physiological, neurological, and cognitive components, according to the componential theory of human emotion (Paul et al., 2020). When humans and machines collaborate in a dynamic, human-centered setting, context awareness is essential, particularly for collaborative robots (Müller et al., 2023). Being aware of any external entity or internal entity, including feelings, memories, sensations, and ideas, is the state of consciousness (Hashim & Ramadhan, 2019). Information important to the work at hand is known as situational awareness (Valerie Jane, 2019).

2.2.6 Awareness and E-Waste Management Performance

Universiti Utara Malaysia

In the context of managing e-waste, awareness refers to the degree of knowledge and consciousness that SMEs possess about the problems and difficulties associated with managing e-waste. It entails having knowledge of the social, legal, health, and environmental effects of e-waste. The intents, attitudes, and actions around the disposal of e-waste are directly impacted by consumer awareness, which is essential for directing behavioural outcomes. From the standpoint of consumer awareness, environmental awareness influences customers' behaviour towards the disposal of e-waste and determines their readiness to do so (Adeel et al., 2023). One of the keys to creating a long-term, strategic e-waste strategy is raising consumer awareness. Three elements are used by Almulhim (2022) to emphasise awareness which are knowledge, behaviour,

and practice. These components are necessary to build an e-waste management structure that is both ecologically and financially sustainable.

Ananno et al. (2021) suggests that increasing environmental awareness, informing people about the advantages of recycling e-waste, and improving the convenience of e-waste recycling are all ways to encourage e-waste recycling. Based on Mahat et al. (2019), reducing the quantity of e-waste generated contributes to resource preservation and lowers the amount of energy extracted from the planet. Increasing community awareness of sustainable e-waste disposal practices is one way to tackle this issue. Study conducted in Dubai by Attia et al. (2021), using Dubai as a case study, a structured questionnaire is used to examine household awareness, the usage of mobile phones in particular, the consumption of EEE overall, and the disposal practices for e-waste. The survey's findings showed disparities in the knowledge and practices of households regarding the disposal of e-waste, with low rates of recycling seen. Goel et al. (2020) studied the consumer that uses statistical tools to determine the factors that raise consumer awareness and help them ensure that e-waste is disposed of and treated properly. The results indicate that there are five main factors that influence customer choice when it comes to e-waste disposal, awareness of the harmful effects on human health, environmental threats, awareness of e-waste disposals, knowledge of the value, and ease of recycling by different stakeholders in the e-waste management process.

Universiti Utara Malaysia

Bhatia et al. (2019) said that urban residents need to be made aware of the need of properly disposing of their e-waste. Miner et al. (2020) directed a study in Nigeria stated that the country produced around 290,000 tonnes of e-waste in 2017. Given the country's high rates of population growth, rapid urbanisation, high demand for EEE, and end-of-life disposal, this amount is expected to rise even more in the future. E-

waste is also linked to contamination of the environment and adverse effects on human health. Thus, in order to control and perhaps minimise this waste stream, environmental awareness is essential.

Hypothesis 3 (H3): Awareness significantly influenced e-waste management performance among SMEs in the northern region of Malaysia.

2.2.7 Policy

A policy is an organised, all-inclusive framework that SMEs create and implement to control and direct their operations concerning the creation, processing, elimination, repurposing, and general administration of e-waste. An organization's approach to environmental challenges demonstrates a wide range of strategic solutions. While some organisations approach the topic more deliberately and implement more aggressive environmental policies, others believe it is sufficient to follow laws and regulations and respond to environmental problems as necessary (Dhillon & Sandhu, 2020). The worldwide production of e-waste has significantly increased as a result of the electrical and electronic industry's fast product obsolescence. As a result, safer e-waste management is turning into a significant issue for several nations worldwide. More significantly, laws pertaining to the management and disposal of e-waste are either non-existent or not effectively enforced (Azeem et al., 2019).

Today's firms have given business regulations a lot of attention (Corea & Delfmann, 2018). The concept of "regulation" in the business world was associated with any administrative task including external reporting or documentation requirements. In addition to legislative requirements, owner-managers addressed a variety of data that may be used to establish devotion to or agreement with external requirements, such as values, industrial sector bodies, etc (Higton et al., 2019). Entity-

based policies for big technology in areas like operational resilience and competitiveness would address the risks arising from their diverse range of operations, and these needs should be incorporated into the regulatory framework (Restoy, 2021). For organisations, managing decisions and business logic is a crucial task (Smit & Zoet, 2018). Business rule types must be considered in order to guarantee correct implementation, as each type may have distinct functions (Van et al., 2020). Business policies, which have been widely used in industrial domains for more than 20 years, provide non-IT users with the ability to design decision-making policies in an easy-to-understand manner (Ducamp et al., 2018). One of the most important factors for success in a corporate setting is how rapidly regulations may change and spread in real time (Ezekiel et al., 2019).

2.2.8 Policy and E-Waste Management Performance

A company's collection of codified declarations, guidelines, and regulations that regulate its operations, activities, and decision-making processes are referred to as company policies. In this situation, the organisation in question is SMEs. A corporate policy describes how the organisation will handle and manage e-waste in the context of its activities. It is commonly known that organisational culture and leadership play a significant role in fostering corporate ecological responsiveness. It has been suggested that organisational culture is a strategic asset that enables businesses to convert their environmental strategies into improved performance (Dhillon & Sandhu, 2020). Building organisational capacity is centred on an organization's overall functioning and performance as well as its capacity for change adaptation. According to the organisational method, a single organisation, a group of organisations, or even an entity is essential to growth (Azeem et al., 2019).

Universiti Utara Malaysia

Fischer et al. (2020) stated that informal e-waste recycling is linked to a number of health risks. Research on the e-waste industry has thus far mostly concentrated on evaluating exposure sites, such as the concentration of organic or heavy metal contaminants. Compared to the control group, e-waste workers experienced a much higher rate of back discomfort, red, itchy eyes, and work-related injuries. Study conducted in India towards workers by Decharat and Kiddee (2022) highlighted that the health dangers connected with recycling e-waste were poorly understood and addressed by e-waste workers, who also lacked basic hygiene practices. An immediate priority should be a thorough remediation package that includes techniques for raising awareness and sensitising the public to the health dangers connected to the recycling of unregulated e-waste. All employees must get occupational safety trainings and be provided with personal protective equipment. Researchers stated that to improve workers' knowledge, educational programmes are required. Additionally, workers must disseminate information and participate in groups and organisations. Srivastava and Pathak (2020) studied that e-waste management has become essential and is seen as a significant concern for modern civilization. Larger contributing rich countries have set regulations around it and have taken control of their interests by enforcing laws, making payments to underdeveloped nations, and transferring old goods to impoverished nations in an effort to close the technological divide.

According to Debnath et al. (2018), the issue of disposing of e-waste is a concern for all parties involved, including the consumer and policymakers. As a result, research and development on ecologically responsible e-waste disposal has intensified. Patil and Ramakrishna (2020) encourages increasing the viability and effectiveness of e-waste policy implementation worldwide in the upcoming years. Borthakur (2023) claims that legislative changes are necessary to foster constructive cooperation between

Universiti Utara Malaysia

the official and informal sectors and the prudent use of the best practices for sustainable e-waste governance in India. Yong et al. (2019) stated that Legislative frameworks in Malaysia oversee the treatment of industrial e-waste, whereas societal and legal constraints have made location e-waste disposal difficult. For the policy relationship with e-waste management performance, it was found that there were not many studies on this topic.

Hypothesis 4 (H4): Policy significantly influenced e-waste management performance among SMEs in the northern region of Malaysia.

2.2.9 E-Waste Management Performance

E-waste management performance is the efficiency of methods and techniques for managing e-waste, such as outdated computers and mobile devices, in an environmentally responsible manner. It includes initiatives to lessen the production of e-waste, encourage recycling, and lessen the dangers to the environment and public health that come with disposing of EEE improperly. It needs a mix of cradle-to-cradle policies and methods to manage e-waste effectively (Rautela et al., 2021). These strategic activities should be seen from the viewpoints of consumer awareness, social and economic affordability, a sustainable and resilient environment, and the availability of peripheral technologies. E-waste management performance, which entails the methodical collecting of e-waste and its processing for the recovery of precious materials, offers an invaluable instrument to decrease the growing amount of e-waste, mitigate the scarcity of certain key resources, and bolster the economy (Ahirwar & Tripathi, 2021). A comprehensive strategy that includes enhanced product design, a higher recycling rate, and the least amount of risky e-waste contaminants released into the environment is needed to efficiently exploit the advantages of e-waste management without jeopardizing public health.

In order to get a better understanding of the social and environmental effects of disposing of e-waste, particularly the discharge of potentially dangerous materials into the environment, researchers have examined the effectiveness of e-waste management in their publications. To lessen the detrimental effects of e-waste on the environment and public health, they seek to assess the efficacy of various e-waste management solutions and offer insights into how to develop practices for sustainable e-waste management. Gollakota et al. (2020) highlighted that the majority of developing and less developed countries lack the necessary treatment facilities, technology, socioeconomic and cultural hurdles, gaps in policy making, and legislation. The key is found in the following: the formal and informal sectors must be integrated; network registries must be required; strict law enforcement is applied; transboundary movements are regulated; manufacturers are held accountable; consumer awareness and better eco-designs are fostered, and funds should be allocated to efficient recycling and disposal facilities.

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Xavier et al. (2021) undertook an investigative analysis of e-waste management across the American continent at various balances which are economic blocs and country levels, with a focus on group designs, e-waste changes, and regulatory frameworks in Brazil and Canada. The goal is to determine how particular legal, economic, and environmental criteria influence e-waste management options. The results indicate that while Brazil and Canada have different regulatory frameworks, they have both approved the Basel Convention, have action plans that prioritise managing hazardous materials, lack unified regulations, have little control over the illicit trade in e-waste, and lack traceability. According to Anuardo et al. (2023), the production of e-waste has increased significantly as a result of technological improvements, with dire environmental consequences. The Sustainable Development

Goals are hampered by inadequate e-waste management, which also has negative consequences including pollution, health hazards, and resource depletion. Unfortunately, a number of obstacles stand in the way of efficient administration, such as weak policies, few collecting places, and low awareness. Because of this, the purpose of this paper is to provide strategies for creating and enhancing organisational activities.

Hypothesis 5 (H5): Knowledge, awareness, behaviour and policy significantly influenced e-waste management performance among SMEs in the northern region of Malaysia.

2.3 Hypotheses Development

A particular statement of prediction is called a hypothesis. It is a tentative or preliminary explanation or hypothesis put out by the researcher regarding what they believe the investigation's conclusion will be (Binoy, 2019). One of the most important phases of research is developing a hypothesis. Following the formulation of the study problem, the investigator may proceed to draw specific conclusions on the problem's resolution. Hypotheses are these potential fixes or responses to the issue (Shelke, 2020). Hypotheses consist of two types which are null hypotheses and alternative hypotheses. According to Ranganathan and Pramesh (2019), there is a null hypothesis and an alternative hypothesis in every investigation. In research examining superiority, the null hypothesis asserts that there is no change between the treatments (that is, they are equal); the alternative hypothesis asserts that one therapy (often the novel or experimental treatment) is superior to the other. The Table 2.1 shows the research hypotheses for this study.

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Table 2.1: Research Hypotheses Development

Hypotheses	Statement
Hypothesis 1 (H1)	*Knowledge significantly influenced e-waste management performance among SMEs in the northern region of Malaysia.*
Hypothesis 2 (H2)	*Behaviour significantly influenced e-waste management performance among SMEs in the northern region of Malaysia.*
Hypothesis 3 (H3)	*Awareness significantly influenced e-waste management performance among SMEs in the northern region of Malaysia.*
Hypothesis 4 (H4)	*Policy significantly influenced e-waste management performance among SMEs in the northern region of Malaysia.*
Hypothesis 5 (H5)	*Knowledge, behaviour, awareness and policy significantly influenced e-waste management performance among SMEs in the northern region of Malaysia.*

Universiti Utara Malaysia

2.4 Conceptual Framework

The conceptual framework is a narrative or visual representation of the research project. It is made up of the research variables, which include the independent, dependent, and occasionally intervening or control variables, as well as the assumed connections between the variables (Salawu et al., 2023). The outcome of combining many related ideas to describe and provide a more comprehensive grasp of the topic being studied is a conceptual framework. This suggests that a conceptual framework, which puts out the research plan for a well understanding of the study aims, is a summary of the many results from the literature sources that have been studied concerning the research (Emvula, 2020).

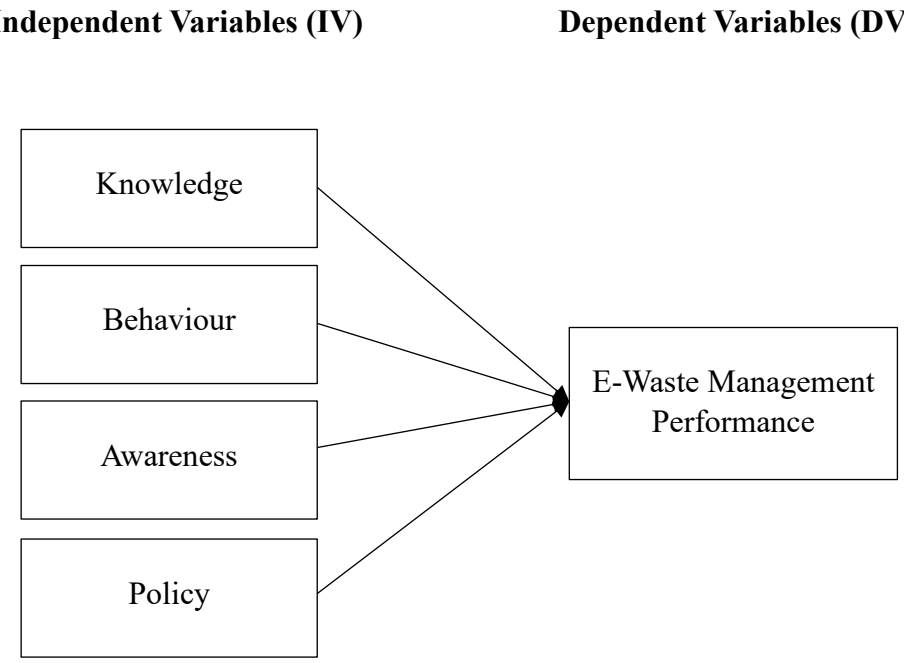

Figure 2.1: Conceptual Framework

As shown in Figure 2.1, it is the conceptual framework developed and adapted by the researcher to conduct this study. The research identifies a theoretical gap observed in two studies by Leng and Muhammad Arif (2022) and Maphosa et al. (2022), where one focuses on independent variables like awareness and perceived behaviour control with e-waste recycling as the dependent variable, and the other on lack of knowledge and policy with e-waste management as the dependent variable. The researcher will integrate and adapt these independent variables which are knowledge, behaviour, awareness, and policy into the study based on Figure 2.1. The researcher discovered that these 4 independent variables would affect the e-waste management performance towards SMEs. The aim of this study is to analyse the relationships between knowledge, awareness, behaviour, policy with e-waste management performance in SMEs. Thus, e-waste performance for SMEs is considered the result of these connected aspects, with the idea that better e-waste management practices inside SMEs will arise from greater knowledge, awareness, behaviours, and policies.

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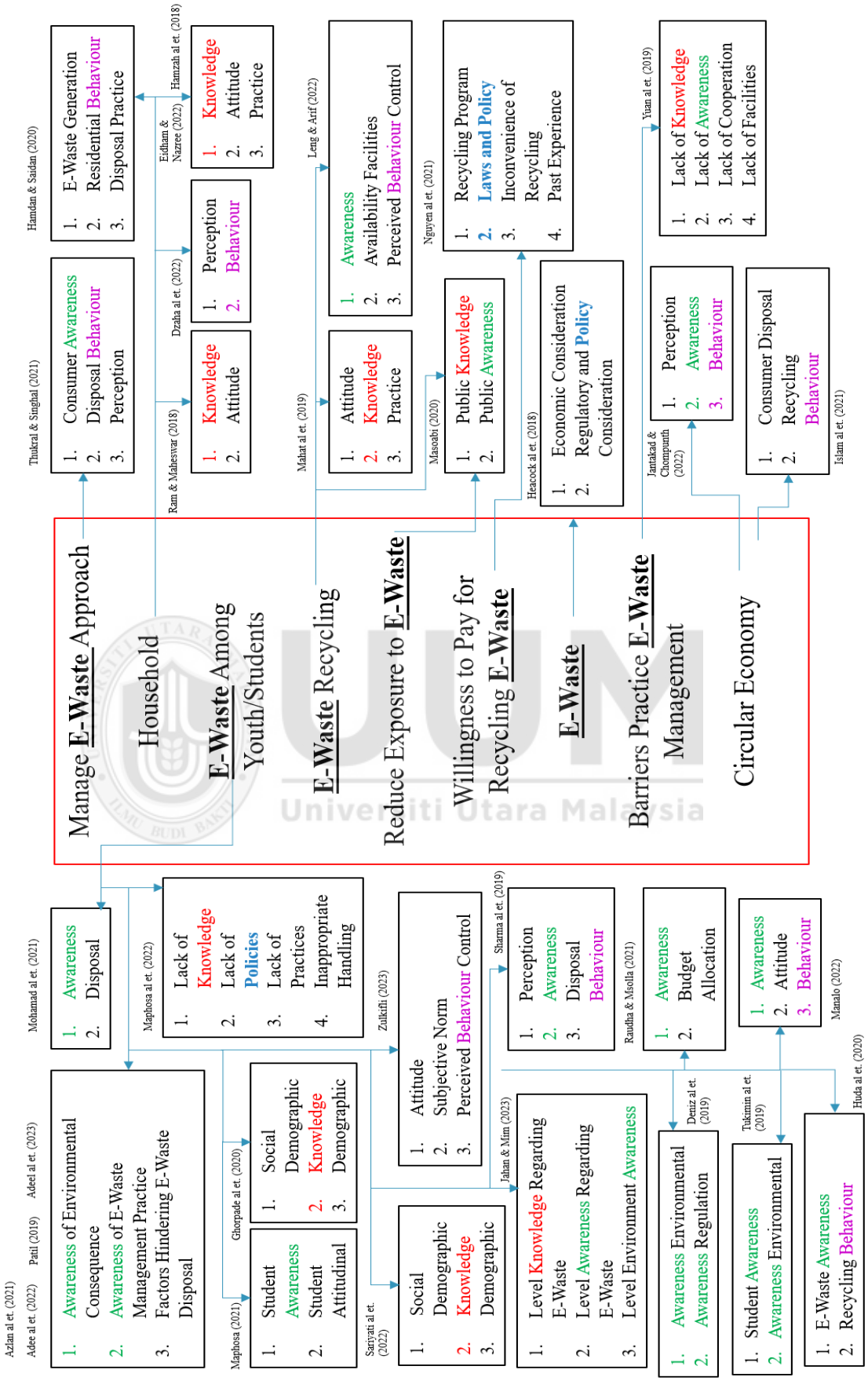

Figure 2.2: Independent Variables Diagram/Mapping

Figure 2.2 shows how the research got the 4 independent variables (knowledge, behaviour, awareness and policy). Firstly, the researcher gathered around 50 past articles regarding e-waste globally from the year 2018 to 2023. After that, the researcher had to find the independent variables and dependent variables for each of the past articles. The researcher noticed that some past articles have the same independent variables and made a diagram based in Figure 2.2. Based on the problem statements outlined in Chapter 1, a theoretical gap in existing research can be identified. In Leng and Muhammad Arif's (2022) research, awareness and perceived behaviour control are presented as independent variables, with e-waste recycling as the dependent variable. Conversely, in Maphosa et al. (2022) research, lack of knowledge and policy are highlighted as independent variables, with e-waste management as the dependent variable. However, both studies appear to lack consideration of independent variables from each other's domains. Consequently, the proposed research aims to integrate and adapt these independent variables into a conceptual framework based on Figure 2.1. The four independent variables for this research are knowledge, behaviour, awareness and policy. This is how the researchers got the 4 independent variables and found out that no one have studied this 4 together before. Table 2.1 and Table 2.2 shows the literature review of both independent variables and dependent variable.

Universiti Utara Malaysia

Table 2.2: Literature Review for Independent Variables

Variables	Statements	Authors
Knowledge (IV1)	The level of knowledge among SMEs regarding e-waste management significantly impacts their ability to minimize its harmful environmental and health effects.	Juma and Kagoya, 2022; Hamzah et al., 2020; Fatin et al., 2021; Azlan et al., 2021; Mahat et al., 2019; Kariwala et al., 2023; Maphosa et al., 2022
Behaviour (IV2)	Attitudes and behaviors are crucial in e-waste management, shaping individual actions and organizational policies.	Hamzah et al., 2020; Leng and Muhammad Arif, 2022; Sofian et al., 2023; Juma & Kagoya, 2022; Thukral et al., 2023; Gilal et al., 2022
Awareness (IV3)	Enhancing awareness among consumers and SMEs about recycling benefits and proper e-waste disposal practices is crucial.	Ahmed, 2019; Mahat et al., 2019; Adeel et al., 2023; Almulhim, 2022; Ananno et al., 2021; Attia et al., 2021; Goel et al., 2020
Policy (IV4)	The escalating global production of e-waste and its associated health risks underscore the imperative for SMEs to establish comprehensive policies governing e-waste creation, processing, and management.	Dhillon and Sandhu, 2020; Azeem et al., 2019; Fischer et al., 2020; Decharat and Kiddee, 2022; Srivastava and Pathak, 2020; Debnath et al., 2018

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Table 2.3: Literature Review for Dependent Variable

Variables	Statements	Authors
E-Waste Management Performance (DV)	Efficient e-waste management is crucial for mitigating environmental and health risks, yet challenges persist due to inadequate infrastructure and policy gaps.	Rautela et al., 2021; Ahirwar & Tripathi, 2021; Gollakota et al., 2020; Xavier et al., 2021; Anuardo et al., 2023; Yong et al., 2019

2.5 Underpinning Theory

A theory, which defines the connection between variables to describe a natural occurrence, is a collection of connected concepts, components, interpretations, and premises that give a systematic picture of phenomena (Taha, 2020). The fundamental component of organisational studies, theory serves as a major yardstick for assessing the calibre and significance of our work. This editorial article emphasises conceptual work above empirical research to show how theorising may take many different shapes and how it manifests itself in various kinds of theory papers (Cornelissen et al., 2021).

In general, the term "underpinning theory" refers to the underlying or basic theories, notions, or concepts that serve as the framework for comprehending and elucidating a certain subject or area of study. The theory serves as the cornerstone or foundation for further specialised knowledge and study. According to Mkhomazi and Iyamu (2013), a study's underlying theory may be able to identify the variables that influence an organization's information systems' creation, implementation, or both. In order to address present or new issues, gaining a greater understanding of the socio-technical processes of organisations and businesses, as well as how people engage with the structures, is the goal.

For this research, as the researcher mentioned that there are 4 independent variables which are knowledge, awareness, behaviour and policy. There will be 2 theories for 2 of them as a justification framework to support it.

2.5.1 Behavioural Reasoning Theory (BRT)

Behavioural Reasoning Theory (BRT) implies that people frequently base their decisions and choices on their observations of how particular behaviours result in particular outcomes and their prior experiences. According to Sahu et al (2020), the literature on consumer behaviour has made frequent use of behavioural theories to comprehend the variables affecting user intentions and behaviour. BRT is a relatively new theory that explains the relationship between views, causes, motivations intentions, and action. Researchers Dhir et al. (2021) highlighted that a variety of theoretical frameworks are accessible, allowing academics and professionals to comprehend how any invention gets adopted. The Theory of Reasoned Action (TRA), the Technology Acceptance Model (TAM), the Diffusion of Innovation Theory (DOI), and the Theory of Planned Behaviour (TPB) are a few such examples. Nevertheless, the majority of these frameworks face criticism since they primarily concentrate on aspects associated to acceptance, often ignoring customer opposition (Sahu et al., 2020).

Universiti Utara Malaysia

This theory focuses on awareness and behaviour. Dhir et al. (2021) stated that previous research has previously demonstrated that new services and products have a high failure rate due to a lack of consideration paid to comprehending the many causes of customer resistance or the problems preventing their adoption. In the case of recycling e-waste, little has changed since the majority of earlier research concentrated on identifying the favourable elements that impact recycling intentions. As a result, nothing is known about customers' readiness to recycle their e-waste, which worries lawmakers, who are calling for an immediate investigation of the issue (Dhir et al.,

2021; Sahu et al., 2020). Based on Meng et al. (2022) mentioned that from the standpoint of information processing, people often look for justifications and defences for their actions. When there are good reasons, people become more confident in their ability to act. The explanations provide a psychologically useful purpose by motivating individuals to fulfil their wants and comprehend the environmental causes of those demands. This is significant for sustainable behaviour since the particular justifications may be utilised to support and validate the sustainable actions of employees (Sharma et al., 2021).

2.5.2 Diffusion of Innovations Theory (DOI)

García, (2020) stated that the theory of Diffusion of Innovations Theory (DOI) is the groundbreaking study of communication scientist and sociologist Everette M. Rogers (1931–2004). Diffusion is defined as "the process by which an innovation is communicated among the members of a social system over time through specific channels." Diffusion is therefore considered an exclusive kind of communication where people generate and exchange knowledge with one another to arrive at a shared understanding (Rogers, 1995).

Universiti Utara Malaysia

This theory focuses on knowledge and policy. A readily available collection of ideas and methods is provided by the research and practice paradigm known as the diffusion of innovations, which may be used to explain why people and organisations are open to adopting new health care policies and practices. It is also possible to operationalize diffusion principles to increase the pace of acceptance and reach of health breakthrough (Dearing & Cox, 2018). According to Al-Razgan et al. (2021), highlighted that based on the DOI hypothesis, social change within a society is strongly influenced by communication. Four important elements are present. The first element is inventiveness. an initiative, method, or concept that someone or another adoption unit

considers novel. Communication is described by Rogers as "a process in which participants create and share information with one another to reach a mutual understanding" and constitutes the second element of the DOI definition. The majority of behavioural research ignores the third element, which is time. According to Rogers, one of the benefits of diffusion research is demonstrated by including the temporal dimension. A temporal dimension is present in the innovation-diffusion process, adopter classification, and adoption rate. The last component in the dissemination process is the social system. Rogers (1995) described the social system as "a collection of connected units involved in cooperative problem solving to achieve a shared objective."

As a summary, DOI describes how novel concepts, behaviours, or technological advancements proliferate within a social structure. It is helpful to comprehend how an organization's e-waste policies are adopted and communicated to employees, as this influences their awareness and actions about e-waste management, in the context of organisation policy and employees' understanding of e-waste. This hypothesis can shed light on how and why information regarding e-waste is spread within an organisation.

Universiti Utara Malaysia

2.6 Chapter Summary

The literature on knowledge, awareness, behaviour, and policy of e-waste management performance in SMEs in this section based on past articles. The hypotheses, theoretical framework and underpinning theory are also included. The next chapter will be discussed concerning the use of research methodology.

CHAPTER 3
RESEARCH METHODOLOGY

3.1 Introduction

This chapter outlines the research methodology employed in this study, encompassing the research process, which includes research design, population, sample and sampling technique, questionnaire design, research measurement, data collection, and data analysis technique. Finally, the methodology will be summarized towards the conclusion of this chapter.

3.2 Research Framework and Summary of Research Hypotheses

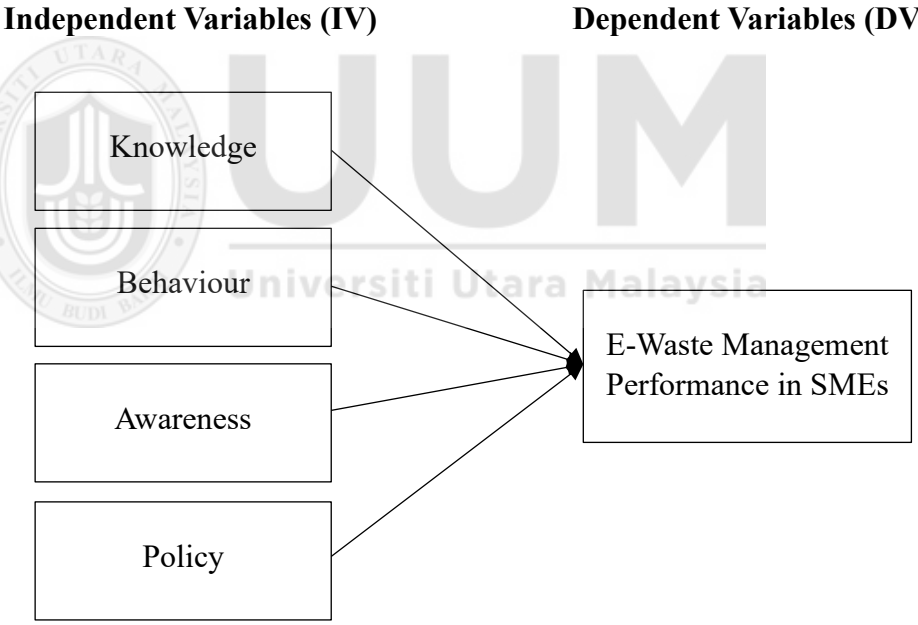

Figure 3.1: Conceptual Framework

It is the conceptual framework that the researcher created and modified to carry out this investigation, as seen in Figure 3.1. The study found that the performance of e-waste management for SMEs will be impacted by these four independent factors. This study aims to examine the connections between e-waste management performance in SMEs and knowledge, awareness, behaviour, and policy. With the understanding that

improved e-waste management practices inside SMEs would emerge from more knowledge, awareness, behaviours, and policies, e-waste performance for SMEs is therefore seen as the outcome of these interconnected components. The Table 3.1 shows the research hypotheses for this study.

Table 3.1: Research Hypotheses Development

Hypotheses	Statement
Hypothesis 1 (H1)	*Knowledge significantly influenced e-waste management performance among SMEs in the northern region of Malaysia.*
Hypothesis 2 (H2)	*Behaviour significantly influenced e-waste management performance among SMEs in the northern region of Malaysia.*
Hypothesis 3 (H3)	*Awareness significantly influenced e-waste management performance among SMEs in the northern region of Malaysia.*
Hypothesis 4 (H4)	*Policy significantly influenced e-waste management performance among SMEs in the northern region of Malaysia.*
Hypothesis 5 (H5)	*Knowledge, awareness, behaviour and policy significantly influenced e-waste management performance among SMEs in the northern region of Malaysia.*

Universiti Utara Malaysia

3.3 Research Design

The most common approach for adding to and updating the body of knowledge on something or someone is research. In the domains of business, advertising, sociology, psychology, technological innovation, economics, etc., there are two typical methods for doing research: both quantitative and qualitative research (Ahmad et al., 2019).

Qualitative research focuses on feelings, ideas, or experiences. Data collection, which is typically done using narrative approaches, aims to find trends that might lead

to verifiable ideas (Asenahabi, 2019). When conducting a study, instructors use qualitative research methods to find patterns or new perspectives. The goal of qualitative research is to gather not mathematical data and offer insights. It is not statistical and can be either semi-structured or unstructured (Ugwu & Val, 2023). The natural environment, the researcher as a participant, subject-based communication, subject intentionality, and pragmatics are some of the common traits of the qualitative research technique. Comparably, qualitative research techniques are crucial for gaining insight into the human and social sciences and understanding how people think. It is also comprehensive in that it concentrates on issues that impact the population as a whole and covers a broad spectrum of people (Anas, 2022).

Quantitative research methods involve the systematic analysis of events and their interactions using numbers and anything quantifiable. In order to understand, forecast, and regulate a phenomenon, it is utilised to provide answers to inquiries about connections within quantifiable variables (Mohajan, 2020). Numerous academics prefer the quantitative research technique. Additionally, administrators may easily disseminate the quantitative study results to other academics and districts since it provides quantifiable data that can either support or refute a notion. Even though the study may be based on relative sample size, educators and researchers can generalise the results from quantitative data to anticipate outcomes for larger student populations and groupings (Siripipatthanakul et al., 2023). Quantitative research is based on the positivist paradigm, which endorses statistical analysis-based methods and adds other strategies like blinding, structured protocols, inferential statistics, hypothesis testing, mathematical justification, randomising in experimental and quasi-experimental designs, and questionnaires with a predefined range of answers. Variables and hypotheses are inextricably linked to quantitative research objectives, which are

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quantifiable entities with several possible values, while hypotheses are unproven assertions or relationships between variables (Adedoyin, 2020).

For this study, the researcher has chosen quantitative research to collect the data. By producing numerical data, it is used to quantify attitudes, views, behaviours, and other specific factors and extrapolate findings from a broader sample group (Mohajan, 2020). In a quantitative study, the research design seeks to give a methodical explanation of how research issues are approached. By doing this, scholars are able to plan ahead or reflect on their past work (Thomas & Zubkov, 2023).

3.4 Population, Sample and Sampling Technique

3.4.1 Population

The study's goals provide clarification on which group the research findings may be used to or for which group they can be generalised. In study, this kind of group is called a population. The collection or grouping of all the units to which the study results are to be applied is stated to as the population (Shukla, 2020). The target population that the study aims to investigate or treat is known as the population of interest (Majid, 2018). The population of interest is the target demographic that the study intends to examine or assist (Liu et al., 2020).

For this study, the population is the SMEs in the northern region of Malaysia. Since SMEs are frequently involved in all facets of e-waste creation, recycling, and disposal, they constitute a crucial element within the larger e-waste environment. The management of e-waste has a substantial impact on resource recovery and environmental sustainability, making these businesses vital participants in the e-waste ecosystem. Businesses ranging from electrical and electronic recyclers and refurbishes to component suppliers and repair shops are among the SMEs involved in e-waste

activities. Their involvement in e-waste management is extensive and diverse due to their broad connections to consumer markets and bigger technological companies. Creating solutions that effectively reduce the environmental impact of e-waste requires an understanding of the practices, difficulties, and behaviours of these SMEs.

The e-waste industry offers a distinct mix of opportunities and problems. These include concerns about data security, recycling technologies, dangerous chemicals, and changing rules. SMEs in this business confront unique challenges, include resource scarcity, adhering to e-waste laws, and competing in a market that is evolving quickly. This study intends to evaluate the knowledge, behaviour, awareness and policy that SMEs face during the e-waste management process and discuss the findings based on the results.

In Malaysia, SMEs made the most significant economic impact. According to the Economic Census, which was carried out in 2016 by the Malaysian Department of Statistics, there are 907,065 SMEs in Malaysia, or 98.5 percent of all firm establishments in the nation (Abdul Rahman et al., 2023). For this study, it focuses on the northern region of Malaysia which are Pulau Pinang, Kedah and Perlis. The total population of SMEs of these 3 states is 122,623. Table 3.2 shows the number of SMEs establishment by state in Malaysia and Table 3.3 shows the number of SMEs establishment in northern region of Malaysia which are Pulau Pinang, Kedah and Perlis.

Universiti Utara Malaysia

Table 3.2: Total Number of SMEs in Malaysia (Profile of Small and Medium Enterprises (reference year 2015)

State	Total SMEs	Percent (%)
Selangor	179,271	19.8
WP Kuala Lumpur	133,703	14.7
Johor	98,190	10.8
Perak	75,140	8.3
Pulau Pinang	66,921	7.4
Sarawak	61,036	6.7
Sabah	55,702	6.2
Kedah	48,894	5.4
Kelantan	46,618	5.1
Pahang	37,573	4.1
Negeri Sembilan	32,721	3.6
Melaka	31,361	3.5
Terengganu	29,324	3.2
Perlis	6,808	0.8
WB Labuan	2,567	0.3
WB Putrajaya	1,236	0.1
Total SMEs	907,065	100.0

Source: From Economic Census, 2016. Department of Statistics, Malaysia.

Universiti Utara Malaysia

Table 3.3: Total Number of SMEs in Pulau Pinang, Kedah and Perlis

State	Total SMEs	Percent (%)
Pulau Pinang	66,921	54.6
Kedah	48,894	39.9
Perlis	6,808	5.5
Total SMEs	122,623	100.0

Source: From Economic Census, 2016. Department of Statistics, Malaysia.

3.4.2 Sample

Sampling is the process of selecting a sample from a large or individual population for a certain kind of research objective. It is possible to quantify sample errors using sampling. As a result, it helps to obtain information on certain demographic features (Bhardwaj, 2019). Sometimes, collecting data or information from the whole population is challenging while conducting research to help certain groups, such as those who live in disaster-affected areas. This may occur if the population is too large to accommodate a census-based study, which entails asking every member of the population to take part in the investigation, or if it is impossible to identify or contact every member of the population individually. When the entire population is unavailable to engage in research or cannot be independently identified, sampling is employed to gather data that are believed to be representative of the target group (Stratton, 2021).

To determine the number of samples, the researcher will use Krejcie and Morgan Table. Given that empirical research requires an accurate statistical sample, there is an increasing demand for an effective method of determining sample size. Krejcie and Morgan (1970) developed a table for calculating sample size for a given population for convenient reference in order to close the gap (Bukhari, 2021). Since the

total number of SMEs in the chosen states are more than 75,000, based on the table, the researcher will need to collect 382 SMEs data. Table 3.4 shows the Krejcie and Morgan Table.

Table 3.4: Krejcie and Morgan Table, 1970

N	***S***	***N***	***S***	***N***	***S***
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	1000000	384

N is population size *S* is sample size
Source: From Sample Size Determination Using Krejcie and Morgan Table, by Bukhairi, 2021.

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3.4.3 Sampling Technique

Sampling refers to the process of choosing a sample from the population. In experimental research, including clinical ones, sampling strategies are essential.

Sampling techniques may be broadly classified into two categories: probability sampling and non-probability sampling (Etikan & Babatope, 2019).

There are 2 techniques of sampling which are probability and non-probability sampling. The term "probability sampling technique" refers to a situation in which every member of the population has an equal likelihood of being selected. It is seen to be the best way to ensure that every sample unit fairly represents the populations it represents. The primary objective of probability sampling is to provide a sample that is representative of the population from which it was taken. The random sampling technique does not imply that each sample is an exact representation of the population. Instead, it implies that most random samples will generally be near the population and that it is possible to determine the chance that a sample is correct. (Rahman et al., 2022).

In non-probability sampling, samples are selected by the researcher based on their subjective evaluation as opposed to random chance. It is a less strict method. This sampling approach is primarily based on the experience of the researchers. It is frequently employed by researchers as a method of observation for qualitative research. Non-probability sampling, in contrast to probability sampling, offers a subset of the population an alternate possibility of participating in the study. Each member of the population has a predetermined chance of being selected. Non-probability sampling is particularly useful for undertaking exploratory research, such as pilot surveys, because it enables the deployment of surveys to a smaller sample size than what is specified (Jan, 2020).

For this study, the sampling technique used is probability sampling. With probability sampling, each person or thing in a population has a known, non-zero chance of being chosen to be included in the sample. It guarantees that every component

of the population has an equal and fair chance of being included, enabling the production of objective and statistically representative data. Simple random sampling technique will be technique for this sampling. One popular sampling technique for research with many of participants is simple random sampling. Because data selection in simple random sampling relies on chance, the research's data might produce exact, broadly applicable findings (Tajik & Golzar, 2022). By using these randomization procedures, each member of the population has an equal chance of being chosen for the sample. Additionally, it is an impartial and unbiased technique of selection; with careful design, the sample may be representative of the entire population. According to Stockemer (2019) , randomization can assist reduce the confounding effects of both known and unknown factors by selecting instances at random, which could result in a more thoughtful sample selection procedure for the intended study. Researcher will choose any SMEs in the northern region of Malaysia randomly to collect the data.

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3.5 Questionnaire Design Development

In order to assist the researcher in gathering pertinent data on the research topic, a questionnaire is a crucial tool in research studies. It is important to make sure the questionnaire is designed in a way that minimises mistakes. However, creating an effective questionnaire may be difficult for researchers, since it can have negative effects on usage, appearance, and content, which can result in unreliable and skewed study results (Taherdoost, 2022).

For this study, the questionnaire will be divided into two sections. The first section will be the demographic questionnaires. These questionnaires will be about the gender, race, age group, marital status, educational level and organization variety which are manufacturing or service. The type of measurement scale will be nominal scale. A

scale for categorising variables into distinct groups is called a nominal scale, or categorical variable scale. Nominal scales are employed in research to analyse categorical variables including gender, blood group, political party, marital status, and location of residence, among others (Anjana, 2021).

For the second section, it will be about independent variables and dependent variables questionnaires. These questionnaires will be asking based on the 4 independents variables which include 6 questions. The dependent variables will consist of 4 questions based on the 4 independent variables respectively. The questionnaires will be given to 1 representative (anyone) of the SMEs. The ideal representative would be someone that has knowledge about their own organization and a higher ranking than the normal employees (Hong, 2020).

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Table 3.5: Independent Variables Questionnaires (Knowledge and Behaviour)

Independent Variables	Questionnaires Items	Authors
Knowledge (IV1)	The organization knows and understands about e-waste recycling.	(Nguyen & Qi, 2019)
	The organization knows where to find information about e-waste.	(Cai et al., 2020)
	E-wastes should be disposed of separately from general household wastes.	(Nduneseokwu et al., 2017)
	The organization has received education/information about e-waste.	(Uhunamure et al., 2021)
	The organization knows the availability and locations of e-waste bins.	(Ravindra & Mor, 2019)
	The organization believes that everyone should contribute to taking care of the environment.	(Ramzan et al., 2019)
Behaviour (IV2)	Proper e-waste recycling has positive impacts on human health and the environment.	(Cai et al., 2020)
	The organization is mindful of the amount of e-waste it generates.	(Azodo et al., 2017)
	Level of understanding about the environmental and health impact associated with proper handling of e-waste.	(Kwatra et al., 2014)
	The organization believe that newer technology influences e-waste management performance.	(Subhaprada & P., 2017)
	The organization has participated in e-waste recycling activities in the past.	(Ramzan et al., 2019)
	The organization knows about the appropriate disposal techniques and environmental effects connected to e-waste.	(Rodrigues et al., 2020)

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Table 3.6: Independent Variables Questionnaires (Awareness and Policy)

Independent Variables	Questionnaire Items	Authors
Awareness (IV3)	The organization is willing to donate outdated or broken e-waste.	(Nguyen & Qi, 2019)
	Recycle of e-waste can reduce environmental pollution and resource consumption.	(Zhong & Huang, 2016)
	The organization considers old electrical and electronic equipment as waste.	(Ali & Akalu, 2022)
	The organization believes that there is e-waste present in their area.	(Edumadze et al., 2013)
	The organization regularly reads the operational instructions of new electrical and electronic equipment.	(Abeliotis et al., 2006)
	The organization plans to recycle or dispose of e-waste after storing them in the future.	(Rodrigues et al., 2020)
Policy (IV4)	The organization retains e-waste after its average life cycle in accordance with its organizational policy.	(Azodo et al., 2017)
	The organization is ready to recycle e-waste if community pick-up locations or e-waste bins are provided, aligning with its management policy.	(Nduneseokwu et al., 2017)
	The organization's policy allows for the distribution or proper disposal of old or malfunctioning e-waste.	(Ali & Akalu, 2022)
	Participation in a program on e-waste management would help the organization in managing e-waste better.	(Uhunamure et al., 2021)
	The organization is willing to pay for e-waste management practices.	(Abeliotis et al., 2006)
	The organization uses personal protective equipment (PPE) (e.g. gloves, face mask) when handling e-waste.	(Wang et al., 2011)

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Table 3.7: Dependent Variables Questionnaires

Dependent Variables	Questionnaire Items	Authors
E-Waste Management Performance (DV)	Does your organization think knowledge influences e-waste management performance?	Own work
	Does your organization think behaviour influences e-waste management performance?	Own work
	Does your organization think awareness influences e-waste management performance?	Own work
	Does your organization think policy influences e-waste management performance?	Own work

For Table 3.5, Table 3.6 and Table 3.7, the questionnaires will be interval scale. In other words, Likert-Type Rating Scale. A measuring scale known as an interval scale is one that, in addition to arranging data and giving each point a significant numerical value, also makes sure that the intervals between values are equal and constant, enabling useful comparisons of the degree of variation between values. It is commonly known that the Likert scale is a simple, trustworthy scaling method that makes it simple to gauge and comprehend responder impression (Mumu et al., 2022). Aside from that, the respondents said a Likert scale was easier to use and quicker than other measures It does not, however, have a genuine zero point, and ratios between values have no significance. Strongly Agrees = 1, Agrees = 2, Neutral = 3, Disagrees = 4, and Strongly Disagrees = 5 represent each respondent's rating. The total of all available points determines a person's score. To create the Likert scale, add up all of the defining elements (Mumu et al., 2022). Refer to the Appendix A and B for the questionnaire in terms of online and physical.

3.6 Research Measurement

Every research endeavour needs an adequate research design in order to be completed successfully. In order to genuinely achieve the study purpose, the researcher selected this approach before to beginning data collection. The core of research design is converting a research problem into data for analysis in order to provide relevant answers to research questions at the lowest feasible cost (Asenahabi, 2019). The overall approach is to select to combine the numerous study components in a logical and cogent manner is referred to as the research design, and it serves as a guarantee that to successfully answer the research hypothesis. It acts as a manual for gathering, measuring, and analysing data (Thakur, 2021).

For demographic questionnaire, the type of measurement scale will be nominal scale. With no innate hierarchy or order, a nominal scale is a categorical scale that divides data into discrete groups or categories. It doesn't indicate any quantitative or significant correlations between categories, it only labels or categorises data. A measuring scale known as an ordinal scale classifies or ranks data according to a meaningful sequence, but the intervals between the categories are neither definable or constant. It does not state the precise degree of difference between values; instead, it just shows relative variations in magnitude. For Table 3.4 and Table 3.5, the questionnaires will be interval scale. In other words, Likert-Type Rating Scale. A measuring scale known as an interval scale is one that, in addition to arranging data and giving each point a significant numerical value, also makes sure that the intervals between values are equal and constant, enabling useful comparisons of the degree of variation between values. It does not, however, have a genuine zero point, and ratios between values have no significance.

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3.7 Data Collection

The first phase of research, data collection, can improve the quality of outcomes by reducing the possibility of mistakes within the project. Thus, in addition to a well-designed study, a significant amount of effort should be dedicated to the data collection process in order to get relevant results, as incomplete or erroneous data might compromise the reliability of the findings. However, while a robust data gathering strategy aids in the planning of research, it does not always ensure the project's success as a whole (Taherdoost, 2021). During the data collecting stage of empirical research, a number of choices are made, including the specific type of study design, the sampling techniques used, the usage of control variables and their specific selection, and the handling of missing data (Aguinis et al., 2021).

For this study, the questionnaires consist of two sections. The first section demographic and the second section are independent variables and dependent variables. The researcher will collect data from SMEs in the northern region of Malaysia by handing out questionnaire by online and physically/in-person. For online, the researcher will make google form and send the link to the SMEs through email or WhatsApp. For the email address and contact numbers, the researcher will get it from the Federation of Malaysian Manufacturers website (https://www.fmm.org.my/default.aspx) to find the SMEs from Pulau Pinang, Kedah dan Perlis. The researcher will send a formal letter for verification and the google form questionnaires. Refer Appendix C for the formal letter and Appendix B for the google form. Another would be asking for assistance from relatives and friends who are living in these 3 states for distributing the questionnaires to the SMEs in their area. This is due to time limitation which is 3 to 4 months to conduct this study and 1 month for the data collection phase. In addition, the researcher needs to collect at least 382 SMEs.

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For physical, the researcher will print out the questionnaires and go to the SMEs place by place to give them the questionnaires. Most of the data collection will be in Kedah and the rest would be Pulau Pinang and Perlis because the researcher is living in UUM, Kedah. Refer Appendix A for the physical questionnaires. The reason why the researcher does the mixed gathering method is because online data collection takes time and to speed up it up due to time limitation, the researcher had to do physical. This technique for gathering data provides a methodical and effective way to get information from SMEs. To ensure a thorough grasp of their activities in the context of e-waste, these questionnaires will be created to enquire about their regulatory compliance, technical methods, environmental issues, and e-waste management practices by providing their answer in terms of Likert Scale in the questionnaire.

The lowest level of information from which further measurements and analysis are performed is called data. The observations obtained on the variables related to the study issue provide the data. In research, there are two kinds of data which are primary data and secondary data (Ganesha & Aithal, 2022) The researcher will collect these 2 data for this study.

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3.7.1 Primary Data

Primary data are those that the researcher himself collected directly from the source. Surveys, observations, questionnaires, focus groups, case studies, and interviews are a few forms of primary data (Ajayi, 2023). This study primary data is the questionnaire. An observational method consisting of a set of written items delivered to the respondent with an expectation that they will reply in writing. Here, a list of written things is provided to the respondents, and they are asked to react by checking the ones they believe to be acceptable.

The questionnaire is a useful instrument for getting direct feedback on e-waste management from a wide range of stakeholders, such as waste management experts, consumers of EEE, and SMEs. This methodology facilitates the methodical gathering of information about several facets of the e-waste life cycle, including production, elimination, recycling methods, consciousness levels, and adherence to e-waste laws. The questionnaire will be thoughtfully crafted to extract precise and pertinent data, guaranteeing that the study's goals are successfully fulfilled.

This research aims to create a rich dataset that will be crucial for evaluating the current state of e-waste management in the area, identifying areas for improvement, and informing policy recommendations to support more environmentally conscious and sustainable practices in the handling of e-waste. The questionnaire will be the main tool used to collect data for this study.

3.7.2 Secondary Data

Data gathered earlier by someone else is referred to as secondary sources. Secondary data are ones that were collected in the past by a party unconnected to the study project for a different purpose and at a different period. If the researcher uses these data, they become secondary data for the current customers. Sources of secondary data include government publications, websites, books, journal articles, and internal documents (Ajayi, 2023).

Through methodical scanning and evaluation of a broad range of pertinent academic papers, reports, and publications, the researcher managed to gather secondary data from the internet collection. This thorough analysis of the corpus of research on e-waste was a useful tool for gathering information that deepens our understanding of the topic. In order to gather secondary data, papers, publications, and reports covering a

range of topics related to e-waste such as its effects on the environment, legal frameworks, recycling technologies, and best practices were examined. The research gained from the insights and conclusions made by professionals and academics in the area by utilising this abundance of data, which enhanced the study's academic rigour and comprehensiveness.

In summary, the use of secondary data from several reliable sources strengthens the research's depth and credibility and guarantees that it is well-informed by the corpus of knowledge already available in the field of e-waste management.

3.8 Data Analysis Technique

The act of turning collected data into information with significance is known as data analysis. Various methods, including modelling, are utilised in this process to identify patterns, connections, and ultimately, conclusions that pertain to the decision-making process. But prior to being utilised in the data analysis procedure, the data must be prepared (Taherdoost, 2020).

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For this study, Statistical Package for the Social Science (SPSS) version 27 will be a suitable tool to analyse the data. The most important aspect of SPSS is that it was designed with non-technical users in mind, particularly those in the social sciences. As a result, no prior programming language expertise is needed to begin using the programme. Consequently, the application is easily usable in any type of quantitative analysis and is also user-friendly. Another fantastic feature that makes it a top pick for scholars worldwide is its data management capability (Rahman & Muktadir, 2021).

With its ability to delve deeper into analytical data, SPSS is a far more effective tool than other spreadsheets, databases, or conventional multi-dimensional tools. When it comes to making inferences and forecasts from user data, SPSS Statistics shines.

When compared to many non-statistical programmes, it is in fact among the quickest at performing tasks like data processing and statistical operations. Its functions include statistical analysis as well as data administration and documentation. enabling academics to conduct intricate studies and then plot the results on several program-available charts and graphs.

This study data analysis will be normality and reliability analysis. Normality analysis is used to assess whether a set of data follows a normal distribution. Normality analysis is considered as skewness and kurtosis. It helps researchers determine if their data meets the assumption of normality required for certain statistical tests (Kaliyadan & Kulkarni, 2019). Reliability analysis assesses the consistency and stability of measurements or scales used in research. It is commonly used in psychometrics to evaluate the reliability of survey or test items (Bujang et al., 2018). SPSS offers tools to calculate various reliability coefficients, such as Cronbach's alpha, which measures internal consistency reliability.

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After that, it will be the pearson correlation. Pearson correlation is a statistical measure of the strength and direction of the linear relationship between two continuous variables. It describes in detail the direction and intensity of a linear relationship between two quantitative variables (Obilor & Amadi, 2018). It ranges from -1 to 1, where -1 indicates a perfect negative linear relationship, 0 indicates no linear relationship, and 1 indicates a perfect positive linear relationship (Schober et al., 2018). In SPSS, Pearson correlation coefficients are calculated to assess the association between pairs of variables. In particular, it can determine if two variables significantly correlate with one another. Next will be linear regression which is used to describe the connection between one or more independent variables and a dependent variable. Its goal is to forecast the dependent variable's value by using the independent variables'

values as a guide. With SPSS, linear regression analysis enables researchers to anticipate or test hypotheses regarding the impact of one variable on another, as well as analyse the direction and strength of the relationship between variables (Senthilnathan, 2019). A summary hypothesis in research is a concise statement that outlines the expected relationship or outcome of a study based on existing knowledge or theories (Miah, 2016). It summarizes the main idea or prediction being tested. Table 3.8 shows a table of Pearson correlation coefficient (*r)* value. Lastly, it will be summary hypothesis.

Table 3.8: Pearson Correlation Coefficient (r) Value

Pearson correlation coefficient (*r)* value	**Strength**	**Direction**
Greater than .5	Strong	Positive
Between .3 and .5	Moderate	Positive
Between 0 and .3	Weak	Positive
0	None	None
Between 0 and -.3	Weak	Negative
Between -.3 and -.5	Moderate	Negative
Less than -.5	Strong	Negative

Source. From Usefulness of Correlation Analysis, by Senthilnathan, 2019. SSRN.

3.9 Pilot Test

In research, a pilot test is a small-scale preparatory study carried out before to the major study in order to assess and improve research processes, such as data gathering techniques or experimental protocols (In, 2017). Feasibility study intended to guide the planning of a large-scale investigation is a term that is frequently used interchangeably with "pilot." To lower the likelihood of a bigger project failing, pilots essentially constitute a risk mitigation method. "A small-scale experiment or set of observations undertaken to decide how and whether to launch a full-scale project" is what a pilot study is, because it helps with decision making (Fraser et al., 2018).

3.9.1 Face Validity

In research, "face validity" describes how easily the general public or other pertinent stakeholders can comprehend and accept the results of a study. This entail focus groups or one-on-one interviews where participants are given individual things and asked to share their opinions on each one (Allen et al., 2023). In other words, face validity in research refers to the extent to which a measurement or instrument appears, on the surface, to accurately assess the construct or phenomenon it is intended to measure. It involves a subjective judgment by researchers or participants regarding the instrument's relevance and appropriateness. It has to do with how simple it is to explain, evaluate, and use research findings in practical settings (Connell et al., 2018). Face validity is crucial because it increases the significance and influence of study findings. Findings that are accessible and simply understood are more likely to be accepted by practitioners, policymakers, and the general public, which will improve decision-making and result in beneficial social change.

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For this research, the researcher has asked some people to help the researcher to check the questionnaire if they can understand it. The people are 3 Master students, 3 lecturers from any university and 1 SMEs representative. The questionnaires will distribute through physical and asking for their comments face-to-face.

The researcher gave out the questionnaire to 3 students. One of researcher’s classmates, Abdisamad Elmi Abdishakur have no issue and understood the questionnaire. The second student, Tan Wei Bin commented on the questionnaire statement. He found out that some of the questions are in the mixture of positive and negative statement and advised the researcher to make it into 1 type either fully positive or full negative. The third student, Awadh Faisal commented on some of the questions.

He stated that those questions are easily misunderstood and helped the researcher to correct the questions making it easier to understand.

Next respondents are the lecturers. The first lecturer is Dr Razak Bin Wahab, a lecturer from University Technology Sarawak. He commented on some demographic questions and stated that it might give a misdirection. The researcher took note and fixed the questions. The second lecturer is Dr Suman Tiwari, a lecturer from University Technology Sarawak. She commented on the independent questions. She highlighted that some of the questions in that section does not fit with the title. Certain questions in "Awareness" section have no connection with it. The third lecturer is Dr Ivy, a lecturer from University Technology Sarawak. She commented on the "Policy" section, saying some questions have no connection with the "Policy" and need to be fix.

The next respondent is the SMEs representative. The researcher chose Intertek from Pulau Pinang. The reason is because a classmate is working in that organization. Centered around its laboratory testing services, the company provides quality and safety assurance to industries such as construction, healthcare, food and transport. Products tested include batteries, accessories, apparel and chemicals. The researcher gave the questionnaires to one of the staffs, Miss Donnathy. She commented that some questions are in a question form and stated that it should appropriate for the questions to be all in a positive statement making it easier for respondents to answer it. All the comments can be seen in Table 3.9.

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Table 3.9: Respondents' Comments

Respondents	Comments
Abdisamad Elmi Abdishakur (Student)	No issue and understood the questionnaire
Tan Wei Bin (Student)	Some of the questions are in the mixture of positive and negative statement and advised the researcher to make it into 1 type either fully positive or full negative.
Awadh Faisal (Student)	Questions are easily misunderstood and helped the researcher to correct the questions making it easier to understand.
Dr Razak Bin Wahab (Lecturer)	Commented on some demographic questions and stated that it might give a misdirection.
Dr Suman Tiwari (Lecturer)	Some of the questions in that section does not fit with the title. Certain questions in "Awareness" section have no connection with it.
Dr Ivy (Lecturer)	Commented on the "Policy" section, saying some questions have no connection with the "Policy" and need to be fix.
Miss Donnathy (SMEs Representative)	Some questions are in a question form and stated that it should appropriate for the questions to be all in a positive statement making it easier for respondents to answer it.

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3.9.2 Reliability

For this section, researcher had pilot test 30 SMEs from outside of the sampling area to test out the questionnaires. The researcher would want to know if the questionnaires are valid or not through Cronbach Alpha. The result is that all of the questionnaires are valid based on the Table 3.10.

Table 3.10: Cronbach's Alpha

Independent Variables	Cronbach's Alpha
Knowledge	0.798
Behaviour	0.630
Awareness	0.788
Policy	0.765
E-Waste Management Performance	0.863

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Table 3.10 shows the purpose using Cronbach's Alpha is to evaluate the pilot test instruments' internal consistency in a scale. Cronbach's Alpha value below 0.6 is considered poor, 0.6 to 0.69 considered acceptable, 0.7 to 0.89 considered good and 0.9 to above considered excellent. The results show that the Cronbach Alpha value for knowledge (α=0.798), behaviour (α=0.630), awareness (α=0.788), policy (α=0.765) and e-waste management performance (α=0.863). All of the results are good except for knowledge which is acceptable. Based on the results, the results are valid and positive.

3.10 Chapter Summary

This chapter discussed the research framework and summary of research hypotheses, research design, population, sample and sampling technique. The research also explained the questionnaire design, research measurement, data collection and data analysis technique. The next chapter will be discussed about the data analysis in terms of demographic, normality, reliability, correlation, regression and summary hypothesis.

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CHAPTER 4
DATA ANALYSIS AND FINDINGS

4.1 Introduction

This chapter discusses about the response rate of survey, demographic analysis, data screen and cleaning, normality analysis, reliability analysis, hypothesis test and result analysis hypothesis.

4.2 Response Rate of Survey

In research, the percentage of people who fill out and return a survey or questionnaire relative to the total number of people who were invited or qualified to participate is known as the response rate of survey. It is used to determine the efficacy and representativeness of the survey sample and is commonly reported as a percentage (Wu et al., 2022). For this study, the researcher distributed 450 questionnaires and only 400 respondents completed the questionnaires. Based on the Krejcie and Morgan's Table, the researcher only needs to gather 382. Since the researcher manage to get 400, the researcher will analyse them all but the result will still be the same as 382.

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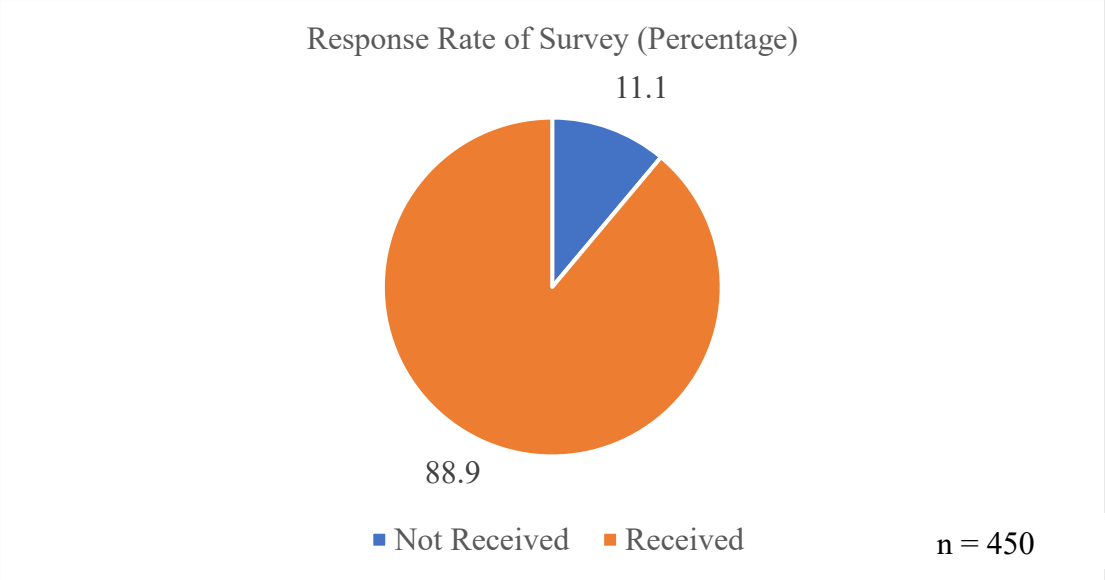

Figure 4.1: Response Rate of Survey

n = Number of Respondents

Figure 4.1 shows the chart of response rate of survey. The researcher has distributed a total of 450 questionnaires to the respondents (SMEs) through online and physical. For the online is through WhatsApp and email using google form and for physical is going places by places by printing out the questionnaires and distributed it. Only 400 questionnaires were received (88.9 percent) and the rest which is 50 questionnaires (11.1 percent) have not been received and not fully completed. In other words, 88.9 percent of the respondents have completed the questionnaires All physical questionnaires have been received which is 310. As for online, the researcher distributed 140 questionnaires but only received 90. Because of this, the researcher finds it difficult to find respondents through online due to time limitation. The first plan was to fully online gathering method but due to this problem, the researchers had no choice but to give the questionnaires physically by going to the SMEs. For some research contexts, physical questionnaires may be preferable to online ones because they offer a number of benefits, including a higher response rate among specific demographics, a tangible reminder for participants, and a lower risk of technological barriers or distractions that could prevent completion. Furthermore, physical surveys may be favoured in environments with limited internet access or technical skill since they can foster a more personal connection with responders.

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4.3 Demographic Analysis

According to Klimczuk (2021), demographic analysis is the study of human populations and the variations in their size due to migration, fertility, and death is commonly referred to as demography. The Greek word from which the word demography derives means "describing people." As a result, this field studies demographic characteristics, accounting for elements like the sex ratio, age distribution, composition, regional distribution, and population density. Furthermore, a distinction

is occasionally made between "population studies," which examine the causes and effects of changes in the population's structure in a larger context and in relation to other phenomena and processes, and "formal demography," or "demographic analysis," which includes the statistical analysis of population parameters and their dynamics (Robert et al., 2021).

For this research, the demographic questions consist of 7 which are gender, race, age, marital status, education, organization established year and organization variety/type. This facilitates the analysis and interpretation of data by researcher in relation to various demographic groupings, which can spot trends and draw more precise conclusions about the population.

4.3.1 Gender

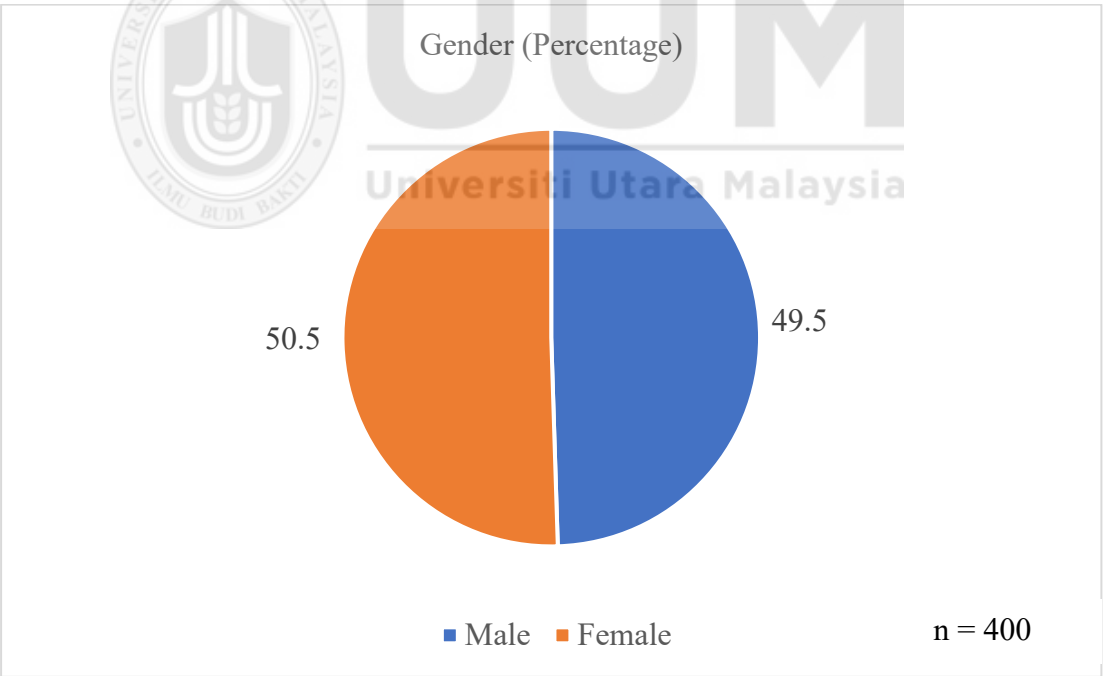

Figure 4.2: Gender

n = Number of Respondents

Figure 4.2 shows female is greater than men. There is a total of 400 SMEs with 1 representee. The above chart demonstrates that the proportions of SMEs in Kedah,

Perlis and Penang are comparable, with orange representing female (50.5 percent) and blue representing male (49.5 percent). The data highlights a gender-balanced representation, highlighting a consistent demographic profile. A possible reason for the observed gender imbalance in SMEs might be that specific industries, including retail, restaurants, and healthcare, which have historically been dominated by SMEs, have historically attracted a higher proportion of female employees. Furthermore, as compared to bigger organisations, SMEs may provide a more welcoming and encouraging work atmosphere, which may appeal to female employees looking for a feeling of belonging and more influence over decision-making.

4.3.2 Race

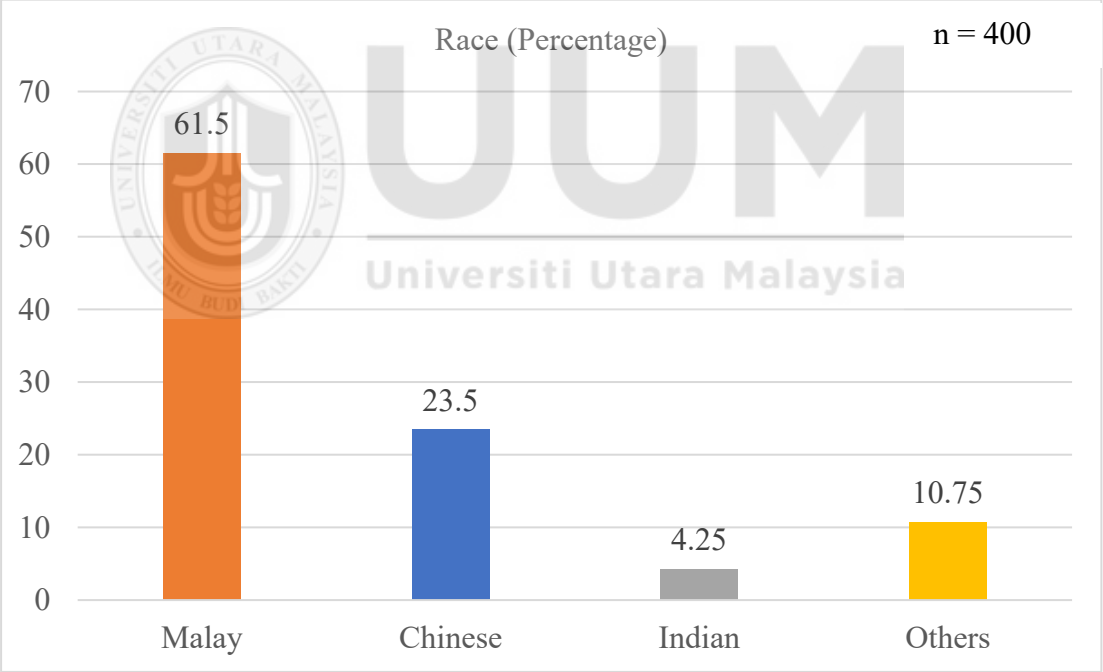

Figure 4.3: Race

n = Number of Respondents

Based on Figure 4.3, there are four types of races of respondents which are "Malay", "Chinese", "Indian", and "Others". The histogram chart shows the race background of the population, with Malay being the biggest race group, followed by Chinese, Others and a minor category as Indian. Malay represents the orange are the

highest population race group, with 61.5 percent of the total sample. Chinese represents the blue are the second highest race group, with 23.5 percent. With 10.75 percent of the population, Others which represents the yellow are the third highest race group. The race group Indian represents the grey, a small portion of the population, with only 4.25 percent of the total population. Indians are a small but important population that adds to the diverse mix of northern region of Malaysian SMEs, with Malays making up the majority and Chinese and other races following. The higher percentage of Malay workers in SMEs than in Chinese, Indian, and other ethnic groups can probably be attributed to socioeconomic and cultural factors which are Malays' language advantages, geographic dispersion, and cultural propensities towards SMEs employment are some of the major contributing factors to this difference.

4.3.3 Age

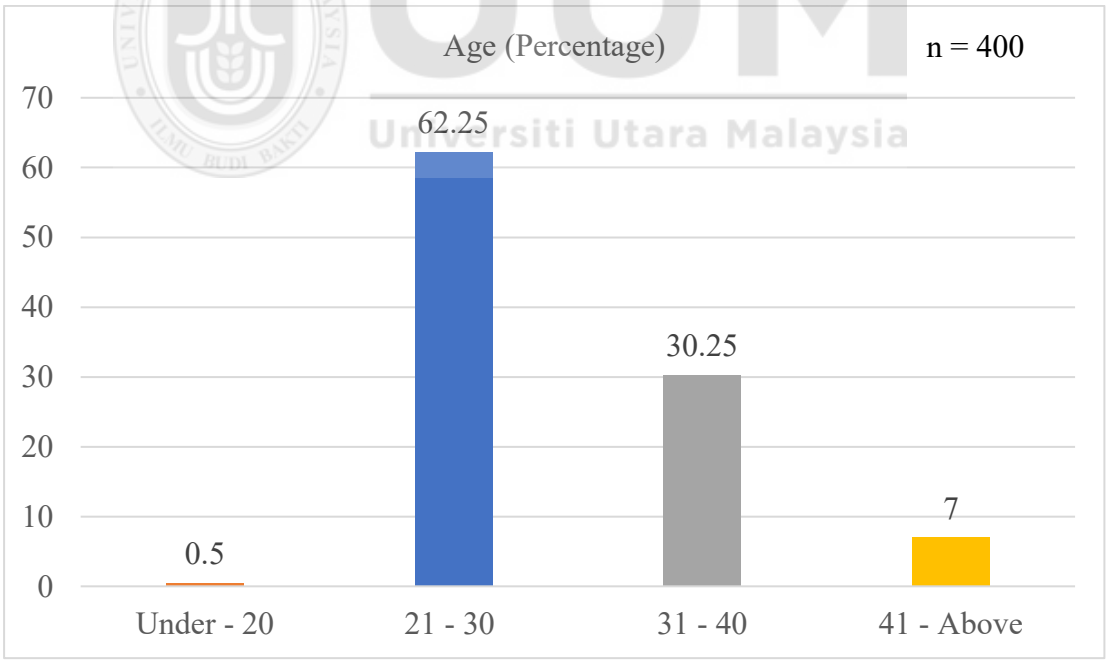

Figure 4.4: Age

n = Number of Respondents

Figure 4.4 shows there are four categories of age of the respondents which are "Under- 20", "21-30", "31-40", and "41-Above". The chart shows the age background

of the population, with the age “21-30” being the largest group, followed by age “31-40”, “41-Above”, and “Under-20”. Age “21-30” (blue) are the highest percentage, with 62.25 percent of the total population. Age “31-40” (grey) are the second highest percentage, with 30.25 percent. With 7 percent of the result, age “41-Above” (yellow) is the third highest percentage. The minor category with only 0.5 percent shows the age “Under-20” (orange). In short, SMEs representative between ages of “21-30” are the most common in Kedah, Perlis, and Penang, while those between the ages of “31-40” and “41-Above” are the majority, and those “Under-20” are the smallest group. A possible reason for the higher proportion of workers in northern region of Malaysian SMEs between the ages of 21 and 30 might be the ubiquity of younger people looking for work, who are frequently distinguished by their agility, flexibility, and readiness to take on entry-level roles in SMEs. In addition, they are more knowledgeable in terms of e-waste.

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4.3.4 Marital Status

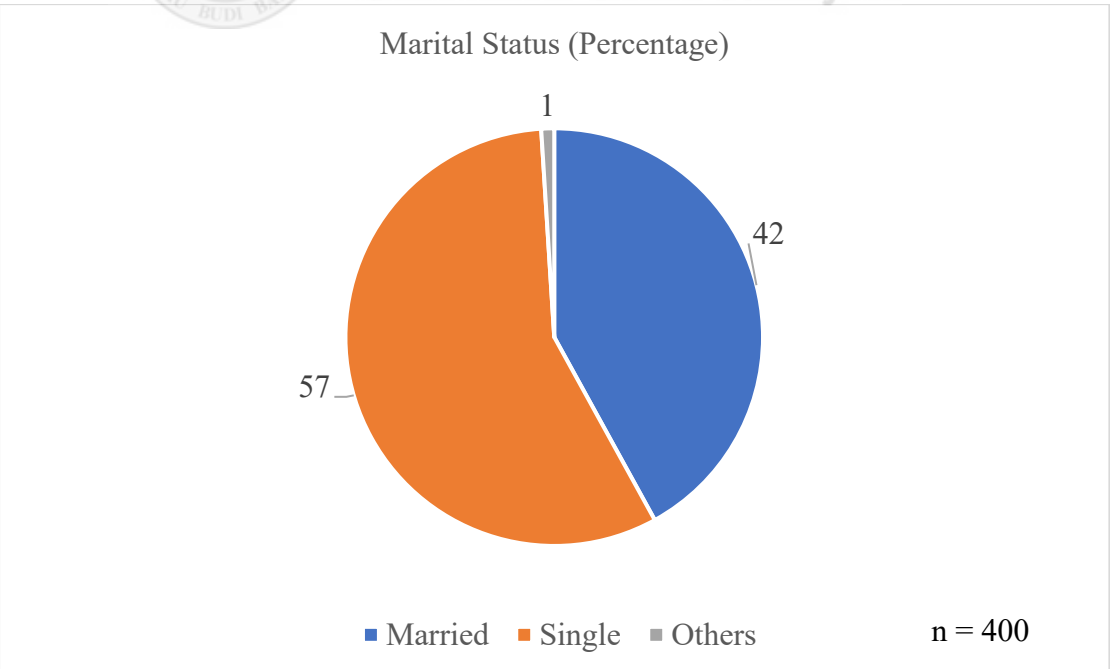

Figure 4.5: Marital Status

n = Number of Respondents

Based on Figure 4.5, there are four category of marital status which are “Married”, “Single”, and “Others”. The highest percentage are “Single” which represents the orange colour with 57 percent, this shows a high proportion of single SMEs representative. The second highest result are “Married” which represents the blue colour with 42 percent, this category shows a significant number of SMEs representatives that are married. The lowest percentage is “Others” which represents the grey colour with only 1 percent of the total number of SMEs representative. There could be a straightforward explanation for why there are more single employees than married employees in northern region of Malaysian SMEs, single people might be more willing to accept entry-level jobs or put in longer hours because they may have fewer responsibilities related to their families than married or others like divorced people, who might have greater responsibilities and find it harder to balance work and life. In summary, “Single” represents the majority, followed by significant additions from the ‘Married” and “Others”. Marital status has a notable impact on quality of life, showing that single men generally experience lower quality of life compared to married men, with this relationship varying across gender and age groups (Han et al., 2014). People's quality of life influences e-waste generation and management by affecting consumption habits, awareness, access to technology, and socioeconomic status, impacting both the quantity of e-waste generated and the effectiveness of disposal practices.

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4.3.5 Education

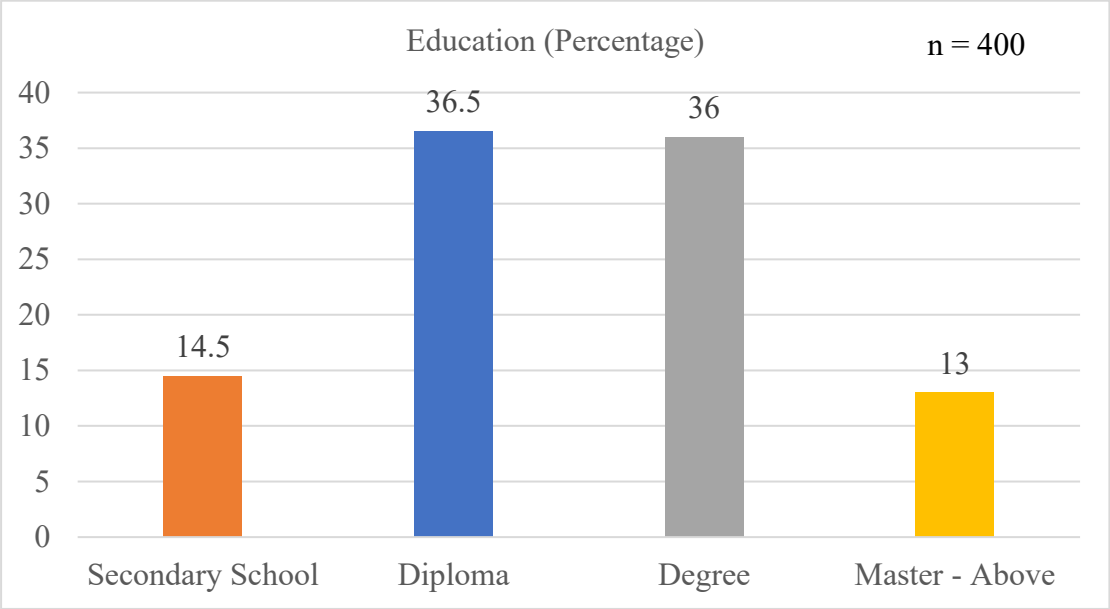

Figure 4.6: Education

n = Number of Respondents

Based on the results in Figure 4.6, the education identified in four category such as "Secondary School", 'Diploma", "Degree", and "Master-Above". The highest education from the representatives is "Diploma" (blue) with 36.5 percent of the population and "Degree" (grey) with the second highest percentage of 36 percent. Third highest percentage are "Secondary School" (orange) with 14.5 percent and the least are 'Master-Above" (yellow) with 13 percent. A straightforward explanation for the higher proportion of workers with diplomas in northern region of Malaysian SMEs compared to those with secondary school, bachelor's, or master's degrees could be that diploma programmes frequently provide more practical and vocational training catered to particular job roles, making diploma holders more directly employable for certain positions within SMEs. In conclusion, the majority of the respondents have "Diploma", representing an employee base with an effective academic basis. "Secondary School" and "Degree" are also important, showing a wide group of employees with different

levels of education. While less frequent, the “Master-Above” may represent a least but possibly specialist section of the SMEs population.

4.3.6 Organization Established Year

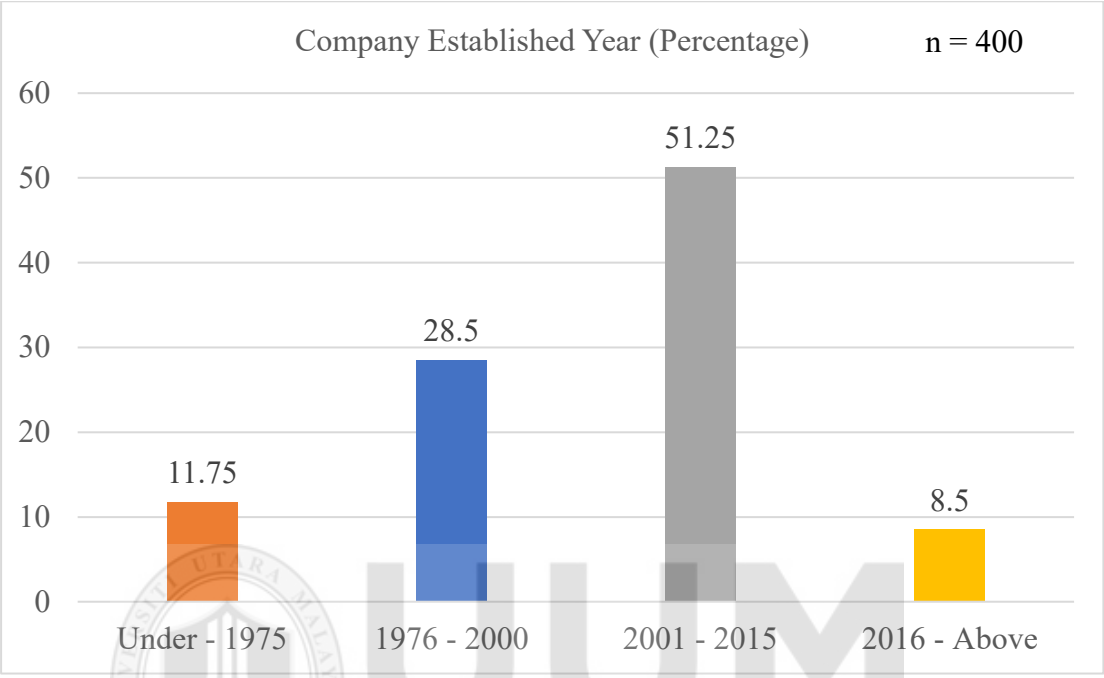

Figure 4.7: Organization Established Year

n = Number of Respondents

Four categories of company establishment year are shown in Figure 4.7, "Under-1975," "1976-2000," "2001-2015," and "2016-Above." The graph displays the SMEs' formed year background, with "2001-2015" being the largest value, followed by "1976-2000," "Under-1975," and a smaller category, "2016-Above." Among all SMEs, "2000-2015" (grey) represents the largest share with 51.25 percent. With 28.5 percent, "1976-2000" (blue) are the second-highest. "Under-1975" (orange) has the third-highest percentage, at 11.75 percent. At just 8.5 percent, the category "2016-Above" (yellow) only makes up a tiny fraction of SMEs. In summary, the majority is represented by "2001-2015," with notable contributions from the other groups coming after.

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4.3.7 Organization Variety

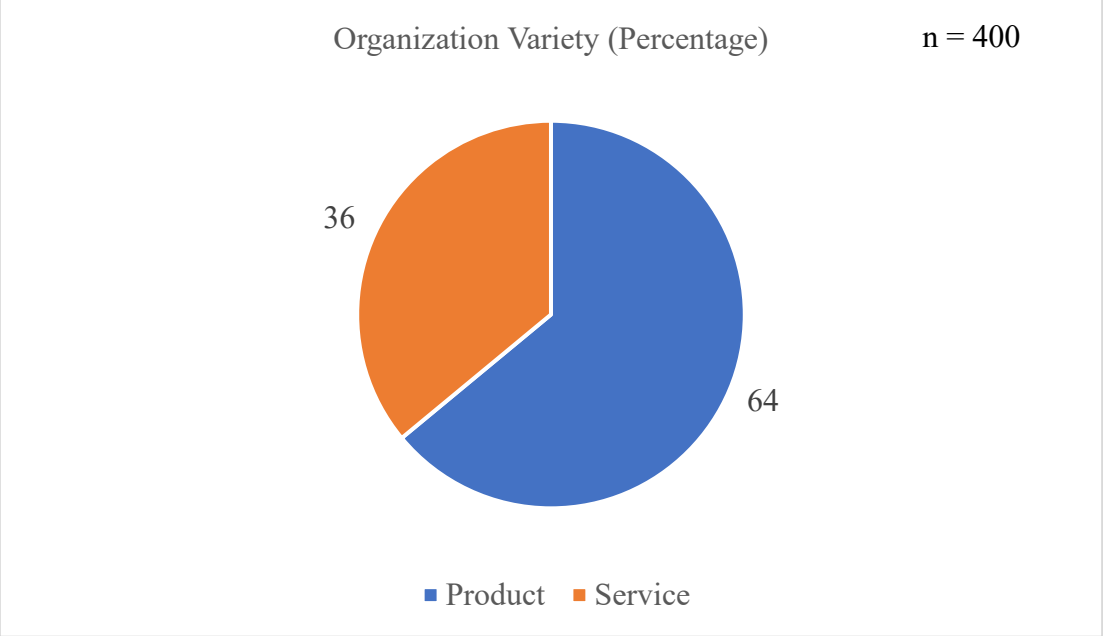

Figure 4.8: Organization Variety

n = Number of Respondents

Based on Figure 4.8, business models in two variety which are "Product" and "Service". From the results above, the "Product" is higher than "Service" business models. Product (blue) with 64 percent while "Service (orange) with 36 percent. The general popularity of the "Product" business models shows that SMEs have an important function in manufacturing and physical products industries. Although "Service" is a smaller section, it also reflects the importance of service-oriented activities among the SMEs. This might include a variety of professional services, shows the variety of corporations performing in the service sector. One straightforward explanation for why there are more product-focused SMEs in northern region of Malaysia than services-focused SMEs could be that the manufacturing and product-based industries have a stronger legacy and infrastructure than services-based industries, including supply chains, technology, and resource access. In conclusion, the larger proportion of respondents employing the "Product" business model shows an interest

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in physical manufacturing. The presence of the “Service” business model shows a number of business environment which involves intangibles goods and professional services.

4.3.8 Demographic Summary

The study's results provide a thorough demographic summary of 400 SMEs, highlighting a range of factors like response rate, gender, age, race, and marital status in addition to education, firm creation year, and organisation type. Notably, for the response rate of survey, the researcher received around 88.9 percent from the total distribution. In other words, 88.9 percent of the respondents have completed the questionnaires. Compared to online techniques, physical questionnaires had a greater response rate of survey, highlighting the difficulties associated with online outreach. Malays made up the majority of the racial demography (61.5 percent), although gender representation was balanced with a mix of male and female representatives. 62.25 percent of the SMEs representatives were between the ages of 21 and 30, which may indicate that they were prepared for entry-level positions. Among those with marital statuses, single people made up the greatest number (57 percent) presumably because of their more flexible work schedules. With a 36.5 percent educational attainment, diploma holders made up the highest group. This is likely due to the practical training that is frequently included in vocational programmes. The majority (51.25 percent) were SMEs founded between 2001 and 2015, indicating a developed business environment. Moreover, firms that prioritised their products outperformed those that were service-oriented (64 percent vs. 36 percent), demonstrating northern region of Malaysia's dominance in manufacturing. Table 4.1 shows the demographic summary of all the demographic analysis.

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Table 4.1: Demographic Summary

Demographic	**Type (Percent %)**				**n**
Gender	Male	Female			
	49.5	50.5			400
Race	Malay	Chinese	Indian	Others	
	61.5	23.5	4.25	10.75	400
Age	Under – 20	21 -30	31 – 40	41 – Above	
	0.5	62.25	30.25	7	400
Marital Status	Married	Single	Others		
	42	57	1		400
Education	Secondary School	Diploma	Degree	Master – Above	
	14.5	36.5	36	13	400
Organization Established Year	Under – 1975	1976 – 2000	2001 – 2015	2016 – Above	
	11.75	28.5	51.25	8.5	400
Organization Variety	Product	Service			
	64	36			400

n = Number of Respondents

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4.4 Data Screening and Cleaning

The quality of the initial data screening and cleaning determines the quality of an approved analysis. The achievement of data screening in multivariate analysis is essential and forms the basis for any significant result from quantitative research (Chai, 2020). The calibre of the preliminary data screening determines the calibre of the analysis and its results. However, proof reading is difficult with huge data sets, therefore one must examine the data using descriptive statistics and readily available computer

applications (Saidu et al., 2023). The researcher has the chance to find hidden faults in computer software that may not be found in other methods. First off, the researcher will be able to interpret the data with clarity since they are well-versed in the interrelationships that exist among the variables. Second, knowing how to properly filter and examine data is essential to meeting the assumptions of multivariate data analysis. Using SPSS tools, both normality and hypothesis tests were used for the data screening and assessment First off, the researcher will be able to interpret the data with clarity since they are well-versed in the interrelationships that exist among the variables. Second, knowing how to properly filter and examine data is essential to meeting the presumptions of multivariate data analysis (Chai, 2020).

Using SPSS tools, both normality and hypotheses tests were used for the data screening and cleaning. The researcher only has twelve weeks to complete this study. The data collection phase is 4 weeks (January 28th, 2024, to February 27th, 2024). 450 questionnaires were distributed out in accordance with the survey's guidelines, and only 400 respondents have completed the questionnaire.

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4.4.1 Normality Analysis

In research, determining whether a dataset has a normal distribution, which is represented by a symmetrical bell-shaped curve, is known as "normality analysis". Researchers can use this analysis to better understand the distribution of their data and decide which statistical tests or hypotheses should be used in subsequent investigations (Khatun, 2021). In research, a normality test is a statistical technique that determines if a sample's data distribution follows a normal distribution, sometimes referred to as a Gaussian distribution or bell curve. Researchers can determine if data fulfils the assumptions of specific statistical procedures, such parametric tests like t-tests and ANOVA, by looking at the distributional form of the data. This test aids in the decision-

making process for researchers on the suitability of statistical studies and the dependability of their findings.

Examining the skewness and kurtosis values of the data is another method for determining if it is normal. Orçan (2020) stated that there is disagreement on the values that denote normalcy, despite the fact that skewness and kurtosis measurements are frequently used in practice. Some people propose that skewness and kurtosis up to an absolute value of 1 may represent normalcy, while others propose far higher skewness and kurtosis values to represent normality. "The absolute values of skewness and kurtosis less than 1.0 as slight nonnormality, the values between 1.0 and about 2.3 as moderate nonnormality, and the values beyond 2.3 as severe nonnormality" is how the researchers classified nonnormality.

Table 4.2: Skewness and Kurtosis Value

Variable	**Knowledge**	**Behaviour**	**Awareness**	**Policy**	**E-Waste Performance**
Skewness	-0.472	-0.396	-0.102	-0.216	-0.391
Kurtosis	0.240	0.748	-0.111	0.133	0.438

Table 4.2 shows the data at hand indicates that the following independent variables have slightly negatively skewed distributions: knowledge (Kurtosis = -0.472), behaviour (Kurtosis = -0.396), awareness (Kurtosis = -0.102), and policy (Skewness = -0.216). Their Kurtosis values indicate that these variables are near-normally peaked: knowledge (Kurtosis = 0.240), behaviour (Kurtosis = 0.748), awareness (Kurtosis = -0.111), and policy (Kurtosis = 0.133), with the exception of behaviour, which is moderately peaked (Kurtosis = 0.748). In a comparable way, the dependent variable e-waste performance has a distribution that is moderately peaked (Kurtosis = 0.438) and

somewhat negatively skewed (Skewness = -0.391), similar to the pattern seen in behaviour. This shows that although the majority of independent variables have distributional patterns that are comparable to each other, behaviour stands out as having a heavier-tailed distribution.

4.4.2 Reliability Analysis

In research, reliability analysis is evaluating the stability and consistency of measuring methods or equipment to make sure they produce consistent results over time and under various circumstances. One of the most used dependability metrics in the social and organisational sciences is Cronbach's alpha. A statistical metric called Cronbach's alpha, also known as Cronbach's coefficient alpha or Cronbach's alpha, is used in research to evaluate the internal consistency or dependability of a scale or questionnaire (Amirrudin et al., 2020). It measures how closely connected and measuring the same underlying construct items are in a scale or instrument. Greater consistency across items is indicated by higher Cronbach's alpha values, which may imply improve measuring device reliability (Bonett & Wright, 2014). As of right now, Cronbach's alpha reliability sample values are presented, however, a confidence interval for the population reliability value should also be provided.

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Table 4.3: Cronbach's Alpha Value

Variable	Cronbach's Alpha	Number of Items
Knowledge	0.750	6
Behaviour	0.662	6
Awareness	0.714	6
Policy	0.636	6
E-Waste Management Performance	0.720	4

Table 4.3 shows the purpose using Cronbach's Alpha is to evaluate the instruments' internal consistency in a scale. Cronbach Alpha value below 0.6 considered poor, 0.6 to 0.69 considered acceptable, 0.7 to 0.89 considered good and 0.9 to above considered excellent. The results show that the Cronbach Alpha value for knowledge (α=0.750), behaviour (α=0.662), awareness (α=0.714), policy (α=0.636) and e-waste performance (α=0.720) are all considered good.

4.5 Descriptive Statistics

In research, descriptive statistics refer to techniques used to enumerate and characterise the fundamental characteristics of data gathered from a study. It comprises statistics like range, standard deviation, mean, median, and mode (Kaur et al., 2018). By outlining the correlation between the variables in a sample or population, descriptive statistics help organise and summarise data. When doing research, calculating descriptive statistics is an essential initial step that should always come before performing inferential statistical comparisons (Dong, 2023). The mean, often referred to as the average, is a central tendency metric that expresses a group of data' typical value. It is computed by taking the total number of values in a data collection and dividing by that total (Andrade, 2020). A set of data points' dispersion or spread around the mean is measured by the standard deviation. It shows the degree of variation between individual data points and the mean. Greater variability within the data set is indicated by a higher standard deviation, whereas closer proximity to the mean is suggested by a smaller standard deviation (Chi et al., 2023). Table 4.4 shows the descriptive statistics of all the variables in terms of means and standard deviation.

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Table 4.4: Descriptive Statistics

Variable	Mean	Std. Deviation
Knowledge	3.8017	0.66518
Behaviour	3.8325	0.56306
Awareness	3.7971	0.63050
Policy	3.7071	0.60234
E-Waste Management Performance	4.0175	0.61518

For knowledge, the mean is 3.8017 and standard deviation is 0.66518. For the second independent variable which is behaviour, the mean is 3.8325 and standard deviation is 0.56306. Awareness mean is 3.7971 is standard deviation is 0.63050. Policy mean is 3.7071 and standard deviation is 0.60234. The dependent variable which is e-waste management, the mean is 4.0175 and standard deviation is 0.61518.

4.6 Hypothesis Development Test

In research, developing clear testable predictions or assertions on the anticipated relationship between variables is referred to as hypothesis development. This usually include determining the variables of interest, reviewing the literature, and formulating research hypotheses that will be empirically evaluated. A hypothesis is an attempt by the researcher to "guess" or "find" the solution to the issue that the observation raised (Mourougan & Sethuraman, 2017). Researchers can draw conclusions about the population parameter by computing a test statistic from the sample data and figuring out the likelihood of seeing such extreme findings. Scholars may reject the hypothesis in favour of a different explanation if the observed outcomes seem unlikely to fit the presumptive explanation. Table 4.5 shows the hypothesis development test of this research.

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Table 4.5: Hypothesis Development

Hypotheses	Statement
Hypothesis 1 (H1)	*Knowledge significantly influenced e-waste management performance among SMEs in the northern region of Malaysia.*
Hypothesis 2 (H2)	*Behaviour significantly influenced e-waste management performance among SMEs in the northern region of Malaysia.*
Hypothesis 3 (H3)	*Awareness significantly influenced e-waste management performance among SMEs in the northern region of Malaysia.*
Hypothesis 4 (H4)	*Policy significantly influenced e-waste management performance among SMEs in the northern region of Malaysia.*
Hypothesis 5 (H5)	*Knowledge, awareness, behaviour and policy significantly influenced e-waste management performance among SMEs in the northern region of Malaysia.*

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4.6.1 Pearson Correlations (r)

The statistical metric known as person correlations, or "r," is frequently employed in research to evaluate the direction and intensity of a link between two continuous variables. It evaluates the degree to which the values of two variables are almost identical. Positive values of the correlation coefficient "r" indicate a positive association between the variables, negative values indicate a negative relationship, and zero indicates no relationship at all (Samuels & Gilchrist, 2014). The correlation coefficient "r" spans from -1 to +1. The strength (represented by the coefficient r between -1 and +1) and existence (shown by the p-value) of a linear relationship between two variables are measured using Pearson correlation. A statistical indicator of the direction and intensity of a linear relationship between two continuous variables is Pearson correlation. A perfect negative linear relationship is represented by a value

of -1, no linear relationship is represented by a value of 0, and a perfect positive linear relationship is represented by a value of 1. Pearson correlation coefficients are computed in SPSS to evaluate the relationship between variables. Between each independent variables and between independent variable and dependent variable. For example, if one of the independent variables is positive then it is positive relationship. It means if the independent variable increase or decrease, then the dependent variable will follow it. But if its negative relationship, then it will have an opposite effect.

Table 4.6: Pearson Correlation

Independent Variables	Pearson Correlation
Knowledge	0.291
Behaviour	0.425
Awareness	0.473
Policy	0.483

Table 4.6 shows the variable mean e-waste performance (DV) exhibited a moderate positive correlation with behaviour (IV2) (r = 0.425), awareness (IV3) (r = 0.473) and policy (IV4) (r = 0.483), indicating a robust relationship between these variables. On the other hand, variable mean e-waste performance (DV) showed a weak correlation with knowledge (IV1) (r = 0.291). In summary, the results indicate that the higher level of positive correlations of the independent variables (knowledge, behaviour, awareness, policy), the higher level of e-waste performance (DV). All the relationships are positive and significant.

4.6.2 Multiple Regression

Analysis that is versatile is multiple regression. The link between a dependent and an independent variable is displayed by simple linear regression. In addition to

modelling and accounting for the impacts of extra independent variables, multiple regression may also take interaction effects into account (Rosenthal, 2017). A statistical analysis method called multiple regression is used in research to look at the link between one or more independent variables and one or more dependent variables. While accounting for the influence of other factors, it enables researchers to evaluate the relationship between changes in the independent variables and changes in the dependent variable. By taking into account their simultaneous impacts, the method produces a regression equation that calculates the influence of each independent variable on the dependent variable (Holmes & Rinaman, 2014).

Table 4.7: Multiple Regression (r)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.548	0.300	0.293	0.51720

Predictors: (Constant), meanKnowledge, meanBehaviour, meanAwareness, meanPolicy

Dependent Variable: meanEWastePerformance

Table 4.7 shows the model summary indicates that the knowledge (IV), behaviour (IV), awareness (IV), policy (IV) and e-waste performance (DV) have a moderate positive relationship with a value of 0.548. This shows that the IV may around 55 percent of the changes in the DV, showing a clear and moderate relationship. A R-Square value is greater than 0.1 indicates that the model is moderately effective in determining relationships. The value is 0.3, which is acceptable.

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4.6.3 The Result of Analysis Hypothesis Testing

The act of analysing and assessing study results in light of suggested hypotheses or research questions is known as result analysis hypothesis in research. It entails determining if the gathered information confirms or contradicts the put-out hypotheses and making judgements in light of the analysis of the facts. This stage is essential for comprehending the implications of the research findings and assessing their importance in relation to the goals of the study. Table 4.8 and Table 4.9 shows the result analysis hypotheses.

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Table 4.8: Result Analysis Hypothesis 1 to Hypothesis 3

Hypothesis	**Statement**
Knowledge significantly influenced e-waste management performance among SMEs in the northern region of Malaysia (H1)	A correlation value of 0.291 indicates that knowledge (IV1) and e-waste performance (DV) have a poor relationship, according to the investigation. Even while it isn't as strong as it is with other factors, the positive correlation nonetheless points to a link.
Behaviour significantly influenced e-waste management performance among SMEs in the northern region of Malaysia (H2)	When compared to knowledge, behaviour (IV2) shows a moderately positive connection (r = 0.425) with e-waste performance (DV), indicating a larger effect.
Awareness significantly influenced e-waste management performance among SMEs in the northern region of Malaysia (H3)	E-waste performance (DV) and awareness (IV3) have a comparable moderately positive association (r = 0.473), suggesting that awareness has a big impact on performance.

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Table 4.9: Result Analysis Hypothesis 4 to Hypothesis 5

Hypothesis	**Statement**
Policy significantly influenced e-waste management performance among SMEs in the northern region of Malaysia (H4)	Of the independent variables, policy (IV4) had the highest correlation (r = 0.483) with e-waste performance (DV), indicating a significant effect on performance.
Knowledge, awareness, behaviour, and policy significantly influenced e-waste management performance among SMEs in the northern region of Malaysia (H5)	The findings are consistent with hypotheses 1, 2, 3, and 4, suggesting that e-waste management performance (DV) among SMEs in the Northern area is significantly and favourably impacted by all independent variables (knowledge, behaviour, awareness, and policy).

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4.6.4 Multiple Regression Formula

Regression coefficients are provided in column Unstandardized 'B' of the coefficient table in Table 4.10, which aids in determining the regression equation. The first is the y intercept, or constant, and the second is the dependent variable's (Y) regression coefficient on the independent variable (X).

Table 4.10: Coefficient Table

Model	Unstandardized B	Significant
(Constant)	1.629	< 0.001
meanKnowledge	-0.129	0.019
meanBehaviour	0.265	< 0.001
meanAwareness	0.213	< 0.001
meanPolicy	0.284	< 0.001

Dependent Variable: meanEWastePerformance.

The following formula represents the use of multiple regression as a statistical tool in research to examine the connection between a dependent variable (y) and two or more independent variables (x):

$$y = a + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4$$

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Note: y is the dependent variable. a is the intercept. b_1, b_2, b_3 …… b_n are the coefficients representing the effect of each independent variable. x_1, x_2, x_3 …… x_n are the independent variables.

Researchers can forecast or explain the behaviour of the dependent variable based on the values of the independent variables by examining how changes in the independent variables correlate to changes in the dependent variable. The method calculates coefficients for each independent variable while accounting for the impact of other variables in the model to estimate the direction and intensity of these associations (Karuna et al., 2021).

$$y = 1.629 + (-0.129)x_1 + (0.265)x_2 + (0.213)x_3 + (0.284)x_4$$

$$= 2.262$$

The relationship between the independent variables X and the dependent variable Y is expressed in this equation. Each independent variable's impact on the dependent variable is displayed by the coefficients. The final result, 2.262, represents the overall constant item in the equation, the anticipated value of Y when all independent variables have been set to zero. In this instance, correctly interpreting the coefficients requires a grasp of the units of measurement for the Y and X variables.

Because the p-values of Hypotheses 2, 3, and 4 are less than 0.05, the linear regression analysis indicates that these variables have significantly positive connections with the dependent variable (DV), indicating that greater levels of DV are correlated with increases in behaviour, awareness, and policy. The p-value for hypothesis 1 (knowledge) is higher than 0.05, particularly 0.019, indicating a strongly negative connection with DV. This suggests that lower DV levels are linked to an increase in knowledge.

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All things considered, the study shows that, in comparison to knowledge, behaviour, awareness, and policy have larger positive relationships with e-waste management performance. Furthermore, the model summary indicates a moderate link between the independent variables (knowledge, behaviour, awareness, and policy), which taken together account for approximately 55 percent of the variance in e-waste management performance. This suggests that SMEs in the northern region of Malaysia's e-waste management performance is significantly influenced by these factors.

4.7 Summary Hypothesis

The purpose of the research was to evaluate how different factors affected the performance of e-waste management among SMEs in the northern region of Malaysia. To find out how knowledge, behaviour, awareness, and policy affected the effectiveness of e-waste management, hypotheses were developed. The findings showed that although there was little association between knowledge and e-waste performance, there was a moderately high correlation between behaviour, awareness, and policy, with policy demonstrating the strongest relationship. A moderate association was established, with the independent factors accounting for around 55 percent of the variance in e-waste management performance. The results validate the hypotheses by indicating that e-waste management performance among SMEs in the northern region of Malaysia is heavily influenced by behaviour, awareness, and policy. This underscores the significance of these elements in fostering efficient e-waste management practices.

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Table 4.11: Summary Hypothesis Table

Hypotheses	Hypothesis Statement	Result
Hypotheses 1 (H1)	*Knowledge significantly influenced e-waste management performance among SMEs in the northern region of Malaysia.*	Supported
Hypotheses 2 (H2)	*Behaviour significantly influenced E-waste management performance among SMEs in the northern region of Malaysia.*	Supported
Hypotheses 3 (H3)	*Awareness significantly influenced e-waste management performance among SMEs in the northern region of Malaysia.*	Supported
Hypotheses 4 (H4)	*Policy significantly influenced e-waste management performance among SMEs in the northern region of Malaysia.*	Supported
Hypotheses 5 (H5)	*Knowledge, awareness, behaviour, and policy significantly influenced e-waste management performance among SMEs in the northern region of Malaysia.*	Supported

Table 4.11 shows that all the hypothesis are significant. The findings generally confirm the connections investigated in the study, indicating positive support for the theoretical framework or research aims of the study when all research hypotheses are supported.

Universiti Utara Malaysia

4.8 Chapter Summary

This chapter discussed the response rate of questions and demographic analysis which consist of 7 demographic questions. The research also explained the data screening and cleaning, normality test, hypothesis test which consist of person correlations and multiple regressions and ends with the summary hypothesis. The next chapter will be discussed concerning the discussion and conclusion.

Universiti Utara Malaysia

CHAPTER 5
DISCUSSION AND CONCLUSION

5.1 Introduction

The study's discussion and conclusion are presented in this chapter. This study aimed to give precise information on the effectiveness of SMEs' knowledge, behaviour, awareness, and policies with regard to the performance of e-waste management in the northern region of Malaysia. This chapter summarises the study's research from Chapter 1 to Chapter 4, which is followed by the researcher's analysis of the findings. The study's primary findings are presented in the next section, which is followed by its contributions. The study's limitations and recommendations for the future come next. The final section is the study's conclusion.

5.2 Summary Research

This study explores the problem of managing e-waste with a special emphasis on SMEs in northern region of Malaysia. Examining how population expansion, technology development, and growing affluence all contribute to a rise in e-waste creation, this study intends to investigate how knowledge, awareness, behaviour, and legislation affect SMEs' ability to manage e-waste. The research aims to promote a more mindful business climate and contribute to discussions on sustainable development by examining these variables and their interactions. Despite time and budgetary limitations, the study is important for a range of stakeholders, including businesses, academic institutions, researchers, and participants. It provides information on how to enhance e-waste management procedures and SMEs compliance with regulations.

Several important variables, such as knowledge, behaviour, awareness, policy, and e-waste performance among SMEs in northern region of Malaysia, are described

and conceptualised in this study. The performance of e-waste management in SMEs is hypothesised to be highly influenced by knowledge, behaviour, awareness, and policy. These hypotheses are developed to investigate the links between these factors and e-waste management performance. The conceptual framework defines the mutual dependence of these factors, predicated on the idea that improved e-waste management techniques stem from increased cognizance, awareness, actions, and regulations. The underlying theories of diffusion of innovation and behavioural reasoning offer theoretical frameworks for comprehending how e-waste management inside SMEs is impacted by both individual actions and the spread of new practices.

This study uses a quantitative research approach to look at how knowledge, awareness, behaviour, and policy affect how well SMEs in northern region of Malaysia manage their e-waste. There are 122,623 SMEs in Pulau Pinang, Kedah, and Perlis, making up the population. Based on Krejcie and Morgan's Table, the researcher needs to gather 382 SMEs but since the researcher manage to get 400 SMEs, the researcher analysed them all using probability sampling, more precisely simple random sampling. The result will still the same as 382 SMEs. The questionnaire is divided into two sections: questions about demographics using a nominal scale, and questions about independent and dependent variables using an interval scale with a Likert-type rating scale. Both online and in-person techniques will be used to collect the data; questionnaires will be used to acquire primary data, and previous papers will be used to collect secondary data. For data analysis, including demographic analysis, hypothesis testing, Pearson correlation, and multiple regression, the SPSS will be used. The goal of this extensive study design is to offer insightful information about enhancing e-waste management procedures in SMEs, hence promoting environmental sustainability and regulatory compliance. The pilot test has been conducted by giving out the

Universiti Utara Malaysia

questionnaires to several candidates to test the validity of the questionnaires. The candidates are 3 students, 3 lecturers and 1 representative from an organization.

Using quantitative research methodologies, this study examines the factors impacting the performance of SMEs in northern region of Malaysia's e-waste management. The population is varied in terms of gender, race, age, marital status, education, year of establishment, and type of organisation, according to the demographic analysis. Only 88.9 percent of the respondents completed the questionnaires. For the majority of variables, skewness and kurtosis values show nearly-normal distributions, while Cronbach's alpha values show strong internal consistency. Positive correlations between knowledge, behaviour, awareness, policy, and e-waste performance are demonstrated by Pearson correlation analysis, and multiple regression analysis indicates that these components together explain almost 55 percent of the variance in e-waste management performance. The performance of e-waste management is strongly influenced by behaviour, awareness, and policy, with policy showing the largest correlation. Knowledge shows a weaker effect. Overall, the results show the role that behaviour, awareness, and policy play in helping SMEs in the northern region of Malaysia adopt efficient e-waste management procedures. They also point to opportunities for enhancing environmental sustainability and regulatory compliance within the e-waste ecosystem.

Universiti Utara Malaysia

5.3 Discussion Analysis Result

Important details on the characteristics of the respondent community emerged from the demographic study of 400 SMEs in northern region of Malaysia. Researchers had distributed 450 questionnaires and only 400 respondents completed it through online and physical gathering method. Based on the Krejcie and Morgan Table, researcher only need to gather 382 but since researcher manage to get 400, researcher

analysed them all. The result will still the same as 382. Furthermore, a balanced distribution of genders was seen among the respondents, the bulk of whom (61.5 percent) were Malay. 62.25 percent of the respondents were in the age range of 21 to 30 years old, which may suggest that SMEs representatives often hold entry-level jobs. Furthermore, the majority of respondents (57 percent) were unmarried and 42 percent were single. Marital status significantly influences quality of life, with single men typically experiencing lower quality of life than married men, a trend that varies across gender and age groups. Similarly, people's quality of life affects e-waste generation and management through its impact on consumption behaviours, awareness levels, technological access, and socioeconomic status, ultimately shaping the volume of e-waste produced and the efficiency of disposal methods. 36.5 percent of the respondents had diplomas, which is indicative of the flexible work hours and hands-on training that are frequently linked to vocational programmes. The majority of SMEs (51.25 percent) were founded between 2001 and 2015, indicating a developed business climate. Product-focused businesses surpassed service-oriented ones (64 percent vs. 36 percent), highlighting northern region of Malaysia's leadership in manufacturing.

Using SPSS tools, the hypothesis testing showed substantial correlations between the performance of e-waste management among SMEs in northern region of Malaysia and the independent variables (knowledge, behaviour, awareness, and policy). The first hypothesis (H1) proposed that knowledge had a substantial impact on the performance of e-waste management; a weak but positive association was shown by a correlation value of 0.291. According to hypotheses 2, 3, and 4 (H2, H3, H4), e-waste management performance was strongly impacted by policy, behaviour, and awareness, in that order. The behaviour (0.425), awareness (0.473), and policy (0.483) correlation coefficients showed moderate to significant positive correlations, supporting the

Universiti Utara Malaysia

hypothesis. Furthermore, the results corroborated hypothesis 5 (H5), which proposed that all independent factors had a substantial impact on the performance of e-waste management. Furthermore, a moderate association between the independent variables and the performance of e-waste management was found by the linear regression analysis, which accounted for around 55 percent of the performance variation.

The study's conclusions provide insight on how SMEs in northern region of Malaysia handle their e-waste, indicating a greater response rate for paper surveys and offering insightful demographic data. The performance of e-waste management was shown to be positively influenced by knowledge, while behaviour, awareness, and policy were found to be greater factors. This suggests the significance of proactive behaviours and supportive policy contexts. The need for focused interventions and regulations to support sustainable e-waste management practices is suggested by these findings, which have important ramifications for researchers, businesses, and legislators.

Universiti Utara Malaysia

Overall, the results point to the fact that although knowledge is important in how well SMEs in northern region of Malaysia manage their e-waste, behaviour, awareness, and policy have stronger and more substantial positive associations with performance. This emphasises how crucial it is for SMEs to have proactive practices, increased knowledge, and supporting policy frameworks in order to promote effective e-waste management procedures. Policymakers, companies, and researchers looking to improve e-waste management plans and advance sustainability in the area can benefit greatly from the study's findings.

5.4 Major Finding Study

The study's primary finding is that, although knowledge has an impact, behaviour, awareness, and policy have a greater influence on how well SMEs in northern region of Malaysia manage their e-waste. The results of the study showed that physical questionnaires received a higher response rate than online ones, suggesting difficulties with internet outreach because of the target respondents are SMEs which is difficult to collect large amount in a short period of time. The demographic study revealed a variety of respondents, with a notable proportion of SMEs having a product emphasis and having been established between 2001 and 2015. Significant connections between e-waste management performance and independent factors were found through pearson correlation, with policy having the highest positive correlation (0.483) followed by behaviour (0.425) and awareness (0.473).

The main finding of the research is that SMEs in northern region of Malaysia who manage their e-waste effectively are impacted by a variety of variables other than expertise alone. The study found that while having knowledge about e-waste management is unquestionably significant, it is not the only factor that determines how successfully SMEs manage their e-waste. Rather, three additional important elements were found by the research: awareness levels, behavioural practices, and the existence of supportive policy frameworks. This implies that managing e-waste requires a comprehensive strategy that goes beyond simply educating SMEs.

According to the study conducted by Ikhlayel (2018), SMEs that use proactive behavioural practices, such appropriate waste segregation and recycling procedures, often have better results with regard to e-waste management. Additionally, SMEs are more likely to implement responsible practices if they demonstrate a high degree of understanding on the legal and environmental ramifications of disposing of e-waste.

Universiti Utara Malaysia

SMEs' e-waste management methods are also greatly influenced by the existence of supportive policies, such as laws and incentives for sustainable waste management.

The implications of these discoveries for scholars, corporations, and politicians are significant. With this data, policymakers can create and execute efficient regulatory frameworks that encourage SMEs to manage their e-waste sustainably. In a similar vein, companies may use this information to create proactive plans for better e-waste management, improving their regulatory compliance and environmental sustainability credentials. Furthermore, by building on these findings, researchers may investigate the ways in which knowledge, behaviour, awareness, and policy interact to shape e-waste management practices, perhaps revealing new areas for intervention and advancement.

When compared to previous research, there are a number of significant gaps in the literature on e-waste management, especially when it comes to SMEs in Malaysia. First off, a large number of studies have been carried out outside of Malaysia, and the few that have focused on SMEs within the country are broad as to where they are located. Second, prior studies have focused more on residents and students than on SMEs, and when SMEs are included, the sample size is often limited due to case studies. Thirdly, the effect of knowledge, behaviour, awareness, and policy on e-waste management among SMEs has not been comprehensively studied in previous research. Studies like Leng and Muhammad Arif (2022), which focus largely on awareness and perceived behaviour control, and Maphosa et al. (2022), which highlight the lack of information and policy, both highlight this theoretical gap. Despite their importance, these and other studies overlook how all four independent variables should be integrated into a comprehensive structure. In order to overcome these constraints, this study combines and adapts the independent variables of knowledge, behaviour, awareness, and policy within the particular setting of SMEs in northern region of

Malaysia. The result is a more comprehensive understanding of e-waste management performance.

In summary, the study underscores the complexity of managing e-waste and stresses the value of adopting a comprehensive strategy that takes into account the several aspects affecting the practices of small and medium-sized enterprises. Stakeholders in northern region of Malaysia's SMEs sector may collaborate to promote a more sustainable and compliant approach to e-waste management by taking into account not just knowledge but also behaviour, awareness, and policy.

5.5 Contribution of the Study

By examining the connections between knowledge, awareness, behaviour, policy, and the effectiveness of e-waste management among SMEs in northern region of Malaysia, this study advances theory. Utilising well-established theoretical frameworks like behavioural reasoning and diffusion of innovation, the study improves our comprehension of how individual actions and the spread of novel practices affect e-waste management in SMEs. Moreover, this study's conceptual framework clarifies how these variables are interdependent, offering a disciplined foundation for further investigation into the sustainability and management of e-waste.

This study offers useful information to companies, regulators, and legislators that want to enhance e-waste management procedures. The study provides recommendations on designing targeted interventions and policies to improve environmental sustainability and regulatory compliance within SMEs. It does this by identifying the main implications of behaviour, awareness, and policy on e-waste management performance. The results may be used to guide the creation of industry standards, training curricula, and legislative frameworks that encourage SMEs to

manage their e-waste responsibly, lessening their impact on the environment and maximising their use of resources.

By taking part in this research, SMEs will be better able to comprehend how knowledge, awareness, behaviour, and policy shape their e-waste management strategies. The results provide SMEs with the knowledge and tools they need to improve their e-waste management performance, which in turn improves regulatory compliance, reduces costs, and helps the environment.

Universities gain from this study by helping to create and disseminate knowledge in the sustainability and management of e-waste fields. Universities contribute to the advancement of scholarly understanding of the intricate dynamics surrounding e-waste management in the context of SMEs by carrying out thorough research and publishing findings in academic publications. Universities are also essential for promoting cooperation between academics, business, and government in order to convert research results into workable solutions and advance sustainable development programmes.

Researchers have the chance to make a substantial contribution to a field of study that is crucial and has broad social ramifications through this research. Researchers can further their understanding of e-waste management, quantitative research methods, and multidisciplinary approaches to sustainability by planning and carrying out a thorough study. The research's conclusions raise the researcher's scholarly reputation, aid in their professional growth, and establish them as authorities on sustainability and e-waste management.

Universiti Utara Malaysia

5.6 Limitation of Study

Various limitations encountered throughout the study's completion duration are taken into account. The research limitation is the occurrence of an uncontrolled obstacle that develops during the study's completion term. The first limitation is distributing the questionnaires. Despite attempts to reach over 90 firms via email and messaging apps like WhatsApp, the researcher had trouble getting answers to the online questionnaires sent during the pilot test period. Within a week, a minimum response rate was only obtained, requiring a change in approach. The researcher physically delivered questionnaires to SMEs in the targeted locations of Kedah, Perlis, and Penang in order to reduce time limitations and increase response rates. Even with the continuous use of email distribution to supplement efforts and lighten work, in-person encounters produced a greater number of answers.

The second limitation is resource constraints. Budget and time restrictions were a problem for the study, especially throughout the lengthy distribution procedure that involved travel to several different regions. The researcher's own transportation fuel put further strain on the budget. A major logistical issue was also created by the time-consuming nature of physically distributing and gathering over 310 surveys for the physical gathering method. The time and money needed for data collection increased due to the researcher's reliance on personal transportation. As for online gathering method, the researcher had to ask for assistance from relatives and friends who are living in Pulau Pinang and Perlis to help distribute the questionnaires.

The third limitation is respondents' resistance and inaccurate responses. Some respondents showed disinterest by giving similar replies throughout the questionnaire, while others expressed unwillingness to participate or gave incorrect answers, claiming time restrictions. Such replies have to be eliminated in these cases in order to guarantee

Universiti Utara Malaysia

the accuracy and consistency of the data that was gathered. Time restrictions were mentioned by respondents as a barrier to completing the questionnaire, which the researcher found to be problematic because there are conflicting demands on respondents' schedules.

5.7 Future Recommendation

Based on the findings of the discussion analysis and the study's limitations, future recommendations should address the difficulties encountered during data collection by looking into alternate strategies like making better use of digital platforms, offering incentives for participation, and expediting the delivery of questionnaires in order to reduce time and resource constraints. Future research endeavours may concentrate on broadening the geographical reach to encompass a more varied selection of SMEs, executing mixed-method techniques to procure more comprehensive insights, and executing longitudinal studies to monitor alterations in e-waste management methodologies over time. In order to reduce errors and guarantee data dependability, efforts should also be taken to improve respondents' comprehension of the significance of timely and correct data reporting. Another is utilizing digital platforms more effectively, and expanding geographical not on in northern region of region but the entire Malaysia region reach for more comprehensive insights. To create targeted interventions and policies that promote sustainable e-waste management practices among SMEs in northern region of Malaysia, collaboration with industry stakeholders and policymakers is also advised. Additionally, long-term gains in performance and environmental sustainability may be attained by supporting capacity development programmes to increase SMEs' knowledge and awareness of best practices for managing e-waste.

Universiti Utara Malaysia

5.8 Summary Chapter

This chapter discussed the research summary from all the previous chapters. This chapter also explained about the discussion analysis result, major finding research, contribution, limitation of study and ends with future recommendation.

In conclusion, this study highlights the varied character of effective approaches and clarifies the challenges of e-waste management among SMEs in northern region of Malaysia. Although knowledge is important, behavioural patterns, awareness, and supporting policy frameworks are just as important in determining the results of e-waste management. The results highlight the necessity of an all-encompassing strategy that takes into account these interrelated elements in order to support compliant and sustainable e-waste disposal processes. Stakeholders may improve regulatory compliance and environmental sustainability in the SME sector by implementing supporting policies and utilising proactive measures. In addition to adding to the body of knowledge in academia, this research provides useful information for businesses, academics, and legislators that want to enhance e-waste management in northern region of Malaysia and elsewhere.

Universiti Utara Malaysia

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APPENDICES

APPENDIX A

PHYSICAL QUESTIONNAIRE

My name is **Muhammad Hakimi Bin Razak**. I am a Master's student from the University Utara Malaysia (UUM). I am currently in my final semester and conducting my final year project (thesis). My research titled "Knowledge, Behaviour, Awareness, and Policy Towards E-Waste Management Performance Among SMEs in Northern Region of Malaysia.

Thank you in advance for participating in my research study. Your valuable insights are crucial to my research. The questionnaires will be about a short demographic about yourself and e-waste about your organization. Please take a few minutes to complete the following questionnaire, providing honest and thoughtful responses. Your input will greatly contribute to the success of my research.

Your privacy is important to us. Rest assured that all the information you provide in this questionnaire will be treated with the utmost confidentiality. Please feel free to express your opinions openly and honestly. Thank you.

Muhammad Hakimi Bin Razak
mhakimiraz@gmail.com
019-821 5050

Section A: Demographic

Please circle the answers.

1. **What is your gender?**
   A. Male
   B. Female

2. **What is your race?**
    A. Malay
    B. Chinese
    C. Indian
    D. Others

3. **What is your age group?**
    A. Under 20
    B. 21 to 30
    C. 31 to 40
    D. 41 and over

4. **What is your marital status?**
    A. Married
    B. Single
    C. Other

5. **What is your highest level of education achieved?**
    A. Secondary school
    B. Diploma
    C. Bachelor's degree
    D. Master's degree and above

6. **When was your organization established?**
    A. Under 1975
    B. 1976 to 2000
    C. 2001 to 2015
    D. 2016 and above

7. **What is your organization variety/type?**
    A. Product
    B. Service

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Section B (Independent Variables)

Please indicate the extent to which your organization strongly agree, agree, neutral, disagree or strongly disagree with the statements presented by circling.

Note. **E-waste** is electrical and electronic waste. **E-waste** refers to discarded electronic devices, such as computers, smartphones, and appliances, that have reached the end of their useful life and require proper disposal or recycling due to their potential environmental and health hazards.

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
No	**Knowledge**					
1	The organization knows and understands about e-waste recycling.	1	2	3	4	5
2	The organization knows where to find information about e-waste.	1	2	3	4	5
3	E-waste should be disposed of separately from general household wastes.	1	2	3	4	5
4	The organization has received education/information about e-waste.	1	2	3	4	5
5	The organization knows the availability and locations of e-waste bins.	1	2	3	4	5
6	The organization believes that everyone should contribute to taking care of the environment.	1	2	3	4	5

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
No	**Behaviour**					
1	Proper e-waste recycling has positive impacts on human health and the environment.	1	2	3	4	5

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2	The organization is mindful of the amount of e-waste it generates.	1	2	3	4	5
3	Level of understanding about the environmental and health impact associated with proper handling of e-waste.	1	2	3	4	5
4	The organization believe that newer technology influences e-waste management performance.	1	2	3	4	5
5	The organization has participated in e-waste recycling activities in the past.	1	2	3	4	5
6	The organization knows about the appropriate disposal techniques and environmental effects connected to e-waste.	1	2	3	4	5

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
No	**Awareness**					
1	The organization is willing to donate outdated or broken e-waste.	1	2	3	4	5
2	Recycle of e-waste can reduce environmental pollution and resource consumption.	1	2	3	4	5
3	The organization considers old electrical and electronic equipment as waste.	1	2	3	4	5
4	The organization believes that there is e-waste present in their area.	1	2	3	4	5
5	The organization regularly reads the operational instructions of new	1	2	3	4	5

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	electrical and electronic equipment.					
6	The organization plans to recycle or dispose of e-waste after storing them in the future.	1	2	3	4	5

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
No	**Policy**					
1	The organization retains e-waste after its average life cycle in accordance with its organizational policy.	1	2	3	4	5
2	The organization is ready to recycle e-waste if community pick-up locations or e-waste bins are provided, aligning with its management policy.	1	2	3	4	5
3	The organization's policy allows for the distribution or proper disposal of old or malfunctioning e-waste.	1	2	3	4	5
4	Participation in a program on e-waste management would help the organization in managing e-waste better.	1	2	3	4	5
5	The organization is willing to pay for e-waste management practices.	1	2	3	4	5
6	The organization uses personal protective equipment (PPE) (e.g. gloves, face mask) when handling e-waste.	1	2	3	4	5

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Section C (Dependent Variables)

Please indicate the extent to which your organization strongly agree, agrees, neutral, disagree or strongly disagree with the statements presented by circling.

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
No	**E-Waste Management Performance**					
1	Does your organization think knowledge influences e-waste management performance?	1	2	3	4	5
2	Does your organization think behaviour influences e-waste management performance?	1	2	3	4	5
3	Does your organization think awareness influences e-waste management performance?	1	2	3	4	5
4	Does your organization think policy influences e-waste management performance?	1	2	3	4	5

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Thank you for participating. Rest assured that all the information you provided in this questionnaire will be treated with the utmost confidentiality.

APPENDIX B

ONLINE QUESTIONNAIRE (GOOGLE FORM)

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Section 1 of 6

Research Questionnaires Survey

My name is Muhammad Hakimi Bin Razak. I am a Master's student from the University Utara Malaysia (UUM). I am currently in my final semester and conducting my final year project (thesis). My research titled "Knowledge, Behaviour, Awareness, and Policy Towards E-Waste Management Performance Among SMEs in Northern Region of Malaysia".

Thank you in advance for participating in my research study. Your valuable insights are crucial to my research. The questionnaires will be about a short demographic about yourself and E-Waste about your organization. Please take a few minutes to complete the following questionnaire, providing honest and thoughtful responses. Your input will greatly contribute to the success of my research.

Your privacy is important to me. Rest assured that all the information you provide in this questionnaire will be treated with the utmost confidentiality. Please feel free to express your opinions openly and honestly. Thank you.

Muhammad Hakimi Bin Razak

mhakimiraz@gmail.com

019-821 5050

Section A: Demographic *

Please click the answer

1. What is your gender?

- Male
- Female

2. What is your race? *

- Malay
- Chinese
- Indian
- Others

3. What is your age group? *

- Under 20
- 21 to 30
- 31 to 40
- 41 and over

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4. What is your marital status? *

- Married
- Single
- Others

5. What is your highest level of education achieved? *

- Secondary School
- Diploma
- Bachelor's Degree
- Master's Degree and above

6. When was your organization established? *

- Under 1975
- 1976 to 2000
- 2001 to 2015
- 2016 and above

7. What is your organization variety/type? *

- Product
- Service

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Section 2 of 6

Section B (Independent Variables)

Please indicate the extent to which your organizations strongly agree, agree, neutral, disagree and strongly disagree with the statement presented by choosing the linear scale.

Note. *E-waste is electrical and electronic waste. E-waste refers to discarded electronic devices, such as computers, smartphones, and appliances, that have reached the end of their useful life and require proper disposal or recycling due to their potential environmental and health hazards.*

Knowledge *

The organization knows and understands about e-waste recycling.

	1	2	3	4	5	
Strongly Disgree	○	○	○	○	○	Strongly Agree

The organization knows where to find information about electronic waste. *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

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E-wastes should be disposed of separately from general household wastes. *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

The organization has received education/information about electronic waste. *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

The organization knows the availability and locations of e-waste bins. *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

The organization believes that everyone should contribute to taking care of the environment. *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

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Section 3 of 6

Behaviour

Description (optional)

Proper e-waste recycling has positive impacts on human health and the environment. *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

The organization is mindful of the amount of electronic waste it generates. *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

Level of understanding about the environmental and health impact associated with proper handling of e-waste. *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

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The organization believe that newer technology influences e-waste management performance. *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

The organization has participated in e-waste recycling activities in the past. *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

The organization knows about the appropriate disposal techniques and environmental effects connected to e-waste. *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

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Section 4 of 6

Awareness

Description (optional)

The organization is willing to donate outdated or broken electronic waste. *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

Recycle of e-waste can reduce environmental pollution and resource consumption. *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

The organization considers old electronics and electrical equipment as waste. *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Disagree

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The organization believes that there is e-waste present in their area. *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

The organization regularly reads the operational instructions of new electric and electronic equipment. *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

The organization plans to recycle or dispose of e-waste after storing them in the future. *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

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Section 5 of 6

Policy

Description (optional)

The organization retains electronic waste after its average life cycle in accordance with its organizational policy. *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

The organization is ready to recycle e-waste if community pick-up locations or e-waste bins are provided, aligning with its management policy. *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

The organization's policy allows for the distribution or proper disposal of old or malfunctioning e-waste. *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

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Participation in a program on e-waste management would help the organization in managing e-waste better. *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

The organization is willing to pay for e-waste management practices. *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

The organization uses personal protective equipment (PPE) (e.g. gloves, face mask) when handling e-waste. *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

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Section 6 of 6

Section B (Dependable Variable)

E-Waste Management Performance

Please indicate the extent to which your organization strongly agree, agree, neutral, disagree or strongly disagree with the statements presented by circling.

Does your organization think knowledge influences e-waste management performance? *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

Does your organization think behaviour influences e-waste management performance? *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

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Does your organization think awareness influences e-waste management performance? *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

Does your organization think policy influences e-waste management performance? *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

Thank you for taking the time to share your valuable insights with us. Your thoughtful responses are instrumental in shaping our research. I truly appreciate your participation, and your input will contribute significantly to the success of my study.

Rest assured that all the information you provided in this questionnaire will be treated with the utmost confidentiality. Thank you for your time and valuable contribution.

APPENDIX C

FORMAL LETTER AND EMAIL

UNIVERSITY UTARA MALAYSIA

SCHOOL OF TECHNOLOGY MANAGEMENT AND LOGISTICS

Date: 28 January 2024

To Whom It May Concern,

INVITATION TO PARTICIPATE IN AN ONLINE RESEARCH STUDY

NAME	**: MUHAMMAD HAKIMI BIN RAZAK**
STUDENT ID	**: 831818**
PROGRAMME	**: MASTER IN SUPPLY CHAIN MANAGEMENT**
SCHOOL	**: SCHOOL OF TECHNOLOGY MANAGEMENT AND LOGISTIC**
TITLE	**: KNOWLEDGE, BEHAVIOUR, AWARENESS, AND POLICY TOWARDS E-WASTE MANAGEMENT PERFORMANCE AMONG SMES IN NORTHERN REGION OF REGION**

2. I trust this letter finds you well. My name is Muhammad Hakimi Bin Razak (831818), and I am currently pursuing my Master's in Supply Chain Management at the University Utara Malaysia (UUM). I am reaching out to seek your cooperation and support for my Master's thesis research.

3. My research aims to understand the perspectives and practices related to electrical and electronic waste (e-waste) management among Small and Medium-sized Enterprises (SMEs). Your valuable insights and responses to the questionnaire will significantly contribute to the success of my study.

4. The questionnaire (Google Form link) which is designed to gather information on knowledge, behaviour, awareness, and policy related to e-waste management within SMEs, is attached to this letter which is in the email. Your participation is crucial in shaping the findings of my research, and your responses will be handled with the utmost confidence.

5. Rest assured that all the information you provide in this questionnaire will be treated with the utmost confidentiality. Please feel free to express your opinions openly and honestly when answering the questionnaire.

I sincerely appreciate your time and cooperation in advance. Should you have any concerns or require further clarification, please do not hesitate to contact me at mhakimiraz@gmail.com or my phone number, 019- 821 5050.

Thank you for considering my request, and I look forward to your positive response.

Yours sincerely,

Muhammad Hakimi Bin Razak
University Utara Malaysia

Email : mhakimiraz@gmail.com
Phone Number : 019-821 5050

APPENDIX D

All SPSS Results

Case Processing Summary

		N	%
Cases	Valid	400	100.0
	Excluded[a]	0	.0
	Total	400	100.0

a. Listwise deletion based on all variables in the procedure.

Cronbach's Alpha for Knowledge

Reliability Statistics

Cronbach's Alpha	N of Items
.750	6

Item Statistics

	Mean	Std. Deviation	N
Knowledge1	3.7300	1.04395	400
Knowledge2	3.7500	.98230	400
Knowledge3	4.2525	.82185	400
Knowledge4	3.4450	1.06997	400
Knowledge5	3.3900	1.16244	400
Knowledge6	4.2425	.86055	400

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Knowledge1	19.0800	10.645	.616	.677
Knowledge2	19.0600	10.778	.649	.670
Knowledge3	18.5575	12.999	.380	.741
Knowledge4	19.3650	11.175	.505	.711
Knowledge5	19.4200	10.831	.490	.717
Knowledge6	18.5675	13.254	.309	.757

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
22.8100	15.929	3.99108	6

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Cronbach's Alpha for Behaviour

Reliability Statistics

Cronbach's Alpha	N of Items
.662	6

Item Statistics

	Mean	Std. Deviation	N
Behaviour1	4.5150	.68260	400
Behaviour2	3.6200	1.04323	400
Behaviour3	3.8350	.86292	400
Behaviour4	3.8900	.72055	400
Behaviour5	3.4000	1.16980	400
Behaviour6	3.7350	.96286	400

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Behaviour1	18.4800	10.671	.062	.706
Behaviour2	19.3750	7.052	.591	.536
Behaviour3	19.1600	8.435	.446	.603
Behaviour4	19.1050	9.428	.331	.641
Behaviour5	19.5950	7.199	.453	.600
Behaviour6	19.2600	7.982	.460	.594

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
22.9950	11.414	3.37839	6

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Cronbach's Alpha for Awareness

Reliability Statistics

Cronbach's Alpha	N of Items
.714	6

Item Statistics

	Mean	Std. Deviation	N
Awareness1	3.6200	1.01892	400
Awareness2	4.2950	.83349	400
Awareness3	3.7475	1.06140	400
Awareness4	3.6550	.96348	400
Awareness5	3.6175	1.07195	400
Awareness6	3.8475	.92541	400

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Awareness1	19.1625	10.242	.465	.670
Awareness2	18.4875	11.163	.441	.679
Awareness3	19.0350	10.184	.443	.677
Awareness4	19.1275	10.277	.503	.658
Awareness5	19.1650	10.599	.367	.702
Awareness6	18.9350	10.572	.479	.666

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
22.7825	14.311	3.78298	6

Cronbach's Alpha for Policy

Reliability Statistics

Cronbach's Alpha	N of Items
.636	6

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Item Statistics

	Mean	Std. Deviation	N
Policy1	3.3675	1.08415	400
Policy2	3.7925	.95746	400
Policy3	3.8300	.99175	400
Policy4	4.1750	.80685	400
Policy5	3.5375	.99553	400
Policy6	3.5400	1.19035	400

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Policy1	18.8750	10.576	.186	.664
Policy2	18.4500	9.526	.443	.565
Policy3	18.4125	9.245	.470	.554
Policy4	18.0675	10.650	.334	.606
Policy5	18.7050	9.126	.490	.545
Policy6	18.7025	9.257	.330	.613

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
22.2425	13.061	3.61405	6

Cronbach's Alpha for E-Waste Management Performance

Reliability Statistics

Cronbach's Alpha	N of Items
.720	4

Item Statistics

	Mean	Std. Deviation	N
DV1	4.0025	.86566	400
DV2	3.9850	.83757	400
DV3	4.0750	.80995	400
DV4	4.0075	.82410	400

DV is Dependant Variables (E-Waste Management Performance)

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
DV1	12.0675	3.652	.500	.663
DV2	12.0850	3.687	.518	.652
DV3	11.9950	3.769	.518	.652
DV4	12.0625	3.788	.495	.666

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
16.0700	6.055	2.46074	4

Skewness and Kurtosis for Knowledge

Statistics

		k1	k2	k3	k4	k5	k6
N	Valid	400	400	400	400	400	400
	Missing	0	0	0	0	0	0
Skewness		-.624	-.805	-1.368	-.294	-.232	-1.271
Std. Error of Skewness		.122	.122	.122	.122	.122	.122
Kurtosis		.017	.576	2.816	-.429	-.815	1.809
Std. Error of Kurtosis		.243	.243	.243	.243	.243	.243

Note. k is Knowledge

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Knowledge1

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	16	4.0	4.0	4.0
	Disagree	25	6.3	6.3	10.3
	Neutral	115	28.7	28.7	39.0
	Agree	139	34.8	34.8	73.8
	Strongly Agree	105	26.3	26.3	100.0
	Total	400	100.0	100.0	

Knowledge2

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	15	3.8	3.8	3.8
	Disagree	23	5.8	5.8	9.5
	Neutral	96	24.0	24.0	33.5
	Agree	179	44.8	44.8	78.3
	Strongly Agree	87	21.8	21.8	100.0
	Total	400	100.0	100.0	

Knowledge3

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	7	1.8	1.8	1.8
	Disagree	4	1.0	1.0	2.8
	Neutral	43	10.8	10.8	13.5
	Agree	173	43.3	43.3	56.8
	Strongly Agree	173	43.3	43.3	100.0
	Total	400	100.0	100.0	

Knowledge4

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	19	4.8	4.8	4.8
	Disagree	49	12.3	12.3	17.0
	Neutral	140	35.0	35.0	52.0
	Agree	119	29.8	29.8	81.8
	Strongly Agree	73	18.3	18.3	100.0
	Total	400	100.0	100.0	

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Knowledge5

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	23	5.8	5.8	5.8
	Disagree	71	17.8	17.8	23.5
	Neutral	115	28.7	28.7	52.3
	Agree	109	27.3	27.3	79.5
	Strongly Agree	82	20.5	20.5	100.0
	Total	400	100.0	100.0	

Knowledge6

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	5	1.3	1.3	1.3
	Disagree	13	3.3	3.3	4.5
	Neutral	42	10.5	10.5	15.0
	Agree	160	40.0	40.0	55.0
	Strongly Agree	180	45.0	45.0	100.0
	Total	400	100.0	100.0	

Statistics

meanKnowledge		
N	Valid	400
	Missing	0
Skewness		-.472
Std. Error of Skewness		.122
Kurtosis		.240
Std. Error of Kurtosis		.243

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meanKnowledge

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.50	1	.3	.3	.3
	1.83	1	.3	.3	.5
	2.00	3	.8	.8	1.3
	2.17	4	1.0	1.0	2.3
	2.33	3	.8	.8	3.0
	2.50	10	2.5	2.5	5.5
	2.67	14	3.5	3.5	9.0
	2.83	4	1.0	1.0	10.0
	3.00	13	3.3	3.3	13.3
	3.17	14	3.5	3.5	16.8
	3.33	30	7.5	7.5	24.3
	3.50	29	7.2	7.2	31.5
	3.67	57	14.2	14.2	45.8
	3.83	39	9.8	9.8	55.5
	4.00	44	11.0	11.0	66.5
	4.17	32	8.0	8.0	74.5
	4.33	32	8.0	8.0	82.5
	4.50	26	6.5	6.5	89.0
	4.67	12	3.0	3.0	92.0
	4.83	14	3.5	3.5	95.5
	5.00	18	4.5	4.5	100.0
	Total	400	100.0	100.0	

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Skewness and Kurtosis for Behaviour

Statistics

		b1	b2	b3	b4	b5	b6
N	Valid	400	400	400	400	400	400
	Missing	0	0	0	0	0	0
Skewness		-2.026	-.521	-.875	-.277	-.385	-.735
Std. Error of Skewness		.122	.122	.122	.122	.122	.122
Kurtosis		6.998	-.208	1.290	-.089	-.594	.565
Std. Error of Kurtosis		.243	.243	.243	.243	.243	.243

Note. b is Behaviour

Behaviour1

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	5	1.3	1.3	1.3
	Neutral	13	3.3	3.3	4.5
	Agree	148	37.0	37.0	41.5
	Strongly Agree	234	58.5	58.5	100.0
	Total	400	100.0	100.0	

Behaviour2

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	15	3.8	3.8	3.8
	Disagree	40	10.0	10.0	13.8
	Neutral	112	28.0	28.0	41.8
	Agree	148	37.0	37.0	78.8
	Strongly Agree	85	21.3	21.3	100.0
	Total	400	100.0	100.0	

Behaviour3

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	9	2.3	2.3	2.3
	Disagree	15	3.8	3.8	6.0
	Neutral	88	22.0	22.0	28.0
	Agree	209	52.3	52.3	80.3
	Strongly Agree	79	19.8	19.8	100.0
	Total	400	100.0	100.0	

Behaviour4

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	11	2.8	2.8	2.8
	Neutral	95	23.8	23.8	26.5
	Agree	221	55.3	55.3	81.8
	Strongly Agree	73	18.3	18.3	100.0
	Total	400	100.0	100.0	

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Behaviour5

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	32	8.0	8.0	8.0
	Disagree	51	12.8	12.8	20.8
	Neutral	120	30.0	30.0	50.7
	Agree	119	29.8	29.8	80.5
	Strongly Agree	78	19.5	19.5	100.0
	Total	400	100.0	100.0	

Behaviour6

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	14	3.5	3.5	3.5
	Disagree	20	5.0	5.0	8.5
	Neutral	108	27.0	27.0	35.5
	Agree	174	43.5	43.5	79.0
	Strongly Agree	84	21.0	21.0	100.0
	Total	400	100.0	100.0	

Statistics

meanBehaviour		
N	Valid	400
	Missing	0
Skewness		-.396
Std. Error of Skewness		.122
Kurtosis		.748
Std. Error of Kurtosis		.243

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meanBehaviour

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.83	3	.8	.8	.8
	2.17	3	.8	.8	1.5
	2.33	1	.3	.3	1.8
	2.50	1	.3	.3	2.0
	2.67	2	.5	.5	2.5
	2.83	8	2.0	2.0	4.5
	3.00	16	4.0	4.0	8.5
	3.17	23	5.8	5.8	14.2
	3.33	24	6.0	6.0	20.3
	3.50	45	11.3	11.3	31.5
	3.67	43	10.8	10.8	42.3
	3.83	50	12.5	12.5	54.8
	4.00	54	13.5	13.5	68.3
	4.17	38	9.5	9.5	77.8
	4.33	31	7.8	7.8	85.5
	4.50	24	6.0	6.0	91.5
	4.67	15	3.8	3.8	95.3
	4.83	7	1.8	1.8	97.0
	5.00	12	3.0	3.0	100.0
	Total	400	100.0	100.0	

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Skewness and Kurtosis for Awareness

Statistics

		a1	a2	a3	a4	a5	a6
N	Valid	400	400	400	400	400	400
	Missing	0	0	0	0	0	0
Skewness		-.671	-1.303	-.721	-.513	-.627	-.608
Std. Error of Skewness		.122	.122	.122	.122	.122	.122
Kurtosis		.292	1.921	.113	.073	-.092	.122
Std. Error of Kurtosis		.243	.243	.243	.243	.243	.243

Note. a is Awareness

Awareness1

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	20	5.0	5.0	5.0
	Disagree	24	6.0	6.0	11.0
	Neutral	120	30.0	30.0	41.0
	Agree	160	40.0	40.0	81.0
	Strongly Agree	76	19.0	19.0	100.0
	Total	400	100.0	100.0	

Awareness2

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	4	1.0	1.0	1.0
	Disagree	11	2.8	2.8	3.8
	Neutral	40	10.0	10.0	13.8
	Agree	153	38.3	38.3	52.0
	Strongly Agree	192	48.0	48.0	100.0
	Total	400	100.0	100.0	

Awareness3

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	18	4.5	4.5	4.5
	Disagree	26	6.5	6.5	11.0
	Neutral	102	25.5	25.5	36.5
	Agree	147	36.8	36.8	73.3
	Strongly Agree	107	26.8	26.8	100.0
	Total	400	100.0	100.0	

Awareness4

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	11	2.8	2.8	2.8
	Disagree	30	7.5	7.5	10.3
	Neutral	122	30.5	30.5	40.8
	Agree	160	40.0	40.0	80.8
	Strongly Agree	77	19.3	19.3	100.0
	Total	400	100.0	100.0	

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Awareness5

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	20	5.0	5.0	5.0
	Disagree	37	9.3	9.3	14.2
	Neutral	104	26.0	26.0	40.3
	Agree	154	38.5	38.5	78.8
	Strongly Agree	85	21.3	21.3	100.0
	Total	400	100.0	100.0	

Awareness6

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	6	1.5	1.5	1.5
	Disagree	24	6.0	6.0	7.5
	Neutral	98	24.5	24.5	32.0
	Agree	169	42.3	42.3	74.3
	Strongly Agree	103	25.8	25.8	100.0
	Total	400	100.0	100.0	

Statistics

meanAwareness		
N	Valid	400
	Missing	0
Skewness		-.102
Std. Error of Skewness		.122
Kurtosis		-.111
Std. Error of Kurtosis		.243

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meanAwareness

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2.00	3	.8	.8	.8
	2.33	4	1.0	1.0	1.8
	2.50	9	2.3	2.3	4.0
	2.67	6	1.5	1.5	5.5
	2.83	7	1.8	1.8	7.2
	3.00	18	4.5	4.5	11.8
	3.17	25	6.3	6.3	18.0
	3.33	34	8.5	8.5	26.5
	3.50	37	9.3	9.3	35.8
	3.67	49	12.3	12.3	48.0
	3.83	38	9.5	9.5	57.5
	4.00	46	11.5	11.5	69.0
	4.17	39	9.8	9.8	78.8
	4.33	23	5.8	5.8	84.5
	4.50	8	2.0	2.0	86.5
	4.67	17	4.3	4.3	90.8
	4.83	16	4.0	4.0	94.8
	5.00	21	5.3	5.3	100.0
	Total	400	100.0	100.0	

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Skewness and Kurtosis for Policy

Statistics

		p1	p2	p3	p4	p5	p6
N	Valid	400	400	400	400	400	400
	Missing	0	0	0	0	0	0
Skewness		-.391	-.642	-.506	-.731	-.349	-.288
Std. Error of Skewness		.122	.122	.122	.122	.122	.122
Kurtosis		-.337	.338	-.376	-.029	-.188	-.935
Std. Error of Kurtosis		.243	.243	.243	.243	.243	.243

p is Policy

Policy1

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	27	6.8	6.8	6.8
	Disagree	48	12.0	12.0	18.8
	Neutral	135	33.8	33.8	52.5
	Agree	131	32.8	32.8	85.3
	Strongly Agree	59	14.8	14.8	100.0
	Total	400	100.0	100.0	

Policy2

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	11	2.8	2.8	2.8
	Disagree	18	4.5	4.5	7.2
	Neutral	113	28.2	28.2	35.5
	Agree	159	39.8	39.8	75.3
	Strongly Agree	99	24.8	24.8	100.0
	Total	400	100.0	100.0	

Policy3

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	6	1.5	1.5	1.5
	Disagree	31	7.8	7.8	9.3
	Neutral	107	26.8	26.8	36.0
	Agree	137	34.3	34.3	70.3
	Strongly Agree	119	29.8	29.8	100.0
	Total	400	100.0	100.0	

Policy4

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	14	3.5	3.5	3.5
	Neutral	59	14.8	14.8	18.3
	Agree	170	42.5	42.5	60.8
	Strongly Agree	157	39.3	39.3	100.0
	Total	400	100.0	100.0	

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Policy5

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	13	3.3	3.3	3.3
	Disagree	38	9.5	9.5	12.8
	Neutral	141	35.3	35.3	48.0
	Agree	137	34.3	34.3	82.3
	Strongly Agree	71	17.8	17.8	100.0
	Total	400	100.0	100.0	

Policy6

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	18	4.5	4.5	4.5
	Disagree	66	16.5	16.5	21.0
	Neutral	111	27.8	27.8	48.8
	Agree	92	23.0	23.0	71.8
	Strongly Agree	113	28.2	28.2	100.0
	Total	400	100.0	100.0	

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Statistics

meanPolicy		
N	Valid	400
	Missing	0
Skewness		-.216
Std. Error of Skewness		.122
Kurtosis		.133
Std. Error of Kurtosis		.243

meanPolicy

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2.00	3	.8	.8	.8
	2.17	6	1.5	1.5	2.3
	2.33	4	1.0	1.0	3.3
	2.50	3	.8	.8	4.0
	2.67	8	2.0	2.0	6.0
	2.83	5	1.3	1.3	7.2
	3.00	22	5.5	5.5	12.8
	3.17	33	8.3	8.3	21.0
	3.33	38	9.5	9.5	30.5
	3.50	50	12.5	12.5	43.0
	3.67	42	10.5	10.5	53.5
	3.83	33	8.3	8.3	61.8
	4.00	45	11.3	11.3	73.0
	4.17	34	8.5	8.5	81.5
	4.33	31	7.8	7.8	89.3
	4.50	14	3.5	3.5	92.8
	4.67	13	3.3	3.3	96.0
	4.83	5	1.3	1.3	97.3
	5.00	11	2.8	2.8	100.0
	Total	400	100.0	100.0	

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Skewness and Kurtosis for E-Waste Management Performance

Statistics

		DV1	DV2	DV3	DV4
N	Valid	400	400	400	400
	Missing	0	0	0	0
Skewness		-.727	-.512	-.849	-.554
Std. Error of Skewness		.122	.122	.122	.122
Kurtosis		.461	-.311	1.144	-.184
Std. Error of Kurtosis		.243	.243	.243	.243

Note. DV is Dependant Variable (E-Waste Management Performance)

DV1

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	4	1.0	1.0	1.0
	Disagree	15	3.8	3.8	4.8
	Neutral	80	20.0	20.0	24.8
	Agree	178	44.5	44.5	69.3
	Strongly Agree	123	30.8	30.8	100.0
	Total	400	100.0	100.0	

DV2

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	21	5.3	5.3	5.3
	Neutral	80	20.0	20.0	25.3
	Agree	183	45.8	45.8	71.0
	Strongly Agree	116	29.0	29.0	100.0
	Total	400	100.0	100.0	

DV3

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly DIsagree	4	1.0	1.0	1.0
	Disagree	9	2.3	2.3	3.3
	Neutral	66	16.5	16.5	19.8
	Agree	195	48.8	48.8	68.5
	Strongly Agree	126	31.5	31.5	100.0
	Total	400	100.0	100.0	

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DV4

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	20	5.0	5.0	5.0
	Neutral	74	18.5	18.5	23.5
	Agree	189	47.3	47.3	70.8
	Strongly Agree	117	29.3	29.3	100.0
	Total	400	100.0	100.0	

Statistics

meanDV		
N	Valid	400
	Missing	0
Skewness		-.391
Std. Error of Skewness		.122
Kurtosis		.438
Std. Error of Kurtosis		.243

meanDV

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2.00	5	1.3	1.3	1.3
	2.50	3	.8	.8	2.0
	2.75	4	1.0	1.0	3.0
	3.00	18	4.5	4.5	7.5
	3.25	25	6.3	6.3	13.8
	3.50	39	9.8	9.8	23.5
	3.75	49	12.3	12.3	35.8
	4.00	101	25.3	25.3	61.0
	4.25	54	13.5	13.5	74.5
	4.50	30	7.5	7.5	82.0
	4.75	22	5.5	5.5	87.5
	5.00	50	12.5	12.5	100.0
	Total	400	100.0	100.0	

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Pearson Correlations and Multiple Regression

		meank	meanb	meana	meanp	meanDV
meank	Pearson Correlation	1	.651**	.578**	.526**	.291**
	Sig. (2-tailed)		.000	.000	.000	.000
	N	400	400	400	400	400
meanb	Pearson Correlation	.651**	1	.584**	.523**	.425**
	Sig. (2-tailed)	.000		.000	.000	.000
	N	400	400	400	400	400
meana	Pearson Correlation	.578**	.584**	1	.694**	.473**
	Sig. (2-tailed)	.000	.000		.000	.000
	N	400	400	400	400	400
meanp	Pearson Correlation	.526**	.523**	.694**	1	.483**
	Sig. (2-tailed)	.000	.000	.000		.000
	N	400	400	400	400	400
meanDV	Pearson Correlation	.291**	.425**	.473**	.483**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	400	400	400	400	400

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

meank is meanKnowledge

meanb is meanBehaviour

meana is meanAwareness

meanp is meanPolicy

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	meanp, meanb, meank, meana[b]	.	Enter

a. Dependent Variable: meanDV

b. All requested variables entered.

Model Summary

					Change Statistics			
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.548[a]	.300	.293	.51720	.300	42.376	4	395	<.001

a. Predictors: (Constant), meanPolicy, meanBehaviour, meanKnowledge, meanAwareness

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ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	45.341	4	11.335	42.376	.000[b]
	Residual	105.661	395	.267		
	Total	151.002	399			

a. Dependent Variable: meandv

b. Predictors: (Constant), meanPolicy, meanBehaviour, meanKnowledge, meanAwareness

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	1.629	.197		8.262	.000
	meank	-.129	.055	-.140	-2.362	.019
	meanb	.265	.065	.243	4.096	.000
	meana	.213	.062	.218	3.410	.001
	meanp	.284	.061	.278	4.624	.000

a. Dependent Variable: meanDV

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	3.0310	4.8392	4.0175	.33710	400
Residual	-1.41346	1.56785	.00000	.51460	400
Std. Predicted Value	-2.926	2.438	.000	1.000	400
Std. Residual	-2.733	3.031	.000	.995	400

a. Dependent Variable: meanDV

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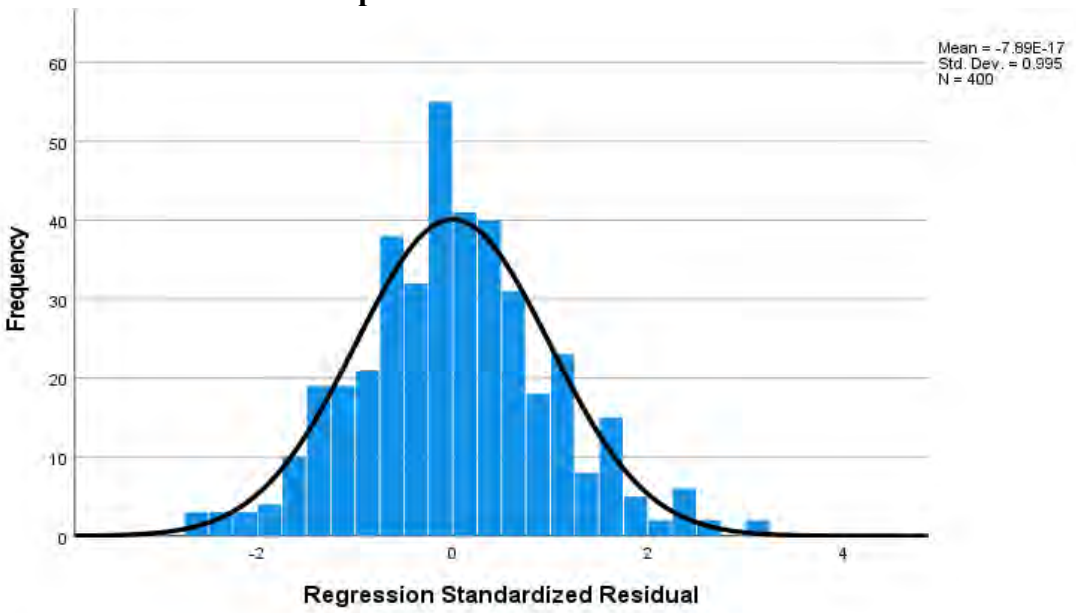
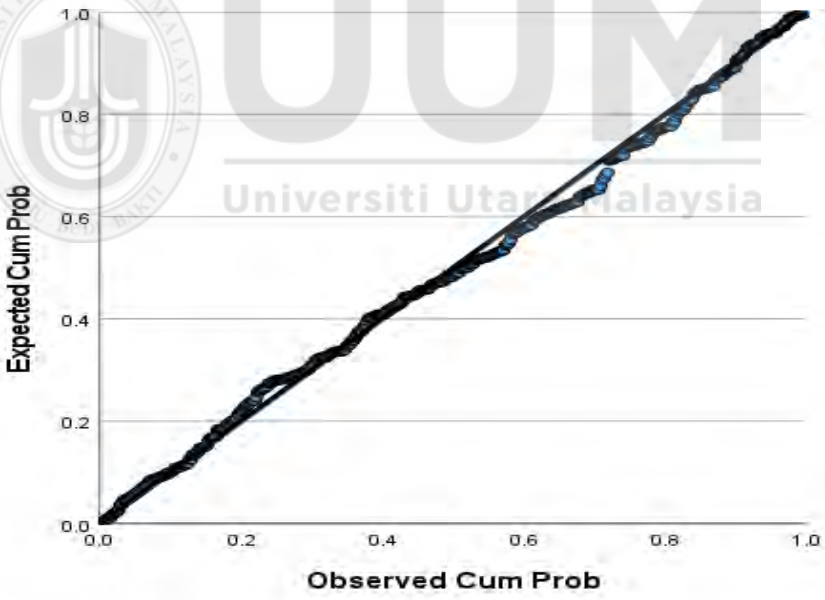
Histogram
Dependent Variable: meanDV



Normal P-P Plot of Regression Standardized Residual
Dependent Variable: meanDV



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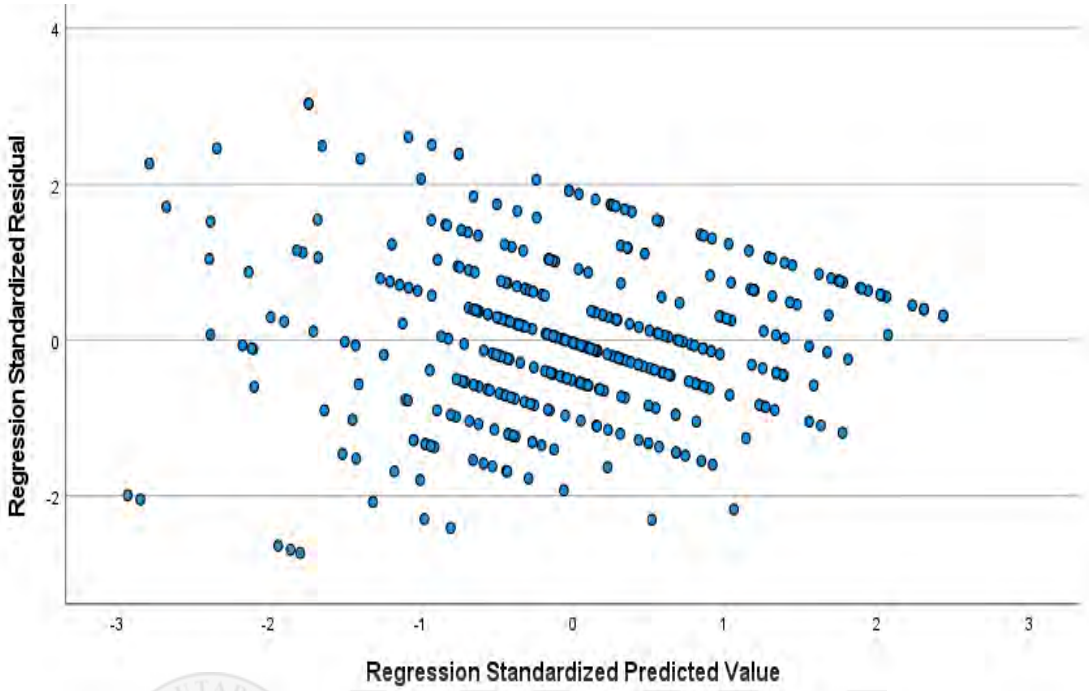
Scatterplot
Dependent Variable: meanDV



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