INVESTIGATING BARRIERS TO ENVIRONMENTAL, SOCIAL, AND GOVERNANCE (ESG) ADOPTION IN THE MALAYSIAN CONSTRUCTION INDUSTRY

TAN EE YINN

UNIVERSITI TUNKU ABDUL RAHMAN

INVESTIGATING BARRIERS TO ENVIRONMENTAL, SOCIAL, AND GOVERNANCE (ESG) ADOPTION IN THE MALAYSIAN CONSTRUCTION INDUSTRY

TAN EE YINN

A project report submitted in partial fulfilment of the requirements for the award of Bachelor of Science (Honours) Quantity Surveying

Lee Kong Chian Faculty of Engineering and Science
Universiti Tunku Abdul Rahman

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DECLARATION

I hereby declare that this project report is based on my original work except for citations and quotations which have been duly acknowledged. I also declare that it has not been previously and concurrently submitted for any other degree or award at UTAR or other institutions.

Signature : 

Name : Tan Ee Yinn

ID No. : 20UEB03212

Date : 8 May 2025

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ABSTRACT

The growing global emphasis on sustainability has placed Environmental, Social, and Governance (ESG) practices at the forefront of responsible business operations. Despite the construction sector's significant role in economic development, environmental impact, and community well-being, ESG adoption in Malaysia's construction industry remains limited due to various contextual challenges. This research aims to investigate the key barriers hindering the adoption of ESG practices and to identify the main drivers and strategies that can facilitate its implementation. A comprehensive literature review was conducted to identify 12 drivers, 14 barriers, and 10 strategies, which were further explored through a quantitative questionnaire survey. The survey targeted construction professionals, including consultants, developers, and contractors within the Klang Valley area, yielding 132 valid responses. The collected data were analysed and ranked according to their mean scores. The results revealed that external pressures, such as market force and clients' demand, industry competitiveness, and government legislation and policy emerge as the key drivers for ESG integration. On the other hand, limited data and lack of long-term comparability, lack of resources, and lack of established standards and guidelines for ESG activities are the major barriers impeding the adoption of ESG practices in construction firms. Meanwhile, the findings also highlighted the importance of government subsidies, standards for ESG activities, and enforcement of regulations and policies as effective strategies to encourage ESG adoption. Notably, the enforcement of regulations and policies was found to be significantly correlated with all identified barriers. Additionally, the Spearman's correlation test uncovered that resistance to change and top management initiatives have the strongest correlation among the variables. This research provides valuable insights into the current state of ESG adoption in Malaysia's construction industry and highlights specific areas requiring policy and industry attention. The results can guide construction professionals, policymakers, and regulators in formulating practical strategies to overcome existing barriers and drive sustainable transformation in the sector.

Keywords: ESG adoption; sustainable development; corporate sustainability; Malaysian construction industry; barriers.

Subject Area: TH6014-6081 Environmental engineering of buildings. Sanitary engineering of buildings

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LIST OF SYMBOLS / ABBREVIATIONS

α	Cronbach's alpha reliability coefficient
$\bar{X}$	Mean
H	Value of Kruskal-Wallis test
AI	Artificial Intelligence
BIM	Building Information Modeling
BREEAM	Building Research Establishment Environmental Assessment Methods
CIDB	Construction Industry Development Board
DGNB	German Sustainable Building Council **(**Deutsche Gesellschaft für Nachhaltiges Bauen**)**
ESG	Environmental, Social, and Governance
GDP	Gross Domestic Product
GRI	Global Reporting Initiative
IBS	Industrialized Building System
ICT	Information and Communication Technologies
IoT	Internet of Things
ISO	International Organization for Standardization
LED	Light-emitting Diode
LEED	Leadership in Environmental and Energy Design
malaysiaGBC	Malaysia Green Building Council
MCS	malaysiaGBC Carbon Score
MITI	Ministry of Investment, Trade and Industry
NCP 2030	National Construction Policy 2030
NGTP	National Green Technology Policy
OSH	Occupational Safety and Health
SDG	Sustainable Development Goals
SMEs	Small and Medium Enterprises
WorldGBC	World Green Building Council

CHAPTER 1

INTRODUCTION

1.1 Chapter Introduction

Chapter one presents an introduction to this research. It covers the background of the research and the problem statement, whereas the aim and objectives are also specified. The research methodology and the scope of the research are presented to guide the research process. The following section includes brief descriptions of the outlines of the subsequent chapters and a summary of Chapter one.

1.2 Background of Research

The construction industry has always been a crucial driver of a country's economic growth. Its substantial contribution to the gross domestic product (GDP) of a country is undeniable. Department of Statistics Malaysia (2025a) reported that Malaysia's construction sector contributed approximately RM17.4 billion to the country's GDP by the fourth quarter of 2024, accounting for an estimated 4.04% of the total GDP. The construction industry's interconnections with other sectors, such as manufacturing, retail, and agriculture, revealed its significant influence on national prosperity and catalyses sustainable development (Alaloul, et al., 2021).

The construction industry offers job opportunities to populations across various skill levels and is well-known as highly labour-intensive (Carter, 2023). According to Statista Research Department (2025a; 2025b), the construction industry had over 1.27 million job positions in Malaysia, with 1.4 million people employed in 2024. Moreover, the increasing construction projects such as infrastructure, facilities, and housing, provide essential services and shelters, which foster the development of a country. Hence, it is apparent that the construction industry has a considerable influence on social sustainability due to its extensive employment of a diverse workforce and extended operations of buildings and facilities by end-users (Ershadi and Goodarzi, 2021). Therefore, the construction industry should play a vital role in building communities by

improving the quality of life, promoting health and wellbeing, and reducing social inequity (Júnior, Macêdo and Martins, 2023).

Despite its significant role in a nation's physical and economic development, the construction industry is a leading contributor to environmental issues. Notably, it is accountable for nearly 40% of global energy consumption and approximately 36% of the world's greenhouse gas emissions across its entire life cycle (Wagar, et al., 2024). These effects can arise from various stages, including resource extraction, manufacturing, transportation of materials, on-site construction, building and infrastructure operations, and eventually demolition. Globally, the construction industry is the top consumer of natural resources and contributes about 25% to 40% of total carbon emissions (Star Property, 2023). Besides, the construction industry produces a considerable amount of waste, which makes up 45-65% of the waste disposed of in landfills and generates 35% of the world's carbon dioxide emissions (Lima, et al., 2021). Consequently, this has prompted the world to cope with environmental challenges such as global warming, climate change, and pollution. Such environmental repercussions present critical risks to achieving sustainability (Ershadi and Goodarzi, 2021). Given this, companies across various industries are actively progressing towards environmental awareness, with a pressing pertinence in the construction sector, where projects are revolving to shape the future (CIDB Malaysia, 2023b).

The profound influence of the construction industry on the economy, society, and environment has significantly increased global awareness and attention to sustainability issues. Cruz, et al. (2023) observed that construction companies are progressing slowly towards sustainability compared to the rate of environmental degradation. In view of this, global has evolved its approach to addressing these issues by embracing Environmental, Social, and Governance (ESG) principles as a framework to promote more sustainable and ethical practices across industries (Adewumi, et al., 2024; Wang and Xue, 2023; Thomas, 2023). The application of ESG in construction practices means considering environmental factors through energy conservation, waste reduction, and recycling, while social aspects pertain to health and safety, labour rights, and community engagement (Wang and Xue, 2023). The governance dimension includes various aspects such as ethics and integrity, risk

management, transparency of leadership, and executive compensation. By incorporating these factors into construction practices, key industry players such as developers, investors, and regulatory bodies seek to optimise financial advantages as well as to enhance societal and environmental impacts in the long run (Sulaiman, et al., 2024).

From an international perspective, numerous countries have expressed strong interest in adopting and strengthening ESG practices within the construction industry. In order to meet the sustainability goals, the construction industry has established various ESG assessment frameworks such as Leadership in Environmental and Energy Design (LEED) in the US, Green Star Certification in South Africa, and Building Research Establishment Environmental Assessment Methods (BREEAM) in the UK (Adewumi, et al., 2024). Furthermore, the 'ESG Recognition Scheme' has been introduced in Hong Kong to promote ESG initiatives in the construction industry, providing an ESG database, financial aid for the application of advanced technology, and incentives for practitioners who adopt ESG principles (MYsinchew, 2024). Similarly, in Singapore, the establishment of the Green Mark scheme by the Building and Construction Authority (BCA) has been a significant factor in ESG adoption by engaging industry stakeholders in the acceptance of new green buildings (Building and Construction Authority, 2023). In Malaysia, the National Construction Policy 2030 (NCP 2030) was launched by the Works Ministry in 2021 to embrace a sustainable built environment and resilient infrastructure by adopting innovative technologies and governance in construction practices (CIDB Malaysia, 2022a). Bursa Malaysia has also introduced the FTSE4Good ESG Rating, a tool used to assess a company's ESG practices based on criteria such as carbon footprint, safety and health measures, and corporate ethics (CIDB Malaysia, 2023a).

Considering these initiatives and frameworks, it is evident that there is a worldwide momentum towards incorporating ESG principles into the construction industry. This shift is vital for mitigating the environmental consequences of construction activities, improving socioeconomic outcomes, and instilling reliable governance standards in the industry. According to Saharuddin, Hassan and Kamar (2022), Malaysia is still a beginner to green development. While sustainable development goals (SDGs) and environmental,

social, and governance (ESG) concepts have been recognised as the current trends in the built environment, their successful implementation requires the efforts and cooperation of construction companies and government to better internalise these principles into their operations. Thus, this research is devoted to studying ESG adoption in the Malaysian construction industry, aiming to identify key barriers and contribute insights to support more effective and sustainable industry practices.

1.3 Problem Statement

ESG has emerged as a crucial approach for achieving sustainable development worldwide, especially in the aftermath of the COVID-19 pandemic, during which enterprises are increasingly prioritising environmental awareness, social responsibility, and solid governance to develop a sustainable business ecosystem (Wang, Hong and Long, 2023). Numerous studies have explored the benefits of ESG practices as critical motivators for their integration into corporate operations across various industries. For instance, the study by Wang, Hong and Long (2023) brought up the importance of ESG in the manufacturing industry, particularly emphasising how technologies like the Internet of Things (IoT) can promote energy conservation and reduce emissions in pursuit of low-carbon goals. Besides, Chen, Yu and Gao (2023) pointed out that adopting ESG principles in business organisations can influence the corporation's success and financial performance. Referring to a study by Yang, Wang and Yang (2024), ESG integration in supply chains facilitates consistent standards and sustainable practices across different levels of companies. In addition, Fu, et al. (2024) underscored the significance of ESG in the mining industry, outlining how it helps in mitigating financial risks and promoting the development of a green economy through measures such as pollution control and utilisation of renewable energy. Overall, the extensive application of ESG concepts across industries reveals their pivotal role in advocating sustainable business conduct.

Despite these compelling drivers for ESG integration, the obstacles to ESG adoption are undeniable. For example, Liou, Liu and Huang (2023) revealed that a lack of top management support and a perceived low return on investment are factors hindering the adoption of ESG in Chinese enterprises. In the construction context, Bezerra, Martins and Macedo (2024) examined twelve

obstacles in the implementation of ESG practices in Brazil, according to the viewpoints of professionals. These obstacles include a lack of interest, inadequate regulations and educational systems on ESG concerns, political uncertainty, and many others. Similarly, Osuizugbo, et al. (2020) also discovered the main barriers to sustainable construction in Nigeria, such as lack of government support, insufficient pertinent legislation and regulations, low client demand, and limited awareness. Due to these barriers, the ESG formation in the construction industry remains in the early phases compared to other sectors despite the growing interest in sustainability management (Park, et al., 2023). Although extensive research has been conducted on the barriers to ESG adoption in the construction industry globally, the topic has yet to receive much attention in the Malaysian context.

Moreover, it was discovered that China emerged as a leader in green practices related to ESG in the construction sector, followed by the USA, Italy, and the UK (Cruz, et al., 2023). In China, Lei and Zhao (2024) determined that corporate governance and technological innovation are the primary factors influencing the overall ESG performance of construction firms. They recommended five aspects for improving ESG performance, which were enhancing economic efficiency, fostering technological innovation, upholding environmental responsibility, reinforcing human resource management, and enhancing corporate governance. On top of that, Dang, Peng and Deng (2024) explored that Chinese construction firms can boost their ESG performance by developing achievable environmental goals and implementing a comprehensive environmental management system. Moreover, a study by Ishak, Aziz and Rahim (2023) disclosed that the industry's capacity to embrace the ESG movement may be accelerated by the government's initiatives and support for sustainable construction practices. Since current research on ESG in construction has concentrated on factors influencing adoption and opportunities for improvement, there remains a significant gap regarding the potential strategies to address the barriers and promote ESG adoption.

In short, many researchers have investigated the adoption of ESG principles in conjunction with the global trend towards sustainable development, which covers a wide range of sectors and countries. Nevertheless, it is notable that there is relatively limited study on the concept of ESG in the Malaysia

context. Existing studies mainly focused on other aspects, such as evaluating the relationship between ESG principles and company performance (Sani, et al., 2020), determining factors that influence Malaysian listed firms' ESG performance and disclosures (Wong, et al., 2022; Ramba, Joseph and Said, 2021), and investigating the impact of ESG initiatives and reporting on the financial performance of public listed companies (Zailani and Razak, 2024; Ahmad, et al., 2021; Mohamad, 2020; Sadiq, et al., 2020). This has marked an apparent gap in understanding the barriers specific to ESG adoption in Malaysia's construction sector, where environmental awareness, social obligation, and effective governance are crucial to fostering sustainability and ethical conduct. To address this gap, this research attempts to unveil the key drivers and barriers encountered by Malaysian construction firms in incorporating ESG criteria into their operations. Besides, strategies to encourage the adoption of ESG principles in the construction industry will also be appraised to conquer the barriers while addressing environmental and social concerns for sustainable development.

1.4 Aim

This research aims to probe the barriers to the adoption of environmental, social, and governance (ESG) practices in the Malaysian construction industry.

1.5 Objectives

The objectives set up for this research are:

1. To explore the key drivers for ESG integration in the Malaysian construction industry.
2. To examine the barriers to the adoption of ESG practices in the Malaysian construction industry.
3. To ascertain potential strategies to encourage ESG adoption in the Malaysian construction industry.

1.6 Research Methodology

In this research, the quantitative research approach was the primary method used to achieve the research objectives through a questionnaire survey.

A questionnaire was developed using Google Forms and shared online via email, LinkedIn, and WhatsApp to construction practitioners, including contractors, consultants, and developers. The questionnaire comprised multiple-choice questions and Likert scale items to evaluate the respondents' opinions on ESG adoption in construction activities. The data obtained was analysed using four statistical tests, including Cronbach's alpha reliability test, arithmetic mean, Kruskal-Wallis test, and Spearman's correlation test.

Additionally, a comprehensive literature review was undertaken to improve understanding of the topic and identify gaps in existing research on ESG adoption in the construction industry globally and in Malaysia. The literature review was conducted by studying relevant journals, conference papers, news articles, e-books, and other online resources.

1.7 Research Scope

ESG practices are applicable across various industries, including manufacturing, mining, banking, and more. This research focused on the construction industry, aiming to explore the perceptions of construction professionals regarding the drivers, barriers, and strategies for adopting ESG practices. The research is geographically concentrated in the Klang Valley region, which encompasses Selangor and Wilayah Persekutuan Kuala Lumpur (WPKL), a central hub for construction activities in Malaysia. The targeted respondents were construction practitioners, comprising consultants, contractors, and developers, from different professions, including quantity surveyors, architects, engineers, project managers, and builders. The diverse backgrounds of respondents, such as their working experience, organisational activities, and company sizes, were identified for detailed analysis and comparisons.

1.8 Chapter Outline

Five chapters are included in this research:

Chapter 1 introduces this research, starting with the background and problem statement about ESG adoption in the construction industry. This chapter also provides the research aim and objectives. Moreover, the research methodology and scope are proposed to provide a clear framework for the investigation.

The literature review relevant to this research is discussed in Chapter 2. It begins with an overview of ESG principles and their relevance to the construction industry, followed by a review of existing studies conducted by other researchers on the drivers of ESG integration in the construction industry, barriers to ESG adoption in construction activities, and strategies to encourage the adoption of ESG.

Chapter 3 describes the research methodology used in accomplishing the research aim and objectives, with justification for the selected research approach. The research design, data collection methods, sampling determination, and data analysis techniques are also described.

The data obtained from the questionnaire distributed are analysed and discussed in Chapter 4. The results are displayed in tables for thorough review. This chapter compares the findings against the literature review, and the analysed data will be supported by secondary data.

Lastly, Chapter 5 sums up the research by summarising all the findings. The drivers of ESG integration in the construction industry, barriers to ESG adoption, and strategies to encourage the adoption are concluded to meet the aim and objectives. The limitations of this research are addressed, while recommendations for further investigation into related topics are offered.

1.9 Summary

The construction industry plays a pivotal role in driving a country's economic growth, contributing significantly to GDP and employment. However, it faces a range of challenges that hinder its transition towards sustainability. In response, there has been a global shift towards incorporating ESG principles into construction practices, aiming to promote sustainability and ethical conduct. In Malaysia, despite the growing recognition of ESG's importance, its adoption in the construction sector remains in the early stages. Hence, this research seeks to investigate the barriers to ESG adoption in the Malaysian construction industry and identify strategies to support its effective implementation, ultimately supporting the sector's long-term sustainable development.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter presents the literature review of previous studies undertaken by other researchers. The first section provides an overview of the concept of Environmental, Social, and Governance (ESG). Following this, the idea of ESG in the construction context is discussed along with its key constituents and current trends in the construction industry. Next, previous studies on relevant topics, including the key drivers for embracing ESG principles, barriers that global and local industries face in adopting ESG, and strategies to overcome these barriers are also discovered in this chapter.

2.2 Environmental, Social, and Governance (ESG) Principles

Since the execution of various environmental protection and sustainability agreements like the Kyoto Protocol 1997 and the Paris Agreement 2015, the topic of sustainable development has been discussed more extensively from national to corporate levels (Gong, et al., 2023). Sætra (2023) described sustainable development as fulfilling current demands without hindering the ability of future generations to fulfil theirs. The notion of sustainable development encompasses three interrelated dimensions: environmental, social, and economic, which have been embodied into a blueprint that serves as the foundation for Agenda 2030 and the sustainable development goals (SDGs) of the United Nations (United Nations, 2023). The 17 SDGs specify challenges pertaining to all three sustainability aspects and are intended to be addressed by 2030 to guarantee a better and greener future (Kango, 2023). This vision is supported by the environmental, social, and governance (ESG) principles as a mechanism to integrate sustainable and responsible practices into corporate operations towards shared goals.

ESG principles originated from the concept of socially responsible investing (SRI) in the 1960s (Zhu and Huang, 2023). To date, ESG has been evolving for two decades since its formal proposal in 2004. ESG is a set of criteria used to assess environmental and social impacts of a company (Krantz

and Jonker, 2024). These impacts will be evaluated through the disclosure of a company's ESG practices, including its strategies, goals, and procedures, which determine how well it performs in compliance with ESG considerations by using specific indicators and metrics. As global discussion on sustainability has shifted to include environmental, social, and financial concerns, ESG initiatives are being embraced by international organisations and countries to establish a comprehensive framework for societal development (Li, et al., 2021). In short, ESG provides a framework to achieve the broader SDGs vision, which is often adopted by organisations and investors as practical steps towards global sustainability.

Nowadays, major companies have progressively integrated sustainability efforts into their corporate ESG programs (Ure, et al., 2024). Meanwhile, global investors may discover truly sustainable enterprises using the ESG framework, which emphasises a company's performance on environment, social, and governance over financial achievement (Gong, et al., 2023). In other words, the growing emphasis on sustainable development and investment has led to considerable attention on ESG. ESG criteria, often referred to as sustainable or socially responsible investments, allow a company's efforts and dedication to environmental, social, and governance concerns to be evaluated (De Souza Barbosa, et al., 2023). These criteria include metrics like resource consumption, carbon emissions, labour practices, employee diversity, stakeholder engagement, etc.

2.3 ESG in the Construction Industry

According to Haryani and Anjani (2023), the increase in the significance of ESG is driven by the emphasis on sustainability issues. A business or project now prioritises not only the greatest profit and earnings but the long-term impacts on society are also taken into consideration. Ahmed (2022) described ESG in construction as how a company or project considers environmental, social, and governance aspects of its operations, including initiatives such as controlling waste and emissions, minimising water and energy usage, employing eco-friendly materials, and fostering transparent relationships with stakeholders. ESG is also known as a conceptual framework that helps stakeholders in assessing the efforts of a construction firm in addressing environmental, social,

and governance risks and opportunities (Pandey and Thampi, 2024). In the construction context, ESG considerations should align with the more comprehensive sustainability goals outlined in international agreements such as the SDGs of the United Nations (Sulaiman, et al., 2024).

Sustainability in construction encompasses three essential aspects: social responsibility, economic efficiency, and environmental impact (Liu, et al., 2020). It refers to a construction approach that seeks to reduce the harmful effects of buildings on the environment, society, and economy (Loughlin, 2024). Besides providing jobs and creating value, the construction sector consumes a substantial amount of resources, resulting in severe environmental consequences (Araújo, Carneiro and Palha, 2020), such as resource depletion, climate change, pollution, and loss of biodiversity (WorldGBC, 2023b). According to the World Green Building Council, WorldGBC (2023a), approximately 35% of energy consumption, 38% of carbon emissions corresponding to energy use, 35% of waste produced, and 50% of resource utilisation are linked to the construction industry. Without intervention, it is anticipated that construction-related carbon emissions will spike over the next three decades, potentially doubling the overall footprint by 2060 in response to the demands of an increasing population around the world (CIDB, 2023b). Considering its vast impact, it is essential that the construction industry place the adoption of ESG concepts as a priority in light of the rising global challenges. Although significant progress has been made, the Malaysian construction sector still confronts a considerable journey ahead (Star Property, 2023). This transformation is beyond a reaction to global trends, it is also a strategic step towards culpable progress in urbanising regions. The respective aspects of ESG constitute various factors and considerations, they will be discussed in the following section.

2.3.1 Key Constituents of ESG

ESG comprises of three dimensions, namely environmental, social, and governance. Table 2.1 shows the components of ESG in the construction industry.

Table 2.1: ESG Considerations in the Construction Industry (Sulaiman, et al., 2024; Wang and Xue, 2023; Li, et al., 2021)

Dimension	**Environmental**	**Social**	**Governance**
Factors	- Energy consumption and efficiency - Waste production and management - Pollution control - Climate change - Greenhouse gas emissions - Natural resource consumption - Green building practices - Sustainable materials - Biodiversity	- Labour practices - Product safety - Supply chain management - Training and education - Health and safety - Diversity and inclusion - Equity - Stakeholder relations - Employee engagement - Community impacts	- Company's leadership - Executive pay - Internal controls - Shareholder rights and engagement - Ethics and integrity - Transparency and disclosure - Anti-corruption measures - Risk assessment - Sustainability reporting

The ESG framework is built upon three main pillars, each addressing a key aspect of sustainability and collectively guiding organisations towards responsible and ethical practices.

2.3.1.1 Environmental (E)

Environmental factors measure a company's performance in relation to the environment, considering its impact on carbon emissions, energy consumption, waste production, water quality, resource utilisation, and biodiversity (Baratta, et al., 2023). Environmental governance includes developing and enforcing regulations to protect the environment from adverse outcomes of business activities as well as periodically reviewing environmental performance (Sadiq, et al., 2022). In the construction industry, the environmental element entails the integration of sustainable development concepts at every stage of a building's lifespan, attempting to balance natural and built environments while creating habitable and economically equal communities (Sulaiman, et al., 2024).

Recognising that construction activities contribute heavily to carbon emissions, tackling climate change is one of the critical aspects of this dimension (Yap, 2022).

2.3.1.2 Social (S)

The social dimension covers a company's relationships with its workforce, customers, and society (Matos, 2020). It encompasses the organisation's influence on individuals, communities, and culture, which focuses on the social implications of supply chains, diversity, inclusion, and human rights (Krantz and Jonker, 2024). In the construction sector, safety and health are of utmost importance in social considerations, primarily due to its reliance on labours and the involvement of a diverse workforce that is exposed to occupational hazards, health threats, and insecure working circumstances (Wang and Xue, 2023; Yap, 2022). Sulaiman, et al. (2024) highlighted that this prioritisation of safety and health issues eliminates potential risks, sustains workers' emotional and physical well-being, boosts productivity, and facilitates the lasting prosperity and success of construction projects and companies. Therefore, to achieve a favourable social outcome in the construction industry, it is imperative to foster safe and fair workplaces, ensure workers' interests, and support multiculturalism and tolerance (Wang and Xue, 2023).

2.3.1.3 Governance (G)

Governance aspects refer to the internal framework of practices, mechanisms, and procedures a company employs to manage itself, make informed decisions, adhere to legal regulations, and satisfy the requirements of external stakeholders (Henisz, Koller and Nuttall, 2019). The governance pillars cover various elements including risk management, moral conduct, authentic leadership, and consistency of company operations with societal goals (Sulaiman, et al., 2024). Governance procedures in construction can conform to ethical business standards, such as transparent fiscal disclosures and rational decision-making, thereby establishing effective governance frameworks that maximise the continuous viability and profitability of construction firms (Pandey and Thampi, 2024; Wang and Xue, 2023). According to Yap (2022), in the construction context, governance challenges arise due to the complexity and range of

contracts, the competitive tendering system, and the engagement with both public authorities and private stakeholders. Hence, in an industry prone to corruption, bribery, and disruptive conduct, maintaining integrity, transparency, and a strong commitment to fair and truthful practices is vital.

2.3.2 ESG Trends in Construction Industry

Over the years, the construction industry has experienced a notable transition in integrating ESG concepts into its project management and operational procedures. This shift reflects an enhanced awareness of the absolute necessity for sustainable development, social accountability, and responsible governance in a sector that has substantial influences on the economy, environment, and society. Given the varying nature of projects, the construction industry has not established a standardised approach to ESG adoption, allowing companies to formulate their own ESG practices and embrace different initiatives put forth by industry bodies and other organisations (Forristal, Sutton and Ross, 2021). The integration of ESG principles into the construction sector encompasses a range of methods, including mitigating carbon emissions, adopting sustainable construction methods and materials, adhering to green building standards, transparent governance practices, compliance with local and global regulations, etc. (Pandey and Thampi, 2024; Star Property, 2023; Forristal, Sutton and Ross, 2021). The subsequent section outlines various examples of ESG trends in the construction industry, illustrating how nations and enterprises embrace ESG principles to stimulate positive transformations and advocate long-term sustainability.

2.3.2.1 Net-Zero Carbon Commitment

The reaction to the rising greenhouse gas emissions and climate change has emerged as one of the most urgent concerns facing the globe today. The World Green Building Council has initiated the Net Zero Carbon Buildings Commitment to encourage climate leadership action among corporations, cities, and local authorities in mitigating operational and embodied carbon emissions in the construction industry (World Green Building Council (WorldGBC), 2023a). They hold a goal of a 50% reduction in emissions from the building and

construction industry by 2030, with complete decarbonization to be achieved by 2050.

A growing number of governments across the world have declared their commitment to achieving Net Zero by 2050, underscoring the crucial role of cities as the intersection where people and policies come together to attain carbon neutrality (Park, et al., 2023). According to Net Zero Tracker (2023), approximately 149 countries, including the UK, China, Korea, the European Union, India, Japan, France, Singapore, Australia, and Canada, have pledged to join the US's initiative towards net-zero emissions. Being one of the participating councils in the WorldGBC's Advancing Net Zero project, the Malaysia Green Building Council (malaysiaGBC) established the malaysiaGBC Carbon Score (MCS) program, which is an extensive assessment method created to evaluate the carbon footprint associated with building construction and occupation (WorldGBC, 2022; Chung, 2021). With this initiative, the country's commitment to global decarbonization will be strengthened while making net zero buildings to be the standard of construction in all economic sectors.

2.3.2.2 Using Sustainable Building Materials

Cruz, et al. (2023) explored 488 publications about ESG practices and innovation in civil construction. Among these, over 200 papers centred on two main subjects, including the use of innovative and sustainable materials such as bamboo-reinforced concrete beams and multilayer cement roofs. Marsh (2024) asserted that adopting eco-friendly, recycled, or renewable building materials could reduce emissions by up to 40% by 2050. These materials are manufactured with greater energy efficiency and are sustainable, reducing landfill disposal at the end of their lifespan. For instance, using green steel, or steel produced without fossil fuels, has the potential to achieve a 70% carbon emissions reduction in commercial buildings. Besides, it is recommended to substitute prevalent materials and equipment with more energy-efficient options, such as carbon-neutral and productive materials, as well as electrified heavy machinery (Blanco, et al., 2021). Overall, adopting sustainable materials more extensively can save both material and construction costs while cutting embodied energy and other adverse impacts from overproduction and overuse.

2.3.2.3 Improving Energy Efficiency

The study by Sulaiman, et al. (2024) discovered that efficiency or consumption of energy contribute to 49% of climate change issues. Improving buildings' energy efficiency is essential for addressing the environmental crisis, optimising resources, and saving energy costs (Liu, et al., 2020). Corporations emphasise greater energy efficiency in appliances and buildings as part of their ESG initiatives, which include adopting renewable energy systems and green technologies to lower energy usage and manage greenhouse gas emissions. To illustrate, the Energy Performance Contracting program of British Land makes investments in energy-saving techniques to lower energy expenses and usage (Izyumov, 2023). In Nigeria, Tunji-Olayeni, Kajimo-Shakantu and Osunrayi (2020) observed the increased use of solar panels and light-emitting diode (LED) technologies to optimise buildings' energy efficiency. Since solar energy cuts greenhouse gas emissions, installing solar panels is a greener alternative energy option for experienced developers (Sulaiman, et al., 2024). Therefore, enhancing energy efficiency is a critical approach for construction firms to contribute to climate change mitigation that fulfils their environmental responsibility under ESG requirements.

2.3.2.4 Sustainable Construction Methods

The adoption of sustainable construction methods is the most frequently discussed topic in publications related to ESG practices and innovation. A study by Cruz, et al. (2023) observed that 23% of the 488 articles they reviewed focused on sustainable construction techniques, including modular construction, smart homes, prefabricated, and drywall. Given its tangible positive impacts on the environment, sustainable construction has been recognised as the present trend in environmentally friendly practices in the construction sector (Saharuddin, Hassan and Kamar, 2022).

According to Li et al. (2022), the development of prefabricated buildings, or offsite construction, holds profound effects on the ESG performance of construction firms. Sulaiman, et al. (2024) also stressed that developers are continuously seeking new options in construction technology, such as utilising the Industrialized Building System (IBS), to minimise the amount of construction waste produced. In fact, since the beginning of the 21st

century, Malaysia has actively encouraged the application of IBS to lower material waste, elevate building quality, and boost construction efficiency while marking substantial progress towards innovative and green construction practices (Star Property, 2023). The concept of sustainable development in construction aims to achieve a balance between social, economic, and environmental factors. Thus, sustainable construction practices should consider factors such as the lifecycle costs of buildings, effective site and waste management, reusing materials, and responsible consumption of natural resources (Abidin, et al., 2020).

2.3.2.5 Technology Integration

The incorporation of technologies has emerged as a crucial trend in today's industry development. Utilising advanced technologies such as artificial intelligence (AI), big data, and the Internet of Things (IoT) can greatly enhance an organisation's competitiveness, operational efficiency, productivity, and management quality (Yu, Xu and Yuan, 2024; Pandey and Thampi, 2024). These factors are significant in ensuring a company's long-term growth and improving its ESG performance in the industry. For example, Lu, et al. (2023) discovered that employing digital technologies like Building Information Modeling (BIM) and smart construction methods can successfully encourage ESG performance of construction firms by stimulating green innovation and strengthening internal control. According to Chen and Zhang (2024), applying artificial intelligence (AI) can elevate corporate ESG performance, risk evaluation, and management competencies concerning ESG by improving the transparency of environmental information and refining internal control mechanisms. Moreover, technologies such as smart sensors and building automation systems can also be used to track and optimise indoor air quality, water consumption, and energy usage in their buildings or facilities (Izyumov, 2023).

2.3.2.6 ESG Evaluation Framework

ESG assessments have gained prominence as an approach to appraise a company's commitment to corporate governance, environmental responsibility, and financial proficiency, which is prompted by the urgency of climatic and

environmental concerns (Gong, et al, 2023). Several leading ESG evaluation frameworks include ISO (International Organization for Standardization), and GRI (Global Reporting Initiative), each features unique sets of disclosure criteria and analytical indicators. Kong, et al. (2024) underscored the relevance of ISO 14001 Environmental Management Systems as an application for Malaysian enterprises to enhance ESG performance.

The construction industry leads with 16.98% of ISO 14001 certifications, indicating its outstanding effort to adhere to international standards that assess environmental and social performance (Falqi, Alsulamy and Mansour, 2020). Other than that, companies strive to achieve certifications like LEED, BREEAM, DGNB or WELL, which validate the environmental footprint and sustainability of their buildings (Izyumov, 2023; Liu, et al., 2020). Some construction firms employ these assessment frameworks in their projects to showcase their dedication to ESG goals while boosting their reputation with stakeholders, staff, and the public (Adewumi, Opoku and Dangana, 2024). Moreover, amid the construction sector's shift towards ESG principles, having "green" certifications may offer developers a significant edge over their competitors (Meshcheryakova, 2022).

2.4 Drivers for ESG Integration

In the context of ESG, drivers refer to forces or influences, either external or internal, that motivate an organisation to embrace and implement ESG practices. These drivers compel companies to consider and act upon their environmental impact, social responsibilities, and corporate governance to engage in sustainable and responsible conduct. There are numerous factors that can encourage the construction industry to adopt ESG principles. This section proposes to determine the drivers for ESG integration from three aspects, namely organisational, social-environmental, and external aspects, as outlined in Table 2.2.

Table 2.2: Summary of Drivers for ESG Integration

Code	Drivers	References													Total
		1	2	3	4	5	6	7	8	9	10	11	12	13	
	Organisational aspect														
D1	Company image and reputation	✓	✓	✓	✓	✓		✓	✓			✓	✓	✓	10
D2	Corporate financial performance	✓	✓						✓		✓	✓	✓		6
D3	Organisational size	✓	✓				✓						✓		4
D4	Corporate governance	✓	✓	✓											3
	Social-environmental aspect														
D5	Environmental responsibility		✓	✓	✓			✓	✓	✓	✓		✓		8
D6	Building occupants' wellbeing and comfort			✓					✓	✓	✓		✓		5
D7	Workers' health and safety							✓			✓		✓		3
	External aspect														
D8	Government legislation and policy	✓	✓	✓		✓	✓	✓	✓		✓	✓		✓	10
D9	Market force and clients’ demand		✓				✓	✓	✓			✓		✓	6
D10	Government incentives	✓							✓		✓	✓		✓	5
D11	Industry competitiveness					✓		✓			✓	✓	✓		5
D12	Availability of emerging technologies			✓	✓	✓			✓						4

Authors: **1**- Zhang, Liu and An (2024); **2**- Khamisu, Paluri and Sonwaney (2024); **3**- Wang and Xue (2023); **4**- Curz, et al. (2023); **5**- Ni (2023); **6**- Ratnasingam, et al. (2023); **7**- Gu, et al. (2023); **8**- Zulu, et al. (2022); **9**- Saharrudin, et al. (2022); **10**- Dosumu and Aigbavboa (2021); **11**- Tunji-Olayeni, Kajimo-Shakantu and Osunrayi (2020); **12**- Durdyev, et al. (2018); **13**- Bohari, et al. (2016).

2.4.1 Organisational Aspect

Organisational drivers pertain to the internal governance and operational frameworks that facilitate the integration of ESG principles into a company's business practices. These drivers encompass various characteristics of an organisation and internal efforts undertaken by its director and employees to embed sustainable and ethical practices within its operations. They include management-related and organisational capacities, such as the goals, resources, culture, and structure of the company.

2.4.1.1 Company Image and Reputation

As illustrated in Table 2.2, nearly all studies of related topics identify company reputation as a key driver for the adoption of ESG and sustainable practices in the construction industry. Companies committed to ESG are perceived as more responsible, ethical, and trustworthy from the public's perspective, which results in a buoyant market reputation (MITI, 2024). In the construction sector, projects often involve long duration, and it is competitive to win a bid. It indicates that establishing a strong reputation is particularly essential to gain trust and confidence from the public and industry stakeholders, which may lead to more opportunities for collaboration.

According to Zulu, et al. (2022), the adoption of sustainable construction is motivated by the enhanced image that a firm gains from its participation in environmentally sustainable infrastructure. This is especially prevalent for large enterprises, where strengthening their image is a major incentive to promote environmental sustainability. In the Malaysian construction industry, early adoption of ESG practices offers participating companies a position as the industry pioneers, which has grown to be a primary influencing factor for involvement, especially for private developers (Bohari, et al., 2016). For instance, Gamuda Berhad and IOI Properties Group Berhad, the prominent Malaysian construction firms, have been recognised for their proactive approach to sustainability. In the words of Shen (2023), ESG performance not only brings favourable impacts on company value but also reflects compliance with sustainable development standards, which supports a company's capacity to gain and maintain social recognition. Therefore, enhancing company image and reputation through ESG adoption is an effective strategy that can lead to market

dominance, increased client retention, and public confidence, collectively contributing to a company's long-term success and sustainability.

2.4.1.2 Corporate Financial Performance

Several studies have explored the impact of ESG practices on financial performance (Chen, Yu and Gao, 2023; Shen, 2023; Zhou, Liu and Luo, 2022; Li, et al., 2021). It has been discovered that ESG is an effective strategy that can boost corporate financial performance and social influence. By promoting sustainability, businesses can develop an outstanding reputation and boost management effectiveness, which can ultimately lead to corporate and project success (Li, et al., 2021). Baratta, et al. (2023) emphasised that companies committed to sustainable development objectives, such as exercising social and environmental responsibility, can considerably enhance their reputation while gaining financial benefits. This effort further improves the company's standing in the market and its financial stability, signifying its contribution to a greener world.

At the same time, as investors are increasingly incorporating ESG concerns into their decision-making, companies with robust ESG commitments are more likely to attract investment, which will support their economic achievements in the long run (Song, et al., 2024; Ishak, Aziz and Rahim, 2023). Therefore, companies may be motivated to adopt ESG practices due to the potential to attract and retain investors and enhance the company's as well as a project's financial performance. However, although ESG performance is typically linked to better financial outcomes, its effects might differ across industries. In this regard, Shen (2023) and Zhou, Liu and Luo (2022) argued that ESG performance may improve a company's operational performance, but it does not directly affect a firm's financial performance. Compared to service sectors, the effect may be more noticeable in sectors that produce tangible outputs.

2.4.1.3 Organisational Size

An organisation is typically classified into large, small-medium, or micro depending on its scale of operations and number of employees. Firm characteristics are the most influencing factors in ESG implementation

(Khamisu, Paluri and Sonwaney, 2024). Different organisational sizes may pose varying levels of awareness, initiative, involvement, and availability of skilled workforce and capital, all of which have an impact on the construction industry's readiness to embrace ESG principles.

According to Ratnasingam, et al. (2023), unlike small and medium-sized companies (SMEs) and micro-sized firms, large-sized enterprises are more inclined to employ ESG practices. This may because large companies are more conscious of ESG requirements, have better access to resources, greater financing capacity, and stronger governance structures, which enable them to embrace ESG practices and comply with sustainability standards (Alhoussari, 2024). Further supporting this, a study by Chang, et al. (2024) determined that larger firms tend to have more resources, enabling them to participate in more visible initiatives, even though all companies comply with regulatory requirements. Their study also discovered that larger organisations are more likely to reveal Occupational Safety and Health (OSH) statistics, indicating the firms' compliance with ESG reporting in an effort to enhance transparency and demonstrate their commitment to responsible business practices. Conversely, for smaller construction firms, it may be difficult for them to design and implement effective ESG management strategies (Park, et al., 2023). This implies that a company's ability and motivation to adopt ESG practices may depend on its size and available resources.

2.4.1.4 Corporate Governance

Strong corporate governance supports sustainable development and enhances overall corporate performance, making it a crucial factor in driving ESG adoption across the construction sector. By establishing a robust governance framework, companies can ensure transparency and accountability through rigorous reporting and disclosure of their organisational practices. ESG considerations are becoming a significant component in making organisational decisions and assessing companies' potential performance (Khamisu, Paluri and Sonwaney, 2024). This shift reflects a broader recognition that ESG practices provide valuable insights into a company's sustainability and long-term viability. According to MITI, Ministry of Investment, Trade and Industry (2024), adopting ESG practices allows companies to assess potential long-term risks

more accurately, which enables them to make more informed decisions and improve readiness for unforeseen events or market changes. Therefore, integrating ESG considerations into strategic planning and operational decisions supports effective governance.

On top of that, the focus on ESG also contributes to employee satisfaction and retention. Research by Narayanan (2022) underscored that corporations that have embraced ESG initiatives have a better chance of retaining existing employees and attracting new ones. Thus, the commitment to ESG not only ensures a company's risk management and decision-making, but also boosts employee engagement and performance, underlining the motivations of incorporating ESG principles in the construction industry.

2.4.2 Social-Environmental Aspect

The socio-environmental aspect refers to the interconnected relationship between social and environmental factors in the construction industry that influence organisations to consider their impact on the natural environment and society. As a sector that involves a diverse workforce and contributes significantly to environmental issues, both factors can drive the adoption of ESG practices to ensure sustainable and desirable outcomes.

2.4.2.1 Environmental Responsibility

In the construction industry, environmental impact is one of the pressing concerns that draws significant public attention to the urgent need for sustainable practices. Issues such as resource degradation and waste generation underscore the importance of adopting environmentally responsible approaches. According to Dosumu and Aigbavboa (2021), conserving natural resources is a critical benefit of sustainable construction. Besides, the need for higher levels of water and energy efficiency is also highlighted by Zulu, et al. (2022), which is the top-ranking environmental driver of ESG practices. This emphasis on reducing natural resource consumption aims to minimise environmental degradation and enhance sustainability.

Among all, carbon emission mitigation stands as a pivotal environmental driver for integrating ESG practices within the construction industry. As a significant contributor to greenhouse gas emissions across its operations and

project lifecycles, the construction sector faces a pressing need to address this core issue. Khamisu, Paluri and Sonwaney (2024) claimed that improved environmental performance, like reduced greenhouse gas emissions and better carbon management, facilitates the adoption of ESG principles. Construction firms can reduce their carbon footprint by utilising renewable energy sources, employing energy-efficient technologies, and integrating eco-friendly building materials, which comply with ESG standards.

Previous research has established that sustainable construction practices are gaining traction in various countries, including Cambodia (Durdyev, et al., 2018), South Africa (Dosumu and Aigbavboa, 2021), Zambia (Zulu, et al., 2022), and India (Khamisu, Paluri and Sonwaney, 2024), as an initiative to curtail environmental consequences. The pressing global issue of climate change has propelled governments worldwide to develop ambitious goals for carbon neutrality, with many declaring Net Zero by 2050. For instance, over ten regions and nations, including Canada and Japan, have proposed a timeline following China' proclaimed plan to be carbon neutral before 2060 (Shao and Chen, 2022). In alignment with the Paris Agreement, South Korea has announced a national target to attain carbon-free status in 2050 with an initial step of 24.4% emissions reduction by 2030 (Park, et al., 2023). Similarly, Malaysia is dedicated to achieving the same target, as specified in the Twelfth Malaysia Plan (12MP), with a focus on improving energy efficiency and limiting dependence on traditional sources of energy (Shahril, 2023). These international commitments reveal the construction industry's indispensable role in fulfilling its environmental responsibilities within ESG frameworks in order to accomplish global climate objectives.

2.4.2.2 Building Occupants' Well-being and Comfort

The well-being and comfort of building occupants are compelling drivers for ESG adoption in the construction industry, aligning with the growing demand for healthier living and working environments. The COVID-19 pandemic has amplified the global emphasis on fostering sustainable internal environments other than a resilient society (Shen, Chen and Rajagopal, 2023). The influence of indoor settings on human health is significant and cannot be overlooked since people spend nearly 90% of their lives indoors (Fantozzi and Rocca, 2020).

Decisions regarding a building's design, materials, and systems directly impact the health and comfort of occupants. This underscores the industry's role in prioritising features that enhance quality of life by providing better air quality, adequate natural light, and comfortable thermal conditions.

In addition, the improvement of occupants' health and comfort is also a key advantage of sustainable construction (Dosumu and Aigbavboa, 2021). Individuals working or living in green buildings exhibit greater concentration and productivity due to access to improved air quality, natural lighting, and efficient use of energy resources (Saharuddin, Hassan and Kamar, 2022). This demonstrates that the living conditions and life standards of building occupants are given significant consideration in leading sustainable construction.

2.4.2.3 Workers' Health and Safety

Due to its extremely labour-intensive nature of work and hazardous working atmospheres, the occupational safety and health threats in the construction industry are particularly high. Compared to accident data of other sectors, the construction sector is of ill repute for having terrible safety performance (Yap, et al., 2022). In most nations worldwide, the construction sector consistently reports the highest accident rates (Juhari, et al., 2023).

Malaysia reported 159 occupational accidents, with the highest case of 45 deaths across all sectors in 2023 (Department of Occupational Safety and Health (DOSH), 2023). In Singapore, the construction sector accounted for the highest risk of 27% and maintained its position as the top contributor to fatal and major injuries in 2023 (Ministry of Manpower, 2024). Meanwhile, Phillips (2023) reported that in the United States, the construction industry had the highest fatality rate, with 9.6 fatalities per 100,000 full-time workers.

In view of this, safety and health concerns can prompt construction firms to adopt ESG practices, such as strengthening occupational safety and health (OSH) regulations, engaging safety professionals to assist in assessing potential risk and establishing feasible ESG requirements, and utilising cutting-edge technologies to mitigate risks associated with conventional work procedures (Martin and Massyn, 2023; Yap, et al., 2022).

2.4.3 External Aspect

A shift in an organisation's internal environment may be triggered by external factors that go beyond the dominance of the organisation. Businesses are being put under more external pressure to alter their practices and concentrate on integrating ESG considerations into their operations (Zaccone and Pedrini, 2020). The construction industry is significantly influenced by external drivers to adopt ESG principles due to its regulatory obligations, stakeholder expectations, industry's competitive nature, and market trends.

2.4.3.1 Government Legislation and Policy

Government legislation and policies, including regulations, guidelines, industry standards, and administrative procedures, are crucial to direct and manage the conduct of industries and businesses. This is especially relevant in the construction industry, which operates in a constantly evolving environment. In order to facilitate local councils in conforming construction practices with the national and international sustainability goals, authoritative bodies, such as the Construction Industry Development Board (CIDB), play a vital role in establishing, enforcing, and regulating these standards (Star Property, 2023). As suggested by several previous research, government legislation and regulatory policies are viewed as influential factors encouraging industry participants to embrace ESG practices that stimulate sustainable growth in the construction sector, whereby building laws and standards for future design and construction are of great relevance (Ratnasingam, et al., 2023; Ni, 2023; Gu, et al., 2023; Zulu, et al., 2022).

Governments worldwide are enacting new legislation mandating organisations to fulfil certain ESG standards (MITI, 2024). In Malaysia, industry rules and government regulations have been the driving forces behind the success of green projects. In its role as a prominent client, the government generates demand and influences industry practices through policies that require sustainable criteria for construction projects in the public sector (Bohari, et al., 2016). For example, the National Green Technology Policy (NGTP) was established to assist industry participants, including suppliers, manufacturers, and builders, in delivering green services and products to be more sustainable and remain competitive in the local and international markets (Ishak, Aziz and

Rahim, 2023). This commitment has motivated industries to adopt environmentally friendly practices, comply with regulatory requirements, and improve their reputation. Therefore, government legislation and regulatory policies are crucial to drive ESG implementation and ensure long-term sustainable development within the construction industry.

2.4.3.2 Market Force and Clients' Demand

Clients' demand often drives practices in the construction industry to adapt to market trends and standards. In Nigeria, the employment of sustainable construction is driven by client demand, forcing construction firms to meet sustainability requirements to maintain their reputation and competitiveness (Tunji-Olayeni, Kajimo-Shakantu and Osunrayi, 2020). Yet, in Malaysia, many industry participants still lack a sense of urgency to consider the importance and adoption of sustainable practices. After all, when the market demand increases, developers' interest is expected to rise (Bohari, et al., 2016).

The influence of consumer purchasing power on the construction industry is particularly notable (Poderytė and Banaitis, 2024). As the global awareness of environmental issues is growing, the preference for green buildings may lead to higher demand and occupancy rates, inspiring developers and builders to integrate ESG principles into their projects to remain competitive (RealVantage, 2022). The pressure from stakeholders and third-party evaluations plays a critical role in promoting sustainable development worldwide (Khamisu, Paluri and Sonwaney, 2024). Nowadays, stakeholders such as employees, clients, investors, and regulators are more concerned about ESG criteria and how organisations react to them. This is primarily owing to stakeholders' expectations and the need for corporations to be more transparent and accountable regarding sustainability-related matters (Hadro, et al., 2021). Investors, in particular, assess a company's ESG disclosure and relevant information to identify sustainable companies before making investment decisions. Companies might be encouraged by the favourable market response resulting from ESG disclosure to consistently improve their ESG performance, including strategic decision-making, performance evaluation, and risk management for growing their business (Shen, 2023).

2.4.3.3 Government Incentives

Since regulatory rules alone may not be adequate to achieve desired sustainability reforms, government incentives should be put in place to encourage stakeholders to participate in green operations to achieve ESG objectives. Governmental incentives and support are significant boosters of sustainability strategies (Zhang, Liu and An, 2024; Zulu, et al., 2022; Xie, et al., 2022; Tunji-Olayeni, Kajimo-Shakantu and Osunrayi, 2020). Governments can increase the attractiveness of green policies and initiatives by offering monetary and non-monetary incentives. Monetary incentives are provided in various forms, such as direct subsidies, tax deductions or exemptions, loan assurances, and green financing, while non-monetary incentives include expedited permitting, training and education, and guarantee programs (Xie, et al., 2022; Bohari, et al., 2016).

Given this, many countries have implemented various incentives to promote green development. For example, the Malaysian government launched the Green Technology Financial Scheme, providing financial loan refunds for initiatives involving green technology (Star Property, 2023). With the support of this scheme, it enables the construction sector to incorporate green technologies more easily by reducing the cost associated with adopting sustainable practices. In China, the government provides incentives to developers, manufacturers, and consumers to encourage the development of prefabrication (Yuan, et al., 2022; Wang, Qin and Zhou, 2021). The relevant governmental institutions have also introduced a number of subsidy schemes to promote investment in environmental protection and the application of green technologies (Shao and Chen, 2022).

According to Lim (2022), the announcement of a carbon tax by the Malaysian government is a major factor propelling the ESG agenda. Providing tax allowances and tax exemptions will continue to foster and motivate enterprises to accelerate the utilisation of ESG-focused technologies and initiate green projects. Reducing taxes on environmentally friendly construction can also further stimulate developers' enthusiasm in investing in green buildings (Sajjad, et al., 2021). Being a prevalent financial incentive, subsidies serve as an inspiration for all parties involved in the construction industry (Chen, et al., 2021). Therefore, government subsidies drive businesses to use government

funding for resource reallocation and to prioritise green and sustainable development in future projects (Zhang, Liu and An, 2024).

2.4.3.4 Industry Competitiveness

ESG initiatives have been discovered to positively impact a firm's value, which helps foster competitiveness and a sustainable management approach (Ngwa, et al., 2025; Chang and Lee, 2022). Greater ESG performance enables companies to be prioritised in projects and boost their reputation in the industry (Dang, Peng and Deng, 2024). Other than to show their commitment to sustainable growth to their stakeholders, Malaysian companies that reported their green initiatives also present ethical corporate conduct, which offers a greater chance to cultivate long-term development, resilience, and innovation (Sulaiman, et al., 2024). For example, adopting waste reduction strategies into practice can lead to lower operational costs, which allows more competitive tender prices.

In addition, employing technology such as BIM enables construction firms to be more capable of delivering projects on time and within budget, increasing client satisfaction while building stakeholders' confidence. Hence, companies that uphold their ESG obligations can gain a competitive edge as such initiatives improve their corporate reputation besides contributing towards a more sustainable environment and society (Muhmad, et al., 2021). The integration of ESG practices into a company's strategy has become crucial due to its ability to enhance investors' and stakeholders' trust while improving its competitiveness, making it stand out from competitors in the industry.

2.4.3.5 Availability of Emerging Technologies

Technological advancements play a significant part in facilitating ESG adoption in the construction industry. Modern innovations such as Building Information Modeling (BIM), smart construction methods, and green building technologies can be incorporated into ESG implementations, which enable the design and construction of more sustainable structures. These innovations optimise resource consumption, avoid waste, and increase energy efficiency, thereby facilitating construction firms' adherence to ESG criteria and the achievement of sustainability targets. Through the integration of technological solutions, corporations may improve their ESG performance, which can lead to long-term

advantages for the companies themselves and improve their operations in terms of financial management and monitoring efficiency (Wang, Song and Xue, 2023).

Green innovation acts as an important measure in driving companies towards environmental sustainability. It can be regarded as practices that result in better environmental innovation, which is an influencing factor in lowering carbon emissions and producing positive financial outcomes (Baratta, et al., 2023). Indeed, technology is an essential component in the global pursuit of achieving net zero emissions. Han, et al. (2023) claimed that green technological innovation not only reduces a company's reliance on resources and its environmental impact but also boosts its competitive edge. To illustrate, technology such as BIM can be applied across the whole construction project, enabling comprehensive project visualization and streamlining the administration and supervision procedures (Gottmann, Djakona and Stankevics, 2024). Furthermore, it also helps to save the cost of construction and operation, promotes consistency among project participants, and eliminates project documentation mistakes.

The integration of ESG concepts with Information and Communication Technologies (ICT) like drones, IoT, and AI may facilitate cooperation, communication, and coordination while ensuring the compliance of construction projects with ethical and sustainable requirements (Pandey and Thampi, 2024). Moreover, applying automation and digital tools in construction activities improves accuracy and reduces waste, contributing to ESG conformance and more environmentally friendly practices. Hence, the availability of technologies may be a crucial driver to the implementation of ESG practices in the construction industry due to the ability to generate positive project results with a favourable impact on both society and the environment.

2.5 Barriers to ESG Adoption

The integration of ESG principles into the construction industry is gradually realised as vital for fostering sustainable growth and ethical business conduct. Apart from the significant advantages and positive influences, several barriers have hindered the adoption process, impeding the shift towards sustainability. In this research, these barriers are classified into five aspects, including financial,

technological, organisational, social, and external. As shown in Table 2.3, barriers from different aspects have been identified and will be discussed in this section.

Table 2.3: Summary of Barriers to ESG Adoption

Code	Barriers	References																							Total
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
	Financial																									
B1	High associated cost	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	21
B2	Uncertain returns on investment	✓								✓			✓	✓								✓				5
	Organisational																									
B3	Resistance to change	✓		✓	✓		✓	✓		✓	✓	✓	✓		✓	✓		✓		✓		✓			✓	15
B4	Lack of resources	✓				✓	✓			✓		✓	✓	✓	✓			✓		✓	✓	✓		✓		13
B5	Limited data and lack of long-term comparability	✓				✓			✓				✓		✓											5
B6	Improper carbon offsetting	✓											✓													2
	Technological																									
B7	Technology complexity	✓				✓	✓									✓	✓		✓							6
B8	Immaturity of new technologies and innovations		✓							✓			✓								✓					4
	Social																									
B9	Limited ESG awareness	✓	✓	✓	✓		✓		✓	✓	✓			✓	✓			✓	✓	✓	✓	✓			✓	16
B10	Low interest and demand	✓			✓	✓													✓	✓	✓	✓	✓	✓	✓	10
B11	Lack of training and education system	✓			✓		✓			✓							✓	✓			✓	✓		✓		9

Table 2.3: Summary of Barriers to ESG Adoption (Continued)

Code	Barriers	References																							Total
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
	External																								
B12	Insufficient regulations and policies for sustainable practices	✓	✓	✓		✓				✓		✓				✓		✓	✓	✓	✓	✓	✓		✓	14
B13	Lack of government support	✓			✓	✓		✓							✓	✓		✓	✓	✓		✓		✓		11
B14	Lack of established standards and guidelines for ESG activities	✓							✓	✓			✓		✓											5

Authors: **1**- Bezerra, Martins and Macedo (2024); **2**- Sulaiman, et al. (2024): **3**- Ferreira, Morgado and Lins (2024); **4**- Jaradat, et al. (2024); **5**- Abdulai, et al. (2024); **6**- Pandey and Thampi (2024); **7**- Zhang, Liu and An (2024); **8**- MITI (2024); **9**-Wang and Xue (2023); **10**- Curz, et al. (2023); **11**- Maqbool, Arul and Ashfaq (2023); **12**- Liou, Liu and Huang (2023); **13**- Ratnasingam, et al. (2023); **14**- Parameswar, et al. (2023); **15**- Gu, et al. (2023); **16**- Ayarkwa, et al. (2022); **17**- Zulu, et al. (2022); **18**- Saharuddin, Hassan and Kamar (2022); **19**- Dosumu and Aigbavboa (2021); **20**- Sajjad, et al. (2021) ; **21**- Osuizugbo, et al. (2020); **22**- Abidin, et al. (2020); **23**- Durdyev, et al. (2018); **24**- Bohari, et al. (2016).

2.5.1 Financial Barrier

Financial barriers include economic concerns that limit the capacity of an organisation to enforce sustainable practices regarding the ESG principles. This constraint may be particularly notable in small and medium-sized companies, which affects their ability to invest in and incorporate ESG programs.

2.5.1.1 High Associated Cost

Among the barriers identified through the literature review, the high cost associated with ESG practices stands out as the most critical barrier to the adoption of ESG, which is consistently mentioned in almost all past studies on related topics. The shift to sustainable practices comprises not only initial capital investment but also ongoing maintenance and operating expenditures (Ayarkwa, et al., 2022). These expenses include assessment costs, dealing with hazardous emissions, and meeting other environmental compliance obligations. Meanwhile, organisations will incur additional costs for staff training, adopting new technology, and integrating digital platforms (MITI, 2024). For instance, businesses face significant financial difficulties due to the requirements to reduce emissions and save energy, and the transition from conventional to green technology (Ruan and Liu, 2021).

The financial burden is especially tough for small and medium-sized enterprises (SMEs) in the construction industry due to the lack of sufficient financial resources and access to affordable financing options to employ new technologies or practices that could improve their sustainability profile. Additionally, firms facing financing constraints may struggle to allocate funds for digital transformation, potentially reducing the effectiveness of ESG initiatives involving digitisation (Yu, Xu and Yuan, 2024). It would also deter organisations from adopting ESG disclosures because of the costs involved in maintaining sustainable goals (Parameswar, et al., 2023). While some clients are willing to bear the additional costs involved, this might discourage other clients from engaging in sustainable projects, which would impede the implementation of ESG (Bohari, et al., 2016).

2.5.1.2 Uncertain Return on Investment

Another critical financial barrier to the implementation of ESG is the uncertain return on investment. This uncertainty arises from various factors that dissuade investors and developers from embracing ESG programs that do not offer obvious and immediate financial rewards. The high upfront costs required for ESG adoption can significantly impact their profit margins and overall profitability (Liou, Liu and Huang, 2023). To illustrate, companies that invest in green technologies to meet ESG standards require considerable capital expenditures. Despite these technologies offer long-term benefits, the immediate impact is less apparent. This large initial spending may affect the firm's current financial performance, consequently putting companies under economic pressure to realise ESG applications (Chen, 2024).

Furthermore, the emphasis on maximising profits means that the rate of return becomes a primary concern for investors and company executives (Liou, Liu and Huang, 2023). In this context, adopting sustainable practices that align with ESG consideration, which often involve significant funding and may not deliver instant financial returns, is less attractive compared to other green investments with more predictable and quicker returns. In the construction sector, contractors must invest additional time and money to integrate sustainable construction requirements (Saharuddin, Hassan and Kamar, 2022). Given that it impacts contractors' profits and they might not be able to generate the desired returns quickly enough to justify the investment, these increased expenses can be a demotivation factor for companies to undertake ESG initiatives (Gu, et al., 2023). Hence, the delayed returns and substantial upfront costs on sustainable practices create uncertainties on the rate of return, placing significant financial strain on companies to fully embrace ESG principles.

2.5.2 Organisational Barrier

The term 'organisational barrier' describes difficulties within a company that prevent it from effectively embracing ESG principles. These challenges may be attributed to top management's resistance, misalignment of company strategy, and a lack of capacity or resources to implement ESG initiatives for sustainable growth.

2.5.2.1 Resistance to Change

The adoption of ESG principles may be impeded by concerns of many stakeholders, including top management, about perceived interference with current procedures and potential financial impacts. Companies may think that it is unfeasible to modify their established business operations as these are matters that they have habitually disregarded to optimise profits (Liou, Liu and Huang, 2023). Convincing experienced practitioners to switch from their standard approach to the sustainable system may turn out to be challenging. This resistance may result from apprehensions about cultural changes and a lack of understanding about the importance and advantages of embracing ESG strategies (Bezerra, Martins and Macedo, 2024). Even when there is awareness of sustainability concepts, many still prefer conventional methods due to obstacles such as substantial start-up expenses and insufficient technical capability in employing new practices (Bohari, et al., 2016).

In the UK, Maqbool, Arul, and Ashfaq (2023) reported that construction practitioners prefer to stick with the status quo since they believe there are more risks and unknowns involved in applying new techniques. In Malaysia, Abidin, et al. (2020) revealed a noticeable gap in contractors' self-inventiveness when it comes to applying the concept of sustainability. Since implementing ESG practices requires collaboration among various stakeholders, the process may be hampered by a lack of support or recognition from any of the parties (Parameswar, et al., 2023). In order to overcome this resistance, organisations must strive to incorporate stakeholder requirements and concerns into sustainability planning and performance monitoring (Bezerra, Martins and Macedo, 2024).

2.5.2.2 Lack of Resources

A major organisational barrier to the adoption of ESG practices could be the lack of resources, including financial access, digital tools, as well as the availability of professional personnel with technical support capabilities. In the Malaysian construction industry, where SMEs account for 90% of firms, this challenge is particularly apparent (CIDB Malaysia, 2022b). The shortage of optimised digital procedures, adequate capital, and necessary knowledge makes

it challenging for SMEs to pursue sustainability and ESG reporting (The Star, 2024).

Since digital technologies are essential for effective ESG reporting and monitoring, the lack of access to relevant digital systems restricts the governance of ESG practices, whereas poor technological application results in laborious processes and minimal data exchange (Bezerra, Martins and Macedo, 2024). Besides, according to Liou, Liu and Huang (2023), the shortage of low-carbon and sustainable energy sources creates an obstruction between energy-production and energy-saving equipment, making it difficult for firms to be less reliant on energy sources that are non-renewable. Moreover, sourcing materials that satisfy green requirements or sustainable construction standards can be another challenge for construction companies (Saharuddin, Hassan and Kamar, 2022).

Studies constantly demonstrate that a scarcity of human resources with knowledge and experience of sustainability principles further limits the adoption (Abdulai, et al., 2024; Lange and Banadaki, 2023). Even though contractors can stand out from the competitive market and cultivate skilled employees by going green, they may face difficulties with time and cost limitations, technical expertise, and the unavailability of qualified suppliers and subcontractors for sustainable construction (Star Property, 2023). As a result, the absence of these resources creates a roadblock in adopting ESG principles to achieve sustainable development.

2.5.2.3 Limited Data and Lack of Long-Term Comparability

ESG-related data is crucial for comparison and benchmarking, which must be incorporated into investment and management decisions (Jonsdottir, et al., 2022). This is because to persuade company executives and external investors to embrace ESG objectives, they must have access to comparable, transparent and precise parameters for assessing the feasibility and potential hazards (Liou, Liu and Huang, 2023). Given the broad scope and complexity of the ESG concept, lacking relevant data makes it tough to comprehend, manage, and measure ESG risks (MITI, 2024). Without sufficient information, it is challenging to regularly compare and examine the ESG performance of companies, which hinders the ability to identify areas for improvement and

establish realistic goals, ultimately affecting reliability and transparency (Bezerra, Martins and Macedo, 2024).

In addition, Abdulai, et al. (2024) also claimed that the absence of a concise and comprehensive vision, which refers to a holistic approach to the shift to sustainability, further complicates the adoption of sustainable practices. In other words, this lack of a long-term strategy interrupts the effective implementation of ESG practices, as companies are unable to determine the risks and likelihood of success without sufficient successful cases to draw on. Furthermore, adoption is further discouraged by the lack of a well-defined business structure that justifies how organisations develop, deliver, and acquire value in different contexts, which prevents them from understanding the potential benefits and practical applications of the ESG principle. Consequently, many companies are hesitant and reluctant to apply ESG activities because they perceive it would be complicated, risky, and incompatible with current practices (Abdulai, et al., 2024).

2.5.2.4 Improper Carbon Offsetting

In the global commitment to achieve net-zero emissions, carbon offsetting has become a strategy employed by companies to compensate for their emission of carbon dioxide or greenhouse gases by placing for a reduction elsewhere, such as through investments in projects that achieve a comparable reduction or capture of carbon dioxide (Selin, 2024). This approach often involves shifting to renewable energy sources like wind and solar energy, engaging in reforestation, and implementing waste recycling, intending to minimise or eliminate greenhouse gas emissions that align with the global pursuit of carbon neutrality and sustainability initiatives (Bezerra, Martins and Macedo, 2024).

However, actual reductions in emissions are not always reflected in the outcome of carbon credits. Instead, they merely serve as a method to balance carbon emissions, which can undermine the goal of carbon neutrality (Liou, Liu and Huang, 2023). To make matters worse, it may inadvertently cause other significant harm to the environment and impact the economy negatively, thereby jeopardizing the sustainability plans and ESG practices that they are supposed to promote. The situation is further complicated by the lack of proper management and extensive adoption of carbon reduction practices. According

to a study by Ratnasingam, et al. (2023), very few companies are actively assessing their carbon footprints. Specifically, only 1% of the survey participants revealed that they have an established policy for managing greenhouse gases, while 3% reported conducting any carbon footprint evaluation for their products. As a result, the effectiveness of carbon offsetting can be weakened if not properly controlled or tested, which poses a barrier to attaining actual sustainability and adhering to ESG standards.

2.5.3 Technological Barrier

Since the use of advanced technologies is one of the trends in ESG, which is crucial in achieving sustainability, the presence of technological barriers is unavoidable. Some technologies that can be used in the construction sector to enhance sustainability include BIM, 3D printing, IoT, augmented reality (AR), artificial intelligence (AI), renewable energy systems, etc. The integration of technologies in construction operations and ESG adoption can be hampered by the following factors.

2.5.3.1 Technology Complexity

Digital transformation has been proven to enhance ESG performance by allowing companies to embrace greener production techniques and make more efficient use of resources (Su, Wang and Li, 2023). However, the construction industry confronts a significant barrier in attaining sustainable objectives due to the complexity associated with emerging technologies and inadequate expertise in adopting these technologies (Pandey and Thampi, 2024; Saharuddin, Hassan and Kamar, 2022). The advanced technologies and tools developed to promote sustainability are often highly intricate. This complexity indicates that the project management team must possess the knowledge and a thorough understanding of their functionalities to efficiently incorporate them into construction projects. Conversely, their unfamiliarity with these modern technologies could undermine the project's overall performance and outcome (Ayarkwa, et al., 2022).

Furthermore, the lack of technical expertise related to smart technologies presents additional problems for the development of smart buildings, which necessitates a high level of competence (Ghansah, Owusu-Manu and Ayarkwa,

2020). This skills deficiency can lead to inappropriate technology utilisation and poor project results, which can cause technical difficulties and seem burdensome rather than beneficial. For this reason, the complexity of technologies may deter construction firms from applying them, ultimately hindering their ability to accomplish ESG goals effectively.

2.5.3.2 Immaturity of New Technologies and Innovations

Emerging technologies offer significant opportunities for improving sustainability within the construction sector by reducing environmental impacts and improving efficiency. However, they may also constrain the sustainability effort due to their immaturity and the lack of clear application guidelines and standards, which often restrict their availability and applicability (Wang and Xue, 2023). These limitations are particularly troubling as some technologies have yet to be thoroughly examined or validated on a broad scale. In addition, commitment from companies is necessary to integrate advanced technologies with ESG considerations. This approach involves more than simply adopting innovative technologies, it also ensures that they support the company's sustainability objectives and improve the credibility of its ESG initiatives (Bezerra, Martins and Macedo, 2024). Considering the immaturity of technologies and uncertainty about their long-term performance and effectiveness, construction firms tend to be hesitant to invest in these innovations.

The gaps in the global adoption of sustainable energy technologies serve as an actual demonstration of these challenges. For instance, in many European nations, installing solar panels is a prevalent practice that fosters their sustainability ambitions. Yet, the scenario differs in parts of Asia and other regions where sustainable energy technologies are still in the early stages of development (Efthymiou, Kulshrestha and Kulshrestha, 2023). This disparity underscores the barriers associated with the global effort for sustainability, as the availability and maturity of cutting-edge technologies may vary considerably across different regions and industries.

2.5.4 Social Barrier

Social barriers refer to obstructions arising from the public community, which pertain to the cultures, mindsets, and society norms that influence the way in which ESG initiatives are perceived and executed. The primary barriers include a lack of awareness and understanding, insufficient training and education system, and low levels of interest and demand.

2.5.4.1 Limited ESG Awareness

Public awareness is crucial for stimulating market demand and participation in sustainable development, particularly in the construction industry. As Gu, et al. (2023) advocate, increased public awareness of green construction can contribute to greater recognition of its value and higher readiness for sustainable projects. However, there are still differences in how different organisations and industries view and comprehend ESG concepts, underscoring the need for more awareness efforts to foster a more robust and broadly applied ESG approach (MITI, 2024; Wang and Xue, 2023). A significant issue is that communities often have little influence over construction project decisions, even though the outcomes have a direct impact on them (Ferreira, Morgado and Lins, 2024). This limited influence may be due to their insufficient understanding of how ESG practices can improve their quality of life, which would eventually hinder broader integration of ESG principles as the demand is low.

Moreover, Pandey and Thampi (2024) discovered that 69% of construction practitioners view a major barrier to the adoption of ESG practices pertains to stakeholders' poor awareness of the advantages, indicating an awareness gap within the industry as well. Consequently, it would prevent legislators, organisations, and communities from entering into a voluntary agreement to promote sustainable practices and innovations, thereby hindering the adoption of ESG practices (Tunji-Olayeni, Kajimo-Shakantu and Osunrayi, 2020). Additionally, enterprises of different sizes also exhibit different levels of ESG awareness. Research by Ratnasingam, et al. (2023) shows that while large enterprises are typically aware of ESG concepts, only one-third of SMEs are similarly aware of the requirements, whereas micro-sized companies often have no knowledge of ESG practices at all. Therefore, the gaps in awareness among

various stakeholders highlight the broader challenge of achieving widespread ESG adoption in the construction industry.

2.5.4.2 Low Interest and Demand

Without adequate client demand and stakeholder interest, implementing and promoting sustainable and responsible initiatives in the construction sector becomes challenging (Abdulai, et al., 2024; Zulu, et al., 2023; Sajjad, et al., 2021). One of the key factors contributing to the lack of interest in sustainable construction is the view of its high upfront cost, extended timelines, and limited financial incentives from the government, notwithstanding its long-term benefits (Jaradat, et al., 2024).

From the perspective of building occupants and users, integrating green building features can introduce further complications as they need to adapt to the advanced smart systems meant to optimise energy and water consumption. In order to ensure the effectiveness of these green building technologies, it may require occupants to practice responsible conduct and perform regular maintenance, which might also restrict their control options and be considered as an inconvenience (Star Property, 2023). Conversely, if clients request sustainability policies and explicitly define their sustainability requirements, it can significantly enhance the adherence to sustainability standards while raising consciousness among firms and communities about the importance of sustainability in construction (Tunji-Olayeni, Kajimo-Shakantu and Osunrayi, 2020). Therefore, addressing these issues requires stronger client involvement, community awareness, and stakeholders' commitment to drive the adoption of ESG practices.

2.5.4.3 Lack of Training and Education System

The lack of a comprehensive training and education system has been identified as a critical barrier to the adoption of ESG practices. According to Sulaiman, et al. (2024), 67% of their research participants perceived that there is inadequate training offered to various stakeholders in the construction sector regarding sustainable building development. This suggests that many construction professionals are not getting official training courses that address the latest advancements in sustainable materials, technologies, and construction

techniques. Nevertheless, successful implementation of sustainable practices heavily depends on access to pertinent information and proper training to equip staff with knowledge and specialised skills to handle the intricate process and diverse challenges associated with sustainability (Dang, Peng and Deng, 2024; Ayarkwa, et al., 2022). Without sufficient training and education, professionals in the sector may find it difficult to comprehend, embrace, and promote the necessary initiatives to incorporate ESG principles into their practices (Bezerra, Martins and Macedo, 2024).

Furthermore, the coverage of sustainable construction methods in university programs related to the construction sector may be inadequate, further limiting the knowledge and application of these practices in professional contexts (Jaradat, et al., 2024). Despite the younger generation may have become acquainted with sustainability concepts during their studies, their inexperience in the real world restricts their ability to put this knowledge into effect. In short, the lack of training and education framework in the construction industry is a major obstacle to develop skilled workforce necessary to implement ESG practices.

2.5.5 External Barrier

External barriers are challenges that exist beyond the control of an individual or organisation. They may originate from various sources, including government, professional associations, and global actions.

2.5.5.1 Insufficient Regulations and Policies for Sustainable Practices

The formulation of regulations, policies, and standards serves as the cornerstone for mandating sustainable practices in the construction industry by triggering awareness among construction stakeholders to embrace a more sustainable approach. Yet, when these rules and guidelines are insufficient, it can significantly hinder the execution of ESG practices, leading to inconsistencies and gaps in the legislative framework that governs sustainable operations (Abdulai, et al., 2024). According to Abidin, et al. (2020), government policies on sustainable initiatives were regarded as not flourishing enough to stimulate significant progress. There are few practical guidelines for applying sustainable construction methods, which is insufficient to motivate contractors to adopt a

sustainable approach in construction projects to address environmental concerns (Sulaiman, et al., 2024). For instance, the lack of waste management options and poorly executed waste policies pose major challenges for construction firms in developing an efficient waste management framework (Lee, Chang and Tan, 2022). Therefore, in order to overcome these legal gaps and ensure successful ESG implementation in the construction industry, more organised and attainable regulations and policies must be drawn up.

2.5.5.2 Lack of Government Support

Government support is imperative in driving innovation and facilitating the transformation necessary for the effective integration of ESG principles. When governments fail to actively promote ESG initiatives or provide financial incentives, such as subsidies or tax reductions for sustainable projects, it becomes an inhibitor in the development of sustainable practices in the construction industry (Abdulai, et al, 2024; Zulu, et al., 2022; Dosumu and Aigbavboa, 2021; Osuizugbo, et al., 2020). The insufficient encouragement and financial backing from the government not only restricts investment in innovation but also demotivates construction companies from incorporating environmental and social considerations into their operations (Bezerra, Martins and Macedo, 2024).

Besides, the absence of government assistance can result in diminished awareness and interest among stakeholders, further delaying the progress toward sustainability. For instance, in Malaysia, even though the government has been promoting sustainability programs since the early 2000s, construction practitioners have not been inspired to fully embrace and develop sustainable construction due to a lack of incentives (Saharuddin, Hassan and Kamar, 2022). Therefore, without robust government support, efforts to introduce ESG practices in the construction industry are likely to encounter resistance or inaction, which would slow down the overall transition to meet sustainable goals.

2.5.5.3 Lack of Established Standards and Guidelines for ESG Activities

The adoption of ESG requires the reporting and disclosure of ESG performance to measure a company's effort and achievement in adherence to ESG criteria and standards in their operations. However, the present ESG standards are not

consistent and the information available is vast and complicated (Gong et al., 2023). The abundance of frameworks and criteria complicates the process, making it difficult for internal and external decision-makers, as well as the society to comprehend and incorporate ESG strategies (Bezerra, Martins and Macedo, 2024). This complexity is exacerbated by the fact that 85% of enterprises use several ESG reporting systems (MITI, 2024).

Since there is no common framework for ESG assessment and reporting, companies have limited knowledge to conduct their own ESG management and present additional challenges in accurately benchmarking their performance or comparing with industry peers (Gong, et al., 2024; Parameswar, et al., 2023; Tran and Nguyen, 2023). In addition to companies struggling in analysing and reporting their ESG performance, investors are also affected by this inconsistency as they lack reliable and comparable data to assess potential investments (Ngwa, et al., 2025; Sætra, 2023). Investors and other stakeholders may become less confident if the validity of disclosed ESG data is questionable. Hence, the lack of industry-wide measures for rating and reporting ESG performance can lead to increasing concerns about sustainability and transparency, thereby restricting the adoption of ESG practices across the industry.

2.6 Strategies to Encourage ESG Adoption

To overcome the barriers to ESG implementation, some strategies must be developed and executed by stakeholders, including the government, financial organisations, educational institutions, as well as the company itself to promote and drive the integration of ESG principles in the construction industry. As outlined in Table 2.4, several strategies to encourage the adoption of ESG have been discovered and will be discussed in this section.

Table 2.4: Summary of Strategies to Encourage ESG Adoption

Code	Strategies	References															Total
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
S1	Training and education	✓		✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12
S2	Encouraging collaboration in the industry	✓		✓	✓	✓	✓					✓		✓		✓	8
S3	Strengthening organisational framework	✓	✓				✓	✓			✓	✓	✓			✓	8
S4	Enforcement of regulations and policies			✓		✓	✓	✓		✓		✓		✓	✓		8
S5	Intensifying green technology research and innovations	✓	✓			✓			✓		✓	✓		✓			7
S6	Government subsidy	✓			✓					✓	✓	✓		✓	✓		7
S7	Support from financial institutions					✓	✓			✓				✓			4
S8	Top management initiatives	✓					✓		✓			✓					4
S9	Establishing standards for ESG activities		✓	✓		✓			✓								4
S10	Reinforcing human resource management	✓	✓										✓				3

Authors: **1**- Abdulai, et al. (2024); **2**- Lei and Zhao (2024); **3**- Bezerra, Martins and Macedo (2024); **4**- Zhang, Liu and An (2024); **5**- Chen, Xie and He (2024); **6**- Ferreira, Morgado and Lins (2024); **7**- Jaradat, et al. (2024); **8**- Liou, Liu and Huang (2023); **9**- Ratnasingam, et al. (2023); **10**- Ishak, Aziz and Rahim (2023); **11**- Gu, et al. (2023); **12**- Ayarkwa, et al. (2022); **13**- Sajjad, et al. (2021); **14**- Tunji-Olayeni, Kajimo-Shakantu and Osunrayi (2020); **15**- Bohari, et al. (2016).

2.6.1 Training and Education

In order to effectively embed ESG principles in the construction industry, training and education are essential to raise awareness and improve understanding of ESG concerns (Bezerra, Martins and Macedo, 2024). It is imperative for corporate executives to participate in ESG-related learning and training events, which equip them with a comprehensive knowledge of ESG considerations and strategies (Liou, Liu and Huang, 2023). By doing so, it enables them to develop and guide their organisations in implementing effective ESG approaches to achieve these goals. Besides, educating employees in protecting the environment stimulates a stronger commitment to sustainable practices, which may substantially boost their enthusiasm to contribute positively to the company's ESG targets (Dang, Peng and Deng, 2024).

On top of that, construction practitioners are encouraged to attend more local and international seminars and conferences to stay updated on the latest developments in sustainability (Saharuddin, Hassan and Kamar, 2022). These events underscore the urgency of sustaining our environment, society, and economy for coming generations, as well as the role of construction in driving sustainable development. For example, adequate training on environmental strategies should be provided for contractors and vendors, such as how to utilise and install Industrialized Building Systems (IBS), which can encourage more adoption of sustainable materials (Abidin, et al., 2020). Furthermore, developers should be informed about the advantages of green buildings and motivated to incorporate more sustainability features into their projects, which will enhance environmental performance while simultaneously increasing public awareness of sustainable practices (Sajjad, et al., 2021).

Meanwhile, universities and other educational institutions also play a vital role in this process. One way to raise awareness among future industry practitioners is to incorporate sustainable construction concepts into university courses (Bohari, et al., 2016). Academic programs and university policies should also be revised so that graduates will be better equipped with the knowledge and skills needed to apply these concepts in real-world settings, closing the gap between theory and practice (Jaradat, et al., 2024). In short, comprehensive training and education at all levels are critical to develop a culture of sustainability in the construction industry. These efforts not only

enhance understanding and application of ESG principles but also promote broader engagement in the sustainability initiatives, benefiting both companies and communities (Tunji-Olayeni, Kajimo-Shakantu and Osunrayi, 2020).

2.6.2 Encouraging Collaboration in the Industry

In an effort to advance the adoption of ESG in the construction industry, industry stakeholders, including regulators, employers, contractors, suppliers, and local communities, must work together. This connection enables organisations to better align their sustainability initiatives with stakeholders' interests by understanding their expectations and concerns (Bezerra, Martins and Macedo, 2024). Besides, since joint venture teams can pool resources, reduce risks, and boost profitability, collaboration and partnership between construction companies and investors may significantly enhance sustainable construction (Sajjad, et al., 2021). For instance, according to Malaysian Green Technology and Climate Change Corporation, MGTC (2023), the Malaysian government is calling on government-linked companies (GLCs) and government-linked investment companies (GLICs) to promote its sustainability agenda by introducing a sustainability framework that outlines these companies' responsibilities and establishes goals for them to attain ESG-compliant portfolios.

Moreover, collaboration is equally essential on an international scale, given that the local industry's ability to implement ESG practices can be considerably improved by learning from other countries' experiences with sustainable practices (Bohari, et al., 2016). Malaysia may benefit from working with other developed countries like China, Singapore, Australia, and the United States, which have been actively promoting green construction. In midst of projects' acknowledged requirement for sustainability, a gap often exists between theoretical information and practical implementation, highlighting the importance of closer cooperation between industry and academia (Ferreira, Morgado and Lins, 2024). To illustrate, universities can collaborate with industry professionals to organise workshops regarding sustainable construction and materials or offer industrial training opportunities that provide real-world experience. These initiatives enable a continuous exchange of knowledge, which helps graduates and academic professors to remain abreast of the latest

advancements in sustainable construction. Additionally, building partnerships with non-governmental organisations (NGOs) may provide organisations with essential resources to interact with communities efficiently and ensure their demands are considered in the implementation of sustainable solutions (Ferreira, Morgado and Lins, 2024).

2.6.3 Strengthening Organisational Framework

Strengthening the organisational framework is crucial for the effective implementation of sustainability practices in the construction industry. This is because institutional frameworks and guidelines serve as the fundamental structures that guide the adoption and execution of any policy (Parameswar, et al., 2023). They provide a clear blueprint for organisations to follow, assuring that sustainability goals are included in every aspect of their operations.

According to a study by Jaradat, et al. (2024), adopting green construction methods is not prevalent, mainly due to the lack of a comprehensive framework that strikes a balance of demands between environment and social. Therefore, organisations must improve their strategies to embrace sustainable project management, which can be done by defining procedures, governance, and policies that will strengthen the requirements for sustainability in both business and projects (Ferreira, Morgado and Lins, 2024). Companies should also place sustainability considerations in priority when conducting feasibility studies of all practices (Ayarkwa, et al., 2022). By doing so, companies can ensure that every decision aligns with the organisation's sustainability objectives while ensuring ethical and transparent business practices, thereby leading to better project outcomes and compliance with ESG standards.

Moreover, Su, Wang and Li (2023) proposed that enterprises should establish a long-term growth plan that stresses digital transformation and greater ESG performance. By introducing advanced technology into their decision-making and management processes, organisations can significantly enhance their resource utilisation, operational efficiency, and project planning, which enable them to achieve the ultimate ESG goals. Hence, an organisational framework is essential in developing operational strategies that align with global sustainability goals while facilitating ethical business conduct and responsible

decision-making. This approach builds trust among stakeholders and positions the organisation as a leader of sustainable practices in the industry.

2.6.4 Enforcement of Regulations and Policies

Government and professional bodies play a critical role in developing and enforcing regulatory rules and frameworks necessary for advancing sustainable construction. The implementation of regulatory policies, which may include rigid requirements on sustainable construction practices and prohibitions on the use of environmentally harmful materials, is fundamental to initiate the transformations within the construction industry (Tunji-Olayeni, Kajimo-Shakantu and Osunrayi, 2020). According to Handoyo and Anas (2024), companies operating under strict regulatory environments are more prone to engage in ESG initiatives as they face greater compliance obligations and higher risks of incurring non-compliance costs. In view of this, the government should lead this shift by incorporating ESG criteria into public procurement procedures, acting as the principal advocate for this concept while regulating different business sectors to support and contribute to green development (Ferreira, Morgado and Lins, 2024).

The formulation of regulations, standards, and guidelines raises awareness among stakeholders and is regarded as an initiative to adopt a more sustainable approach (Sajjad, et al., 2021). In Malaysia, the National Construction Policy 2030 (NCP) plays a significant role in guiding sustainable construction in Malaysia, which outlines strategies to achieve high-quality and durable infrastructure by ensuring that planning, resource use, design, construction, and maintenance processes prioritise building structures capable of withstanding natural disasters (CIDB Malaysia, 2023c). This policy also promotes the adoption of advanced technologies, particularly the IBS and BIM, with a focus on digitising the entire construction industry (CIDB Malaysia, 2022b).

Although current laws still permit some environmental impact, regulatory bodies should advocate for stricter standards that only approve completely offset impacts, and the government could support this by establishing a dedicated sustainability agency to better regulate and address these issues (Ferreira, Morgado and Lins, 2024). By developing explicit

regulations and policies that enforce green construction methods, the government can motivate construction practitioners and project stakeholders to adopt more sustainable practices (Jaradat, et al., 2024).

2.6.5 Intensifying Green Technology Research and Innovations

Green technology encompasses innovations and technologies designed to be environmentally friendly, which integrates environmental preservation with economic growth (Han, et al., 2023). According to Chouaibi and Chouaibi (2021), firms that intensify their green innovation efforts tend to observe a stronger positive correlation between their social and ethical practices and financial performance. This is because green technology innovation is pivotal in driving environmentally sustainable development within enterprises (Han, et al., 2023). By reducing reliance on limited resources and minimising negative environmental impacts, green innovation not only supports sustainability goals but also bolsters a company's competitiveness and enhances its brand image. Other than that, to achieve sustainable development, increasing investment in research and development for green construction technologies is also crucial (Gu, et al., 2023). By utilising the latest research methods and processes, it can enhance the integration of research outcomes into policy formulation and execution, ensuring that sustainability initiatives are both effective and practical (Sajjad, et al., 2021). This initiative enhances green construction capabilities while accelerating the industry's transition towards sustainability.

A practical example of integrating green technology into the construction industry is the "ICT-Driven ESG-Enabled Model" proposed by Pandey and Thampi (2024). This model combines ICTs with ESG principles, leading to significant improvements in productivity and efficiency of operations while maintaining a positive societal and environmental influence. Additionally, Sætra (2023) introduced the AI ESG Protocol, an advanced tool intended to assess and disclose a company's risks and opportunities driven by AI and ESG data. This protocol promotes better governance and stakeholders’ engagement while assisting companies in identifying their ESG impacts, opportunities, and gaps, which allows them to make informed decisions and add value to their projects and overall business.

2.6.6 Government Subsidy

In order to lower the financial barriers that often hinder the adoption of ESG practices, financial support through subsidies should be readily accessible for construction firms, especially SMEs that demonstrate a low level of readiness to adopt ESG practices (Ratnasingam, et al., 2023; Purwandani and Michaud, 2021). Empirical findings suggest that green business practices and technological innovation may be greatly influenced by government subsidies, which in turn facilitate the green transition of the construction industry. For instance, research has shown that a 1% increase in subsidies may result in a 3.2% growth in the application of green patents (Zhang, Liu and An, 2024).

Subsidies are the most direct way to promote the utilisation of green building technologies, which compensate for substantial expenses, stimulate construction stakeholders' interest, and motivate the practitioners to develop innovations (Chen, et al., 2021). Besides, these subsidies also facilitate the importation of sustainable materials and technologies into a country (Tunji-Olayeni, Kajimo-Shakantu and Osunrayi, 2020). This is because by providing financial support, such as permits and reductions in import duties, the cost of importing eco-friendly products is lowered. As a result, it becomes more affordable and attractive for companies to adopt sustainable practices since there is more access to green materials and advanced technologies that are often essential for implementing sustainable construction projects or meeting ESG standards.

To support its goal of reaching net zero emissions by 2050, the government is enhancing tax incentives and reinforcing existing financing programs to promote green technology adoption in Malaysia. For instance, under Budget 2023, it is proposed to prolong the deadline for applications for the Green Investment Tax Allowance (GITA) and Green Income Tax Exemption (GITE), which offer up to 70% waivers of income tax, until the end of 2025 (MGTC, 2023). While financial subsidies and incentives such as cash grants, tax exemptions, and funds for research and green development are essential, non-monetary incentives like training, carbon credits, public recognition, and awards can be equally impactful in promoting long-term sustainable practices, which have proven effective in various countries (Parameswar, et al., 2023; Wang, Qin and Zhou, 2021; Bakar, et al., 2020).

Therefore, government subsidies are indispensable in motivating the construction industry to embrace sustainable practices by alleviating the financial burden of green transitions. The availability of various financial and non-financial incentives lowers the entry barriers, encourages innovation, and ultimately develop a more sustainable and competitive industry.

2.6.7 Support from Financial Institutions

Financial institutions, such as banks and insurance companies, are significant in promoting ESG adoption in the construction sector as they can develop various strategies to provide financial support and facilitate the shift to more sustainable practices. Integrating ESG requirements into lending processes is one effective approach. For example, the government could mandate that construction projects getting loans from commercial banks should include ESG criteria as a prerequisite to be eligible for a loan (Ratnasingam, et al., 2023). This requirement compels all investors and insurers to make sure that the projects they decide to fund or insure adhere to the ESG principles and objectives (Ferreira, Morgado and Lins, 2024). Therefore, by carefully evaluating the nature of each initiative, they can protect their reputation and encourage commitment to ESG practices.

Other than that, financial institutions can establish funds specifically meant to bolster construction projects that fulfil high sustainability standards, which might draw in investors who are keen to support environmentally and socially accountable projects, thereby directing substantial resources into the industry (Nasir and Ahmed, 2024). For example, environmentally conscious investors and financial organisations are increasingly turning to green financing, such as offering green bonds, which provide a channel for funding projects and initiatives that target to mitigate environmental damage and foster sustainability (KWAP, 2024; Cortellini and Panetta, 2021).

Furthermore, financial institutions can also collaborate with the government to provide special funding aimed at supporting technological research and development of enterprises (Su, Wang, and Li, 2023). This cooperative approach ensures organisations' accessibility to the resources needed to pursue their sustainability goals by helping them in incorporating digital technologies into their activities and management processes, thereby

enhancing their innovation capabilities and operational efficiency. Therefore, by integrating ESG requirements into borrowing procedures and promoting green investment funds, financial institutions can significantly stimulate ESG adoption while propelling the construction industry toward more sustainable and ethical practices.

2.6.8 Top Management Initiatives

A company's business strategy and future path are largely shaped by its top management, which includes the board of directors and senior executives. Their decisions have a direct impact on the organisation's success or failure, particularly when it comes to embracing and promoting new practices like ESG (Liou, Liu and Huang, 2023). In view of this, management's commitment to sustainability growth is crucial to integrate ESG principles into the main business plan. However, resistance to ESG initiatives can arise within an organisation due to a lack of understanding or a perception that they go against existing corporate objectives. To overcome this, top management must take the initiative to participate and organise awareness campaigns that illustrate the advantages to the organisation when implementing ESG practices, thereby gaining the support of all members (Bezerra, Martins and Macedo, 2024).

In addition, boards of directors bear an integral responsibility in increasing employee awareness of the environmental and social effects of the company's operations and steering them in adopting the ESG concept. This involves establishing attainable sustainability goals, prioritising stakeholder concerns, and developing programs to address these implications (Bezerra, Martins and Macedo, 2024). When sustainability criteria are well understood and shared among the stakeholders, projects may greatly benefit from proactive executives that emphasise green and responsible practices, which also enhance the company's reputation (Ferreira, Morgado and Lins, 2024). Therefore, company leaders should encourage innovation and demonstrate a commitment to ESG goals in order to motivate employees to embrace changes rather than resist them (Zhu and Huang, 2023).

2.6.9 Establishing Standards for ESG Activities

The lack of standardised frameworks and mandatory disclosure guidelines from regulatory bodies has significantly discouraged firms from pursuing ESG reporting as they confront inadequate incentives, and the inconsistency often leads to different opinions on ESG disclosure (Parameswar, et al., 2023). To address these issues, it is necessary to formulate and implement uniform metrics and procedures to assess ESG performance (Bezerra, Martins and Macedo, 2024). By developing clear benchmarks, the integration of sustainable practices can be facilitated while allowing companies to align their goals more efficiently.

Besides, immediate measures should be taken to establish proper policies and ESG information disclosure systems to standardise business conduct and encourage more companies to engage in voluntary performance reporting (Su, Wang and Li, 2023; Li, et al., 2021). With comprehensive ESG disclosure systems, construction professionals may privately release information about their environmental and social impacts against established metrics on a regular basis (Akomea-Frimpong, et al., 2024). Such efforts help reinforce industry governance and improve the value of ESG information revealed by companies while preventing the exaggeration of ESG accomplishments or dissemination of misleading statements (Chen, Xie and He, 2024). Therefore, having a set of guidelines and mechanisms in place empowers corporate managers to integrate their strategies with specified performance standards, which enables them to conduct appraisals on a fair comparison basis (Liou, Liu and Huang, 2023). As a result, standardised ESG frameworks are essential to set realistic organisational goals and track progress toward sustainable growth of enterprises and the construction industry.

2.6.10 Reinforcing Human Resource Management

To achieve an organisation’s objectives of ESG, it is essential to leverage both individual skills and company resources, which are reflected in the overall competencies that the firm possesses (Sierdovski, et al., 2022). Given this, directors, employees, and the organisation as a whole must be equipped with the abilities and knowledge necessary to adapt to changing market demands, tackle challenges, and grasp innovation opportunities. In the construction industry, engaging experts with green construction expertise from the outset of any

project is vital to guide and implement the complex and costly sustainable building processes more efficiently (Ayarkwa, et al., 2022). The involvement of these skilled workers and technical experts provides invaluable support, mitigates challenges, and contributes positively to the adoption of sustainable practices (Gu, et al., 2023).

Additionally, organizations can leverage the expertise of ESG consultants, industry professionals, and third-party auditors to navigate the complexities of ESG integration, ensuring a more effective and efficient path toward achieving their goals (Carreno, 2024). Recruiting professional consultants enhances sustainability efforts and impacts by helping to establish clear sustainability standards tailored to the specific requirements of a project or enterprise while utilising various metrics and evaluation tools to track progress and monitor project outcomes (Ferreira, Morgado and Lins, 2024). At the same time, human resource leaders are recognising the significance of ESG, particularly as the world now increasingly incorporates diversity and inclusion into organisational practices (Narayanan, 2022). By embedding these principles into their core operations, organisations can better address the demands of diverse stakeholders, foster a positive workplace culture, drive innovation, and achieve their ESG objectives more effectively. Hence, reinforcing human resource management by developing specialised skills and competencies as well as emphasising social criteria like diversity and tolerance in corporate operations are essential for enhancing sustainable practices and the ESG performance of an organisation.

2.7 Chapter Summary

In essence, this chapter reviewed and discussed previous research undertaken by various researchers on the topic of Environmental, Social, and Governance (ESG). An overview of the ESG concept, including its development, key constituents, and current trends in the construction industry is provided. Besides, the drivers of ESG integration have been identified across organisational, social-environmental, and external aspects. Various barriers to ESG adoption from different perspectives have also been explored. Additionally, this chapter also discovered several strategies to overcome these barriers and promote the uptake of ESG in the construction sector. Understanding these drivers, barriers, and

strategies is essential, as it provides a foundational framework for identifying the challenges faced by the Malaysian construction industry and supports the development of more effective approaches to enhance ESG adoption.

CHAPTER 3

METHODOLOGY AND WORK PLAN

3.1 Introduction

Chapter three primarily discusses the research methodology of this research, which includes descriptions of the research approaches, rationale of selection, research design, sampling method, data collection, and data analysis methods.

3.2 Research Methodology

Research methodology is a crucial component of any research paper, as it provides a framework that guides and shapes the entire research process. According to Mukherjee (2019), research methodology serves as a comprehensive guideline that facilitates and directs the entirety of a research project in any field, including how the research is designed, implemented, and analysed. It delivers clarity and structure to the investigation to achieve the research aim and objectives successfully.

Research can generally be approached in three ways, which are quantitative, qualitative, and mixed-method. Since each approach has distinct advantages and drawbacks, the selection of research method must take into account the nature of the topic, the type of data needed, and the anticipated outcomes. Hence, it is vital to ensure that the appropriate research method is adopted, as it will affect the research design and the form of data collection. The quantitative research method was selected for this research, with the rationale of selection described in section 3.2.3.

3.2.1 Quantitative Method

Quantitative research is recognised as a systematic inquiry into phenomena through the collection and analysis of numerical data using statistical, mathematical or computational techniques (Adedoyin, 2020). This type of research is also known as empirical research as it can be accurately and precisely measured. It focuses on the quantification of data, asking questions such as "how long," "how many," and "to what extent" (Ghanad, 2023). The data produced is

typically in numerical form, such as ratios, averages, or ranges, which provides statistically reliable insights into the research question (Nayak and Singh, 2015).

By collecting quantitative information, a range of statistical analyses can be performed to compile and interpret the data (Ahmad, et al., 2019). Data collected through quantitative methods can be categorised, ranked, or measured using standardised units. This makes it possible to present the data in non-textual forms such as graphs, tables, charts, and figures that facilitate data analysis. Some examples of quantitative research techniques include surveys, questionnaires, structured observations, and experiments. This technique aims to establish cause-and-effect relationships between variables by using statistical methods (Ahmad, et al., 2019).

3.2.2 Qualitative Method

In contrast to quantitative methods that emphasise on numerical analysis, qualitative research attempts to investigate complex social and human issues by exploring them from multiple perspectives (Gupta and Gupta, 2022). In qualitative research, data is collected and interpreted through non-numerical techniques, such as narratives and open-ended observations. Researchers can collect data through interviews, group discussions, case studies, or ethnographies, which allow them to gather detailed insights into participants' thoughts, feelings, experiences, intentions, and behaviours. By using these methods, researchers can delve into the underlying reasons behind how and why people think and feel, leading to a more comprehensive understanding beyond superficial observations (Ahmad, et al., 2019).

However, since qualitative methods generate data in text-based and non-numerical form, participants may express their views using varied words and phrases. This variability in language can complicate the comparison and analysis process, as people may interpret questions differently or emphasise different aspects of the topic. Additionally, the qualitative research process is often time-consuming and requires intensive resources in terms of data collection, analysis, and interpretation (Hassan, 2024).

3.2.3 Mixed Method

The mixed method approach combines quantitative and qualitative approaches to develop a more comprehensive understanding of a research issue. It allows researchers to gather both broad numerical data for generalising results across a larger population, while also obtaining detailed contextual insights that enrich the depth and reliability of the findings (Dawadi, Shrestha and Giri, 2021). While this method offers a more balanced perspective, it also demands greater time, effort, and careful coordination to ensure both data types are effectively managed and integrated. It is especially useful when a single method alone may not fully capture the complexity of the research circumstances (Taherdoost, 2022).

3.2.4 Justification of Selection

This research applied the quantitative method to address the research questions and accomplish the research objectives. This research aims to probe the barriers to the adoption of environmental, social, and governance (ESG) practices in the Malaysian construction industry. According to Ghanad (2023), the results of quantitative research can be used to analyse how a large population perceives a problem and the range of viewpoints within that population. Given the need to capture the views of a broad range of construction professionals in Klang Valley, the quantitative research approach is more feasible for achieving comprehensive outcomes.

A questionnaire was adopted as a means for primary data collection from the targeted respondents. This tool consists of systematically structured questions designed to obtain specific information from a selected sample of the population (Nayak and Singh, 2015). This approach was employed due to its efficiency in distribution through social media and online platforms, allowing data collection to be conducted more quickly compared to other methods like interviews, which usually take longer and require extensive coordination with respondents. Therefore, this method is particularly advantageous and practical to obtain an extensive amount of data from diverse construction practitioners in a limited time. It also ensures that the responses are reliable, consistent, and comparable, thereby facilitating data analysis process in subsequent stages.

On the other hand, the qualitative method was considered less suitable for this research since it places more weight on individual experiences, ideas, and perspectives to comprehend a phenomenon. Given the construction industry's wide range of professions, including quantity surveyors, architects, engineers, and builders, each with potentially different viewpoints and considerations on ESG adoption, selecting a small sample to accurately reflect the opinions of the entire industry would be both challenging and time-consuming. Owing to this, a quantitative approach is more effective in acquiring diverse perspectives as it affords greater representation across different professions and enables participants to convey their opinions in a more systematic and structured manner.

3.3 Research Design

Research design is a comprehensive blueprint that outlines the specific steps a researcher proposes to implement to achieve the intended research objectives (Verma, Verma and Abhishek, 2024). This plan is vital for setting a clear direction and guiding the researcher from the initial to the final stages. By planning these steps in advance, the research process can be carried out more efficiently as data can be acquired effectively without wasting effort, time, or resources (Patel and Patel, 2019).

Figure 3.1 illustrates the workflow of this research based on the process suggested by Binaymin (2019). The research commenced with the selection of research topic, followed by the identification of the research aim and objectives. Next, relevant information and data were collected through a comprehensive review of previous studies regarding drivers, barriers and strategies to ESG adoption conducted by researchers. This research then employed a quantitative method to gather data from the targeted respondents, including consultants, developers, and contractors using a questionnaire. Once sufficient data was obtained, several data analysis methods were applied to interpret the data. After that, the findings from the research were discussed in-depth with the support of secondary data collected from the literature review on relevant topics. Finally, the research concludes with the implications, limitations, and recommendations for future studies.

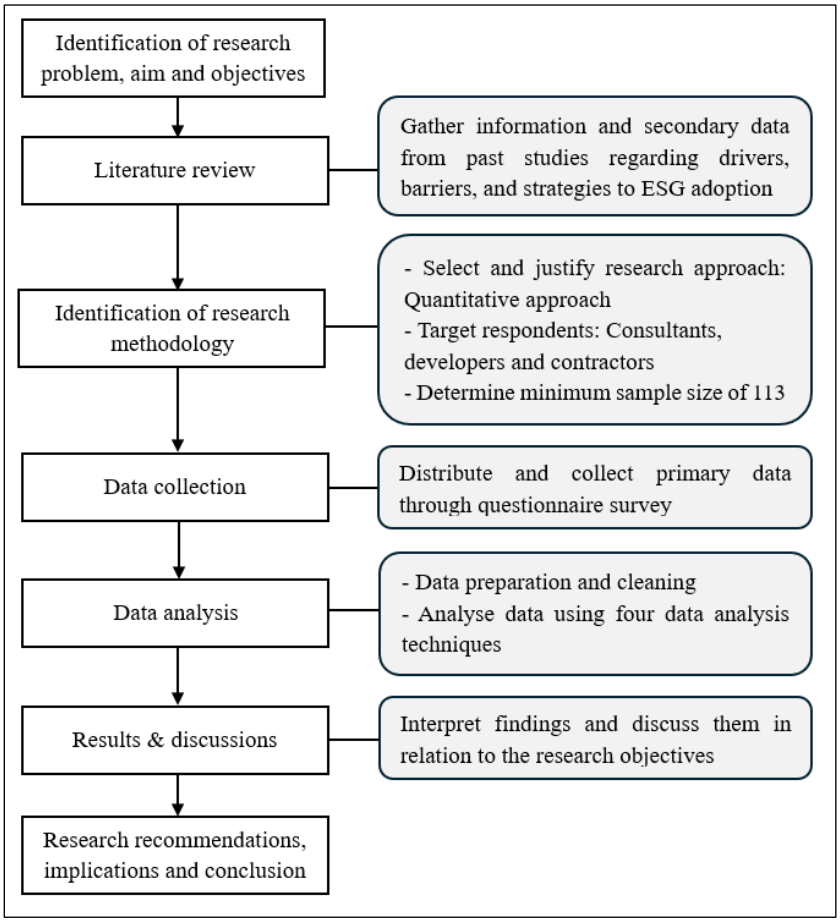

Figure 3.1: Research Design

3.4 Sampling Design

3.4.1 Sampling Method

Sampling is a process that involves the careful selection of individuals from a broader population of interest to be studied, which can be performed using either probabilistic or non-probabilistic methods (Mweshi and Sakyi, 2020). In this research, a non-probability convenience sampling approach was employed. This approach involves selecting participants based on their availability and willingness to participate (Hossan, Mansor and Jaharuddin, 2023). It was chosen mainly due to the ease of accessing potential respondents, specifically construction professionals, through online platforms.

3.4.2 Sampling Size

The determination of an appropriate sample size is a necessary step before commencing any research project (Sapra, 2021). Cochran's formula was applied

to calculate the appropriate sample size for this research. The formula is as follows:

$$n = \frac{z^2 pq}{e^2} \tag{3.1}$$

Where,

n = Sample size

z = Z-score at required confidence level

p = The population proportion

q = 1 - p

e = Margin error

Based on this formula, a sample size was derived with a confidence coefficient of 95%, an optimal margin error of 5%, and a corresponding z-value of 1.96 (Sapra, 2021). Table 3.1 illustrates the number of employed individuals in Selangor and the WPKL area in 2023 in both the construction industry and across all industries, as reported by DOSM (2024). It can be computed that the total number of employed persons in the construction industry within Klang Valley is 418,800, whereas the total number of employed persons across all industries is 5,079,300. Therefore, the value of p, proportion of population is 0.08, and q is 0.92. By applying the Cochran formula, the targeted sample size was calculated to be 113 individuals.

$$n = \frac{1.96^2(0.08)(1-0.08)}{0.05^2} = 113$$

Table 3.1: Statistics of Population in Klang Valley

Category	Selangor	WPKL	Total
Employed persons in construction industry	333,200	85,600	418,800
Employed persons across all industries	3,967,600	1,111,700	5,079,300

Additionally, this research also considered the Central Limit Theorem (CLT) to ensure precise population inferences and reliable outcomes. When the sample size is large, the CLT allows the assumption that the sampling distribution of the mean will approach a normal distribution, which simplifies statistical analysis and inference (Ganti, 2024). This suggests that a well-chosen sample will result in statistics or attributes that are more representative or closely resemble those of the entire population (Mweshi and Sakyi, 2020). Generally, a sample size of 30 or more is regarded as adequate for the CLT to be valid. Accordingly, this research set 30 as the minimum number of samples for each sample group to ensure that the analysis would yield meaningful results.

3.4.3 Targeted Respondent

Considering the vast amount of people involved in the Malaysian construction industry, a group of target respondents must be selected as a sample that accurately represents this broader population. A sample is necessary because conducting a census of the entire population is often impractical and rarely cost-effective (Mujere, 2016). This approach enables the research to be more manageable while still yielding valuable insights into the industry.

The intended respondents for this research were the construction practitioners, comprising consultants, contractors, and developers, who are based in Klang Valley, covering areas around WPKL and Selangor. These locations were selected due to the large number of construction projects involved. According to data released by Department of Statistics Malaysia (2025b), the value of work completed on construction projects by 2024 amounted to RM35.8 million in Selangor and RM18 million in WPKL, contributing to major value of the product in the Malaysian construction industry. Furthermore, the diverse professional backgrounds of the respondents can also provide different points of view. This is because they are involved in different scopes of work, which may have different considerations in integrating ESG criteria into their activities. Therefore, this research identified the construction practitioners in Selangor and WPKL area to be the targeted respondents regardless of their age, gender, or educational background.

3.5 Data Collection

The data collection process in this research involved two main approaches, namely primary data and secondary data. Primary data are information that have not been published and are first-hand sources that remain original and unaltered by any individual (Taherdoost, 2021). A quantitative data collection was adopted to gather primary data from a large sample group, which ensures the results are more reliable and in line with the objectives of the research. Meanwhile, secondary data was obtained through an extensive review of relevant literature from journals, e-books, news articles, government publications, as well as other credible sources to provide support and additional context for the research.

3.5.1 Questionnaire Design

A questionnaire is a research tool made up of a series of structured questions used to collect responses from respondents in a consistent way (Nayak and Singh, 2015). For this research, the questionnaire was developed in Google Forms, which could be easily distributed to the targeted respondents via a shareable link. The questionnaire was created and categorised into four sections, each specifically designed to obtain data essential to achieve the research objectives. Table 3.2 shows a summary of the details of each section in the questionnaire.

Table 3.2: Design of Questionnaire

Section	Description	Type of questions
A	Demographic information of respondents	Multiple-choice
B	Drivers for ESG integration in the Malaysian construction industry	Five-point Likert scale
C	Barriers to adoption of ESG practices in the Malaysian construction industry	Five-point Likert scale
D	Strategies to encourage ESG adoption in the Malaysian construction industry	Five-point Likert scale

First and foremost, a brief introduction that outlined the research topic and objectives was presented to provide the respondents with an understanding

of the purpose of this research. Section A mainly collected the respondents' demographic information, such as their professional role, the nature of their company's business, working experience, academic qualification, and organisation size. In Section B, there were 12 drivers for ESG integration in the construction industry, while Section C comprised 14 barriers to the adoption of ESG practices across five different aspects. These two sections required respondents to indicate their agreement level with each factor on how it would influence or hinder the incorporation of ESG considerations in the construction sector. Moving to Section D, the respondents were asked to rate the effectiveness of 10 strategies intended to overcome the barriers and encourage ESG adoption in the construction industry based on their opinions.

Regarding the type of questions in each section, Section A consisted of closed-ended questions with multiple answers to be selected by the respondents depending on their background. On the other hand, the questions in Sections B, C and D were designed with a five-point Likert scale, which is widely employed in social studies to gauge people's opinions by asking them to indicate how strongly they agree or disagree with a particular statement (McLeod, 2023). The five-point Likert scale was adopted for these sections as it offers distinct choices ranging from "strongly disagree" to "strongly agree", making it effective in gathering respondents' perspectives (Tanujaya, Prahmana and Mumu, 2022). The scale used in the questionnaire of this research ranged from 1 to 5, which reflects the respondents' opinions on the level of agreement and perceived effectiveness, as depicted in Table 3.3.

Table 3.3: Five-point Likert Scale for Questionnaire

Rating	**1**	**2**	**3**	**4**	**5**
Section B	Strong disagree	Disagree	Neutral	Agree	Strongly agree
Section C	Strong disagree	Disagree	Neutral	Agree	Strongly agree
Section D	Ineffective	Slightly effective	Effective	Very Effective	Extremely effective

3.5.2 Questionnaire Distribution

This research used Google Forms to create the questionnaire, which was then distributed via a link across various online platforms, such as email, LinkedIn, WhatsApp, and other social media channels. Since the research focused on the perspectives of the Malaysian construction industry, the survey specifically targeted construction practitioners, encompassing individuals including quantity surveyors, architects, engineers, developers, builders, and other professionals based in Klang Valley. The use of online distribution methods enabled efficient outreach to a diverse pool of participants while maintaining focus on those actively engaged in the construction industry within the selected region.

3.6 Data Analysis Method

Data analysis was conducted to evaluate and interpret the data collected once the anticipated response rate had been reached and sufficient data had been obtained. The Statistical Package for the Social Sciences (SPSS) software was used to analyse the data that had been collected. This research employed four data analysis techniques, including Cronbach's Alpha Reliability test, Arithmetic Mean test, Kruskal-Wallis test, and Spearman's correlation test.

3.6.1 Cronbach's Alpha Reliability Test

Cronbach's alpha is a statistical tool used to assess the consistency or reliability between multiple items, measurements or ratings (Bujang, Omar and Baharum, 2018). Reliability reflects the extent to which a test or measuring procedure produces consistent results across repeated trials (Kennedy, 2022). By conducting this test, it determines how consistently participants respond to a series of questions, thereby ensuring the reliability of the data obtained to fulfil the research objectives. The formula for Cronbach's alpha reliability test is displayed in equation 3.2 (Ahmad, et al., 2024).

$$\alpha = \frac{N\bar{c}}{\bar{v} + (N-1)\bar{c}} \tag{3.2}$$

Where,

n = number of items

$\bar{c}$ = mean covariance between items

$\bar{v}$ = mean item variance

The Cronbach's Alpha value ranges from 0 to 1, with a higher value indicating greater consistency in responses from participants across a set of questions, thus producing more reliable data (Frost, 2022). A standard benchmark value for Cronbach's alpha is 0.70. According to the recognised rules of thumb, coefficient alpha (α) with values exceeding 0.70 denote acceptable internal reliability (Morera and Stokes, 2016). In this research, the reliability and consistency of the data from the Likert scale items in Sections B, C, and D of the questionnaire were evaluated using this test.

3.6.2 Arithmetic Mean Test

The Arithmetic Mean test is a basic statistical technique used to determine the central tendency of a numerical dataset. The arithmetic mean, or average, is computed by adding up all the values in a dataset and dividing the result by the total number of observations (Lord, Qin and Geedipally, 2021). This measure is useful for summarising datasets and comparing various groups since it provides a single value that reflects the standard or central point of the data. In this research, the mean values were used to rank the drivers, barriers, and strategies for ESG adoption. This approach allows a clear and intuitive interpretation of the data by identifying which factors are perceived as more or less significant by the respondents, thereby providing insight into their relative importance from the participants' perspective. According to Martinez and Bartholomew (2017), the general formula for arithmetic mean ($\bar{X}$) is computed in equation (3.3) below:

$$\bar{X} = \frac{\sum_{i=1}^{n} x_i}{n} \tag{3.3}$$

Where,

n = total number of the sample

x_i = observed values of the sample ($x_1, x_2, x_3, \ldots, x_n$)

3.6.3 Kruskal-Wallis Test

The Kruskal-Wallis test is a non-parametric hypothesis test used to compare the medians of three or more independent groups. This test involves ranking all the data from lowest to highest, and the average rank for each group is then calculated. If the test reveals a significant difference, it indicates that the value of at least one group is different from the others (Frost, 2024).

The level of statistical significance is represented by a p-value ranging from 0 to 1. The p-value, or probability value, indicates the likelihood that the observed data would have occurred by random chance (McLeod, 2023). If the p-value is equal to the predefined significance level of 0.05 or lower ($p \leq 0.05$), it suggests a statistically significant result. Hence, the null hypothesis (H_0) will be rejected in favour of the alternative hypothesis (H_1). Conversely, if the p-value exceeds 0.05 ($p > 0.05$), the result is not statistically significant, indicating strong support for the null hypothesis (H_0) and rejecting the alternative hypothesis (H_1). The formula of this method is shown in equation (3.4) (Okeke and Okeke, 2016).

$$H = \left[\frac{12}{n(n+1)}\sum_{i=1}^{k}\frac{{R_i}^2}{n_i}\right] - 3(n+1) \tag{3.4}$$

Where,

n = sum of the sample sizes

k = number of groups used for comparison

R_i = sum of ranks of the samples

n_i = observed numbers of the samples

In this research, the non-parametric Kruskal-Wallis test was performed to assess the significant differences in opinion among three groups of participants from different natures of company business, which are contractors, consultants, and developers. Since their areas of expertise are different, there could be disparities in considerations and opinions regarding the drivers, barriers, and strategies for adopting ESG practices in the construction industry. The following are the hypotheses for this test:

H_0: There is no significant difference between the groups regarding the drivers, barriers, and strategies for adopting ESG practices in the construction industry.

H_1: There is a significant difference between the groups regarding the drivers, barriers, and strategies for adopting ESG practices in the construction industry.

3.6.4 Spearman's Correlation Test

Spearman's correlation, also known as Spearman's rank correlation coefficient, is a non-parametric technique for assessing the relationship between two variables. It is particularly useful when one or both variables are measured on an ordinal scale or when they do not follow a normal distribution (Lord, Qin and Geedipally, 2021). This method helps to understand the trend between two variables and whether they tend to increase or decrease together (Xia and Shen, 2024).

The Spearman's coefficient is often denoted as ρ (rho) or "r_s," ranges from −1.0 to +1.0 (Schober, Boer and Schwarte, 2018). A value of −1.0 indicates a perfect negative linear relationship, which means as one variable increases, the other decreases. In contrast, a value of +1.0 signifies a perfect positive relationship, where both variables increase together. This correlation coefficient provides insights into the direction and extent of the relation between the variables. Table 3.4 presents the categorisation of correlation as suggested by Lord, Qin and Geedipally (2021). In this research, this test was used to assess the correlations between the barriers to ESG adoption and the strategies to encourage the adoption of ESG in the construction industry.

Table 3.4: Categorisation of Correlation

Correlation Coefficient, ρ	Interpretation
±0.9 to ±1.0	Very strong correlation
±0.7 to ±0.9	Strong correlation
±0.5 to ±0.7	Moderate correlation
±0.3 to ±0.5	Weak correlation
0.0 to ±0.3	Insignificant correlation

3.7 Summary

This chapter explained research methodology and selected the quantitative research approach to achieve a broad representation of construction professionals' perspectives. The primary tool used for data collection is a questionnaire, with a minimum target of 113 responses. Construction practitioners, namely consultants, developers, and contractors based in the Klang Valley area, were identified as the target respondents and reached through email, LinkedIn, and WhatsApp. Lastly, four data analysis methods were employed to interpret the collected data, including Cronbach's Alpha Reliability test to assess the internal consistency, Arithmetic Mean test to identify the significance of each factor, Kruskal-Wallis test to compare differences among professional groups, and Spearman's correlation test to examine relationships between variables. Overall, this chapter provided a comprehensive explanation of the procedures for data collection and data analysis, ensuring the research process was systematic, structured, and aligned with the research's objectives.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Introduction

This chapter analyses and discusses the outcomes of the data collected from the construction professionals. An overview of the demographic background of respondents is first presented. Following that, the reliability and internal consistency of the data obtained are verified through Cronbach's Alpha Reliability test. Next, the drivers, barriers, and strategies are ranked according to their arithmetic means. Besides, the Kruskal-Wallis test is applied to determine the significant differences in opinion across different business activities, whereas Spearman's correlation test is also conducted to assess the relationship between the barriers and the strategies.

4.2 Demographics of Respondents

The questionnaire was sent to the construction practitioners within Klang Valley via email, LinkedIn, and WhatsApp as the primary distribution channels. As displayed in Table 4.1, out of the 235 questionnaires distributed, a total of 132 responses were received over the data collection period from 2nd January 2025 to 27th February 2025, leading to a response rate of 56.17%.

Table 4.1: Overview of Distribution and Collection of Questionnaires

No. of Responses Required	No. of Questionnaires Distributed	No. of Responses Received
113	235	132

Table 4.2 summarises the respondents' backgrounds, including their company business type, professional role, academic qualification, working experience, organisational size, and sector of project involved. Among the respondents, consultants comprised the largest group (40.9%), followed by developers (31.1%) and contractors (28.0%). In terms of professional roles, quantity surveyors made up the highest proportion (42.4%), with engineers

(21.2%) and architects (12.1%) following. Chartered builders, sustainability professionals, and project managers were also represented, accounting for 10.6%, 7.6% and 6.1% of respondents respectively. Regarding academic qualification, most respondents hold a bachelor's degree (73.5%), while 15.2% have postgraduate degrees, indicating that the responses are well-informed by strong educational backgrounds. Besides, majority of the respondents have at least two years of industry experience. Specifically, 28.0% have worked for 2-5 years, 22.0% for 6-10 years, and 25% exceeding ten years, whereas the remaining 25% have less than two years of experience.

The distribution of organisation sizes reveals that 45.5% of respondents are employed in small to medium enterprises (10–49 employees), while 22% work in large firms with over 250 employees. This diversity ensures representation from both SMEs and large corporations, offering a broader perspective of ESG adoption across different business scales. Additionally, it was observed that respondents are primarily engaged in residential (59.1%), commercial (37.9%), and mixed-use (34.1%) projects, reflecting the prominence of these sectors in the construction industry and their potential influence on ESG adoption.

Table 4.2: Respondents' Demographic Information

Parameter	Categories	Frequency (n)	Percent (%)
Company Business Type	Consultant	54	40.9
	Developer	41	31.1
	Contractor	37	28.0
Professional Role	Architect	16	12.1
	Chartered Builder	14	10.6
	Engineer	28	21.2
	Quantity Surveyor	56	42.4
	Project Manager	8	6.1
	Sustainability	10	7.6
Academic Qualification	Foundation / STPM	2	1.5
	Diploma	13	9.8
	Bachelor's Degree	97	73.5
	Postgraduate Degree (Master's Degree, PhD)	20	15.2

Table 4.2: Respondents' Demographic Information (Cont'd)

Parameter	Categories	Frequency (n)	Percent (%)
Working Experience	Less than 2 years	33	25.0
	2 - 5 years	37	28.0
	6 - 10 years	29	22.0
	11 - 15 years	20	15.2
	More than 15 years	13	9.8
Organisation Size	Less than 10 employees	19	14.4
	10 – 49 employees	60	45.5
	50 – 249 employees	24	18.2
	More than 250 employees	29	22.0
Sectors Involved	Residential	78	59.1
	Commercial	50	37.9
	Mixed-use	45	34.1
	Industrial	28	21.2
	Infrastructure	27	20.5
	Institutional	12	9.1
	Others	3	2.4

4.3 Cronbach's Alpha Reliability Test

Cronbach's Alpha reliability test is used to assess the reliability of the data gathered from the 132 construction practitioners. The results of the reliability test for the three groups of variables in this research are displayed in Table 4.3. The Cronbach's Alpha values are 0.837 for drivers for ESG integration, 0.845 for barriers to ESG adoption, and 0.893 for strategies to encourage ESG adoption. With Cronbach's Alpha values exceeding 0.80, the data are considered highly reliable (Ahmad, et al., 2024). This indicates that the survey demonstrates strong internal consistency, which ensures that the responses within each category are reliable and suitable for further analysis.

Table 4.3: Statistic of Reliability Test

Variables	Cronbach's Alpha, α	Number of Items
Drivers for ESG Integration	0.837	12
Barriers to ESG Adoption	0.845	14
Strategies to Encourage ESG Adoption	0.893	10

4.4 Drivers for ESG Integration

4.4.1 Mean Ranking of Drivers for ESG Integration

The 12 drivers for ESG integration are ranked according to their mean value and presented in Table 4.4. Among the identified drivers, D9= “Market Force and Clients’ Demand” is ranked at the highest, with a mean value of 4.27. This is supported by the findings of Poderytė and Banaitis (2024) and Tunji-Olayeni, Kajimo-Shakantu and Osunrayi (2020) who identified clients' demand as a key driver of sustainability implementation. This highlights the significant influence of market forces and client anticipations in shaping ESG adoption. With sustainability gaining more emphasis among developers, investors, and end-users, construction companies are under increasing pressure to conform their practices to ESG standards (Khamisu, Paluri and Sonwaney, 2024). Even if a construction firm does not voluntarily adopt ESG practices, it must still comply with local ESG criteria when working with clients that enforce strict building rules or regulations (Dang, Peng and Deng, 2024). Therefore, construction practitioners are more likely to align their practices with market demands and client expectations to secure projects and remain relevant in the industry.

The following highest-ranked driver is D11= “Industry Competitiveness”, having a mean value of 4.23. This finding is parallel with the study of Ngwa, et al. (2025), which indicated that improvement of a company’s public image in comparison to its rivals is a key factor influencing ESG reporting. Practically speaking, sustainability serves as an essential approach to secure a competitive edge over industry rivals (Parameswar, 2023). This is because a strong ESG commitment enables companies to expand their market share, stimulate innovation, and establish strategic collaborations around shared sustainability targets (Mbonigaba and Sujatha, 2024). Furthermore, organisations that put sustainability and social responsibility as priorities are valued more by investors, customers, and employees in the current business landscape (Carreno, 2024). Thus, incorporation of ESG principles into company operations is motivated by industry competitiveness as they strive to enhance their public image, strengthen stakeholder confidence, attract investors, and maintain long-term competitiveness in a rapidly evolving market (Ni, 2023; Mohammad and Wasiuzzaman, 2021).

The driver ranking the third highest obtained a mean value of 4.20, which is D8= “Government Legislation and Policy”. This outcome is supported by several previous studies, where Ratnasingam, et al. (2023), Zulu, et al. (2022) and Sajjad, et al. (2021) reported legislative requirements as an influential factor for industry participants to adopt ESG practices. These studies emphasised the critical role of building laws and standards in shaping future design and construction, underscoring how a well-developed regulatory framework can significantly enhance sustainable development. Compliance with laws and regulations enforced by the government is not optional but a fundamental obligation for all organisations (Parameswar, et al., 2023). However, research revealed that industry participants usually only implement remedial measures in response to regulations, legal requirements, or new market demands (Ratnasingam et al., 2023). This underscores the need for stringent policies that encourage proactive ESG implementation rather than reactive compliance. Therefore, a robust and enforceable regulatory framework and policies are crucial for fostering ESG integration and ensuring long-term sustainability in the construction industry.

D2= “Corporate Financial Performance” is ranked at the lowest among the 12 drivers, with a mean value of 3.37. This suggests that while financial factors are relevant, the construction industry does not primarily regard them as the driving forces behind ESG integration. One possible reason might be that companies view ESG integration as a long-term investment instead of a financial priority for the near future (Olanrewaju, Daramola and Babayeju, 2024). Therefore, organisations with budget constraints or financial limitations may focus on short-term gains and immediate economic benefits rather than long-term sustainability initiatives (Zhang, Liu and An, 2024; Akilah, 2024). Although certain studies indicated that strong ESG performance can augment profitability through enhanced efficiency and decreased operational costs, these financial advantages are not always assured, as the financial viability of ESG initiatives seems contingent upon market conditions and execution approaches (Paužuolienė and Derkach, 2024). As a result, corporate financial performance plays a less significant role in driving ESG integration in the Malaysian

construction industry due to the perceived uncertainty of financial returns, which can be influenced by various factors.

4.4.2 Kruskal-Wallis Test for Drivers to ESG Integration

Table 4.4 outlines the findings from the Kruskal-Wallis test, which examined the drivers influencing ESG integration in the Malaysian construction industry. The outcomes showed that there are two drivers with significant differences in opinions between the respondents from different company business activities, which are D1= "Company image and reputation" and D2= "Corporate financial performance". Both drivers show a p-value of less than 0.05, leading to the acceptance of the alternative hypothesis (H_1), confirming that perceptions of these drivers vary significantly across consultants, developers, and contractors.

Based on Table 4.4, the mean values for D1= "Company image and reputation" are 4.02 for consultants, 4.24 for developers, and 3.92 for contractors. With an overall mean value of 4.06, it is discovered that developers place a stronger emphasis on this factor for ESG integration than consultants and contractors, contributing to a p-value of 0.049. This may be because developers are often involved in large-scale and long-term projects, where their company reputation directly influences financing opportunities, project approvals, and marketability. For example, homebuyers tend to consider a developer's reputation when buying property, as they believe that a firm with a good reputation can ensure the quality of its products (Li, Li and Wareewanich, 2021). Moreover, since developers engage directly with key stakeholders such as investors, regulatory bodies, purchasers, and the public, implementing ESG practices is crucial for establishing a favourable corporate image, building trust, and securing ongoing support (Hu, et al., 2023). Conversely, consultants focus more on technical expertise and project performance, while contractors prioritise financial capability and operational considerations over external perceptions when it comes to sustainable initiatives, even though maintaining a reputable image is undoubtedly beneficial (Raouf and Al-Ghamdi, 2020). Therefore, developers are more influenced by company image and reputation for ESG integration, as their market positioning and stakeholder relationships directly impact their business success.

Besides, D2= “Corporate financial performance” obtained mean values of 3.37 for consultants, 3.61 for developers, and 3.11 for contractors, with all groups ranking it the lowest among the identified drivers. Notably, contractors viewed this driver as far less significant compared to consultants and developers, resulting in a p-value of 0.025. This disparity can be attributed to the distinct financial arrangements and risk tolerances among these business activities. ESG adoption may require substantial capital investment, which can temporarily affect a company's profit margins (Chen, Yu and Gao, 2023; Phan, et al., 2020). Contractors, who typically operate on tight profit margins and short project durations, may perceive ESG initiatives as a financial burden rather than an opportunity for financial gains, particularly if such initiatives are not properly managed and lead to cash flow issues. In contrast, as long-term investors involved in extensive project planning, developers may recognise ESG integration as a strategic approach to improve financial performance by attracting investors and customers through sustainable practices (Chouaibi, Chouaibi and Rossi, 2022). Overall, while ESG adoption may not provide immediate financial returns, its potential long-term benefits make it a more relevant financial driver for developers.

Table 4.4: Mean Ranking and Asymptotic Significance of Drivers for ESG Integration in the Malaysian Construction Industry

Code	Drivers	Overall (N=132)			Consultant (N=54)			Developer (N=41)			Contractor (N=37)			Asymptotic Significance
		Mean	SD	Rank	Mean	SD	Rank	Mean	SD	Rank	Mean	SD	Rank	
D9	Market force and clients' demand	4.27	0.581	1	4.28	0.627	2	4.37	0.536	1	4.16	0.553	1	0.279
D11	Industry competitiveness	4.23	0.587	2	4.30	0.537	1	4.27	0.672	3	4.10	0.547	2	0.184
D8	Government legislation and policy	4.20	0.659	3	4.20	0.711	3	4.29	0.642	2	4.08	0.595	4	0.264
D6	Building occupants' well-being and comfort	4.13	0.585	4	4.07	0.640	5	4.24	0.538	4	4.08	0.547	3	0.347
D1	Company image and reputation	4.06	0.615	5	4.02	0.566	6	4.24	0.663	5	3.92	0.595	8	0.049
D7	Workers' health and safety	4.02	0.636	6	3.89	0.769	10	4.17	0.495	7	4.05	0.524	5	0.178
D4	Corporate governance	4.01	0.704	7	3.96	0.776	7	4.20	0.679	6	3.86	0.585	9	0.073
D12	Availability of emerging technologies	3.99	0.586	8	4.07	0.508	4	4.00	0.632	9	3.86	0.631	10	0.244
D3	Organisational size	3.98	0.599	9	3.91	0.622	8	4.07	0.565	8	3.97	0.600	7	0.452
D10	Government incentives	3.89	0.764	10	3.91	0.830	9	3.78	0.759	10	4.00	0.667	6	0.334
D5	Environmental responsibilities	3.53	0.920	11	3.63	0.996	11	3.61	0.862	12	3.30	0.845	11	0.171
D2	Corporate financial performance	3.37	0.851	12	3.37	0.831	12	3.61	0.802	11	3.11	0.875	12	0.025

4.5 Barriers to ESG Adoption

4.5.1 Mean Ranking of Barriers to ESG Adoption

The mean ranking of the barriers to ESG adoption in the construction industry is tabulated in Table 4.5. A higher ranking indicates a more significant barriers in the perspective of the respondents.

Based on Table 4.5, B4= “Lack of resources” is recognised as the most significant barrier to ESG adoption, with a mean value of 4.01. In an organisational context, resources include financial capital, digital tools, and human expertise, which are essential for successful ESG implementation. This result is coherent with Abdulai, et al. (2024) and Lange and Banadaki (2023) findings, which reported financial and human resource constraints as primary obstacles for engaging ESG initiatives, particularly among smaller firms. Adopting ESG practices often necessitates substantial investment in green technologies, training for employees, and compliance reporting. However, it involves high costs and is often perceived as onerous due to the lack of instant profits, which can be challenging for companies with constrained budgets (Carreno, 2024; Mbonigaba and Sujatha, 2024). In the construction industry, where SMEs constitute a major portion of businesses, limited resources further impede their ability to allocate funds and workforce for ESG activities, making it difficult to fulfil extensive reporting and compliance obligations (Ngwa, et al., 2025; Alhoussari, 2024; Alaloul, et al., 2020). Consequently, lack of resources becomes a hindrance for organisations from adopting ESG practices.

Ranking second, B5= “Limited data and lack of long-term comparability” also recorded a mean value of 4.01, but it was placed below B4 due to a higher standard deviation, indicating greater variability in responses and thus a lower overall consistency in perception among respondents. This suggests that B5 is perceived as a slightly less critical barrier than B4. This is parallel with the study of Jonsdottir, et al. (2022), which underscored challenges related to limited access, poor quality of ESG data, and a lack of comparability resulting from the variability of ESG reporting standards. Similarly, other relevant studies have also identified the lack of clarity regarding data required for ESG reporting as a major barrier (Tran and Nguyen, 2023; Lange and Banadaki, 2023). Furthermore, Li, et al. (2021) emphasised that ESG databases

often lack relevance and practicality across diverse national frameworks and industry contexts, making standardisation more difficult. Even when reporting methods are agreed upon, access to credible and comparable ESG data remains limited, especially in relation to non-financial and qualitative dimensions (Tang, 2023). In the absence of reliable data, companies struggle to formulate effective sustainability strategies, assess ESG performance, and satisfy investor or regulatory requirements. To overcome these challenges, businesses must actively collaborate with stakeholders to enhance ESG data collection and disclosure, while policymakers should work toward establishing standardised ESG reporting frameworks that promote transparency, consistency, and long-term comparability (Olanrewaju, Daramola and Babayeju, 2024).

The third ranking barrier, B14= “Lack of established standards and guidelines for ESG activities”, has a mean value of 3.99. This finding aligns with Liou, Liu and Huang (2023), who also identified lack of standards for measuring ESG performance as the third most significant barrier to ESG adoption. Similarly, Ngwa, et al. (2025) and Tran and Nguyen (2023) highlight that the absence of clear government regulations has hindered ESG adoption in their country. Without uniform metrics and standards, it hinders companies’ ability to define achievable ESG goals, compare their performance against defined standards, and determine appropriate strategies (Bezerra, Martins and Macedo, 2024; Parameswar, et al., 2023). Moreover, corporate executives and boards may hesitate to invest in ESG initiatives due to uncertainty in measuring impact and effectiveness without standardized assessment criteria (Liou, Liu and Huang, 2023). Therefore, comprehensive ESG guidelines and policies must be developed and implemented in the construction sector. A clear and consistent regulatory environment would not only facilitate ESG integration but also improve the communication and execution of sustainable practices (Bezerra, Martins and Macedo, 2024).

In contrast, barrier B8= “Immaturity of new technologies and innovations” is ranked the lowest among all identified barriers, recording an average score of 3.38. This implies that while some industry practitioners acknowledge the challenge posed by underdeveloped technologies, it does not represent a critical hindrance to ESG adoption. This may be because

technological advancements in the construction sector are progressing steadily, thereby reducing concerns regarding immaturity. Recent studies suggested that green construction technologies, digitalisation, and automation are increasingly being integrated into industry practices, which mitigate their perceived limitations (Musarat, et al., 2024). Green innovations such as BIM, prefabrication techniques, and smart construction materials have enhanced the industry's ability to align with ESG principles (Masyhur, et al., 2024; Zhang and Jin, 2022). These advancements reflected that the construction industry has access to viable solutions that facilitate sustainability efforts, even though certain emerging technologies remain in early development. Hence, technological immaturity is not a decisive factor that limits ESG adoption in the Malaysian construction industry.

4.5.2 Kruskal-Wallis Test for Barriers to ESG Adoption

The results of the Kruskal-Wallis test on the barriers hindering ESG adoption in Malaysia's construction industry are displayed in Table 4.5. The outcomes revealed that out of the fourteen barriers, the respondents have varying perceptions on two barriers, which are B3= "Resistance to change" and B4= "Lack of resources", as their significance levels were below 0.05. Hence, these findings led to the rejection of the null hypothesis for these two barriers.

B3= "Resistance to change" was perceived differently by the respondents, with a mean value of 3.52 for consultants, 3.12 for developers, and 3.89 for contractors. It is ranked 8th by contractors, which is higher compared to consultants and developers who ranked it at 13th and 14th, resulting in a p-value of 0.006. Okaye, et al. (2021) observed that contractors tend to resist changes towards sustainable practices when they lack sufficient knowledge and awareness, perceive the changes would significantly increase project costs, or believe they do not align with their organisational goals. This resistance is further compounded in organisations where sustainability is not ingrained in the main business plan, as it requires a shift from a profit-focused approach to a more purpose-oriented mindset, which often encounters internal disagreement (Mbonigaba and Sujatha, 2024). These factors contribute to hesitation, as contractors may view sustainability efforts as risky, costly, or impractical within

the context of their existing priorities and constraints. Moreover, contractors often manage a diverse workforce, including foreign labour, where the cultural and behavioural differences among workers have appeared as the primary sources of their reluctance to follow proper safety procedures (Zulkeflee, et al., 2023). This challenge further hinders the adoption of ESG practices, particularly in the social dimension, as ensuring worker safety and well-being becomes more complex when cultural differences affect compliance with established guidelines. In contrast, this factor poses the least significant barrier to developers and consultants, as their ability to stay attuned to market trends and lead innovation is essential for meeting evolving client demands and industry standards (Candel and Törnå, 2022).

Other than that, B4= "Lack of resources" is ranked first by consultants, third by contractors, and sixth by developers, with mean values of 4.17, 4.05, and 3.76 respectively. This significant difference in opinions leads to a p-value of 0.013. For consultants, their responsibilities often require deep technical knowledge and the ability to incorporate environmental and social considerations into project design and planning. A lack of resources such as skilled personnel, updated tools, and access to reliable data can severely hinder their ability to deliver high-quality, sustainable design solutions and expert advice, directly impacting project outcomes (Berrone, et al., 2023). From the contractor's perspective, they depend heavily on the availability of skilled labour, materials, and equipment for daily operations. As highlighted by Saharuddin, Hassan and Kamar (2022), sustainable construction requires more time and financial commitment, making it a major barrier for contractors in Malaysia. Compared to the conventional approach, the shift towards sustainable practices demands more intensive management and the use of modern technologies, which in turn incurs higher costs and requires specialised knowledge (Gu, et al., 2023). Without sufficient financial and human capital, it is challenging to implement ESG principles effectively, limiting their capacity to invest in sustainable materials, technologies, or workforce training necessary to meet ESG standards. In contrast, developers' ability to set project budgets and influence project direction allows them to mitigate resource-related issues more efficiently. Developers are often better positioned to obtain financial

support from investors and allocate funds strategically across the project lifecycle (Brill, 2021). With access to broader investment channels, they may not experience the same degree of financial strain as contractors or consultants when it comes to adopting ESG practices.

Table 4.5: Mean Ranking and Asymptotic Significance of Barriers to ESG Adoption in the Malaysian Construction Industry

Code	Barriers	Overall (N=132)			Consultant (N=54)			Developer (N=41)			Contractor (N=37)			Asymptotic Significance
		Mean	SD	Rank	Mean	SD	Rank	Mean	SD	Rank	Mean	SD	Rank	
B4	Lack of resources	4.01	0.648	1	4.17	0.575	1	3.76	0.734	6	4.05	0.575	3	0.013
B5	Limited ESG-related data and lack of long-term comparability	4.01	0.671	2	4.09	0.591	3	3.93	0.787	1	3.97	0.645	4	0.518
B14	Lack of established standards and guidelines for ESG activities	3.99	0.715	3	4.00	0.777	6	3.85	0.823	4	4.14	0.419	1	0.367
B9	Limited ESG awareness	3.98	0.654	4	4.04	0.699	5	3.85	0.691	3	4.05	0.524	2	0.257
B12	Insufficient regulations and policies for sustainable practices	3.96	0.725	5	4.11	0.718	2	3.80	0.843	5	3.92	0.547	6	0.103
B13	Lack of government support	3.94	0.769	6	4.06	0.787	4	3.76	0.830	7	3.97	0.645	4	0.108
B11	Lack of training and education system	3.93	0.595	7	4.00	0.727	7	3.90	0.539	2	3.86	0.419	9	0.153
B1	High associated cost	3.85	0.860	8	3.94	0.96	8	3.66	0.794	8	3.92	0.759	7	0.125
B6	Improper carbon offsetting	3.67	0.728	9	3.83	0.841	9	3.54	0.596	9	3.57	0.647	13	0.119
B2	Uncertain returns on investment	3.64	0.753	10	3.69	0.797	12	3.44	0.743	10	3.81	0.660	10	0.063
B7	Technology complexity	3.63	0.814	11	3.74	0.851	10	3.41	0.774	11	3.70	0.777	11	0.126
B10	Low interest and demand	3.55	0.952	12	3.74	0.935	11	3.27	0.923	12	3.59	0.956	12	0.066
B3	Resistance to change	3.50	1.066	13	3.52	1.112	13	3.12	1.053	14	3.89	0.875	8	0.006
B8	Immaturity of new technologies and innovations	3.38	0.904	14	3.50	1.06	14	3.15	0.792	13	3.46	0.730	14	0.180

4.6 Strategies to Encourage ESG Adoption

4.6.1 Mean Ranking of Strategies to Encourage ESG Adoption

Table 4.6 presents the ranking of the ten strategies to encourage ESG adoption based on their respective mean score.

S6= "Government subsidy" received the highest ranking at a mean score of 4.14. This suggests that financial support from governing bodies is seen as the most effective strategy to encourage ESG adoption, particularly within the construction sector, which is predominantly composed of small and medium-sized enterprises (SMEs). Given their limited financial capacity, SMEs often rely on governmental support to facilitate ESG adoption through funding programs and incentives (Alaloul et al., 2020). Government subsidies can take various forms, including direct financial aid, technological innovation grants, tax incentives, and other sorts of support that are typically allocated to enterprises that meet specific funding criteria or demonstrate significant progress in ESG integration (Mbonigaba and Sujatha, 2024). Research indicates that such financial support not only enhances corporate environmental performance but also drives innovation in green processes, incentivizes investment in research and development, and improves overall productivity (Zhang, Zhang and Feng, 2023). Furthermore, subsidies assist SMEs better embrace ESG practices by lowering the upfront costs, which helps them overcome resource limitations and meet ESG standards (Alhoussari, 2024; Mbonigaba and Sujatha, 2024). As a result, subsidies make ESG adoption more feasible, especially for companies with limited resources, ultimately promoting broader industry participation in sustainable initiatives.

The strategy with the second highest mean ranking is S9= "Establishing standards for ESG activities", obtained a mean value of 4.08. This highlights the importance of clear and standardized guidelines in ensuring effective ESG compliance. However, the lack of uniform standards often leads to inconsistent implementation and difficulties in measuring ESG performance, which in turn raises investor concerns over sustainability (Bezerra, Martins and Macedo, 2024). In this context, a well-structured, consistent and developed ESG evaluation framework is essential for advancing sustainable development, enhancing the credibility of corporate social responsibility reporting, and

serving as a benchmark for assessing the effectiveness of ESG initiatives (Li, et al., 2021). Moreover, standardised evaluation criteria establish an equitable foundation for performance reviews, guide the formulation of strategic actions in accordance with sustainability expectations, set measurable improvement goals, and facilitate the monitoring of progress towards long-term sustainability objectives (Liou, Liu and Huang, 2023). Therefore, establishing standardized ESG guidelines is crucial for fostering transparency, ensuring consistency in ESG implementation, and enabling companies to align their strategies with recognized sustainability criteria. This will ultimately strengthen investor confidence in ESG reporting and drive overall improvements in ESG practices and performance (Oernholt, 2023).

Following that, S4= “Enforcement of regulations and policies” is ranked as the third most effective strategy, achieving a mean value of 4.06. This is supported by Handoyo and Anas (2024) in their study, who unveiled the crucial role of strong regulatory frameworks and governmental procedures in facilitating ESG implementation. Their analysis found that corporations derive greater advantages from sustainable practices and may enhance performance when bolstered by effective government regulations. Strict regulations and policies compel companies to conform to sustainability criteria, establishing ESG adoption as an industry standard rather than a voluntary initiative. In view of this, many countries have initiated regulatory structures that mandate ESG reporting, with a focus on environmental and social impacts, which obligate organisations to integrate sustainable practices into their operations (Akilah, 2024). Therefore, in order to promote ESG adoption, governments must develop explicit and enforceable regulations on sustainable practices, while ESG disclosures should be required by legal frameworks, accompanied by penalties for failing to comply and incentives for outperforming standards (Alhoussari, 2024).

The strategy with the lowest ranking is S5= “Intensifying green technology research and innovations”, with a mean value of 3.61, considered to be the least effective or immediately impactful approach to promote ESG adoption in the construction industry. This may be attributed to the fact that research and innovation often require long-term investments, extensive testing,

and gradual industry acceptance, which delay tangible benefits for construction firms (Baah, et al., 2021; Emilsson, et al., 2020). Unlike strategies that offer direct financial or regulatory incentives, green technology research and innovation require a long development cycle, making it less attractive for companies seeking practical and economically feasible ESG solutions. This prolonged timeline may hinder the growth of corporate financial performance as firms may struggle to justify substantial investments in innovation without short-term returns (Jiang, et al., 2024). Moreover, many existing green technologies such as energy-efficient systems, modular construction, and digital solutions are already available for adoption, reducing the urgency for further research. Hence, the impact of intensifying research and innovation appears to be limited compared to other strategies that deliver more direct and immediate ESG benefits.

4.6.2 Kruskal-Wallis Test for Strategies to Encourage ESG Adoption

The Kruskal-Wallis test was also employed to examine whether perceptions on the effectiveness of strategies for encouraging ESG adoption varied significantly among different respondent groups. As shown in Table 4.6, there is only one strategy, S5= “Intensifying green technology research and innovations”, which shows a significance level below 0.05, with a p-value of 0.019. Thus, the null hypothesis is dismissed, and the alternative hypothesis is supported.

S5= “Intensifying green technology research and innovations” received mean scores of 3.74 from consultants, 3.71 from developers, and 3.30 from contractors. Contractors viewed this strategy as the least effective among all identified strategies, placing it 10th, while consultants and developers ranked it 8th. This variation may be attributed to the nature of green technology research and innovation, which is a long-term commitment that requires significant investment in the development of both processes and products (Shahzad, et al., 2022). The benefits of such research and innovation are typically realised over an extended period, whereas contractors often operate under project-based frameworks that emphasise short-term deliverables and profit margins. Since construction projects are bound by fixed timelines and

budgets, there is limited flexibility to accommodate delayed returns or the uncertainties associated with emerging technologies (Baah, et al., 2021). As a result, the perceived relevance and effectiveness of this strategy may be diminished among contractors. While consultants and developers also regarded the strategy as less effective relative to others, it may hold more relevance for them due to their broader involvement in long-term planning, design, and development. Cheah, et al. (2024) highlighted that green innovation is crucial for turning sustainability into a strategic advantage in the current competitive corporate environment. Developers may consider the potential of green innovations to increase the future market value, regulatory alignment, brand reputation and attractiveness of their projects to environmentally conscious buyers or investors. Meanwhile, consultants may see value in promoting research and innovation as they can propose better design solutions and advanced products that enhance building performance, environmental sustainability and operational efficiency while enhancing competitiveness and opening up new growth prospects (Alsharif and Tong, 2019).

Table 4.6: Mean Ranking and Asymptotic Significance of Strategies to Encourage ESG Adoption in the Malaysian Construction Industry

Code	Strategies	Overall (N=132)			Consultant (N=54)			Developer (N=41)			Contractor (N=37)			Asymptotic Significance
		Mean	SD	Rank	Mean	SD	Rank	Mean	SD	Rank	Mean	SD	Rank	
S6	Government subsidy	4.14	0.655	1	4.15	0.656	1	4.22	0.613	1	4.05	0.705	2	0.576
S9	Establishing standards for ESG activities	4.08	0.567	2	4.02	0.598	3	4.07	0.519	2	4.19	0.569	1	0.371
S4	Enforcement of regulations and policies	4.06	0.663	3	4.09	0.708	2	4.07	0.648	3	4.00	0.624	3	0.728
S7	Support from financial institutions	3.92	0.695	4	3.89	0.793	5	3.95	0.631	4	3.95	0.621	4	0.963
S8	Top management initiatives	3.79	0.731	5	3.78	0.744	7	3.76	0.734	7	3.84	0.727	5	0.841
S1	Training and education	3.77	0.809	6	3.91	0.830	4	3.66	0.794	10	3.68	0.784	7	0.240
S2	Encouraging collaboration in the industry	3.76	0.857	7	3.87	0.870	6	3.68	0.907	9	3.68	0.784	7	0.452
S3	Strengthening organisational framework	3.74	0.638	8	3.72	0.627	9	3.85	0.654	5	3.65	0.633	9	0.434
S10	Reinforcing human resources management	3.73	0.689	9	3.70	0.717	10	3.78	0.725	6	3.70	0.618	6	0.764
S5	Intensifying green technology research and innovations	3.61	0.759	10	3.74	0.782	8	3.71	0.680	8	3.30	0.740	10	0.019

4.7 Spearman's Correlation Test

Table 4.7 shows the findings of Spearman's correlation test adopted to assess the relationship between the barriers to ESG adoption and the strategies to encourage the adoption of ESG in the construction industry. The analysis indicated that there is a total of 211 correlations, with each barrier associated with at least four influential strategies with significant correlation.

As displayed in Table 4.7, B10= "Low interest and demand" and B12= "Insufficient regulations and policies for sustainable practices" emerged as the most significant barriers to ESG adoption, each demonstrating 10 significant correlations with the strategies. The prominence of "low interest and demand" suggests a lack of strong market demand or stakeholder motivation to drive sustainability, revealing that ESG practices are not yet prioritised by many key players in the industry. This observation is validated by the findings of Samad, et al. (2020), who noted that most developers show minimal interest in incorporating green practices into their projects. Despite the existence of long-standing environmental policies in Malaysia, the practical implementation of these policies remains limited, with fewer than 5% of buildings in the country being certified as "green" (Masyhur, et al., 2024). This reflects a broader systemic issue where sustainable construction is still widely perceived as an optional initiative rather than a regulatory necessity. Additionally, the high correlation of "insufficient regulations and policies for sustainable practices" emphasises the critical role of government intervention in shaping industry behaviour. The absence of enforceable and comprehensive regulations continues to hinder the widespread adoption of ESG practices by limiting stakeholder engagement and undermining the institutional support necessary for effective implementation (Tang, 2023). Without stronger policy enforcement and a uniform regulatory framework, sustainability in the Malaysian construction sector is likely to remain a low priority.

Meanwhile, S4= "Enforcement of regulations and policies" was identified as the most effective strategy to encourage ESG adoption, supported by a total of 14 significant correlations. This extensive association underscores its potential applicability in addressing all the identified barriers hindering ESG implementation. Its effectiveness is further validated by the mean ranking

results, where it was ranked among the top three strategies. Mandatory ESG activities, such as ESG disclosure driven by regulatory pressures and government initiatives, are expected to prompt companies to treat ESG practices as an integral part of their operational responsibilities (Kaleeswari and Chaudhuri, 2024). For example, the Malaysian government's phased approach to mandating ESG practices, which outlines a transition from voluntary adoption during 2024–2026 to mandatory reporting aligned with international standards by 2027–2030, demonstrates a strategic commitment to institutionalising ESG principles across all business sectors (MITI, 2024). This regulatory approach is anticipated to compel companies to integrate ESG considerations into their core operations, thereby elevating the industry's emphasis on sustainability.

Furthermore, the findings indicated that while all observed relationships between the variables were positive, the associations were relatively weak. Among these, the highest correlation was identified between B3= "Resistance to change" and S8= "Top management initiatives", with a coefficient of 0.332. This suggests that proactive engagement and commitment from top management are essential in addressing internal resistance and facilitating organisational change towards ESG adoption. Resistance to change often arises from internal organisational factors, such as rigid corporate norms, limited awareness, uncertainty about the impact of ESG on business performance, and concerns over the resources required for execution (Paridhi, et al., 2024; Rendtorff, 2023). As emphasised by Liu, et al. (2024), the board of directors and senior leadership play a crucial role in driving ESG commitments, while active involvement across all organisational levels are necessary for successful implementation. This indicates that to overcome resistance, organisational leaders must empower employees to lead ESG initiatives, provide training, and clarify the benefits of ESG integration (Olanrewaju, Daramola and Babayeju, 2024). Despite the low correlation strength, its positive association reinforces the importance of leadership commitment in shifting organisational mindsets and embedding sustainability into an organisation's business practices.

Table 4.7: Correlation between Barriers to ESG Adoption and Strategies to Encourage ESG Adoption

Barriers \ Strategies	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	Total Correlations
B1	0.236**	0.237**	0.149	0.318**	0.122	0.268**	0.268**	0.239**	-	0.153	9
B2	0.187*	-	-	0.126	-	-	-	0.178*	-	0.119	4
B3	0.282**	0.197*	-	0.300**	0.205*	0.204*	0.212*	0.332**	-	0.190*	8
B4	0.292**	0.152	-	0.140	0.172*	0.177*	0.139	0.148	0.131	0.189*	9
B5	0.196*	0.105	0.101	0.198*	0.205*	-	0.122	0.130	0.133	0.252**	8
B6	0.118	-	0.172*	0.198*	0.322**	-	0.118	0.223*	-	0.235**	7
B7	0.229**	-	0.156	0.144	-	-	-	0.199*	0.213*	0.105	6
B8	0.209*	0.142	-	0.189*	-	-	-	0.168	-	0.094	5
B9	0.311**	0.185*	-	0.253**	0.194*	0.206*	0.155	0.142	.0193*	0.189*	9
B10	0.301**	0.162	0.119	0.201*	0.109	0.133	0.162	0.247**	0.129	0.141	10
B11	-	-	0.137	0.154	0.101	0.147	-	-	0.121	0.142	6
B12	0.274**	0.197*	0.245**	0.327**	0.137	0.235**	0.132	0.213*	.0192*	0.114	10
B13	0.103	0.159	0.104	0.134	0.150	0.155	-	-	-	-	6
B14	0.166	0.219*	0.140	0.274**	-	0.107	0.154	0.152	0.137	-	8
Total Correlations	13	10	9	14	10	9	9	12	8	12	

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

*. Correlation is significant at the 0.05 level (2-tailed).

4.8 Summary of Chapter

In short, this chapter examined and interpreted the findings derived from data collected from 132 construction practitioners comprising consultants, contractors and developers within the Klang Valley area. The data were analysed using Cronbach's Alpha Reliability test, Arithmetic Mean test, Kruskal-Wallis test, and Spearman's correlation test. The reliability analysis showed that the data obtained was reliable, as alpha values for all three categories of variables exceeding 0.8. Based on the mean ranking, the top three drivers for ESG integration were identified as "market force and clients' demand", "industry competitiveness", and "government legislation and policy". Besides, this research also uncovered "limited data and lack of long-term comparability", "lack of resources", and "lack of established standards and guidelines for ESG activities" as the most significant barriers to ESG adoption in the Malaysian construction industry. Other than that, the most effective strategies to encourage ESG adoption were revealed to be "government subsidy", "establishing standards for ESG activities" and "enforcement of regulations and policies". Furthermore, the Kruskal-Wallis test determined significant differences in perceptions among respondents from different company business activities regarding the ESG drivers, barriers, and strategies. Lastly, Spearman's correlation test unveiled "enforcement of regulations and policies" as the most effective strategy with correlations with all identified barriers.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This final chapter concludes the research by summarising the findings regarding the fulfilment of the aim and objectives. Besides, the contributions of this research are discussed, including benefits to the construction industry, government, and researchers. Moreover, this chapter identifies the limitations faced during the research and proposes recommendations for future studies on relevant topics.

5.2 Conclusions

The concept of Environmental, Social, and Governance (ESG) has gained significant global attention as a vital framework for advancing sustainable development across industries. Despite its importance, ESG adoption within the construction industry remains relatively low, with limited emphasis on its implementation in the Malaysian context. To bridge this gap, this research was conducted to provide a deeper understanding of ESG adoption by exploring the key drivers for ESG integration, examining the barriers to its adoption, and ascertaining the potential strategies to encourage ESG practices in the Malaysian construction industry.

As part of this research, a comprehensive literature review presented in Chapter 2 identified 12 key drivers, 14 barriers, and 10 potential strategies related to ESG adoption. To validate these findings, a questionnaire survey was carried out to collect data from construction practitioners, comprising contractors, consultants, and developers within the Klang Valley area. In total, 132 responses were collected and analysed using selected statistical methods. Prior to the main analysis, a Cronbach's Alpha reliability test was carried out to assess the internal consistency of the data, with results confirming a high level of reliability. In short, the research objectives were successfully achieved, and the results are summarised as follows:

Objective 1:

The first objective of this research is to explore the key drivers for ESG integration in the Malaysian construction industry. A thorough literature review identified 12 key drivers for ESG adoption, and they were subsequently ranked by respondents based on their level of agreement. The ranking, measured by the mean score of each driver, reveals the priority placed by construction practitioners on different factors when incorporating ESG principles into their operations. A higher mean score indicates that a driver is regarded as more critical in influencing ESG integration. The results of the analysis identified the top three most significant drivers: market force and clients' demand, industry competitiveness, and government legislation and policy, all of which fall under the external aspect. These factors highlight the influence of external pressures in shaping the adoption of ESG practices within the industry. In addition, there was broad consensus among the three respondent groups regarding the overall rankings of the drivers. However, notable differences in opinion were observed concerning the drivers of "company image and reputation" and "corporate financial performance", reflecting differing priorities across various business activities within the construction sector. For instance, developers tend to prioritise enhancing corporate image and fulfilling market demand to sustain their competitive advantage. Meanwhile, contractors may view ESG initiatives more as financial obligations than opportunities for economic benefit.

Objective 2:

The second research objective sought to examine the barriers to the adoption of ESG practices in the Malaysian construction industry. This objective was achieved by identifying 14 potential barriers through an extensive literature review and gathering the perspectives of industry respondents. The findings revealed three major barriers to ESG adoption, which are lack of resources, limited data and lack of long-term comparability, and lack of established standards and guidelines for ESG activities. In further analysis using the Kruskal-Wallis Test, it was found that the barriers of "lack of resources" and "resistance to change" were ranked lower by developers compared to consultants and contractors. This suggests that developers may perceive these

barriers as less critical than other challenges, which reflect their specific concerns and experiences in implementing ESG practices within their operations. Furthermore, Spearman's correlation test unveiled that the barriers of "low interest and demand" and "insufficient regulations and policies for sustainable practices" exhibited the highest levels of correlation, with significant associations across all identified strategies. This indicates that both the lack of market demand and the absence of strong regulatory support are perceived as critical obstacles to ESG integration. Addressing these fundamental issues would be essential to fostering a more conducive environment for ESG adoption within the Malaysian construction sector.

Objective 3:

The third objective of this research is to ascertain potential strategies to encourage ESG adoption in the Malaysian construction industry. This research identified 10 strategies through a review of previous studies. According to the perspectives of construction practitioners, government subsidy, establishing standards for ESG activities, and enforcement of regulations and policies were recognised as the most effective strategies, suggesting that these external factors are crucial in promoting ESG integration. Moreover, the Kruskal-Wallis test indicated that the different respondent groups showed different opinions about the strategy of "intensifying green technology research and innovations", with contractors rating it as the least effective strategy. This is likely due to its long-term nature and high costs, which conflict with their short-term, project-based priorities. To further investigate the relationships between the barriers and strategies, Spearman's correlation test was conducted. The results uncovered that "enforcement of regulations and policies" was significantly correlated with all 14 barriers, underscoring its strong influence on ESG adoption. Among these correlations, the most notable relationship was between "resistance to change" and "top management initiatives". This highlights the critical role of leadership and organisational commitment in overcoming resistance and driving ESG practices within the industry.

5.3 Research Contributions

This research provides a comprehensive exploration of ESG adoption in the Malaysian construction industry. By identifying and addressing the unique barriers faced by the industry, this research lays the groundwork for advancing the integration of ESG practices and fostering sustainable growth within the industry.

The insights derived from this research offer critical resources for policymakers and regulatory authorities by offering practical recommendations that facilitate ESG implementation. By pinpointing specific barriers such as the absence of established standards and guidelines, the research highlights the importance of formulating clear and enforceable regulations aligned with the current state of ESG adoption within the construction sector. These findings are particularly relevant for enhancing the effectiveness of initiatives like the National Construction Policy 2030, ensuring that regulatory efforts are directly aligned with the needs and challenges faced by the industry. Furthermore, the research emphasises the value of government-driven actions, including offering subsidies and establishing standardised ESG frameworks, as essential approaches to accelerate the widespread adoption of ESG practices within the construction industry.

Moreover, this research provides strategic insights for industry stakeholders. It underscores the significance of a deep understanding of the drivers and potential strategies that can promote ESG integration. This knowledge is crucial for encouraging construction firms to proactively prepare for ESG adoption and to embed sustainability principles into their business operations, which is vital for maintaining a competitive edge in today's market, where sustainability is increasingly prioritised. By identifying the lack of resources as a significant challenge under the organisational aspect, the research calls attention to the need for improving resource allocation, hiring sustainability experts, and providing adequate training to overcome this challenge. Such efforts will empower industry professionals to embrace innovative solutions, improve operational efficiency, and reduce environmental footprints, thereby positioning themselves as leaders in sustainable construction. In addition, it highlights the crucial role of top management in overcoming

resistance to change within an organisation. By demonstrating strong leadership and commitment to ESG principles, top management can foster a culture of sustainability, ensuring that the entire organisation is aligned with these transitions through clear communication, proper resource allocation, and ongoing support.

From the academic perspective, this research contributes to the academic field by focusing on the Malaysian construction industry and uncovering localised barriers to ESG integration. This research not only enriches the existing literature on ESG adoption but also addresses knowledge gaps, specifically within the context of Malaysia. The findings establish a foundation for future research, enabling scholars to gain insights and explore related topics by incorporating the identified drivers, barriers, and strategies into their studies and contexts. In addition, the structured analysis of barriers and proposed solutions equip academics with an extensive framework to further investigate sustainability issues, not just in the construction industry but also in other related sectors.

5.4 Research Limitations

While this research offers valuable insights into the ESG adoption in the Malaysian construction industry, several limitations should be acknowledged. Firstly, the research mainly employed a quantitative research method by relying on a questionnaire survey for data collection. The survey was limited to closed-ended questions, which may have restricted respondents from providing more specific and comprehensive views. Consequently, some critical barriers, drivers, or strategies might have been overlooked, limiting the depth of the findings. Additionally, the focus on individual perspectives, rather than organisational viewpoints, may not fully reflect the broader and actual attitude of companies towards ESG practices.

Besides, some respondents might not have direct experience with or be involved in ESG practices. Although they may have been familiar with general sustainability concepts, a limited knowledge of ESG principles may lead to misconceptions about the drivers, barriers and strategies for advancing ESG implementation in Malaysia. This gap in knowledge could have led to

misinterpretations or inaccurate assessments of the drivers, barriers, and strategies for ESG adoption, potentially affecting the reliability of the ranking of variables.

Another significant limitation arises from the early stage of ESG development in Malaysia. Given that ESG practices are still relatively new in the local context, there is limited domestic research and literature on the topic. As a result, much of the supporting literature and references were drawn from studies conducted in other countries, such as China, Russia, Nigeria, and the United Kingdom, where ESG adoption is more established. However, the level of ESG implementation, regulatory environments, and industry practices vary across countries, which may limit the direct applicability of these findings to the Malaysian construction industry. Therefore, the findings should be interpreted with consideration of Malaysia's unique industry landscape.

5.5 Research Recommendations

In light of the limitations identified in this research, several recommendations are proposed for future studies. Given the constraints of quantitative methods in capturing subjective viewpoints, it is advisable for future research to adopt a mixed-method approach. By combining quantitative surveys with qualitative interviews, researchers would be able to obtain more in-depth insights. In particular, interviews with companies actively engaged in ESG practices would allow respondents to share more detailed experiences, perceptions, and barriers, providing richer data beyond what structured surveys can capture. Additionally, this qualitative input would create opportunities to uncover additional variables, thereby enhancing the validity and reliability of the research findings within the Malaysian construction industry context.

Other than that, future research should expand the respondent pool by including a broader range of stakeholders, such as senior management, ESG specialists, and regulatory bodies. Incorporating organisational-level perspectives in addition to individual views would provide a more comprehensive understanding of the drivers, barriers, and strategies related to ESG implementation. To further strengthen the accuracy and relevance of the findings, it is recommended that future research should prioritise participants

who have direct involvement in ESG initiatives. Focusing on experienced stakeholders would ensure that the findings reflect a deeper and more practical perspective of ESG principles and the challenges associated with their adoption.

Since ESG practices are wide-ranging and cover multiple aspects, future research could also consider narrowing the scope to focus on a specific dimension either environmental, social or governance aspect. Concentrating on one area would enable researchers to conduct a more detailed investigation of its unique barriers, implementation challenges, and potential improvements. Alternatively, researchers could explore particular themes such as technological influence, regulatory impacts, financial implications, or workforce development. Focusing on these specific areas allows for a deeper exploration into emerging trends, facilitates the identification of key barriers, and supports the development of more precise and actionable strategies to enhance ESG adoption in the Malaysian construction industry.

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APPENDICES

APPENDIX A: Questionnaire

Investigating Barriers to Environmental, Social, and Governance (ESG) Adoption in the Malaysian Construction Industry

Dear Sir/Madam,

I am Tan Ee Yinn, a final year undergraduate student pursuing a Bachelor of Science (Honours) Quantity Surveying at Universiti Tunku Abdul Rahman (UTAR). As part of my Final Year Project, I am currently conducting research entitled "Investigating Barriers to Environmental, Social, and Governance (ESG) Adoption in the Malaysian Construction Industry." The objectives of this research are to explore the key drivers for ESG integration, examine the barriers to the adoption of ESG practices, and ascertain potential strategies to encourage ESG adoption in the Malaysian construction industry.

This questionnaire comprises four (4) sections and is expected to take approximately 5-10 minutes to complete. Kindly be assured that all information acquired will be treated with the strictest confidentiality and will be used solely for academic purposes. Your time and effort in completing this survey are sincerely appreciated.

Should you require any further information or clarification, please feel free to contact me at eeyinnt23@1utar.my or 017-7278643.

Thank you.

Yours faithfully,
Tan Ee Yinn

Section A: Demographic Information

This section collects your personal information for statistical purposes related to this study. Please read each question and select the answer(s) that best describe you.

1. Which of the following best classifies your company?
   - □ Contractor
   - □ Consultant
   - □ Developer

2. What is your professional role?
   - □ Architect
   - □ Engineer
   - □ Quantity Surveyor
   - □ Chartered Builder
   - □ Other (Please specify): _____

3. What is your highest academic qualification?
   - □ High school
   - □ Foundation / STPM
   - □ Diploma
   - □ Bachelor’s Degree
   - □ Postgraduate Degree (Master's Degree, PhD)
   - □ Other (Please specify): _____

4. How long have you been working in the construction industry?
   - □ Less than 2 years
   - □ 2 – 5 years
   - □ 6 – 10 years
   - □ 11 – 15 years
   - □ More than 15 years

5. How many employees in your organisation?
   - □ Less than 10 employees
   - □ 10 – 49 employees
   - □ 50 – 249 employees
   - □ More than 250 employees

6. Which construction sector(s) are you currently or most frequently involved in?
   - □ Residential
   - □ Commercial
   - □ Mixed-use
   - □ Industrial
   - □ Infrastructure
   - □ Institutional
   - □ Other (Please specify): _____

Section B: Drivers for the ESG Integration in the Malaysian Construction Industry

Environmental, Social, and Governance (ESG) refers to a set of criteria used to assess a company's operations and their sustainability impact. In the construction industry, ESG emphasizes in adopting practices that reduce environmental harm, promote social responsibility, and maintain strong governance. Adopting ESG principles in the construction industry involves various approaches, including:

Environmental *(E)*: integrating energy-efficient designs, using sustainable construction methods and materials, and adhering to green building standards such as LEED or BREEAM.
Social *(S)*: prioritizing worker safety, promoting diversity and inclusion, and engaging with local communities.
Governance *(G)*: enhancing transparency in project management, complying with both local and global regulations, and fostering responsibility through strong corporate governance policies.

These efforts collectively contribute to long-term sustainability and ethical business practices across the industry.

This section consists of a list of the potential drivers influencing ESG integration in the construction industry. From your point of view, please indicate the level of agreement on the following drivers.

Code	Drivers	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
Organisational aspect						
D1	Company image and reputation that can be enhanced from participating in ESG initiatives.					

Code	Drivers	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
D2	Corporate financial performance that can be improved with robust ESG commitments.					
D3	Organisational size and available resources that influence the awareness, initiative, involvement, and readiness to embrace ESG principles.					
D4	Strong corporate governance that supports sustainable development and facilitates overall corporate performance.					
Social-environmental aspect						
D5	Environmental responsibilities such as carbon emission mitigation and natural resources conservation.					
D6	Building occupants' well-being and comfort for healthier living and working environments.					
D7	Better workers' health and safety					

Code	Drivers	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
External aspect						
D8	Government legislation and policies, including regulations, guidelines, industry standards, and administrative procedures.					
D9	Market force and clients' demand regarding sustainability in construction projects.					
D10	Government incentives in the form of monetary and non-monetary.					
D11	Enhancing industry competitiveness by improving reputation, stakeholder trust, and operational efficiency.					
D12	Availability of emerging technologies that supports construction firms' adherence to ESG criteria and the achievement of sustainability goals.					

Section C: Barriers to the Adoption of ESG Practices in the Malaysian Construction Industry

The potential barriers that may hinder ESG adoption in the construction industry are presented below. From your perspective, please indicate the level of agreement on the following barriers.

Code	Barriers	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
Financial aspect						
B1	High cost associated with ESG practices, including initial capital investment, ongoing maintenance, and operating expenditures.					
B2	The delayed returns and substantial upfront costs on sustainable practices that create uncertainties on the rate of return.					
Organisational aspect						
B3	Resistance to change due to perceived interference with current procedures, potential financial impacts, and insufficient technical capability in employing new practices.					

Code	Barriers	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
B4	Lack of resources, including financial access, digital tools, and the availability of professional personnel with knowledge and experience in sustainable practices.					
B5	Limited data and lack of long-term comparability to assess the feasibility and potential risks.					
B6	Improper carbon offsetting which can undermine the goal of carbon neutrality.					
Technological aspect						
B7	Technology complexity and the lack of technical expertise related to smart technologies.					
B8	Immaturity of new technologies and the lack of clear application guidelines and standards, which often restrict their availability and applicability.					

Code	Barriers	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
Social aspect						
B9	Limited public awareness and awareness gaps among various stakeholders regarding ESG principles.					
B10	Inadequate client demand and stakeholder interest in sustainable construction.					
B11	Lack of comprehensive training and education system to develop skilled workforce required to implement ESG practices.					
External aspect						
B12	Insufficient regulations and policies for mandating sustainable practices in the construction industry.					
B13	Lack of government support to actively promote ESG initiatives or provide financial incentives for sustainable projects.					

Code	Barriers	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
B14	Lack of established standards and guidelines for ESG activities, including inconsistent ESG standards and abundant frameworks for ESG assessment and reporting.					

Section D: Strategies to Encourage ESG Adoption in the Malaysian Construction Industry

The suggested strategies to encourage ESG adoption in the construction industry are compiled below. In your opinion, please indicate the perceived effectiveness on the following strategies.

Code	Strategies	Not Effective (1)	Slightly Effective (2)	Effective (3)	Very Effective (4)	Extremely Effective (5)
S1	Training and education to raise awareness and improve understanding of ESG concerns.					
S2	Encouraging collaboration in the industry to pool resources, reduce risks, boost profitability, and enable a continuous exchange of knowledge.					

Code	Strategies	Not effective (1)	Slightly effective (2)	Effective (3)	Very Effective (4)	Extremely Effective (5)
S3	Strengthening organisational framework to provide a clear blueprint and ensure that sustainability goals are included in every aspect of the operations.					
S4	Enforcement of regulations and policies, such as rigid requirements and guidelines on sustainable construction practices.					
S5	Intensifying green technology research and innovations to enhance green construction capabilities and accelerate the industry's transition towards sustainability.					
S6	Government subsidies that make sustainable practices more affordable and attractive.					

Code	Strategies	Not effective (1)	Slightly effective (2)	Effective (3)	Very Effective (4)	Extremely Effective (5)
S7	Support from financial institutions, including making ESG criteria a prerequisite to be eligible for a loan and offering green bonds or funding.					
S8	Top management initiatives and commitment to ESG goals.					
S9	Establishing standards for ESG activities by having a set of guidelines and mechanisms in place.					
S10	Reinforcing human resources management by developing specialised skills and competencies as well as emphasising social criteria like diversity and tolerance in corporate operations.					

End of Questionnaire Survey

Thank you very much for your time and participation.