

MALAYSIAN PROPERTY INDUSTRY:  
CHALLENGES FACED BY PRACTITIONERS IN THE  
ADOPTION OF GREEN BUILDING CONCEPT

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BY

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DECLARATION

We hereby declare that:

(1) This undergraduate research project is the end result of our own work and that due acknowledgement has been given in the references to ALL sources of information be they printed, electronic or personal.

(2) No portion of this research project has been submitted in support of any application for any other degree or qualification of this or any other university, or other institutes of learning.

(3) The word count of this research report is 22,097

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## DEDICATION

This final year project is the result of numerous and arduous sacrifices. This research is wholeheartedly dedicated to each and every one who has guided me throughout my journey. From my supervisor, Cik. Nur Hafizah Binti Juhari, to my respondents, and family members who have been my source of inspiration, supported me and offered help throughout the journey of my research. They have continuously supported me both physically and mentally by giving advice and words of encouragement to complete this research. Lastly, this research is dedicated to all parties who has helped me. Without your assistance, this research would not have been successful at all. Thanks for making me see this adventure through to the end.

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## PREFACE

I am very grateful that this research has been resolved smoothly. The topic of “Challenges faced by Practitioners in the Adoption of Green Building Concept Towards the Malaysia Property Industry” is expected to provide useful insights as well as information for all writers as well as readers of this research.

“Challenges faced by Practitioners in the Adoption of Green Building Concept Towards the Malaysia Property Industry” was chosen because I am interested to find out the causes to it. With the climate change the world is experiencing now, it is important to reduce the consumption of resources, energy, and waste that is harmful to the environment to ensure that the future generations will have an adequate amount of resources with a safe and healthy living environment. This research paper will provide the factors leading to the challenges faced by practitioners in the adoption of green building concept. To the end, readers are expected to be able to understand each content presented in this paper well.

In case readers are interested in this topic, here are a few journals that are similar to the topic. Esa et al., (2011) describes the “Obstacles in Implementing Green Building Projects in Malaysia. Ong et al., (2021) describes the “Challenges of Green Office Implementation: A Case Study in Penang, Malaysia”. Wong et al., (2021) describes the “Barriers for green building implementation in Malaysian construction industry. Ha et al., describes “The Barriers of Implementing Green Building in Penang Construction Industry”. Lastly, Yee et al., describes “A Study on the Challenges of implementing green building concept in Sarawak, Malaysia”.

## ABSTRACT

It is without doubt that the green movement is constantly growing throughout recent years. Although the green building concept is a vital key to improve Malaysian's standards, there is still a large gap in terms of people's understanding and awareness on green building issues where Malaysia faces difficulty in implementing the green building concept. This is caused by the slow pace and hesitance to participate in it. Therefore, this research aims to evaluate on the most challenge faced by practitioners in the implementation of green building concept towards the Malaysian property industry. About 100 questionnaires are used to collect data and analysed using descriptive analysis and relative importance index. The results obtained shows that there were eight challenges and the lack of professional knowledge was the most difficult challenge faced by practitioners in the adoption of green building concept in the construction industry. Thus, practitioners are required to join more related events, training and seminars to gain more knowledge. Furthermore, the future researchers are encouraged to study on the knowledge required to be obtained by practitioners or even study specifically on only one practitioner or property type.



## **CHAPTER 1: RESEARCH OVERVIEW**

### **1.0 Introduction**

This research is conducted to study on The Assessment of Challenges faced by Practitioners in the Adoption of Green Building Concept. Researcher will list out the background of this study alongside with the problem statement in this chapter. An overview of the whole research determines the research questions to be investigated follow with the development of research objectives to be achieved, the contribution in the significance of the study, as well as the chapter layout.

### **1.1 Research Background**

It is without doubt that the green movement is constantly growing throughout recent years. The development of green buildings started back in 1970's in the midst when Henri Becquerel witnessed the solar energy transforming into electrical energy during the industrial revolution. At such, the power is known as photovoltaic power. Solar power plants were created to harness the sun's energy and transform into steam. Paving the way for solar panel solution twenty years later, solar energy is utilized on a modest scale in the 1950's. Aside from harnessing the sun's energy, a variety of other options for making a building more environmentally friendly has been reviewed by green builders in the past (Patsalides, 2011). Green building is a concept aimed to encourage sustainability by raising awareness on environmental issues as well as the significance of green technology in buildings among individuals in the construction, development, design industry, as well as the general public (Oluwunmi, Oladayo, Role & Afolabi, 2019). Green buildings are a part of a worldwide effort to raise awareness on human activity's impact that causes global climate change. It is also known as a sustainable or high-quality building involving complicated design, building method as well as maintenance approach (Fischer, 2010). The green building concept helps to reduce a building's impact to the

environment and human health by maximising the conservation of resources, reducing the environment pollution, protecting the ecological environment as well as providing a healthy and high efficiency space.

The first ever green building rating system, Building Research Establishment Environmental Assessment Method (BREEAM) was introduced back in 1990 by the United-Kingdom based organization, Building Research Establishment (BRE). This system is recognized as the first Sustainability Assessment Method for buildings and is the world's longest established method of assessing, rating, as well as certifying buildings' sustainability. Overall, the country with the most green buildings is the United States with around 124,200 (124,212) Leadership in Energy and Environmental Design green buildings (LEED) (USWITCH, 2021). The second country is China with 5,700 (5,678) and the third country is Canada with just over 3,000 (3,066) green buildings. According to the US Green Building Council (USGBC), the construction industry consumes 40% of worldwide energy and it is expected to grow by 1.8% by 2030. Hence, with the recognition of being healthy, LEED-certified buildings can help save cost and is highly efficient (USWITCH, 2021). Table 1.1 shows the top five countries with the most green buildings.

Table 1.1 Top five countries with the most green buildings

| <b>Country</b> | <b>Number of green buildings</b> |
|----------------|----------------------------------|
| United States  | 124,212                          |
| China          | 5,678                            |
| Canada         | 3,066                            |
| India          | 2,246                            |
| UAE            | 2,029                            |

Source: Uswitch.com (2021)

According to Mellino (2015), there are currently more than 69,800 commercial and institutional projects, and 76,500 residential units which are certified under LEED that are found in more than 150 countries across the world. Malaysia has established its own green rating tool, Green Building Index (GBI) which is established by Pertubuhan Akitek Malaysia (PAM) together with the Association of Consulting

Engineers Malaysia (ACEM) on 21 May 2009 to promote and enhance the Malaysian Property industry to be more environmental-friendly. The green building rating systems is produced for environmental performance and energy evaluation that spreads a broad spectrum of sustainability. The evaluation on the design and building performance is based on 6 key criteria which are Energy Efficiency (EE), Indoor Environment Quality (EQ), Sustainable Site Planning and Management (SM), Materials and Resources (MR), Water Efficiency (WE), as well as Innovation (IN) (Yusoff & Wong, 2014). With the implementation of Green Building Index (GBI), it can be seen that Malaysia has taken a giant leap forward to access green buildings performances throughout Malaysia (Chua & Oh, 2011). With the GBI rating concept, it provides building owners and developers a chance to design and build green and sustainable building that can reduce the negative impact on the environment while promoting resources efficiency and effectiveness (GBI, 2016).

## **1.2 Problem Statement**

The construction sector plays a very important role in the Malaysian economy. This sector is responsible for the consumption of high-energy, the generation of solid waste, the depletion of resources, external and internal pollution, the global greenhouse gas emissions as well as the damage to the environment. It is the pivotal role for the country's economic growth and development as well as to improve the life and living standards of Malaysians (Khan, Liew & Ghazali, 2014). In such, the construction sector is the backbone of a country's economic growth. According to Alaloul et al. (2021), construction industry is the prime factor to these rising issues. With the climate change the world is experiencing now, it is important to reduce the consumption of resources, energy, and waste that is harmful to the environment to ensure that the future generations will have an adequate amount of resources with a safe and healthy living environment. The extraction of raw materials from the Earth are mainly used for the building construction in which it uses up to 60% of it (Bribian et al., 2011). Even though the construction industry will help with urbanisation and help with economic growth, it leads to negative environmental outcomes. With the increasing population in the world today, it has led to an

increase of demand for natural resources, water as well as energy. This will deplete the environment's non-renewable resources by fostering the overburden on our ecosystem which leads to global warming (Olubunmi et al., 2012).

Socially, there is still a large gap in terms of people's understanding and consciousness on green building issues as well as their role in achieving social supportability for the entire community (Algburi & Faieza, 2018). The environmental defects that people are facing today is due to the large amount of resources and energy used. The old or current construction has led to many environmental problems which includes high energy consumption, pollution, erosion, as well as global warming. Hence, the green building concept is a vital key to improve Malaysians' life and living standards as they consumer fewer resources and energy. According to Green Building Index (2013), green buildings helps recycle materials and reduces acid emissions. Since natural resources are insufficient and are decreasing as years go by, the implementation of green building concept must be sped up. Green buildings will help by promoting building's efficiency respecting to the usage of water, energy and resources. It will help reduce the impact of buildings on individual's health and the environment with better design, operation, construction and maintenance. At such, Malaysia has become dedicated to sustainable development by creating government agencies such as the Sustainable Energy Development Authority (SEDA) and Greenbuildingindex Sdn Bhd which operates the Green Building Index (GBI) rating system (Johan, 2013).

Even though the Green Building Index has been established by Pertubuhan Akitek Malaysia (PAM) together with the Association of Consulting Engineers Malaysia (ACEM) back in 2009, many people are still not aware of it. According to Tan (2011), GTower, which is a premium Grade A+ building located at Kuala Lumpur Golden Triangle along the intersection of Jalan Ampang and Jalan Tun Razak is Malaysia's first green certified building since 2005 and has been recognized as Green Mark Gold by the Building and Construction Authority of Singapore (BCA). Previously known as Zero Energy Office (ZEO), it is the first ever certified building in the Malaysia's Green Building Index (GBI) and is it also the earliest green-rated office building developed. It is now known as the Green Energy Office (GEO)

(Green Building Index, 2013). According to Mohd Reza et al., (2011), the government has indicated a strong interest to implement green buildings because Malaysia is very much lacking behind other Asia Pacific countries in terms of the green building concept. Even though the certification of green building is rated through design assessment and the Completion and Verification Assessment (CVA), it does not evaluate on the operation and maintenance work of the building. At such, it only evaluates how “green” a building is without knowing how well the building is performing. This will make it hard for and difficult to implement the maintenance cost (Ling, 2016). This is because when green operations and maintenance are not included in the green building certificate it makes it hard and impractical for operation and maintenance contractor to implement them.

Generally, Malaysia faces difficulty in implementing green building concept in the construction industry. This is caused by the slow pace and hesitance to participate in green building concept is due to the lack of awareness on the Green Building Rating Systems (GBRS) and the green building concept among construction professionals such as developers, consultants, contractors, as well as clients (Abidin & Powmya, 2014). Besides that, the lack of enforcement and government intervention has a huge impact on the adoption of green building concept. At such, the government plays an important role in the implementation of green buildings by developing or adopting new technologies and practices. This concept is rarely implemented in Malaysia because of the complicated involvement of numerous economic sectors as well as the development sequence formation from planning, designing, construction to project management and demolition (Deng et al., 2018). As a result, there is a knowledge gap in terms of the understanding, analysing, as well as identifying the true factors on why green building concept is rarely implemented in the Malaysian construction industry. Despite the fact that this concept has been around for a while, there are still insufficient professionals in the Malaysia to help with the implementation of it. Since resources are scarce, capitals and non-renewable energy are limited, establishing techniques to promote the green building concept will motivate developers, contractors and other relevant parties to create environmentally friendly buildings in the future (Soon et al., 2017).

### **1.3 Research Questions**

The research questions that arise are:

1. What are the challenges faced by practitioners in the implementation of green building concept in Malaysia?
2. What is the most challenge faced by practitioners in the implementation of green building concept in Malaysia?

### **1.4 Research Objectives**

The research objectives are developed as below.

#### **1.4.1 General Objective**

The objective of this research is to evaluate the challenges faced by practitioners in the implementation of green building concept towards the type of properties.

#### **1.4.2 Specific Objectives**

The specific objective of this research are stated as below:

1. To determine the challenges faced by practitioners in the implementation of Green Building Concept in Malaysia.
2. To evaluate the most challenge faced by practitioners in the implementation of Green Building Concept in Malaysia.

## **1.5 Hypotheses of the Study**

In the Malaysian Construction Industry, there are challenges faced by practitioners like architects, contractors, developers, engineers, property consultants and quantity surveyor in the implementation of green building concept where the type of property is categorised into residential, commercial and industrial property. The challenges faced by practitioners has caused the Malaysian Construction Industry to be lagged behind in the green building concept which will leave more negative impact on the environment. Hence, the most challenge faced by practitioners in the implementation of green building concept needs to be evaluated.

## **1.6 Significance of the Study**

This research is to understand the community as well as the people's behaviour towards the environment where it would bring a significant impact to the environment as well as the industry. By carrying out this research, it will encourage, push and convince developers, consultants and contractors all around the world to inspire a better future with sustainable structures and developments. Besides that, with the awareness of green building concept, it can help decrease and eliminate negative environmental consequences by consuming lesser water, energy, or natural resources. Not only that, green building concept brings beneficial environmental impact such as improving economic productivity, conserving resources and ending climate change by generating their own energy as well as increase biodiversity. Hence, the potential advantages of developing a new generation of green building concepts to a prosperous community can then be determined and prioritised.

### **1.6.1 Developers**

This research would benefit developers where they can amalgamate human needs with environmental needs. In short, negative environmental impact can be reduced with the usage of renewable energy at such, water consumption, non-renewable energy and natural resources will be reduced. Besides that, this study can guide developers to reduce their costs and risks in achieving their green building accreditation. Green accreditation demonstrates that developers have committed efforts and resources in meeting environmental standards, and ensuring that their buildings' performance meets certain thresholds (Bertrand, 2010). It aims to reduce utility expenses while improving environmental quality. Since a green building concept meets the rising demand from buyers who are concerned about energy and water conservation, as well as good indoor air quality for health benefits, a green building contributes to the revitalization of a community and the growth of local businesses (Jesus, 2020). Therefore, with the implementation of green building concept, there will be a reduction on utility bills in which renewable energy is taking place during the day and night. Hence, this concept has the potential to reduce costs for all parties involved, enhance construction quality and protect the environment.

### **1.6.2 Government and investors**

Government can benefit from this research with the increase of revenue as a result of the entry of foreign investments. This is because green buildings investment would provide investors with a higher return in the form of higher rent price, capital appreciation as well as cost savings (Isa et al., 2013). Since green buildings contribute many benefits towards the environment and hence, they attract investors to invest in them. Social and environmental benefits are what attract investors the most. Green developments are ideal investments since they use renewable energy sources and have superior air ventilation which makes them appealing to tenants who prioritize and value a healthy lifestyle. In such, green buildings are intended to be energy efficient, provide thermal comfort, encourage healthy living lifestyle and reduce the cost of heating for users. Due to the advantages of green building concept,



it can be foreseen that tenants would be pleased to pay a higher rent (Isa et al., 2013). Consequently, tenants' productivity can be enhanced by offering good air ventilation, natural light, and the capacity to maintain indoor environment quality.

### **1.6.3 Investors**

With the implementation of green building concept, investors can benefit by living a healthier lifestyle. This is because green building uses few chemical products which helps to decrease many respiratory issues. Despite being more costly upfront, it will probably be more money saving in the long-run. Because of inefficient use of lights and operating equipment, the average building waste around 30% of energy being consumed. With the green building concept, demand control ventilation is one of the most effective energy conservation methods that can be implemented in such that it has a payback of 2.5 years with an average energy saving of 38 percent in building which will lead to a 15-20 percent reduction in the energy bill. Besides that, green building concept benefits investors by being more energy-efficient which requires less energy to operate which will have lesser impact on the environment. With energy-efficiency, it can boost profits while lowering energy use. Rental premiums and greater values are paid for healthier assets. Hence, with the green building concept, investor engagement can be fantastic as a bonus and incentives can be improved through incentives (Brewster, 2020).

## **1.7 Chapter Layout**

The structure of this research is divided into five chapters to provide the readers a map that can help guide them through reading and understanding. It provides guidance on how each chapter is constructed to have a better understanding.

## **Chapter 1: Research Overview**

This chapter will provide an overview of the study context and a thorough explanation of the research proposal where extensive understanding is essential. It will present explanations to clarify the research. It sets forth the problem statement, research objectives to be achieved, research questions to be answered, hypotheses to be tested and the significance of the study.

## **Chapter 2: Literature Review**

This chapter provides the documentation of a comprehensive review of published and unpublished information from secondary sources of available data on a topic. The sources are then discussed in a conversation with each other. It presents the research foundation by discussing and identifying the factors that are contributing to the research objectives. It usually follows a discussion of the theses statement.

## **Chapter 3: Methodology**

This chapter will provide the definite procedures of techniques that will be used to analyse, determine, identify, process and explore information on a topic. Is it an overarching strategy with clear and simple sentences that are easy to understand. Methodology refers to the rationale of the research focusing on evaluating a study's overall validity as well as reliability critically. Throughout this chapter, there will be a conceptualisation of surveyed questionnaires, targeted populations, data collection, data procession, data analysis and results.

## **Chapter 4: Data Analysis**

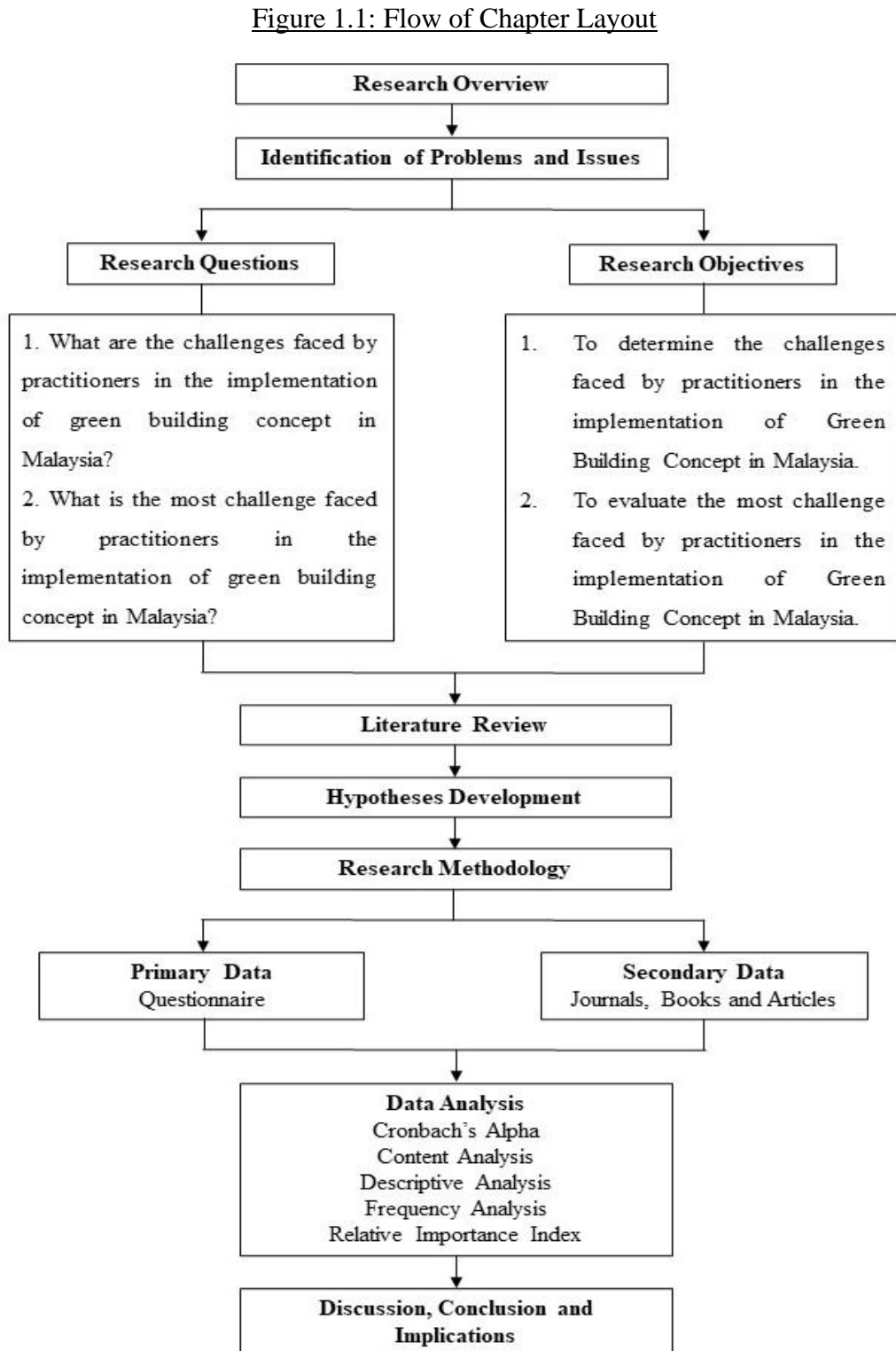
This chapter will provide the results pattern and results analyses that are relevant to the research questions as well as hypotheses. It demonstrates the data that have been collected from the respondents. Data analysis systematically apply statistical and logical techniques that explains and demonstrates, condense and review, as well as evaluate data. The key component that ensures data integrity is through appropriate, precise, exact and accurate analyses of research findings.

## **Chapter 5: Discussion, Conclusion and Implications**

This final chapter will provide the conclusion of this research. It aims to remind the readers of the main argument and why this research is important. The conclusion restates the prime and key evidence which are supporting the argument or finding. It wraps up all ideas and leave a strong final impression.

### 1.7.1 Flow of Chapter Layout

Figure 1.1 shows the flow of Chapter Layout



Source: Researcher (2022)

## **1.8 Conclusion**

This chapter has delivered the main idea of the whole research project regarding the challenges faced by practitioners like architects, contractors, developers, engineers, property consultants as well as quantity surveyor in the implementation of green building concept and the relationship with the type of property. In the next chapter of Chapter 2, Literature Review, a clear, detailed and logical presentation on the issue stated in Chapter 1 will be further discussed.

## **CHAPTER 2: LITERATURE REVIEW**

### **2.0 Introduction**

After giving an overview on the research topic in the previous chapter, this chapter will provide a review of the literature on the challenges faced by practitioners in implementing the Green Building Concept in Malaysia property industry. The green building concept and green building assessment criteria will be analysed. Next, a literature review on the factors affecting the challenges faced by practitioners will be explained followed by the review of relevant theoretical models, a conceptual framework and the development of hypotheses. Lastly, it ends with a conclusion.

### **2.1 Green Building Concept**

According to Chandra (2018), the clause “green” is an eco-friendly application from the building outline to the landscape design. It was supported by Zachariah, Kennedy and Pressnail (2002), that the term “green building” is especially important with the need to develop environmentally friendly buildings in fostering a sustainable nation becoming paramount. “Sustainable construction” and “green building” are the two expressions that are used conversely and originate from the sustainable development concept. In the occurrence of uncontrolled and persistence degradation to the environment and inevitable climate changes on our society, the green building concept is developed for universal sustainability. At such, green buildings aim to increase the efficiency of buildings by utilizing water, energy and materials and hence, decreasing the effect of buildings on human well-being and the environment (Akadiri, Chinyio & Olomolaiye, 2012). It was supported by Kibert (2012) that “green building” are buildings that are planned and built in accordance with sustainable development standards. At such, they are “healthy facilities planned and constructed wisely using ecologically based standards”.

Not only that, green buildings are concerned with the durability, economy, utility as well as the comfort of a building by using environmentally friendly and sustainability method throughout the building process. Accordingly, it includes the conservation of energy, enhanced indoor air quality, resource management and the wellbeing of tenants. Green buildings are a necessity for continuous living as “Health and Comfort” which is essential for the continuation of life (Hsieh et al., 2012). To conclude, a building is only regarded as “green” if it aligns with the green rating system benchmark of Building Environment Assessment Methods (BEAM) (Cole, 2003). The green rating system benchmark includes the Building Research Establishment Environmental Assessment Method (BREEAM) and Leadership in Energy and Environmental Design green buildings (LEED). Hence, the awareness of green building is important if practitioners in the Malaysian property industry promotes reduced building footprints that impacts the environment entirely.

## **2.2 Green Building Index (GBI)**

In order to determine if a building aligns with the green rating system benchmark, there are several certification bodies that can be used to decide. In Malaysia, the Green Building Index (GBI) is used. It is established by Pertubuhan Akitek Malaysia (PAM) together with the Association of Consulting Engineers Malaysia (ACEM) on 21 May 2009 to promote the Malaysian Property industry to be more environmental-friendly (Tan, 2009). According to Kibert (2012), GBI is used to encourage sustainability in the built environment and raise awareness among practitioners and the public regarding environmental issues and our responsibility for future generations. The GBI rating tool allows practitioners to plan and construct green sustainable buildings that saves water, energy, incorporate recycling and greenery into projects, provide a healthy indoor environment, and most importantly, reduce our impact on the environment (Liew, 2012). BGI rating tools are produced for environmental performance and energy evaluation where various type of field includes Residential New Construction (RNC), Non-Residential New Construction (NRNC), Non-Residential Existing Building (NREB), Industrial New Construction (INC), Industrial Existing Building (IEB), and Township (T) (Ling, 2016).

### 2.2.1 Green Building Index (GBI) Criteria

The evaluation on the design and building performance is based on 6 key criteria which are Energy Efficiency (EE), Indoor Environment Quality (EQ), Sustainable Site Planning and Management (SM), Materials and Resources (MR), Water Efficiency (WE), as well as Innovation (IN) (Yusoff & Wong, 2014). According to Nizarudin, Hussain & Tukiman (2015), the first criteria of Energy Efficiency (EE) is the study of energy distribution and its consumption by enhancing building orientation, reducing solar heat gain through the building envelope, collecting natural lighting, and taking on the best practices in building services. Next, Indoor Environment Quality (EQ) is the need to achieve good quality performance in the quality of air, thermal comfort, visual as well as acoustics. Besides that, proper control of air movement, temperature and humidity has to be achieved. Sustainable Site Planning and Management (SM) states that sites selected needs to have easy access to public transportations. In addition, Materials and Resources (MR) talks on the environmental-friendly and sustainable building materials where proper construction waste management systems should be implemented. Water Efficiency (WE) suggests recycling water, the use of water-saving fittings in the pipes, harvesting rainwater, as well as filtering used water. Lastly, Innovation (IN) in which innovation design needs to meet the objectives of GBI. For example, solar thermal technology, as well as self-cleaning facades. Table 2.1 shows the assessment criteria for non-residential new construction (NRNC).

Table 2.1: Assessment Criteria (Overall Points Score)

| <b>Assessment Criteria</b>                    | <b>Scoring</b> |
|---|----------------|
| Energy Efficiency (EE)                        | 35             |
| Indoor Environmental Quality (EQ)             | 21             |
| Sustainable Site Planning and Management (SM) | 26             |
| Material and Resources (MR)                   | 11             |
| Water Efficiency (WE)                         | 10             |
| Innovation (IN)                               | 7              |
| <b>TOTAL SCORE:</b>                           | <b>100</b>     |

Source: Green Building Index (2009)



Table 2.2 shows the assessment criteria for residential new construction (RNC).

Table 2.2: Assessment Criteria (Overall Points Score)

| <b>Assessment Criteria</b>                    | <b>Scoring</b> |
|---|----------------|
| Energy Efficiency (EE)                        | 23             |
| Indoor Environmental Quality (EQ)             | 11             |
| Sustainable Site Planning and Management (SM) | 39             |
| Material and Resources (MR)                   | 9              |
| Water Efficiency (WE)                         | 12             |
| Innovation (IN)                               | 6              |
| <b>TOTAL SCORE:</b>                           | <b>100</b>     |

Source: Green Building Index (2009)

### **2.2.2 Green Building Index Classification**

Table 2.3 shows the Green Building Index Classification.

Table 2.3: Green Building Index Classification

| <b>Points</b>    | <b>BGI Rating</b> |
|------------------|-------------------|
| 86 to 100 points | Platinum          |
| 76 to 85 points  | Gold              |
| 66 to 75 points  | Silver            |
| 50 to 65 points  | Certified         |

Source: Green Building Index (2009)

## **2.3 Green Building Concept towards Properties**

There are various green development in the Malaysian property market, ranging from residential to commercial property. Up to date, there are over 500 registered Green Building Index (GBI) building in Malaysia (Yong, 2021). However, Malaysia is still considered to be at the beginning stage if compared to other developed countries (Wong, et al., 2021). This is because Malaysia faces challenges in implementing the green building concept in the construction sector.

Accordingly, there are a few green building features applied to properties in Malaysia. According to Tobias (2021), green building features include Solar Photovoltaic Panels, Solar Thermal Collectors, Geothermal Heating and Cooling, Rainwater Harvesting, LED Lighting, Daylight-controlled lighting systems, Energy Recovery Ventilation, Micro Wind Turbine, HEPA Air Filtration, CO2 Controlled Ventilation, as well as Energy Efficient Lighting Fixtures and Sensors.

### **2.3.1 Malaysian Residential Property**

Residential property is a property for the usage of living or dwelling for individuals or households like single-family or multi-family. They are the most common type of property where they are the asset class with which the majority of people are acquainted. The Malaysian Residential Property includes condominium, apartment, serviced apartment, flat, duplex, penthouse, terrace house, bungalow, semi-detached, and townhouse. According to Elias and Chong (2015), houses, being a component of human life, should be designed to strike a balance between physical buildings, the environment, and the people who live there. Correspondingly, a conventional home emits around 10 to 30 tonnes of carbon dioxide (CO<sub>2</sub>) every year, making it one of the primary contributors to global warming catastrophes. Therefore, Malaysia's construction industry now has a new impetus in the form of a green development agenda. The Green Building Index – Residential New Construction (GBI-RNC) developed by PAM (Malaysian Institute of Architects)

and ACEM (Association of Consulting Engineers Malaysia) is an environmental rating system used for buildings. The GBI - RNC intended to assess a house in Malaysia's tropical weather conditions (Elias & Chong, 2015). Table 2.4 shows the Residential New Construction (RNC) in Malaysia.

Table 2.4: Residential New Construction (RNC) in Malaysia

| <b>Green Building Project</b> | <b>Certification Date</b> | <b>GBI Rating</b> |
|-------------------------------|---------------------------|-------------------|
| Skyluxe                       | 24 June 2021              | Certified         |
| Highpark Suites               | 15 October 2020           | Gold              |
| Ken Bangsar                   | 24 May 2019               | Certified         |
| Residensi Chymes Gurney       | 30 August 2018            | Silver            |
| Veerde @ Ara Damansara        | 11 July 2018              | Gold              |
| Verdana at North Kiara        | 13 September 2016         | Certified         |

Source: Green Building Index (2009)

Table 2.5 shows the Township (T) in Malaysia.

Table 2.5: Township (T) in Malaysia

| <b>Green Building Project</b>       | <b>Certification Date</b> | <b>GBI Rating</b> |
|-------------------------------------|---------------------------|-------------------|
| Bandar Gamuda Gardens               | 25 May 2021               | Silver            |
| Leisure Farm Resort – Central Spine | 12 June 2019              | Certified         |

Source: Green Building Index (2009)

### **2.3.2 Malaysian Commercial Property**

According to Toivonen and Viitanen (2016), since commercial buildings have a variety of economic, environmental, political, social and cultural aspects, they are inextricably related to the surrounding society. Commercial properties are commonly used for business purposes where it may also refer to a land that is used to generate revenue, as well as large residential rental properties where it is leased to tenants to conduct income-generating business. It is supported by Chen (2021) that Commercial Real Estate (CRE) is a property used exclusively for business-

related purposed or to offer a workspace, as opposed to being utilised as a living space, which would be classified as residential real estate. The Malaysian Commercial Property includes office space, retail stores, shopping centres, hotels & resorts, sport facilities, restaurants, cafes and healthcare. Table 2.6 shows the Non-Residential New Construction (NRNC) in Malaysia.

Table 2.6: Non-Residential New Construction (NRNC) in Malaysia

| <b>Green Building Project</b>    | <b>Certification Date</b> | <b>GBI Rating</b> |
|----------------------------------|---------------------------|-------------------|
| University of Technology Sarawak | 20 October 2021           | Platinum          |
| Menara Hong Leong                | 7 June 2019               | Silver            |
| Somerset Hotel                   | 31 May 2019               | Certified         |
| MyTown Shopping Centre           | 22 March 2019             | Silver            |
| IKEA Cheras                      | 9 August 2018             | Gold              |
| Menara Worldwide                 | 26 April 2018             | Certified         |

Source: Green Building Index (2009)

Table 2.7 shows the Non-Residential Existing Building (NREB) in Malaysia.

Table 2.7: Non-Residential Existing Building (NREB) in Malaysia

| <b>Green Building Project</b> | <b>Certification Date</b> | <b>GBI Rating</b> |
|-------------------------------|---------------------------|-------------------|
| Petronas Twin Towers          | 21 June 2019              | Gold              |
| Menara 3 Petronas             | 17 June 2019              | Silver            |
| Cap Square Tower              | 15 March 2019             | Certified         |
| Menara SME Bank               | 25 March 2016             | Certified         |
| Bangunan Yayasan Melaka       | 7 October 2013            | Certified         |

Source: Green Building Index (2009)

### 2.3.3 Malaysian Industrial Property

According to Turner (2020), all land and buildings that accommodate industrial operations such as manufacturing, research, production, storage, warehousing, assembly, as well as distribution are referred to as the industrial property. It is supported by DiLallo (2021) that the industrial property is used to develop or produce goods and products, and also logistics real estates that facilitate product transit as well as storage. It is a vital properties where they are crucial to support the global economy. The industrial properties will serve as an essential venue for the manufacturing, producing, distributing and storing of goods and services that the global economy requires. Consequently, in order to keep the global economy to run smoothly, a well-located and high-quality industrial real estate is the key to it (DiLallo, 2021). The Malaysian Industrial Property includes heavy industrial buildings or manufacturing facilities, warehouses, Telecom centres, cold storage buildings, light manufacturing buildings, research and development set up and flex buildings. Table 2.8 shows the Industrial New Construction (INC) in Malaysia.

Table 2.8: Industrial New Construction (INC) in Malaysia

| <b>Green Building Project</b>                           | <b>Certification Date</b> | <b>GBI Rating</b> |
|---|---------------------------|-------------------|
| Lam Soon @ Cyber Valley                                 | 15 March 2019             | Certified         |
| Sandisk Storage Malaysia Sdn Bhd                        | 19 November 2018          | Certified         |
| The Hershey Company                                     | 14 November 2018          | Gold              |
| Bersatu Integrated Logistics New Warehouse (Port Klang) | 23 April 2018             | Certified         |
| Oldtown Manufacturing Plant                             | 16 December 2014          | Silver            |

Source: Green Building Index (2009)

Table 2.9 shows the Industrial Existing Building (IEB) in Malaysia.

Table 2.9: Industrial Existing Building (IEB) in Malaysia

| <b>Green Building Project</b>                             | <b>Certification Date</b> | <b>GBI Rating</b> |
|---|---------------------------|-------------------|
| Osram Opto Semiconductors (M)<br>Sdn Bhd                  | 13 June 2019              | Certified         |
| Sena Diecasting Industries Sdn Bhd                        | 19 December 2014          | Certified         |
| Pidscmy Geo Building (Panasonic<br>New Production Office) | 3 June 2013               | Certified         |

Source: Green Building Index (2009)

## 2.4 Practitioners

In order for the success of projects in the construction industry, professionals are required to be highly-qualified and trained to contribute within their specific knowledge and experience. This is because construction management is challenging and requires professionalism (Hussin & Omran, 2009). Construction in the modernised world today mostly involves the conversion of paper or computer-based designs into reality. To prepare these physical proceedings and combine them with other aspects, a formal design team may be gathered. Drawings and specifications are frequently included in the design which are developed by the design team which includes architects, surveyors, consultants, and engineers. They are usually responsible to deal with the technology, equipment and materials, cost, time and people when managing a construction project. The practitioners are required to arrange these resources into activities, carry out the activities in a logical order, and to accomplish projects within the schedule and budget constraints. Besides that, they are also accountable to oversee the construction process in order to meet clients' needs with legal, cost as well as environmental constraints (Hussin & Omran, 2009).

### **2.4.1 Architect**

According to Aziz (2006), “architect” (for that agreement means) refers to an architect that is named by the clients. Generally, an architect is required to plan, design and oversee the construction of a building by interpreting the users’ needs into the builders’ requirements in an understandable form (Anyanwu, 2013). Architects are professionals leading the process to create functional spaces, from a design and concept to a full actualization of the designs. It is essential that the building and operational codes are understood thoroughly by an architect. An architect is responsible to determine a budget and timeline. After that, a conceptual design is required to be produced for the approval or rejection of clients before a more comprehensive drawings are prepared. When an agreement between clients and consultants have reached, the architect will then begin with detailed design and contract drawings, schedules and specification to seek quotations (Anyanwu, 2013).

### **2.4.2 Contractors**

A contractor refers to any individual or organization employer that works for another individual or organization on a contract basis. Accordingly, there are three types of contractor. Firstly, a general contractor is in charge of overseeing a building project from start to finish. Moving on, subcontractor is a person who is only responsible for fulfilling a specific portion of a contract. Lastly, independent contractor is someone who is employed to conduct a specific task (Tobias, 2021). Contractors are in charge for an entire construction process and they must establish the most effective means to complete the project according to specifications. According to Tobias (2021), a contractor is in charge of designing, leading, performing, overseeing as well as inspecting a construction project in general.

### **2.4.3 Developers**

A construction developer is a person or company that is involved in the acquisition of property and the development of structures on that land (Fellows, n.d.). Construction developers can either be project owners of a development project or both the owner as well as the contractor. A developer, in any position, has particular responsibilities that must be stated out in the contract agreements (Schonrock et al., 2018). They are typically thought of in the construction business as someone who develops land through construction and so becomes the owner of the developed area. Developers are in charge of assessing the feasibility of a project, financing and project timing, assembling a team, as well as managing a project.

### **2.4.4 Engineers**

Jackson & Powell (1992) said that an “engineer” is a person who performs the same duty as what an architect in the engineering construction contract does. Engineers are responsible to contribute in the overall project design within their field of expertise. According to Anyanwu (2013), before deciding on the optimal design solution for a certain structure, engineers are required to carry out several analysis and calculations. After that, they must then generate drawings, specifications, schedules and other pertinent data for the overall project design, as well as assisting quantity surveyor. Other than that, engineers must also visit job sites to ensure that all general work are completed in accordance with the design drawings, specifications, schedules, and timelines (Hussin & Omran, 2009).

### **2.4.5 Property Consultants**

According to Flynn (2021), property consultants are experts that gives clients who wants to purchase or develop property specialised advice and recommendations. It is supported by Damewood (2018) that a property consultant’s main responsibility



is to give reliable advice to potential purchasers. To boost sales, he must promote properties in the best light possible, and provide financing advice tailored to each client's needs based on extensive research and industry expertise. To guide the clients with integrity and earn their trust, property consultant is required to have knowledge of local demographic and economic trends. Property consultants will first meet with clients to talk through primary and secondary objectives, then formulate a plan to achieve them in the most cost-effective way (Flynn, 2021).

#### **2.4.6 Quantity Surveyor**

Royal Institution of Surveyors Malaysia (2020) describes quantity surveyor as a construction expert who is competent and well-trained to provide advice on all aspects of construction costs, financial management as well as contractual administration. They are experts on the costs and administration of construction projects no matter they are building, civil or heavy engineering industries. Quantity surveyors will also help to assist the client and design team in determining if the proposed projects are feasible and offer good value for money by assisting them in assessing and comparing various possibilities as well as tracking variations to ensure that all costs will remain under control as the project advances.

### **2.5 Challenges faced by Practitioners in the Implementation of Green Building Concept**

According to the current climate in Malaysia, it is somewhat challenging to have more green buildings whether it is residential, commercial or industrial industry. This concept is rarely implemented in Malaysia because of the complicated involvement of numerous economic sectors as well as the development sequence formation from planning, designing, construction to project management and demolition (Deng et al., 2018). As a result, there is a knowledge gap in terms of the

understanding, analysis, as well as identification of true factors on why green building concept is rarely implemented in the Malaysian construction industry.

### **2.5.1 Lack of Professional Knowledge**

It is supported by Gundogan (2012), Yusof and Awang (2012), Goh et al., (2013), Masrom et al., (2017), Samari et al., (2013) and Shafii et al., (2006) that the lack of professional knowledge is identified as a challenge in implementing the green building concept. Despite the importance of green buildings, the awareness and knowledge level of green buildings among Malaysian construction industry is below average (Aliagha, 2013). The slow pace and hesitance to participate in green building concept is due to the lack of professional knowledge among construction professionals (Abidin & Powmya, 2014). According to Abidin (2009), the construction industry are still learning about the benefits of green building concept. Despite being introduced years ago in Malaysia, the development level of green building concept is still unsatisfactory. According to Abidin (2009), practitioners who are lack of knowledge will make the implementation of green building more difficult. The lack of knowledge will lead to significant risk and hence, influence the overall performance of the project. This is because green building concept is complex and confusing which requires professional knowledge in order for it to success. It was supported by Ha, Ismail and Khoo (2020) that without the professional knowledge and technical staff, stakeholders as well as the clients will lack confidence in the implementation of green building concept.

Furthermore, green building concept requires another extent of knowledge and expertise where in Malaysia, most practitioners are only expert in conventional constructions (Goh et al., 2013). Hence, it is hard for older practitioners to shift to green building concept since they have been implementing the conventional approach since ages ago (Bohari et al., 2016). At such, most employers have difficulty in finding professionals to implement the green building concept. According to Abidin et al., (2012), up until a decade ago, environmental concerns were not deemed important or given priority in education. Despite being exposed to

the green building concept as part of their higher education, insufficient real-world experience has made it difficult for them to put their theoretical knowledge of green building concept into reality. Since there is a lack of knowledge on the green building concept, it will lead to the delay and increase of project initial cost (Gundogan, 2012). Hence, this prevents them from learning green building concepts because they focus too much on handling the cost and quality of the project. Therefore, existing experienced practitioners are more likely to disregard the concept of green building by younger practitioners and hence, making green buildings adoption tougher (Abidin, 2009). Therefore, the lack of knowledge in green building concept is a critical issue that will influence the judgement to develop a green building and hence, become a barrier to implement green building concept.

### **2.5.2 Lack of Government Incentives**

Prior to studies, government is an essential key to advance the development of green building concept buildings by developing or adopting new technologies and practices. (Masrom et al., 2017; Samari et al., 2013; Shafii, Ali and Othman, 2006). According to Elforgani and Rahmat (2012), government is the most important stakeholder within the construction industry when it comes to the promoting of green buildings. At such, the challenge identified includes the lack of government incentives. Incentives are the main tools to promote green building concept. The lack of incentives will reduce the motivation of construction firms to implement green building concept because when they don't receive any incentives or support, they will not have enough capital as well as incentives and fund for the development of green buildings (Ha, Ismail & Khoo, 2020). This is because government incentives such as financial and non-financial incentives, regulations and policies helps in encouraging the implementation of green buildings (Qian & Chan (2010).

Government incentives can be direct which includes rebates in tax and green financing while indirect incentives include the sharing of knowledge, as well as training assistance (Ghodrati et al., 2012). For GBI certified buildings, it include the exemption of income tax, sales tax, investment tax allowance and stamp duties

(KeTHA, 2010). However, as stated by Samari et al., (2013), these current incentives provided are insufficient to motivate the construction industry to implement the green building concept. This is because these incentives provided are not enough to cover the high cost of developing green buildings and make it affordable for the construction industry. Since the government is not concerned with importance of green buildings, they do not provide enough of financial help or incentives. Hence, this discourages the practitioners in implementing the green building concept. Contrary, it will encourage them to implement the green building concept if there are more financial incentives provided (Tam, 2013). With more financial support provided to them, it lowers the risk of implementing the concept. Hence, since the incentives provided are not enough to cover the high cost of green buildings development, it does not encourage the practitioners to implement the green building concept since there is no motivation (Ha, Ismail & Khoo, 2020).

### **2.5.3 High Investment Cost**

High investment cost is one of the critical challenge in implementing the green building concept (Hwang & Tan, 2012; Liu, 2012; Gundogan, 2012; Balaban, 2013; Bohari et al., 2016; Lee et al., 2020; Ong et al., 2021). Besides that, the resistance in implementing the green building concept is due to high financial risk (Wilson & Tagaza, 2004). Typically, high initial cost is a barrier to implement the green building concept. This is because green buildings will have higher cost where green materials are more costly than materials needed to build conventional buildings (Hwang & Tan, 2012). Hence, this has become one of the factors behind the environmentally unfriendly building in executing the green building concept. Besides that, higher initial cost indicates the import of green materials and technologies, life cycle costing as well as computer energy modeling (Chan et al., 2014). The higher upfront cost is due to the latest and advanced designs, technologies as well as the construction methods. Not only that, the technical difficulty during the design and construction process will also increase the design and construction cost. It is supported by Wilson and Tagaza (2012) that the development of green buildings is 25% more costly than the development of

conventional buildings. Similar to Williams and Dair (2007), the cost of providing green buildings that aligns with the green rating system benchmark of Building Environment Assessment Methods (BEAM) is remarkably higher than for standard schemes. Not only that, Langston (2001) has stated that the cost of developing green buildings will increase depending on how “green” the building is developed.

Moving on, according to Wilson and Tagaza (2012), the high investment cost in green building concept will lead to high financial risk of investment and hence, they will be reluctant to implement the green building concept. Even though the higher initial cost may be offset in the long run by lower running expenses, developers are still hesitant to invest in green buildings because they feel that the purchasers will enjoy the operational savings rather than themselves (Wilson & Tagaza, 2006). It is supported by Abidin and Powmya (2014) that practitioners are not interested in the green building concept because they are concerned with the upfront costs. Since the development of green buildings will be a long-term return of profit, developers and even clients will be worried regarding their profitability (Ametepey et al., 2015). Practitioners will be more worried about their profits rather than the environment’s long-term sustainability because they don’t want to bear the high initial investment costs (Balaban 2013). Generally, practitioners focus on earning more profit by investing the slightest amount within the shorted period (Liu, 2012). Hence, this has become a barrier for practitioners to implement the green building concept.

#### **2.5.4 Lack of Public Awareness**

Accordingly, there are several researchers who claimed that the lack of public awareness on green building concept is one of the challenges faced in implementing green buildings (Zhang et al., 2021, Masrom et al., 2017, Hasan & Zhang, 2016, Othman et al., 2013, Goh et al., 2013, Samari et al., 2013, Zainul Abidin, 2009, Chan et al., 2014). Despite the fact that the green building concept was established in Malaysia many years ago, the development level has been unsatisfactory. According to Balaban (2013) and Palanisamy (2011), green buildings demand will be influenced indirectly by consumer’s awareness on the benefits of green building

concept (Sharif, Kamaruzzaman & Pitt, 2014). Therefore, it has led to be a lack in demand for green building from the community due to the lack of public awareness on the green building concept. Besides that, contractors are more likely to be profit-driven where they are more motivated by profit (Chan, Lee & Lee, 2014). Since the public is unaware on the green building concept, practitioners' desire to obtain knowledge about it will be restricted (Yusof & Awang, 2012). Therefore, they are hesitant to impose the green building concept (Ling, 2016). Samari et al., (2013) said that when the public do not demand for better products from the construction company, it discourages the green development.

### **2.5.5 Lack of Information and Database**

There is inadequate amount of information and database on the green building concept in Malaysia. It is supported by Balaban (2013), Samari et al. (2013) and Griffin et al. (2010) that the lack of information and database is a barrier to implement the green building concept. This is because buyers are in a scenario where they have insufficient amount of knowledge on the advantages and efficiency of green building's performance. Hence, this is one of the reasons to why buyers are unconcerned about the environmental benefits of green buildings (Ling, 2016). Griffin et al. (2010) mentioned that the buyer and practitioner's low understanding on green building concept is caused by the lack of information and database available. This will cause stakeholders to have no interest in conducting research since there is insufficient information to meet the strategic objectives of a project. Furthermore, investors will not be motivated to invest in green buildings too since they do not have enough information to identify the efficiency of a green building. Therefore, practitioners will not be motivated to implement the green building concept due to the low demand of green buildings (Griffin et al., 2010).

Abidin (2009) stated that green building concept is complex and confusing which requires professional knowledge in order for it to success where problems always occur throughout the design stage due to its complexity of the green building design and construction (Griffin et al., 2010). Guidelines are without doubt important to

guide practitioners whenever they face a problem. Without sufficient guidelines, practitioners will consider if they should implement the green building concept or not. It makes it hard for them as there is a lack of precedent to refer to whenever a problem occurs (Ha et al., 2020). Since there is a lack of information and database on the green building concept and environmental performance of green building, it makes it challenging for practitioners to execute it. When the amount of materials and equipment needed cannot be estimated, it will lead to wastage increment. With this, construction companies will need to bear the risk of implementing the green building concept due to the lack of information on knowledge and cost needed. When the green building concept is executed without sufficient amount of information and database, the final product will not perform well and hence, influence a company's reputation (Ha et al., 2020). Therefore, green building information and database is vital to promote the green building development.

#### **2.5.6 Lack of Demand**

The lack of demand in green buildings in Malaysia is continuously happening as it is still considered as freshly begin (Abidin et al., 2012). It is supported by Liu (2012), Yusof & Awang (2012) and Samari et al. (2013) that the lack of demand for green buildings is a barrier to implement the green building concept. Green building materials, elements and technologies are more expensive as compared to conventional homes. This is because due to non-acceptance of local construction materials, developers have difficulty in obtaining green materials in the local market (Goh et al., 2015). Green materials are demanded from foreign countries because it reflects a higher level of quality. However, the lack of rebate for the import of green materials has resulted in an increase of import cost. Hence, higher cost incurred to import green materials and technologies slows down the implementation of green building concept (Jamaludin, Mahayuddin & Hamid, 2018).

Moving on, higher priced materials will lead to an increase on the overall cost where consumers don't think that it's worth it. (Zainul Abidin et al., 2012). Generally, practitioners focus more on the public's demand and their affordability. According

to Ling (2016), the market continues to be dominated by the medium and low-cost buildings. This has discouraged the public from purchasing a green building (Yusof & Awang, 2012). At such, green buildings which are priced higher than conventional homes make it hard for practitioners to implement the green building concept. Besides that, the older generation buyers will refuse to learn new things and technologies since green buildings are more advanced as compared to the traditional method used to construct conventional homes. Zainul Abidin (2010) mentioned that the market demand exhibits a direct impact on developers' actions. When market demand is low, green buildings will not be constructed. Vice versa, when there is demand for green buildings, practitioners will be motivated to invest and participate in the development of green building (Ong et al., 2020). It is supported by Liu (2012) that a practitioner's motivation and determination to be involved in green building development is affected by the rate of demand.

### **2.5.7 High Final Price**

According to Hwang & Tan (2012) and Samari et al. (2012), high final price is one of the challenges faced by practitioners in the implementation of green building concept. Higher market valuation as well as the high cost of green materials, products, technologies and systems are the ones that contribute to the high final price (Samari et al., 2012). The green building concept is always related to high cost because of the import of green materials and technology (Chan, Lee & Lee, 2014). Most buyers will prefer to buy a house at a low and affordable price where they will think that green buildings are too expensive and do not worth the price. Besides that, several practitioners believe that green products are too costly and technically unpredictable since traditional sources are more known to them rather than green materials which are still fresh. It was stated by Hwang and Tan (2012) that if the cost of green material is higher, it will have a direct impact on the final cost. When compared to conventional buildings, the initial cost of constructing a green building will increase by 25 percent (Wilson & Tagaza, 2006). In terms of cost, green material costs 3 to 4 percent more than conventional building materials (Hwang & Tan, 2012). In short, in order to meet the requirements of green building concept,



the final price will increase due to the use new green technologies and systems. The complexity of green building concept will also increase the final price since it requires professional knowledge in order for it to success (Ha, Ismal & Khoo, 2020)

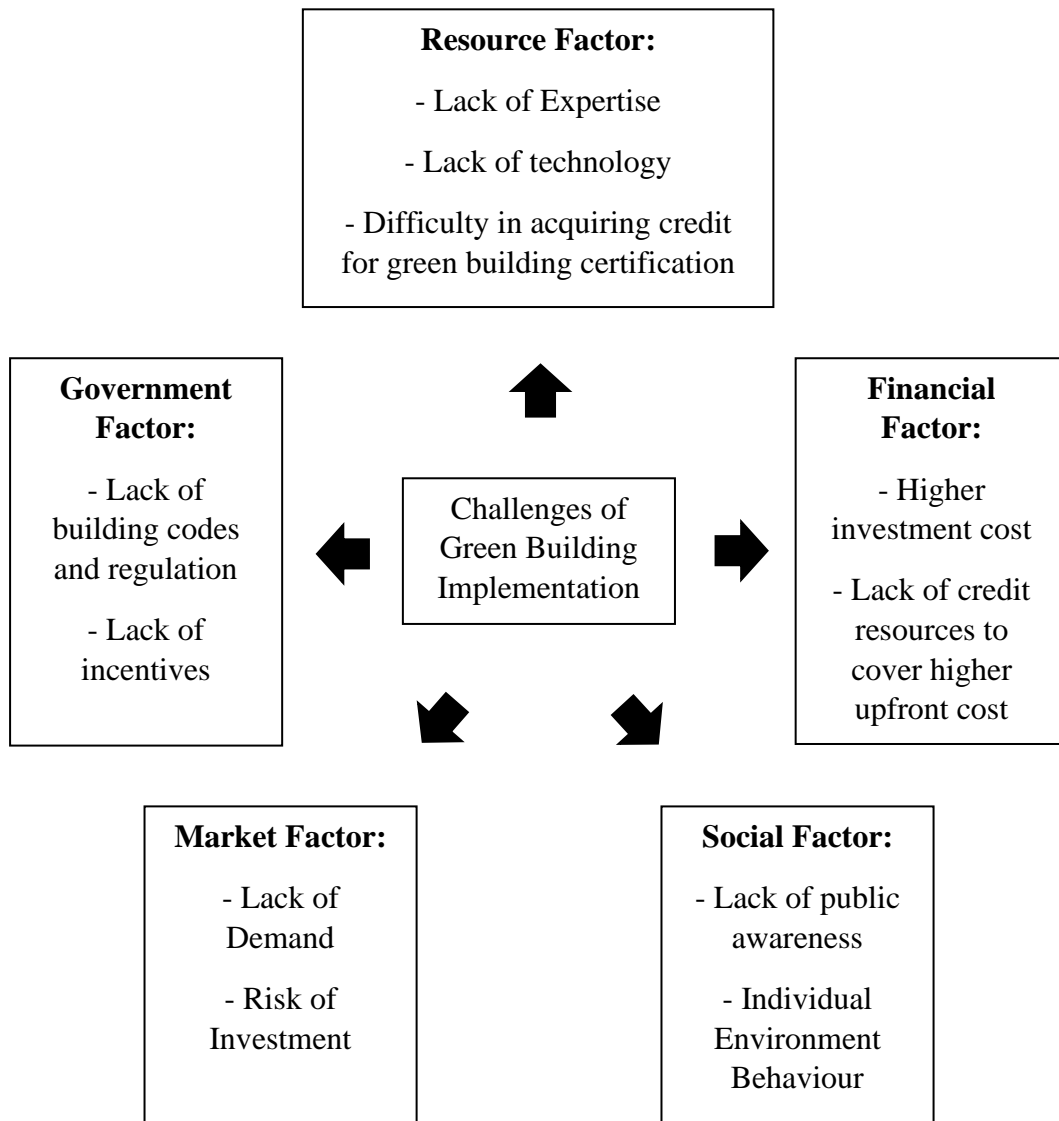
### **2.5.8 High Investment Risk**

According to Hwang & Tan (2012), investment risk is one of the challenges faced by practitioners in the implementation of green building concept. This is because green buildings typically cost higher where green materials are more costly than materials needed to build conventional buildings (Hwang & Tan, 2012). The higher upfront cost is due to the latest and advanced designs, technologies as well as the construction methods. It is supported by Wilson & Tagaza (2012) that the development of green buildings is 25% more costly than the development of conventional buildings. Hence, the high investment cost in green building concept will lead to high financial risk of investment (Wilson & Tagaza, 2012). Considering that green buildings development will yield a long-term profit, practitioners will be concerned about their profitability (Ametepey et al., 2015). Since practitioners will be worried about their profit, they will not implement the green building concept because they do not want to put up with the high initial investment costs (Balaban 2013). Not only that, Hwang & Tan (2012) mentioned that the complicated and various types of contract forms of project delivery will also lead to investment risk. In some contract forms, all details the green building concept must be provided. If they are not generated fully, difficulties may occur. Hence, any changes made to the design will result in various variations which will then increase the cost of project and hence, lead to a risk in investment (Samari et al., 2012).

## 2.6 Review of Relevant Theoretical Models

Theoretical models is the foundation to develop a proposed conceptual framework. It is a reference or mechanism explaining ideas that connects to existing knowledge. Figure 2.1 shows the challenges of green building implementation.

Figure 2.1: Challenges of Green Building Implementation

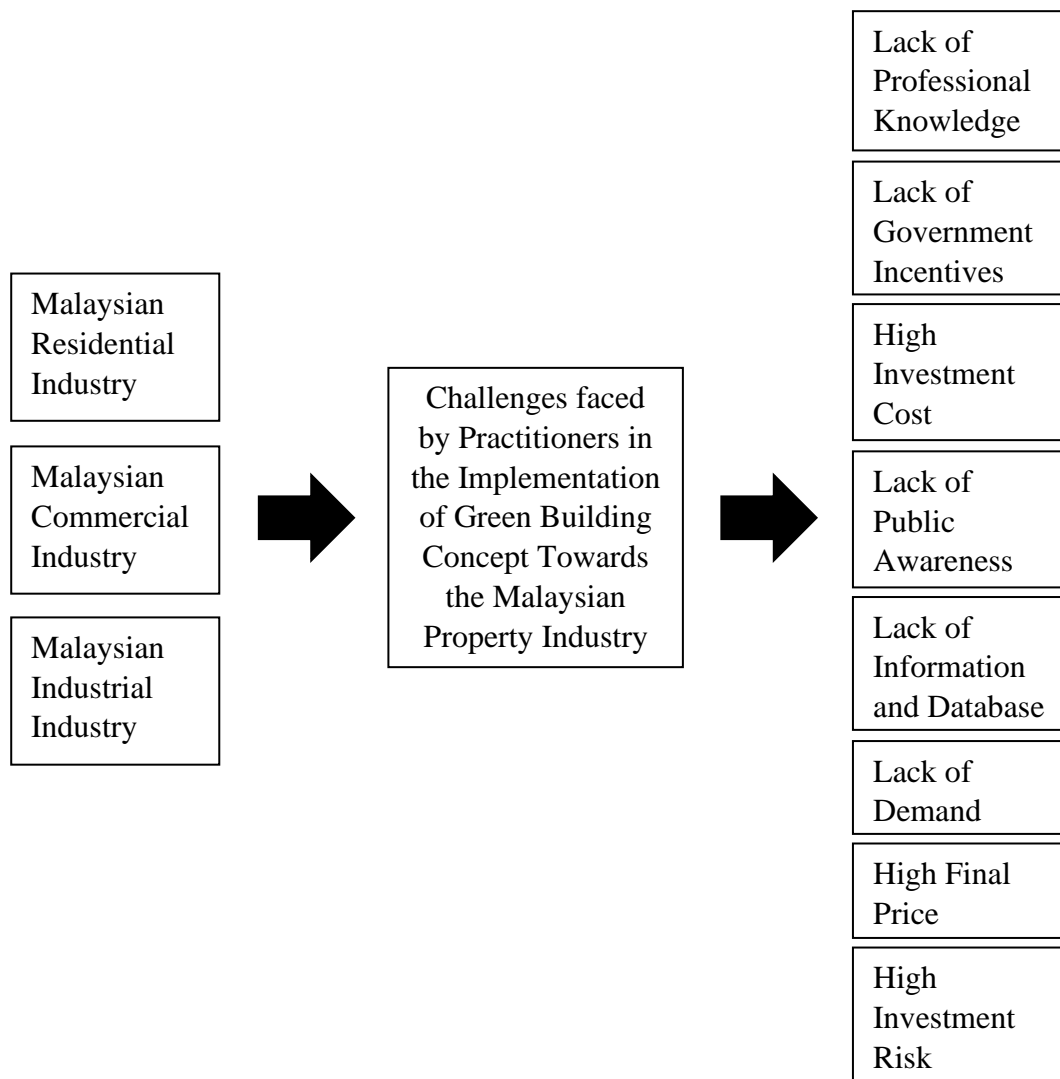


Source: Ong, Yusof & Osmadi (2021)

## 2.7 Proposed Conceptual Framework

A proposed conceptual framework is formed based on the research objectives and research questions. It provides a conceptual foundation to pursue the research project and the identification of the network of relationships among important variables in the problem situation. It helps to identify problems by setting a broad set of ideas and theories Figure 2.2 shows the proposed conceptual framework of the challenges faced by practitioners in the implementation of Green Building Concept towards the Malaysian Property Industry.

Figure 2.2: Challenges faced by Practitioners in the Implementation of Green Building Concept Towards the Malaysian Property Industry



Source: Researcher (2022)

## 2.8 Hypotheses Development

H<sub>0</sub> - The lack of professional knowledge is not the challenge faced by practitioners

H<sub>1</sub> - The lack of professional knowledge is the most challenge faced by practitioners

H<sub>0</sub> - The lack of government incentives is not the challenge faced by practitioners

H<sub>2</sub> - The lack of government incentives is the most challenge faced by practitioners

H<sub>0</sub> - High investment cost is not the challenge faced by practitioners

H<sub>3</sub> - High investment cost is the most challenge faced by practitioners

H<sub>0</sub> - The lack of public awareness is not the challenge faced by practitioners

H<sub>4</sub> - The lack of public awareness is the most challenge faced by practitioners

H<sub>0</sub> - The lack of information and database is not the challenge faced by practitioners

H<sub>5</sub> - The lack of information and database is the most challenge faced by practitioners

H<sub>0</sub> - The lack of demand is not the challenge faced by practitioners

H<sub>6</sub> - The lack of demand is the most challenge faced by practitioners

H<sub>0</sub> - High final price is not the challenge faced by practitioners

H<sub>7</sub> - High final price is the most challenge faced by practitioners

H<sub>0</sub> - High investment risk is not the challenge faced by practitioners

H<sub>8</sub> - High investment risk is the most challenge faced by practitioners

## **2.9 Conclusion**

In this chapter, the past studies on the challenges faced by practitioners in the implementation of Green Building Concept towards properties have been reviewed through journals, articles and Ebook through previous research. Hence, it allows the readers to understand the concept of research in this chapter. It consists of theoretical model and a proposed conceptual framework to allow better understanding. For the following Chapter 3, research methodology will be used to achieve the research objectives will be discussed in detail.

## **CHAPTER 3: RESEARCH METHODOLOGY**

### **3.0 Introduction**

After providing a review of the literature on the challenges faced by practitioners in implementing the Green Building Concept towards the type of properties in Malaysia, this chapter will describe the research methods on data collection and the discovery of the research problems. The various procedures include research design, data collection methods, sampling design, operational definitions of constructs, measurement scales and methods of data analysis. Thus, this chapter will present the methods used to obtain as well as analyse the data.

### **3.1 Research Design**

According to Zikmund (1988), research design is a master plan laying out the methods and procedures that gathers and evaluates the needed information. It is a set of parameters to collect and analyse data with the goal of balancing relevance to the research objective with economy and procedure (Selltiz et al., 1962). The validity of research design is driven by accurate and reliable results. Hence, suitable and correct technique will allow the conduct of an accurate research. There are four vital characteristics which defines a good research design. Firstly, neutrality where the projected results must be unbiased and remain neutral in which every observer will get to the same conclusion when visualizing a performance. When more observers agree on it, the observation and assessment of the responses will be more objective. Secondly, reliability is when researchers expect for similar results when conducting a market research. The research design must ensure that the standard of results are maintained with the help of research questions. Thirdly, validity where a valid argument will need to match up to the rules of correct reasoning. Lastly, generalisation where the results of the research design must be applicable to the entire population with similar accuracy level, but not just a small group.

### **3.1.1 Quantitative Research**

Quantitative research is a process of gathering and interpreting numerical data. It may be used to look for patterns and averages, projections, evaluate causal relationships, and generalize results to broader populations (Bhandari, 2020). Quantitative data collected can be used to conduct simple to highly sophisticated statistical analyses that aggregate the data, show the connection between the data, or differentiate among aggregated data. Quantitative research method gathers information from targeted persons by using sampling methods. The quantitative research comprises of methodologies such as questionnaires, polls, surveys, structured observations, experiment or by using computational approaches to manipulate pre-existing statistical data. Quantitative research design is used to obtain the results in this research. It aims to indicate the relationship between two variables using mathematical, computational and statistical methods.

### **3.2 Data Collection Methods**

Data collection is an essential element and one of the most important stages when conducting a research. Data collection is a systematic process of acquiring and measuring information on variables of interest in order to answer research questions, test hypotheses and evaluate outcomes (Kabir, 2018). The purpose of data collection is to acquire quality evidence that can be translated into rich data analysis and is used to construct a persuasive and credible response to the questions addressed. The most important objective of data collection is to collect information-rich and accurate data for statistical analysis so that the data-driven research choices may be made. Regardless of the study field or preference to define quantitative or qualitative data, accurate data collection is crucial to maintain the research integrity (Kabir, 2018). There are two categories of data collection methods where they are divided into primary data and secondary data.

### **3.2.1 Primary Data**

Primary data are data that has been collected from first-hand experiences or sources. They are data that have not been published yet and are more valid, reliable and objective. Since primary data have not been updated or manipulated by humans because they have not been around before, it has a higher level of validity than secondary data (Kabir, 2018). In general, primary data are collected through questionnaire, interview, experiments, survey or observation. Primary data are useful to be applied in the statistics to analyse and interpret the research questions because they are data collected specifically related to the research objectives.

The primary data used in this research is through the distribution of questionnaires. Questionnaires are a set of open-ended or closed-ended questions to which respondents will need to respond. They can be conducted through face-to-face, email, fax, telephone, or even post (Kabir, 2018). The responds of questionnaire are collected through email and social media for this research. It is the fastest and most efficient way to obtain large number of information from a large sample of people in a limited time frame. Since the questions are standardized, the data are easier to compile and can be replicated easily to check for reliability.

### **3.2.2 Secondary Data**

Secondary data are data gathered from sources that has been previously published in any form. The literature review in any research is based on secondary data. Secondary data are collected by someone for some other purpose and can be used by investigator for other purposes (Kabir, 2018). Secondary data analysis are leveraged by researchers in an attempt to answer new research questions or to investigate for alternate perspective on an original issue of prior studies. Not only that, secondary data can be served as a formative research which helps to assist in determining where further primary data is required to obtain precise information. It can also help support or confirm the findings of primary data.



There are various ways of collecting secondary data and it includes journals, newspapers, magazines, books, articles, published censuses or other statistical data. The secondary data used in this research are journals, articles as well as published censuses or other statistical data. Not only that, much information have been referred to through a reliable official website such as Green Building Index (GBI). The fact that most of the background work has already been carried out is an obvious advantage of the secondary data. Because of this abundance of background research, secondary data has a pre-determined level of validity and reliability that does not need to be re-examined by researchers who are re-using it (Kabir, 2018). They are readily available so that there will be no hassles of data collection. Therefore, secondary data has helped to justify the content of this research by analysing the challenges faced by practitioners in the adoption of green building concept.

### **3.3 Sampling Design**

Sampling design is the strategy and process to be followed in selecting a sample from the target population, as well as the estimate approach used to compute sample statistics. These statistics are the estimations applied to gather the population parameters (Kabir, 2018). It provides the best information to achieve the research aim (Ranjit, 2011). Sampling design includes target population, sampling frame and sampling location, sampling elements, sampling technique and sampling size.

#### **3.3.1 Target Population**

Target population is a group of individuals which analysts would like to gather data from with a particular component (Richardson et al., 1995). They are a certain group of the population with similar characteristics who are associated as the intended audience for a research. It is a part of the entire universe of people who have been chosen as the objective audience. According to Godwin (1998), it will be simpler to obtain acceptable referrals if the programme is more specific in identifying this

population. Since this research highlights on the Malaysian property industry, the targeted population will be practitioners in Malaysia. Their viewpoint on the challenges affecting the implementation of green building concept in Malaysia is significant and important in relation to the research objectives.

### **3.3.2 Sampling Frame and Sampling Location**

Sampling frame is the list of all people in the appropriate population (Stephanie, 2014). It is a complete list of everyone or everything a researcher wants to study. Besides that, sampling location is the actual location where an environmental sample is acquired. The selected practitioners in Malaysia for this research includes architect, contractor, developer, engineer, property consultant and quantity surveyor. Since the selected area in this research is Malaysia, citizens from the Klang Valley areas like Kuala Lumpur, and its adjoining cities and towns in the state of Selangor are the main targeted respondents for this research.

### **3.3.3 Sampling Elements**

This research targets 100 practitioners who are working as architect, contractor, developer, engineer, property consultant and quantity surveyor in Malaysia. The practitioners are required to be working in Klang Valley areas like Kuala Lumpur, and its adjoining cities and towns in the state of Selangor such as the district of Petaling, Klang, Gombak, Hulu Langat, Sepang and Kuala Langat. They are required to have basic knowledge on the green building concept based on their present and past experiences. Practitioners' responses will affect the results of the survey since they are more capable of identifying the challenges faced in the implementation of green building concept in Malaysia based on their experience.

### **3.3.4 Sampling Technique**

Sampling technique is the name or other identification of a certain process by which the entities of the sample were pick. According to Saunders et al., (2009), sampling technique provides a range of procedures that enable analysts to reduce the amount of information needed to be collected from a targeted population instead of from all conceivable components. The choice of sampling technique is affected by the research objectives, availability of financial resources, time constraint as well as the nature of the problem to be investigated (Kabir, 2018). There are two primary approaches of sampling techniques which are probability sampling and non-probability sampling (Shantikumar, 2018). Firstly, probability sampling which is also known as random sampling is when the sample is drawn in a way where each and every unit of the population will have an equal and favourable probability or being chosen. As a result, all eligible persons will have a chance of being picked for the sample and the investigation will be able to summarise the research's outcomes. A few probability sampling includes simple random sample, systematic random sample, stratified random sample and multistage sample (Kabir, 2018). Secondly, non-probability sampling refers to any sampling method in which certain members of the population have no chance of being selected or which the probability of selection cannot be determined precisely. It involves selecting elements based on assumptions about the population of interest, which serves as the selection criteria. It focuses mainly on small samples and is intended to investigate real life phenomenon rather than making statistical inferences with a broader population (Taherdoost, 2018). A few non-probability sample includes convenience sampling, quota sampling, judgement sampling as well as snowball sampling.

Convenience sampling chosen as the sampling technique in this research. Convenience sampling is a sort of sampling in which the first available primary data source is used without any additional condition for the research. It involves selecting a sample from the part of population which is close to hand. In the sense that a sample population is chosen for its availability and convenience. Hence, convenience sampling is easier to carry out data collection and calculation. The respondents are selected based on their availability and willingness to take part.

### **3.3.5 Sampling Size**

Sample size is referred to as the number of participants or observations involved in a research. According to Zamboni (2018), sample size evaluates the number of individual samples measured or observations used in a survey or experiment. This number is normally represented by “n”. Accordingly to Roscoe (1975), sample sizes that are larger than 30 and lesser than 500 are appropriate for most research (Sekaran, 2013; Hill, 2008; Memon, 2020; Tan, 2018; Isa, 2006; Jauhar, Ghani & Islam, 2016; Chen, 2009). Therefore, for this research, a total of 100 questionnaires will be distributed to respondents in Klang Valley areas due to the time and other resources constraints. Hence, the sample size for this research will be 100 respondents.

### **3.4 Research Instrument**

The distribution of questionnaire is used to collect data for this research. A questionnaire is a research tool that consists of a series of questions related to the research topic designed to gather data from respondents through survey or statistical study. It allows researchers to collect real time data and information from targeted respondents in a limited period of time. Questionnaire is chosen because it is fast, efficient, economical, has a wide coverage to connect with more people, easily understood by respondents, and it is flexible to collect large amounts of data. Besides that, questionnaires are widely known and are commonly used by researchers to collect data then use them to construct data for research purposes. It is a general tool that the public is familiar with. Hence, questionnaire is the most suitable way to collect accurate data from practitioners.

### 3.4.1 Questionnaire

The questionnaire consists of a cover page with a brief introduction which includes the researcher's name, the aim of the questionnaire and the questionnaire layout.

The questionnaire contains of two sections and the structure is as follow:

Section A: Demographic Profile

Section B: Challenges faced by practitioners in the implementation of green building concept towards the Malaysian property industry.

Section A is to collect the demographic information of respondents. There are a total of 8 questions and it includes gender, age, highest education level, profession, working experience, type of project your company mostly work on, and which type of property is more challenging to implement the green building concept. The last question is to determine the challenges faced by practitioners in the implementation of green building concept towards the Malaysian property industry.

Section B includes questions aimed to identify the main factors affecting the challenges faced by practitioners in implementing the green building concept towards the Malaysian property industry. It comprises of individual questions for each independent variables of the research. The 8 independent variables includes professional knowledge, government incentives, high investment cost, public awareness, database and information, market performance, high final price and investment risk. There are a total of 29 questions in Section B. Respondents are required to answer all the questions based on their opinion regarding the challenges faced by practitioners in the implementation of green building concept. The five-point Likert scale (i.e. 1= Strongly Disagree, 2= Disagree, 3= Slightly Agree, 4= Agree, 5= Strongly Agree) recommended by Losby and Wetmore (2012) is used in Section B to determine the respondents' agreement level on the variables. Table 3.1 shows the summary of questionnaire.

Table 3.1: Summary of Questionnaire

| <b>Section</b> | <b>Description</b>  |
|----------------|---|
| A              | Demographic Profile   |
| B              | Challenges faced by practitioners in the implementation of green building concept towards the Malaysian Property Industry |

Source: Researcher (2022)

### **3.4.2 Pilot Test**

In order to improve survey efficiency, pilot test should be conducted before the distribution of questionnaires. Pilot test is a method of testing a questionnaire using smaller sample size than the planned sample size before conducting the main study (wright, 2018). Pilot testing evaluates the whole questionnaire under survey conditions by identifying any issues needed to be addressed before implementing the full survey because it examines the validity of each questions (Abu Hassan et al., 2006). A pilot test helps to assess the accuracy of the instructions by determining if all respondents in the pilot sample can follow the guidelines exactly as written. Moreover, pilot test helps identify if there are any confusion where respondents have trouble understanding the questions and hence, improve the clarity of questions. Besides that, pilot test also provides further information on whether the survey type is effective in meeting the research objectives. The pilot test of questionnaire should be carried out under survey conditions. According to Isaac & Michael (1995) and Hill (1998), 10 to 30 participants are suggested for pilot testing in survey research. Besides that, Julious (2005) and Treece & Treece (1982) stated that a minimum of 12 participants should be considered for pilot testing. Hence, 20 sets of questionnaires are required to be distributed to respondents for pilot testing.

### **3.5 Constructs Measurement**

According to Nielsen (2014), construct measurement is to enhance management research and scholars by demonstrating that the measurements used accurately captures theoretical constructs and that the suggested construct match is theoretically and empirically sound. Measurement is the essence of empirical research which covers careful and meticulous observations of the real world. It relays a different kind of information about a theoretical concept. However, a measure must, at the very least, be capable of detecting the existence or absence of the theoretical construct (Watt & Berg, 2002). Hence, to improve management research, construct management is pivotal and must at the very least illustrate that measures used can plausibly capture theoretical constructs and theoretical as well as the empirical analysis levels for the proposed construct match (Lawrence, 1997). It is essential for researchers to understand the information in order to obtain measurements that are precise and consistent. It will prevent any confusion to define the collected data and perform with an accurate measurement in a research project. In this research, the scale of measurement used includes nominal, ordinal and interval scales. The measure scale used in Section A of the questionnaire includes nominal scale and original scale while Section B includes interval scale.

#### **3.5.1 Nominal Scale**

Nominal scale is the simplest type of scale which uses numbers and letters assigned to things as labels for identification or classification (Dalati, 2018). It comprises of the collection of data on a variable that may be divided into two or more mutually exclusive and collectively exhaustive groups (Cooper & Schindler, 2014). Nominal data cannot be quantified and assigned to any type of order. Nominal data includes respondent's gender, nationality, marital status and many other factors. Section A in the questionnaire includes a few nominal data such as gender, profession, type of properties in Malaysia and the challenges faced by practitioners. Figure 3.1 shows the example of nominal scale used in the questionnaire.

Figure 3.1: Example of Nominal Scale used in Questionnaire

Gender:  Male  
 Female

Source: Researcher (2022)

### 3.5.2 Ordinal Scale

Ordinal scale groups and allocate objects in an ordered relationship based on their degree (Dalati, 2018). Ordinal scale measures rank-ordered data without providing the degree of quality. It is the second level of measurement, reporting the data's ranking and ordering without determining the degree of variation between them (Bhat, 2019). In easier words, ordinal data is a categorical, statistical data type in which the variables are divided into natural, ordered categories without knowing the distances between them. Section A in the questionnaire includes a few ordinal data such as age, education level as well as working experience. Figure 3.2 shows the example of ordinal scale used in the questionnaire.

Figure 3.2: Example of Ordinal Scale used in Questionnaire

Highest Education Level:  Certificate  
 Diploma  
 Degree  
 Master  
 Doctorate Philosophy

Source: Researcher (2022)

### 3.5.3 Interval Scale

Interval scale refers to a numerical scale in which the variables' order as well as the difference between them are known. The equidistant distance between objects is the most distinguishing feature of interval scale (Dalati, 2018). It comprises a principle of fixed distance in which there is an equal distance between them (Zigmund, 2013).



It can be used to calculate variables existing at equal intervals along a common scale. The data collected from interval scale allows the conduct of a central tendency measures such as mode, mean, median, as well as standard deviation.

In this research, respondents are required to answer 8 independent variables questions with individual questions for each of them that affects the challenges faced by practitioners in implementing the green building concept towards the Malaysian property industry. There are a total of 29 questions in Section B to compute respondents' opinion regarding the challenges faced by practitioners in the adoption of green building concept towards the Malaysian property industry. The five-point Likert scale (i.e. 1= Strongly Disagree, 2= Disagree, 3= Slightly Agree, 4= Agree, 5= Strongly Agree) recommended by Losby and Wetmore (2012) is used in Section B to determine the respondents' agreement level on the variables. Table 3.2 shows the five-point Likert scale used in the questionnaire.

Table 3.2: Five-point Likert scale used in questionnaire

| <b>Numerical scale</b> | <b>Measurement</b> |
|------------------------|--------------------|
| 1                      | Strongly Disagree  |
| 2                      | Disagree           |
| 3                      | Slightly Agree     |
| 4                      | Agree              |
| 5                      | Strongly Agree     |

Source: Researcher (2022)

### **3.6 Data Processing**

Data processing is a set of operations or procedures conducted on data in order to validate, filter, convert, analyse, store, integrate as well as extract data in an appropriate output form to be used later (Duggal, 2021). Data processing converts raw data to obtain relevant, usable and meaningful information to be evaluated by computers which will be then used by employees throughout an organization (Rudo, 2013). It is usually conducted in a step-by-step approach. In order to ensure the

data's utility and integrity, processing methods must be rigorously recorded. Data processing increases productivity and data accuracy. There are a total of four stages in data process and it includes checking, editing, coding, as well as transcribing.

### **3.6.1 Data Checking**

Data checking is the process of verifying the accuracy and quality of data prior to import and process the data. It is the first step of data processing to determine whether the questionnaires are accepted or not. Questionnaires should not be accepted if it is incomplete, and answered by a person with inadequate knowledge (Jerry, 2016). This is to ensure that the data is complete and is consistent with the range of values expected. Besides that, data checking will help assure that the results obtained will be accurate and valid when performing analysis. Moreover, data checking can be used to find error-free data, erroneous, as well as invalid data.

### **3.6.2 Data Editing**

Data editing is a process of examining the acquired raw data to discover errors omissions and to rectify them if possible (Jerry, 2016). This process is done to ensure that the data is as accurate as possible, compatible with other information acquired, uniformly entered, as thorough as possible, and neatly organised to make coding and tabulation easier. There are different types of editing and it includes editing for quality, editing for tabulation, field editing as well as central editing.

### **3.6.3 Data Coding**

Data coding is a process of assigning numbers or other symbols to answers in order to categorise or classify them into a restricted number of groups or classes (Jerry, 2016). These classifications should be relevant to the research problem under

consideration. It categorises data relative to the research topic as well as the research design. Data coding is important for efficient analysis, and it allows for the reduction of several responses into a small number of classes that comprises of critical information needed for analysis. Not only that, coding of data brings out the important and essential meaning of data provided by respondents.

### **3.6.4 Data Transcribing**

According to Bailey (2008), data transcribing is the initial phase in data analysis and it requires close observation of data through repeated attentive listening or watching. This familiarity with data and attention to what is actually there rather than what is expected can aid in the development of realisations or ideas that emerge during analysis. Data transcribing involves the transfer of coded data from questionnaires directly into computers (Stuckey, 2016). However, if the data have been collected from computer-assisted telephone interviewing (CATI), computer-assisted personal interviewing (CAPI) or internet surveys, this step is not required because the data are entered directly into the computer as they are collected.

## **3.7 Data Analysis**

Data analysis is the process of gathering, modelling and analysing data to derive insights that supports decision-making. In this part, descriptive analysis, inferential analysis and reliability test will be discussed to achieve research objectives.

### **3.7.1 Scale Measurement (Reliability Test)**

Reliability test is required to be evaluated in order conduct a reliable research. It indicates the accuracy with which a method, approach or test measures something which shows how consistent a measure is (Middleton, 2019). According to Shreyas

(2013), a test constructor must examine the measure procedure's accuracy and precision, as well as the extent to which the test measures what it claims to measure. Reliability test is important for the research design, methods planning, and writing up of findings especially for a quantitative research. Since the consistency with which a method assess something is referred to as reliability, the measurement is deemed trustworthy if the same result can be attained regularly by using the same procedures under the same conditions (Middleton, 2019). There are a few measures of reliability and it includes Cronbach's Alpha, Pearson's Correlation, the Spearman Brown formula as well as Cohen's Kappa (Stephanie, 2016). The reliability test used in this research is Cronbach's Alpha which is most widely used.

Cronbach's Alpha is the most popular indicator of internal consistency. It was developed by Lee Cronbach back in 1951 for the measure of internal consistency of a test or scale (Tavakol & Dennick, 2011). In other words, it determines how reliable the responses of a questionnaire, an instrumentation, or a rating given by respondents are, indicating the stability of tools (Bujang, Omar & Baharum, 2018). Cronbach's Alpha is a measure of "internal consistency" reliability if the measurements represent multiple questionnaire, which is the most typical application (Bonett & Wright, 2014). Moving on, there is a linear relationship between the score and reliability coefficient in which the higher the score, the greater the reliability of the generated score. The degree of credibility produced by Cronbach's Alpha normally ranges between 0 and 1.00 where greater value indicates higher consistency (Wells & Wollack, 2003). The common notion that there is an acceptable threshold for alpha values, if only as a rule of thumb, was not necessarily interpreted as suggesting that lower alpha values indicate an unsatisfactory instrument (Taber, 2017). According to Pallant (2001), a Cronbach's Alpha value that is above 0.6 is considered to have high reliability and is considered to be an acceptable index. Whereas a Cronbach's Alpha value below 0.6 is considered low and poor. A Cronbach's Alpha that ranges between 0.6 to 0.8 is considered to be moderate, but is acceptable. Any Cronbach's Alpha value that ranges between 0.8 to 1.0 is considered very good (Nunnally & Bernstein, 1994). Generally, a score of around 0.6 to 0.7 is acceptable. Table 3.3 shows the acceptable Cronbach's Alpha values for checking internal consistency.

Table 3.3: Acceptable alpha values for checking internal consistency

| <b>Cronbach's alpha</b> | <b>Internal consistency</b> |
|-------------------------|-----------------------------|
| $a \geq 0.9$            | Excellent                   |
| $0.7 \geq a \geq 0.9$   | Good                        |
| $0.6 \geq a \geq 0.7$   | Acceptable                  |
| $0.5 \geq a \geq 0.6$   | Poor                        |

Source: Selwin, Selvan & Sivaraman (2017)

### **3.7.2 Content Analysis**

According to Holsti (1968), content analysis is a technique that makes inferences systematically and objectively by identifying special characteristics of texts. In simple words, it is a technique of analysing communicative messages that follows a specified process. It is a research tool that determines the presence of certain words or concepts that can be found from many research studies by studying documents and communication artefacts. Content analysis allows qualitative data that are non-numerical to be converted into quantitative data that are numerical. It is a technique that generates the finding and search of appropriate content to support a studies' point of view. Data will be collected systematically deriving from a set of texts (Luo, 2019). In the same way that survey data is presented, the results collected from content analysis may be presented in tables with frequencies or percentages.

### **3.7.3 Descriptive Analysis**

Descriptive analysis is the process of converting raw data into a format that is easier to understand and analyse by rearranging, ordering and manipulating data in order to generate descriptive information (Zikmund, 2003). It is an important step to conduct statistical analysis because it will be difficult to visualise what the data was indicating if the raw data is simply presented, especially if there is a lot of it. They simplify large amounts of data where each descriptive statistic will be reduced into

a simpler summary. Besides that, it offers an overview of how the data is distributed, assists in detecting outliers and mistakes, as well as allowing identifications of associations among variables. Hence, it prepares for the conduct of further statistical analysis. Descriptive analysis studies and understands the characteristics of a particular group of individuals. It is a phrase used to describe data analysis that helps to describe, present or summarise data in an understandable way. It was supported by Munro (2005) that “Descriptive statistics are the graphical techniques and numerical procedures that used to organize and describe the characteristics or factors of a given sample”. According to Loeb et al., (2017), this analysis stands alone as a research product, since the data pattern have not been recognised before.

### **3.7.3.1 Frequency Analysis**

Frequency analysis is a part of descriptive analysis where it is the study of the frequency of letter or groups of letters in a ciphertext. In simple words, the number of occurrences of each response chosen by the respondents will be displayed by using frequency analysis. This frequency analysis is important to examine the number of occurrences and study the measures of central tendency, dispersion, as well as percentiles. For this research, frequency analysis will be used to analyse the data collected for Section A of the questionnaire. A few variables that will be analysed includes gender, age, highest education level, profession, working experience as well as the type of project the respondent’s company mostly work on.

### **3.7.3.2 Mean**

Typically, two types of statistics used to describe data includes measures of spread as well as measures of central tendency like mean and standard deviation. For this research, mean will be used to analyse question 8 in Section A of the questionnaire which is “Below are the challenges of the adoption on green building concept towards property. Please number the answer below from 1 (being the most

challenging) to number 8 (being the least challenging). Mean is the average of a group of given numbers. Figure 3.3 shows the formula for calculating mean.

Figure 3.3: Formula to calculate Mean

$$\text{Mean} = \frac{\sum x}{n}$$

Where,  $\sum x$  = sum of all numbers in data  
 $n$  = number of terms

Source: Researcher (2022)

### **3.7.3.3 Relative Importance Index (RII)**

The Relative Importance Index (IRR) is the mean of a factor which gives it weight in the respondents' perceptions. It ranks the factor according to their relative importance. The IRR is calculated for each of the indicators and are ranked accordingly where it is derived to summarize the importance of each indicator. The importance of each factor is determined based on the higher the value the RII. It is simply an item's mean score, scaled to a value between 1/A and 1, where A refers to the number of response categories. Figure 3.4 shows the formula of RII.

Figure 3.4: Formula of Relative Importance Index (RII)

$$\text{Relative Importance Index (RII)} = \frac{\sum W}{A \times N}$$

Where,  $W$  = weight given to each factor by respondents  
 $A$  = highest weight  
 $N$  = total number of respondents

Source: Rajgor, Paresh, Dhruv, Chirag & Dhmesh (2016)

According to Ismail, Bujang, Jiram, Zarin and Jaafer (2015), the decision rule for the relative importance index is that any range of index above 0.840 that falls within the very significant and extremely significant scale is considered to contribute significantly to variance in rateable values. The relative importance index that

ranges between 0.632 to 0.701 is considered to be not at all significant which is ruled to be rejected. Next, the range of index between 0.702 to 0.771 is considered to be slightly significant which is ruled to be rejected. Moving on, the range of index between 0.772 to 0.840 is considered to be somewhat significant which is also ruled to be rejected. Besides that, the range of index between 0.841 to 0.910 is considered to be very significant and the range of index between 0.911 to 0.979 is considered to be extremely significant where both of these ranges are ruled to be accepted. Table 3.4 shows the Relative importance index decision rule.

Table 3.4: Relative Importance Index decision rule

| <b>Scale of Index</b>         | <b>Range of Index</b> | <b>Decision Rule</b> |
|-------------------------------|-----------------------|----------------------|
| <b>Not at all Significant</b> | 0.632 to 0.701        | Reject               |
| <b>Slightly Significant</b>   | 0.702 to 0.771        | Reject               |
| <b>Somewhat Significant</b>   | 0.772 to 0.840        | Reject               |
| <b>Very Significant</b>       | 0.841 to 0.910        | Accept               |
| <b>Extremely Significant</b>  | 0.911 to 0.979        | Accept               |

Source: Field Study (2016)

### **3.8 Conclusion**

In this chapter, research methodologies such as research design, data collection methods, sampling design, research instrument, constructs measurement, data processing as well as data analysis have been discussed. All relevant information on this research has been identified, selected, processed and analysed. A total of 20 sets of questionnaire will be distributed for pilot testing and a total of 100 sets of questionnaire will be later distributed to the targeted respondents in Klang Valley areas. In the following Chapter 4 of Data Analysis, the results and analyses of the results which are relevant to the research questions and hypotheses will be presented.



## CHAPTER 4: DATA ANALYSIS

### 4.0 Introduction

Chapter 3 has discussed on the research design which includes data collection methods, sampling design, research instrument, constructs measurement, and approaches which Chapter 4 will focus on the data analysis. There are 20 sets of questionnaire that have been distributed to architects, contractors, developers, engineers, property consultants and quantity surveyors in Klang Valley areas for pilot test and 100 sets of questionnaire that were conveyed to the targeted respondents who are practitioners working in Klang Valley. All data collected were analysed by using Statistical Package for the Social Sciences (SPSS) Software. The results were further discusses with figures, tables and charts.

### 4.1 Scale Measurement

In this research, the Cronbach's Alpha test is used to measure the reliability and consistency of the 20 sets of questionnaire for pilot testing before distributing them to the targeted respondents of this research by looking at the coefficient value

#### 4.1.1 Reliability Test

The Cronbach's Alpha for pilot test is used to measure the consistency and reliability of the data collected in this research by viewing the coefficient value.

Table 4.1: Cronbach's Alpha Case Processing Summary

|       |       | N  | %     |
|-------|-------|----|-------|
| Cases | Valid | 20 | 100.0 |
|       | Total | 20 | 100.0 |

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

Table 4.2: Summary of Reliability Statistic for the Challenges faced by  
Practitioners in the Implementation of Green Building Concept

| Challenges                  | Cronbach's Alpha | N of Items |
|-----------------------------|------------------|------------|
| A: Professional Knowledge   | .609             | 5          |
| B: Government Incentives    | .621             | 3          |
| C: High Investment Cost     | .862             | 5          |
| D: Public Awareness         | .666             | 3          |
| E: Information and Database | .838             | 4          |
| F: Market Performance       | .771             | 3          |
| G: High Final Price         | .625             | 3          |
| H: High Investment Risk     | .739             | 3          |

Source: Researcher (2022)

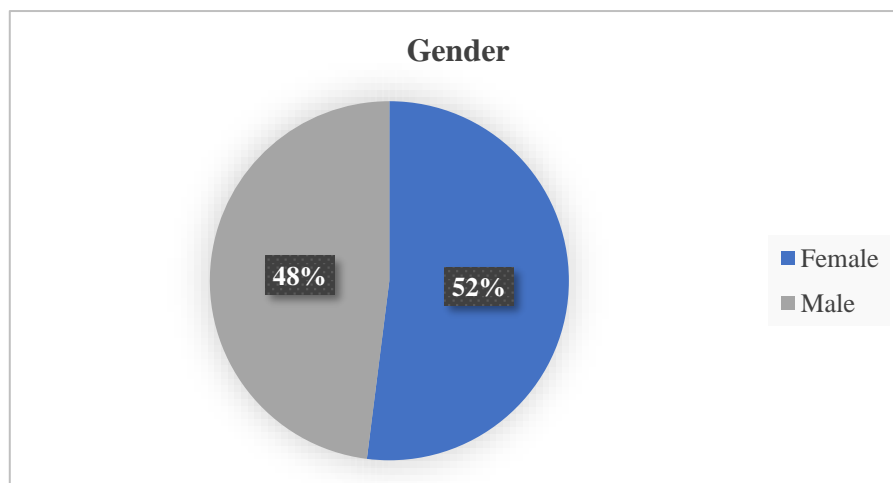
According to Table 4.2 Summary of Reliability Statistic for the Challenges faced by Practitioners in the Implementation of Green Building Concept above, “N” indicates the number of items for each variables. The tables shows the Cronbach’s Alpha for the professional knowledge is 0.609 with 5 items. Secondly, the result of Cronbach’s Alpha for government incentives is 0.621 with 3 items. Thirdly, the result of Cronbach’s Alpha of high investment cost is 0.862 with 5 items. Fourthly, the result of Cronbach’s Alpha of public awareness is 0.666 with 3 items. Fifthly, the result of Cronbach’s Alpha of database and information is 0.838 with 4 items. Sixthly, the result of Cronbach’s Alpha of market performance is 0.771 with 3 items. Seventhly, the result of Cronbach’s Alpha of high final price is 0.625 with 3 items. Lastly, the result of Cronbach’s Alpha of investment risk is 0.739 with 3 items. According to the Rule of Thumb, the Cronbach’s Alpha for professional knowledge, government incentives, public awareness and high final price have a value above 0.6 which is considered acceptable. Besides that, the Cronbach’s Alpha for market performance and investment risk is between 0.6 to 0.8 which is considered good and moderate. Lastly, Cronbach’s Alpha for the high investment cost as well as the database and information is above 0.8 which is considered very good. Based on the table and discussion, it shows that the values are all within the acceptable range. This can be supported by Selwin, Selvan and Sivaraman, (2017).

## 4.2 Respondent Demographic Profile

Respondent demographic profile refers to the age, gender, race, ethnicity, income, employment and other related information. Demographic is the characteristics of a population. They can be easily collected by conducting a survey to allow researchers to analyse the respondent's data. There are a total of 6 demographic characteristics collected in this research which included gender, age, highest education level, profession, working experience and the type of project mostly worked on by respondents. The targeted respondents in this survey are practitioners working in Klang Valley areas and it includes architect, contractor, developer, engineer, property consultant and quantity surveyor. The demographic characteristics will be analysed by using the frequency analysis by generating frequency tables and charts.

### 4.2.1 Gender

Figure 4.1: Gender

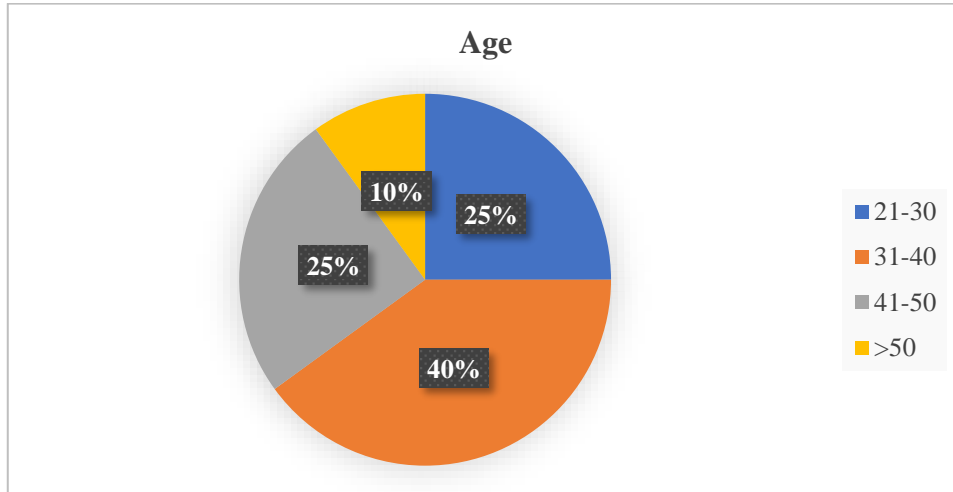


Source: Researcher (2022)

According to Figure 4.1 , it shows the frequency analysis of the respondents' gender. 52% of the respondents are female while 48% of them are male.

### 4.2.2 Age

Figure 4.2: Age

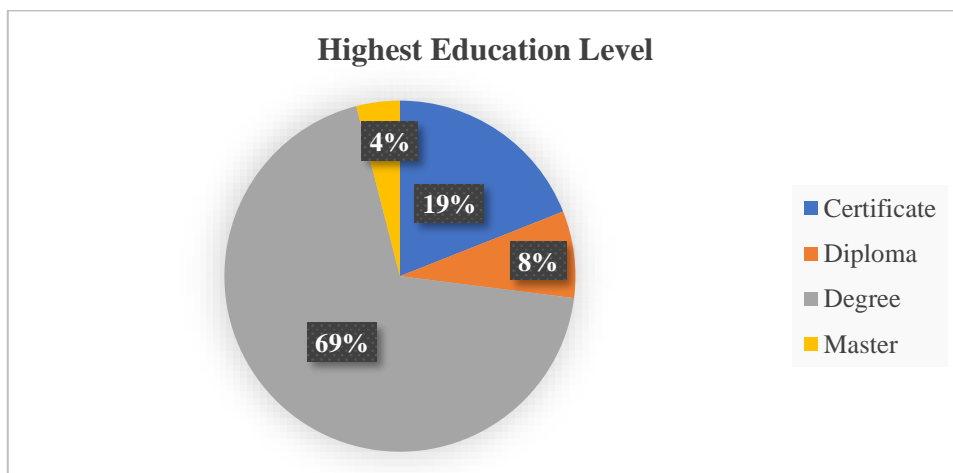


Source: Researcher (2022)

According to Figure 4.2, it shows the frequency analysis of the respondents' age. 40% of the respondents are aged between 31 to 40, 25% of the respondents are aged between 21 to 30, another 25% of the respondents are aged between 41 to 50 and only 10% of the respondents are aged above 50 years old.

### 4.2.3 Highest Education Level

Figure 4.3: Highest Education Level

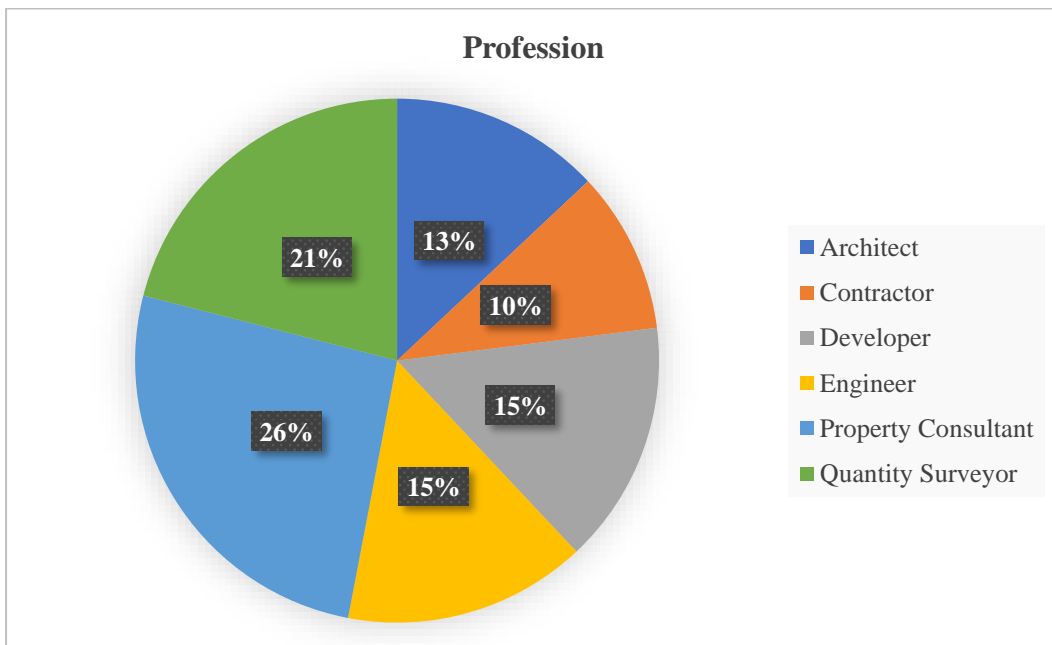


Source: Researcher (2022)

According to Figure 4.3, it shows the frequency analysis of the highest education level of respondents. At 69%, more than half of the respondents have completed their degree studies. Next, 19% of them have completed their certificates. Moving on, 8% of the respondents have completed their diploma and only 4% of them have completed their master. According to the responses collected, none of the respondents have completed doctorate philosophy.

#### 4.2.4 Profession

Figure 4.4: Profession

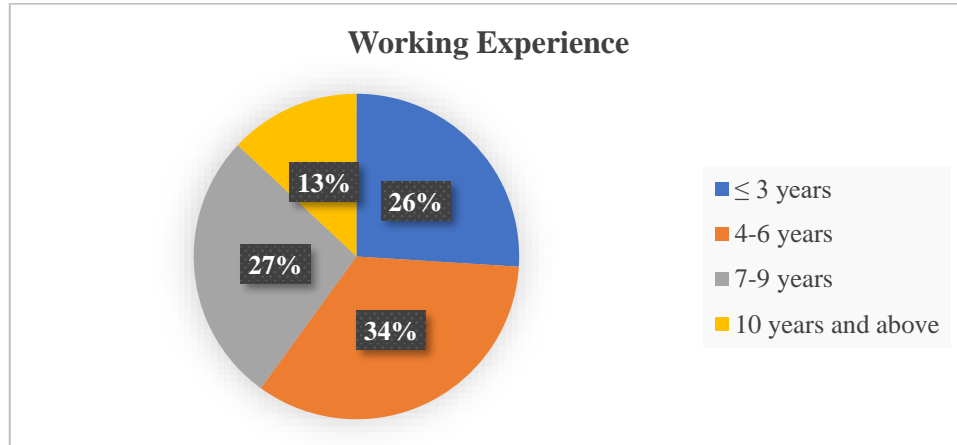


Source: Researcher (2022)

According to Figure 4.4, it shows the frequency analysis of the respondents' profession. The profession recorded as the highest is property consultant at 26%. Moving on, quantity surveyor is the second highest with 21%. Next, developer and engineer are tied as the third highest with 15%. Architect is recorded at 13% and lastly, contractor who only contributes 10% to this survey.

#### 4.2.5 Working Experience

Figure 4.5: Working Experience

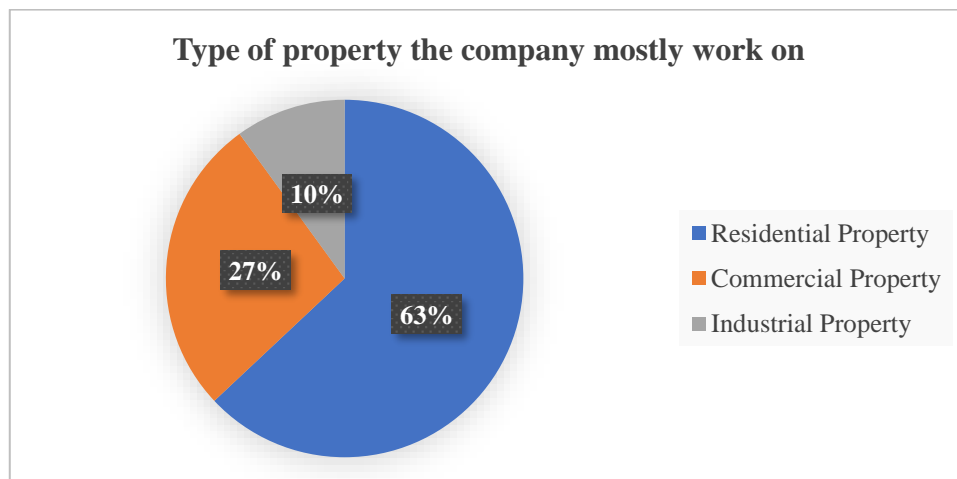


Source: Researcher (2022)

According to Figure 4.5, it shows the frequency analysis of the respondents' working experience. Most of the respondents have worked 4 to 6 years and was recorded at 34%. Next, 27% of the respondents have worked around 7 to 9 years. Moving on, 26% of them have worked for 3 years and below. Lastly, only 13% of the respondents have worked 10 years and above as their profession.

#### 4.2.6 Type of property the company mostly work on

Figure 4.6: Type of property the company mostly work on



Source: Researcher (2022)

According to Figure 4.6, it shows the frequency analysis of the type of property that the respondents' company mostly work on. A majority of 63% mostly work on residential properties. Moving on, 27% of the respondents' company mostly work on commercial properties. Lastly, only 10% of the respondents' company mostly work on industrial properties.

### 4.3 Analysis for Objective 1

According to the research overview in Chapter 1, the first objective in this research is to determine the challenges faced by the practitioners in the implementation of green building concept in Malaysia. Hence for the analysis of objective 1, content analysis and descriptive analysis have been conducted.

#### 4.3.1 Content Analysis

Content analysis is a technique of generating the finding and search of relevant content to validate a study's point of view. Hence, content analysis have been used to determine the challenges faced by the practitioners in the implementation of green building concept. Table 4.3 shows the result for Objective 1.

Table 4.3: Result for Objective 1

| <b>Challenges</b>              | <b>Authors</b>  |
|--------------------------------|---|
| Lack of professional knowledge | Abidin (2009); Abidin and Powmya (2014); AdomBent et al. (2019); Aliagha (2013); Goh, Goh and Seow (2013); Gundogan (2012); Ha, Ismail and Khoo (2020); Masrom et al. (2017); Samari et al. (2013); Shafii, Ali and Othman (2006); Yusuf and Awang (2012) |
| Lack of government incentives  | Elforgani and Rahmat (2012); Ghodrati et al. (2012); Ha, Ismail and Khoo (2020); Masrom et al. (2017); Samari et  |

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|                                  |  |
|----------------------------------|--|
|                                  | al. (2013); Shafii, Ali and Othman (2006); Tam (2013); Qian and Chan (2010)  |
| High investment cost             | Abidin and Powmya (2014); Ametepey et al. (2015); Balaban (2013); Bohari et al. (2016); Chan et al. (2014); Gundogan (2012); Hwang and Tan (2012); Langston (2001); Lee et al. (2020); Liu (2012); Masrom et al. (2017); Ong et al. (2021); Williams and Dair (2007); Wilson and Tagaza (2012) |
| Lack of public awareness         | Abidin (2009); Balaban (2013); Chan, Lee and Lee (2014); Goh et al. (2013); Hasan and Zhang (2016); Ling (2016); Masrom et al. (2017); Othman et al. (2013); Palanisamy (2011); Samari et al. (2013); Sharif, Kamaruzzaman and Pitt (2014); Yusof and Awang (2012); Zhang et al. (2021)        |
| Lack of information and database | Abidin (2009); Balaban (2013); Griffin et al. (2010); Ha et al. (2020); Ling (2016); Samari et al. (2013)  |
| Lack of demand                   | Abidin (2010); Abidin et al. (2012); Goh et al. (2015); Jamaludin, Mahayuddin and Hamid (2018); Ling (2016); Liu (2012); Ong et al. (2020); Samari et al. (2013); Yusof and Awang (2012)   |
| High final price                 | Chan, Lee and Lee (2014); Ha, Ismail and Khoo (2020); Hwang and Tan (2012); Wilson and Tagaza (2006); Samari et al. (2012)   |
| High investment risk             | Ametepey et al. (2015); Balaban (2013); Hwang and Tan (2012); Samari et al. (2012); Wilson and Tagaza (2012)   |

Source: Researcher (2022)

The result shows that there are a few challenges faced by practitioners in the implementation of green building concept in their constructions.



#### **4.3.1.1 Lack of professional knowledge**

According to Abidin (2009), practitioners with the lack of knowledge on green building concept will make it harder to implement the green building concept. It was supported by Abidin and Powmya (2014) and Aliagha et al. (2013) that the awareness and knowledge level on green buildings among the Malaysian construction industry is below average. Therefore, Adomßent et al. (2019), Goh et al., (2013), Gundogan (2012), Masrom et al., (2017), Samari et al., (2013) and Shafii et al., (2006), and Yusof and Awang (2012) stated that the lack of professional knowledge is identified as a challenge in implementing the green building concept. Referring to Ha, Ismail and Khoo (2020), without professional knowledge, stakeholders and clients will lack confidence in green buildings because it will lead to the delay and increase of initial cost (Gundogan, 2012).

#### **4.3.1.2 Lack of government incentives**

According to Ali and Othman (2006), Masrom et al. (2017) and Samari et al. (2013), government is crucial for the expansion of green building concept. Government stakeholders contribute to the promotion of green buildings (Elforгани & Rahmat, 2012; Tam, 2013). This is because incentives from the government will help to support by providing financial and non-financial incentives, regulations and policies for green building developments (Ha, Ismail & Kho, 2020; Qian & Chan, 2010). However, it was stated by Samari et al. (2013) that the current incentives provided by the government is not sufficient to enhance the motivation of construction industries to implement the green building concept.

#### **4.3.1.3 High Investment Cost**

Supported by Balaban (2013), Bohari et al. (2016), Gundogan (2012), Hwang and Tan (2012), Lee et al. (2020), Liu (2012), Masrom et al. (2017) and Ong et al. (2021), high investment cost is one of the major barrier to adopt the green building concept.

It will lead to high financial risk upfront costs because green materials are more costly due to high import costs (Hwang & Tan, 2012; Powmya & Abiding (2014); Wilson & Tagaza, 2004). According to Wilson and Tagaza (2012) and Langston (2001), green buildings will cost 25% more than conventional building depending on how “green” it is developed. Lastly, since green buildings development is a long-term return of profit, the construction industries are reluctant to participate in it to not bear the high investment cost (Ametepey at al., 2015; Balaban, 2013).

#### **4.3.1.4 Lack of Public Awareness**

According to Abidin (2009), Chan et al. (2014), Goh et al. (2013), Hasan and Zhang (2016), Masrom et al. (2017), Othman et al. (2013), Samari et al. (2013), and Zhang et al. (2021), lack of public awareness contributes to the challenge to implement the green building concept. This is because Balaban (2013) and Palanisamy (2011) stated that the demand of green buildings is influenced directly by the consumer’s awareness on the green building concept benefits and hence, this will demotivate practitioners to obtain more knowledge (Yusof & Awang, 2012).

#### **4.3.1.5 Lack of Information and Database**

It was supported by Balaban (2013), Samari et al. (2013) and Griffin et al. (2010) that the lack of information and database is an obstacle to implement the green building concept. This is caused by the low understanding on green building concept by buyers and practitioners. Abiding (2009) stated that since the green building concept is confusing and complex, it requires professional knowledge where guidelines are very important whenever a problem arises (Griffin et al., 2010). Without sufficient information and database, the final product will not be successful since there is a lack of precedent to refer to when problems occur (Ha et al., 2020).

#### **4.3.1.6 Lack of Demand**

According to Abidin et al. (2012), the lack of demand for green buildings is continuously happening where it was supported by Liu (2012), Ong et al. (2020), Samari et al. (2013) and Yusuf and Awang (2012) that it is a barrier to the green building concept. This is because local construction materials are not accepted (Goh et al., 2015) and it leads to higher cost of import for green materials and technologies (Jamaludin, Mahayuddin & Hamid, 2018). Abidin et al. (2012) also stated that consumers think that green buildings are not worth for the high price which has led to be discouragement to purchase a green building (Yusof & Awang, 2012).

#### **4.3.1.7 High Final Price**

According to Hwang and Tan (2012) and Samari et al. (2012), high final price is a barrier to implement the green building concept. This is due to the higher market valuation as well as the import of high green materials, products and technologies (Chan, Lee & Lee, 2014; Samari et al., 2012). It was proved by Hwang and Tan (2012) that green materials cost 3 to 4 percent more than conventional building materials and hence, it will increase the cost of constructing a green building to increase by 25 percent (Wilson & Tagaza, 2006). Lastly, since green building concept is complex and requires professional knowledge to effectuate it, it will lead to the increase of final price (Ha, Ismail & Khoo, 2020).

#### **4.3.1.8 High Investment Risk**

According to Hwang and Tan (2012), high investment risk is the barrier to implement the green building concept due to the higher cost of materials. Since green buildings require higher investment costs, it will lead to higher investment risk because it is a long-term profit and practitioners will be more concerned about their profitability Ametepey et al., 2015; Balaban, 2013; Wilson & Tagaza, 2012). Hwang and Tan (2012) mentioned that the various types of contract forms of project

delivery will also lead to the risk of investment. Lastly, the complexity of green building concept will increase the cost of project whenever a design requires to be changed and hence, lead to a risk in investment (Samari et al., 2012).

To support the content analysis on the lack of professional knowledge, the lack of government incentives, high investment cost, the lack of public awareness, the lack of information and database, the lack of demand, high final price and high investment risk of the green building concept, descriptive analysis will be presented.

### 4.3.2 Descriptive Analysis

This analysis will be used to support the result in content analysis. To support, mean has been used. Mean is a measure of central tendency which calculates the average value in a number collections. It is used to get an overall picture of the data set collected. Table 4 shows the descriptive analysis for the challenges faced by practitioners in the implementation of green building concept in Malaysia.

Table 4.4: Descriptive Analysis for the Challenges Faced by Practitioners in the Implementation of Green Building Concept in Malaysia

| <b>Challenges</b>                | <b>Mean</b> | <b>Rank</b> |
|----------------------------------|-------------|-------------|
| High Investment Cost             | 3.62        | 1           |
| High Investment Risk             | 3.67        | 2           |
| High Final Price                 | 4.07        | 3           |
| Lack of Professional Knowledge   | 4.10        | 4           |
| Lack of Government Incentives    | 4.54        | 5           |
| Lack of Public Awareness         | 4.88        | 6           |
| Market Performance               | 5.22        | 7           |
| Lack of Information and Database | 5.90        | 8           |

Source: Researcher (2022)

Table 4.4 shows the summary of the average mean score and standard deviation for the challenges faced by practitioners in the implementation of green building concept. The N indicates how many responses are valid with correct answers. Therefore, only 92 out of the 100 responses collected are valid. According to the questionnaire, respondents are required to number the challenges from 1 to 8 where 1 indicates the most challenging and 8 indicates the least challenging. Since 1 indicates “most challenging”, when the mean calculated is small, it indicates that the variable is more challenging because more respondents have chosen it as the more challenging variable. Vice versa, a bigger mean indicates that the variable is less challenging. Hence, the lower the mean, the more challenging it is.

Table 4.4 show the summary of Average Mean score for the challenges. The mean score for each variables range from 3.62 to 5.90. Accordingly, “high investment cost” is ranked first as the most challenging variable with a mean of 3.62. Next, “high investment risk” is ranked second with a mean of 3.67. Moving on, “high final price” is ranked third with a mean of 4.07. In addition, the “lack of professional knowledge” is ranked fourth with a mean of 4.10. Furthermore, the “lack of government incentives” is ranked fifth with a mean of 4.54. Moreover, the “lack of public awareness” is ranked sixth with a mean of 4.88. Besides, the “market performance is ranked seventh with a mean of 5.22. Lastly, the “lack of information and database” is ranked eight as the least challenging with a mean of 5.90.

#### **4.4 Analysis for Objective 2**

According to the research overview in Chapter 1, the second objective in this research is to identify the hardest challenge faced by practitioners in the implementation of Green Building Concept in Malaysia. Hence for the analysis of objective 2, Relative Importance Index (RII) have been conducted.

#### 4.4.1 Relative Importance Index (RII)

Table 4.5 shows the Relative Importance Index for the challenges faced by practitioners in the implementation of green building concept.

Table 4.5: Relative Importance Index for the challenges faced by practitioners in the implementation of green building concept.

| Statement                        | Question   | RII   | Overall RII by Category | Overall Rank by Category |
|----------------------------------|--|-------|-------------------------|--------------------------|
| <b>A. Professional Knowledge</b> |  |       |                         |                          |
| PK1                              | Lack of professional knowledge will delay and increase the initial cost of the project.                            | 0.914 | 0.908                   | 1                        |
| PK2                              | Lack of professional knowledge on the green building concept will lead to unforeseen risks.                        | 0.912 |                         |                          |
| PK3                              | Expertise on green building concept is very important.   | 0.912 |                         |                          |
| PK4                              | Limited knowledge makes it hard to reach an agreement between experienced practitioners and younger practitioners. | 0.878 |                         |                          |
| PK5                              | 5. It is important that practitioners are required to have proper and adequate skills.                             | 0.922 |                         |                          |
| <b>B. Government Incentives</b>  |  |       |                         |                          |
| GI1                              | Government incentives will increase the motivation of construction firms to implement the green building concept.  | 0.88  | 0.874                   | 4                        |
| GI2                              | Government incentives from the government provides financial advantage for practitioners.                          | 0.874 |                         |                          |
| GI3                              | Limited incentives from the government slows down the development of green buildings.                              | 0.868 |                         |                          |

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| <b>C. High Investment Cost</b>     |  |       |       |   |
|------------------------------------|--|-------|-------|---|
| HIC1                               | 1. Green buildings require higher initial cost.  | 0.888 | 0.866 | 5 |
| HIC2                               | 2. Green materials are more costly.  | 0.884 |       |   |
| HIC3                               | 3. It requires more time to adopt to the new technology.   | 0.854 |       |   |
| HIC4                               | 4. Lack of credit resources to cover upfront cost will decrease the interest of construction firms.      | 0.868 |       |   |
| HIC5                               | 5. It requires high cost to send practitioners for training.   | 0.836 |       |   |
| <b>D. Public Awareness</b>         |  |       |       |   |
| PA1                                | 1. Lack of public awareness on the green building concept decreases the demand for green buildings.      | 0.850 | 0.825 | 8 |
| PA2                                | 2. The public is unaware about the benefits and efficiency of green building concept.                    | 0.836 |       |   |
| PA3                                | 3. The lack of advertising in social media makes it hard to educate public about green building concept. | 0.788 |       |   |
| <b>E. Database and Information</b> |  |       |       |   |
| DI1                                | 1. Lack of database and information makes it difficult for practitioners to execute.                     | 0.848 | 0.831 | 7 |
| DI2                                | 2. Lack of database and information will delay the project.  | 0.858 |       |   |
| DI3                                | 3. There is a lack of history and guideline on the green building concept in Malaysia.                   | 0.794 |       |   |
| DI4                                | 4. Lack of building codes and regulations to implement green building concept towards certain property.  | 0.824 |       |   |
| <b>F. Market Performance</b>       |  |       |       |   |
| MP1                                | 1. The lack of demand has slowed down the development of green buildings.                                | 0.862 | 0.839 | 6 |
| MP2                                | 2. Green buildings are less implemented in Malaysia,   | 0.840 |       |   |

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|                            |  |       |       |   |
|----------------------------|--|-------|-------|---|
| MP3                        | 3. Consumers think that an environmentally-friendly green building is not worth for extra cost.              | 0.814 |       |   |
| <b>G. High Final Price</b> |  |       |       |   |
| HFP1                       | 1. Green materials and technologies are more costly and will increase the final price.                       | 0.888 | 0.887 | 2 |
| HFP2                       | 2. The complexity of design and modelling costs will lead to a higher final cost.                            | 0.896 |       |   |
| HFP3                       | 3. High final price will decrease the demand of green buildings.   | 0.878 |       |   |
| <b>H. Investment Risk</b>  |  |       |       |   |
| IR1                        | 1. Uncertain payback period will increase the risk of investment.  | 0.894 | 0.885 | 3 |
| IR2                        | 2. Complicated and various types of contract forms of project delivery will increase the risk of investment. | 0.868 |       |   |
| IR3                        | 3. The change in design will increase the project cost.  | 0.894 |       |   |

Source: Researcher (2022)

According to Table 4.5, it shows the Relative Importance Index (IRR) for Objective 2 “to identify the hardest challenge faced by practitioners in the implementation of Green Building Concept in Malaysia”. Accordingly, it can be observed that the highest overall IRR calculated is professional knowledge at 0.908 which can be explained that the lack of professional knowledge is the hardest challenge faced by practitioners in the implementation of green building concept. Moving on, the second highest overall IRR is high final price at 0.887. Next, the third highest overall IRR is investment risk at 0.885. Furthermore, the fourth highest IRR is government incentives at 0.874. Moreover, the fifth highest IRR is high investment cost at 0.866. In addition, the sixth highest IRR is market performance at 0.839. Besides that, the seventh highest IRR is database and information at 0.831. Lastly, public awareness is ranked last with only 0.825. From this, it can be explained that the lack of public awareness is the least challenging challenge faced by practitioners in the implementation of green building concept in Malaysia.



## **4.5 Conclusion**

In this chapter, the reliability of the determinants have been analysed by using the Cronbach's Alpha reliability test. Besides that, the respondent's demographic characteristics have been analysed by using the frequency analysis through frequency tables and charts. Next, the analysis for Objective 1, "to determine the challenges faced by practitioners in the implementation of green building concept in Malaysia" by using the Content Analysis and Descriptive Analysis. Objective 2, "To identify the hardest challenge faced by practitioners in the implementation of Green Building Concept in Malaysia" have been analysed by using Relative Importance Index. In the following Chapter 5 of Discussion, Conclusion and Implications, the summary of the key findings of statistical analyses including the descriptive analysis and correlation analysis will be interpreted.

## **CHAPTER 5: DISCUSSION, CONCLUSION AND IMPLICATIONS**

### **5.0 Introduction**

In Chapter 5, the summary of all the key findings of statistical analyses have been analysed according to the previous chapter. In this chapter, a few things will be discussed and it includes the summary of statistical analyses, the discussion of major findings, implications of the study, limitation of the study as well as the recommendations for future research.

### **5.1 Summary of Statistical Analyses**

Statistical analysis is the collection and analysis of quantitative data to investigate trends, as well as patterns. This section will cover the discussion and summarising of all results in Chapter 4 in achieving the objectives.

#### **5.1.1 Summary of Demographic Profile**

For the analysis of demographic profile, frequency analysis, which is a descriptive statistical method has been used to show the number of occurrences each response have been selected by the respondents. The variables that have been analysed includes gender, age, highest education level, profession, working experience, as well as the type of project the respondent's company mostly work on.

Accordingly, the respondents have been separated to 52% female and 48% male which is almost balanced. Next, the 31 to 40 age group contributed the most to the survey with a total of 40% following with 25% each for 21 to 30 and 41 to 50 and

only 10% for above 50 years old. Moving on, majority of the respondents have completed their degree studies with a total of 69% while the remaining 31% respondents have completed their certificate, diploma and masters while none have completed doctorate philosophy. Moreover, property consultants have contributed the most with a total of 26%, following by quantity surveyor with 21%, developer and engineer each with 15%, architect with 13% and lastly, contractor with 10%. Furthermore, a total of 34% have working experience between 4 to 6 years, 27% have 7 to 9 years, 26% have 1 to 3 years while only 13% have a working experience for 10 years and above. Lastly, a majority of 63% of the respondents' company work mostly on residential properties while commercial properties take up 27% and industrial properties only take up 10% out of the 100 responses collected.

### **5.1.2 Scale Measurement**

In order to perform a reliability test on the variables, the internal consistency of the variable have been measured by using the Cronbach's Alpha reliability test. The data used for the Cronbach's Alpha reliability test is collected from the 20 sets of questionnaire through pilot testing. There are a total of 29 items for the challenges faced by practitioners in the implementation of green building concept. The Cronbach Alpha's value ranges from 0.609 to 0.862 where according to the Rule of Thumb, a value above 0.6 is considered acceptable, any value between 0.6 to 0.8 is considered good and average while any value above 0.8 is considered very good. Based on the results collected, the scale reliability of this questionnaire is considered to be good and it shows that the set of items are closely related as a group.

## **5.2 Discussions of Major Findings**

According to the statistical analyses conducted in Chapter 4, discussions of the major findings will be analysed. The objective of the discussion is to explain any new knowledge or insights that occurred as a result of the research and to interpret

and characterise the significance of the major findings in connection to what was already known about the research topic being studied.

### 5.2.1 Objective 1:

#### **To determine the challenges faced by practitioners in the implementation of green building concept in Malaysia**

The first objective of this research is to determine the challenges faced by practitioners in the implementation of green building concept in Malaysia. This research objective is attained through content analysis and descriptive analysis. There are eight challenges that has been identified from the review of literature. In order to support the content analysis, descriptive analysis have been performed accordingly in Chapter 4. The mean value ranges from 3.62 to 5.90 where high investment cost is ranked first as the most challenging obstacle faced by practitioners in the implementation of green building concept with a mean of 3.62. The least challenging obstacle is the lack of information and database with a mean of 5.90. Table 5.1 shows the overall results for objective 1.

Table 5.1: Overall Results for Objective 1

| <b>Challenges</b>                | <b>Mean</b> | <b>Rank</b> |
|----------------------------------|-------------|-------------|
| High Investment Cost             | 3.62        | 1           |
| High Investment Risk             | 3.67        | 2           |
| High Final Price                 | 4.07        | 3           |
| Lack of Professional Knowledge   | 4.10        | 4           |
| Lack of Government Incentives    | 4.54        | 5           |
| Lack of Public Awareness         | 4.88        | 6           |
| Lack of Demand                   | 5.22        | 7           |
| Lack of Information and Database | 5.90        | 8           |

Source: Researcher (2022)

### 5.2.2 Objective 2:

**To identify the most challenge faced by practitioners in the implementation of Green Building Concept in Malaysia.**

The second objective of this research is to identify the most challenge faced by practitioners in the implementation of green building concept in Malaysia. This research objective is attained by using Relative Importance Index (RII). The overall RII by category ranges from 0.825 to 0.908. It can be seen that professional knowledge is ranked first with 0.908 and high final price is ranked second with 0.887. Both of these variable are identified as the more challenging variable faced by practitioners. Next, database and information is ranked seventh with 0.831 and public awareness is ranked eight at 0.825 where both of them are identified as the least challenging variable faced by practitioners. Therefore, it can be concluded for objective 2 that the lack of professional knowledge and high final price is the most challenge faced by practitioners in the implementation of green building concept in Malaysia. Table 5.2 shows the overall results for objective 2.

Table 5.2: Overall Results for Objective 2

| Challenges                  | Overall RII by Category | Overall Rank by Category |
|-----------------------------|-------------------------|--------------------------|
| A. Professional Knowledge   | 0.908                   | 1                        |
| G. High Final Price         | 0.887                   | 2                        |
| H. Investment Risk          | 0.885                   | 3                        |
| B. Government Incentives    | 0.874                   | 4                        |
| C. High Investment Cost     | 0.866                   | 5                        |
| F. Market Performance       | 0.839                   | 6                        |
| E. Database and Information | 0.831                   | 7                        |
| D. Public Awareness         | 0.825                   | 8                        |

Source: Researcher (2022)

### 5.3 Hypothesis tested

Through the Hypotheses Development in Chapter 2, testable hypotheses have been formulated. Table 5.3 shows the summary of hypothesis tested.

Table 5.3: Summary of Hypothesis Tested

| <b>Hypothesis</b>   | <b>Accepted/ Rejected</b>                               |
|---|---|
| H1: The lack of professional knowledge is the most challenge faced by practitioners   | 0.908 > 0.841 (Very significant)<br><b>Accepted</b>     |
| H2: The lack of government incentives is the most challenge faced by practitioners    | 0.874 > 0.841 (Very significant)<br><b>Accepted</b>     |
| H3: High investment cost is the most challenge faced by practitioners                 | 0.866 > 0.841 (Very significant)<br><b>Accepted</b>     |
| H4: The lack of public awareness is the most challenge faced by practitioners         | 0.825 < 0.841 (Somewhat significant)<br><b>Rejected</b> |
| H5: The lack of information and database is the most challenge faced by practitioners | 0.831 < 0.841 (Somewhat significant)<br><b>Rejected</b> |
| H6: The lack of demand is the most challenge faced by practitioners                   | 0.839 < 0.841 (Somewhat significant)<br><b>Rejected</b> |
| H7: High final price is the most challenge faced by practitioners                     | 0.887 > 0.841 (Very significant)<br><b>Accepted</b>     |
| H8: High investment risk is the most challenge faced by practitioners                 | 0.885 > 0.841 (Very significant)<br><b>Accepted</b>     |

Source: Researcher (2022)

According to Table 5.3, there are a total of eight (8) hypotheses developed. Based on the relative importance index decision rule, five (5) hypotheses are accepted while three (3) hypotheses should be rejected. The relative importance index for the lack of professional knowledge, the lack of government incentives, high investment cost, high final price and high investment risk are above 0.841 which is very significant. Therefore, the hypotheses for these five variables are accepted. Meanwhile, the lack of public awareness, the lack of information and database and the lack of demand is below 0.841 which is regarded to be somewhat significant. Therefore, the hypotheses for these three variables should be rejected.

## **5.4 Implications of the Study**

The implication of a study justifies what the findings of a study signify to researchers or to certain subgroups or populations beyond the basic data as well as the interpretation of results. It indicates how the findings could affect policy, practice, theory as well as future research.

### **5.4.1 Managerial Implications**

This section will provide the practical implications for policy makers and practitioners. Practical implication is the possible future effect that is known as the reality that would occur if certain circumstances were met. Therefore, practical implications are needed to be provided to parties such as developers, government and investors, property consultants, contractors and engineers and other parties that are related to the Malaysian property industry. This will be determined by why it is necessary to perform it and how it will affect the future research in this field. This study offers assistance in providing references to all related parties who are involved in the Malaysian property industry. The related parties will be able to understand the challenges faced in the implementation of green building concept towards the type of properties in Malaysia through the end result of this research conducted.

### **5.4.2 Government and Investors**

According to this research outcome, government and investors can know more on what are the challenges faced in the implementation of green building concept. It can be seen that the lack of government incentives is ranked fifth as the most challenging variable to implement the green building concept. This is because government is an essential key for the advancement of green buildings development. Besides that, high investment cost and high investment risk are ranked as the first and second most challenging variable. Through this research, the government and

investors can know that developers will be reluctant to take the risk because they are concerned with the upfront costs since it will be a long-term return of profit. Therefore, through this research, the government and investors will understand that incentives play an important role to implement the green building concept. They can understand that more financial incentives will encourage developers to implement the green building concept since it lowers the risk of implementing it.

### **5.4.3 Developers**

This research outcome will provide references to developers to understand more on the challenges faced in the implementation of green building concept. According to the data collected from the questionnaire, developers can know that the high investment cost, high investment risk and high final price are one of the main challenges faced to implement the green building concept. This is because green materials are more costly than conventional building materials and hence, this will lead to a higher final price, higher investment cost as well as higher investment risks. Through this research, developers can know that these are the challenges to why the green building concept is hard to implement to the types of properties in Malaysia. Accordingly, these variables are one of the few that can be controlled by the developers themselves. Despite the fact that green materials are costly, developers can price the green buildings lower so that consumers will not think that green buildings are too expensive and are not worth the price.

### **5.4.4 Property Consultants**

Property consultants are the other related parties that can benefit from this research. According to the overall results for objective 1, the lack of public awareness is ranked as the sixth challenging variable. Despite only being the sixth, public awareness plays an important role for the enhancement of green buildings. This is because consumer's awareness on the benefits of green building concept will influence the demand for green buildings. Besides that, the lack of demand is ranked



as the seventh challenging variable. Even though it is ranked seventh, but without demand, green buildings will not be able to advance since no one buys it. This is because when market demand for green building is low, practitioners and investors will not be motivated to participate or invest in the development of green buildings. Therefore, through this research, property consultants can know that it is important to promote green buildings either residential, commercial or industrial more so that it increases consumer's knowledge on the green building concept.

#### **5.4.5 Contractors and Engineers**

Contractors and engineers will get more knowledge on the challenges to implement the green building concept in Malaysia through this research. According to the survey conducted, it can be seen that the lack of professional knowledge is ranked as the fourth challenging variable. This is because the green building concept requires another extent of knowledge and expertise to implement. This research will benefit the contractors and engineers because it allows them to understand that the lack of professional knowledge will lead to significant risk and therefore influence the overall project performance. It will influence the judgement to develop a green building. Therefore through this research, contractors and engineers can know that it is important to gain more knowledge on the green building concept. With the ample amount of knowledge, developers and investors will have more confidence in the contractors and engineers in the implementation of green building concept.

#### **5.5 Limitations of the Study**

This section will discuss the limitations that visibly affect the progress of delivering a quality research. Limitations of study are the characteristics that influenced the findings interpretation in the research. The purpose to why these limitations are discussed is to assist and improve the standard of future researches. Throughout this

research, there are a few limitations that I have faced and it includes practitioners, the type of property, the scope of study and the awareness of green building concept.

### **5.5.1 Practitioners**

According to this research, the practitioners covered includes only architect, contractor, developer, engineer, property consultant and quantity surveyor. These six practitioners have been chosen for this research because they are the most related parties for the implementation of green building concept. This is because architects are responsible to develop structure concepts, contractors will supply the necessary materials, equipment, machineries, labour and services, developers will purchase land to build new structures, engineers will supervise the design and execution of projects, property consultant will show and give financial advice and quantity surveyor will help estimate and control costs. However, other than these six practitioners, there are many more parties that are involved such as lender, facility manager, project manager, designer, supervisor, electrician, and many more. More practitioners will increase the reliability of statistical analyses.

### **5.5.2 Type of Property**

Accordingly, the type of properties covered in this research includes residential, commercial and industrial property. These three are selected because they are the most common type of properties in Malaysia. However, there are other types of properties that are not covered in this research. For example, special use property such as mixed-used properties, gas stations, recreational facilities, government buildings, private or public schools, and places of worship are not included. These properties can also benefit a lot from the green building concept. Therefore, this research only limits to residential, commercial as well as industrial property.

### **5.5.3 Scope of Study**

According to the sampling frame and sampling location in Chapter 3, this research will only cover practitioners from the Klang Valley areas like Kuala Lumpur, and its adjoining cities and towns in the state of Selangor. This area is chosen because it is one of the fastest growing metropolitan cities. There are many more practitioners who are working in the Malaysian construction industry in other states such as Sabah, Sarawak, Pahang, Kedah, Perak, Kelantan, Malacca, Perlis, Johor, Negeri Sembilan, Penang, and Terengganu. However, only the Klang Valley area is chosen due to the time constrain for the collection of questionnaire survey. Therefore, this research limits to only practitioners in Klang Valley areas.

### **5.5.4 Awareness of Green Building Concept in Malaysia among professionals**

Accordingly, the green building concept in Malaysia is still considered to be new. This is because some of the literature reviews are incomplete with information that are incomplete with weak supporting evidence. This may be caused by the lack of understanding on the green building concept. Since the green building concept is slowly expanding, future researchers may be able to provide more detailed information and explanation on the green building concept. Hence, this research limits on the awareness of green building concept in Malaysia among professionals since they have shallow knowledge on the green building concept.

## **5.6 Recommendations for Future Research**

Recommendations suggested in this research is to propose what can be done in future research where further studies can be done to achieve better results and more reliable data. This research focuses on the challenges faced by practitioners in the

implementation of green building concept towards the type of properties in Malaysia. Thus, a few recommendations will be suggested for future research.

### **5.6.1 Practitioners**

As stated above, this research only limits to architect, contractor, developer, engineer, property consultant and quantity surveyor. Hence, a similar research can be conducted by involving a larger group of respondents which includes lender, facility manager, project manager, designer, supervisor, electrician, and many more. When there are more practitioners involved, it will increase the reliability of statistical analyses by providing more accurate mean values. For example, a recommendation research topic of “Challenges faced by Developers in the Implementation of Green Building Concept in Malaysia”. Besides that, the researcher can benefit from the diversified demographic profile of the respondents when analysing the data when there is an increase in sample size. Hence, more information can be collected when there are more respondents participating.

### **5.6.2 Type of Property**

As stated above, this research only limits to residential, commercial and industrial property. Therefore, a similar research can be conducted by including the other types of properties in Malaysia. For example, special properties which includes mixed-used properties, gas stations, recreational facilities, government buildings, private or public schools, and places of worship. Besides that, future researchers can also further elaborate on either one of the type of property by focusing only on the property. This would allow clearer and more detailed information. For example, a research topic of “Challenges Faced by Practitioners in the Implementation of Green Building Concept towards Residential Property in Malaysia.

### **5.6.3 Scope of Study**

As stated above, this research only limits to practitioners from the Klang Valley areas like Kuala Lumpur, and its adjoining cities and towns in the state of Selangor. Consequently, a similar research can be conducted by covering other states in Malaysia such as Sabah, Sarawak, Pahang, Kedah, Perak, Kelantan, Malacca, Perlis, Johor, Negeri Sembilan, Penang, and Terengganu. Researchers can either choose one state for future research or choose the whole Malaysia as the scope of study. For example, a recommendation research topic of “Challenges faced by Practitioners in the Implementation of Green Building Concept in Kuala Lumpur”. This would allow researchers to collect more information that are clearer and more precise among practitioners working in different states where different states might face different challenges in the implementation of the green building concept.

### **5.6.4 Awareness of Green Building Concept in Malaysia among professionals**

As stated above, this research limits on the awareness of green building concept in Malaysia among professionals since they have shallow knowledge on the green building concept. Hence, more studies on the green building concept should be conducted. This is because some of the literature reviews are not complete with detailed information. A similar research can be conducted in the future with clearer, more complete, more specified and more detailed information on the green building concept. Thus, when time goes on, when this research gets more popular, it will help to aid and assist in one’s research with a tremendous amount of effort.

## 5.7 Conclusion

As a conclusion, this research is conducted to study on the Assessment of Challenges faced by Practitioners in the Adoption of Green Building Concept in Malaysia. Research questions have been investigated through the development of research objectives to be achieved in this research. This research is aimed to achieve two objectives. The first objective is to determine the challenges faced by practitioners in the implementation of green building concept in Malaysia while the second objective is to evaluate the most challenge faced by practitioners in the implementation of green building concept in Malaysia. Both objectives of this research have been conducted through the review of literatures, data collection, as well as data analyses. In the reviewing of literature, the green building concept including the Green Building Index (GBI) criteria and classification has first been discussed to understand and gain more knowledge on the research topic. Moving on, there are eight challenges that have identified from the literature review. Next, after the data collection through questionnaire, data analysis have been conducted. Data analysis that have been used for the first objective of “to determine the challenges faced by practitioners in the implementation of green building concept in Malaysia” includes content analysis and mean. Meanwhile, Relative Importance Index (RII) has been used to analyse the second objective “to identify the most challenge faced by practitioners in the implementation of green building concept”. According to the relative importance index, the lack of professional knowledge, the lack of government incentives, high investment cost, high final price and high investment risk are above 0.841 and hence, these hypotheses are accepted while the relative importance index for the lack of public awareness, the lack of information and database and the lack of demand are below 0.841 and hence, they are rejected. This research is implicated to the government and investors, developer, property consultants as well as contractors and engineers. Despite having limitations of study, a few recommendations of topic and methodology for future research have been included. This is to allow better results achievement and more reliable data.

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APPENDICES

**Challenges Faced by Practitioners in The Adoption of Green  
Building Concept (Residential, Commercial, Industry)**



**FACULTY OF ACCOUNTANCY AND MANAGEMENT  
BACHELOR OF BUILDING AND PROPERTY MANAGEMENT  
(HONOURS)**

**SURVEY QUESTIONNAIRE**

Dear Sir/ Madam,

I am a final year undergraduate student from Universiti Tunku Abdul Rahman (UTAR), Chen Wan Shi, who is currently pursuing in Bachelor of Building and Property Management (Honours). The aim of this questionnaire is to study on the challenges faced by practitioners in the implementation of green building concept towards Malaysian property industry.

A set of questionnaire will require 10 minutes to be completed. This questionnaire consists of two sections, which are Section A and Section B. Section A is about demographic profile while Section B is regarding the challenges faced by practitioners in the implementation of green building concept towards Malaysian property industry.

Information obtained is strictly confidential and will be used for statical and mathematical analysis for the purpose of study only. Your kind participation in this study is highly valued and appreciated. Should you have any enquiry regarding this study, kindly contact me through this email: [michellechen1104@lutar.my](mailto:michellechen1104@lutar.my).

Thank you.

Section A: Demographic profile

INSTRUCTION: Please select your answer of your choice or write in the space provided as case may be.

1. Gender

- Male
- Female

2. Age

- 21-30
- 31-40
- 41-50
- >50

3. Highest education level

- Certificate
- Diploma
- Degree
- Master
- Doctorate Philosophy

4. Profession

- Architect
- Contractor
- Developer
- Engineer
- Property Consultant
- Quantity Surveyor

5. Working experience

- ≤ 3 years
- 4-6 years
- 7-9 years
- 10 years and above

6. What type of project does your company mostly work on?

- Residential Property
- Commercial Property
- Industrial Property

7. Which of the following type of property is more challenging to implement the green building concept?

- Residential Property

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- Commercial Property
- Industrial Property

8. Below are the challenges of the adoption on green building concept towards property. Please number the answer below from 1 (being the most challenging) to number 8 (being the least challenging).

- Professional knowledge
- Government incentives
- High investment cost
- Public awareness
- Database and information
- Market performance
- High final price
- Investment risk

Section B: Challenges faced by practitioners in the implementation of green building concept towards the Malaysian property industry.

This section requires your opinion regarding the challenges faced by practitioners in implementing the green building concept.

INSTRUCTION: Please indicate your answer to each statement using **FIVE** Likert scale below.

**(1)= Strongly disagree; (2)= Disagree (3)= Slightly Agree; (4)= Agree; (5)= Strongly Agree**

| <b>A: Professional Knowledge</b>  |   |   |   |   |   |
|---|---|---|---|---|---|
| 1. Lack of professional knowledge will delay and increase the initial cost of the project.                            | 1 | 2 | 3 | 4 | 5 |
| 2. Lack of professional knowledge on the green building concept will lead to unforeseen risks.                        | 1 | 2 | 3 | 4 | 5 |
| 3. Expertise on green building concept is very important.   | 1 | 2 | 3 | 4 | 5 |
| 4. Limited knowledge makes it hard to reach an agreement between experienced practitioners and younger practitioners. | 1 | 2 | 3 | 4 | 5 |
| 5. It is important that practitioners are required to have proper and adequate skills.                                | 1 | 2 | 3 | 4 | 5 |
| <b>B: Government Incentives</b>   |   |   |   |   |   |
| 1. Government incentives will increase the motivation of construction firms to implement the green building concept.  | 1 | 2 | 3 | 4 | 5 |

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|  |   |   |   |   |   |
|--|---|---|---|---|---|
| 2. Government incentives from the government provides financial advantage for practitioners.             | 1 | 2 | 3 | 4 | 5 |
| 3. Limited incentives from the government slows down the development of green buildings.                 | 1 | 2 | 3 | 4 | 5 |
| <b>C: High Investment Cost</b>   |   |   |   |   |   |
| 1. Green buildings require higher initial cost.  | 1 | 2 | 3 | 4 | 5 |
| 2. Green materials are more costly.  | 1 | 2 | 3 | 4 | 5 |
| 3. It requires more time to adopt to the new technology.   | 1 | 2 | 3 | 4 | 5 |
| 4. Lack of credit resources to cover upfront cost will decrease the interest of construction firms.      | 1 | 2 | 3 | 4 | 5 |
| 5. It requires high cost to send practitioners for training.   | 1 | 2 | 3 | 4 | 5 |
| <b>D: Public Awareness</b>   |   |   |   |   |   |
| 1. Lack of public awareness on the green building concept decreases the demand for green buildings.      | 1 | 2 | 3 | 4 | 5 |
| 2. The public is unaware about the benefits and efficiency of green building concept.                    | 1 | 2 | 3 | 4 | 5 |
| 3. The lack of advertising in social media makes it hard to educate public about green building concept. | 1 | 2 | 3 | 4 | 5 |
| <b>E: Database and Information</b>   |   |   |   |   |   |
| 1. Lack of database and information makes it difficult for practitioners to execute.                     | 1 | 2 | 3 | 4 | 5 |
| 2. Lack of database and information will delay the project.  | 1 | 2 | 3 | 4 | 5 |
| 3. There is a lack of history and guideline on the green building concept in Malaysia.                   | 1 | 2 | 3 | 4 | 5 |
| 4. Lack of building codes and regulations to implement green building concept towards certain property.  | 1 | 2 | 3 | 4 | 5 |
| <b>F: Market Performance</b>   |   |   |   |   |   |
| 1. The lack of demand has slowed down the development of green buildings.                                | 1 | 2 | 3 | 4 | 5 |
| 2. Green buildings are less implemented in Malaysia,   | 1 | 2 | 3 | 4 | 5 |
| 3. Consumers think that an environmentally-friendly green building is not worth for extra cost.          | 1 | 2 | 3 | 4 | 5 |



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| <b>G: High Final Price</b>   |   |   |   |   |   |
|--|---|---|---|---|---|
| 1. Green materials and technologies are more costly and will increase the final price.                       | 1 | 2 | 3 | 4 | 5 |
| 2. The complexity of design and modelling costs will lead to a higher final cost.                            | 1 | 2 | 3 | 4 | 5 |
| 3. High final price will decrease the demand of green buildings.   | 1 | 2 | 3 | 4 | 5 |
| <b>H: Investment Risk</b>  |   |   |   |   |   |
| 1. Uncertain payback period will increase the risk of investment.  | 1 | 2 | 3 | 4 | 5 |
| 2. Complicated and various types of contract forms of project delivery will increase the risk of investment. | 1 | 2 | 3 | 4 | 5 |
| 3. The change in design will increase the project cost.  | 1 | 2 | 3 | 4 | 5 |

The End

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Thank you for your time to complete this questionnaire.