PERSPECTIVES OF BUILDING PROFESSIONALS ON ADOPTION OF GREEN BUILDING INDEX (GBI) CLASSIFICATION: MOTIVATORS, HURDLES AND RECOMMENDATIONS

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

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DECLARATION

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

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APPROVAL FOR SUBMISSION

I certify that this project report entitled **"PERSPECTIVES OF BUILDING PROFESSIONALS ON ADOPTION OF GREEN BUILDING INDEX (GBI) CLASSIFICATION: MOTIVATORS, HURDLES AND RECOMMENDATIONS"** was prepared by **VIVIANE CHEE SHU VEI** has met the required standard for submission in partial fulfilment of the requirements for the award of Bachelor of Science (Hons.) Quantity Surveying at Universiti Tunku Abdul Rahman.

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Specially dedicated to
my beloved mother, father and sister

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ABSTRACT

Green Building Index (GBI) is the first green building rating system to be developed in Malaysia. However, limited studies have been carried out to investigate the perspectives of building professionals pertaining to GBI. This study aims to examine the perceptions of Malaysian building professionals on the adoption of GBI in terms of perceptions, motivations, obstacles and recommendations. Data were collected through questionnaires and interviews. Descriptive analysis method was used to summarize the data in a very clear manner so that it is understandable to everyone. Relative importance index (RII) was used to determine the ranking of the preference between GBI ratings and foreign rating systems; motivation factors; demotivation factors and recommendations for the adoption of GBI. The reliability test used for this study is Cronbach's Alpha test. Based on the findings, there is still limited adoption of GBI classification in Malaysia. Generally, building professionals have a positive impression on GBI system; however there are fewer chances to be involved with the system in practice. The professionals are highly motivated to apply GBI in their work due to the savings on building lifecycle and operation costs. Promotion efforts seemed to fall short in terms of raising awareness and educating the public, who constitutes the potential buyers and who can also create demand for the buildings. Higher initial costs and insufficient incentives proved to be a stumbling block in the adoption of GBI. The progress of GBI development will be sluggish without the support of property owners and the public. Acknowledging the barriers to GBI system, building professionals identified the need to prioritize on public awareness and education related to sustainable building practices. Furthermore, the current incentive system requires major revamp in order to increase the adoption rate.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF SYMBOLS / ABBREVIATIONS

APEC	Asia-Pacific Economic Cooperation
BCA	Building and Construction Authority
BEI	Building Energy Use Index
BMI	Building Monitoring System
BREEAM	Building Research Establishment Environmental Assessment Methodology
CASBEE	Comprehensive Assessment System for Built Environment Efficiency
CCAP	Centre for Clean Air Policy
CIDB	Construction Industry Development Board
CVA	Completion & Verification Assessment
DA	Design Assessment
DBKL	Dewan Bandaraya Kuala Lumpur (Kuala Lumpur City Hall)
GBI	Green Building Index
KeTTHA	Ministry of Energy, Green Technology and Water
ktoe	thousand tons of oil equivalent
LEED	Leadership in Energy and Environmental Design
MEWC	Ministry of Energy, Water and Communications
MGBC	Malaysia Green Building Confederation
MyCREST	Malaysian Carbon Reduction and Environmental Sustainable Tool
NAPIC	National Property Information Centre
OPEC	Organization of the Petroleum Exporting Countries
OTTV	Overall Thermal Transfer Value
PWD	Public Works Department
REHDA	Real Estate & Housing Developers' Association Malaysia
RICS	Royal Institution of Chartered Surveyors
RII	Relative Importance Index

SBS	Sick Building Syndrome
UNEP	United Nations Environmental Programme
USGBC	U.S. Green Building Council
WGBC	World Green Building Council

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.1 Background

The construction sector contributes significantly to the economies of most developing countries. All these constructions carry both positive and negative impacts on the surrounding environment and stakeholders. Realising the adverse effects to the built environment, the concept of green building started to evolve. The concept of sustainable development and green building has been extensively discussed globally among scholars and practitioners as the construction industry consumes a significant amount of the world's resources. Generally, green buildings are constructed to achieve refinement in construction practices and optimised designs so that there will be lesser operating cost, extended lifespan of building, enhanced productivity and better living environment for occupants.

Integrating sustainable and green practices into traditional design and construction operations requires a revamp to the roles played by project participants involved in the design and construction processes to achieve an efficient and healthier environment for the clients and occupants. Most project participants are building professionals who are actively involved in the planning and implementation of a project. During the 1990s, green building rating systems were introduced for buildings. Some notable green building rating systems that are currently implemented around the world are LEED, Green Globes, ENERGY STAR, CASBEE, Green Mark, CASBEE and GBI.

Malaysia has also jumped onto the green building bandwagon by introducing its very own green building rating system, Green Building Index (GBI) in 2009. Development of GBI was carried out by Pertubuhan Arkitek Malaysia (PAM) and Association of Consulting Engineers Malaysia (ACEM). GBI is driven by the initiative of a group of passionate building professionals spearheading the Malaysian construction industry towards becoming more environment-friendly. The GBI rating tool act as a guideline enabling professionals to design and construct green buildings that can provide improved energy and water savings, better indoor environment, greater connectivity to public transport and the adoption of recycled materials and greenery for their projects.

The criteria of GBI rating comprise energy efficiency, indoor environmental quality, sustainable site planning and management, materials and resources, water efficiency and innovation. Buildings in Malaysia will be rated and certified as Silver, Gold and Platinum based on the scores achieved. At intervals of every three years, the buildings will be reassessed to ensure that they are well maintained.

GBI is a relatively new green building rating tool compared to other building environmental assessment tools. Professionals may view GBI as a possible solution for reducing or resolving environmental problems caused by the construction industry. However, the benefits of GBI must be amplified and widely publicised so as to overshadow the barriers of the rating system. Hopefully, GBI would be widely adopted across the country in the course of time.

1.2 Rationale of Research

Since the eruption of the energy crisis, academicians and practitioners consider the green building initiatives to be a reaction to revamp the way depleting resources are being utilised. Sustainable development and green buildings inevitably are among the hottest issues that had been constantly debated over the past decade. There is no lack of researches or studies about various green building rating systems worldwide.

However, there are relatively fewer studies being carried out on Malaysia's very own green building rating system, GBI. This situation could be attributed to the maturity level of the GBI classification. GBI is still in its infancy stage compared to other existing green building rating systems such as LEED.

Nevertheless, the green trend is growing in Malaysia even though it is still insufficient to make a huge impact. The number of GBI-certificated buildings is relatively small compared to the volume of construction in Malaysia. There are only 281 GBI-certificated projects in Malaysia as of January 2015. The benefits of using the GBI classification should be amplified and the barriers faced by the system should be overcome by applying suitable strategies to promote the development of certified buildings in Malaysia. This study will reveal different building professional's perceptions on the motivating and demotivating factors of implementing GBI classifications. Strategies to be undertaken to promote the development and adoption of GBI will also be studied.

1.3 Aims and Objectives

The aim of this research is to examine the building professional's perceptions towards the adoption of Green Building Index (GBI) in Malaysia.

The objectives of this research are:

1. To unravel the building professionals' perceptions of Green Building Index (GBI).

2. To identify the motivational factors that encourages the implementation of Green Building Index (GBI) from the perspectives of building professionals in Malaysia.

3. To determine the hurdles of adopting Green Building Index (GBI) from the viewpoint of the building professionals.

4. To identify effective strategies for the development and adoption of Green Building Index (GBI).

1.4 Brief Research Methodology

This study utilizes two types of research strategy which are quantitative research and qualitative research. Both survey questionnaires and interviews are used to collect data and information. The targeted respondents are identified to be building professionals in Malaysia's construction industry. The data collected will be analysed using suitable methods of analysis. The results obtained are discussed and inferences will be drawn from the analysis.

1.5 Scope of Work and Limitations

This study concentrates only on the perspectives of building professionals in Malaysia's construction industry on the adoption of GBI. They are chosen as target respondents because they are experienced and knowledgeable in the construction industry. Unfortunately, some of the respondents may not be involved in the application of GBI and their responses are based on mere perceptions. Other existing green building rating systems will also be compared to GBI. The time available to conduct the research is limited thus inevitably lesser in-depth information would be obtained.

1.6 Report Outline

Chapter 1 provides a general view on the research conducted. The reason to carry out this particular research is mentioned in the rationale of research. The aim and objectives of the study show the significance of this research. The limitations and scope of work are also highlighted in this chapter.

Chapter 2 contains reviews and discussions of other researchers' work in addition to the author's critical comments surrounding the area of research. It includes green development in Malaysia, GBI components, comparisons between GBI and other green building rating systems, the benefits and barriers of adopting GBI.

In chapter 3, readers will be able to understand the approaches taken by the author to collect data for this research. The survey instrument used to collect data is also mentioned. The approaches are dependent upon the type of data and information needed. Methods applied to analyse and evaluate the data collected will also be outlined in this chapter.

The results of the data analysis will be emphasized in chapter 4. There will be detailed discussions on the data collected and the findings obtained.

In chapter 5, conclusions will be drawn from the analysis and supported by the data. It will also address whether the aims and objectives set are achieved through this study. The limitations discovered throughout the research will also be mentioned. This chapter also includes recommendations for future researches in related areas.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The origins of the green movement can be traced back to the 1970s when the eruption of the OPEC oil crisis has awakened nations on the need of conserving scarce resources. Development comes with a hefty price tag for those who failed to address the issue of depleting resources. The global primary energy usage is predicted to increase by 1.6% annually between 2009 and 2030 (Chua and Oh, 2011). The construction industry is identified as the major culprit in the consumption of resources. 40% of global energy, 25% of global water and 40% of other global resources are used in construction. These consumptions also emit one-third of greenhouse gases. On the contrary, established technologies such as green building systems allow energy usage of buildings to be reduced by 30-80% (UNEP, 2014).

Malaysia's final energy consumption has increase significantly from 16,185 ktoe in 1992 to 46,709 ktoe in 2012. The residential and commercial sector alone accounts for 15% of the total energy consumption during 2012 (Suruhanjaya Tenaga, 2014). The increasing demand for resources further compounds concerns on the effect to the environment. The burning of fossil fuels and production of cement emits carbon dioxide. The greenhouse gases emission per capita of Malaysia is 3 times greater than the amount recorded for ASEAN countries (Salahudin, Abdullah and Newaz, 2013). Realising the gravity of this situation, the government had introduced various green policies and programmes to reduce the adverse effects of development.

2.2 Malaysia's Green Movement

2.2.1 Definition of Green Buildings

Green buildings can be defined as one that can minimize the adverse effects of real estate development on environment and human health in order to promote the sustainability of life (Addae-Dapaah, Hiang and Sharon, 2009). This resonates with the definition given by the GBI organization, which refers green buildings as those that increase the efficiency of resource utilization such as energy, water, and materials while reducing building impact on human health and the environment during the building's lifecycle, through better siting, design, construction, operation, maintenance, and removal (GBI, 2013).

2.2.2 Green Agencies

2.2.2.1 Ministry of Energy, Green Technology and Water

Following the 2009 cabinet reshuffle, the Ministry of Energy, Green Technology and Water (KeTTHA) was established on 9 April 2009, replacing the Ministry of Energy, Water and Communications (MEWC). The Prime Minister of Malaysia views that green technology is capable of forming and maintaining a sustainable future in Malaysia, addressing environmental issues which may bring forth major adverse consequences if adequate care is not taken. The ministry is tasked to manage green technology, energy and water services countrywide (KeTTHA, 2015). The bulk of the responsibility of promoting efficient use of energy rests with KeTTHA, but its jurisdiction covers only these areas of electrical and gas supply at reticulation ends (APEC, 2011).

2.2.2.2 Malaysia Green Building Confederation (MGBC)

Malaysia Green Building Confederation (MGBC) is a non-profit organisation registered during April 2009 and a member of the World Green Building Council (WGBC). The organisation has various representatives of stakeholders from the construction industry. It seeks to promote green practices, technologies and processes in the building industry by embracing responsible sustainable initiatives. MGBC is an avid supporter of Malaysia's GBI and held workshops and seminars relating to GBI. MGBC had also published Green Pages Malaysia, an information resource directory for green building products and services. (Green Pages Malaysia, 2014) This eases the burden of consumers to obtain trusted and certified green building products.

2.2.3 Green Policy

2.2.3.1 MS 1525:2007

MS 1525:2007 is the Code of Practice on Energy Efficiency and Use of Renewable Energy for Non-residential Buildings. Building Energy Use Index (BEI) is used to compare the energy usage of buildings and normally expressed as kWh/m2/year. According to energy audits carried out by Malaysia Energy Centre, most of Malaysia's office buildings have a BEI falling within a range of 200 to 250 kWh/m2/year (Chan, 2009). However, the recommended Building Energy Use Index (BEI) should not exceed 135 kWh/m2/year (Chua and Oh, 2011). During March 2005, a proposal had been submitted by the Ministry of Energy, Water and Communications to the Ministry of Housing and Local Government to amend the Uniform Building By-Law (UBBL) to fulfil the requirements of MS1525. This new by-law came into force in 2007 (Chan, 2009). It is used to encourage the usage of renewable energy in new and existing buildings to reduce non-renewable energy sources, energy usage and pollution while maintaining the comfort, safety and health of occupants (Chua and Oh, 2011).

2.3 Green Building Index (GBI)

2.3.1 GBI Criteria

2.3.1.1 Energy Efficiency

Energy Efficiency is most vital among the six criteria as most points are allocated for this criterion. It was specifically addressed in the 9th Malaysia Plan (2006-2010), signifying the government's determination to promote reduced energy consumption (Oh, Pang and Chua, 2010). This criterion set standards for minimum energy usage and encourages the application of various strategies to reduce their overall energy consumption. Proper design of the building envelope can positively influence the heat exchange between the building and the outdoor environment. Optimisation of building orientation requires zero to minimal cost as it only involves the location and direction of a building. Building owners can utilize smart energy management systems and highly efficient mechanical systems to scale down on their energy usage.

2.3.1.2 Indoor Environmental Quality

One of the objectives of building green is being able to enhance the health, comfort and productivity of the occupants. Results from a study indicate that occupants of LEED-certified buildings are more satisfied in terms of thermal comfort, indoor air quality and cleanliness (Lee and Kim, 2008). Since LEED is a reference point for GBI, it is safe to believe that GBI-certified buildings will achieve the same level of satisfaction or even better. Indoor air quality is one of the most pivotal factors in influencing the occupant's health and wellbeing. Other factors affecting indoor environmental quality include thermal comfort, acoustic, day lighting, outdoor views and ventilation.

2.3.1.3 Sustainable Site Planning and Management

This criterion guides us on implementing strategies to choose and manage sites effectively. It encourages redevelopment of previously developed land and brownfields to avoid and conserve environmentally sensitive sites. The criterion also applauds smart transportation choices and reduction in pollution, erosion and heat island effect. Proper management for storm water quality and quantity is crucial in tropical countries where rain showers are a norm. However, there are always challenges posed to designers that have to be overcome. The major encumbrances of sustainable storm water management identified include cost and performance uncertainties, lack of engineering standards and guidelines, fragmentation of responsibilities, insufficient institutional capacity, lack of legislative mandate, insufficient funding and incentives and resistance to change (Roy et al., 2008).

2.3.1.4 Material and Resources

Green building materials can be defined as materials that are eco-friendly and constitute of renewable resources (Kubba, 2012). This criterion promotes the selection of environmental friendly materials originating from sustainable resources and recycled contents. It focuses on reduction of waste generated during building construction and operation stages by encouraging storage and collection of recyclables.

2.3.1.5 Water Efficiency

Water is the essence of life. Human activities could not carry on without water. Although water covers a substantial area of the earth's surface, significant portion of the water is unfit for human consumption (UNEP, 2008). Water efficiency emphasise on reduction of water usage and wastage. Various strategies such as applying high

efficient fittings, rainwater harvesting and water recycling are encouraged to minimize the strain on limited water resources. Efficient irrigation and landscape design is one of the prerequisites in Water Efficiency to reduce usage of potable water.

2.3.1.6 Innovation

Innovation is ranked the lowest in the level of importance to green building experts, but it actually offers projects an opportunity to gain extra credits in addition to the above criteria (Rahardjati et al., 2010). Exemplary performance points can be obtained by including innovative design and initiatives to improve the building's performance beyond GBI's requirements. The other way to score points for this criterion is through the engagement of GBI facilitator.

2.3.2 GBI Rating Tools

- Residential New Construction (RNC)
- Non-Residential New Construction (NRNC)
- Non-Residential Existing Building (NREB)
- Industrial New Construction (INC)
- Industrial Existing Building (IEB)
- NRNC: Retail
- NREB: Retail
- NRNC: Data Centre
- NREB: Data Centre
- Township (T)
- Hotel & Resort
- NRNC: Hotel
- NRNC: Resort

- NREB: Hotel
- NREB: Resort
- Interiors (ID)
- NRNC: Hospital
- NREB: Hospital

Source: (GBI, 2015)

2.3.3 GBI Classification

Table 2.1 GBI Classification

Points	GBI Rating
86+ points	Platinum
76 to 85 points	Gold
66 to 75 points	Silver
50 to 65 points	Certified

Source: (GBI, 2013)

2.3.4 Current Status of GBI

Table 2.2 GBI Certified Projects by Category

Update on Green Building Index	**Total as of 15 June 2015**	**NRNC**	**RNC**	**INC**	**NREB**	**IEB**	**T**
Applied	668	345	265	20	20	4	14
Registered	627	318	254	19	19	3	14
Total	307	150	132	6	10	2	7

Certified	(100%)	(48%)	(44%)	(2%)	(3%)	(1%)	(2%)
Provisional Certification after DA	261	127	118	2	7	-	7
Final Certification after CVA	45	22	14	4	3	2	-
Renewal Certification after RVA	1	1	-	-	-	-	-

Source: (GBI, 2015)

* DA – Design Assessment, CVA – Completion & Verification Assessment

2.4 Other Green Building Rating Systems

Green building rating systems, also known as building environmental assessment methods are defined as a method, scheme or system with recognizable frameworks that organize or classify environmental performance criteria in a structured manner with allocation of marks or weightages and are operated within known organizational contexts (Wong and Abe, 2014).

Many studies have been carried out, evaluating the criteria, similarities and differences between different green building rating systems. It is disappointing to say that GBI had not been reviewed or mentioned in recent studies (Wong and Abe, 2014; Reed et al., 2011; Poveda and Yound, 2014; Siew, et al., 2013). Perhaps this is due to the fact that GBI is still relatively new compared to more prominent rating tools such as LEED, BREEAM and Green Mark. Most green building rating tools are voluntary systems and are adapted to each country's climate, culture and building systems. The downside is different nations utilizes different frameworks. This has created confusion and difficulty for stakeholders to understand the differences between locations (Dixon et al., 2008).

2.4.1 Leadership in Energy and Environmental Design (LEED)

LEED is the most widely accepted building environmental assessment method globally with 1.7 million square feet of area certified every day. This prominent rating system is adopted in more than 150 countries with over 60,000 projects participating, covering approximately 11 billion square feet. The awarding of points is covered under 9 categories: Integrative Process, Location and Transportation, Sustainable Sites, Water Efficiency, Energy and Atmosphere, Materials and Resources, Indoor Environmental Quality, Innovation and Regional Priority. The certification levels is categorised into 4 levels: Platinum, Gold, Silver and Certified (USGBC, 2015). Projects must fulfil the requirements of the LEED Minimum Program Requirements as a condition to obtain certification.

2.4.2 Building Research Establishment Environmental Assessment (BREEAM)

BREEM was established in 1990 by the Building Research Establishment Ltd. (BRE) and believed to be the world's first building environmental assessment method. 425,000 buildings were certified under BREEAM. The system is mainly used in United Kingdom and other European Union countries. Being a global building rating system, BREEAM offers different schemes suited for different countries and also on an international level. BREEAM International includes schemes such as BREEAM International New Construction (NC), BREEAM International Refurbishment, BREEAM In-Use International and BREEAM Communities Bespoke International (BRE, 2015; Darus et al., 2009). BREEAM rates buildings in 5 categories: Outstanding, Excellent, Very Good, Good, Pass and Unclassified. BREEAM New Construction has 9 assessment criteria: Management, Health and Wellbeing, Energy, Transport, Water, Materials, Waste, Land Use and Ecology, Pollution. An additional 10% is allocated for innovation (BRE, 2011).

2.4.3 BCA Green Mark Scheme

In order to promote sustainable building practices and raise environmental awareness in Singapore's construction industry, Building and Construction Authority (BCA) had launched BCA Green Mark Scheme in January 2005. (BCA, 2015) Green Mark is one of a kind as it is the first green building rating system tailored for urban tropical countries (BCA, 2010). BCA had revamped Singapore's building regulation by setting up the Building Control (Environmental Sustainability) Regulations 2008. It's a mandatory requirement for new building works and additions, extensions or major retrofitting to existing buildings with gross floor area equivalent or more than 2000 m2 to achieve Green Mark Certified Level. Green Mark contains 5 areas of assessment as follows: Energy Efficiency, Water Efficiency, Environmental Protection, Indoor Environmental Quality and other green and innovative features. Buildings assessed will be awarded with a Certified, Gold, Gold Plus or Platinum rating (BCA, 2015).

2.5 Comparison of Green Building Rating Tools

Table 2.3 Comparison of Green Building Rating Tools

Rating Systems	**GBI**	**BREEAM**	**LEED**	**Green Mark**
Year	2009	1990	1998	2005
Origin	Malaysia	U.K.	U.S.	Singapore
Ratings	-Platinum -Gold -Silver -Certified	-Outstanding -Excellent -Very Good -Good -Pass -Unclassified	-Platinum -Gold -Silver -Certified	-Platinum -Gold Plus -Gold -Certified
Criteria	-Energy Efficiency	-Energy -Management	-Integrative Process	-Energy Efficiency

	-Indoor Environmental Quality -Water Efficiency -Innovation -Sustainable Site Planning and Management -Material and Resources	-Health and Wellbeing -Transport -Water -Materials -Waste -Land Use and Ecology -Pollution	-Location and Transportation -Sustainable Sites -Water Efficiency -Energy and Atmosphere -Materials and Resources -Indoor Environmental Quality -Innovation and Regional Priority	-Indoor Environmental Quality -Water Efficiency -Environmental Protection -Other Green Features and Innovation
Assessment	Accreditation panel	Trained assessors	USGBC	Trained assessors
Governance	Greenbuildingindex Sdn. Bhd.	UK Accreditation Service (UKAS)	USGBC	BCA

Sources: (BRE, 2008; USGBC, 2015; BCA, 2015; BRE, 2015; GBI, 2013)

GBI is still in its infancy stage compared to other global rating systems. It is evident that GBI had referred to LEED and Green Mark as basis for the establishment of criteria as there are many similarities. Since GBI is custom designed to suit our country's tropical climate, it is logical to research on Green Mark which is the only rating tool operating in tropical climate prior to GBI. However, Green Mark prioritises on energy and water efficiency, customized to Singapore's situation. Malaysia differs in this situation thus it can be concluded that rating systems of different countries depends on the country's situation and allocation of resources (MBAM, 2008).

2.6 Benefits

2.6.1 Higher Asset Value

Enhancement of building values is always the main focus of investors. Unfortunately, many in the property investment market remain oblivious to the ability of green design in boosting asset values due to lack of sustainability awareness. Lack of demand for green/GBI-certified buildings is no longer a viable excuse as studies showed that there is increasing demand for green developments over the years (McGraw Hill Construction, 2013). Due to the novelty of green buildings in Malaysia, the increase in selling price could not be established. However, an equivalent study discovers that U.S. green buildings achieved a 64% higher sales price (Burr, 2008). Evidence from a study done by NAPIC concluded that green buildings command higher rentals compared to their conventional peers, increasing from RM 0.50 to RM 2.25 per square feet (NAPIC, 2008). Studies consistently shows that the features of green buildings are translating into higher value in the form of higher rentals, increased sales price, higher occupancy rates, lower operating expenses, increased net operating income, lower capitalization rates and better worker productivity (Institute for Building Efficiency, 2015).

In spite of that, doubts are shown in a study on economic returns to green building investment, especially in the residential sector. Results from the study shows that green investments do not directly improves the financial performance of residential developers. The green price premium is realised largely on resale transactions and lesser during presale stage (Deng and Wu, 2014). There is also possibility of a decrease in asset value as shown in a study conducted in Japan. The authors found evidence showing that prices of green condominiums had been lowered by 5-10%. The ubiquity of energy efficiency appliances and equipment in Japan was one of the reasons that energy efficiency is not viewed as an important aspect in building design (Yoshida and Sugiura, n.d.).

Critical Review: The author of this study sides with the argument that GBI certification boost building values as it enhances its aesthetical value. In terms of

investment, green buildings actually generate more benefits to the end-users rather than to the developers. End-users can enjoy the savings on lifecycle costs provided by green buildings while developers have to pay higher upfront costs for the certification of green buildings. The only remedy the developers may get is by transferring the upfront costs to the end-users by increasing green building prices. However, the lifecycle costings may be able to offset the initial costs over the long run. Thus it depends on the users' perspectives on the worth of the building. Thorough research has to be carried out on this issue to justify the long term benefits of green buildings. Investors of green buildings can also achieve higher resale prices and rentals than their conventional counterparts. The situation in Japan may not be applicable in Malaysia as energy efficient equipment and appliances are not fitted in most buildings locally. Old buildings require retrofitting of energy efficient appliances which cost quite a significant amount, thus it might be better off to upgrade a building by applying GBI certification.

2.6.2 Cost Savings

The major factor that can differentiate green buildings and their conventional counterparts are the cost savings throughout the green building's lifecycle. Reduction in energy and water consumption are the main contributors to cost savings which are the criteria included in most green building rating systems including GBI. Green buildings are capable of offering better economic advantages compared to conventional buildings in terms of cost savings through energy and water conservation, waste reduction, operational and maintenance cost reduction, production gains and also improvement of occupant's health (Rahardjati et al., 2010). Evidence from study carried out shows that green buildings saved up to 10% in operating cost. Significant energy and cost savings actually shortens the average payback period ranging from 2 to 8 years for Green Mark certified buildings (CCAP, 2012). Consistent studies show that energy savings of green buildings was found to be RM 0.16 per square feet in Malaysia (NAPIC, 2008). The typical payback time is around 3 years solely based on operational savings (Reimann, 2014).

Table 2.4 Green Benefits and Cost

Green Building Index Rating	BEI kWh/m2/year	Energy Savings %	Incremental construction cost %
Average Malaysian Building	250	Base	Base
Meets MS1525	200 - 220	10 - 20	1 - 3
GBI Certified	150 - 180	30 - 40	5 - 8
GBI Silver	120 - 150	40 -50	8 - 12
GBI Gold	100- 120	50 – 60	12 - 15
GBI Platinum	<100	> 60	>15

Source: (GBI, 2010)

*The above table is solely for non-residential buildings

The table above shows that a GBI Platinum building has the potential to achieve less than 100 BEI kWh/m2/year, raking in energy savings of more than 60% compared to non-green building. This shows that green developments are feasible as the additional green cost can be compensated by the savings of energy consumption. This value is a far cry from the index achieved by an average Malaysian building.

2.6.3 Health, Wellbeing and Productivity

The biggest beneficiaries of green buildings are the occupants as they experience higher well-being, improved productivity and lesser sick leaves although these benefits are difficult to quantify. In Malaysia, bulk of the operating expenses goes to the salaries of employees instead of rents and energy bills. The cost of greening an office can be economically justified even by just a modest improvement in staff's productivity, health and well-being. The total annual real property expenditure is usually 10% of the business operating costs whilst the staff costs can go up to 85 %. This implies that the biggest return on investment could be achieved when green buildings improve business productivity (Simon Powell, 2015). The advantages of green attributes had been proven in recent studies. Natural daylight improves

worker's productivity by 18%. Just by having better outdoor views, hospital stays can be reduced by 8.5%. High levels of indoor pollutants and low levels of fresh air contribute to Sick Building Syndrome. Nevertheless, SBS can be reduced by 70-85% if the building ventilation maintains indoor carbon dioxide levels to be similar to outdoor levels (WGBC, 2013).

On the other hand, we cannot be overly optimistic about the satisfaction and comfort of green buildings. A study in China proves that although green buildings bring greater satisfaction but that is not the case with comfort (Gou et al., 2013).

Much of the emphasis on green development has been placed on resource efficiency rather than users' satisfaction. Intense attention had been placed on the financial implications of going green while the human element which is the soul of a dwelling was forsaken. Green buildings should also aim on improving the comfort and wellbeing of occupants.

2.7 Barriers

2.7.1 Perceived Higher Upfront and Certification Cost

One of the main reasons that refrain stakeholders from incorporating green design or applying green building rating tools is the perceived high initial costs (Kubba, 2012). The higher costs of certified green buildings are due to lack of communication and knowledge gap in quantification of green development (Isa et al., 2013). A study also shows that professionals who are inexperienced in green development tend to increase the assumed cost of green buildings significantly. Many building professionals assumed that green buildings cause a rise in design and construction costs by 10-20% (with estimates going as high as 29%) compared to conventional buildings. Majority of certified green buildings actually displays an increase in cost ranging from less than 0% to 4% (WGBC, 2013). Misconceptions had misled stakeholders into believing that building green incurs significant cost while the actual

cost is not as high as what they presumed. They may be unaware that green costs are decreasing over the years due to improvement of technology and maturity in its development.

There are also those who were misguided that green building rating systems charges extremely high registration, accreditation and certification fees. Registration for GBI classification only requires the payment of a one-off-all-in fee which includes certification and site verification visits. The charges for every rating level are similar. LEED accredited professionals and Green Mark Manager fees had spiral downwards over the years and GBI Facilitator fees will also follow suit. One of the main reasons that refrain stakeholders from incorporating green design or applying green building rating tools is the perceived high initial costs (Kubba, 2012). The higher costs of certified green buildings are due to lack of communication and knowledge gap in quantification of green development (Isa et al., 2013). A study also shows that professionals who are inexperienced in green development tend to increase the assumed cost of green buildings significantly. Many building professionals assumed that green buildings cause a rise in design and construction costs by 10-20% (with estimates going as high as 29%) compared to conventional buildings. Majority of certified green buildings actually displays an increase in cost ranging from less than 0% to 4% (WGBC, 2013). Misconceptions had misled stakeholders into believing that building green incurs significant cost while the actual cost is not as high as what they presumed. They may be unaware that green costs are decreasing over the years due to improvement of technology and maturity in its development.

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Table 2.5 GBI Tabulated Fee Structure

SIZE OF PROJECT	TOTAL GROSS FLOOR AREA (m2)	REGISTRATION FEES (RM)
SINGLE RESIDENCE	Below 2,000	5,000
SMALL	Up to 4,000	8,000
INTERMEDIATE	4,001 to 10,000	10,000
MEDIUM	10,001 to 30,000	20,000
LARGE	30,001 to 50,000	32,000
EXTRA LARGE	50,001 to 100,000	45,000
MEGA PROJECT	Above 100,000	Assessment fee will be based on projects

Source :(GBI, 2013)

Based on the table above, the registration fee for a link house residential project is RM 5,000 per unit. However, it is misinterpreted that the developer will incur an extra cost of RM 5 million for a thousand units of link houses. Sabah REHDA (SHAREDA) has clarified this myth stating that development of 1,000 units of double-storey terrace houses with an area of 172 square metres each, it costs as low as RM 65 per unit (based on Mega Project charges) to register for GBI certification.

Accurate cost increase for GBI are hard to establish as the system is still relatively new, cost estimates can only be drawn from research data of other green rating systems, marking an increase of 3-15% depending of the level of certification (GBI, 2013).

As most buildings are sold on completion, the focus of the developer is narrowed down to reducing initial cost instead of reducing life cycle cost. Hence, even a tiny increase in cost of going green is considered expensive because the developers in the immature green building market of Malaysia worry that it might not add value to the building at the point of sale although figures from overseas show otherwise. Besides that, developer does not benefit from the operating savings once the building is sold. The end user is the one who will reap the benefits of green design. This is among the reasons as to why the developers are reluctant to venture

into green development. However, if there is demand of green buildings by end users, it will certainly motivate the business-conscious developers to follow market trend.

2.7.2 Insufficient Incentive for Adoption of GBI

In an effort to promote the usage of GBI, incentives such as tax exemption and stamp duty exemption have been introduced for buildings that were GBI-certified in any grade. For tax exemption, owners of GBI-certified buildings are eligible for tax exemption equivalent to 100% of the additional cost incurred to obtain GBI certification. It is also allowed to be set-off against 100% of the statutory income for each year of assessment. Purchasers of GBI-certified buildings and residential properties qualify to apply for stamp duty exemption on instruments for ownership transfer for such buildings. The amount of this exemption is on the extra expenditure incurred to obtain GBI-certification. Both of these incentives are only effective from 24 October 2009 until 31 December 2014 (KeTTHA, 2010). The proposal's effectiveness has lapsed since January this year. Without these inducements, stakeholders are less motivated to adopt GBI classification in their buildings.

2.7.3 Lack of Awareness, Education and Knowledge

Based on a survey done on RICS members and their engagement with the sustainability agenda, the major hurdles of applying green rating tools are lack of knowledge and expertise. Some maintained the belief that rating tools are too complex and inflexible. This reflects that insufficient education and training are provided in relevant matters (Dixon et al., 2008). This is consistent with the findings of relevant researches that emphasise on the value of knowledge in facilitating green development (Chan, Qian and Lam, 2009; Dimoudi and Tompa, 2008).

Majority of experienced building professionals currently in practice graduated from technical institutions decades ago where green developments were not that pertinent. These institutions do not offer any subjects focusing on sustainability issues. Current generation had been exposed to sustainable development in tertiary education, but they have problems in applying their knowledge in reality due to their inexperience (Zainul Abidin, 2010).

The author thinks that the scarcity of researches and literatures of green developments in Malaysia contributed to limited uptake of green developments. It is relatively harder to obtain information on green developments. Lack of reliable statistics on the cost and benefits of sustainable developments in Malaysia causes stakeholders to refrain from incorporating green elements in buildings as there is greater risk when diving into the unknown. Resistance to change also hinders green movement as stakeholders are used to traditional construction methods. Credible evidence is needed to convince these stakeholders to accept green technology and willing to assimilate sustainable issues. Government, educational institutions, professional boards; construction related companies should bear the responsibility of educating the stakeholders on the benefits of green development.

CHAPTER 3

METHODOLOGY

3.1 Introduction

Research methodology is a systematic way to solve a problem. It is a science of studying the process of carrying out a research. Alternatively, it can be defined as the steps undertaken by researchers in describing, explaining and predicting a phenomenon. It enables researchers to develop a work plan of the research. Research methodology constitutes: i) selecting a suitable method, ii) determining the accuracy of the results and iii) the efficiency of the method. There is always confusion between research methodology and research method. Research methods are different types of procedures and algorithms applied in research. Research methods are scientific, planned and value-neutral. These methods assist researchers in collecting data, samples and provide solution to a problem. On the other hand, research methodology involves theoretical frameworks which guide research practices. Research methodology concerns about the employment of correct procedures to discover solutions.

3.2 Research strategy

Research strategy is the way in which research objectives can be questioned. It is divided into two types, quantitative research and qualitative research.

Quantitative research is defined as an inquiry into a social problem, based on testing a hypothesis composed of variables, measured with numbers and analysed with statistical actions, in order to determine whether the hypothesis hold true. It is objective in nature. It is also conclusive. Quantitative research is non-descriptive, numerical and involves the application of mathematic.

Qualitative approach is concerned with subjective evaluation of opinions, behaviour and attitudes. It is descriptive, non-numerical and involves the application of reasoning. Qualitative research is classified into exploratory research and attitudinal.

3.3 Approaches to Data Collection

Two approaches, namely, fieldwork and desk study, can be adopted for data collection. The type of information and data needed and the nature of investigation influences the approach to be implemented. This study utilizes both approaches to gather data.

Fieldwork research also known as primary data collection includes the survey approach which is applied in this research. Survey research encompasses the following: the data is collected in the field instead in a laboratory setting; data organised by individual record but still applying various methods to collect data on the individual; a means of establishing the extent of the phenomena investigated by measuring information collected.

Data gathered through the desk study approach are secondary data as they are obtained from other sources. Literature review is a collection of journals, books, articles and other documents related to the research topic. Literature review assists researchers to obtain practical knowledge in investigating the problem. Researchers will be able to have a proper understanding on the topic chosen and examine the works of other researchers related to the topic. Although literature review is time consuming, it enables the author to understand the concept and to review the topic

investigated. Different perspectives on the development of green buildings, implementation of GBI and other relevant green building ratings can be identified through relevant searches by carrying out literature review.

3.4 Data Collection

3.4.1 Mixed Method Approach

Mixed method approach is a combination of several survey formats capable of enhancing response rates. The mixed method approach was adopted in this study because it integrates the best of quantitative and qualitative methods. Analyses from mixed methods probably produce research findings greater than the sum of their quantitative and qualitative components.

3.5 Data Collection Instrument

3.5.1 Survey Questionnaire

The survey format employed in this study was internet survey which is a form of self-administered survey questionnaire. Responses for self-administered questionnaires can be more thoughtful and reflective as respondents can complete the questionnaire at their own leisure. Internet surveys eliminate the cost of paper and questionnaire production. The geographic distribution and sample size have almost no cost implications on internet surveys. It is definitely speedier as the data collection period for this survey takes only 2 weeks to complete. Internet surveys also ensure that questionnaires are completed upon submission, reducing the chances of incomplete questionnaires.

The purpose of conducting this survey is to examine the perceptions of building professionals on the implementation and development of the GBI rating

system. This will justify whether GBI classification is generally accepted by the construction industry in Malaysia.

This questionnaire is designed to gather feedback on five sections – respondent's profile, perceptions, motivations, barriers and recommendations.

The questionnaires will be rated by respondents using the 5-point Likert scale. Likert scale is a psychometric response scale mainly used in questionnaires to understand respondent's preferences or extent of agreement with a statement or a set of statements. The responses are normally treated as ordinal data due to the fact that we cannot presume that participants perceive the difference between adjacent levels to be equal even though the response levels do have relative position. The usage of Likert scale as an interval scale implies that means and standard deviations can be used when interpreting results, however it was incorrect. Midpoints are added into the rating scale in order to increase the reliability and validity of the ratings (O'Muircheartaigh, 2015). This is advantageous so that neutral respondents will not feel being forced to express their opinion.

3.5.2 Semi-Structured Interview

Semi-structured interviews are chosen to conduct this research as it is able to complement, develop, expand, confirm and diversify the findings from the analysis of questionnaires. Survey questionnaires are inflexible in nature, but this disadvantage can be overcome by carrying out interviews. Open-ended questions that may arise during the interview can be posed, increasing flexibility. By adopting the interview method, higher quality data can be obtained, allowing more in-depth discussions to be carried out on the topic in question.

3.6 Data Analysis

3.6.1 Descriptive Analysis

Descriptive Statistics applies numerical and graphical procedures to summarize the data gathered in a clear and easily understood way. Large amount of data can be simplified by using descriptive statistics. The descriptive analysis applied in this research is percentages to analyse the general characteristics of respondents, namely, gender, profession, working experience and involvement in green building projects.

3.6.2 Relative Importance Index

The relative importance of the preference for GBI ratings or foreign rating systems; motivation factors; demotivation factors and recommendations for adopting GBI were established by using the Relative Importance Index (RII) method. The RII can be calculated using the following formula:

$$RII = \frac{5N5 + 4N4 + 3N3 + 2N2 + N1}{5(N5+N4+N3+N2+N1)}$$

Figure 3.1: Relative Importance Index

Where:

N1 = Number of respondents answered “Strongly Disagree/Most Effective”
N2 = Number of respondents answered “Disagree/Quite Effective”
N3 = Number of respondents answered “Neutral/Moderately Effective”
N4 = Number of respondents answered “Agree/Slightly Effective”
N5 = Number of respondents answered “Strongly Agree/Not Effective”

3.6.3 Cronbach's Alpha

Cronbach's alpha is a reliability test which only requires a single test administration to furnish a unique estimate for the reliability of a given data. It is an average value of the reliability coefficients obtained for all the possible integration of the items. The reliability coefficient ranges from 0 to 1. The closer the reliability coefficient is to 1.0, the greater is the internal consistency of the items in the rating scale. The size of the alpha can be determined using the formula $\alpha=rk/[1+(k-1)r]$ whereby k is the number of items under consideration and r is the mean of the inter-item correlations (Gliem and Gliem, 2003).

3.7 Research Methodology Process

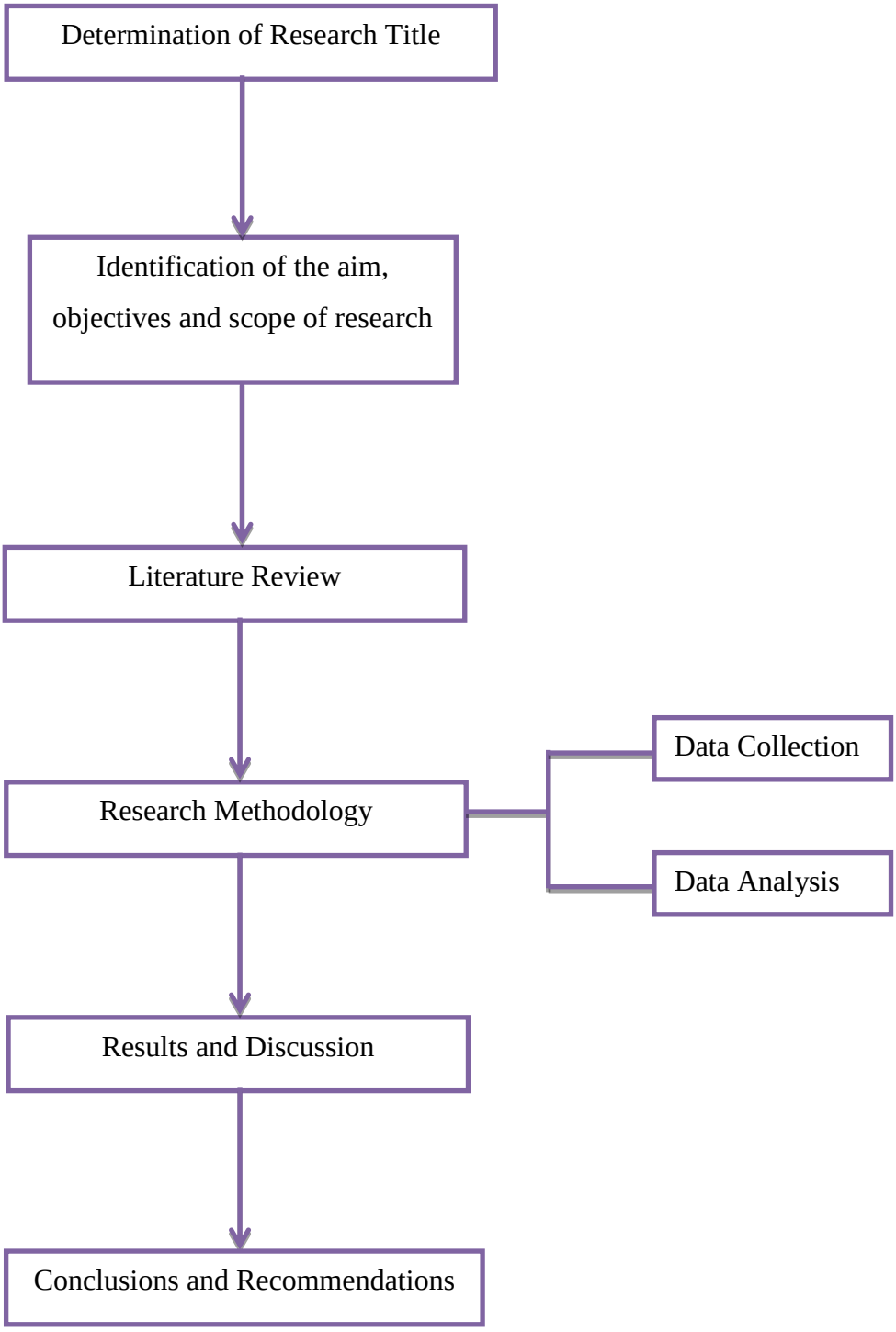
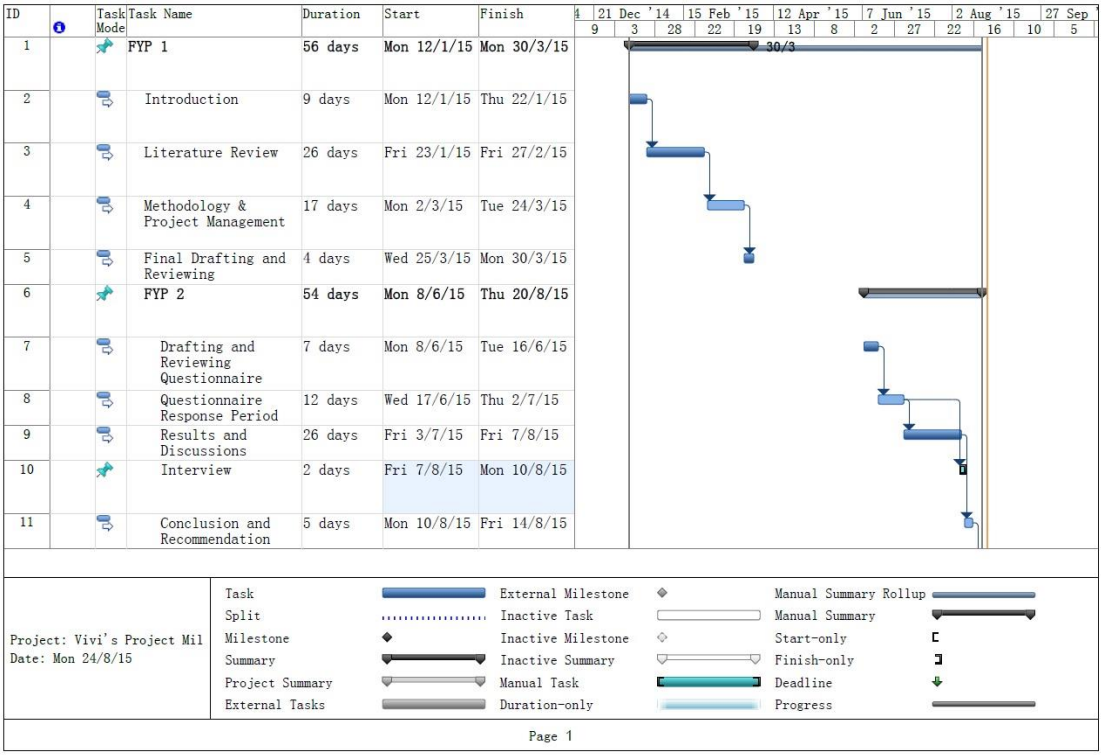


Figure 3.2: Research Methodology Process

3.8 Project Milestones



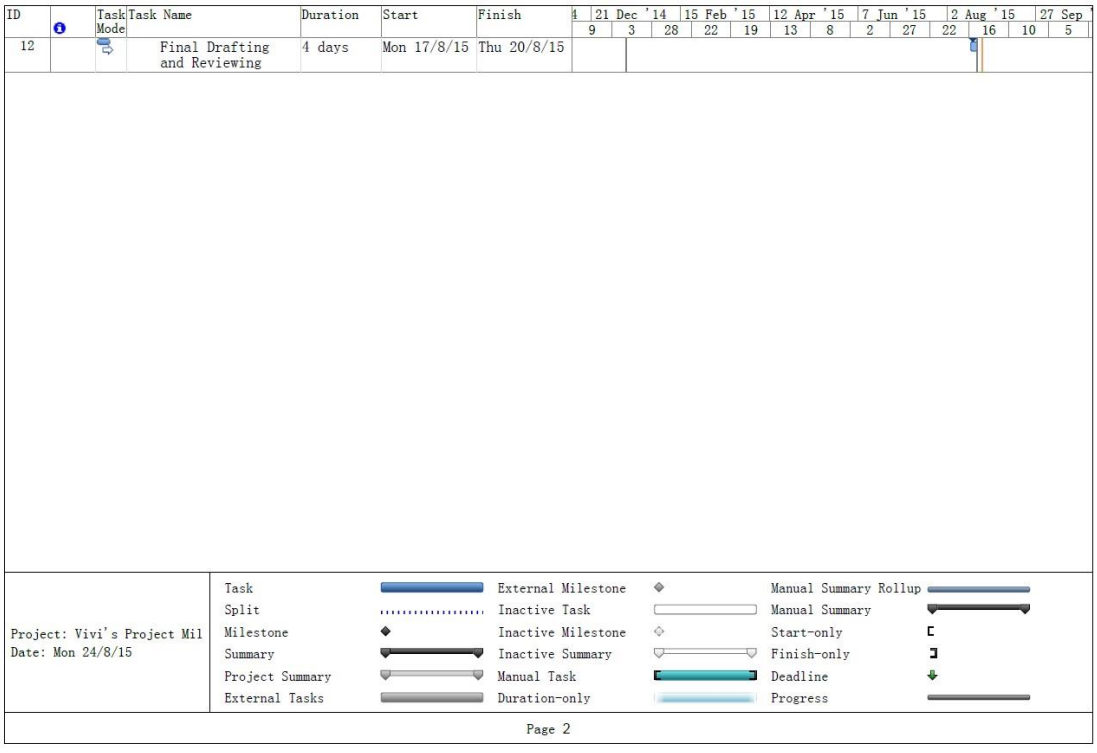


Figure 3.3: Project Milestones

CHAPTER 4

ANALYSIS AND DISCUSSION

4.1 Introduction

This section highlights the results obtained from the data collected and discussion of the findings. There will be five sections of data analysis and discussion based mainly on respondents' responses with regard to background, perceptions, motivations, barriers and recommendations.

4.2 Respondents' Background

A total of 100 sets of questionnaire have been sent out to different professionals in the construction industry of Malaysia via internet survey. The response rate of the data collected is 63% equivalent to 63 sets. The following section shows the distribution of the 63 respondents in terms of profession, working experience, involvement in green projects, involvement in GBI rated projects and experience as a GBI Accredited Facilitator.

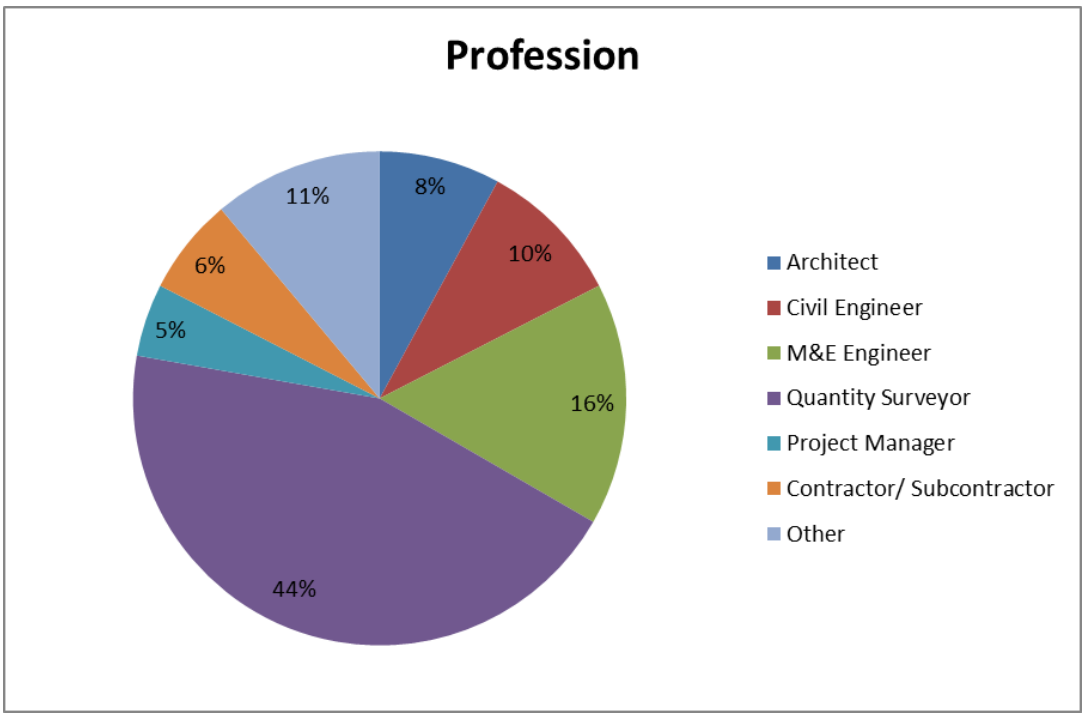


Figure 4.1: Professions

As shown in Figure 4.1, most of the respondents that completed the questionnaire are Quantity Surveyors (44%). The second highest group of respondents are M&E Engineers (16%), followed by Civil Engineers (10%), Architects (8%), Contractors/Subcontractors (6%) and Project Managers (5%). Around one-tenth of the respondents are sustainability and green building consultants (11%), providing valuable insights into matters related to GBI.

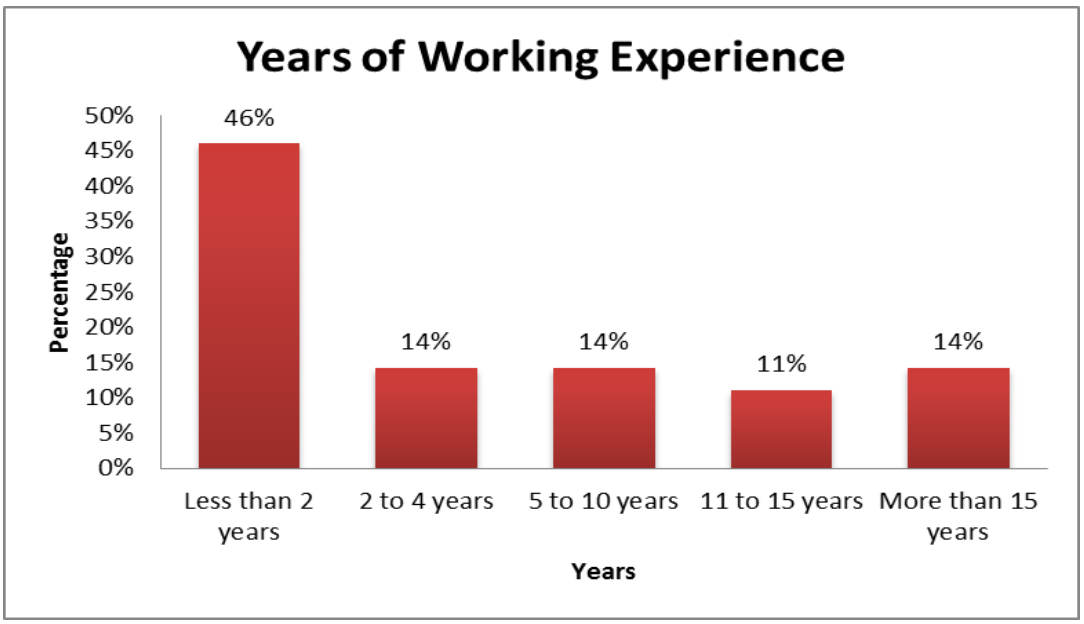


Figure 4.2: Years of Working Experience

The numbers of years of working of the respondents were summarized in Figure 4.2. The chart indicated that most of the respondents have worked less than 2 years in the industry (46%). Respondents with 2-4 years, 5-10 years and more than 15 years of working experience have the same percentage at 14%. Only 11% of the respondents have worked in the industry for 11-15 years. Although experienced professionals' may provide more reliable data, perspectives from the younger generation can also prove its worth as green building rating tools are still relatively new in Malaysia.

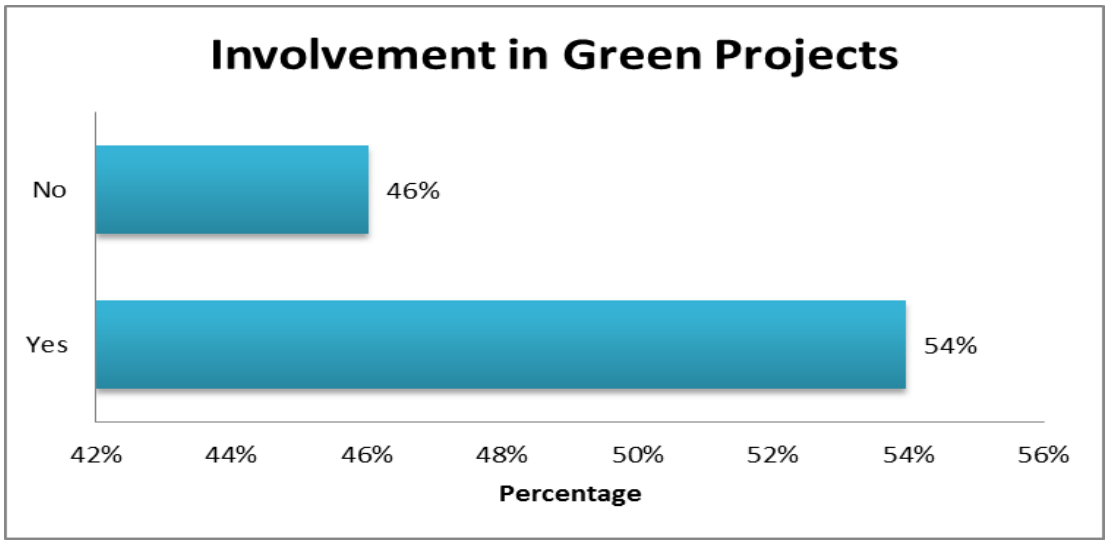


Figure 4.3: Involvement in Green Projects

Figure 4.3 shows that a higher percentage (54%) of building professionals were involved in green projects, increasing the reliability of data as they have the experience of handling green projects. The green projects that they were involved in include foreign green rating systems and other green systems other than the local GBI system, providing insights on the similarities and differences between the rating systems.

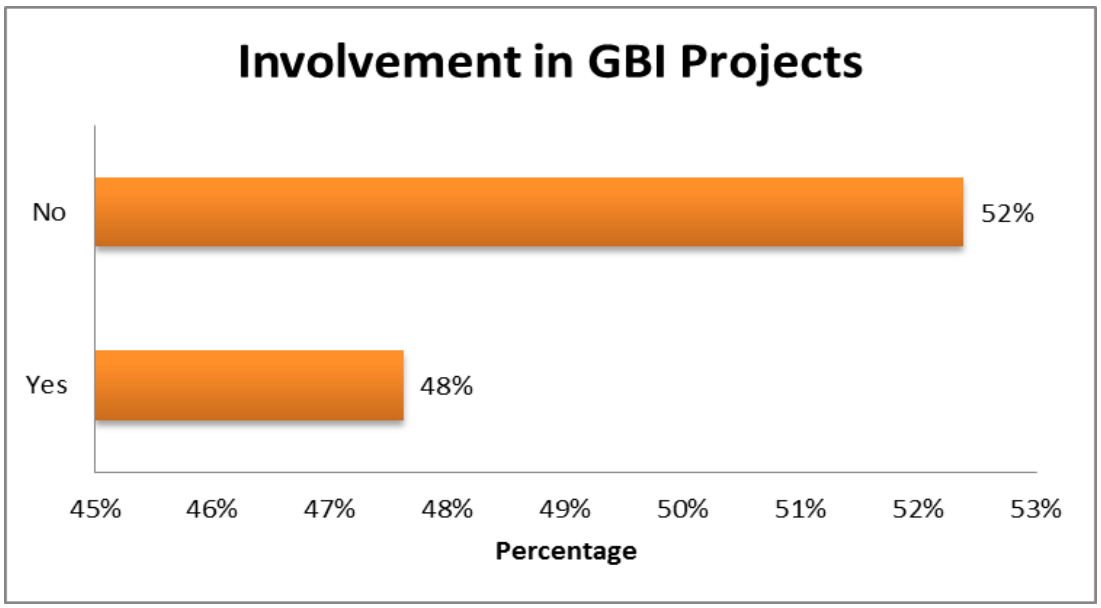


Figure 4.4: Involvement in GBI Projects

The results shown in Figure 4.4 confirmed that practical application of GBI is extremely limited in Malaysia. 52% of respondents indicated that they had no practical experience in handling GBI projects while individuals who were involved in GBI projects consists of 48%. This study therefore, represents the unbiased impressions of both experienced and inexperienced respondents as they are almost equally distributed.

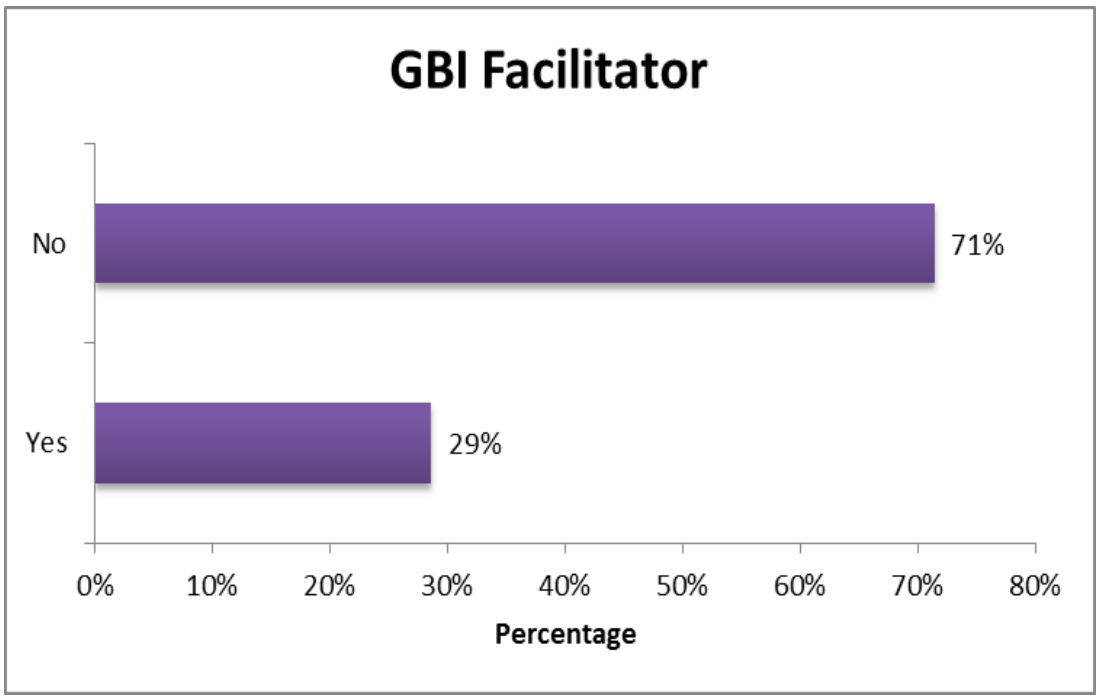


Figure 4.5: GBI Facilitator

Figure 4.5 shows the distribution of the respondents on their participation as a GBI Facilitator. Only a minority of the respondents (29%) are a GBI Registered Facilitator. They are professionals who assist the employer and the design team to improve their project in order to achieve or exceed GBI rating system requirements, thus they are proficient in terms of the procedures, facilitation and requirements of GBI.

4.3 Perceptions

4.3.1 General Perceptions

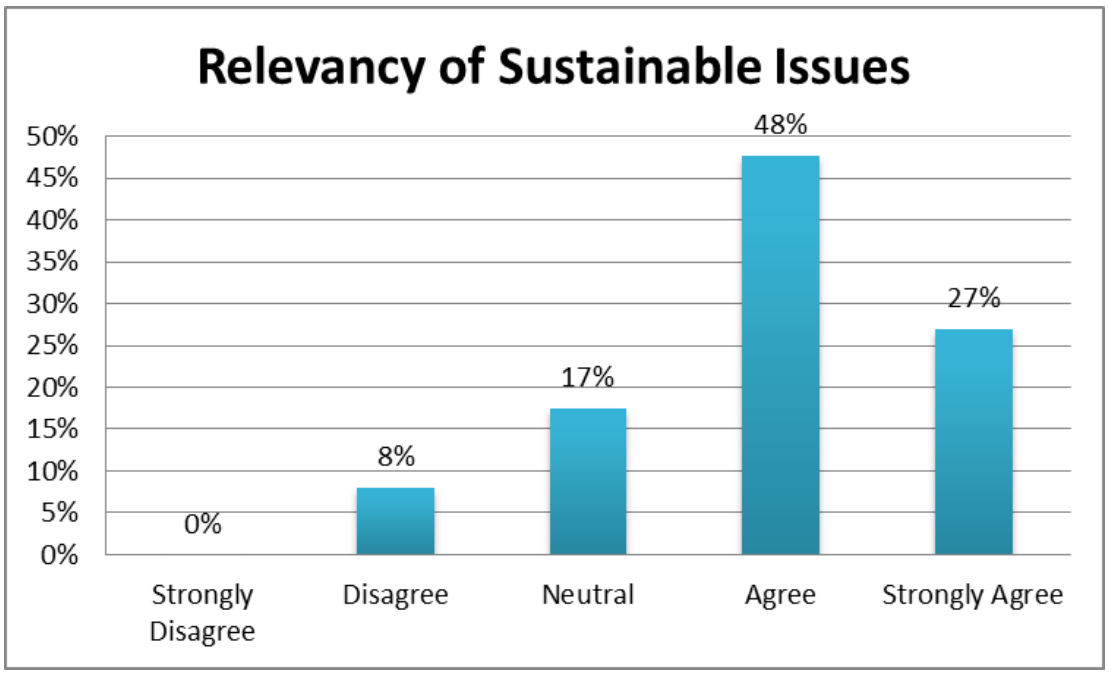


Figure 4.6: Relevancy of Sustainable Issues

As illustrated by Figure 4.6, three-quarters of respondents 'agreed' or 'strongly agreed' that sustainability issues are relevant to their profession. A further 17% of respondents stand neutral on this issue while 8% of respondents disagreed with the statement. There is no strong disagreement shown by the respondents.

This resonates with the findings in a global survey of RICS members where majority of the participants stated that sustainability issues are 'totally' or 'substantially' relevant to their profession (Dixon et al., 2008). Perhaps this is due to the potential of the construction industry in contributing significantly to the creation of a sustainable environment.

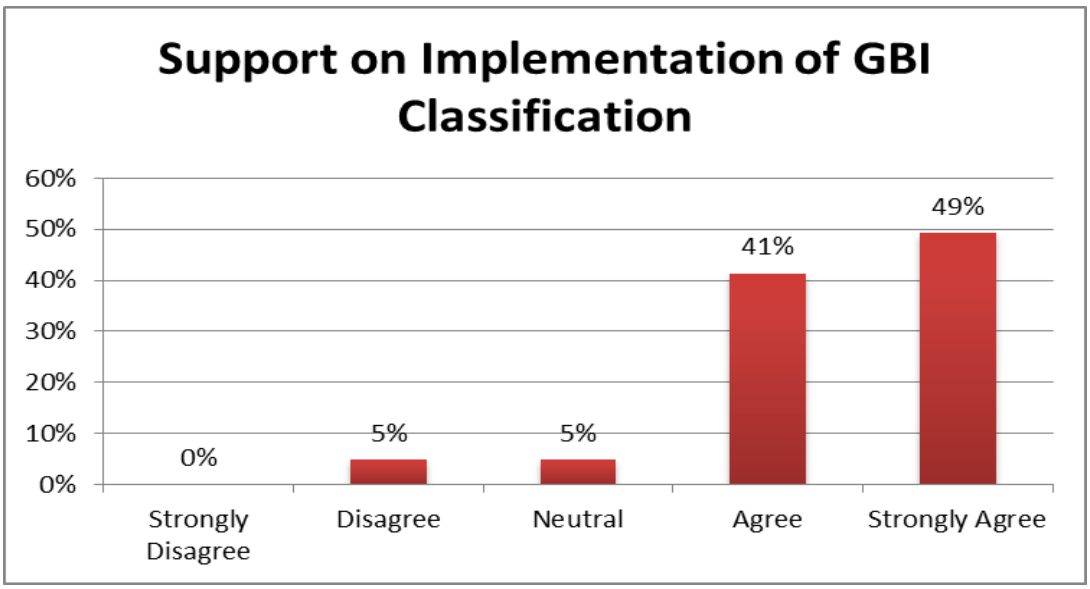


Figure 4.7: Support on Implementation of GBI Classification

Figure 4.7 shows the support of the implementation of GBI classification by construction professionals. It can be observed that generally the professionals have a positive attitude towards GBI classification as 90% of the respondents 'agreed' or 'strongly agreed' on the adoption of GBI classification. Only a small fraction of respondents stand neutral or disagreed with the application.

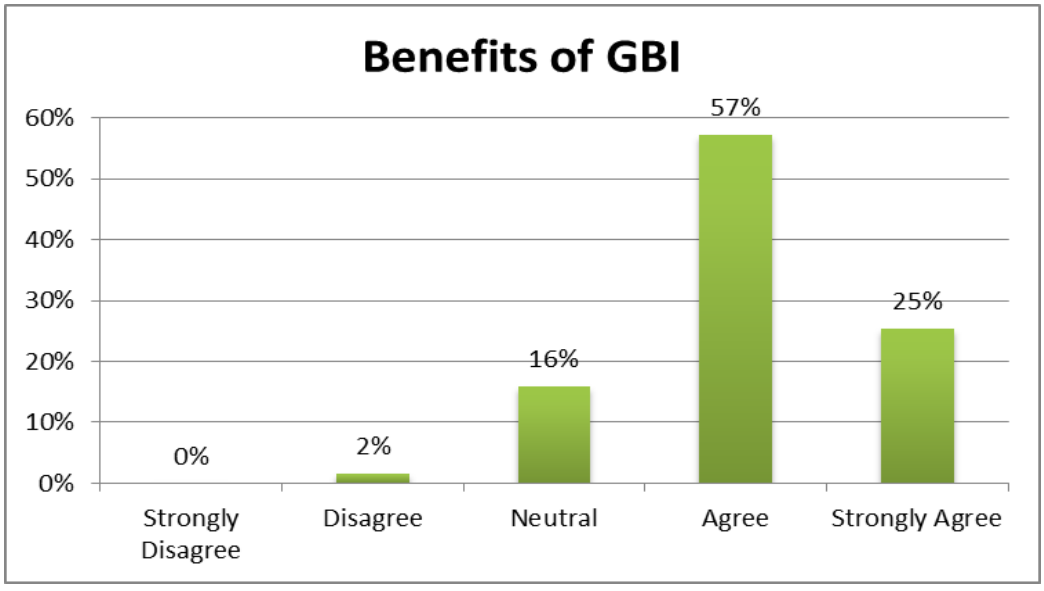


Figure 4.8: Benefits of GBI

As evident in Figure 2.8, majority of the respondents (57%) agreed that GBI classification is beneficial to society in terms of economic, social and environmental

aspects. One-fourth of the respondents are convinced that GBI classification has great potential and strongly agreed that such benefits can be contributed by GBI classification. 16% of the respondents have no opinion on the statement. Only 2% of respondents disagree and have doubts on the possibility of such benefits becoming prevalent. Strong disagreement is not shown among the respondents.

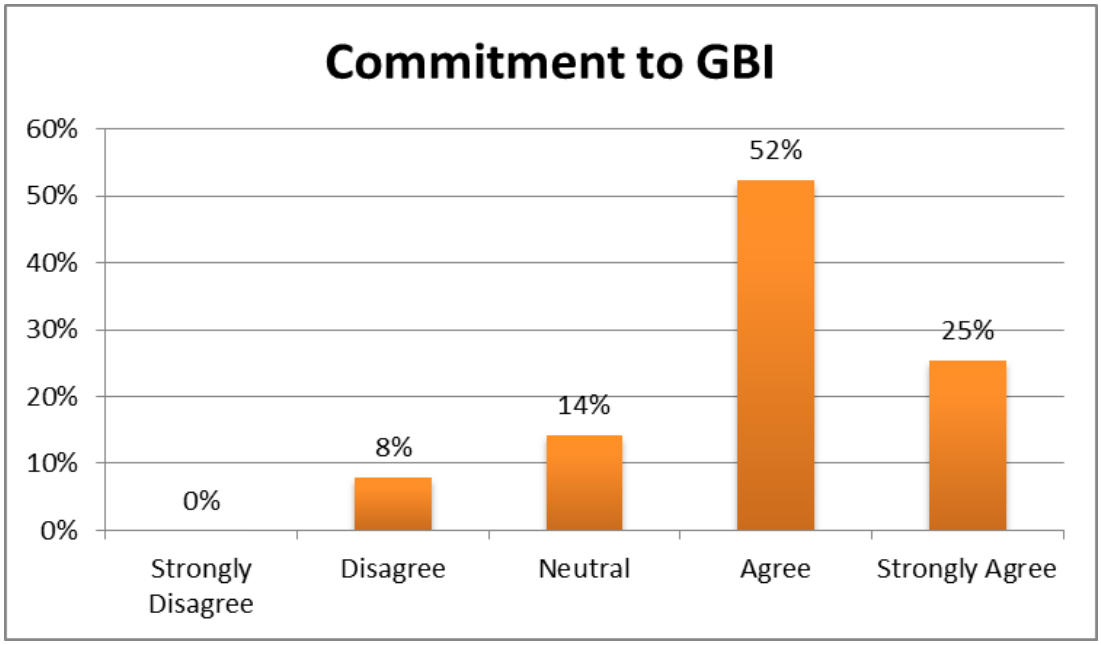


Figure 4.9: Commitment to GBI

As shown in Figure 4.9, more than half of the respondents are willing to recommend and commit to the use of GBI ratings in construction projects if they are given the opportunity. Strong agreement is shown by one-fourth of the respondents. 14% of respondents stand neutral on this issue followed by 8% of respondents who show disagreement.

This is an encouraging result showing that professionals are willing to spend their time and effort in contributing to national good.

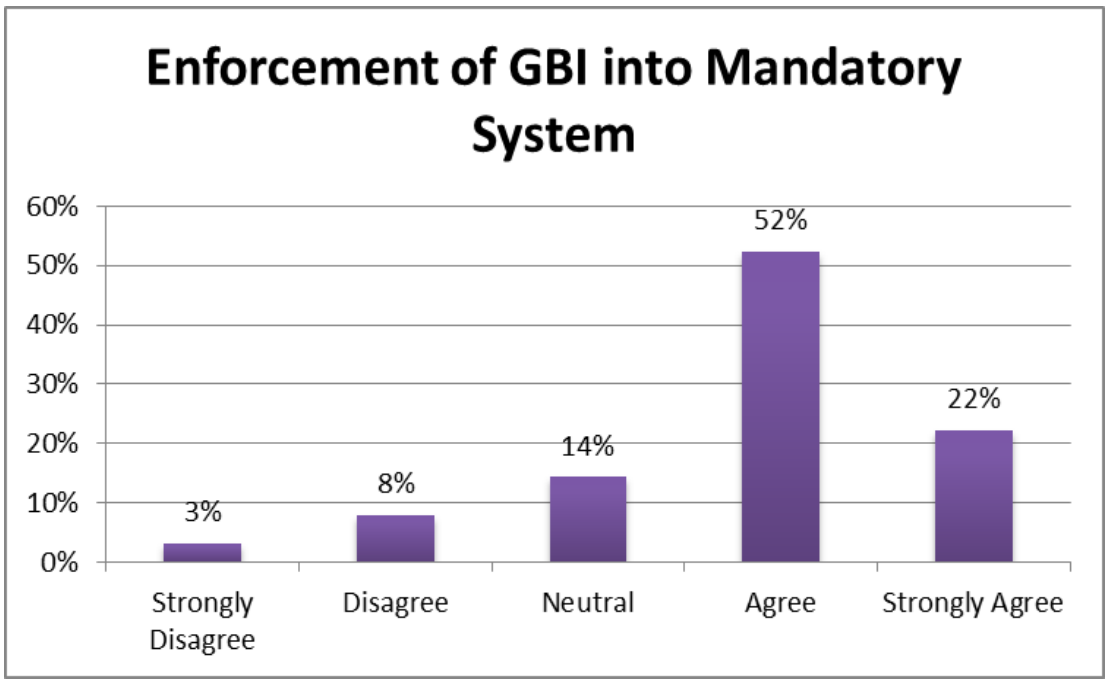


Figure 4.10: Enforcement of GBI into Mandatory System

Figure 4.10 shows the respondents' agreement in making GBI assessment into a mandatory building system. GBI classification has yet to be legislated but it seems that the professionals have a positive response on this issue. About 74% of respondents indicated that they 'strongly agreed' or 'agreed' on legislating GBI rating system. No opinion had been shown by 14% of respondents. 11% of the respondents opposed the legislating of GBI rating system with 8% disagreeing and 3% strongly disagreeing.

4.3.2 Preference of GBI Ratings and Foreign Green Ratings

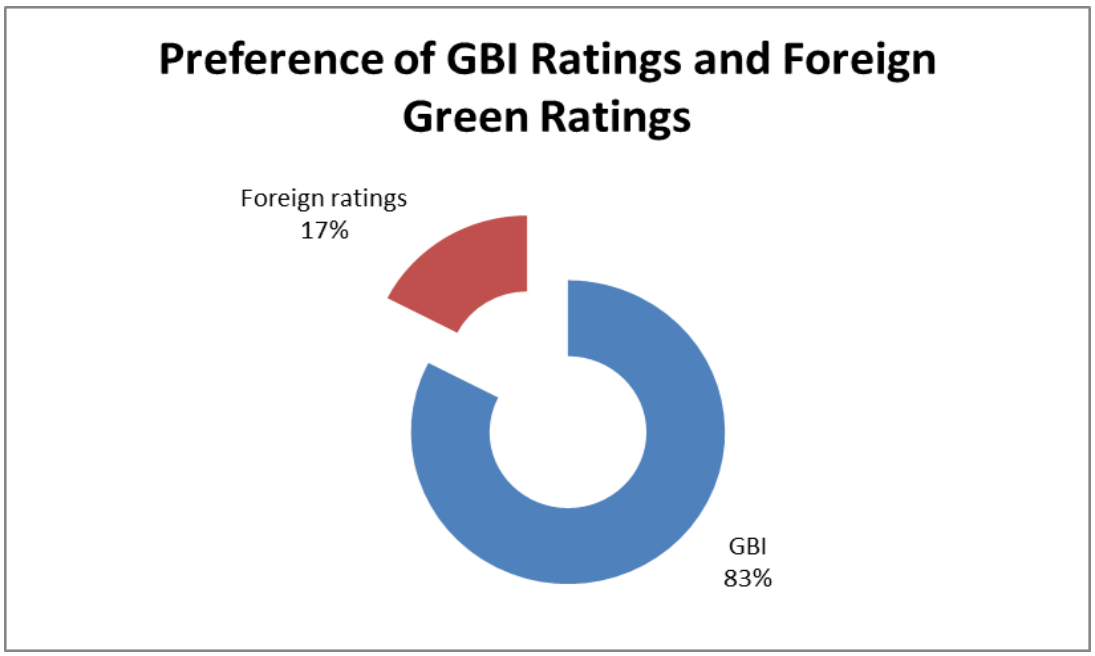


Figure 4.11: Preference of GBI Ratings and Foreign Green Ratings

The preference of GBI ratings and foreign green ratings by the respondents are illustrated in Figure 4.11. Majority of the respondents (83%) perceived that GBI rating systems will be more appropriate to be applied in Malaysia as compared to foreign rating systems which are preferred by 17% of the respondents. The reasons of their choice are shown in the following paragraphs.

Table 4.1 Reasons for Selecting GBI Ratings

Reasons	Degree of Importance					Importance Index	Overall Rank
	5	4	3	2	1		
Custom designed to suit local culture	18	26	6	2	0	0.8308	1
Better communication	12	27	9	4	0	0.7808	2
To reinforce the roles of local experts	12	25	11	3	1	0.7692	3
Easier administration	8	24	16	4	0	0.7385	4
To prevent outflow of cash to other countries	12	15	19	2	4	0.7115	5
To prevent rating system from being dictated by foreign bodies	9	18	16	4	5	0.6846	6

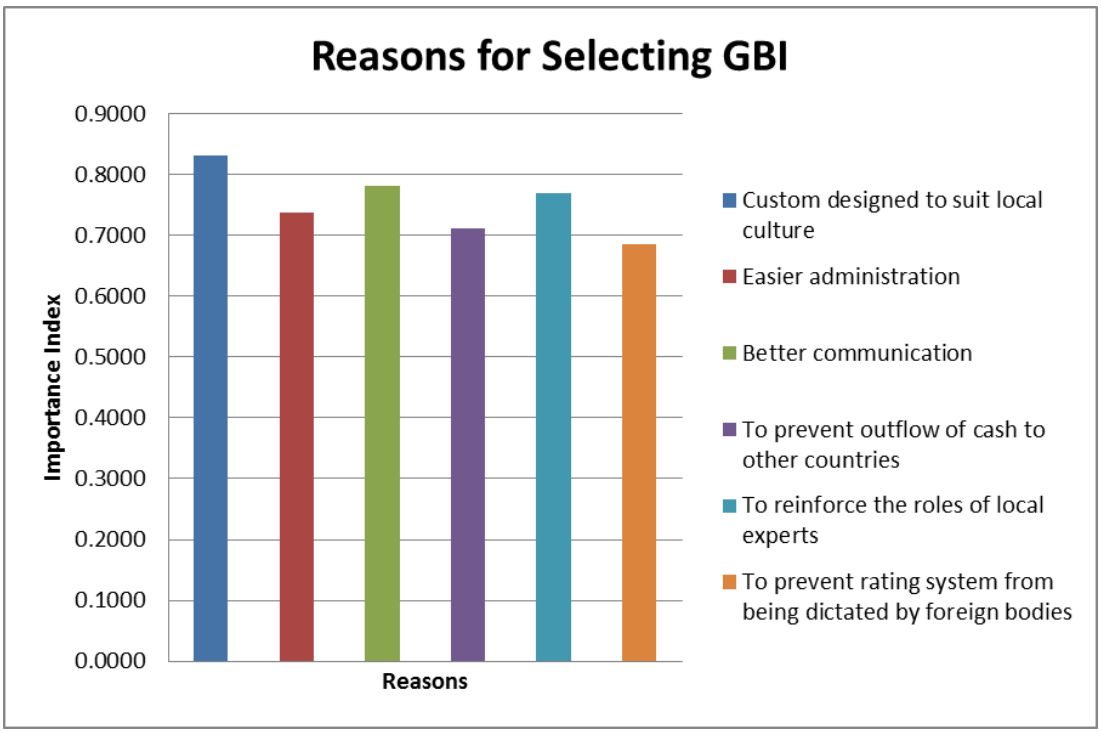


Figure 4.12: Reasons for Selecting GBI Ratings

The relative importance index for the reasons for selecting GBI rating system as a more suitable green rating system in Malaysia are illustrated in Table 4.1 and Figure 4.12. *Custom designed to suit local climate* was chosen by the respondents as the most important reason for selecting GBI rating. Many adaptations have been made to green building rating systems for several reasons, but the prominent reason is to reflect differences between the climate, culture and environmental issues in the specific regions. Malaysia's situation is similar to Singapore as both countries are located near the equator. Thus, Green Mark acted as a basis for the GBI framework. However, Singapore's Green Mark focuses more on water and energy efficiency, customized to Singapore's situation. Malaysia requires its own green rating system which is suitable to local condition (MBAM, 2008).

Better communication was ranked second among the reasons for selecting GBI with an importance index of 0.7808. GBI rating system was developed locally by Pertubuhan Arkitek Malaysia (PAM) and Association of Consulting Engineers Malaysia (ACEM). The GBI Facilitators and GBI Commissioning Specialist are all local professionals from the construction industry. Better communication can be achieved between client and design teams who are familiar with the local procedures

and conditions and they can understand information that is communicated to them by the local GBI consultants.

Table 4.2 Reasons for Selecting Foreign Ratings Systems

Reasons	Degree of Importance					Importance Index	Overall Rank
	5	4	3	2	1		
Perceived to be better quality systems	7	4	0	0	0	0.9273	1
Global acceptance by the practitioners	6	5	0	0	0	0.9091	2
Readily available databases and experience	7	3	1	0	0	0.9091	2
International recognition by all parties	5	6	0	0	0	0.8909	3

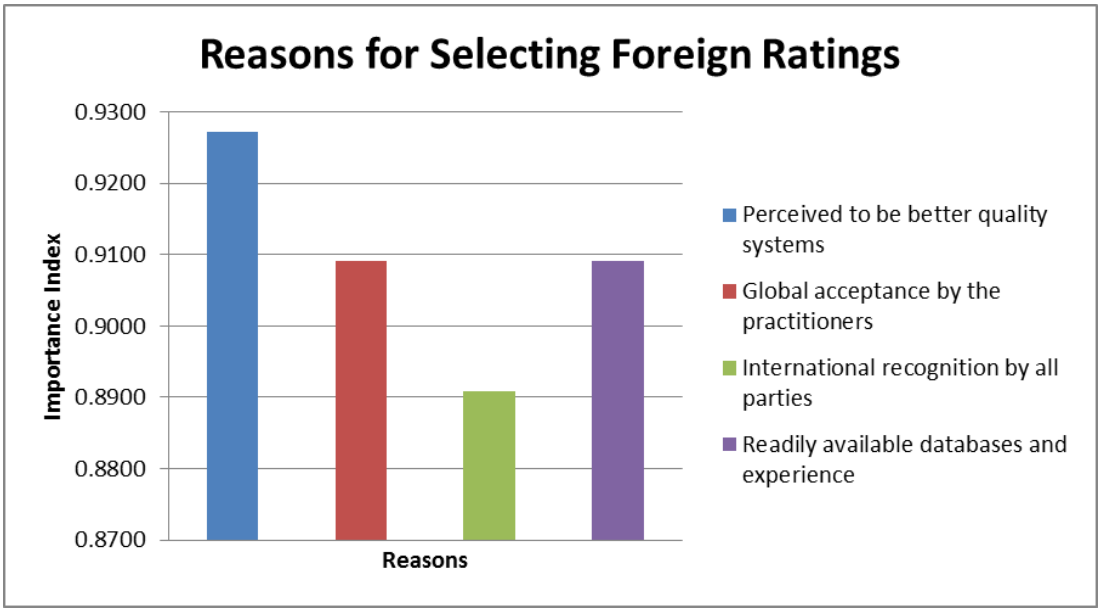


Figure 4.13: Reasons for Selecting Foreign Ratings Systems

As evident in table 4.2 and Figure 4.13, the main reason for selecting foreign ratings over GBI is that it is *perceived to be a better quality system*. Foreign green rating systems such as LEED and BREEAM have been long established while GBI is still in its infancy. GBI itself have been modified and adopted from earlier models of green rating systems such as LEED and Green Mark that originated from other countries. Most foreign rating systems are time-tested and practitioners are aware of their workability, limitations and drawbacks. This familiarity leads to

administrative and cost efficiency and minimizes problems, thus high quality systems are achievable.

The reasons *global acceptance by the practitioners* and *readily available databases and experience* both ranked second followed by *international recognition by all parties* which ranked fourth with an importance index of 0.8909. The author is of the opinion that the reason being many new green rating systems are adapted based on LEED and BREEAM rating systems. It provides a common foundation which makes it possible to be an internationally accepted rating system. LEED, BREEAM and Green Star are currently working towards developing common metrics which allow international stakeholders to compare buildings in different regions utilizing a 'global language' (Kennett, 2009).

4.3.3 Achievability of GBI Criteria

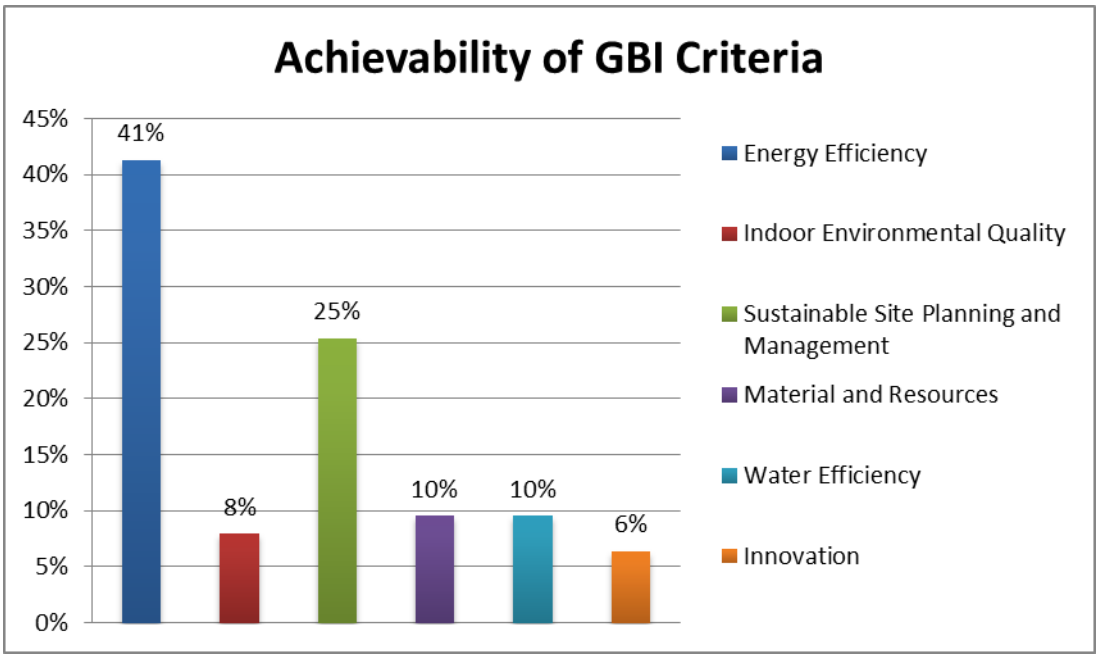


Figure 4.14: Achievability of GBI Criteria

Figure 4.14 presents the respondents' opinion on which criterion of the GBI rating system is the easiest to be attained. It can be observed that two-fifth of the

respondents thought that energy efficiency (41%) is the easiest to be achieved. This is possibly due to the common availability of energy efficient appliances and systems in the market. The second easiest criterion selected is sustainable site planning and management (25%). It seems that the respondents who chose this criterion is of the opinion that site planning, construction management, transportation and design can be achieved if proper care is taken. The criteria material and resources together with water efficiency are chosen by 10% of respondents. Apart from that, 8% of the respondents chose indoor environmental quality as the easiest criterion to be attained.

The results also indicates that most of the respondents thought that innovation criteria is the hardest to be achieved as only a tiny proportion of respondents chose innovation (6%) as the easiest to be achieved. A possible reason is that the innovation criterion requires a GBI Facilitator to be appointed. Another possible rationale is that innovative ideas and systems are hard to be acquired and requires extra time and effort to be achieved.

4.3.4 Popularity of GBI Ratings

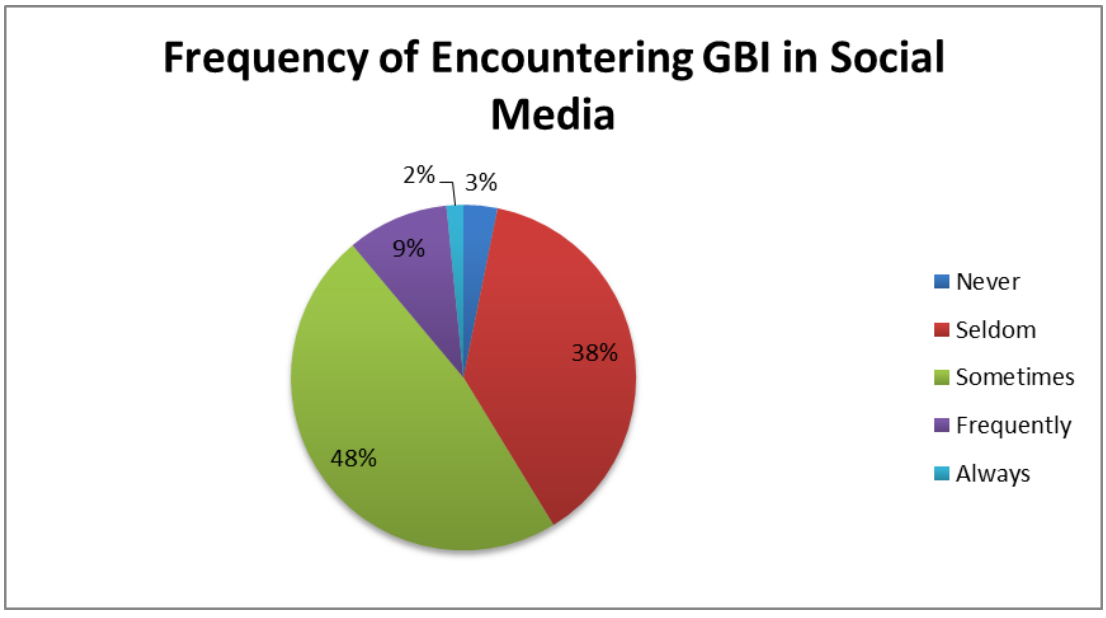


Figure 4.15: Frequency of Encountering GBI in Social Media

As shown in Figure 4.15, around 48% of respondents only encounter information pertaining to GBI from time to time through various social media. The second highest percentage of respondents (38%) stated that they 'seldom' come across GBI information in online articles, newspaper adverts and published materials. 9% of the respondents 'frequently' encounter GBI information while 3% of respondents 'never' stumble upon the relevant information of GBI. The smallest percentage of respondents (2%) 'always' come across particulars of GBI.

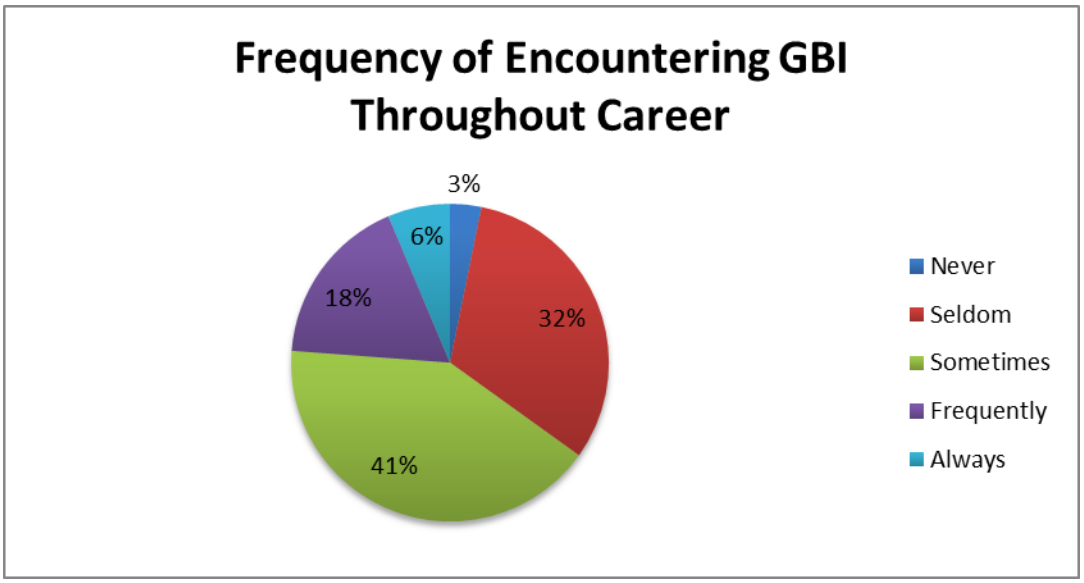


Figure 4.16: Frequency of Encountering GBI in Career

The frequency of encountering GBI information throughout the professionals' career is illustrated in Figure 4.16. 41% of respondents 'sometimes' come across GBI matters while 32% of respondents 'seldom' encounter information pertaining to GBI. 18% of respondents 'frequently' discover information about GBI in social media. 6% of respondents 'always' stumble upon GBI details. Only a minute percentage of respondents 'never' encounter details related to GBI.

Other than encountering GBI-related information in their line of work, professionals also have the chance to attend GBI-related seminars and workshops during their Continuous Professional Development (CPD) Program.

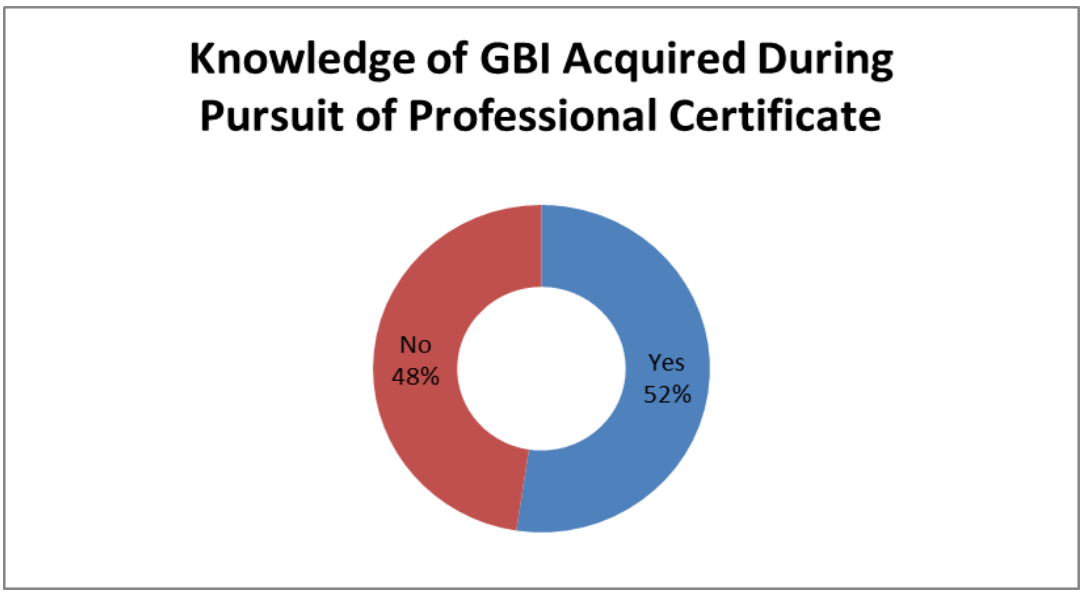


Figure 4.17: Knowledge of GBI Acquired During Pursuit of Professional Certificate

As evident in Figure 4.17, majority of respondents (52%) indicated that they had acquired knowledge pertaining to GBI during the pursuit of their degree, diploma or professional certificate. 48% of the respondents may consist of experienced building professionals currently practicing who graduated from technical institutions decades ago. Green developments were not that relevant during that period. This statement was stated in literature review.

Majority of the respondents had worked in the industry for less than 10 years, thus it's not unusual that their syllabus includes information pertaining to GBI rating system that was developed merely seven years back. However, only basic information relating to GBI is included in degree programmes while in-depth information is only available to the professionals in the seminars and workshops during their Continuous Professional Development (CPD) Program.

4.3.5 Motivations of GBI

Table 4.3 Motivational Factors

Motivational Factors	Degree of Importance					Importance Index	Overall Rank
	5	4	3	2	1		
Savings on building lifecycle and operation costs	26	28	6	2	1	0.8413	1
Promotion of environmental initiatives	19	32	10	1	1	0.8127	2
Improves occupant's health, wellbeing and productivity	17	32	9	5	0	0.7937	3
Better recognition for green buildings	7	39	13	4	0	0.7556	4
Financial incentives	9	36	12	5	1	0.7492	5
Higher asset value	12	26	22	2	1	0.7460	6
Enhanced marketability of GBI buildings	8	36	13	6	0	0.7460	6
Longer building lifespan	14	22	18	8	1	0.7270	8
Increased return on investment	8	30	18	7	0	0.7238	9
Demand for green buildings	9	29	15	10	0	0.7175	10
Assist in market transformation	4	35	17	7	0	0.7143	11
Priority reviews of GBI buildings	4	34	20	4	1	0.7143	11
Compliance with government regulations or building code	8	23	20	12	0	0.6857	13
Reduction in risk and liability of GBI buildings	1	25	26	9	2	0.6444	14
Increased density limit for GBI buildings	3	22	24	13	1	0.6413	15
Preferential interest rates offered by banks	4	20	20	16	3	0.6190	16

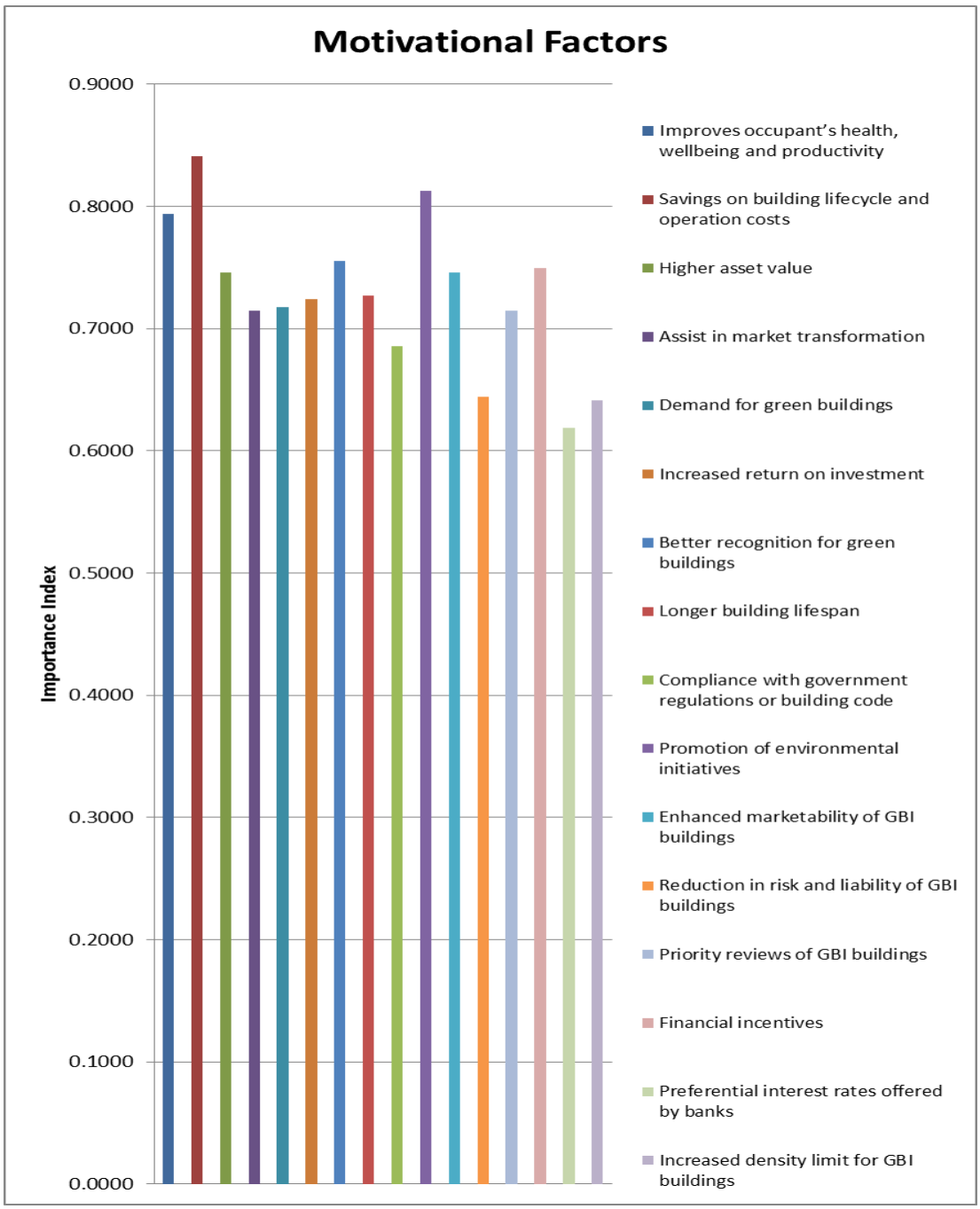


Figure 4.18: Motivational Factors

Table 4.3 and Figure 4.18 show the ranking results on the motivations for the professionals to apply GBI in their line of work. It can be observed that the motivations are quite equally distributed on both tangible rewards and intangible motivations. Monetary incentives or tangible rewards factors such as *savings on building lifecycle and operation costs, financial incentives, higher asset value, priority review of GBI buildings, preferential interest rates offered by banks* etc.

Intangible motivations include factors such as *promotion of environmental initiatives, improves occupant's health, wellbeing and productivity* etc.

Based on the results shown, the respondents revealed that they were highly motivated to adopt GBI in their work due to *savings on building lifecycle and operation costs,* which is ranked first with an importance index of 0.8413. The results coincide with a study carried out in Malaysia which states that the main advantage of green investment is the reduction of lifecycle cost and increase in the net profit of the building due to energy efficiency (Isa et al., 2013).

Promotion of environmental initiatives was ranked the second highest among the motivational factors with an importance index of 0.8127. GBI classification is promoted alongside with environmental measures in order to raise the public's awareness about the seriousness of the environmental issues currently faced globally. These issues are why the green movement get started in the first place as discussed in the literature review.

The third highest ranked motivational factor is *improves occupant's health, wellbeing and productivity* which achieved an importance index of 0.7937. It can be observed that the respondents realise that a moderate improvement in employees' health and productivity can have a major financial impact on the employers as mentioned in literature review.

Other than *savings on building lifecycle and operation costs* and *financial incentives,* other financial benefits such as indirect incentives are less appealing to the respondents as they were ranked relatively low among the 16 factors. Variables such as *priority review of GBI buildings, increased density limit for GBI buildings* and *preferential interest rates offered by banks* are ranked eleventh (RII=0.7413), fifteenth (RII=0.6413) and sixteenth (RII=0.6190) respectively. This led the author to believe that this is due to the absence of real monetary benefits in the market and provide further proof that practical application of GBI has not received support by the surrounding business environment. The results are similar to the findings of a research conducted in Japan for CASBEE buildings (Wong and Abe, 2014).

4.3.6 Demotivation Factors of GBI

Table 4.4 Demotivation Factors

Demotivation Factors	Degree of Importance					Importance Index	Overall Rank
	5	4	3	2	1		
Lack of awareness, education and knowledge	26	25	8	4	0	0.8317	1
Perceived higher upfront and certification cost	25	25	3	6	4	0.7937	2
Insufficient incentives	14	29	14	6	0	0.7619	3
Lack of demand for GBI certified buildings	12	26	9	13	3	0.6984	4
Difficulty in locating certified materials, equipment, labor skills and technology fulfilling GBI standards	8	28	15	10	2	0.6952	5
Complexity of GBI certification	11	24	11	15	2	0.6857	6
Time needed for GBI application and certification	8	24	21	7	3	0.6857	6
Lack of coordination and consistency in GBI system	9	23	19	10	2	0.6857	6
Overwhelmed by information and tools pertaining to GBI	5	23	19	15	1	0.6508	9
Confusion among different versions of GBI	4	25	10	17	7	0.6063	10

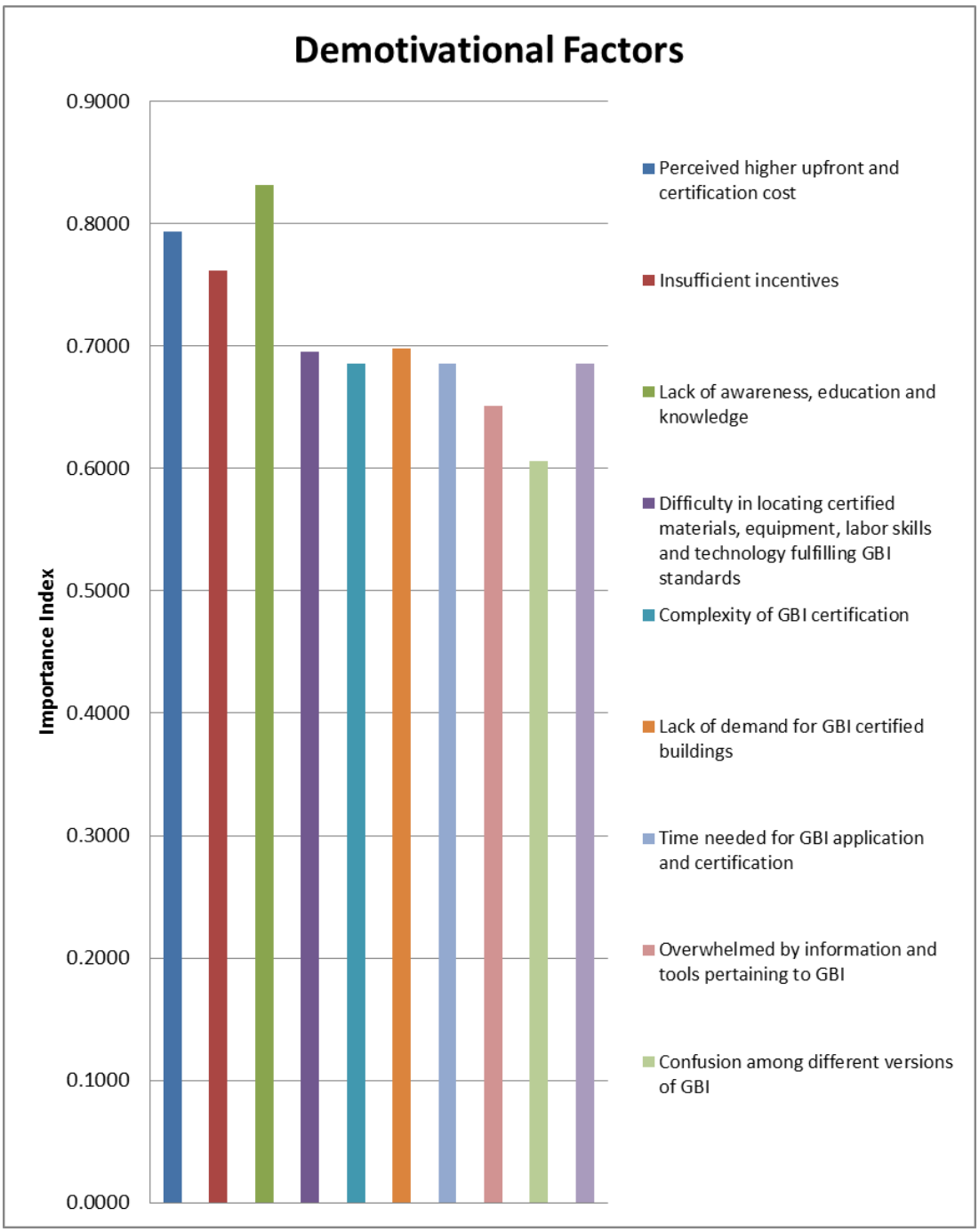


Figure 4.19: Demotivation Factors

The ranking results of the demotivation factors are illustrated in Table 4.4 and Figure 4.19. Similar to the results in the Japanese study of CASBEE buildings, *lack of awareness, education and knowledge* (RII=0.8317) is ranked first among ten demotivation factors. This factor prevailed possibly due to insufficient publicity of GBI rating system which leads to *lack of demand for GBI certified buildings*, which is ranked fourth with a RII of 0.6984. This also reveals that the professionals are

concerned about insufficient opportunities in the current business environment to absorb the diffusion of GBI rating system.

The second highest ranking barrier is *perceived higher upfront and certification cost* (RII=0.7937). This challenge had been quoted numerous times in articles and surveys as one of the major reasons that stakeholders are reluctant to adopt GBI in their projects (Kubba, 2012). More often than not, the first green building developed is plagued with significant learning cost and design problems such as delays and variation orders. Developers tend to keep things simple as experimentation with green building systems increases the project duration and time is equated to money in the construction industry. Besides that, the green price premium may not be easily realized. The buildings are presold or sold immediately after completion to buyers and the only reward the developers get is the lump sum paid. The developers can only get a fraction of the benefits of their energy efficiency investments while the cost of those investments are still paid by them (Deng and Wu, 2014). These are probably reasons as to why the stakeholders perceive green buildings to be expensive.

Insufficient incentives (RII=0.7619) ranked third among the demotivation factors. As mentioned in the literature review, the validity period for tax exemption and stamp duty exemption available for GBI-certificated buildings had lapsed since January 2015. Currently, there are no other known incentives offered by the government.

Factors such as *complexity of GBI certification* (RII=0.6857), *time needed for GBI application and certification* (RII=0.6857), *lack of coordination and consistency in GBI system* (RII=0.6857), *overwhelmed by information and tools pertaining to GBI* (RII=0.6508), *confusion among different versions of GBI* (RII=0.6063) ranked sixth to tenth respectively. It seems that the respondents are not of the opinion that the GBI system is troublesome and complex. The respondents' concerns about complexity of the system are put to rest due to the input of the GBI Facilitator who guides the entire GBI certification process.

4.3.7 Recommendations for GBI

Table 4.5 Recommendations

Recommendations	Degree of Importance					Importance Index	Overall Rank
	5	4	3	2	1		
Prioritize on public awareness and education on sustainable building practices	29	25	6	3	0	0.8540	1
Financial incentives	33	16	11	2	1	0.8476	2
Constant review, maintenance and upgrading of GBI system	19	32	6	5	1	0.8000	3
Incorporating GBI information into CPD	19	29	10	3	2	0.7905	4
Collect constructive feedbacks and advice from relevant parties	14	35	10	3	1	0.7841	5
Improve communications between building professionals and building owners	13	36	8	5	1	0.7746	6
Continual research on GBI rating system	13	37	7	4	2	0.7746	6
Implementing GBI classification as a mandatory system	21	21	12	7	2	0.7651	8
Setting up GBI facilities	13	33	10	6	1	0.7619	9

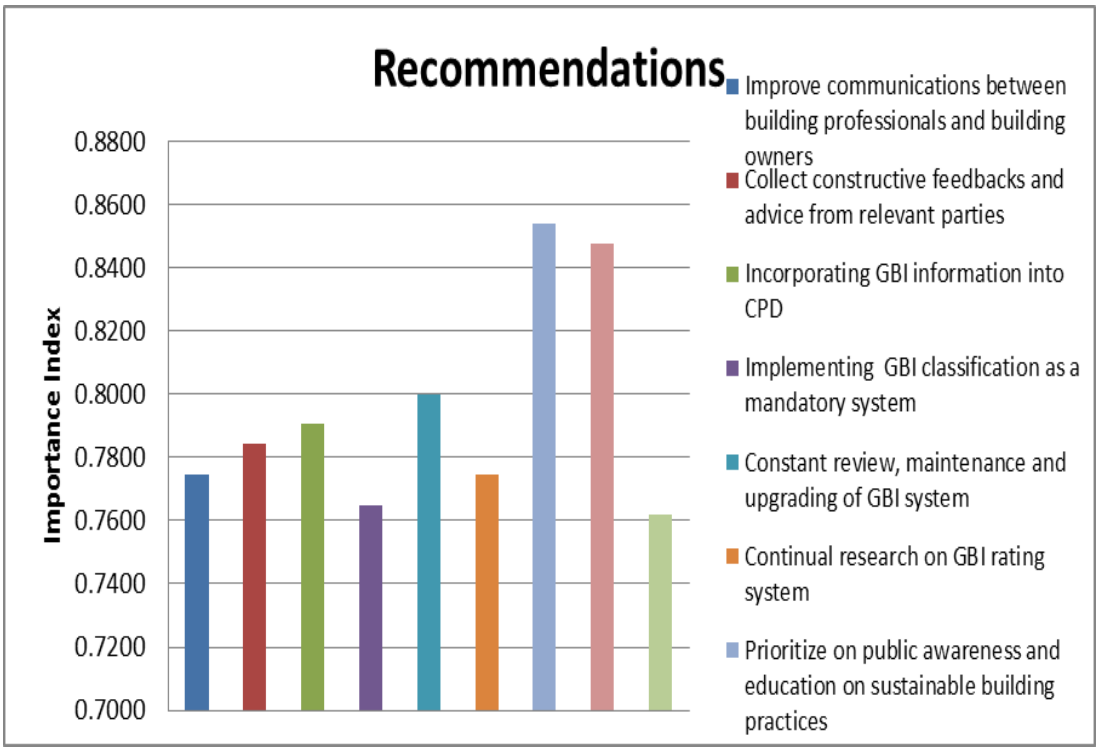


Figure 4.20: Recommendations

Table 4.5 and Figure 4.20 illustrate the respondents' opinion on the effectiveness of the recommendations in encouraging the implementation and development of GBI rating system. In Section 4.3.6, lack of awareness, education and knowledge is identified as the highest ranking demotivation factor. Thus, it's natural for the respondents to perceive that the most important strategy to be taken is to *prioritize on public awareness and education on sustainable building practices* (RII=0.8540). Promotional campaigns could be held with the joint efforts of the government, professional boards and building communities to allow for effective information diffusion. Raising awareness among the stakeholders is important to generate interest especially of project owners, who are able to create demand for green buildings when they endorse GBI system.

The second highest ranking strategy to be implemented is *financial incentives* (RII=0.8476). The lack of incentives had been a major barrier of implementing GBI system as illustrated in Section 4.3.6. Tax incentives and administrative incentives could be provided to create friendly business environments that can accommodate green building practices and overcome the challenges that hamper the development of GBI rating system.

Constant review, maintenance and upgrading of GBI system (RII=0.8000) were ranked the third among nine strategies. There may be a need of re-evaluating the compatibility and practicability of GBI system on a periodic basis in order for it to be updated and keep in pace with the construction industry.

It's surprising that the strategy *implementing GBI classification as a mandatory system* scored quite low in the rankings, only achieving a rank of eighth with an importance index of 0.7651. Perhaps the respondents are of the opinion that GBI certification is quite troublesome and requires extra time and effort to achieve. The author is of the opinion that this strategy is quite effective in accelerating the growth of GBI system. However, the programs should be streamlined to ensure efficiency and effectiveness of GBI system. *Setting up GBI facilities* was the most ineffective strategy to be applied as it had the lowest rank with an importance index of 0.7619. Setting up facilities around Malaysia requires additional costs and

manpower which may not be justified by the benefits of going green. It is also not practical to set up facilities around the country as most GBI-certificated buildings are located at the central region of the Peninsula.

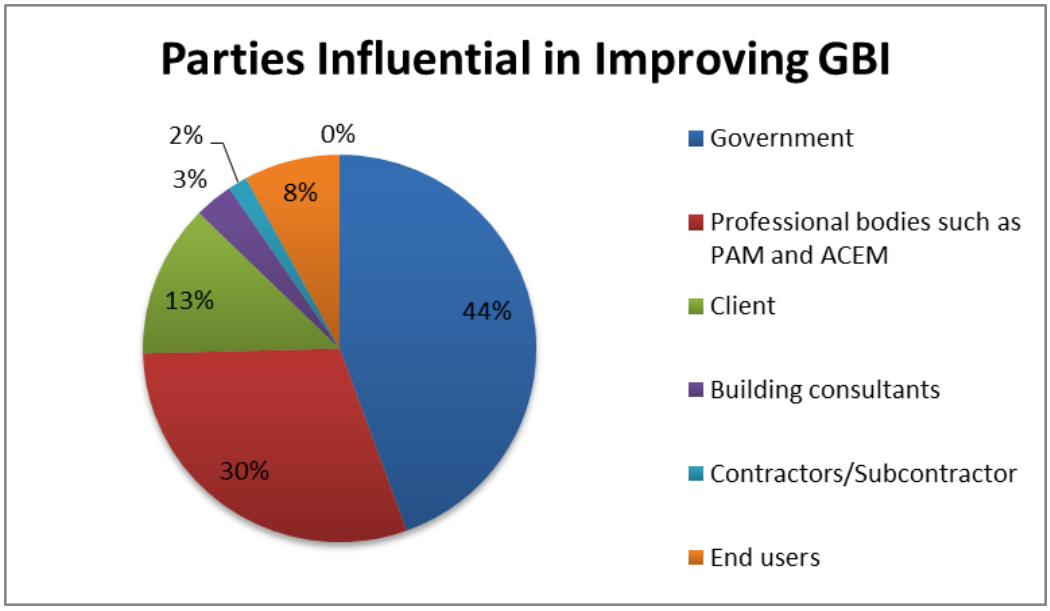


Figure 4.21: Parties Influential in Improving GBI

Figure 4.21 indicates the opinion of the respondents on the party that is the most influential in the development and improvement of GBI rating system. The government was chosen by 44% of the respondents to be the most influential in implementing strategies to enhance the system. The government is the only party to have the power and authority to legislate the GBI classification into a mandatory system. Incentives are also administered by the government. In Section 4.3.5, lower ranking motivational factors such as priority review of GBI buildings and density bonus for GBI buildings can be offered by government departments to encourage stakeholders to adopt GBI in their projects.

30% of the respondents had selected professional bodies to be the most influential party. PAM and ACEM are the authoritative bodies that developed GBI system, thus they should be familiar with the administration of GBI system. They are the ones who are responsible in reviewing, maintaining and upgrading works of the GBI system.

Client was chosen by 13% of the respondents to be the most influential party. Clients are the decision makers in a project and determine on whether they want to apply GBI classification in their project. Generally, demand for green buildings is generated by the endorsement of GBI rating systems by clients.

8% of the respondents expressed their thoughts that end users are the most influential party. One logical argument is that they are the ones who greatly affect the demand for green buildings. 3% of respondents indicated that building consultants is the most influential party while 2% of respondents selected contractors and subcontractors to be the most influential in improving GBI.

4.4 Reliability Test

Cronbach's Alpha Test is chosen to be the reliability test for this study. It measures the internal consistency for each part of the data, i.e. general perceptions; preference of GBI and foreign rating systems; motivational and demotivation factors; and recommendations. The rules of thumb for the test are: >0.9-Excellent, >0.8-Good, >0.7-Acceptable, >0.6-Questionable, >0.5-Poor, and <0.5-Unacceptable (George and Mallery, 2003).

Table 4.6 Cronbach's Alpha Test

Cronbach's Alpha		
Sections	Cronbach's Alpha	N of items
General Perceptions	0.772	5
Preference of GBI System	0.725	6
Preference of Foreign Systems	0.857	4
Motivational Factors	0.826	16
Demotivation Factors	0.722	10
Recommendations	0.793	9

The reliability coefficients of general perceptions, preference of GBI system, demotivation factors and recommendations are within the range of 0.7-0.8, which shows that these items are satisfactorily reliable. Preference of foreign systems and motivational factors has a high level of internal consistency with coefficients ranged more than 0.8 which is preferable. Therefore, the data collected can be concluded to be sufficiently reliable.

4.5 Semi-Structured Interviews

Interviews were conducted with two experience professionals who were involved in GBI-related projects in order to complement, develop, expand, confirm or diversify the findings from the analysis of questionnaires.

4.5.1 Interview A

The first interview was conducted with a senior project manager, hereby named as Interviewee A from Al-Ambia Sdn. Bhd. He has worked in the construction industry for thirty years and has participated in several GBI-certificated projects.

Interviewee A had chosen innovation as the easiest GBI criterion to be achieved. One example of an innovative idea is the setting up of an electric charging station for hybrid cars or electric bikes for the residents. It is fairly easy as it can be done by just acquiring the system and adding a plug point. However, as in the case of energy efficiency, a lot of work had to be done such as calculation of the overall thermal transfer value (OTTV); installation of double glazing windows and low emissivity glass; and the incorporation of sensors and building monitoring systems (BMI). These are actually based on technology advancement which sparks innovations. Ironically, the result from the data analysis shows that innovation ranked the lowest in the achievability of GBI criteria. This is probably due to the fact

that many people had underestimated the importance of innovation criteria as it has the lowest weightage.

Interviewee A expressed his support on legislating GBI ratings into a mandatory system. The reason is fairly simple. The world is currently experiencing climate change and serious pollutions. Mankind should do what they could in order to save the earth. Certain local authorities such as Kuala Lumpur City Hall (DBKL) had started to develop certain criteria requiring new developments situated in the Golden Triangle and central business district to achieve a minimum GBI rating of Silver or Gold. These are the critical areas which are the most congested and densely populated in Malaysia and require proper enforcement to regulate the flow of the occupants. The situation will get out of hand if regulations are not enforced. However, it is unfair to enforce it in other areas especially the outskirts. There are less populated areas whereby adoption of GBI by certain units would not have much impact to the overall situation. The residents also may not be able to afford the higher costs of going green.

From the above paragraph, it can be observed that the government is actually taking initiatives to encourage the implementation of GBI. This is the main reason Interviewee A had selected the government to be the most influential party in implementing strategies to enhance GBI system. This complements the results illustrated in Figure 4.21. Currently, there are many carbon and environmental policies existing in Malaysia, but most of them are adopted on a voluntary basis and mainly implemented in the public sector.

Interviewee A has attended quite a number of GBI seminars and conferences. The speakers mentioned about different systems developed in different countries and highlighted their background and comparisons. Currently, GBI is the most popular green building rating system to be adopted in Malaysia. Other than GBI rating system, there are other rating systems generated by different government agencies and non-governmental organisations such as GreenRE by REHDA and MyCREST by CIDB and PWD. These rating systems are less renowned.

Interviewee A is of the opinion that GBI classification is the most compatible rating system to Malaysian construction industry as one of the developers of GBI ratings are members of PAM, which drafted PAM 2006 building contract that is commonly used in the industry. Their familiarity of GBI and PAM 2006 allows incorporation of GBI into building contracts to be done more easily.

The biggest motivational factor that will encourage the uptake of GBI system chosen by Interviewee A is financial incentives. Financial incentives are ranked fifth among 16 factors, emulating the interviewee's opinion. In a recent seminar that he has attended, the speaker highlighted that the public perceived that most projects that opt for GBI ratings are commercial developments. On the contrary, bulk of the application and certification of GBI comes from residential projects, based on the feedback that the speaker received. Recently, there is an increase in GBI application and certification done on serviced apartments and condominiums. It all boils down to the reasons as to why stakeholders are opting to adopt GBI which are due to incentives, commercial value and marketability. The demand for green buildings is also a major factor in spurring development of green projects.

The single biggest barrier in making GBI more common in Malaysia is the perceived higher upfront cost and certification cost. This factor ranked fairly high among the factors that demotivate stakeholders from adopting GBI. Interviewee A stated that higher initial cost is the main factor stakeholders are reluctant to venture into green investment. As stated before, financial incentives are the most important factor that affects stakeholder's decision. Interviewee A did not realise that the period to apply for tax rebates had lapsed. The withdrawal of financial incentives, in his opinion, is that GBI ratings had gained popularity in the recent years. The demand for green buildings depends on whether the potential buyers focus on initial cost or lifecycle costs. End users who emphasise on lifecycle costs will opt to purchase a GBI building rather than conventional units. As time passes, technological advancements improve the quality and quantity of green materials and systems. Easy availability of green materials increase competitors, thus the prices will be lowered. The public will then have more options. The party who reaps the most benefits from green buildings are the end users. Developers do not benefit from

the savings of the lifecycle costs. However, developers in a competitive business environment sell products that the public desires. Savings on lifecycle costs may be able to offset the high initial costs and act as a main selling point for the project.

Interviewee A has high expectations for GBI as technology advancements and common availability of innovative materials and systems that comply with GBI requirements provide more options to stakeholders.

4.5.2 Interview B

The second interview was conducted with a senior contract executive, hereby named as Interviewee B from Econcos Consultants Sdn. Bhd. He has worked in the construction industry for 5 years and had been involved in GBI-certificated projects.

Quantity surveyors are involved in the calculation of GBI costing which includes the cost of green materials. Suppliers are required to obtain certification for the materials, proving that it complies with GBI standards. The certification obtained indicates the percentage of recycled content and embodied energy. Interviewee B stated that the workload of being involved in the costing of GBI is not that heavy on quantity surveyors. M&E engineers are the ones who have a major role in the GBI process due to the high weightages carried by energy and water efficiency criteria

Interviewee B opined that energy efficiency is the easiest criterion to be attained due to the common availability of energy efficient materials and systems. Energy efficiency carries the highest weightage among GBI criteria. Innovation is chosen to be the hardest to achieve. It also has the lowest weightage among the criteria. The reasoning behind this selection is due to the fact that consultants and the contractors have to procure innovative materials or develop new construction methods. For example, surplus piles that are not used in the construction process can be used as crusher run or extra reinforcement bars can be used to secure bicycles. They have to think out of the box and differentiate their project with others. Thus,

it's harder to score. Energy and water efficiency results can be reflected in electricity and water bills, while it's difficult for the end users to understand the actual benefits for other criteria. The choices made by Interviewee B matches to those selected by the respondents in Section 4.3.3.

Savings on building lifecycle and operation cost was selected by Interviewee B to be the biggest motivational factor for GBI, similar to the results shown in Section 4.3.5. Initial cost for GBI-certificated buildings will certainly be higher as certain materials will be more expensive than their conventional counterparts such as low emissivity glass. It is deemed that lifecycle cost will be able to offset the initial cost in the long term thus enabling justification of the higher initial cost. Sustainability actually emphasises on cradle to cradle design without creating wastage of materials.

In his opinion, the demand for green buildings is still not that strong in the Malaysian market. Fewer individuals are aware about GBI-certificated buildings especially the public who are the potential buyers. Thus, Interviewee B thought that public awareness is really important as doubtlessly, it is all about supply and demand in the business world. Based on his knowledge, there are currently no financial incentives offered for GBI-certificated projects. He had also mentioned that recently the property market starts to slow down and shows no sign of recovery soon, dragging the demand for green buildings along with it due to the weakening of the Malaysia currency.

Mandatory building codes such as QLASSIC is included as a requirement in the GBI system. Normally, high-end projects by mega developers will apply GBI classification because they have the sufficient financial capacity to fund the higher construction cost. A buyer who emphasises on lifecycle costs savings and can afford to buy a higher priced property is normally the target market. Priority reviews of GBI buildings, preferential interest rates offered by the banks and density bonus for GBI buildings are not quite relevant in the Malaysian construction environment.

Lack of awareness, education and knowledge is the most detrimental to Interviewee B as demand from the potential buyers determined whether the developers will construct green buildings. This complements with the results shown in Section 4.3.6. Savings on lifecycle costs provided by GBI classification may act as an attraction to persuade potential buyers to purchase the building. Thus, it is up to the developers to decide on whether they are willing to spend more money to achieve GBI classification and use this as a selling point to increase the demand by purchasers. Other than that, certain materials are quite difficult to be procured such as low emissivity glass, which needs to be imported and increases the time and cost to acquire it. However, most green materials are still quite easy to be acquired since the green trend is growing in Malaysia.

In terms of recommendations, Interviewee B thought that public awareness and education on sustainable building practices should be given priority in order to improve the demand of GBI-certificated buildings.

The government is deemed to be the most influential party as they are the ones who offer incentives and has the power to legislate GBI classification. Interviewee B supports the strategy to enforce GBI ratings as a mandatory system by the government.

Interviewee B does not really have high hopes regarding the acceptance and spread of green buildings in Malaysia over the next few years due to the downturn of the global construction market and the weakening of the Malaysian currency.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter reflected the summary of findings obtained from the previous chapter, as well as the limitations encountered while conducting the study. Recommendations are also suggested for future research on relevant topics.

5.2 Summary of Findings

5.2.1 Perceptions

a) Majority of the respondents perceived that sustainable issues are relevant to their profession.
b) About 90% of respondents support the implementation of GBI classification in Malaysia.
c) Bulk of the respondents agreed that GBI classification is significantly beneficial to the society in terms of economic, social and environmental aspects.
d) More than half of the respondents are willing to recommend and commit to the use of GBI ratings in construction projects.
e) About 74% of respondents agreed on the legislation of GBI classification.

f) GBI rating is more popular in Malaysia compared to foreign rating systems with 83% of respondents favouring GBI rating to be applied in Malaysia due to the fact that it is custom designed to suit local climate. The remaining respondents perceived that foreign rating systems are better quality systems, justifying their choice.
g) Energy efficiency was chosen to be the easiest criterion to be achieved while innovation ranked the last among the six GBI criteria.
h) Almost half of the respondents only encounter information related to GBI through various social media from time to time. The same applies to the frequency of encountering GBI information throughout the respondents' career.
i) Majority of the respondents revealed that they had acquired knowledge pertaining to GBI during the pursuance of their degree, diploma or professional certificate.

The study had revealed that majority of professionals in the Malaysian construction industry have a positive impression of GBI in terms of implementation and benefits. Most professionals are willing to commit to the usage of GBI but there have been a lack of opportunities in the industry with half of the respondents never participated in GBI projects. It appears that the publicity of GBI rating system requires improvements which explain the limited application of GBI by the professionals.

5.2.2 Motivations of GBI

It can be observed from the ranking results that the motivations are equally distributed between tangible rewards and intangible motivations. However, the lower ranking financial benefits led the author to believe that this is due to the absence of real monetary benefits in the market and provide further proof that practical application of GBI is not supported by the surrounding business environment. The respondents revealed that they are highly motivated by the three following factors:

- Rank 1 - Savings on building lifecycle and operation costs (RII=0.8413)
- Rank 2 - Promotion of environmental initiatives (RII=0.8127)
- Rank 3 - Improves occupant's health, wellbeing and productivity (RII=0.7937)

5.2.3 Demotivation Factors of GBI

It can be established that the professionals are concerned with the lack of opportunities of applying GBI in the Malaysian construction industry. Insufficient publicity fuels the lack of awareness among the public, which leads to poor demand for GBI- classified buildings. Higher initial costs and insufficient incentives proved to be a stumbling block in the adoption of GBI. The respondents identified the following factors to be the main barriers in implementing GBI:

- Rank 1 - Lack of awareness, education and knowledge (RII=0.8317)
- Rank 2 - Perceived higher upfront and certification cost (RII=0.7937)
- Rank 3 - Insufficient incentives (RII=0.7619)

5.2.4 Recommendations for GBI

According to the findings, it can be concluded that there is insufficient communication between the promoters (government, professional bodies and non-governmental organisations) and the public. Adequate promotional activities had to be conducted constantly to facilitate effective information diffusion. The lack of financial benefits identified the need of creating incentives to urge the uptake of GBI classification. The respondents indicated the following strategies to be relatively effective in encouraging the adoption of GBI:

- Rank 1 - Prioritize on public awareness and education on sustainable building practices (RII=0.8540)
- Rank 2 - Financial incentives (RII=0.8476)
- Rank 3 - Constant review, maintenance and upgrading of GBI system (RII=0.8000)

The government is identified to be the most influential party in carrying out strategies to improve GBI rating system. As discussed in the results and interviews, the government has the power and authority to administer GBI incentives.

5.2.5 Conclusions

Based on the findings and interviews, it can be concluded that there is still limited adoption of GBI classification in Malaysia. Building professionals have a positive impression on GBI system; however there are fewer chances to be involved with the system in practice. The incentives system requires major improvements in order to increase the adoption rate. Promotion efforts seemed to fall short in terms of raising awareness and educating the public, who constitutes of potential buyers which creates demand for buildings. The progress of GBI development will be sluggish without the support of property owners and the public.

5.3 Limitations and Recommendations

This study has focused on the perspectives of building professionals on the adoption of GBI classification in terms on the general perceptions, motivational factors, demotivation factors and recommendations. These groups sufficiently represent the views of different profession in the construction industry; however there are no representatives from government departments and project owners, thus their viewpoints are not included in this study. Further researches on GBI system can be

done by incorporating more variety of stakeholders in the studies to obtain comprehensive results.

A sample size of 63 respondents may be insufficient and may not reflect the opinions of all professionals within the construction industry. A larger sample size can be used in future studies. This study constitutes of respondents that have lesser working experience and no experience in GBI system. The research should target on respondents that have sufficient experience and possesses knowledge on green construction to obtain more reliable information.

Researches on the social performance of green building rating systems are relatively lean compared to the environmental aspect of green systems. There are also fewer studies on the interaction between green buildings and end users. Integration of advanced technology such Building Information System into green building rating systems is also a potential area to research on. Subsequent studies on these areas can be done for GBI classification to provide a more robust evaluation of GBI in Malaysia.

The area of research is constricted within Klang Valley. Future researches can expand nationwide to obtain better results. Time is also a constraint while conducting the research. More information can be collected when a sufficient timeframe is given.

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APPENDICES

APPENDIX A: Survey Questionnaire

APPENDIX B: Record of Supervision/Meeting