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The Empowerment of Green Technology Knowledge Among Stakeholder in Construction Industry

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Abstract: Green technology in Malaysia construction industry has seen substantial growth in the current years. However, a lack of knowledge about green technology among stakeholder in the construction industry in Malaysia remains an obstacle. Stakeholders does not properly understand the concept of green technology despite their concern about environmental negative effect. Therefore, the objectives of this research is to determine the current understanding of green technology knowledge among the stakeholder in the construction industry, to study the challenges of green technology knowledge acquirement faced by stakeholder in the construction industry and to suggest strategies to empower the green technology knowledge in construction industry. The scope of this research is to determine the current understanding of knowledge related to green technology among the stakeholder in the construction industry in Sabah, Malaysia. The research method of this study is quantitative method where a questionnaire survey was distributed to respondent from well experienced contractors that involved in construction project that use green technology. The data was collected from 76 respondents which represent 88% response rate among contractor in Sabah. The data were then analysed using Statistical Package for Social Science (SPSS) software for analysed on descriptive statistic to obtain the result. The result shows that the understanding of green technology concept is protection of the environment. While the biggest challenges of acquirement in green technology knowledge is lack of guideline from the available source. In addition, the research suggested the strategies to empower the green technology knowledge in construction industry is government policy. In conclusion, this research can potentially help policy makers, industry stakeholders, and advocates to understanding related to the

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empowerment of green technology knowledge and consequently in improving the application of green technology in construction project

Keywords: Green Technology, Green Technology Knowledge, Challenges, Strategies, Stakeholder.

1. Introduction

Green technology is the progress and usage of materials, equipment, and systems used to protect the natural environment and resources, and it encourages the use of renewable resources while minimizing and reducing the harmful effects of human activities (O. Izvekova, 2016). The goal of green technology is to protect the environment and conserve natural resources. Clean energy is defined as the utilization of alternative fuels and technologies that are less damaging to the environment than fossil fuels.

A green building, also known as a sustainable building, is built to achieve such goals, such as the wellbeing of occupants; to allow more effective use of electricity, water and other resources; and to reduce the total environmental effects. While the green technology industry is still in its infancy, it has attracted a considerable amount of investor attention as a result of growing concern about the effects of climate change and natural resource depletion. Green building, also known as sustainable building, is the process of constructing structures by using environmentally responsible and productive materials. The consumption of raw materials and chemicals contributes to global resource depletion. Lack of knowledge about green technology still is a challenge, compared to other developing countries such as the United States, England, and Singapore (P. Gultekin, 2013).

Green building development is being slowed by a lack of knowledge. Stakeholders do not fully understand the concept of green technology, although their concerns about the harmful effects on the environment. Furthermore, the building company would face the issue of staff and laborers that are literate in the new technology. Due to the reason of the green technology still considered new technology and have less construction industry apply it into construction project (Ha Chin Yee R. I., 2020). This causing the construction industry have to take the risk of implementing the green building practices due to lack of knowledge about the green technology's performance. Lack of green skills have cause a major constraint to implement green building practice in construction industry (Mahendriyani, 2016). Lack of incentives would reduce the motivation of construction companies to continue to think about sustainable development when construction companies do not get any incentives or subsidies when the projects are energy-efficient. Moreover, lack of communication among the parties involved also will lead to difficulty in practicing green building in construction industry (Ha Chin Yee R. I., 2020). Old or current construction which using traditional method had cause lots of negative impacts to the environment such as pollution, lost of wild land, erosion, global warming, and high energy consumption. Studies on green technology have been explored, but more visible results are still required especially in the in Sabah, where very few certified green buildings (Post, 2018). It is difficult for construction stakeholders to implement if they do not have deep knowledge and adequate skills in the relevant sector. As a result, the advantages of sustainable development will be forgotten, and construction firms will be resistant to change. Therefore, this study will be directed at identifying the views of stakeholders on the successive implementation of environmental technologies.

The focus of this study is to determine the current understanding of knowledge of green technology among the stakeholder in the construction industry of Sabah, Malaysia. The respondents were among the well-experienced top and senior management level employees in the contractor organisation such as project manager, site manager and senior manager. This study was conducted in Sabah. The research method of this study is quantitative method where a questionnaire survey were distributed to respondent from well experienced contractors that have involvement in construction project that use green

technology. The reasons choosing Sabah as the area of study are the visibility of the implementation of green building is still yet to be seen widely in Sabah.

The research helps stakeholder such as contractor organization or others stakeholder organization for reference to the related topic and issues. This research may help government policy makers to consider certain important information for forming or reforming policies to encourage stakeholders to implement the green technology in construction industry. Besides, this research graduates and undergraduates can refer to the relevant subject and problems in this study help stakeholder such as contractor organization or others stakeholder organization for reference to the related topic and issues.

2. Literature Review

2.1 Green Technology in Construction Industry

According to Roufechaei (2014), many of environmental issues that occur in this country are due to lack of environmental considerations in the exploitation, development and management of resources as well as lack of control of pollution resources (Kamand M. Roufechaei, 2014). The use of green technology in construction would help to promote the dynamic growth of economic development activities while also improving the environment.

(a) Green Technology

Green technology can be defined as a set of technologies that assist mankind in extracting food, feed, fiber, fuel, and fertilizer from the environment using renewable and non-renewable energies and living happily with cultural diversity while maintaining ecosystem resilience, supporting the environment to maintain nutrient cycles, pollination, carbon sequestration and climate regulation, waste decomposition and detoxification, purification of water and air, and pest and disease control (Gunasena, 2019). Green technology's mission is to protect the environment, fix past environmental pollution, conserve natural resources, and preserve the Earth's natural resources. Green technology has now developed into a huge industry that is raising amounts of investment capital. Green technology adoption may be stated as a target of a market sector or an organization.

(b) Green Building

A Green Building, also known as a sustainable building, is a structure that is planned, built, restored, managed, or repurposed for ecological and other goals by utilising resources efficiently and without waste them throughout the building's life cycle. -plants cultivated both indoors and outside (Ar, 2010). Green buildings have a variety of economic or financial opportunities that are important to a wide range of individuals or classes of people. The implications of green building extend beyond economics and the environment.

(c) Green Building Index

The Green Building Index (GBI) is Malaysia’s industry recognised green rating tool for buildings to promote sustainability in the built environment and raise awareness of these issues among relevant stakeholders such as developers, architects, and contractors (Green building index, 2020). The GBI rating tool allows developers and building owners to design and install green, safe buildings that can provide savings the energy, water savings, a cleaner indoor climate, greater access to public transportation, and the implementation of recycling and greenery for their designs, thus reducing our environmental effects.

2.2 Overview of Green Technology in Sabah Construction Industry

There have few of the development projects are developing in Sabah compare to other states, most of the development projects are in the rapidly rising Kota Kinabalu region. The Reason of few development projects is the awareness of green technology knowledge in the Sabah construction industry. Therefore, the government has adopted many solutions to improve the understanding of green technology in the construction industry. Starting August 2017, DBKK will require all new building plan submissions to incorporate energy efficient Overall Transfer Thermal Value (OTTV) and Roof Insulation codes (Green Technology In Sabah, 2017). This indicates that there will be an increase in opportunities and demand for green construction goods and services in Sabah in the future. The Sabah Housing and Real Estate Developers Association (SHAREDA) is eager to incorporate green technologies into residential buildings, such as solar power cells and specific ventilation and insulation systems. In year of 2019, the Sabah Government announce they will ensure that the development implemented in the state is based on sustainable development by taking into account the use of green technology. Since the state government announced the execution of the green idea, there hasn't been much visible progress because there have only been a few seminars or roadshows.

2.3 The Challenge of Application Green Technology in Construction Industry

Green building challenges are divided into two categories: internal and external challenges.

(a) Internal Challenges

Lacking of knowledge and awareness is the major factors that cause the application of green building decreases. According to (Wright TS W. H., 2012), the interview that have been done and it shows that lacking of knowledge of top management will affect the goal of the construction firm to adopt the green practice in construction project. Furthermore, the top management will bring affect to the application of the green building project. The application of green building technologies will be rejected if the top management lack of awareness of the environmental problems and resist to implement the green technology (Du, 2014). Another challenge is technology and training, the insufficient of professional and technical worker make the stakeholders and customers will not like to take the risk in application of green technology in construction projects. Organization and personal behaviour is also an issue slowing down the application of green technology in construction industry. This issues created by the stakeholders and company because of the insufficient of awareness about the environment issues and how to protect it (Richardson GR, 2007). The capital cost or operating cost will also create stumbling blocks for stakeholder to choose between green and conventional buildings. The cost of the green building is more expensive compare to the ordinary building due to the materials and technology cost very high (Kibert, 2016). The construction firm will deal with the problem of insufficient of financial resource to apply or to implement the green technology in construction project.

(b) External Challenge

One of the external challenge is attitude and market. Old generation workers still think that the old traditional method is the most suitable method for construction work even the method they use is harmful to the environment. The green building will not be implemented by construction industry if the market demand of the green building is low. Therefore, the market to invest in green technology in construction industry is affecting by the attitude of the public and clients. Lack of product's information issue is appear in green building development (Davis, 2001). Due to the fact that less information about the capabilities and cost needed for the technology, the construction industry has to take the risk of implementing the green building in the construction industry. Government should take part in playing their role to encourage green building construction and development as government's involvement such as providing of financial and non- financial incentives, regulation and policies to the construction project effect the application of green technology in construction industry (Queena K. Qian, 2010). A firm needed incentives to develop or adopt green technology in construction industry. The incentives given are not enough to cover the high cost of the operating and maintenance fee. Therefore, it stopping

the implementation of the green technology in construction industry even though it is environmental friendly and energy efficiency. Most of the construction firm are not concentrate on the green building development and this led to the time constraints and insufficient of motivation in application of the green building (Horhota M, 2014). Besides, insufficient of simulative pressure for green development policy will increase the obstruction to different and forgotten to the benefits of new technology (Wright TS W. H., 2012).

2.5 The Importance of Implementation of Green Technology in Construction Industry

As we know that, green technology is important to us, it cannot be ignores because it is a part of the renewable energy branch of the environmental technology movement. We are progressively becoming more conscious and learning to control ourselves in the development, if not we will destroy the nature since 1970's oil crisis to the current 'low carbon' concept (Feng, 2011). The Green Technology Master Plan (2017–2030) proposes multi-sectoral methods to minimize greenhouse gas (GHG) emission intensity by 45 percent by 2030 while also supporting economic growth through green technology adoption (Green Technology Master Plan, 2017). This is mainly influenced by factors such as meeting market demands, providing health and comfort to occupants, saving money, and performing as an environmental duty. Furthermore, green construction may face the big obstacles to green practice particularly when there are not spread with the correct information at their organization in the industry because of the constraint in the decision making, management and planning. This problem should be settle and give responses early.

2.6 Existing Strategies to Empower the Construction Industry with Green Technology Knowledge

In the year of 2009, Ex-Prime Minister YAB Dato'Sri Mohd Najib have successfully launched the National Green Technology policy (NGTP) to bring more awareness of green technology applications (Malaysian Green Technology Corporation, Malaysia, 2014). The NGTP's policy statement is to be a motivating force in speed up the economy and facilitate green technology growth. Aside from that, the Malaysia Energy Centre will be reorganised as the National Green Technology Centre, with the responsibility of developing a green technology plan of action. In year of 2009, Green Building Index (GBI) has also launched on 21st of May, GBI is s green rating index on the eco-friendly building to promote sustainability in the built environment and raise awareness among stakeholders and the Public about environmental issues and our responsibility to the future generations (Green building index, 2020). Since 2016, the Malaysian Carbon Reduction and Environmental Sustainability Tool (MyCREST) has been used to promote the development of more green residential and commercial structures (Gearing for Green Buildings, 2021). The Public Works Department has made MyCREST compulsory for all government construction programs worth RM50 million or more. The Ministry of Energy, Science, Technology, Environment and Climate Change proposed several enhancement and improvement to the scheme and name as GTFS 2.0 that has agreed by the Ministry of Finance to assure the support towards the Green technology project (Green Technology Financing Scheme, 2020). GTFS 2.0 provide a financial support for user, manufacture and also new category Energy Service Companies (ESCOs). By offering access to funding via financing from Participating Financial Institutions (PFIs), it has offer 2 percent on the interest rate subsidy for the first seven year with 60% government guarantee on the financing to promote the expansion the investment in green technology with total funding earmarked up to RM2.0 billion (Green Technology Financing Scheme, 2020).

3. Research Methodology

The research methodology section describes all the necessary information that is required to obtain the results of the study. The research methodology consists of detailed information regarding workflow, strategy, and approach. The methodology adopted in carrying out the study should be well explained.

3.1 Research Design

The purpose of the research design is to create an acceptable framework for a study (Sileyew, 2019). This study uses a quantitative strategy to collect data from a specific sample group using questionnaires. This method is used to determine and identify 'What' are the current understanding of green technology knowledge among stakeholder in the construction industry, 'What' are the challenges of green technology knowledge acquirement faced by stakeholder in construction industry and 'What' are the strategies to the green technology knowledge in construction industry. Because to the Covid-19 epidemic and the Movement Control Order (MCO) issued by the Prime Minister, face-to-face interviews are forbidden (Ong, 2021). The questionnaire form will be emailed to the contractors' firm in Sabah as responders in order for them to complete the data. Thus, this study presents numerical data from questionnaires, and the data acquired was statistically analysed using Statistical Package for Social Sciences (SPSS) and Microsoft words transformed into graphical, chart, and table formats.

In this research, the target respondent will be focused on the contractors G6 that involved with construction project. In this study, G6 contractor were selected as a sample since G6 contractors are classified the second highest grade in CIDB registration and tend to receive mega projects. The overall number of contractors registered with the Centralized Information Management System (CIMS) in Sabah is 13,390. The population size of contractor G6 in Sabah is 119. According to the Krejcie and Morgan (1970) as shown in Table 1, the sample size for population 110 is 86.

Table 1: Population (P) and Sample Size (S) Using Krejcie and Morgan (Kenpro, 2012)

N	*S*	*N*	*S*	*N*	*S*
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

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

3.2 Data Collection

(a) Types of Data Source

This research collects two sorts of data: primary data and secondary data. Primary data refers to the first hand data gathered by the researcher himself (Ajayi, 2017). Primary data sources include both qualitative and quantitative information. Field observations, interviews, and informal talks are examples of qualitative data sources, whereas survey questionnaires and interview questions are examples of quantitative data sources. Secondary data is information gathered by someone other than the user

(Sileyew, 2019). Secondary data sources might be both internal and external information sources that cover a wide range of topics. Secondary data sources include government publications, websites, books, journal papers, and internal records.

(b) Questionnaire

This research was conducted utilizing a questionnaire survey in Google form, and the tool for data collection was a four-part questionnaire. For part A, the general information is collect from the respondents. Part B of this questionnaire is designed to gather information about the respondents' current understanding of green technology concept. To collect data for each component of the study model, the majority of the questions use a five-point Likert scale. Respondents are asked to rate the frequency of occurrences for each statement on a scale of 1point (strongly disagree) to 5 points (strongly agree). In part C of this questionnaire aims to investigate the challenges of acquirement of green technology knowledge among the respondents while in part D will be focus on the evaluate the strategies to empower the green technology knowledge in construction industry. Respondents will use a symmetrical agree-disagree scale to indicate their level of agreement or disagreement with a series of statements when completing the questionnaire. The modified Likert scale is preferred since the standard Likert scale provides 5 points to strongly agree, 4 points to agree, 3 points to neutral, 2 points to disagree, and 1 point to strongly disagree.

Respondents were asked to score their agreeableness using a Likert scale, with 1 representing severely disagree, 2 representing disagree, 3 representing neutral, 4 representing agree, and 5 representing highly agree, as shown in Table 2.

Table 2: Five-point Likert Scale measurement (Chyung, 2017)

Score Value	1	2	3	4	5
Likert Scale	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

(c) Pilot Test

A pilot study is a short study designed to test research methods, data collecting tools, sample recruitment tactics, and other research procedures in advance of a study Abu Hassan (2006). It was critical to ensure that the questionnaire items correctly addressed the study issue. The pilot also evaluated if the questionnaire was understandable and acceptable, and whether questions were properly defined, well understood, and presented consistently. Based on the feedback given, the researcher might improve the questionnaire format or questions before making the questionnaire form available to the public. After the pilot study by 5 respondents who involved in construction industry, the results showed that the reliability test done with the alpha value 0.971 which is more than the specific value which is 0.600 (Refer to Table 3). This means that this distribution questionnaire form can be proceeded to real respondents (Datt, 2015).

Table 3: Reliability Test

Number of respondents	Alpha Cronbach's Value
5	0.971

3.3 Data Analysis

Data analysis is a process of bringing facts and numbers together to address a research topic. It is critical to determining the answers to the research question. The data was recorded and analyse with the help of Statistical Package for Social Sciences (SPSS) software. SPSS able to help researchers to

manage, present and analyze large number of data by creating fast and accurate results in form of table and graphical chart and determine frequency, percentage, mean and ranking of the data collected (Landau, 2004) . Table 4 below summarise the research methodology that will be conducted to achieve objectives of this study.

Table 4: Summary of Research Methodology

Methodology	Data Sources	Type	Objectives Achievement	Respondents	Technique	Data Analysis
Quantitative	Primary Data	Questionnaire Form	Objective 1: To determine the current understanding of green technology knowledge among stakeholder in the construction industry.	Contractors G6 in Sabah, Malaysia (86 respondents)	Email	SPSS
Quantitative	Primary Data	Questionnaire Form	Objective 2: To study the challenges of green technology knowledge acquirement faced by stakeholder in construction industry.	Contractors G6 in Sabah, Malaysia (86 respondents)	Email	SPSS
Quantitative	Primary Data	Questionnaire Form	Objective 3: To suggest strategies to empower the green technology knowledge in construction industry.	Contractors G6 in Sabah, Malaysia (86 respondents)	Email	SPSS

(a) Quantitative Data Analysis

This data analysis was performed using Statistical Package for Social Sciences (SPSS) and other programs based on their data type. This data analysis is mostly concerned with numerical or quantitative data analysis. They were chosen from a list of replies, and a number matching to each selection was assigned. Next completion, the data was input into a statistical analysis software tool, Statistical Package for Social Sciences (SPSS), for the following stages. Data exploration has been carried out using descriptive statistics and graphical analysis as part of the data analysis. Measures of central tendency will be utilized to examine data received via questionnaire form in this study shows in Table 5. Common metrics of central tendency in descriptive analysis include the three averages, mean, median, and mode.

Table 5: Assessment Level Based on Mean Score (Moidunny, 2009)

Mean Score	Assessment
1.00 – 1.80	Very Low
1.81 – 2.60	Low
2.61 – 3.20	Medium
3.21 – 4.20	High

4. Results and Discussion

(a) Quantitative Data Analysis

This data analysis was performed using Statistical Package for Social Sciences (SPSS) and other programs based on their data type. This data analysis is mostly concerned with numerical or quantitative data analysis. They were chosen from a list of replies, and a number matching to each selection was assigned. Next completion, the data was input into a statistical analysis software tool, Statistical Package for Social Sciences (SPSS), for the following stages. Data exploration has been carried out using descriptive statistics and graphical analysis as part of the data analysis. Measures of central tendency will be utilized to examine data received via questionnaire form in this study shows in Table 6. Common metrics of central tendency in descriptive analysis include the three averages, mean, median, and mode.

Table 6: Assessment Level Based on Mean Score (Moidunny, 2009)

Mean Score	Assessment
1.00 – 1.80	Very Low
1.81 – 2.60	Low
2.61 – 3.20	Medium
3.21 – 4.20	High

4.1 Results

The data analysis was divided into several sections based on the questionnaire form. The first part (A) discussed the descriptive analysis of respondents' background. The second part (B) discussed about the understanding of the concept in green technology. While for the third part (C) and fourth part (D) are discussed the strategies to empower the green technology knowledge in construction industry respectively.

(a) Respondent's Background

The respondents of this study are included well-experienced top and senior management level employees in the contractor organisation such as project manager, site manager and senior manager. This study involves responses from 76 respondents (88.37% of response rate) which is acceptable (Fincham, 2008). According to Fincham (2008), the normal response rate for questionnaires is within 60%. Table 7 summarise the finding related to respondent's background.

Table 7: Summary of Respondent's Background

No	Description	Frequency	Percentage (%)
1	Gender		
	Male	63	82.89
	Female	13	17.11
2	Highest Academic Qualification and Certificate		
	Certificate	6	7.89
	Diploma	15	19.74

	Bachelor Degree	51	67.11
	Master	4	5.26
	PhD	0	0
3	Current Position		
	Site Supervisor	13	15.79
	Site Manager	12	17.11
	Engineer	13	23.68
	Architect	18	21.05
	Project Manager	16	2.63
	Quantity Surveyor	2	2.63
	Site Clerk	2	2.63
4	Working Experience		
	Less Than 1 Year	10	13.16
	1-5 Years	31	40.79
	6-10 years	23	30.26
	11 Years and Above	12	15.79
5	Organization Knowledge Toward Green Policy Concept		
	Yes	63	82.89
	No	13	17.11
6	Experience in Green Technology Project		
	Yes	61	80.26
	No	15	19.74
7	Types of Green Technology Project Involved		
	Housing	31	40.79
	Office	17	22.37
	Infrastructure	28	36.84

The section was classified into 7 questions which are the gender, highest academic qualification and certificate, current position, working experience, organization knowledge toward green policy concept, experience in green technology project, and types of green technology project involved. According to the result of the questionnaire form, most of the respondents of the study are composed of male that is representative 82.89% of all respondents while female are only 17.11% as shown in Table 6. For the highest academic qualification and certificate of respondents, the majority respondents are bachelor degree which is 67.11% followed by diploma of 19.74% , certificate with 7.89%, master with 5.26% and PhD with 0%. Based on the data obtained for current position, 23.68% of the respondents are architect, followed by project manager 21.05%, Engineer with 17.11%, Site Supervisor with 17.11%, Site Manager with 15.79%, Site Clerk with 2.63% and Quantity Surveyor with 2.63%. While for the data obtained from working experience, 13.61% of the respondents having less than 1 year experiences. 40.79% of the respondents are having 1-5 years experiences; 30.26% for 6-10 years while for the working experience 11 years and above are 15.79% . For the data obtained from organization knowledge toward green policy concept, most of the respondents organization have knowledge of green policy concept which is 82.89%. Then follow by 17.11% respondents organization have no implement the knowledge of green policy concept as shown in Table 6. The data obtained from experience in green technology project, majority respondents have the experience in green technology project which is 80.26% and follow by 19.74% respondents have no experience in green technology project. While for the data that obtained from types of green technology project involved, the most respondents are housing which is 40.79%, followed by infrastructure which is 36.84% and office 22.37%.

(b) The Understanding of the Concept on Green Technology

Part B questions pay more attention to the understanding of the concept on green technology. In this section, the researcher has posed 9 questions which had a Likert scale option. After collecting the data, the summary of understanding of the concept on green technology as shown in Table 8.

Table 8: Summary of the Understanding of the Concept on Green Technology

No	Understanding of The Concept In Green Technology	Mean	Ranking	
1	Protection of the environment	4.62	1	Very High
2	Generating profit without compromising future needs	4.18	9	High
3	Effective environment planning management and control	4.47	2	Very High
4	Enhance the quality of life and customer's satisfaction	4.21	8	Very High
5	Prudent the use of natural resources	4.32	5	Very High
6	Social progress which recognize the need of everyone	4.28	7	Very High
7	Maintaining high and stable level economic growth	4.43	3	Very High
8	Promote environment-friendly practices	4.32	5	Very High
9	Improved health and indoor environmental quality	4.38	4	Very High

As shown in Table 7, majority of respondents understand the concept of green technology as protection of the environment with the highest mean value of 4.62. Followed by effective environment planning management and control in 2nd ranking with the mean value of 4.47 and maintaining high and stable level economic growth is in 3rd ranking with the mean value of 4.43. In addition, improved health and indoor environmental quality is in 4th ranking with the mean value of 4.38, prudent the use of the natural resources in 5th place with the mean value of 4.32 and promote environment-friendly practices is in 5th ranking with mean value of 4.32. Social progress which recognize the need of everyone, enhance the quality of life and customer's satisfaction and generating profit without compromising future needs are ranked in 7th to 9th place with lowest mean value of 4.28, 4.21 and 4.18 respectively.

(c) Challenges of Acquirement in Green Technology Knowledge

Part C questions pay more attention to the challenges of acquirement in green technology knowledge. In this section, the researcher has posed 16 questions which had a Likert scale option. After collecting the data, the summary of challenges of acquirement in green technology knowledge as shown in Table 9.

Table 9: Summary of Challenges of Acquirement in Green Technology Knowledge

No	Challenges of Acquirement in Green Technology Knowledge	Mean	Ranking	
1	Lacking of knowledge	4.50	4	Very High
2	Top management lack of awareness of the environment problem	4.22	14	Very High
3	Resistance to implement green technology among top management	4.49	6	Very High
4	The concept of green technology is still new	4.17	16	High
5	Materials are hard to find for the construction project	4.47	7	Very High
6	Insufficient knowledge about the green building concept	4.25	11	Very High

7	Construction firm are not willing to send their worker to training	4.54	2	Very High
8	Issues in Organizational and personal behaviour	4.26	10	Very High
9	Insufficient of financial resource	4.50	4	Very High
10	Old generation workers still think the old traditional method is most suitable method	4.22	14	Very High
11	Lack of Client's willingness to adopt green technologies without concern about the profits they can earn	4.43	8	Very High
12	Lack of product's information issue	4.24	12	Very High
13	Lack of guidelines from the available source	4.55	1	Very High
14	Government policy and regulation	4.28	9	Very High
15	Lack of incentive from government	4.51	3	Very High
16	Insufficient of simulative pressure of policy	4.24	13	Very High

As shown in Table 9, majority of respondents face the challenges of acquirement in green technology knowledge is lack of guidelines from the available source with the highest mean value of 4.55. Followed by construction firm are not willing to send their worker to training in 2nd ranking with the mean value of 4.54 and lack of incentive from government is in 3rd ranking with the mean value of 4.51. In addition, lacking of knowledge is in 4th ranking with the mean value of 4.50, Insufficient of financial resource in 4th place with the mean value of 4.50 and resistance to implement green technology among top management is in 6th ranking with the mean value of 4.49. Moreover, materials are hard to find for the construction project is in 7th place with the mean value of 4.47, lack of client's willingness to adopt green technologies without concern about the profits they can earn is in 8th ranking with the mean value of 4.43 and government policy and regulation is in 9 ranking with the mean value of 4.28. Besides that, issues in Organizational and personal behaviour is in 10th place with the mean value of 4.26, Insufficient knowledge about the green building concept is in 11th place with the mean value of 4.25, lack of product's information issue in 12th ranking with the mean value of 4.24 and insufficient of simulative pressure of policy is in 13th ranking with the mean value of 4.24. Top management lack of awareness of the environment problem ranked as 14 with the mean value of 4.22, old generation workers still think the old traditional method is most suitable method ranked as 14 with the mean value of 4.22, and the last one is the concept of green technology is still new ranked in 14th to 16th with the lowest mean value of 4.22, 4.22 and 4.17 respectively.

(d) Strategies to Empower the Green Technology Knowledge in Construction Industry

Part D questions pay more attention to the strategies to empower the green technology knowledge in construction industry. In this section, the researcher has posed 10 questions which had a Likert scale option. After collecting the data, the summary of strategies to empower the green technology knowledge in construction industry as shown in Table 10.

Table 10: Summary of Strategies to Empower the Green Technology Knowledge in Construction Industry

No	Strategies To Empower The Green Technology Knowledge In Construction Industry	Mean	Ranking	
1	Government policy (e.g. tax reductions and awards)	4.61	1	Very High
2	Monitoring and enforcement through law	4.28	10	Very High
3	Providing demonstration and examples to promote green technology	4.50	5	Very High

4	Increase the number of supplier of green technology products	4.29	9	Very High
5	Legislation in support of green initiatives	4.59	2	Very High
6	Low-cost loans from government	4.34	8	Very High
7	Educational programs for developers, contractors, and policy makers related to green technology knowledge	4.55	3	Very High
8	Green rating and labelling	4.37	6	Very High
9	Public environmental awareness creation through workshops, seminars, and conferences	4.51	4	Very High
10	Subsidy from government	4.36	7	Very High

As shown in Table 10, majority of respondents agreed the strategies to empower the green technology knowledge in construction industry is government policy with the highest mean value of 4.61. Followed by legislation in support of green initiatives in 2nd ranking with the mean value of 4.59 and educational programs for developers, contractors, and policy makers related to green technology knowledge is in 3rd ranking with the mean value of 4.33. In addition, public environmental awareness creation through workshops, seminars, and conferences is in 4th ranking with the mean value of 4.51, providing demonstration and examples to promote green technology in 5th place with the mean value of 4.50 and green rating and labelling is in 6th ranking with the mean value of 4.37. Subsidy from government, low-cost loans from government, increase the number of supplier of green technology products, and the last monitoring and enforcement through law are ranked 7th to 10th place with lowest mean value of 4.36, 4.34, 4.29 and 4.28 respectively.

4.2 Discussions

The results of the analysis of the questionnaire study have met the first objective which is to determine the current understanding of green technology knowledge among stakeholder in the construction industry. The majority understanding of green technology knowledge among stakeholder in the construction industry is protection of the environment which is ranked as very high. This statement is proved by the study which is represented by (Sweta, 2021) stated that green technology aims at protecting the environment and conservation of natural resources.

The second objective was achieved through data from the collection of questionnaire which is to study the challenges of green technology knowledge acquirement faced by stakeholder in the construction industry. the biggest challenges of acquirement in green technology knowledge is lack of guideline from the available source is ranked as 1st place. While this statement had been proved by (Ha Chin Yee, 2020) which stated insufficient guidelines from available sources should be considered by developers when implementing green building since there is no precedent to which they can look if a problem arises.

While for the third objective was achieved through data from the collection of a questionnaire which is to suggest strategies to empower the green technology knowledge in construction industry. the strategies to empower the green technology knowledge in construction industry is government policy ranked as 1st and is proven by (Chuen, 2017). Indicating that government policies and regulations are key drivers in green technology knowledge adoption and implementation.

5. Conclusion

All objectives of the research had been achieved, which are, to determine the current understanding of green technology knowledge among stakeholder in the construction industry, to study the challenges of green technology knowledge acquirement faced by stakeholder in the construction industry, and to suggest strategies to empower the green technology knowledge in construction industry. In addition, the local stakeholder can refer the related concept, challenges, and strategies to empowerment of green technology knowledge among stakeholder in the construction industry. Moreover, the local government can refer the research in order to improve the policy in construction field in order to encouraging green building construction and development as government's involvement such as provision of financial and non-financial incentives, regulations and policies to building construction impact the implementation of green building.

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