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## THE PRODUCT CONCEPT OF GREEN BUILDING FOR IMPLEMENTATION IN MALAYSIA

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**Abstract:** As we entered the 21<sup>st</sup> Century, the issues on global warming and climate changing have become very serious topic discussed in most countries. Recently, sustainable development has emerged in Malaysia as an important practice to control issues in environmental damage. This scenario marks the beginning of green building developments that optimize energy use, promote resources efficiency and improve indoor environmental quality. However, the vital things in creating sustainable/green building are knowledge and involvement of all key players in the industry. Hence, after thirteen years since its first introduction to the industry, how well our understanding of this concept and its application in order to improve our environment? The objective of this study is to determine the level of involvement of the key players in the implementation of Green Building and also to identify the drivers and barriers in Green Building concept in the industry. A questionnaire survey carried out with the key players in the industry whereby the distribution of questionnaires is narrowed down to Penang Island only. The results have shown that Malaysian key players have little experiences in green building but they are willing to participate in green building project as they saw a huge opportunity in this area especially in increasing their sales growth. In addition, a clear set of drivers and barriers in Green Building concept were identified in this study. The top drivers for the accomplishment in implementing green building concept is mainly the increasing knowledge on green building related subject. Meanwhile, the most factors that hamper the implementation of green buildings are lack of education and lack of awareness.

**Keywords:** Product, Concept, Green Building, Implementation, Malaysia

### 1. INTRODUCTION

As we entered the 21<sup>st</sup> century, the issues on global warming and climate changing have become very serious topic discussed in most countries. The awareness regarding these issues revived in the beginning of the 1990's where the United Nation's Rio Earth Summit alerted the general public on the rise of global warming and the rapid destruction of ecosystem. Numerous actions have been taken since then on industry, transport, energy use and waste management. Human activities are major contributor to environmental damage and current climate changing. Newly founded international think-tank, the Club of Rome in 1972 has pointed out their ideas on development must be combined with the environmental protection. Following the idea, Norwegian prime minister, Brundtland has produced a report entitled "our common future", which was discussed at the 42<sup>nd</sup> UN congress in 1987 and the concept of sustainable development has been 1<sup>st</sup> introduced in this congress based on this report. At the Rio Earth Summit in 1992, heads of state committed their nations to exploring the ways of achieving "development which fulfills current needs without comprising the capacity of future generations to fulfill theirs". Sustainable development can be described as the act of balancing the human needs with the protection of the natural environment in such manner that these needs can be met not only in the present, but in the definite future. Sustainability as stated by Gilman (1992) is "the ability of a society, ecosystem, or any such ongoing system to continue functioning into the indefinite future without being forced into decline through exhaustion or overloading of key resources on which the system depends". Gauzin-Müller (2002) has stated that the concept of sustainable development is based on three principles which are (1) consideration of the "whole life cycle" of materials, (2) development of use of natural raw materials and renewable energy sources, and (3) reduction in the materials and energy used in raw materials extraction, product use and destruction or recycling of waste. From the principle, the foundation of sustainable development is about awareness on environmental risk. However, it is also seek to reconcile ecological, economics and social factors. Recently, sustainable development has emerged in Malaysia as an important practice to control issues in environmental damage and the concept has been introduced in 1996 (Idris, 2009). The awareness on environmental issues is rapidly increasing since then. Public and private sectors are showing massive interests in how their building will affect the environment, workers productivity and public health. Because of this, both parties are beginning to search for building that optimize energy use, promotes resources efficiency and improve indoor environmental quality (Shafii and Othman, 2007). Green Building concept is focusing in giving

impact on human health and the environment and act as a building that (i) efficiency using energy, water and other resources, (ii) protecting occupant health and improving employee productivity, and (iii) reducing waste, pollution and environmental degradation (Wikipedia on Green Building, 2009). Even though Malaysia has introduced sustainable development concept in 1996, its own green rating tool has only officially launch on 21<sup>st</sup> May 2009. Green Building Index was developed by Pertubuhan Arkitek Malaysia (PAM) and the Association of Consulting Engineers Malaysia (ACEM) which is intended to promote sustainability in the built environment and raise awareness among the key players in construction industry as well as the public on environmental issues (Green Building Index, 2009). One of the examples that show Malaysia is committed with the concept that they have introduced in year 1996 is Pusat Tenaga Malaysia (PTM) where it is being recognized as Zero Energy office (ZEO) Building. PTM is situated in Bandar Baru Bangi, Selangor and was occupied by 60 staff since its completion in October 2007. The other example is GTower which was built by Goldis Bhd. And it is the country's first certified green "mixed development building". GTower is situated in the main commercial center of Kuala Lumpur. This Building was certified be Green Mark – a green rating tool in Singapore and has carried Gold Certificate since March 2008. Other than those two buildings as mention earlier, Iskandar Malaysia (IM) will be an example of the implementation of green technology in its development. Under the district cooling building technology, all governments building in this city will be provided with centralized network system for air-conditioning. The technology has been developed under Jana DCS Sdn. Bhd. And it is claimed to reduce maintenance cost and chlorofluorocarbons emission to the air. In the past 5 years have been a rising number of construction projects which have implemented sustainability development in their project (Shafii and Othman, 2007). They then added that these projects to include housing and commercial building as well as urban development where design takes into considerations key sustainability issue with priority catered to local needs. However, the vital things in creating sustainable/green building are knowledge and involvement of all key players in the industry. So, after 13 years since its first introduction to the industry, how well our understanding of this concept and its application in order to improve our environment? The following questions arise in inspiring the research problem (i) how far the environment and commitment of key players in the industry towards Green Building concept? (ii) what are the diverse and barriers in conducting Green Building concept in the industry? And (iii) what are the reasons to get involves in Green Building? This paper aims to investigate the level of awareness and commitment of the key players in Green Building as well as to determine the diverse and barriers in implementing the concept into the actual project. Apart from that, the reasons to get involves in Green Building by the key players are to be identified. In addition, it also aims to observe the expectation of development in various sectors in regards with Green Building.

## 2. RESEARCH METHOD

Construction key players were approached to capture their views and perception towards the problems statement. The targeted respondents in the area of Penang State are chosen due to close proximity for researcher and limited study time and budget. The data collected from the answered questionnaires by the respondents. The data collected from the questionnaires were then tabulated and analyzed using Frequency Analysis method. The questionnaires were taken from previous research paper and were adopted to suit this paper's objectives. Respondents were divided into three categories namely (i) clients, (ii) consultants, and (3) contractors. A total of 50 questionnaires were distributed to these three categories. Of these, only 37 respondents were replied back, yielding a response rate of 74%. The distribution of the questionnaires to these respondents is shown in Table (1).

## 3. RESULTS ANALYSIS

### 3.1. Respondents Background

Out of 37 respondents, 60% were contractor's company, followed by consulting firms which carried 24%. Meanwhile, Table (2) shows the percentage of respondents' designation and years of 'working experiences. It was noted that 32% of participants were quantity surveyor and 27% were architects. Concerning the working experiences, it was seen that 35% were having a working experiences between 11–15 years and 32.4% of them indicated that they are having a working experiences between 1–5 years.

### 3.2. Significance of Green Building

As shown in Table (3), 68% of the respondents mentioned that they never involved in a project that include 'green' product,

**Table 1.** Distribution of Questionnaires

Type of organization	Contracting	Consultant	Client
Sent	25	15	10
Received	22	9	6

**Table 2.** Respondents and Company Background

Items	Percentage (%)
Type of Organization	
Contracting	60%
Consultant	24%
Client	16%
Professional designation of officer responding	
Architect	27%
Engineer	24%
Quantity surveyor	32%
Other	14%
Years of experience	
1-5 years	32.4%
6-10 years	32.4%
11-15 years	35.1%
16-20 years	-
More than 20 years	-

design or other element in green building. Only 32% of the respondents were answered with “yes” for having involved in a project that had green element either in product, design or any other element that related in green building. Table (3) also shows the percentage of the respondent’s company commitment to green building. 38% answered that their company are highly committed with the green building, 49% answered they are moderated in giving commitment to green building and 13% answered low in

**Table 3.** Significance of Green Building

ITEMS	Percentage (%)
Involvement in Green Building	
Yes	32%
No	68%
Firm’s Commitment on Green Building	
Very high	0
High	38%
Moderate	49%
Low	13%
Sales Growth Expectations	
Significant	8%
Some	35%
Little	33%
None	5%
Don’t know	19%
Impact of Green Building on Future Profit	
Significant	14%
Some	43%
Little	22%
None	5%
Do not know	16%

commitment to green building. Referring to Table (3), it can be seen the majority of the respondents which carried 35% of total percentage have some expectation in sales growth to their firms as results of green building while 33% have little expectation. The results showed that only 8% of the participants answered that a green building will bring a significant sales growth to their firm. Further, he majority of the respondents which carried 43% of total percentage responded that green building will have some impact on their future profits followed by 22% that replied little impact on future profits if they involves in green building. Only 14% believed that green building will give significant impact on their future profit while 5% of the responded answered green building will not giving them any profits in the future. Another 16% do not know the impact of green buildings towards their future profits.

As presented in Table (4), it can be noticed that the expected growth for green building in various sectors. These sectors were divided into three categories which none (no growth at all), Growth and Strong Growth. In Strong Growth categories, the 1<sup>st</sup> ranked with 40.54% is in

private sectors, followed by residential sectors with 32.43%. Commercial office and industrial sectors each in 3<sup>rd</sup> place with 29.73%. In addition to that, hospitality and government sectors are also shared the same spot in 5<sup>th</sup> place with 21.63%. This is followed by education sectors with 18.92% and the least expected to have strong growth is in retail sectors which carried only 8.11%. Meanwhile, in Growth categories, majority of the respondents expected government sectors have the most expected growth with 78.38%. Followed in 2<sup>nd</sup> and 3<sup>rd</sup> place are hospitality and education sectors with 75.68% and 72.97% respectively. Commercial office is in 4<sup>th</sup> place with 65.57%. For retail and residential sectors, they only represent 62.16% expected growth from the respondents. This is followed by industrial sectors with 59.46% and the least expected to have growth is in private sectors which carried only 51.35%. From the table (4), for None categories, retail sector is ranked 1<sup>st</sup> with 29.73%, followed by Industrial sectors with 10.81%. Education and private sectors are placed 3<sup>rd</sup> with 8.11% each and residential sectors place 5<sup>th</sup> from the overall ranking in this categories with 5.41%.

**Table 4.** Expected Growth Sectors in Green Building

Sectors	Strong Growth		Growth		None	
	Percentage (%)	Rank	Percentage (%)	Rank	Percentage (%)	Rank
Private	40.45	1	51.35	8	8.11	3
Government	21.62	5	78.38	1	0.00	8
Retail	8.11	8	62.16	5	29.73	1
Residential	32.43	2	62.16	5	5.41	5
Commercial Office	29.73	3	67.57	4	2.70	6
Industrial	29.73	3	59.46	7	10.81	2
Education	18.92	7	72.97	3	8.11	3
Hospitality	21.62	5	75.68	2	2.70	6

### 3.3. Drivers and Barriers Factors

The participants were questioned on their personal opinions on what are the drivers and barriers in implementing ‘Green Building’ in Malaysia by the key players in the industry. Based on the results presented in Table (5), a total of 11 drivers were identified and they were ranked in order based on their priorities. For instance, increased education (94.59%) was ranked the first driver factor in implementing green building in Malaysia followed by competitive advantage, Lower lifecycle cost and Environmental conditions (89.10%). Meanwhile, five barriers were identified that will hampered the progress of implementation green building in Malaysia. For instance, lack of education and Lack of awareness (91.89%) was seen the first barriers followed by no fiscal incentive from government and Perceived higher upfront cost (83.78%).

**Table 5.** Drivers and Barriers in implementing 'Green Building' in Malaysia

Description	Drivers (%)	Barriers (%)	Results
Competitive advantage	89.19	10.81	Driver
No fiscal incentive from Government	16.22	83.78	Barrier
Perceived higher upfront cost	16.22	83.78	Barrier
Lower lifecycle cost	89.19	10.81	Driver
Superior building performance	81.08	18.92	Driver
Lack of education	8.11	91.89	Barrier
Tenant satisfaction and productivity	71.27	29.73	Driver
Lack of research and/case study	13.51	86.49	Barrier
Client demand	81.78	16.22	Driver
Increased education	94.59	5.41	Driver
Industry rating system	72.97	27.03	Driver
Government and building code	70.27	29.73	Driver
Lack of awareness	8.11	91.89	Barrier
Greater availability of green product	75.68	24.31	Driver
Environmental conditions	89.19	10.81	Driver
Rising Energy Cost	83.78	16.22	Driver

### 3.4. Reasons for Green Building to be implemented in Malaysia

Figure (1) displays the reasons to get involved in green building. 24.5% of the respondents were chosen expanding their business with 'green building' clients. 16.3% responded that their reasons were because of the contract requirements and also being part of an industry that values the environment. Attraction and retention of talent carries 10.2% from the total respondents. For 9.2% each, the reason to get involved with green building will be awards for 'green building', benefits from publicity and achieving lower lifecycle cost. Higher return on investment on resale would be the least reason to get involved in green building.

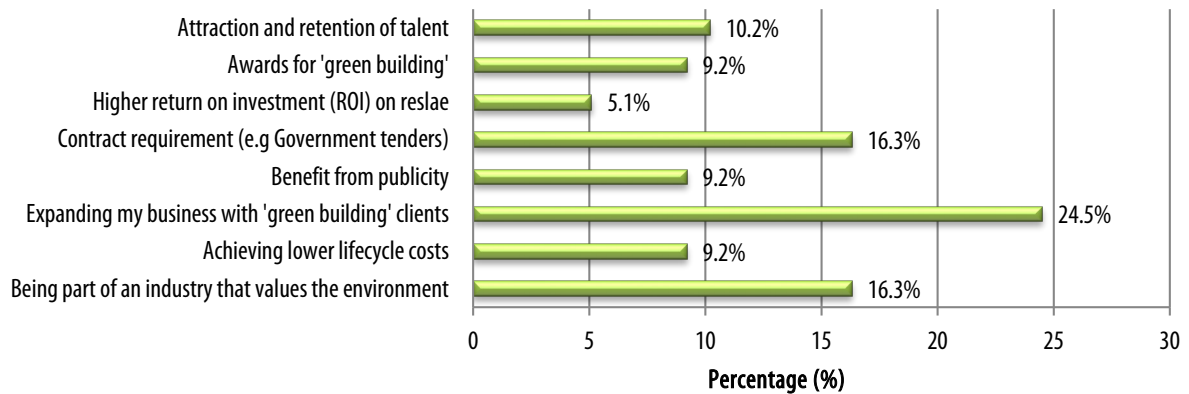
**Figure 1.** Reasons to get involved in 'green building'

Table (6) represents the reasons for green building in perspective of business. As shown in Table (6), the first ranked group, the most important reason was "higher building value" with 35.1%. For the second ranked group, the first important reason was "higher return on investment" with 27%. Concerning the last ranked group, the top reasons were "helping to transfer the market" and also "lower lifecycle cost" with 16.2% each.

**Table 6.** Business Reasons for Green Building

Business Reasons for Green Building	Ranking		
	1 <sup>st</sup> Ranked Group	2 <sup>nd</sup> Ranked Group	3 <sup>rd</sup> Ranked Group
Reduced Liability and Risk	5.4%	5.4%	5.4%
Increased staff productivity and retention	-	-	10.8%
Enhanced marketability	10.8%	21.6%	13.5%
Helping to transfer the market	2.7%	2.7%	16.2%
Higher return on investment (ROI)	16.2%	27.0%	10.8%
Higher building value	35.1%	8.1%	16.2%
Lower lifecycle cost	8.1%	18.9%	16.2%
Lower operating costs	21.6%	16.2%	10.8%

Table (7) shows the reason for green building in perspective of environment. It can be seen that for the first ranking group, the first reason was "protection of the environment" with 32.4% and the second ranking group, the first reason was "protection of the environment" was ranked the first reason under the second group with 24.3%. Consequently, this reason is not valid to be the top reason in its group and 2<sup>nd</sup> top reason which is reducing climate change and carbon emissions with 21.6% will replace its position.

Asper the third group, the same situation occurs for top two reasons. The same measure was taken up and the top reason will be minimizing ecological impact of building and moral imperative of 'green' with 16.2%.

**Table 7. Environmental Reasons for Green Building**

Environmental Reasons for Green Building	Ranking		
	1 <sup>st</sup> Ranked Group	2 <sup>nd</sup> Ranked Group	3 <sup>rd</sup> Ranked Group
Improving indoor environment quality of building and 'sick building' syndrome	10.8%	8.1%	13.5%
Moral imperative of 'green'	5.4%	10.8%	16.2%
Minimizing ecological impact of building	16.2%	18.9%	16.2%
Reducing climate change and carbon emissions	13.5%	21.6%	24.3%
Protection of the environment	32.4%	24.3%	16.2%
Scarcity of natural resources	21.6%	16.2%	13.5%

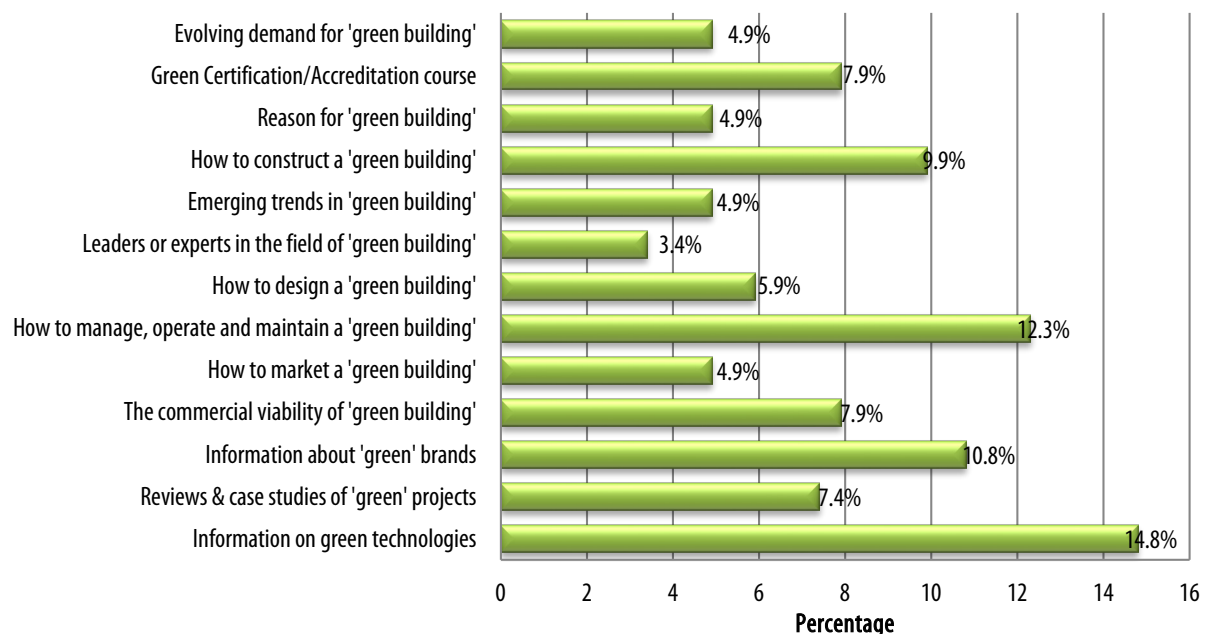
Respondents were asked on their opinions to indicated the top three reasons for 'green building' where a list of reasons were provided in a Table and they have been asked to rank them in accordance with their priorities. Table (8) shows the reasons for green building in general perspective. Based on the data presented in Table (8), it can be seen that the first ranking group, the first reason was "greater health & wellbeing (offices and homes)" with 51.4%. For the second group, the first ranked reason was "improved leaning and healing environment (schools and hospitals)" with 40.5%. And for the third group, the top reasons was support for the local economy and also aesthetics each"" with 37.8% for each. Therefore, the top three business reasons for green building are as follows (1) greater health & wellbeing (offices and homes), (2) improved leaning and healing environment (schools and hospitals), and (3) support for the local economy as well as aesthetics.

**Table 8. Reasons for Green Building**

Reasons for Green Building	Ranking		
	1 <sup>st</sup> Ranked Group	2 <sup>nd</sup> Ranked Group	3 <sup>rd</sup> Ranked Group
Aesthetics	2.7%	5.4%	37.8%
Support for the local economy	16.2%	18.9%	37.8%
Improved leaning and healing environment (Schools and Hospitals)	29.7%	40.5%	18.9%
Greater health & well being (offices and homes)	51.4%	35.1%	5.4%

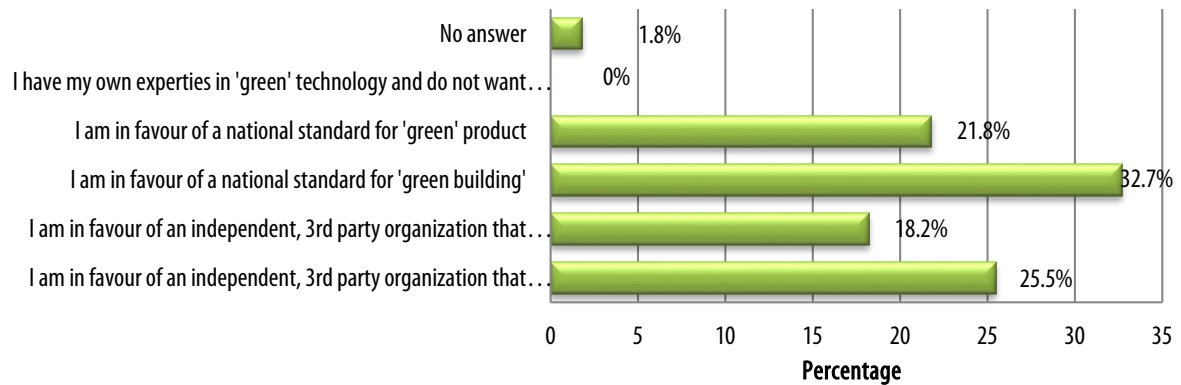
**3.5. Information and Education**

The respondents were asked about their knowledge area on green building that respondents wish to learn more. As show in Figure (2), the topic with the highest percentage is on the information on green technologies with 14.8% and followed by a topic regarding how to manage, operate and maintain a green building with 12.3% and information about green brand with 10.8%. Topics on how to construct green building, green certification/accreditation course, the commercial viability of green building, reviews and case studies of green project and how to design a green building falls in a range from 10% to 5% respectively. Meanwhile, with 4.9% each, topics on evolving demand for 'green building', reason for green buildings, emerging trends in green building and how to market green building also give interest to some respondents to gain more knowledge on it. The latest topic that the respondents wanted to know more is on leaders or experts in the field of 'green building' with 3.4%.



**Figure 2: Exploring the Respondents' Knowledge on Green Building Related Topic**

Figure (3) demonstrates the agreement on statement given on the questionnaires regarding the certification of the green building and green product. As shown in Figure (3), the majority of the respondents would like to use the national standard for green building certification with 32.7%. 25.5% of the respondents responded that an independent, third party organization should certifies green building. The same situation occurred for certification for green products. Nearly twenty two percent of the respondents agreed on a national standard to be used in order to certify green products while 18.2% agreed to an independent, third party organization to certify green products.



**Figure 3:** Respondents 'Agreement on Statement Given

Concerning the level of knowledge of the respondents on green rating tools which is presented in Table (9), the survey showed that the respondents have good knowledge on these tools with 8.11% in green rating tools from Malaysia, Australia and Singapore while 18.92% from USA. Ranges from 19 – 46% of the respondents have fair knowledge on green rating tools to each 4 rating tools. However, the majority of the respondents which carried a range from 38 – 73% have poor knowledge on green rating tools especially from Australia with 72.97%.

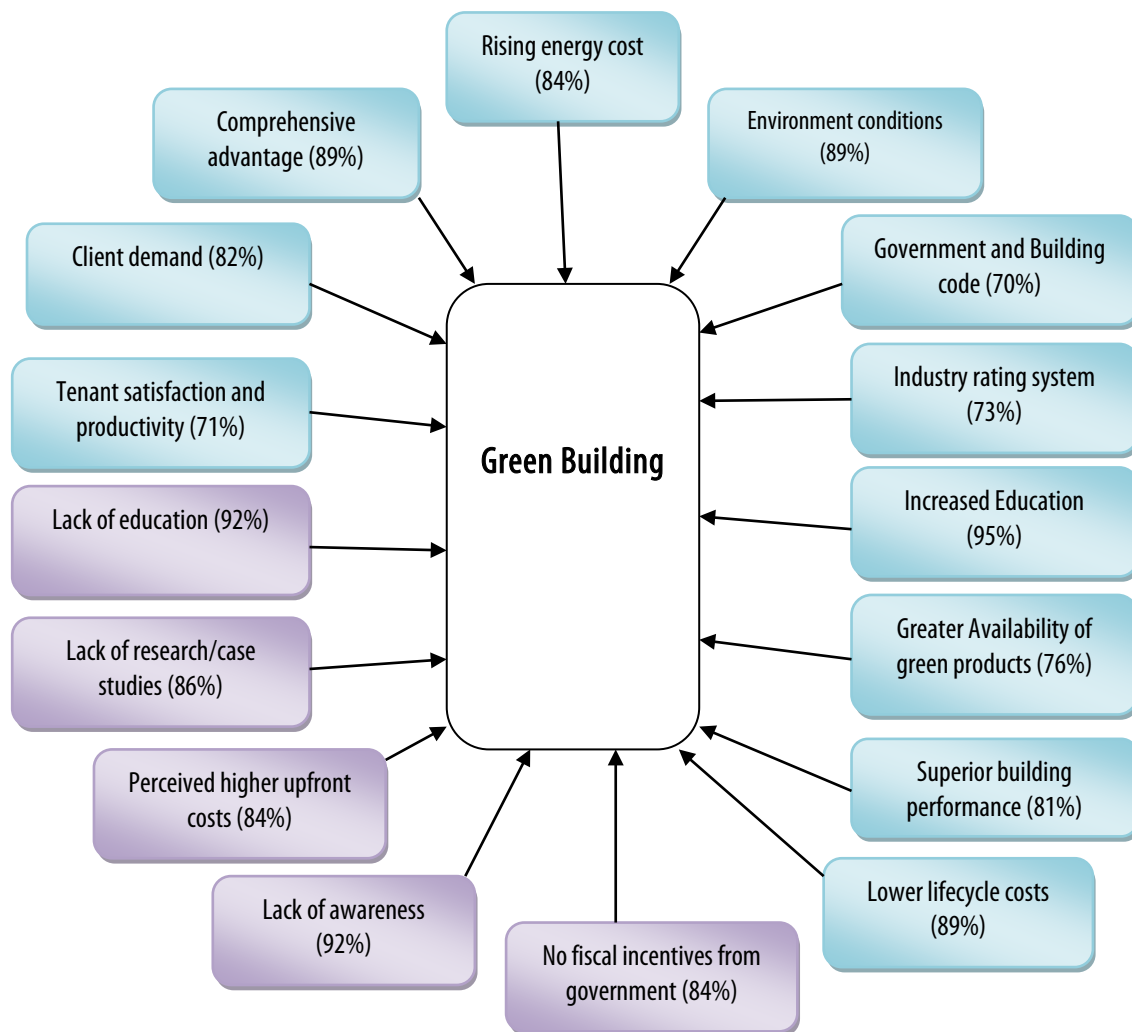
**Table 9:** Knowledge on Green Rating Tools

Knowledge on Green rating tools	Rating		
	Good	Fair	Poor
Green Building Index (Malaysia)	8.11%	45.95%	45.95%
Green Star (Australia)	8.11%	18.92%	72.97%
Green Mark (Singapore)	8.11%	37.84%	54.05%
LEED Certification (USA)	18.92%	43.24%	37.84%

#### 4. FINDINGS AND DISCUSSING

The first objective is to determine the level of involvement of the key players in the implementation of Green Building; this objective was attained in the questionnaires Section B – Significance of Green Building. The results in data analysis showed that majority of the key players in the industry is never been involved in a project that included green products, designs or other elements in green building. This is quite understandable since Malaysia has only recently launched its own green rating tools as other rating tools like Singapore's Green Mark are not suitable to be applied in Malaysia because its scoring priorities are very much customized for their current state where a lot of priority is given to energy and water efficiency scored. However, based on the respond received, they are moderately committed to green building implementation in their projects. This is a good development as it shows that the industry are getting ready to confront important critical issue in environment such as global warming, carbon emission and climate change. The second objective for this paper was to identify the drivers and barriers of the Green Building concept in the industry. From the analysis, a clear set of drivers and barriers in green building concept in the industry were identified. Using the same graphic used by Kerr, Managing Director of BCI Asia in his report on Green Horizon for Malaysia's Building (2008), the drivers and barriers is summarize for easier understanding.

From Figure (4), the first and foremost drivers for the accomplishment in implementing green building concept are mainly the increasing of knowledge on green building and its related subject. Since the launch of GBI, there were a significant seminars and workshops that were held to increase awareness in green buildings among key players in the industry. This awareness is perhaps will motivates the key players in implementing green building concept in their product. The other drivers are the environmental conditions. Lower lifecycle cost and the advantage of having accomplished green building projects. Since sustainable development first introduction in 1996, perhaps the key players in the industry are starting to aware the impact of development to the environment as well as observing the lower lifecycle cost if green building concept were implemented in their building. By having accomplished green building project, this will create a healthy competitive advantage to people who involved in that project. These drivers are parallel with the top reasons why respondents want to get involved with green building.



**Figure 4.** Drivers and Barriers in Malaysia

Source: adopted from Kerr (2008)

Other than factors as mention above, rising energy cost and client demand are also the drivers towards the implementation of green buildings. As renewable energy is one of common trademark of green buildings, perhaps client saw this criterion as an advantage to them in a long run. Therefore, the demand for green building from client indeed is one of the drivers in green building concept in the industry. Superior building performance, greater availability of green product, industry rating system, tenant satisfaction and productivity and also government and building code are also drivers for implementing green building concept in the industry. Five barriers were identified during data analysis. The most factors that hamper the implementation of green buildings are lack of educations and lack of awareness. Even though, as explain earlier that the awareness on green building perhaps is increasing, but because of the green concepts are still new to the key players to implement them in real project as massive knowledge on green building are essential in the implementation process. The other factor that might contribute to hamper the implementation of green building in Malaysia is no fiscal incentive from the Government. As many of us have these skeptical ideas that to build a green building they have to increase the cost in constructing it. Incentives from the Government are also important to raise interest among key players in the industry to actually actively involved in green building projects. This can be seen Singapore initiatives to increase the involvement of their key players in green building concept by offering bonus gross floor area (GFA) for private development which attained the Green Mark Platinum or Gold. Lack of research and/case study also contribute to hamper the implementation of green building in the industry.

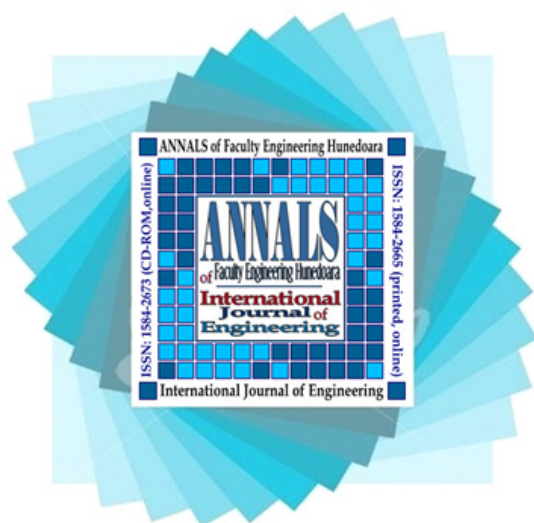
## 5. CONCLUSION AND RECOMMENDATIONS

It can be concluded that key players in the industry have little experience in green building but are willing to participate in green building project as they saw a huge opportunity in this area especially in increasing their sales growth. In addition to that, they are also expecting some growth in green building especially in government, education and hospitality sectors. As government are also encourage green building concept to be implemented in government offices such as development in Iskandar Malaysia, other sectors will perhaps follows the footsteps of this new trend. Sure enough in implementing green building concept in Malaysia,

there are a few factors that can be taken as drivers to motivate this new trend. Increasing education on green building is one of the factors that encourage the key players in the industry to implement green building concept in their project. However, as this concept is still new to our industry, the lack of education and awareness on green building concept are also the factors that slow down the implementation of green building in Malaysia. Despite of all the drivers that can further increase the development of green building in the industry, the initial cost in implement green building still a concern for the users and building owner. It seems that concerns about the potentially higher upfront costs of green building have overshadowed the acceptance of sustainable building strategies and their benefits. This will bring us back to the main factors that slow down this implementation of green building and lack of education as well as awareness on this issue. Key players in the construction industry play major roles in supporting green building concept in Malaysia. The results of this study have shown that Malaysia is getting on the right condition to minimize the impact of development on the environment. This is because these key players see themselves being part of the industry that values environment is important as well as they see there is a huge opportunity in their business growth. Furthermore, these key players are keen to know more on green-building-related topic to have a deeper understanding on this subject. As Malaysia now has its own green rating tool, building in Malaysia can be assessed on their impact to the environment and the new construction of new building can be guided and managed to lessen their impact on their surroundings.

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