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Contractors' Perspective on the Maturity Level of Green Building Practises in Sarawak Construction Industry

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ARTICLE INFO	ABSTRACT
<p>Article history: Received 27 November 2026 Received in revised form 20 February 2026 Accepted 15 April 2026 Available online 4 May 2026</p> <p>Keywords: contractors; green building; maturity level; construction industry</p>	<p>Globalization with rapid construction activities resulted in releasing carbon emissions that reaching to an alarming rate. Such high emission alerted different stakeholders to look into sustainable practices and green building is one of the initiatives. Malaysian government have been promoting green building practices with the support from Construction Industry Development Board and Green Building Council for green rating tools. Despite the efforts from various parties, the maturity level of green practices in Malaysia is still not high comparing to the developed countries. This study aims to investigate the maturity level of green building practices and factors influencing such practices in the Sarawak construction industry from contractors' perspective. Semi-structured interviews with six contractors that are ever involved with green building projects were conducted. Content analysis were employed to analyse the collected data. The findings revealed that the interviewees aware on the existence and benefits of green building practices but not taking initiatives to involve. Hence, the results indicated that the maturity level of green building practices in Sarawak construction industry is still at the low level. The results showed that the key factors that affecting the maturity level are cost and awareness. This study could serve as a basis and provide greater insights into the adoption of green building practices in the Sarawak construction industry.</p>

1. Introduction

The Malaysian construction industry plays a crucial role in contributing to the country's Gross Domestic Product (GDP) yet possess negative implications to the environment, society, and economy. Such negative implications could be due to its heavy reliance on non-renewable resources and generates a substantial amount of waste [1]. Studies had shown that Malaysian construction industry alone contributed to 40% of carbon dioxide (CO₂) emissions [2]. To mitigate these issues, the concept of 'green buildings' has emerged. Sarawak, the largest state in Malaysia, is having tremendous construction projects for the country's development, by contributing 10.5% towards the whole country's construction project in the second quarter of 2023 [3]. Green buildings are designed,

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constructed, and operated in an environmentally friendly manner, aiming to minimize their negative effects on society. Moreover, the adoption of green buildings can assist with conserving natural resources and improving the overall quality of life [4]. Hence, it is of crucial importance to ensure the adoption of green building practices into the construction industry.

Green building practices are the essential components of sustainable construction development [5]. Such practices encompass practices that endorse the conservation of resources, energy, and water, as well as the reduction in the utilization of natural resources. These practices involve strategies such as water and energy conservation, along with building designs that create a healthy indoor environment for occupants. The implementation of green building practices can yield numerous benefits, including a decrease in energy consumption and associated costs, preservation of non-renewable resources, reduction in the usage of building materials, and enhancement of indoor air quality, thereby improving the health and productivity of employees [6]. As a result, construction experts and researchers worldwide have shown significant interest in green building practices, and some of the government authorities had provided support for the adoption of green building practices, such as the Construction Industry Development Board (CIDB) [7]. However, despite having the Green Building Index (GBI) in place for over a decade, the current stocks of Malaysian buildings differ significantly from those in London and Singapore in terms of the proportion that are certified as green buildings [8]. Studies had shown that the perception of green buildings are more expensive compared to conventional hindered the adoption of green building [14].

Various studies had been conducted in relation to green buildings, which focusing on the barriers [15-17], benefits [18-19] and strategies [20-21]. However, little-to-none of the research specifically focuses on the maturity level of green building practices of contractors solely. Contractor is one of the key stakeholders in the construction industry as this stakeholder liaised with most of the stakeholders throughout the entire construction phase of a project [22]. Contractors have the overall responsibility of overseeing and managing every aspect of a construction project, to ensure that a project adheres to relevant laws and regulations [23]. Thence, the maturity level and non-adoption of green building practices by contractors undoubtedly affects the built-up rate of green buildings in a country.

The maturity level could be referred as an organization reaches a state of maturity when it is functioning optimally to achieve its goals or objectives [24]. This shows that an organization is reaching towards the efficiency and effectiveness in the green building practices implementation through different techniques and methods. Moreover, the maturity level of green building practices could be influenced by various factors such as cost [25], government involvement [26] and organizations' support [27]. However, the factors could be varied according to the focus of stakeholders and geographical location. Therefore, this research aims to identify the maturity level of green building practices and its influencing factors in the Sarawak construction industry from the viewpoint of contractors. This research is expected to serve as a foundation and offer deeper understanding on the maturity level of green building practices and its associated influencing factors in the construction sector of Sarawak. This could further assist in ensuring the quality of a project while promoting sustainability.

2. Literature Review

Maturity could be referred to being ripe or reaching the maximum growth and development [28]. It could be achieving the more advanced process stage [24]. Moreover, maturity could be seen as the potential growth in capabilities and indicates the level of sophistication present in both the organizational processes and the consistency of green building projects throughout the organization

[24]. This could include the viewpoints of the project and risk management aspects. Maturity, in the realm of risk management, indicates the level of expertise an organization possesses in comprehending its risk portfolio, effectively mitigating those risks, and having effective measures in place for business continuity and recovery [29].

The Capability Maturity Model (CMM), developed by Carnegie Mellon University, is derived from the Maturity Model. Its main purpose is to offer a structured framework that aids in evaluating the capability of project management or organizational management [30]. Despite the original usage in the software industry in assessing the maturity level of software, CMM has gained popularity in other fields like building information modeling and intelligent manufacturing projects [30-31]. Hence, this research utilized CMM to examine the maturity of green building practices in the Sarawak construction industry.

The CMM consisted of five levels, namely initial, repeatable, defined, managed and optimizing. In Level 1, this initial or ad hoc stage is characterized by chaotic and unstable processes [9-10,24]. Organizations could struggle to commit to proper procedures, often leading to crises. Success at this level relies heavily on experienced managers and skilled development teams [10]. Continual success often hinges on using the same competent individuals for subsequent projects. Level 2 that signified the repeatable or planned level, is a more organized phase in project management maturity [11]. It establishes fundamental project management processes to track costs, schedules, and functions and address issues. Level 2 also addresses managerial challenges, with a focus on policies to ensure the stability and repeatability of project success [11]. In project management, it involves formalizing proposal plans for approval. The defined level (Level 3) represents advanced process maturity. It involves well-documented, standardized, and integrated processes for development and maintenance within an organization. These processes are flexible, allowing customization for different projects, improving worker productivity [9-10,24]. Training programs are essential to ensure that employees possess the necessary knowledge and skills. Organizations gain control over product lines, costs, schedules, and quality. The primary focus shifts to organizational learning through process definition and improvement.

The managed level (Level 4) signifies a high degree of understanding and control over processes and products. All process and product details are clearly defined [9-10,24]. In project management, it involves taking past performance and future expectations into account. Efficient metrics are developed and used for decision-making. Management has a better understanding of their roles and effectively distinguishes between different management styles based on project size and complexity [13]. The optimizing level (Level 5) represents a continuous commitment to improvement within organizations [10]. The focus is on continuous improvement, driven by feedback from processes and resulting in the development of innovative ideas and technologies. These organizations set industry standards for project management discipline and witness increased worker productivity through continuous improvement efforts.

All the aforementioned maturity levels are affected by various factors. The list of factors that derived from literature review is shown in Table 1.

Table 1
Factors Derived from Literature Review

<i>Factors</i>	<i>References</i>
Research and Development	
Technology (Innovation)	[33], [34]
Research and Development	[33], [35]
Culture	
Market Demand for Green Building	[33], [34]

Table 1
 Factors Derived from Literature Review

<i>Factors</i>	<i>References</i>
Motivation	[1], [35]
Education on Green Building	[33], [36]
Awareness of Green Building	[33], [36]
Management Capability and Capacity	
Training	[26], [36]
Knowledge of Green Building	[36], [37]
Expertise (Skilled Labor)	[37], [38]
Organizational Support	[1], [36], [37]
Cost of Green Building	[25], [26]
Performance	
Government Regulatory and Legislation	[26], [38]
Government Support (Incentives)	[26], [36], [38]
Stakeholders Involvement	[1], [26]

These factors were classified under the four categories, namely research and development, culture, management capability and capacity, and performance. Research and development focused on the research and innovation in the context of green building, consisting of technological innovation and research and development [33-35]. The culture category emphasized the cultural factors affecting the development and implementation of GB practices. It includes market demand for green building, awareness, education and motivation, which are vital in promoting and implementing green building practices successfully within a community and society [1, 33-36]. Management capability and capacity involved organizational support, expertise, knowledge of green building, and training, which contributing to the success of the green building practices when being adequately addressed [1, 26, 36-38]. The category of performance considered the importance of stakeholder collaborations, including the government incentives, regulatory guidance and the associated cost in shaping for green building practices maturity [1, 26, 36, 38].

3. Research Methodology

As this research requires the selection of a less rigid method to support the researcher's intention for the multi-perspective understanding of green building practices in the Sarawak construction industry, semi-structured interview was adopted. Semi-structured interview is a suitable data collection technique for managing data generated through interaction between researcher and interviewees, especially in understanding meaning and exchanging views through interaction [39].

Contractor was identified as the targeted interviewees as contractor is the key contact person throughout the entire construction phase of a project [22]. Purposive and snowball sampling methods were adopted to identify the targeted interviewees. The interviewees shall have experience with green building projects with at least five years' experience as a contractor in the Sarawak construction industry. Moreover, the interviewees shall be working in the Grade 7 construction companies. Grade 7 companies were selected as the companies having unlimited construction projects coverage which leads to a high tendency to be involved in the green building projects. The contractors could have a higher chance of being exposed to green building trainings and hence equipped with a better level of knowledge of green building. The data collection ceased when achieving data saturation. As a result, five contractors in Sarawak that are involved with green building projects were recruited as interviewees of this research.

Each interview session was recorded, and notes were taken to ensure an effective transcript. The consent was obtained from the interviewee prior to the recording session. The interview transcripts

were then be analyzed by using content analysis method. To ensure research reliability, the interview transcripts were sent to the respective interviewees for final confirmation on the content being transcribed.

4. Findings and Discussion

This section presents the demographic details of the five interviewees and the maturity level of green building practices adoption in Sarawak construction industry.

4.1 Demographic Details

Five interviewees participated in this study with a minimum of five years' experience. The interviewees had experience in dealing with green building projects and working in Grade 7 construction companies, who are handling larger scale construction projects in Sarawak. All five interviewees were based in Sibu or Kuching (refer to Table 2). Hence, the interviewees provide insight based on the three construction projects in Sarawak, which are University College of Technology Sarawak, Sarawak Museum and Toyota 3S Centre. These projects obtained the certification of GBI. The interviewees pointed out that all three projects are government projects. This seems to indicate that the private sector has less involvement with green building projects.

The interviewees mentioned about the green features that being incorporated into the green building projects, such as recycling water, lighting sensors (I1), double glazed windows, green painting, high ceiling (I2), solar panels, non-chemical shellac (I3), enhancement of indoor environmental quality (I4) and air filtration (I5). These responses showed that the interviewees are aware of the green building features and applied such practices in their projects.

Table 2
Details of Interviewees

<i>Code</i>	<i>Year of Experiences</i>	<i>Location</i>	<i>Position</i>
I1	More than 10 years	Kuching	Construction Manager
I2	More than 25 years	Sibu	Senior Project Manager
I3	More than 15 years	Kuching	Project Manager
I4	More than 20 years	Kuching	Project Manager
I5	More than 5 years	Sibu	Assistant Project Manager

4.2 Maturity Level of Green Building Practices Adoption

The concept of maturity in green building practices was explored, and it was noted that none of the interviewees were familiar with this concept or any associated maturity models. However, three interviewees expressed their opinions on the maturity of green building practices in Sarawak, by stating that such practices is still at infancy stage of development. The interviewees reckoned that the level of maturity is closely related to the acceptance and adoption of green building practices by individuals and organizations, by emphasizing that maturity is about more than just the passage of time.

The interviewees were given the Capability Maturity Model to assess the maturity of green building practices in Sarawak. The interviewees were informed of the five levels of maturity of this model, with 1 as initial level, 2 as repeatable level, 3 as defined level, 4 as managed level and 5 as optimizing level. The interviewees had varying opinions on the maturity levels, with some considering it to be at Levels 1 or 2, and others perceiving it to have reached Level 3. Those who suggested lower

maturity levels pointed out challenges such as extra costs, lack of awareness, demand, expertise, and government support. In the context of Level 1 or 2 maturity being selected, the contractors may lack knowledge of green building concepts due to the use of conventional construction methods. This lack of awareness and resistance to adopting green building practices could possibly place Sarawak lagging behind other countries in terms of green building adoption. This is in line with the literature that Malaysia is having a lower number of certified green buildings compared to other countries [8].

Interviewees who believed in a higher maturity level emphasized factors like government incentives and client support as key contributors. The contractors could receive extensive training and knowledge about green building practices, enabling them to apply these practices in their projects and advocate for green building concepts.

Although there were varying opinions with regards to the maturity level of green building practices in Sarawak construction industry, none of the interviewees suggested Sarawak to have reached Level 4 or 5. This seems to indicate that the green building practices in Sarawak construction industry is still at the early stage of development.

To enhance the maturity of green building practices in Sarawak, the interviewees stressed the importance of government involvement. The interviewees recommended in mandating green building practices, offering incentives, and providing support through policies, regulations, low-cost loans, and subsidies. Additionally, the interviewees highlighted the significance of education, training, and awareness programs for professionals and the public, emphasizing the need to increase environmental consciousness and knowledge about green building practices. This multi-faceted approach involving various stakeholders and government support was seen as essential for enhancing green building practices maturity in Sarawak.

4.3 Factors influencing the Maturity Level of Green Building Practices

This research further explored factors influencing GB practice maturity. Most interviewees noted the significant influence of budget or cost on maturity levels due to the higher costs associated with green building practices. Such finding is tally with [25] that cost of green building technologies and materials influencing the adoption of green building practices. One of the interviewees mentioned that:

The materials and processes used during the construction of green building are different from conventional building, which incurred higher cost. (I3)

Interviewee 5 opined that the role of government support, environmental awareness, and education are of utmost influencing factors. Interviewee 5 underlined the importance of government policies and regulations, as well as the need to raise awareness and incorporate green building education into universities to encourage its adoption. Interviewee 5 highlighted the crucial role of government policies and regulations in promoting the adoption of GB practices in Sarawak.

Government is playing the key role to mandate the green building construction enforcement and adoption rate. Those financial and non-financial provisions could assist its implementation. (I5)

Such finding is in line with [40] that the stakeholders shall collaborate to ensure efficient sustainable buildings implementation, with the support of government. The mandatory requirement of green building from government undoubtedly assists with the green building practices maturity level. For instance, Australia is mandating for a minimum of six star rating based on Australian National Construction Code, which mandate the developers and contractors to include 'green' features into the new building construction [41]. This seems to indicate that with the mandatory requirement by government, the contractors will be made compulsory to learn and improve their

knowledge for the green building practices. Similar approach may be applicable to Malaysia for improving the green building practices and its maturity level.

Three of the interviewees reckoned that there was limited market demand for green building practices unless incentivized by tax deductions or rewards. The financial incentives or tax deductions seem to be able to offset the challenges faced by the contractor in green building practices adoption. Moreover, Interviewee 3 emphasized the need for training and government incentives.

The incentives and training are the encouragement for us to adopt green building practices. Without the encouragement and training, we are afraid to venture into new practices as the rate of return of our investment is unable to be assured. (15)

This seems to imply the hesitation in adopting the green building practices which in turn affecting the maturity. Hence, the training from government and incentives could be able to increase the confidence of contractors in adopting green building practices. Moreover, the training could allow contractors to be more aware on the selection of green building technologies and methods, which in turn, in the future could allow contractors to suggest those technologies to their potential clients.

5. Conclusions

This research examined the maturity level of green building practices in Sarawak through the viewpoints of contractors who worked in large scale construction companies. The findings indicated that the green building practices are still at the early stage of development and adoption in Sarawak construction industry, with all interviewees pointed out that the maturity level is in between initial to defined level.

To increase the level of green building practices maturity, the interviewees suggested for contractors in attending green building-related training and government to provide incentives as well as mandating the incorporation of green building practices for new building construction. As most of the green building projects in Sarawak are government-related projects, local authorities and governments could encourage contractors' involvement to foster green building practices adoption. Support can be provided in the form of incentives, tax breaks, and promoting GB practices through advertising and campaigns. This research could contribute to the Sarawak construction industry as an indication on the current status of the maturity level of green building practices and provide some guidance to the contractors and / or government on the possible strategies to adopt to foster the uptake of green buildings. This could further help to ensure the quality of the projects and encoered with the global Sustainable Development Goals.

As this research only focused on Sarawak, hence the results may not be able to generalize to the entire Malaysia. Future research can expand to cover the entire Malaysia and use different research methods, such as quantitative or mixed methods, for comprehensive understanding of green building practices and the maturity levels.

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