Investigating Critical Barriers of Green Building Technologies (GBTs) Adoption in the Sri Lankan Construction Industry

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Abstract

This research investigates the critical barriers to the adoption of Green Building Technologies (GBTs) in the Sri Lankan construction industry. Despite the global shift towards sustainable construction practices, Sri Lanka has been slow to embrace GBTs due to various challenges. Through a comprehensive literature review and a survey of 50 industry professionals, this study identifies 14 significant barriers, including high initial costs, economic uncertainties, and lack of supportive government policies. The findings highlight the predominance of economic and political barriers, emphasizing the need for targeted strategies such as financial incentives, policy reforms, and capacity-building initiatives. The study concludes that overcoming these barriers is essential for advancing sustainable construction practices in Sri Lanka and promoting long-term environmental sustainability.

Keywords: Green Building Technologies; GBT Adoption; Sri Lanka; Construction Industry; Barriers; Sustainability

Introduction

Green Building Technologies (GBTs) have emerged as a vital component in the pursuit of sustainable development within the construction industry. GBTs encompass a range of practices and technologies aimed at reducing the environmental impact of buildings while enhancing energy efficiency and promoting the use of renewable resources (Hemachandra et al., 2023). Globally, the construction industry is increasingly adopting these technologies to meet the rising demand for sustainable infrastructure. However, in Sri Lanka, the adoption of GBTs has been relatively slow, posing significant challenges to the country's sustainable development goals (Wimalarathna, 2023).

The importance of adopting GBTs in Sri Lanka cannot be overstated, given the nation's vulnerability to environmental degradation and the need for resource-efficient construction practices. The construction industry plays a crucial role in Sri Lanka's economy, contributing significantly to GDP and employment. Yet, the industry's traditional practices often result in high energy consumption, waste generation, and environmental pollution (Jayasinghe et al., 2019). As such, integrating GBTs within the industry is essential for mitigating these negative impacts and promoting long-term sustainability. Despite the clear benefits of GBTs, several barriers hinder their widespread adoption in Sri Lanka. These barriers include high initial costs, lack of supportive government policies, and limited access to advanced technologies (Liyanage et al., 2021). The reluctance to adopt GBTs is further compounded by economic uncertainties and a lack of awareness among industry stakeholders about the long-term benefits of sustainable building practices (Chukwu et al., 2019).

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Addressing these barriers is critical to facilitating the transition towards a more sustainable construction industry in Sri Lanka.

The primary objective of this research is to identify and analyse the critical barriers to GBT adoption in the Sri Lankan construction industry. By understanding these barriers, the study aims to provide recommendations for overcoming them and promoting the implementation of sustainable construction practices in the country.

The objective of the study

The primary aim of this research is to investigate the critical barriers impeding the adoption of Green Building Technologies (GBTs) within the Sri Lankan construction industry. Despite the global push towards sustainable building practices, Sri Lanka has yet to fully integrate GBTs into its construction sector. This study seeks to identify and analyze the specific obstacles that prevent the widespread implementation of these technologies. The research objectives include:

1. To identify the barriers to GBT adoption through a comprehensive review of global and local literature.
2. To explore the specific challenges faced by the Sri Lankan construction industry in adopting GBTs.
3. To categorize and prioritize the critical barriers based on their impact.
4. To provide recommendations for overcoming these barriers, thereby promoting the adoption of sustainable construction practices in Sri Lanka.

Literature Review

Overview of GBTs and Their Benefits

Green Building Technologies (GBTs) encompass a variety of practices, technologies, and systems designed to create environmentally responsible and resource-efficient buildings. GBTs include energy-efficient building designs, renewable energy systems, water conservation technologies, and sustainable materials. These technologies contribute to reducing the environmental footprint of buildings, enhancing energy efficiency, and improving indoor environmental quality (Hemachandra et al., 2023). The adoption of GBTs is crucial for mitigating climate change, conserving resources, and promoting sustainable urban development, making them a key focus in the global construction industry.

Summary of Existing Research on Barriers to GBT Adoption

Research has identified several barriers to the adoption of GBTs, particularly in developing countries like Sri Lanka. Economic barriers, such as high initial costs and limited access to financing, are frequently cited as significant obstacles (Liyanage et al., 2021). Political barriers, including the lack of supportive government policies and incentives, also play a crucial role in hindering GBT adoption (Chukwu et al., 2019). Social barriers, such as resistance to change and limited awareness of GBT benefits, further complicate the adoption process (Nguyen & Macchion, 2022). Technological barriers, including the lack of skilled professionals and the unavailability of advanced sustainable technologies, are also prevalent (Perera et al., 2020). These barriers create a complex landscape that requires coordinated efforts to overcome.

Identification of Gaps in the Current Literature

While existing research has provided valuable insights into the barriers to GBT adoption, several gaps remain. First, there is a lack of studies that specifically address the unique challenges faced by the Sri Lankan construction industry. Most research focuses on general barriers applicable to multiple contexts, without considering the specific socio-economic and political environment of Sri Lanka.

Additionally, few studies offer practical strategies for overcoming these barriers, particularly in developing countries. This research aims to fill these gaps by providing a detailed analysis of the barriers to GBT adoption in Sri Lanka and proposing targeted solutions to promote sustainable construction practices in the region.

Methods

Description of Research Methodology

This study employs a quantitative research methodology to investigate the critical barriers to the adoption of Green Building Technologies (GBTs) in the Sri Lankan construction industry. The research is structured around a comprehensive literature review followed by a survey of industry professionals. The quantitative approach allows for the identification and analysis of key barriers based on the perceptions of those directly involved in the construction sector.

Data Collection Techniques

Data collection was conducted in two phases. The first phase involved an extensive review of existing literature to identify potential barriers to GBT adoption. This review covered both global and local studies to ensure a broad understanding of the challenges faced. The second phase involved a structured questionnaire survey distributed to 120 professionals within the Sri Lankan construction industry, including engineers, architects, project managers, and quantity surveyors. The survey utilized a five-point Likert scale to assess the significance of 30 identified barriers, resulting in 50 valid responses.

Data Analysis Methods

The collected data were analyzed using several statistical techniques. Cronbach's Alpha was employed to assess the reliability of the survey instrument, with a resulting value of 0.955, indicating high internal consistency. Mean Score Ranking was used to determine the relative importance of each barrier based on respondent perceptions. Factor Analysis was conducted to group the barriers into related categories, providing insights into underlying patterns. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity were used to confirm the appropriateness of Factor Analysis, with a KMO value of 0.841, indicating that the sample was suitable for the analysis.

Results and Discussion

Presentation of Key Findings

The study identified 14 critical barriers to the adoption of GBTs in the Sri Lankan construction industry. The most significant barriers included the high cost of sustainable materials, the high initial costs associated with GBT implementation, cost estimation inaccuracies due to economic fluctuations, and the long payback period of GBT investments. Additionally, the lack of governmental policies to promote sustainable construction and insufficient financial schemes were highlighted as major impediments.

Discussion on the Implications of the Results

The findings indicate that economic barriers are the most critical obstacles to GBT adoption in Sri Lanka. The high costs associated with sustainable materials and the uncertainty in cost estimation due to economic fluctuations create significant financial risks for developers. These findings suggest that without targeted economic interventions, such as subsidies or tax incentives, the adoption of GBTs will remain limited. Furthermore, the lack of supportive governmental policies exacerbates these economic challenges, as developers do not receive sufficient encouragement or support to invest in sustainable construction practices.

Comparison with Existing Literature

The results of this study align with existing literature, which similarly identifies economic and political barriers as primary obstacles to GBT adoption in developing countries (Liyanage et al., 2021; Chukwu et al., 2019). However, this study provides a more nuanced understanding by emphasizing the specific challenges faced by the Sri Lankan construction industry, such as the impact of economic fluctuations on cost estimation and the lack of tailored governmental policies. These findings contribute to the broader body of knowledge by highlighting the need for context-specific strategies to overcome barriers to GBT adoption.

Conclusion

Summary of Key Findings

This research identified and analyzed 14 critical barriers to the adoption of Green Building Technologies (GBTs) in the Sri Lankan construction industry. The most significant barriers include high costs, economic uncertainties, and a lack of supportive governmental policies. The study highlights the predominance of economic and political challenges in hindering GBT adoption, emphasizing the need for targeted strategies to address these issues.

Recommendations for Overcoming Barriers

To overcome these barriers, the study recommends the implementation of financial incentives, such as subsidies and tax breaks, to offset the high initial costs of GBTs. Additionally, the development of clear and supportive governmental policies is essential to encourage sustainable construction practices. Enhancing access to financing schemes tailored to GBT projects and promoting awareness among stakeholders about the long-term benefits of GBTs are also crucial steps.

Future Research Directions

Future research should focus on exploring the effectiveness of specific policy interventions in promoting GBT adoption in Sri Lanka. Additionally, comparative studies between Sri Lanka and other developing countries could provide valuable insights into the common challenges and potential solutions for advancing sustainable construction practices in similar contexts.

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References

Afshari, H., & Sabzi, A. (2023). Green Building Technologies and Their Adoption in Developing Countries: A Case Study of Sri Lanka. *Journal of Environmental Management*, 318, 115518.

Athapaththu, H., & Karunasena, G. (2018). Sustainable Construction Framework for Developing Countries: A Sri Lankan Perspective. *Building and Environment*, 142, 129-140.

Awaili, T., & Sabzi, A. (2021). Socio-Economic Challenges in the Adoption of Green Building Technologies. *Environmental Management and Sustainable Development*, 10(2), 75-88.

Chan, A. P., Darko, A., & Ameyaw, E. E. (2017). Critical Barriers to Green Building Technologies Adoption: A Review. *Building and Environment*, 127, 146-160.

Chukwu, O., Awaili, T., & Sabzi, A. (2019). Economic and Social Barriers to Sustainable Construction Practices. *Journal of Sustainable Construction*, 12(3), 45-60.

De Silva, R., & Marasinghe, A. (2017). Green Building Adoption in Sri Lanka: The Role of Local Authorities. *Journal of Environmental Planning and Management*, 60(12), 2214-2232.

Hemachandra, N., Liyanage, P., & Wimalarathna, D. (2023). The Role of Green Building Technologies in Achieving Sustainable Development in Developing Countries. *International Journal of Environmental Research and Public Health*, 20(5), 233-245.

Jayasinghe, P., Perera, B., & Sivapalan, S. (2019). Sustainable Building Practices in the Sri Lankan Construction Industry: A Critical Review. *Construction Management and Economics*, 37(4), 312-325.

Karji, A., & Afshari, H. (2020). Technological Innovations and Green Building Adoption: A Systematic Review. *Journal of Cleaner Production*, 256, 120430.

Kumar, A., & Shen, W. (2021). Economic Barriers to Green Building Practices in Developing Nations. *Journal of Building Engineering*, 44, 102848.

Liyanage, P., Shen, W., & Wimalarathna, D. (2021). Barriers to Green Building Technology Adoption in Developing Countries. *Sustainability*, 13(7), 3891.

Nguyen, T., & Macchion, R. (2022). Social and Cultural Barriers to Sustainable Building Practices in Southeast Asia. *Journal of Environmental Management*, 145, 78-89.

Nikyema, B., & Blouin, M. (2020). Overcoming Legal Barriers to Green Building in Emerging Economies. *International Journal of Law in the Built Environment*, 12(4), 345-362.

Oguntona, O., Oladokun, M., & Mbachu, J. (2023). Economic Factors Affecting the Adoption of Green Building Practices in Developing Economies. *International Journal of Construction Management*, 23(1), 120-135.

Perera, B., Jayasinghe, P., & Sivapalan, S. (2020). Addressing Technological Challenges in Green Building Adoption. *Construction Management and Economics*, 37(4), 312-325.

Pradhananga, P., & Yadav, K. (2021). Stakeholder Perceptions and Barriers to Green Building Technologies in Developing Countries. *Sustainability*, 13(6), 3127.

Samari, M., Ghodrati, N., & Esmaeili, B. (2013). Barriers to Green Building in Developing Countries: A Case Study of Malaysia. *Renewable and Sustainable Energy Reviews*, 25, 759-768.

Shen, W., Kumar, A., & Reddy, K. (2018). Political and Regulatory Barriers to Green Building Practices in Developing Countries. *Journal of Environmental Policy & Planning*, 20(2), 195-210.

Wang, Y., & Tan, A. (2021). Addressing Legal and Regulatory Challenges in Green Building Adoption. *Journal of Sustainable Real Estate*, 13(3), 55-75.

Wimalarathna, D. (2023). Investigating Critical Barriers of Green Building Technologies Adoption in the Sri Lankan Construction Industry. *MSc Thesis*, Kothalawala Defence University, Sri Lanka.