MAJ
Malaysia Architectural Journal

Review of the Literature on Post-Pandemic Sustainable Interior Design Rating Systems from International Perspectives

Shu-Fen Chou[1*], Sujatavani Gunasagaran[2], Siti Norzaini Zainal Abidin[3], Tamil Salvi Mari[4] & Filzani Illia Ibrahim[5]

[1*] *The Design School, Taylor's University, Selangor, Malaysia*
[2,3,4,5] *School of Architecture, Building & Design, Faculty of Innovation & Technology, Taylor's University, Selangor, Malaysia*

* shufenchou@sd.taylors.edu.my

Considering the prevailing pandemic, the coronavirus has successfully boosted awareness of human activities in the natural environment. This would be timely. Increasingly, customers in the COVID-19 era demand healthy, eco-friendly goods while constructing a secure and healthy interior environment for themselves. Sustainable interior design in the 21st century entails creating a good lifestyle employing green technology with little ecological consequences. Interior design companies and creatives, as well as stakeholders, are accountable for executing green design standards and education and guiding their clientele to minimise environmental pollution and inefficient use of resources even during the renovation process so that their clients may perhaps promote a decent, pleasant, and elevated living space. According to research, sustainable growth and development, economics, and the ecosystem have assumed worldwide significance. In the post-pandemic age, the creation of regionally sustainable interior design evaluation standards seems to be a pressing concern. The objectives of this paper are: (1) to approach a literature review on the global sustainable interior design rating system for directing interior design-related companies, regions, and nations to build or amend green interior design grading systems. (2) Furthermore, researchers typically aim to review the promising practices of global-level sustainable interior design grading systems as well as the green interior design indicators being developed as the essential guidelines for promoting green interior design in Taiwan as a case study in the future.

Keywords: *Post-pandemic age, Sustainable interior design rating system, Green interior design*

1. INTRODUCTION

In 2013, the United Nations (UN) established an open working group to develop proposals on the Sustainable Development Goals (SDGs) (2022). Then, in 2015, SDGs with 17 targets were adopted. This has also inspired the development of sustainable interior design (SID). As a result of the coronavirus epidemic, people are becoming more conscious of how human activities impact the environment. In COVID-19, more people choose healthy, eco-friendly and green technical products to create a safe and pleasant indoor environment (Fezi, 2020; Zaher, 2020). Interior designers can aid customers in the creation of hospitable living environments and educate them on eco-friendly design options and concepts for promoting innovative sustainability. For example, a collaborative technical software solution for building and interior projects, BIM (Hamid, et al., 2020) promotes innovation and sustainability throughout the entire life cycle assessment (LCA) while also eliminating waste and costs. Anti-virus photocatalytic paint, a high-tech long-lasting antibacterial product, can improve interior air quality and people's health (Fezi, 2020).

It is a widely held view that natural resources are dwindling, and the environment has been deteriorating. Consequently, a number of regions have initiated the development of green interior grading systems. These suggestions for interior spaces promote, implement, monitor, and evaluate sustainable design and green technological innovation for the people's health, economic, and environmental benefits of sustainable development (Zaher, 2020). Therefore, in order to comply with market and green building rules and regulations, specialists must recognise sustainable standards throughout the design and construction phases and carry a tremendous responsibility for environmental conservation and community health problems.

1.1 Overview of global sustainable interior design

Interior architectural design is a creative endeavour that uses engineering as its practical foundation and artistic design as its form of expression in order to create an indoor living environment in which spirit, material, and health are of equal importance. Interior design offers individuals with a pleasant indoor living environment; yet, broad building projects create a strain on the environment and generate a range of pollutants. According to research, half of the world's annual solid waste is comprised of trash from construction products (Transparency Market Research, 2020).

In addition, Interior design is one of the disciplines seeing the most rapid development in modern civilisation. According to the results of Statista Market Research in 2018 (O'Connell, 2018), the global interior design market continues to increase in value from year to year. It is realistic to anticipate that this will also result in a rise in the usage of renewable and nonrenewable resources, as well as the amount of waste generated during the construction work.

1.1.1 Sustainable Environment

Most individuals spend a large portion indoors. In the 21st century, SID stresses green innovation, health and low environmental impact (Hamid, et al., 2020; Zaher, 2020). However, owing to the investment in real estate and the destruction of interior space after the sale and transfer, the recurring environmental pollution and resource waste associated with redecorating cannot be altered (Chen, 2017). Consequently, the life cycle of construction materials must be considered throughout the interior design and construction process-recycled materials and the 3Rs of manufacturing: Reduce, Reuse and Renew (Celadyn, 2019).

1.1.2 Sustainable Economy

The unsustainable use of natural resources has a negative impact on environmental resources and economic growth. The global market of the interior design industry (O'Connell, 2018) seems stable and strong, which explains why the creation of green interior design indicators may be a viable option for reducing the waste of raw resources (Celadyn, 2019). Developing SID is a win-win strategy for stakeholders controlling the budget by green purchasing and reusing the materials to reduce resource waste.

1.1.3 Sustainable Society

The United Nations (2022) has urged nations to transform sustainable development into concrete policies and initiatives to address climate change and safeguard the environment. Therefore, creating a sustainable society has become the ultimate objective of the interior design business if it is considered the most significant aspect. Interior design businesses have a social obligation to integrate sustainable design and educate their customers on environmental conservation and natural resource appreciation. The green interior design indicators are created and included as a benchmark for design businesses. Thus, some international green interior design criteria provide a framework for global standards that can be customised to the context of each region's climate, economy, and environment (Zarghami & Fatourehchi, 2020; Iwaro, 2014).

1.2 Taiwan's Present Sustainable Interior Design Development

Located in East Asia, Taiwan is a semi-tropical island. Taiwan imports all of its conventional sources and generates insufficient natural resources. Because of Taiwan's significant development in the high-tech industry, the interior design business expanded stable. Despite COVID-19, Taiwan's interior design market has experienced the most rapid expansion, increasing the demand for building materials and resources. As a consequence of strong economic growth, the number of interior design firms and designers increases annually. Meanwhile, several counterfeit-professional design businesses, such as art, product, and creative graphic firms,

participate in interior architecture and control the market (Chen et al., 2017). Therefore, the interior design industry faces competitive hurdles and market demands. Striking the right balance between green regulations, environmental duties, corporate image and reputation, and generating profit might be a significant issue (Kristinae et al, 2020; Küçüksayraç, 2015). To satisfy clients' demands for green interior spaces, interior design firms must adopt a new approach embracing green interior design standards. It is useful to examine ways to reorganise product and service processes and refocus the connection between cities and their inhabitants.

Furthermore, Taiwan has been working on the Green Building assessment system (Intelligent Green Building, 2021) since 1999 including four top criteria: Environmental protection, Energy saving, Waste reduction and Human health as the so-called "EEWH Green Building". However, after more than 20 years, Taiwan does not have an assessment mechanism for green interior design at this time. Due to the specific nature of interior design, the EEWH green building rating standard is not applicable. Therefore, in 2004, the government adopted standards for the sustainable use of environmentally friendly construction materials in the interior area. Taiwanese interior design firms have a duty to the community and the environment. Thus in January 2021, the government of Taiwan mandated the use of environmentally friendly materials for interior construction projects representing up to 60 per cent of the building area (Construction and Planning Agency Ministry of the Interior, 2019). The green materials legislation applies to all types of construction as well as interior design and building projects. In terms of sustainability, the objective of this Act is to blur the boundaries between architecture and interior design. Without even a paradigm of green interior design criteria to govern the development of SID, there will still be a massive disparity between sustainable society, economy, and the environment.

1.3 Problem Statement

Based on the Triple Bottom Line theory, SID covers eco-interior, socio-interior, and econo-interior (Kusumarini et al., 2011). Sustainable development assesses the society, economy, and environment as a whole in order to achieve the UN SDGs by 2030 and net-zero emissions by 2050 (UNO, 2020). To achieve SID, each of these components must collaborate. The objective of green interior design criteria is to decrease waste and environmental damage throughout the design and construction phases, as well as to assist interior design businesses in developing a long-term socially, economical and environmentally sustainable strategy (Küçüksayraç, 2015).

Although many regions developed green interiors evaluation standards, such as US LEED, UK BREEAM, Singapore Green Mark, HK BEAM plus and Malaysia GBI Interiors, the development of ecologically friendly interiors has lagged behind that of a sustainable building (Zarghami & Fatourehchi, 2020). For example, it is necessary for Taiwan to implement a system of green interior design grading. However, despite Taiwan's interior project submission rules for eco-friendly materials, a green grading system's category is not enough. Sustainable project management, material management, innovation, water conservation, energy efficiency, and indoor environmental quality (IEQ) are all examples of green design approaches that must be used in interior design projects (Dissanayake, 2020; Chen, 2017).

In addition, after the recent epidemic of pneumonia, many people are worried about the quality of the interior environmental quality. As a result, a healthy indoor environment standard is a critical benchmark (Zaher, 2020) for the vast majority of individuals who spend the majority of their time inside. Hence, research, technical understanding, and participation from stakeholders have all been necessary for the development of local standards (Zarghami & Fatourehchi, 2020). Conclusions from most models show that a grading system tailored to local climate, social, environmental, and economic elements (Kusumarini et al., 2011) is essential to a sustainable future.

The purpose of this paper is: (1) to approach a literature review on the global SID rating system for directing interior design-related companies, and regions to build or amend green interior design grading systems; and (2) to review the promising practices of global-level SID grading systems as well as the green interior design indicators being developed as the essential guidelines for promoting green interior design in Taiwan as a case study in the future.

2. LITERATURE

For a better understanding of the structure of international green standard models, a thorough

perception on the literature is needed to conduct a literature review that identifies and analyses contributing factors related to the principal arguments, hypotheses, and research gaps. This begins with the concept of SID. Then the current paper concentrates on an evaluation of three distinct grading systems for SID so that readers may better understand how these materials are being developed.

2.1 The Concept of Sustainability in Interior Design

SID refers to the planning and design of indoor environments that meet three criteria: durability, biological health, and environmental friendliness. It also encompasses human and social sustainability, including aesthetic sustainability, interpersonal sustainability, community and neighbourhood sustainability, and corporate sustainability. The definition of SID should take the development of the environment, society, and economy into account (Kusumarini, 2011).

There are " *Humanity has the ability to make development sustainable to ensure that it meets the needs of the present without compromising* the *ability of future generations to meet their own needs.*" according to the UN (1987). As a result, excellent design and sustainable design are not mutually exclusive. A choice and a value judgement are typically required when contemplating a design issue, in addition to how to manage a demand problem, when researchers evaluate the design procedure that, in their view, is the best alternative. In the context of green design, the proper action relates to the previous definition of sustainable design, which is the accurate design according to sustainable design standards (Hamid, et al., 2020; Chen et al., 2017).

Figure 1: Components of Green Interior Design

2.2 Reviews of Global Green Interior Design Evaluation System

The pursuit of a low-waste society will need significant policy green innovation (Zarghami & Fatourehchi, 2020). The green interior design grading system is evolving in response to the varying local environmental situations around the globe. Therefore, SID policies and criteria are crucial schemes to achieve the SDGs.

2.2.1 LEED Interior Design and Construction (ID+C) Evaluation System

The U.S. Green Building Council (USGBC) (2020), a non-profit membership organisation, was founded in 1993 with the objective of encouraging sustainable practices in the building, interior, and construction sectors. With far more than 100,000 LEED-certified buildings in 167 countries, USGBC LEED is the most popular green construction standard on Earth. Any form of commercial interior design, retail, or hospitality project can benefit from the LEED ID+C Commercial Interiors grading system, which was launched in 2014. There are eight primary classifications (Table 1). It is in these three areas that the most points are awarded: Energy and Atmosphere, Location and Transportation, and IEQ.

Table 1: LEED ID+C Commercial Interiors Rating System

Ranking and Categories	Pre-required	Possible Points
1. Energy and Atmosphere	3	38
2. Location and Transportation	0	18
3. Indoor Environmental Quality	2	17
4. Material and Resources	2	13
5. Water Efficiency	1	12
6. Innovation	0	6
7. Regional Priority	0	4
8. Integrative Process	0	2
	Total:	**110**

2.2.2 BREEAM Refurbishment and Fit-Out Evaluation System

UK BREEAM (2018) is a pioneering approach for evaluating the environmental impact of a construction project. More than 600,000 buildings in 93 countries have received BREEAM certification since its inception in 1990, and over 2,300,000 structures have been registered for BREEAM certification. Each of the following four modular frameworks makes up the BREEAM Refurbishment and Fit-Out (RFO) standard: Structure and Fabrication, Core Services, Local Services, and Interior Design are all included in this section. The assessment

approach for interior design is broken down into nine areas (Table 2). The BREEAM RFO is intended for existing non-residential building rehabilitation and fit-out projects. Unlike other evaluation systems, BREEAM distinguishes between "Waste" and "Pollution"; it also adds "Health and Wellbeing" to the idea of indoor environmental safety, quality, and comfort. Management, Health and Wellbeing, and Material are, in order of importance, the three factors with the largest weighting.

Table 2: BREEAM RFO-Green Interior (GI)

Ranking and Categories	Pre-required	Weight
1. Management	3	20.00%
2. Health and Wellbeing	0	19.90%
3. Material	2	19.30%
4. Transport	0	13.40%
5. Waste	2	11.20%
6. Water	1	10.10%
7. Innovation	0	10.00%
8. Pollution	0	3.60%
9. Energy	1	2.50%
	Total:	110%

2.2.3 Green Globes for Sustainable Interiors (SI) Evaluation System

Green Globes for Sustainable Interiors (SI) (Green Building Initiative, 2022) be utilised for commercial and tenant interior projects or fit-outs in various commercial, institutional, and multi-residential building types. Based on the 1996 CSA release of BREEAM Canada, ECD Energy and Environmental Canada produced Green Globes in 2000. The Green Globes SI module is divided into six aspects with a total of 1000 points (Table 3). As Green Globes is an online evaluation questionnaire, the project managers and design teams may examine themselves internally and efficiently. Unlike BREEAM and LEED, this certification has no pre-requirements. "Innovation" and "Site Impact" categories are not included in Green Globes SI.

Table 3: Green Globes for Sustainable Interiors

Ranking and Categories	Points	Weight
1. Energy	300	30%
2. Materials and Resources	250	25%
3. Indoor Environment	250	25%
4. Water	90	9%
5. Project Management	70	7%
6. Emissions and Other Impacts	40	4%
Total Score:	1000	100%

3. FINDING AND DISCUSSION

Examining three green interior design rating systems from across the globe reveals that each has unique qualities. As shown in Figures 2 and 3, In terms of the "Energy" category, LEED and Green Globe rank first: LEED ID+C (Energy and Atmosphere: score = 38; weight = 38%) and Green Globe SI (Energy: score = 300; weight = 30%). Green energy is clearly the most critical issue. Contrary, As shown in Figure 4, among the nine UK BREEAM indicators, the "Energy" (weight=2.5%) indicator has the lowest weight.

"Management" (weight=20%) catalogue is given the highest weight in the UK BREEAM. UK BREEAM places a focus on management throughout the whole project process, from project design, life cycle assessment, and construction practices through commission, handover, and maintenance. In addition, the pre-required of Management category is also the highest (score=3) (as shown in Table 2). Globe SI ranks seventh (Project Management: weight=7%). In the LEED, the category is focused on communication and interaction among all stakeholders in the project. Thus, "Integrative Process" is ranked the last (score=2). Regarding IEQ, Globe SI ranks "Indoor Environment" (score=250; weight=25%) in second. Similarly, the 'Health and Wellbeing' item, UK BREEAM RFO GI, ranks 2nd out of 9 indicators (weight = 19.9%). LEED ID+C also ranks "IEQ" (score = 17; weight = 17%) third. Therefore, IEQ is one of the most valued among of three international criteria.

Global resource conservation has always been a crucial issue for SID. In Green Globes, "Materials and Resources" (weight=25%) is given to second. UK BREEAM (Material weight = 19.3%) places third and pre-reqiued score is 2. US LEED ranks in fourth (score=13); in addition, the pre-required score also is 2. In terms of green transportation, the US LEED is placed second in "location and transportation" (score=18) because of its enormous landmass and geographical surroundings. UK BREEAM lists in fourth (Transportation: weight = 13.4%). According to the preceding study, Energy, Materials, and IEQ play a significant role in global green interior design. These green grading systems are designed for worldwide usage as a standard and will undoubtedly become the norm for sustainable interiors in the future.

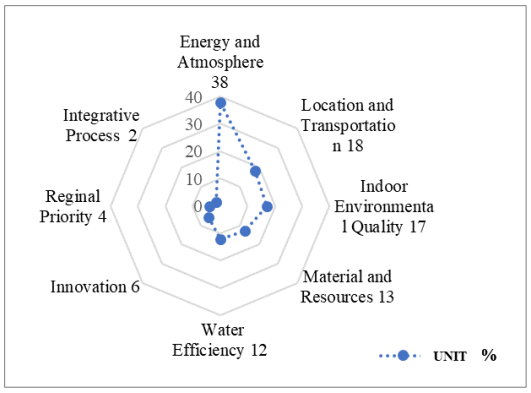

Figure 2: Weighting of LEED ID+C

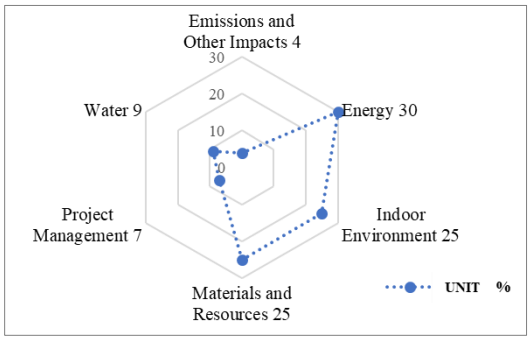

Figure 3: Weighting of Green Globes for SI

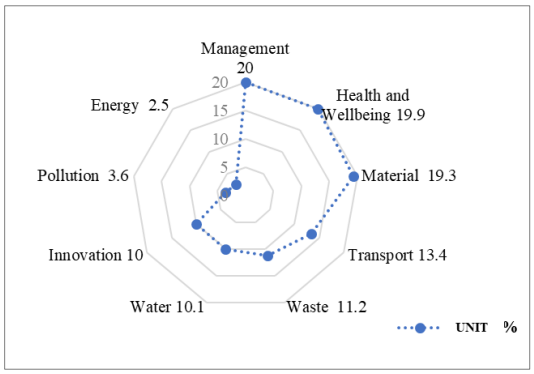

Figure 4: Weighting of UK BREEAM RFO-GI

3.1 Summary of Ideal Green Interiors Criteria in the Post-Pandemic Era

There are some suggestions for the development and improvement of green interior design standards in the post-epidemic period based on the aforementioned literature on international standards rating systems:

- Sustainable environment: "Energy", "Materials Resources", and "IEQ" "Green innovation" may be a crucial strategy for green criteria based on the weighting. Researchers indicated that green innovation had become a strategic plan for companies to approach environmental improvement and profitability (Kristinae et al., 2020). For instance, UV-C LED lighting cleanses the air and reduces energy consumption. In addition to detecting CO2, VOC, and PM (particulate matter) 10 or PM 2.5 emissions for indoor air quality (Zaher, 2020), a Smart-Home system also monitors air quality, water and energy consumption. Solar roof products and cloud computing may be connected with Smart-Home devices to generate green energy and preserve energy. Therefore, green innovation might guide companies to explore new markets and develop customer capital.
- Sustainable economy: The interior design is constantly with limitations of timing and budget constraints. SID rating systems guide decision-makers in choosing where to invest resources based on the priority of weighting. For instance, energy is a priority for US and Canada; on the contrary, it is the last rank for UK. Green innovation might guide companies to explore new markets and develop customer capital. Therefore, green interior assessment systems and regulations can help design companies develop an overall green strategy to strengthen market competitiveness and gain profits.
- Sustainable society: the worldwide COVID-19 trend for "Health and Wellbeing" of users and occupants has been accepted as a core value proposition in green buildings and interior spaces. The interior space is the gathering and activity area. The orientations of interior design indicators may include the well-being of the public, the health of the personnel, and the comfort of the environment.

Furthermore, the accomplishment of a sustainability strategy relies heavily on the excellence of green "project management" since it incorporates all areas of an organisation into a set of actions: a comprehensive evaluation framework where project managers or interior designers can fully comprehend the priorities and connections between the various components of a green project and adopt the appropriate management tools (Kristinae, et al., 2020).

3.2 Developing Taiwan's Green Interiors Criteria

Taiwan's government has established policies and technologies that are ecologically friendly. As far back as 1999, Taiwan was pressing for the implementation of the EEWH green building assessment standard. However, Taiwan has not set assessment criteria for green interior design in the last two decades, but in 2004 the government released "Directions of Design and Technique Specifications of Green Building Materials" to encourage the use of eco-friendly interior materials (CPAMI, 2019). Nevertheless, Taiwanese SID is not entirely eco-friendly, yet there are still loopholes in the current settings. A complete strategy is required for eco-friendly interior design. Consequently, based on the aforementioned worldwide literature on the green interior design index, the following are some suggestions for the development of the SID criteria in Taiwan.

- Sustainable environment: In terms of SID criteria, the concept of a sustainable environment is stated as the priority. Due to Taiwan facing the limitation of natural resources issue, material resources, including building materials, water and energy, and waste management are the priority categories for preserving the environment. In addition, innovative design and green technology can be the solutions for sustainable development in Taiwan.
- Sustainable economy: Afterwards, a sustainable economy is the second most crucial factor. The benefit is what companies and stakeholders always focus on. Strategies use sustainable design to create new values, reallocate resources, and develop innovative business models in response to changing market behaviour. Under these conditions, developing sustainability can create and provide stakeholders with green interior design concepts and benefits.
- Sustainable society: The Taiwanese architecture and interior design sector should host academic seminars with scholars, industry managers, specialists, senior architects, and interior designers to promote and formulate the SID criteria. With a paradigm of SID to govern the development of SID, there will eliminate a massive disparity between a sustainable society, economy, and environment.

Lastly, Taiwan can rely on these three international SID standards as the foundation to develop SID criteria based on Taiwan's climate, culture, society and environmental circumstances.

4. CONCLUSION

The characteristics of the green interior rating systems have the potential to be promoted sustainable development in the present and future. In the conclusion of findings, the new green interior design evaluation system may focus on four aspects: (1) green innovation and project management for encouraging the new market and sustainable development; (2) IEQ- promote managing, measuring, monitoring, and certifying for the indoor environment in the post-COVID 19 era; (3) social well-being for enhancing people's green education and health (4) material resources management- energy and water saving strategies and building material 3R strategies. Furthermore, each country's environmental, climatic, cultural and social context needs to be factored into the development of green interior design standards in order to define the priority of the categories.

The worldwide trend of sustainable green interior design indicators following the pandemic has become universal and entrenched, and as a result, regions in Asia have followed suit. On the other hand, Taiwan is an excellent demonstration, but there is no uniformity in place at this time. Taiwan should genuinely create the green interior design by taking measures that are both concrete and practical to follow and adopt effective practices of international green interior design rating systems and define green interior design indicators in accordance with existing green regulatory requirements. These steps should be taken in order for Taiwan to expand green interior design.

Lastly, the goal of SID is to achieve long-term sustainability of the environment, economy and society. Green interior design rating systems are a guideline for sustainable development. Green indicators of interior design could therefore provide the design industry with a complete and accurate strategy and planning for implementing sustainable design projects, enhancing the efficiency of design tasks, and minimising

decision-making risks in order to achieve sustainable development and attain corporate social responsibility. It is believed that by rigorous management and system improvement, the design industry will indeed be able to build up fresh business benchmarks for the post-pandemic future.

5. REFERENCES

BRE Global Limited. (2018). BREEAM - sustainability assessment method. Retrieved March 20, 2022, from https://www.breeam.com/?msclkid=90d083cebd5a11ecb6a91dde9bee75f9&cn-reloaded=1.

Celadyn, M. (2019). Interior architectural design for adaptive reuse in application of environmental sustainability principles. Sustainability (Switzerland), 11(14), 1-16.

Chen, Y.-L.; Cheng, A.-C.; Hsueh, S.-L.; and Qu, D. (2017). "DAHP expected utility based evaluation model for management performance on interior environmental decoration - An example in Taiwan. Eurasia Journal of Mathematics, Science and Technology Education. 13(12):8257–65.

Construction and Planning Agency Ministry of the Interior (CPAMI). (2019). Directions of Design and Technique Specifications for green building materials in Taiwan. Retrieved May 10, 2021, from https://www.cpami.gov.tw/.

Dissanayake, N.; Shanika, V. G.; Disaratna, V.; and Perera, B. A. K. S. (2020). Adopting environmentally sustainable practices in interior design in Sri Lanka. International Journal of Design Management and Professional Practice, 14(1), 1–22.

Fezi, B. A. (2020). Health engaged architecture in the context of COVID-19. Journal of Green Building, 15(2), 185–212.

Green Building Initiative. (2022). Green Globes for Sustainable Interiors (SI). Retrieved March 25, 2022, from https://thegbi.org/green-globes-certification/how-to-certify/sustainable-interiors/.

Hamid, A.B.A.; Embi, M.R.; Taib, M.Z.M.; and Razak, A.H.N.A. (2020). Enhancing the knowledge and proficiency for interior designers in Malaysia through the implementation building information modelling. IOP Conference Series: Materials Science and Engineering, 713(1) 012047, 1-8.

Intelligent Green Building (IGB). (2021). Taiwan Green Building Label. Retrieved May 10, 2021, from https://smartgreen.abri.gov.tw/en/cp.aspx?n=14294.

Iwaro, J.; Mwasha, A.; Williams, R. G.; and Zico, R. (2014). An integrated criteria weighting framework for the sustainable performance assessment and design of building envelope. Renewable and Sustainable Energy Reviews, 29, 417-434.

Kristinae, V.; Wardana, I.; Giantari, I; and Rahyuda A. (2020). The role of powerful business strategy on value innovation capabilities to improve marketing performance during the COVID-19 pandemic. Uncertain Supply Chain Management, 8(4), 675-684

Kusumarini,Y.; Ekasiwi, S.N.N.; and Faqih, M. (2011). Sustainable interior: A holistic approach of eco-socio-econo interior. *Australian Journal of Basic and Applied Sciences*. 5(12), 2176-2181.

Küçüksayraç, E. (2015). Design for sustainability in companies: strategies, drivers and needs of Turkey's best performing businesses. *Journal of Cleaner Production*, 106, 455-465.

O'Connell, L. (2018). Statista report: Interior design market value worldwide report. Retrieved September 9, 2020, from https://www.statista.com/statistics/899161/global-interior-design-market-value/

Transparency Market Research. (2020). Construction Waste Management Market: Overview. Retrieved December 20, 2020, from https://www.transparencymarketresearch.com/construction-waste-management-market.html.

United Nations (UN). (2022). Department of economic and social affairs sustainable development-the 17 goals. Retrieved December 20, 2022, from https://sdgs.un.org/.

U.S. Green Building Council (USGBC). (2020). LEED v4.1 Interior Design + Construction. Retrieved 20 December 2021, from https://www.usgbc.org/leed/v41#idc.

Zaher, N. (2020). Design solutions for interior architecture post coronavirus (COVID-19). Journal of Arts & Architecture Research Studies, 1(2), 117-133.

Zarghami, E.; and Fatourehchi, D. (2020). Comparative analysis of rating systems in developing and developed countries: A systematic review and a future agenda towards a region-based sustainability

assessment. *Journal of Cleaner Production*, 254, 120024, 1-23.

United Nations. (1987). Report of the World Commission on Environment and Development: note / by the Secretary-General report. *The Units Nations Digital Library*, 24-25.