Revamping design, construction and operations for boosting built asset sustainability

With the construction industry inevitably being a major contributor to global greenhouse gas emissions, sustainability research has become a generic trend in the built environment. Once it has been decided to build a new building, or to refurbish an existing building, or change working practices, the opportunities for improvement through sustainable planning, design, construction, operations and maintenance practices are significant. To this end, sustainability solutions across a diverse range of projects in different contexts are required to bring change and innovations to the sector. However, there is still a lack of sustainability focus on the interfaces of design, construction and operational phases in construction projects that would eventually bring life to “Built asset sustainability”.

This Special Issue was aimed at revisiting and revamping traditional approaches to design, construction and operations with a common focus on boosting “Built asset sustainability”. There was an effort to connect processes and people engaged in different phases, where appropriate, to collectively and collaboratively address built asset sustainability.

This issue is lined up with the first five papers (Papers 1–5) suggesting the integration of different life cycles phases using technology (Paper 1 on blockchain technology), management theories (Paper 2 on lean principles) and sustainability frameworks/applications in unexplored contexts (Paper 3–5) to boost built asset sustainability. The last three papers (Papers 6–8) primarily focus on operational phase while attempting to link to either design or construction phases in varied contexts such as apparel (Paper 6), hotel (Paper 7) and university (Paper 8) sub-sectors. An overview of each paper is offered below.

The opening paper revolutionises the current state of sustainability thinking and integrates different stages of the life cycle of a built asset through blockchain technology. The authors, Alirez Shojaei, Jun Wang and Andriel Fenner, propose and test a model for using blockchain as an infrastructure support within a case study. The highlight of this model is its ability to offer a decentralised, transparent and comprehensive database for life cycle sustainability assessments. This is an evolving, but inspiring piece of research that opens up many avenues for future research in sustainability.

The second paper by Sonali Pandithawatta, Nisa Zainudeen and Savindi Perera, extends traditional lean construction applications based on economic considerations to “social and environmental” considerations in an attempt to boost built asset sustainability across its life cycle phases. This research is conducted in Sri Lanka through a qualitative research method incorporating expert interviews. The paper offers a framework to guide the implementation of integrated lean-green application in the studied context.

The third paper by Chukwuka Ohueri, Wallace Enegbuma and Hadina Habil attempts to apply a sustainability framework to office buildings in Malaysia, in particular testing of latest Malaysian Carbon Reduction and Environmental Sustainability Tool in office building contexts in Sarawak. The research findings are based on a survey of a pool of green construction professionals. The interesting outcome of this research paper is the holistic framework offered by the researchers by embedding existing local and global sustainability frameworks with four strategies on government policies and incentives coupled with technology and processes to integrate design, construction, and operation and maintenance phases and, thereby, to reduce carbon footprint and to promote built asset sustainability.

The fourth paper explores the adoption of renewable energy sources in commercial buildings in Nigeria by incorporating many stakeholder perspectives. The authors,

Maria Unuigbo, Sam Zulu and David Johnston, utilise a grounded theory method and identify five interesting themes as key factors in renewable energy adoption, namely being compliant, change in mindset, normalising, being autonomous and identity. The research method used to capture the perceptions of different stakeholders and the five themes/factors are worthy contributions of this research that would inform any sustainability adoption or application in built assets, in particular in developing countries.

The fifth paper by Subaskar Charles, Hearth Vidyaratne and Damithri Melagoda offers another sustainability application by attempting to integrate design and construction phases by exploring the adoption of green roofs for high-rise buildings in developing countries such as Sri Lanka. It is based on expert interviews and a questionnaire survey. The paper contributes to knowledge by identifying the most significant prospects over restraints that need extensive promotional strategies to motivate the adoption of green roofs in high-rise buildings. Apart from awareness and training, the paper imposes proper government regulations and policies, incentives and promotion as important strategies, in order to discuss green roofs in the upcoming high-rise building projects in Sri Lanka. It also provides the links of green roofs with the other facets of built environment sustainability.

The sixth paper by Nimesha Jayasena, Harshini Mallawaarachchi and Lalith De Silva is primarily focused on the operation phase of a built asset sustainability in the apparel sector in Sri Lanka. The paper provides useful insight into facilities management (FM) functions and indicators of environmental sustainability. The main empirical data collection tool was a questionnaire survey, while analytical hierarchy process was used to analyse data. The paper finds energy management to be the most significant FM function in terms of achieving environmental sustainability in the apparel industry, whereas water management, maintenance management, waste management and asset management were identified, respectively, as other key functions of FM. Ultimately, the paper develops and validates a framework that can be used as a firm base to assess the current status and to formulate the strategies for improving environmental sustainability in broader terms and assuring built asset sustainability.

The seventh paper by Fasna Fasly and Sachie Gunatilake attempts to link operational and construction phases through the adoption and implementation of Building Energy Efficiency Retrofits. It is based on two in-depth case studies in the hotel industry. The paper identifies 38 barriers, which had significant impacts during pre-retrofit, implementation and post-retrofit phases under the sub-groups of financial, technical, informational, managerial, institutional, behavioural, market and social barriers. Furthermore, the study identifies 77 strategies classified at individual, organisational and national levels to overcome the identified barriers. These strategies provide a basis for setting up country-wide and organisation-wide strategies for successfully improving the energy efficiency when retrofitting existing buildings.

Finally, the eighth paper by Joseph Adedeji, Joseph Fadamiro and Timothy Odeyale offers a feedback loop from operational phase to design phase through adapting post-occupancy evaluation of the University Campus Open Spaces (UCOS) in south-west Nigeria. It is based on a structured questionnaire through stratified random sampling. The findings indicate that males use the UCOS more for active and passive recreation than females, who are more concerned about safety and inclement weather. The results were synthesised into a framework, which guide future design actions for innovative strategies between design and use/operational phases to boost and optimise the life cycle sustainability of campus built assets.

In summary, the papers have identified the imperatives to integrate design, delivery and operational phases of varied construction projects to benefit from the true and full value of sustainability in construction projects. It is anticipated that the gaps and barriers addressed by the research papers in this Special Issue will eventually assist the construction industry in the continuing journey towards whole life cycle built asset sustainability. The research findings are expected to collectively inform relevant policy makers to develop guidelines

and good practices locally and globally. As a whole, the society would benefit from such sustainable and environmentally friendly practices and assist in achieving the global zero carbon targets.

Guest editorial

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