Guest editorial: KPIs to help develop the next normal in construction practice, teaching-learning and research

The COVID-19 pandemic has affected all industries globally to different extents and the construction industry is no exception. Indeed, it is arguably one of the more affected sectors given extensive global supply chains and many unavoidable on-site work elements. Advancements in technology together with adaption to changed practices immensely contributed to the survival of the industry, paving the path to a new normal. The lessons learnt during this period suggest the necessity for consciously reviewing the new normal and be ready for the next normal to achieve a resilient future for construction industry. Accordingly, this special issue contributes to priming the construction industry for the next normal by re-examining the emerging needs for reengineering or developing novel and more relevant key performance indicators (KPIs) to better measure the performance of construction projects, online teaching-learning and research following vast digital and other transformations triggered, if not accelerated by the COVID-19 pandemic.

This special issue was based on the suggestion from and strongly supported by the KPIs group of Global Leadership Forum for Construction Engineering Management (GLF-CEM), which represents academic leaders in construction field from many countries. The special issue consists of eight papers providing insights into reengineering the KPIs to help develop the next normal in construction. The papers are ordered based on their research focus, where the first five papers are based on how best KPIs/metrics could be reengineered to evaluate and improve the construction practice in the new normal. The next two papers focus on KPIs/metrics to monitor, benchmark and improve teaching and learning in construction disciplines in the new normal. The final paper focusses on KPIs/metrics to be used to monitor, benchmark and improve innovative research in the next normal in construction.

The first paper by Ismail *et al.* examines the important performance indicators of the lifecycle process of public private partnership (PPP) projects in Malaysia and further investigates the differences in the perception of the importance of those performance indicators between the public and private sectors. This paper has introduced 16 performance indicators. In terms of the differences in the perception of the public and private sector groups, four indicators, i.e. "environment protection", "cost management", "effective risk management system" and "good work environment" show a significant statistical difference. The public sector perceives the "effective risk management system" indicator as significantly more important, implying that the government acknowledges the importance of an optimal risk allocation between the government and the private sector companies to achieve the best performance from the PPP projects. The authors highlight the need to integrate various risks related to the COVID-19 pandemic, which have affected the PPP lifecycle process.

The second paper by Krishnamoorthi and Raphael synthesises the knowledge related to performance evaluation of automated construction processes during the planning and execution phases using a systematic literature review. The primary conclusion of this research is that the effectiveness of construction processes can only be benchmarked using realistic simulations. In automated construction, there are many complex interactions

Built Environment Project and Asset Management
Vol. 12 No. 5, 2022
pp. 701-703

2044-124X
DOI 10.1108/BEPAM-09-2022-196

between humans and machines; therefore, detailed simulation models are needed for accurate predictions. One key requirement for simulation is the calibration of the models using real data from construction sites. This research recommends the development of industry-wide databases containing real data from construction projects that could be used to develop detailed simulation models. This would help in planning decisions in the context of the next normal in construction, where severe restrictions are in place with respect to the use of manual labour.

In the third paper by Van Niekerk *et al.*, knowledge discovery technologies are used on key project data extracted from project site meeting minutes to predict the final project duration of active projects. The research shows that information from project site meetings can be used to predict final project duration of active projects with accuracy of above 80% when using random forest algorithms from Orange and RapidMiner data mining applications. The value of data to predict project duration from project site meeting minutes is demonstrated, whilst noting that it only becomes practically useable if the format of minutes is suitably standardised. The outcome of this study shows that data-rich technologies and data analytics, which form part of the new normal in construction, all have undeniable value as project management tools.

Factory acceptance testing (FAT) in the construction industry has been severely hampered due to restrictions in cross-border travel resulting from the COVID-19 pandemic. Consequently, virtual FAT (vFAT) became a popular substitute for physical FAT. The fourth paper by Peiris and De Silva focusses on reengineering the factory acceptance testing under the new normal. This is because the credibility of vFAT is being questioned as it is being adopted without much scrutiny. A four-step vFAT process has been developed in this research with a note-worthy additional step called "Pre-FAT Meeting". The findings of this study unveil a vFAT process, which is timely and beneficial for construction practitioners to optimise and enhance the effectiveness of vFATs, which are currently conducted in a disarranged manner.

The fifth paper by Safapour and Kermanshachi focusses on performance indicators that most significantly affect the cost, schedule and rework performance of post-hurricane reconstruction of highways, bridges, roadways to name a few. The study identified eight key components for cost, eight for schedule performance and six for reworks. The outcomes of this research will assist authorities and decision-makers in identifying and evaluating the critical root causes of poor cost performance, poor schedule performance and reworks and will enable them to allocate their resources in an effective and timely manner.

The next two papers describe the matrices used to monitor, benchmark and improve teaching and learning in construction disciplines in the new normal. This includes the sixth paper by Manoharan *et al.*, which aims to develop a curriculum guide model to upgrade the construction supervision practices, considering evolving challenges and thereby the next normal of the construction industry. This curriculum guide model consists of a total of 64 competency elements that has been introduced with corresponding assessment weightages and mapping outcomes. A new training programme has been designed and tested with weightage percentages on learning domains using this model. The developed guide model is expected to be a valuable tool for training providers/organisations in upgrading their programmes/practices with the scope of productivity improvement. The mapping outcomes obtained are significant for the evolving next normal situations in teaching, learning and assessment methods relating to construction supervision practices.

The other paper related to teaching and learning in construction is the seventh paper by Samarasinghe and Piri, which attempts to evaluate the impact of visual models on the ability of construction students to assess design buildability. The study found that virtual reality (VR) models have significant advantages for assessing design buildability. Students measured 16.80% higher average buildability with the 3D VR model compared to the 2D

drawing. The participants in the evaluation felt that the visual model significantly improved the comprehensibility of complex designs, which helped identify and manage design buildability. The paper showed construction digitisation such as VR, augmented reality (AR) and building information modelling (BIM) is highly cooperative as it can easily be made available for online learning. Thus, the findings support construction educators to use online-based VR learning to promote efficient teaching of design buildability to students. This would help to effectively assess the buildability of designs and create safe buildings with a high degree of buildability. Additionally, it would produce a new breed of well-equipped construction players for "the next normal" in construction.

The last paper describes the KPIs/metrics to be used to monitor, benchmark and improve innovative research in the next normal in construction. This includes the eighth paper by Fayek and Golabchi, which provides a framework to identify performance metrics for evaluating research and development collaborations. A research roadmap is presented in this study, outlining top research areas and methods and a list of the most in-demand services including research, practical and training and outreach services. Metrics for evaluating the performance of proposed projects, completed projects and a collaborative research centre are also identified in this study. The approach and findings of this study can be adopted by other collaborative research centres and initiatives around the world to develop effective metrics for performance measurement. Continuous implementation of these metrics and the adoption of reliable methods for measuring them are crucial to making the best of and encouraging the continued development of the next normal for the construction industry.

The above overview clearly indicates that this special issue has attracted an exciting set of papers in developing KPIs to help develop the next normal in construction practice, teaching and learning and research. The research papers cover findings related to a wide range of countries such as India, Malaysia, New Zealand, South Africa, Sri Lanka and USA, and the authors of the papers also represent several different institutions within or across countries. Therefore, this special issue provides a snapshot of various KPIs and metrics proposed for the next normal in construction, considering different contextual factors experienced by various different geographical regions across the world. It is expected that the empirical knowledge and research gaps presented in the research papers of this special issue will collectively contribute to the body of knowledge and will inform the interested readers including construction industry practitioners, policy makers, academia and society at large to adopt best practices and to develop further research in forming KPIs to help develop the next normal in construction practice, teaching-learning and research.

The guest editors wish to thank all the authors for making valuable scholarly contributions to this special issue and the reviewers for their immense contribution in providing constructive comments and assisting us to maintain the quality standards of the journal. We extend a special thanks to Professor Mohan Kumaraswamy, Editor-in-Chief of *BEPAM* journal for offering us the great opportunity to play a role as guest editors and for the guidance, advice and support provided throughout the process from inception up to publication of this special issue. Lastly, we sincerely acknowledge the Emerald Publishing team for the tremendous logistical assistance we received to make this special issue a success.

Yasangika Gayani Sandanayake
Department of Building Economics, University of Moratuwa, Moratuwa, Sri Lanka

Aparna Samaraweera
UniSA STEM, University of South Australia, Adelaide, Australia, and

S. Thomas Ng
Department of Civil Engineering, University of Hong Kong, Hong Kong, Hong Kong