

Digitalization and Engineering Management for the Next-Era Industries

Kriengsak Panuwatwanich and John-Paris Pantouvakis

Editors

Editorial

Special issue for the 2022 (12th) International Conference on Engineering, Project, and Production Management (EPPM2022)
Available online August 31, 2023

Copyright © Journal of Engineering, Project, and Production Management (EPPM-Journal).
DOI 10.32738/JEPPM-2023-0017

This special issue features nine articles that were carefully screened and selected through a rigorous peer-review process of the EPPM2022 conference. These high-quality papers consolidate research findings that highlight the enabling roles of digital technology and engineering management in advancing our industries into the next era. This next era represents the transition into the dawn of the fifth industrial revolution (Industry 5.0), which places an emphasis on harmonizing advanced technologies with sustainability, human-centricity, and resilience (Yitmen et al., 2023). In this issue, eight out of nine papers examined salient aspects of this transitional paradigm within the construction industry. As argued by Ikundayisi et al. (2023), it is imperative to explore new research frontiers that align the construction industry, which plays a key role in driving the global economy, with the fifth industrial revolution given its promising contributions. Similar research demand has also been echoed in other industries, acknowledging that the paradigm shift is inevitable, and it is therefore inadvisable to remain insular.

Digital technology is the hallmark of technological advancement that drives the fourth industrial revolution and will continue to serve as a backbone for every nuance of the fifth industrial revolutions. Four papers included in this special issue demonstrate how Digital Twin (DT), Internet of Things (IoT), Unmanned Aerial Vehicles (UAV), and Building Information Modeling (BIM) can serve as core technologies to achieve sustainability that supports the construction industry's journey into the new era.

As DT can be used to optimize various performance measures of a construction project (such as time, cost, environmental impacts, and social outcomes), Y. Bunjaridh, R. A. Rahman, and L. M. Yusof attempted to identify the organizational attributes needed for an effective production of a digital twin. By analyzing the interview data collected from industry professionals in Malaysia, three attributes and three strategies were identified that can be used to serve as a fundamental framework for creating digital twins in the construction industry.

Implementing IoT can lead to the effective and efficient facility management (FM) of a building, which contributes to its sustainability. J. D. Anathan, L. M. Yusof, and R. A. Rahman examined the impact of IOT on the FM of office buildings using interview data from FM professionals in Malaysia. They identified both positive and negative impacts of IOT that can be used to assist FM players in developing and creating a better integration between people, place, process, and environment to improve services of office buildings.

In addition to IoT, UAV can greatly support the monitoring of a facility in terms of improved access to hard-reached elements, increased inspection speed, and reduced safety risks. The paper by K. H. Chelioti, C. N. Tsaimou, and V. K. Tsoukala investigated UAV-enhanced non-destructive testing and remote sensing applications for inspection purposes of port infrastructure aiming at optimizing monitoring practices. The findings provide us with insights into the potential and limitations of the UAV-based monitoring approaches.

Besides monitoring, maintenance work supported by digital technology is extremely essential to ensure the sustainability of a built facility. The work by E. Margaritopoulos and Y. Xenidis presents an example of a comprehensive implementation of BIM for condition-based maintenance of a residential building aiming at increasing its energy efficiency. The findings provide a practical and useful insights to designers and operators in terms of the benefits and the mode of application of BIM in building facility management, thus enhancing their understanding of, and efficiency in, the application in their day-to-day practice.

Human-centricity and resilience are the main foci of the Industry 5.0 era as it is shifting away from simply being technologically savvy. The paper by S. H. Zamani, R. A. Rahman, and L. M. Yusof touches on the issues of health, well-being, and productivity of building residents. By analyzing interview data from industry professionals and individuals living

in multi-story residential buildings in Malaysia, they identified new concepts that may be added to the WELL Building Standard for a developing country.

The work by M. Saufi, L. M. Yusof, and R. A. Rahman also addressed the issue of residential housing quality from the user's perspectives. The authors investigated the complaints during the defect liability period (DLP) by homebuyers and rectifications by housing developers towards these complaints. The findings indicated that the underlying issues during DLP are people, process, and knowledge management.

Human-centricity also places an emphasis on the issue of safety, particularly, in case of the infrastructure serving the public. The research by A. Panas, E. Kavouria, and J. P. Pantouvakis aimed at improving the safety levels of the road infrastructure in Greece by investigating road alignment characteristics and design consistency of a road network. The findings identified the road sections and road curves with a reduced road safety leading to an increased possibility for road accidents.

The quality of public infrastructure is dependent in part on its project delivery. To improve the delivery of public projects, V. Sibuyi and F. Emuze identified and categorized "pathogens" in projects through an analysis of the survey data from 78 municipality employees in South Africa. The authors highlighted some critical areas on which public-sector organizations should focus during the implementation of infrastructure projects.

In preparation for the next industrial era, the last paper in this issue looked back at the impact of the Covid-19 pandemic on Industry 4.0 readiness in a bid to improve the resiliency of the Vietnamese Industry. In this paper, L. T. N. Lan and C. Jeenanunta conducted multiple case studies of four manufacturing companies in Vietnam and found that COVID-19 influenced the decision to implement Industry 4.0 technology in international and local companies within the global market. It is recommended that the government should establish a policy to provide vital support to local SMEs as they largely lack human resource capability to implement Industry 4.0 technology and deal with the pandemic crisis.

We do hope that the papers included in this special issue will provide the readers with fresh updates on, and insights into, how digitalization and engineering management can help industries to achieve sustainability, human-centricity, and resilience in a lead up to our transition into the next era of Industry 5.0.

References

- Ikudayisi, A. E., Chan, A. P., Darko, A., and Yomi, M. D. (2023). Integrated practices in the Architecture, Engineering, and Construction industry: Current scope and pathway towards Industry 5.0. *Journal of Building Engineering*, 73, 106788. doi:10.1016/j.jobbe.2023.106788.
- Yitmen, I., Almusaed, A., and Alizadehsalehi, S. (2023). Investigating the Causal Relationships among Enablers of the Construction 5.0 Paradigm: Integration of Operator 5.0 and Society 5.0 with Human-Centricity Sustainability, and Resilience. *Sustainability*, 15(11), 9105. doi: 10.3390/su15119105.