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Editorial

Buildings 2019 Best Paper Awards

***Buildings* Editorial Office**

MDPI, St. Alban-Anlage 66, 4052 Basel, Switzerland; buildings@mdpi.com

Buildings is instituting the Best Paper Award to recognize outstanding papers published in the journal. We are pleased to announce the *Buildings* Best Paper Award for 2019. Nominations were chosen from all papers published between 1 January 2019 and 31 December 2019. The Selection Committee examined each paper and expressed their preferences, releasing the ranking of the *Buildings* 2019 Best Paper Award.

A Review and Scientometric Analysis of Global Building Information Modeling (BIM) Research in the Architecture, Engineering and Construction (AEC) Industry (10.3390/buildings9100210) [1]

By Ziwen Liu, Yujie Lu and Lu Chang Peh (Figure 1)

In the recent decade, Building Information Modeling (BIM) has widely been adopted in the Architectural, Engineering and Construction (AEC) industry and completely upended the way we build. While BIM continues to gain momentum in the industry, it has also attracted increasing attention from researchers. However, most of the current studies focus on reviewing BIM for management, BIM for green building and BIM for infrastructure. There are few studies about Global BIM review and to discuss their complex inter-connections. In this study, we adopted a scientometric analysis method to review global BIM research during 2004–2019. In total, 1455 scholarly bibliographic records obtained from Web of Science Core Collection database were established for the analysis. This study has identified the top productive and influential researchers, research institutes, regions/countries, subject categories and journals in the BIM field. In addition, 11 clusters of global BIM research were also identified including construction project, green BIM, construction safety planning, automated IFC-based workflow and so on. The authors distinguished the 11 clusters of global BIM research into three stages, namely formulating stage, accelerating stage and transforming stage. These findings provide valuable information for researchers, practitioners and policymakers by visualizing the current progress in the research field of BIM and highlighting future research needs.

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Figure 1. From left to right: Ziwen Liu received his PhD degree from School of Science and Technology at the Singapore Uni-versity of Social Sciences (SUSS). During his PhD, his research focused on leverage on BIM for green building assess-ment and certification process. **Yujie Lu** is currently a professor at Tongji University, China. With years of experience in intelligent construction and O&M and green buildings, he has led several domestic and international research projects with funding from the National Natural Science Foundation of China and the National Research Foundation of Sin-gapore (NRF). His research findings were endorsed by the International Energy Association (IEA); JTC Corporation, the largest industrial real estate agency in Singapore; California carbon emissions trading market; and the director of the national affairs development agency of Singapore. **Lu Chang Peh** is an associate professor at the Singapore University of Social Sciences and is currently the Vice Dean at the School of Science and Technology. He is a PhD supervisor and is keen to do research in multidisciplinary studies in the built environment and technology for sustainability.

DISCLAIMER

The information expressed in this editorial and article [1] are the authors' personal opinions and do not necessarily represent the official position of any organization. The authors shall not be liable for any reliance on or misinterpretation of any information contained in this editorial and the review article [1].

LCC Estimation Model: A Construction Material Perspective (10.3390/buildings9080182) [2]

By Vojtěch Biolek and Tomáš Hanák (Figure 2)

Vojtěch Biolek is an assistant lecturer and Tomáš Hanák is an associate professor of Construction Economics and Management at the Brno University of Technology, Faculty of Civil Engineering, the Czech Republic. Our aim is to contribute to the dynamically developing area of construction sustainability, which has attracted much attention among the research community. In particular, our research responds to the stricter demands on the cost-effectiveness of construction and operation of buildings and reduction of their environmental impact. We believe that advanced applications of life cycle costing approach are key to supporting informed investment decisions at the early stages of construction projects. In our latest study, which was published in *Buildings*, we presented a methodology for building life cycle cost estimation that enables investors to identify the optimum material solution for their buildings on the level of functional parts. The novel approach is applied to the "Façade Composition" functional part, which is important, for example, in terms of the achieved thermal insulation properties of the building. In future, we intend to extend the methodology to other aspects, such as LCA estimation and its closer links to the Building Information Modeling platform.

Figure 2. Dr Vojtěch Biolek (**left**) and Tomáš Hanák (**right**).

BIM-based and AR Application Combined with Location-Based Management System for the Improvement of the Construction Performance (10.3390/buildings9050118) [3]

By Julia Ratajczak, Michael Riedl and Dominik T. Matt (Figure 3)

The research project initiated in the European project ACCEPT (www.accept-project.com accessed on 9 May 2021) was further carried out by Fraunhofer Italia and the Free University of Bozen-Bolzano (Italy) within the PhD program Sustainable Energy and Technologies.

This research project prposes a prototype of a BIM-based and AR application called the AR4C (Augmented Reality for Construction) that is combined with a location-based management system (LMBS) to improve the performance of construction works. The AR4C aims to improve aspects of construction performance such as productivity, quality of construction work and information flow. Productivity is enhanced by implementing the monitoring of construction works daily in a specific location unit of the project. The AR4C aims to enhance project control via the rapid identification of deviations from a project's schedule, as well as variations in performance and progress, by overlaying a 3D BIM model on the real world using AR. The quality of construction works is increased by providing context-specific information on tasks, building components and materials anytime and anywhere on the construction site. Construction works are verified by linking quality checklists to each construction task. Moreover, information flow is streamlined by displaying tailored information for each construction task through 3D models and lists of construction tasks.

This paper describes the most important methods and technologies, which are required to develop the AR4C application. In particular, the data exchange between BIM software and the Unity environment is discussed, as well as the integration of LBMS into BIM software and AR4C. Finally, the implemented and planned functionalities are argued. The AR4C application prototype was tested in a laboratory environment and produced positive feedback. Since the application addresses construction sites, a validation in semi-real scenarios with end-users is foreseen.

Figure 3. Research group from left to right: **Julia Ratajczak** obtained her PhD degree at the Faculty of Science and Technology at the Free University of Bozen-Bolzano and she is currently working at the Innovation Department at Budimex SA. **Domink T. Matt** is the Director of Fraunhofer Italia. As a full professor, he is the Chair for Production Systems and Technologies and heads the re-search department "Industrial Engineering and Automation (IEA)" at the Faculty of Science and Technology at the Free University of Bozen-Bolzano. **Michael Riedl** is Deputy Director and Team Leader of the Automation and Mechatronics Engineering and Business Model Engineering De-partment at Fraunhofer Italia.

The impact of Engineering, Procurement and Construction (EPC) Phases on Project Performance: A Case of Large-scale Residential Construction Project (10.3390/buildings9010015) [4]

By Kamyar Kabirifar amd Mohammad Mojtahedi

These four outstanding papers are valuable contributions to *Buildings*. On behalf of the Editorial Board, we would like to congratulate these four teams for their excellent work. In recognition of their accomplishments, each team will receive a certificate, bonus of different amounts and an offer to publish a paper free of charge in *Buildings* in 2021. We would like to take this opportunity to thank all the nominated research groups of the above exceptional papers for their contributions to *Buildings* and thank the *Buildings* Editorial Board for voting and helping with this Best Paper Award.

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