
Activity Report for TC-34 Digital Transformation for the Sustainable Built Environment

Date: September 6, 2025

Name of Chair: Dr. Shang-Hsien Hsieh

Responsible Society: CICHE

1. Outline of TC

1.1. Background and Objectives

The built environment plays a critical role in shaping our society, economy, and natural ecosystems. As global challenges such as climate change, urbanization, and resource scarcity intensify, there is a growing need to adopt sustainable practices in the design, construction, and operation of buildings and infrastructure. Digital transformation offers significant opportunities to enhance sustainability in the built environment through the integration of advanced technologies, data-driven decision-making, and innovative design approaches.

To harness these opportunities and address the associated challenges, we propose the formation of a Technical Committee on Digital Transformation for the Sustainable Built Environment. This committee will bring together experts, stakeholders, and industry leaders to develop guidelines and best practices that effectively integrate advanced digital technologies to support the sustainable development of the built environment.

The primary objectives of the Technical Committee are as follows:

- 1) **Develop Guidelines:** To establish industry-wide guidelines that integrate digital technologies for enhancing sustainability in the built environment.
- 2) **Promote Innovation:** To encourage the adoption of innovative digital solutions that reduce the environmental impact of buildings and infrastructure while improving their efficiency and resilience.
- 3) **Foster Collaboration:** To create a platform for collaboration among industry stakeholders, academia, government bodies, and technology providers to share knowledge, expertise, and best practices.
- 4) **Support Sustainable Development Goals (SDGs):** To align the committee's work with the United Nations Sustainable Development Goals, particularly those related to sustainable cities and communities, climate action, and responsible consumption and production.
- 5) **Facilitate Education and Training:** To develop educational resources and training programs that equip professionals with the skills and knowledge required to implement digital transformation in the built environment.

1.2. Terms of Reference

The Technical Committee will focus on the following areas:

- 1) **Smart Building Technologies:** Development of standards for the integration of IoT, sensors, and automation systems that enhance energy efficiency, resource management, and occupant comfort.
- 2) **Building Information Modeling (BIM):** Promotion of BIM as an enabling tool for improving sustainability across the lifecycle of buildings and infrastructure, from design to deconstruction.
- 3) **Digital Twin Technology:** Exploration of digital twin applications in predictive maintenance,

energy optimization, and lifecycle management of buildings and infrastructure.

- 4) Data Analytics and Artificial Intelligence: Utilization of data analytics and AI for informed decision-making in sustainability planning, energy management, and resource optimization.
- 5) Sustainable Materials and Construction: Evaluation and standardization of digital tools that support the selection of sustainable materials and reduce construction waste.
- 6) Circular Economy Integration: Development of frameworks for implementing circular economy principles in the built environment through digital transformation.
- 7) Urban Planning and Smart Cities: Guidance on integrating digital solutions in urban planning to create sustainable, smart cities that address environmental and social challenges.

1.3. Expected Outcomes

The expected outcomes of the Technical Committee's work include:

- 1) Published guidelines for facilitating digital transformation to enhance sustainability in the built environment.
- 2) White papers and research reports on best practices and emerging trends in the field.
- 3) Workshops, seminars, and conferences to disseminate knowledge and promote collaboration.
- 4) Case studies showcasing successful digital transformation for more sustainable built environments.
- 5) Educational resources and training programs that equip professionals with the skills and knowledge required to implement digital transformation for sustainable development.

1.4. Period of Activity (1) since TC's inception, and (2) for this Report (Month/Year to Month/Year)

The TC was approved in the 47th ECM held in Wellington, New Zealand, October 20-22, 2024. The period of activity for this report is from October 2024 to February 2025.

1.5. Members

The TC currently has the following members (more are to be invited):

- (Chair) Prof. Shang-Hsien (Patrick) Hsieh, National Taiwan University, Taiwan
- (Co-Chair) Prof. Ying-Chieh Chan, National Taiwan University, Taiwan
- (Co-Chair) Prof. Jacob Je-Chian Lin, National Taiwan University, Taiwan
- (Members) Dr. Amarnath CB, India BIM Association, India
- Prof. Aritra Pal, Indian Institute of Technology Madras, India
- Dr. Adrianto Oktavianus, Bandung Institute of Technology, Indonesia
- Prof. Prasanti Widyasih Sarli, Bandung Institute of Technology, Indonesia
- Prof. Rahimi A. Rahman, Universiti Malaysia Pahang Al-Sultan Abdullah, Malaysia
- Dr. Yang Zou, University of Auckland, New Zealand
- Dr. Brian Guo, University of Canterbury, New Zealand
- Prof. Youngjib Ham, Seoul National University, South Korea
- Prof. Charinee Limsawasd, Chulalongon University, Thailand
- Prof. Veerasak Likhitrungsilp, Chulalongon University, Thailand
- Prof. Damrongsak Rinchumphu, Chiang Mai University, Thailand
- Dr. Somjintana Kanangkaew, Chiang Mai University, Thailand
- Dr. Cong Thanh Do, Hanoi University of Civil Engineering, Vietnam
- Dr. Duc Nguyen, Hanoi University of Civil Engineering, Vietnam
- Dr. Mony Mom, Cambodian Society of Civil Engineers, Cambodia
- Dr. Ros Vatanak, Cambodian Society of Civil Engineers, Cambodia

1.6. Financial Background

The activities of the TC are carried out with the funds provided by each TC member. Additionally, CICHE may arrange possible partial support for major events of the TC.

2. Recent Activities and Outcomes

The major activities and outcomes during this period are as follows:

1. A joint seminar with TC 30 for the 48th ECM held at Yangon, Myanmar: A Joint Technical Seminar of TC30 & TC34 has been organized on “Digital Transformation for the Sustainable Built Environment: Innovations, Technologies, and Strategies for Sustainability” (See Figure 1). Eight presentations are arranged in the joint seminar chaired by Prof. Shang-Hsien Hsieh of National Taiwan University:
 - BIM Adoption in Vietnamese Contractors
Prof. Quan Nguyen, Hanoi Univ. of Civil Engineering, Vietnam
 - Experiences of Advanced Infrastructure Maintenance Technology Using AI, UAV, and Advancing 3D Data Measurement
Prof. Pang-jo CHUN, Univ. of Tokyo, Japan
 - A Communication System to Support Evacuation Routes in Building Construction Projects: A Building Information Modeling (BIM) and Augmented Reality (AR) Approach
Dr. Somjintana Kanangkaew, Department of Civil Engineering, Faculty of Engineering, Chiang Mai University, Thailand
 - Building Sustainability in Post-Earthquake Recovery: A Digital Integration of BIM, Computer Vision, and Web Map Services
Dr. Adrianto Oktavianus, Bandung Institute of Technology, Indonesia
 - Concept Note on Building Information Modeling (BIM) Standards for Cambodia
Dr. Mony Mom, Cambodian Society of Civil Engineers
 - (Online) Strategizing BIM & Digital Adoption in Building & Infrastructure Projects
Dr. Amarnath CB, India BIM Association



(a)



(b)



(c)

Figure 1 A Joint Technical Seminar of TC30 & TC34 for the 48th ECM held at Yangon, Myanmar

2. Online committee meeting on August 6, 2025 (see Figure 2), to review the objectives and expected outcomes of the committee, discuss short-term plans and activities, and formulate strategies for collaboration among members to achieve specific goals. The key outcomes of the meeting are summarized as follows:
 - The group plans to develop guidelines by adapting existing national and international guidelines, rather than creating new ones from scratch. The guidelines will also incorporate

- concepts like National Digital Twin and geospatial data integration.
- A cross-country survey on digital technology adoption will be conducted to serve as a foundation for drafting guidelines and for cross-country comparisons.
- Collaboration activities will include monthly online seminars featuring presentations from one to two members. These seminars will be hosted by different countries, and industry experts may be invited to participate.
- For communication, a LinkedIn group has been created for members of TC34. The use of other tools like WhatsApp is also being considered for quicker communication.
- The group aims to expand its membership by encouraging members to invite participants from other countries, such as Nepal. They are also open to government agency participation to ensure the guidelines align with policy needs.



Figure 2. Participants of the TC34 Kickoff Meeting held online on August 6, 2025.

3. Maintain and update the TC website: The TC34 website has been up and running at <https://ntubimcenter.wixsite.com/asian-civil-engine-1> (see Figure 3), and the link has been provided on the ACECC TC webpage.

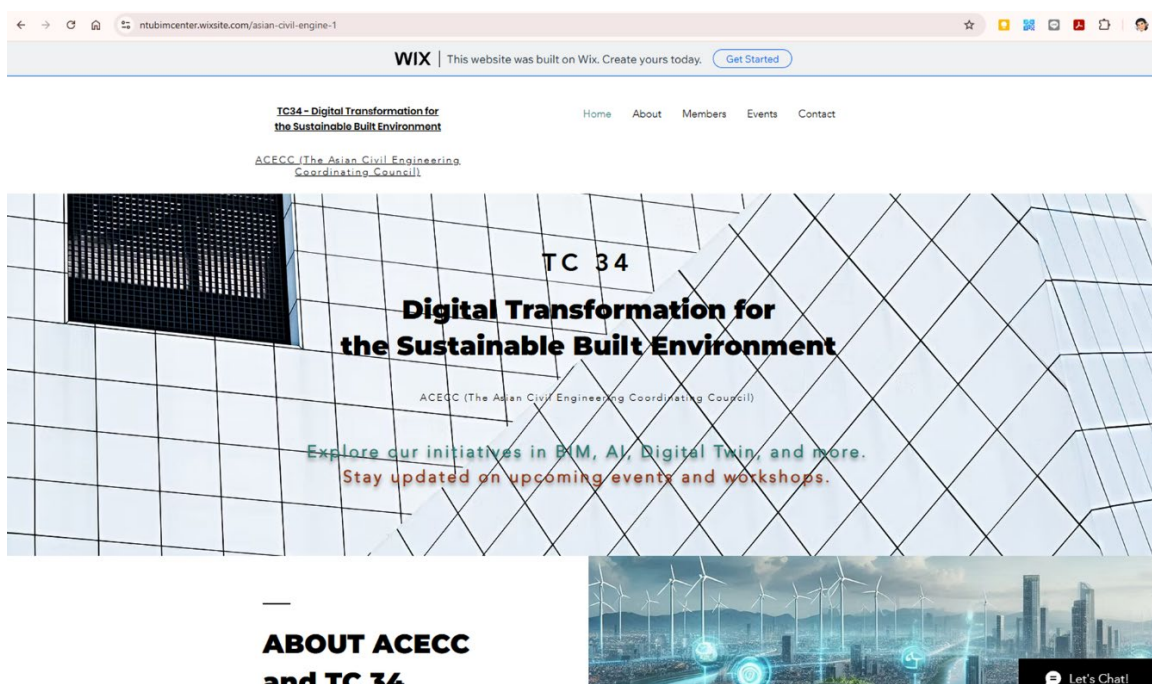


Figure 3. The TC 34 Website.

4. Set up a LinkedIn group (see Figure 4) for the TC to facilitate the communication, exchange of ideas, and sharing of information among members.

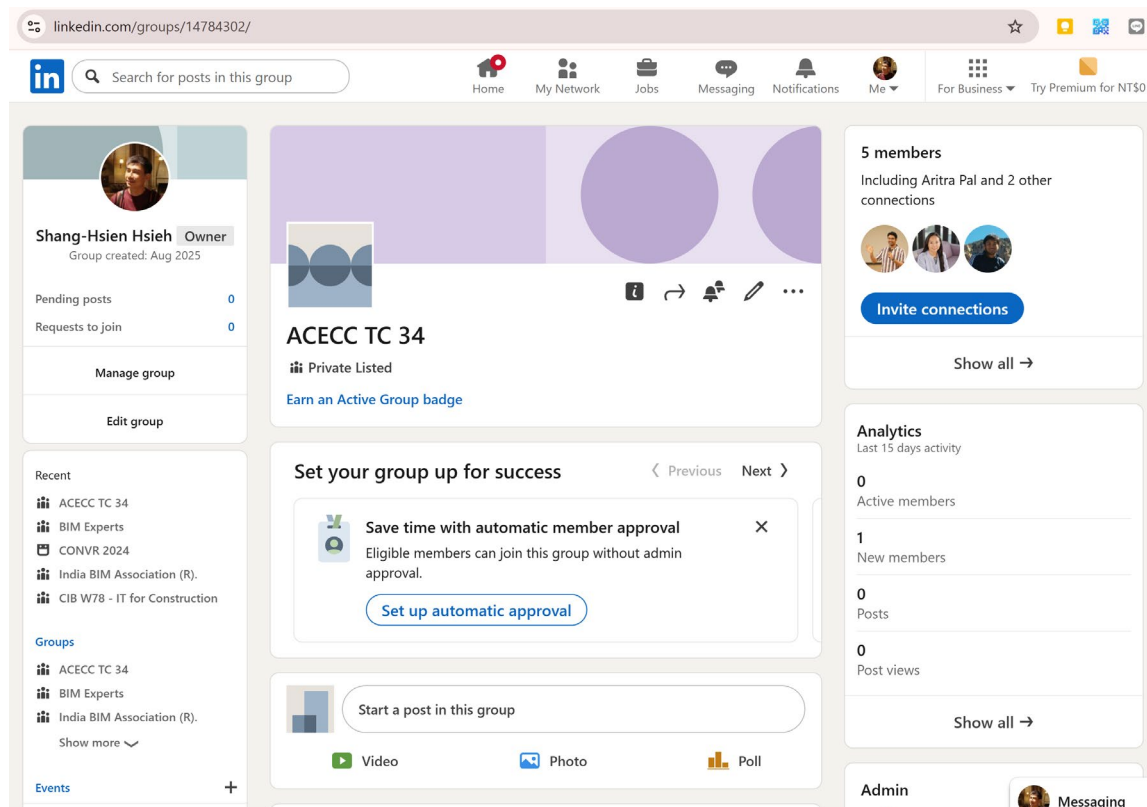


Figure 4. The TC 34 LinkedIn Group.

5. Organization of a TC34 session for the incoming CECAR: Presentations are being invited. The session title and the tentative list of presentations are described in Section 3.
6. Collaboration with TC33 to organize a series of three CECAR sessions under the title of "Advancing AI and Digital Transformation in Civil Engineering: A Workshop for Innovation and Adoption":

3. Activity Plan towards Incoming CECAR

3.1. Session Title

ACECC TC34 Session: Digital Transformation for the Sustainable Built Environment

3.2. List of Presentations

1. Applying Systems Theory for Predictive Maintenance in Facility Management – A Performance Evaluation Framework Using Neo4j
Chien-Pu HUANG, and Shang-Hsien HSIEH* (National Taiwan University, Taiwan)
2. The Application of an Advanced IoT-Based Alert System for Enhancing Rockfall Barrier Effectiveness: Validation Through One Year Manual Trial
Kinjal PARMAR*, Matteo LELLI, and Mayank BATRA (Maccaferri Malayisa, Malaysia)
3. Evaluating YOLOv8 in Post-Earthquake Structural Damage Detection and Segmentation: Opportunities and Challenges
Ensieh Ali BAKHSHI, Omid YAZDANPANA*, and Minwoo CHANG (Myongji University, Korea)
4. Exploring the Potential of Digital Twins in Civil Infrastructure Systems for Enhanced Sustainability and Resilience
Shafayet RAHMAN* (Chittagong University of Engineering and Technology (CUET), Bangladesh)
5. A Multi-Objective Tool Measuring Circular Economy Potential of Built Structures

Goran SIBENIK* , Bibek GUPTA, Rudi STOUFFS and Pieter HERTHOGS (Singapore-ETH Centre & National University of Singapore, Singapore)

6. Evaluating Greenhouse Gas Emissions from Existing Buildings in Ulaanbaatar: A Web-Based Inventory System Approach

Oyuntsatsral TSEYENBALJIR* (Mongolian University of Science and Technology, Mongolia)

7. Evaluating the Mitigation Potential of Embodied Carbon Emissions in South Korea's Residential Buildings

Hyoungwook LIM, Eunjin MOON and Jooyoung PARK (Seoul National University & Construction Technology Research Center, Korea)

8. Machine Learning Instruments to Enhance Predictive Management in Small-scale Wastewater Treatment Systems

Gogina Elena S. *, Gulshin Igor A., Spasibo Elena V. (Research Institute of Building Physics of the Russian Academy of Architecture and Building Sciences (NIISF RAASN), Russia)

4. Other upcoming activities

Organization of a special session in the 2026 International Conference on Computing in Civil and Building Engineering, Taipei, Taiwan, March 23-26, 2026.

5. Any requested Action Items for TCC and /or EC

None