



**ISM**

**IRC 5.0**

**25 FEBRUARY 2023**

**UCSI UNIVERSITY, KUALA LUMPUR**

**INTERNATIONAL RESEARCH  
CONFERENCE 2023**

**BRIDGING WORLD:**

TOWARDS FUTURE SUSTAINABILITY AND  
TECHNOLOGY IN THE BUILT  
ENVIRONMENT

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MESSAGE FROM

**THE DEAN OF UCSI'S FACULTY  
OF ENGINEERING, TECHNOLOGY  
AND BUILT ENVIRONMENT**

Assoc. Prof. EUR ING. Ir. Ts. Dr.  
ANG CHUN KIT

Thank you to each and every one of you for being here with us today. We are very pleased to be able to welcome a diversified group of participants which includes academicians, practitioners, researchers, and students. This conference, which has been held annually since 2019 is an international event and this year, in 2023 – making its 5th appearance, we are greatly honoured to be the co-hosting institution.

As a university navigating into a research and innovation, UCSI University is proud to actively participate in these research conferences hosted by RISM and other affiliated organizations. Being a dynamic higher education institution, UCSI University is ranked 284th globally, and won the most improved award from QS World Ranking 2023.

The conference theme, "Bridging the World: Towards Future Sustainability and Technology in the Built Environment" addresses two important aspects of the world we live in. As humanity progresses, we will need sustainability and the ability to embrace technologies to bridge the world. Thus the conference sub-themes covering:-

- Innovation, Technology and Engineering
- Green and Sustainability
- Quality, Safety and Productivity
- Professional Practice and Management and Education

are all important topics to be addressed, especially by the Quantity Surveying and also Built Environment profession related which plays an active role in the field of construction industry.

Before we begin, I on behalf of School of Architecture & Built Environment UCSI University, would like to express our sincere gratitude to all of you who have contributed to this event. I am confident that the keynote speakers, presenters, participants, and of course the members of the conference committee have worked tirelessly to make this event a success!

Well, I don't want to take up too much of your time, I have to make time for other people and speeches of the day! Today will be filled with creative and interesting dialogue, which, as I can imagine from the list of conference papers, is the result of the hard work and efforts of scholars.

So a very warm welcome to each of you!  
Thank You.



MESSAGE FROM

**THE PRESIDENT, THE ROYAL  
INSTITUTION OF SURVEYORS  
MALAYSIA**

**Sr DAINNA BAHARUDDIN**  
CQS, FRISM, FRICS

Bismillahirrahmanirrahim

Assalamualaikum Warahmatullahi Wabarakatuh

The RISM International Research Conference 2023 is a very significant event for the quantity surveying fraternity as it brings together learned academicians and learners to share their knowledge and thought leadership through the engaging theme of Bridging the World: Towards Future Sustainability and Technology in the Build Environment

Research is a catalyst to innovate upskilling and reskilling the profession for nation building thereby benefitting quantity surveyors in particular and the construction industry at large. Hence, RISM International Research Conference serves as a springboard for participants to discourse current issues and challenges in the built environment. It also provides a platform to network and out-reach on contemporary quantity surveying which is necessary for those in the academic line to accomplish key objectives set around the building of our youth of the future

I would like to congratulate the organising committee for creating this engaging experience for presenters and participants alike. It is hoped that the takeaways from the paper presentations, discussions and interactions will be of great use.

On behalf of the Royal Institution of Surveyors Malaysia, I would like to take this opportunity to thank (university name) for their hospitality in hosting the event. Also our appreciation must be recorded to Sponsors who have supported and contributed generously to the success of this event. I would like to express my gratitude and appreciation to the members of the Organising Committee whose professional style and teamwork have made the made this event a reality

Lastly, it is my hope that all the attendees will enjoy the fellowship that RISM International Research Conference 2023 brings while benefiting positively from the outcome of the conference.

Thank You

Sr Dainna Baharuddin,  
CQS, FRISM, FRICS  
RISM President  
Session 2022/2023  
20 February 2023



MESSAGE FROM

**THE VICE-CHANCELLOR,  
UCSI UNIVERSITY**

Professor Datuk Ir. Ts. Dr.  
SITI HAMISAH TAPSIR

As for conference theme for year 2023, Bridging World: Towards Future Sustainability & Technology in the Built Environment. to recapped when worldwide been faced unprecedented phenomenon of COVID-19. Which has rapidly accelerated the digital transformation of organizations in every sector, offering leaders an opportunity to make fundamental shifts in their practices and reset a strategic vision for their organization grounded in long-term growth and value creation for all stakeholders.

The crisis has also been a wake-up call to a myriad of impending global risks - which are increasingly linked to environmental impacts in terms of likelihood and impact - highlighting the need to prepare for future disruption through resilient business operations backed by reliable data and digital technology. This imperative has been signaled by the financial markets themselves, which have validated the fact that robust environmentally sustainable practices can preserve investments in times of volatility and, in some cases, boost returns.

The Twelfth Plan was formulated when the world was facing extreme challenges from the COVID-19 pandemic. The government direction to introduce and implementing The Twelfth Plan, with the goal of “Keluarga Malaysia - Prosperous, Inclusive, Sustainable”, will enable us to enjoy a better standard of living. All the strategies and initiatives in the Plan are aligned with the 2030 Agenda for Sustainable Development that was accepted by all the United Nations member states in 2015. 12th Malaysia Plan it's in line with the Shared Prosperity Vision 2030 (SPV2030) was released encompassing development model to make Malaysia a nation that achieves sustainable growth along with fair and equitable distribution, across income groups and ethnicities, regions and supply chains. The SPV2030 emphasized on sustainability and big data way forward. Where the emergence of sustainability and technologies comes into one plate.

The National Construction Policy (NCP 2030), which is based on the Shared Prosperity Vision 2030 (SPV 2030), envisions a developed and sustainable nation with an inclusive economic distribution. In essence, WKB 2030 seeks to accomplish three primary goals: reorganise the economy at all levels of society, reduce inequality, and build the nation. The NCP 2030 will act as a catalyst for infrastructure development as part of the drive to restructure the economy and alleviate income and wealth inequalities.



Because all 17 goals are interconnected, the NCP2030 is intended to address the SDGs' guiding principle of "leaving no one behind." The Malaysian construction sector will emphasize holistic development to create better and more sustainable development for all. Digital technology will play a critical role in the achievement of the Sustainable Development Goals (SDGs), although innovation will most likely affect progress in both positive and negative ways. The deployment of new technologies is seen to be essential in achieving the SDGs, considering the need for accelerated progress to fulfil the goals by 2030. The formulation of Sustainable and Technology which come together into once may further Bridging World: Towards Future Sustainability & Technology in the Built Environment.

Thank you.

Professor Datuk Ir. Ts. Dr. Siti Hamisah Tapsir  
Keynotes Speaker , RISM IRC 5.0



## MESSAGE FROM

### **THE CHAIRMAN, RISM IRC 5.0**

Ts. Sr KHOO SUI LAI  
CQS, FRISM

It is a great pleasure for me to extend a welcome to all of you who are participating in the Royal Institution of Surveyors Malaysia International Research Conference 2023 (RISM IRC 5.0). This will be our fifth research conference organised by RISM Quantity Surveying Division, jointly organised with UCSI University Kuala Lumpur Campus – School of Architecture & Built Environment (SABE).

International Research Conference (IRC) always been providing a platform for researchers from academia to exchange their research ideas, results and to discuss the state of the art in the areas of the conference. Contributions are invited on the topics within the conference scope of Innovation, Technology & Engineering Green & Sustainability Professional, Practice & Management, Quality, Safety & Productivity, and Education. With the theme “Bridging World: Towards Future Sustainability and Technology in the Built Environment”, it is important that the construction expert especially Quantity Surveying practice grow in a responsible, technological, and sustainable manner. Construction 4.0 called for the digital revolution of the sector, with digital design, construction, and operation. Clearly, the construction industry undergoes a paradigm shift because of this digital transition.

Finally, I would like to express my sincere appreciation to the conference co-host university, UCSI University, and organising committee members from various public and private higher learning institutions who have worked tirelessly to make this event a reality. Congratulations to the authors and speakers for a job well done. It is their efforts and vision, which provided the impetus to put together this outstanding conference. Thanks also go to the invited lecturers and students. I hope that the conference will be stimulating, informative, enjoyable, and fulfilling experience to all who attend it. Thus, it is expected to be an annual event in the future.

Thank you.

Ts. Sr Khoo Sui Lai,  
CQS, FRISM, MRICS, P.Tech., MBOT, M.T.A.M, Prof MGBC, ICECA, AMIVMM  
Organising Chair, RISM IRC 5.0



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## CONFERENCE OBJECTIVES

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RISM QS Division is pleased to inform you that we will be organising the RISM Research Postgraduate Conference 2023 at UCSI University, Kuala Lumpur Campus, Malaysia. RISM IRC5.0 is jointly organised by the QS Division, Royal Institution of Surveyors Malaysia (RISM), with the School of Architecture & Built Environment (SABE), UCSI University.

The RISM IRC5.0 is intended to serve as an out-reach platform for surveying and built environment for Academia, Practitioner, and Student with the objectives of:

- Serve as a platform for open dialogue among surveying and built environment Academia, Practitioner, and Student in the region on contemporary related issues, challenges and strategies to overcome;
  - Serve as a platform to create and expand networking who have similar interests and research areas;
  - Serve as a platform to enhance awareness of latest current issues and technology available in the industry; and
  - Serve as a platform to outreach the potential employers to talent-scout potential employees.
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## CONFERENCE THEME

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**BRIDGING WORLD:**  
TOWARDS FUTURE SUSTAINABILITY AND  
TECHNOLOGY IN THE BUILT  
ENVIRONMENT

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## SUB - THEMES

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**INNOVATION, TECHNOLOGY & ENGINEERING  
GREEN & SUSTAINABILITY  
QUALITY, SAFETY & PRODUCTIVITY  
PROFESSIONAL PRACTICE & MANAGEMENT  
EDUCATION**

*Publication: All accepted papers have been peer reviewed and will be published in the Malaysia Construction Research Journal (MCRJ) or other Scopus indexed journal(s).*



- 8:00am** Registration
- 8:50am** Arrival of VVIPs
- 8:55am** Safety Briefing
- 9:00am** Welcoming Address  
**Assoc. Prof. EUR ING. Ir. Ts. Dr. Ang Chun Kit**  
Dean, Faculty of Engineering, Technology and Built Environment
- 9:05am** Opening Speech  
**Sr Dainna Baharuddin, CQS, FRISM, FRICS**  
President, The Royal Institution of Surveyors Malaysia
- 9:10am** Official Opening  
Multimedia Conference Montage
- 9:15am** Keynotes Speech  
**Professor Datuk Ir. Ts. Dr. Siti Hamisah Tapsir**  
Vice-Chancellor, UCSI University
- 9:35am** Momentos exchange & Photography Session
- 9:45am** Tea Break

# PROGRAMME LIST

## UCSI University, KL Campus Block G

**10:00AM** Innovation, Technology & Engineering      Green & Sustainability      Professional, Practice & Management

**Venue :** **GG07, Audi 2, Level G**      **GG08, Audi 3, Level G**      **G0110, Classroom, Level 1**

**Session Chair:**

Asst. Prof. Dr. Lew Yoke Lian  
Asst. Prof. Dr. Allen Lau Khin Kiet

Sr Dr. Fara Diva Mustapa  
Sr Azrina Abd Yaakob

Asst. Prof. Dr. Felicia Yong Yan Yan  
Sr Mieranie Watie Shaharudin

TITE_05	TGNS_02	TPPM_02
TITE_06	TGNS_05	TPPM_05
TITE_08	TGNS_07	TPPM_06
TITE_09	TGNS_08	TPPM_08
TITE_13	TGNS_09	TPPM_04
TITE_01	TGNS_10	
	TGNS_11	
	TGNS_03	
Education		Green & Sustainability
Tedu_02		TGNS_12
Tedu_03		TGNS_13

**1230pm** Lunch Break

**2:00pm** Education      Quality, Safety & Productivity      Professional, Practice & Management

**Venue :** **GG07, Audi 2, Level G**      **GG08, Audi 3, Level G**      **G0110, Classroom, Level 1**

**Session Chair:**

Dr. Shazwan Mohamed Shaari  
Dr. Ahmad Bin Abd Jalil

Ts. Ariffuddin Ariffin  
Sr Dr. Ashley Hong WT

Dr. Maisarah Makmor  
Sr Neoh Wen Wan

Tedu_04	TQSP_01	TPPM_15
Tedu_05	TQSP_02	TPPM_16
Tedu_07	TQSP_03	TPPM_17
Tedu_08	TQSP_04	TPPM_18
Tedu_10	TQSP_06	TPPM_11
Tedu_12	TQSP_07	
Tedu_13		

**4:00pm** Tea break

**4:15pm** Best Paper & Best Presenter Awards

**4:45pm** Closing Speech  
**Ts. Sr Khoo Sui Lai, CQS, FRISM**  
Chairman, RISM IRC 5.0

**5:00pm** Photography Session & End of Conference



## TITE 01 - WHY IS MALAYSIA'S CONSTRUCTION SECTOR EMBRACING ETENDERING SO SLOWLY?

Sui Lai Khoo<sup>1</sup>, Nadzirah Zainordin<sup>1</sup>, Zaira Mat Jusoh<sup>1</sup>, Edna Bujang Safawi<sup>2</sup> and Jason Maximino C. Ongpeng<sup>3</sup>

<sup>1</sup>*School of Architecture & Built Environment, Faculty of Engineering, Technology and Built Environment, UCSEI University, Kuala Lumpur, Malaysia*

<sup>2</sup>*BCISM Sdn. Bhd.*

<sup>3</sup>*Civil Engineering Department, De La Salle University-Manila, Philippines*

"eTendering" refers to the whole electronic tendering process, including the submission of bid papers up to the awarded of the contract. Malaysia's construction industry is now embracing eTendering sporadically. Implementation factors are critical indicators to ensure the possibilities, priorities, or circumstances required to ensure effective eTendering implementation in the executing building projects. The objective of this study is to identify and evaluate the factors that affect eTendering used in construction projects. The ultimate aims of this research is to assist policymakers to have general ideas to promoting the usage of eTendering, especially for Malaysia's construction sector and all of its players, including developers, consultants, and contractors. A review of the existing literature was explored to understand the factors that would affect the implementation of eTendering. Resources from the last 10 years, including roughly 19 indexed articles, were included in the study. Targeted focus group has been conducted which includes an experienced panel of managers from the public, private, and academic sectors to provides overview for the relevant factors. The players in the construction sector may thus benefit from this study's results concerning the factors affecting of eTendering deployment to ensure project success. From the findings, network security concerns, costs, and knowledgeable staffs are said to be the primary factors affecting the embracing and adoption of eTendering in the Malaysia's construction industry.

## TITE 03 - BARRIERS IN ECO-INNOVATION IMPLEMENTATION IN MALAYSIAN CONTRACTOR FIRMS

Siti Sarah Mat Isa<sup>1,2</sup>, Nazirah Zainul Abidin<sup>2</sup>, Aimi Shahirah Fisol<sup>2</sup>, Wan Norizan Wan Ismail<sup>1</sup> and Norhafizah Yusop<sup>1</sup>

<sup>1</sup>*Department of Built Environment Studies and Technology, College of Built Environment Studies, Universiti Teknologi MARA, Perak Branch, 32610 Seri Iskandar, Perak, Malaysia*

<sup>2</sup>*School of Housing, Building and Planning, Universiti Sains Malaysia, 11800, USM Penang, Malaysia*

### Abstract

In the past few decades, increased urbanisation has generated serious environmental pollution and ecological destruction, resulting in the global deterioration of the ecosystem. Thus, the construction industry must be eco-innovative to mitigate the negative environmental effects of construction development. In the construction industry of developing countries, the term eco-innovation (EI) is not adequately perceived. Recent literature has explored the determinants of EI but has rarely addressed the barriers to EI implementation. The lack of previous studies accounts for the various perceived barriers. Thus, this paper aims to explore the barriers to EI implementation faced by large contractor firms in the Malaysian construction industry. A qualitative approach is adopted in this research using semi-structured interviews with 14 respondents, consisting of large contractor firms' Grade G7. The results reveal that the barriers to EI adoption are obtained from internal and external sources. Four main barriers that hinder the EI implementation by contractor firms are: 1) the firm-specific barriers; 2) cost difficulties; 3) people-related barriers, and 4) external pressures. This study is practical and relevant for contractor firms undertaking both green and large-scale construction projects. The results obtained from this study on the barriers of EI adoption may guide contractor firms to pursue sustainable competitive advantage effectively by exploring a value creation strategy to enhance EI implementation at the firm level.

## ABSTRACTS

### TITE 05 - EXPLORATORY RESEARCH: SPATIAL VISIBILITY ANALYSIS OF MALACCA HERITAGE SHOPHOUSES

**Yushazila Yusuf<sup>1</sup>, Amirul Hakim Jamil<sup>2</sup>, Intan Liana Samsudin<sup>1</sup>, Norizan Daud<sup>1</sup>, Sara Jaberolansar<sup>3</sup>**

<sup>1</sup>*School of Architecture & Built Environment, Faculty of Engineering, Technology and Built Environment, UCSI University, Kuala Lumpur, Malaysia*

<sup>2</sup>*Department of Architecture, Faculty of Built Environment & Surveying, Universiti Teknologi Malaysia, Johor, Malaysia*

<sup>3</sup>*Radis Design, Australia*

Malacca shophouses in Malaysia contain historical wisdom, especially from design planning. The utilisation of these shophouses includes inhabitants' comfort, social and cultural needs. Most architectural research only emphasises determining the tangible aspect of observation for a shophouse, while empirical analysis is not presented. Thus, this paper is exploratory research to determine the shophouse's visibility and spatial connectivity through empirical approaches as an extension of the observation analysis approach of spaces. The paper aims to explore the spatial relationship between spaces and users by accessing the spatial connectivity of spaces by adopting space syntax. The selected heritage shophouses are Baba Nyonya Heritage Museum & Fwu Chang Gallery. The research sample was taken from the archival system of UCSI University for this exploratory research approach. This research adopts visual graph analysis (VGA) as a quantitative analytical tool to produce the exact values for space relationships. The spatial visibility value is then compared with a coloured chart according to its space categorisation. This study discovered that the Baba Nyonya Heritage Museum is bigger and has more spectrum depth in terms of topological connectivity away from the public street to create its own intimate indoor social integrated spaces. As a result of its simple topological space pattern, Fwu Chang Gallery has the most well-defined space function, and its public gallery workshop function relies heavily on street networks.

### TITE 06 - INDICATOR TOOL USING VIRTUAL REALITY (VR) AND BUILDING INFORMATION MODELING (BIM) FOR ENVIRONMENTAL EDUCATIONAL EXPERIENCES IN SETIU WETLAND

**Balqis Aminuddin<sup>1,2</sup>, Siow May Ling<sup>2</sup>, Sumarni Ismail<sup>2</sup> and Siti Sarah Herman<sup>2</sup>**

<sup>1</sup>*Faculty of Engineering, Built Environment and IT, SEGI University, Kota Damansara, Malaysia*

<sup>2</sup>*Faculty of Design and Architecture, Universiti Putra Malaysia (UPM), Serdang, Malaysia*

Virtual reality (VR) and Building Information Modeling (BIM) have created a new paradigm in building projects and planning due to the multiple benefits of this design and construction technology including information technology. Even though this building approach has been established, the adoption of VR and BIM is significantly lower than expected due to the lack of mass technological exposure in environmental education. The tourism sector is no exception. This paper aims to outline and formulate appropriate facilities design strategies to support the main stakeholder's involvement including an investigation of tourists' nature educational experiences within existing Setiu Wetland facilities. A comprehensive literature study was conducted prior to the establishment of VR and BIM as indicator tools in Setiu Wetland. The literature analysis revealed that none of the indicator tools in Setiu Wetland use VR or BIM. As a result, the findings of this study are intended to provide light on the possible function of facility management in mediating the formation of Eco-touristic educational experiences. The outcome will be essential in justifying the need for planned environmental education and tourism attractions targeted at Generation Z and local tourism.

## TITE 08 - THE ARCHITECTURE OF THE *KAMPUNG* (COMPOUND) IN MALAYSIAN BUILT ENVIRONMENT: POLITICS OF INFORMAL URBANISM

Mohammad Hazazi Hamzah<sup>1</sup>, Azmal Sabil<sup>2</sup> and Ashran Bahari<sup>3</sup>

<sup>1</sup>*School of Architecture, Building and Design, Taylor's University, Selangor, Malaysia*

<sup>2</sup>*Department of Architecture, Faculty of Civil Engineering and Built Environment, University Tun Hussein Onn Malaysia, Batu Pahat, Johor, Malaysia*

<sup>3</sup>*Studio Karya, Petaling Jaya, Selangor*

The *kampung* has always been associated with nostalgia or a memory of a type of informal settlement from the past that is on the verge of extinction. Today, the *kampung* has been considered outdated and irrelevant in the urban context where the territories of the *kampung* have been limited to rural areas. In Architecture, *kampung* houses have been used as models for ideal tropical architecture. However, the *kampung* itself as an architectural type was rarely referred to as an urban form. Architecturally, this has led to the shifting of focus to the formal qualities of the *kampung* houses rather than the spatial qualities and politics of the *kampung* spaces. This paper aim to identify the concept and ideas of the *kampung* as informal urbanism. The reframing of the definition of the *kampung* as an urban form in the Malay Archipelago is crucial in justifying the presence of the *kampung* in the built environment construct. The research is conducted in a qualitative method through content analysis of key literature on the *kampung* and urban forms. The main spatial attribute of the *kampung* - the compound is a unique urban form that goes against the logic of capital. The redefinition of *kampung* as informal urbanism is appropriately associated to the characteristic of this region, rather than the reappropriation of European and American models into our built environment.

## TITE 09 - BUILDING INFORMATION MODELLING (BIM) APPLICATIONS FOR IMPROVING TIME PERFORMANCE

Hue Jin Xuan<sup>1</sup>, Zairra Mat Jusoh<sup>2</sup>, Suzila Mohd<sup>3</sup>, Nur Rafida Hamzah<sup>4</sup> and Nadzirah Zainordin<sup>5</sup>

<sup>1, 2, 4, 5</sup> *School of Architecture and Built Environment, Faculty of Engineering, Technology and Built Environment, UCSI University, 56000 Cheras, Kuala Lumpur, Malaysia.*

<sup>3</sup> *Department of Structure and Materials, School of Civil Engineering, Universiti Teknologi Malaysia, 81310 Johor Bahru, Johor, Malaysia.*

Construction projects are plagued with the issue of poor project performance, such as time performance which is the most common issue in construction projects. The uncertainty of time performance occurs due to the limited technology implementation. Nonetheless, implementing building information modelling (BIM) in construction projects seems like a viable solution to overcome the problem with time performance. Therefore, this paper aims to investigate the BIM applications in enhancing successful time performance in construction projects. Initially, altogether of nine (9) BIM applications have been identified. The questionnaire surveys were distributed and responses were obtained from the developer, contractor and consultant firms involved with construction projects using BIM. The data were analysed using the relative importance index technique. Results show the top three BIM applications are (1) clash detection (RII = 0.909), (2) documentation (RII = 0.897) and (3) design and visualised (RII = 0.891). Thus, the findings revealed that the clash detection, documentation, design and visualisation of BIM applications could enhance the success of time performance in construction projects. The finding will benefit construction stakeholders as it could raise awareness of how BIM applications can enhance time performance and encourage BIM implementation in construction projects.



### TITE 13 - ROLE OF ARCHITECTURAL HERITAGE CONSERVATION AND REGENERATION AS SUPPORT FOR SUZHOU' S HISTORIC DISTRICTS

**Yan Xin<sup>1,2</sup>, Mohd Tajuddin Mohd Rasdi<sup>2</sup>, Allen Lau Khin Kiet and Nangkula Utaberta<sup>1</sup>**

<sup>1</sup>*School of Architecture and Built Environment, FETBE, UCSI University, UCSI Heights, 1, Jalan Puncak Menara Gading, Taman Connaught, 56000 Cheras, Wilayah Persekutuan Kuala Lumpur, MALAYSIA*

<sup>2</sup>*Academy of Fine Arts, Tai Zhou University, Tai Zhou, CHINA*

The aim of the study is to analyze the architectural heritage role in terms of regeneration and conservation in support of the historic district of Suzhou. Suzhou is considered as an ancient district of China. Additionally, Suzhou is renowned for its cultural and historical endowments. The Yangtze River Delta was established about 514 B.C. Suzhou has a 5,7 million population and an urban area of 8,488 square kilometres. Suzhou controls six cities and districts at the county level. China prioritises cultural preservation to promote its traditional building designs. This movement seeks to protect the whole of Chinese culture. It has been found that architecture fosters cultural interaction. In ancient China, temples, imperial palaces, altars, pavilions, official residences, and peasant huts display a variety of architectural styles. This study will be qualitative in nature. Qualitative research gathers non-quantitative data in order to get novel insights. Suzhou is situated southeast of Jiangsu Province on the alluvial plain of the Yangtze River's south branch, with an urban land area of 1,650 square kilometres. Tai Lake in the southwest of the city is linked to the lake and the surrounding region, which was once the most fertile place on earth. At this time, the city's walled wards and enclosed markets were dismantled. The canal network and traditional layout of Suzhou contributed to its growth and development. Suzhou's urban planning is distinct from that of other Chinese cities. Chinese architecture is distinguished by bilateral symmetry, restricted open spaces, feng shui (including directional hierarchies), horizontal emphasis, and cosmological, mythological, or symbolic aspects. These elements determine the urban design of Suzhou.

## TGNS 02 - EXAMINING THE HOMEBUYERS' PREFERENCES AFTER THE COVID-19 PANDEMIC

**Wong Phui Fung<sup>1\*</sup>, Ong Hoo Yee<sup>1</sup>, Li Zi Qian<sup>1</sup>, Kiu Mee San<sup>1</sup>**

<sup>1</sup>*Department of Surveying, Lee Kong Chian Faculty of Engineering and Science, Universiti Tunku Abdul Rahman (UTAR), Sungai Long Campus, 43000 Kajang, Selangor, Malaysia.*

People's lifestyles and preferences had changed after the COVID-19 pandemic in how they work, live and play. There is increasing concerns on the health and safety issues to contain the virus outbreak. Consequently, homebuyers will reshape their housing preferences based on the lifestyle changes and begin to seek for housing that accommodates their new needs. Most of the previous research were focused on the housing preferences before COVID-19 pandemic. There has been a paucity of research investigating housing preferences of post-COVID-19 pandemic. This research, therefore, aims to investigate the housing preferences of the homebuyers after the COVID-19 pandemic. Eight parameters were identified as post-COVID-19 housing preference, which are financial, locational, physical, spatial arrangement, structural and equipment, health and comfort, green and technological parameters. A questionnaire was designed and distributed to homebuyers in the Klang Valley. 141 valid responses were received, and the data obtained were analysed using Friedman test, Mann-Whitney U Test and Kruskal-Wallis Test. The results revealed that health and comfort parameter was ranked as highest preferences among the parameters. Besides, this research discovered that homebuyers with different demographic backgrounds have different post-COVID-19 housing preferences. The findings obtained assist developers and local authorities by incorporating new parameters especially health and well-being parameter in new housing developments to create a healthy and high-quality housing that meet homebuyers' new expectations. This research also aligns with the United Nations Sustainable Development Goal 3 to improve healthy lives and promoting well-being for all persons via better quality of housing.

## TGNS 03 - SUSTAINABLE SMART CITY (SSC) ATTRIBUTES VIA SYSTEMATIC LITERATURE REVIEW

**Nadzirah Zainordin<sup>1</sup>, Sui Lai Khoo<sup>1</sup>, Siti Fatimah Subki<sup>2</sup>, Zairra Mat Jusoh<sup>1</sup>, Irna Nursyafina Rosdi<sup>1</sup>, Syuhaida Ismail<sup>2</sup>, Amirul Izzat Ismail<sup>2</sup>**

<sup>1</sup>*School of Architecture & Built Environment, Faculty of Engineering, Technology and Built Environment, UCSI University, Kuala Lumpur, Malaysia*

<sup>2</sup>*UTM Razak School of Engineering & Advanced Technology Universiti Teknologi Malaysia Jalan Sultan Yahya Petra, Kuala Lumpur, Malaysia*

In recent years, Sustainable Smart City (SSC) implementation have drawn significant attention as initiatives for enhancing urban development. Many studies have incorporated technical and non-technical characteristics to better control the growth of smart cities. However, despite considerable achievements, the direct and indirect effects of smart city characteristics on SSC have not been quantified comprehensively. Thus, the objective of this research is to identify the attributes of sustainable smart city via systematic literature review method. Only journal with Scopus index to consider as a references for this research with year interval of publication between 2012 to 2022. The findings of the thirty-two (32) attributes of SSC has been identified which this may further boosting the level of knowledge among built environment practitioner to have in-depth knowledge before it can be further adopting into relevant vision, mission, strategies or even policy maker.



## TGNS 05 - SUSTAINABLE CONSTRUCTION IN MALAYSIA: A PRELIMINARY ANALYSIS ON THE IMPENDING LEGAL ISSUES

**Muhammad Ariffuddin Arifin<sup>1</sup>, Nadzirah Zainordin<sup>2</sup>**

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Sustainable construction has gained favourable traction in Malaysia for the past decade, especially with the multiple efforts spearheaded by the government in promoting the subject of sustainable development goals (SDGs). Construction Industry Development Board (CIDB) for instance, has taken steps in implementing this subject through the Construction Industry Transformation Programme (CITP 2016-2020) that outlines five strategic thrusts namely Quality, Safety and Professionalism; Sustainability; Productivity; and Internationalisation & Competitiveness. In 2020, CIDB recorded that the thrust of Sustainability has notched 90% of the expected outcomes and has been carried forward as one of the thrusts under the National Construction Policy (NCP2030). Perceivably, the introduction of the sustainable concept and its accelerated implementation to the industry that is already complex and dynamic, will cause various legal issues. This study adopts a secondary research methodology in which the data are collected from academic journals, reports, books etc. to profile the legal issues that might occur under sustainable construction. This paper seeks to identify such legal issues that might be affecting the parties inside and outside construction project, thus offering a better insight in managing the risk associated to sustainable construction.

## TGNS 07 - RESEARCH ON THE REUSE OF HISTORICAL AND CULTURAL BLOCKS IN SHANXI NORTH TOWN CIRCLE

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To preserve the cultural relics, the historical and cultural district is playing an important role in completely and truly reflect the historical and cultural relics in a country and district. There are 8 historical and cultural districts in Jinbei Town, Shanxi which are well preserved and well protected. However, the value of the historical and cultural district has not been fully utilizing in Jinbei Town. In this study, the "organic renewal" in the renewal theory will be used in order to determine the methods that could maximize the values of the historical stories and the unique characteristic of these 8 historical and cultural districts in Jinbei Town. Based on the values that could be found in the historical and cultural district, fully utilize them and identify the purpose of each district in order to target the specific value of each district. Therefore, protecting and utilizing the historical and cultural relics action could be emphasized in Jinbei Town. This study wishes to identify the specific value of the cultural relics in the district and utilize the renewal theory to enhance the sustainable development of the historical and cultural district in Jinbei Town.

## TGNS 08 - EFFECTIVE PUBLIC PARTICIPATION IN ENVIRONMENTAL IMPACT ASSESSMENT: A FEASIBILITY STUDY

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Environmental Impact Assessment (EIA) is defined as the process of identifying, predicting, evaluating, and mitigating the biophysical, social, and other relevant effects of development proposals. Public participation is one of the key elements in an EIA that protects and manages the environment. Effective EIA is attainable with the implementation of public participation which leads to a successful EIA application. Research conducted on the implementation of EIA in Malaysia have emphasized on its weak application mainly on public participation. This paper discusses the feasibility study administered on this research which analysed on the aspect of public participation for effective EIA to be implemented in Malaysia. Discussions on the quantitative analyses conducted with preliminary data are included which focused on the Exploratory Factor Analysis (EFA) using the IBM SPSS Statistics software. Questionnaire survey was conducted for the feasibility study to a group of respondents equipped with the knowledge on EIA. Analysis of reliability using the SPSS software were applied to analyse the results of the feasibility study. The analysis of reliability measures the internal consistency using the Cronbach's alpha coefficient. The results of the analysis of reliability showed that the feasibility study conducted were at the acceptable and preferable value. Analysis using EFA is vital to prepare the data for the main data analyses using the Partial Least Squares Structural Equation Modelling (PLS-SEM). The feasibility study in this research was conducted to prepare the tools to be used in the main data collection. Quantitative analyses were pursued to prepare the data to be more manageable for the main analyses using PLS-SEM.

## TGNS 09 - EVALUATION OF SHOPHOUSES CONSERVATION INTERVENTION LEVEL IN THE MALACCA HERITAGE ENCLAVE AREA

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In the 15th century, Malacca was a fishing village until the time of Malacca Sultanate. It then became the main shipping channel between the Indian and Pacific oceans, linking major Asian economies such as India, Thailand, Indonesia, and China. Its rich and glorious historical identity has contributed to a labyrinth of architectural styles throughout Portuguese, Dutch and Britain colonialism until this day. Although these shophouses have significant historical values, it is now under threat from urban development involving image conversion due to the changes in urban fabric and living pattern. Owners and tenants renovated their historic shophouses to capitalize on the economic expansion. This action may cause the loss of the tangible manifestation of town identity and the physical expression of the cultural heritage of the town's people. To ensure the sustainability of heritage shophouses, it is vital to determine the appropriate level of intervention to conserve, preserve, and adapt the shophouse's functionality to the present context. Thus, this research aims to evaluate the conservation intervention level of shophouses in Malacca heritage enclave areas in connection to their cultural background and architectural adaptation. A qualitative case study is conducted at two heritage shophouses, namely Hotel Puri and Heeren House, through observation and interview. The data is analyzed through a descriptive and content analysis approach. The findings indicate that conservation intervention level to heritage shophouses could be a combination of maintenance, repair, renewal, reuse and new design strategies as means of adaptation to accommodate the present and future needs. Prior to taking action, it is recommended to define the impact of the proposal and intervention not only on building conservation measures but also on cultural heritage values.

## ABSTRACTS

### TGNS 10 - ANALYZING METHOD OF PROJECT PROGRESS CONTROL AND THE INTEGRATION OF INFORMATION TECHNOLOGY TOWARDS A SUSTAINABLE CONSTRUCTION MANAGEMENT IN MALAYSIA

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This study delivers a significant contribution to knowledge through a literature review and supplement with future exploratory study and surveys, that supports construction project management by adopting a suitable method of project control in different progress stage, with information technology integration. This study will also report on the current topic of abandoned projects in terms of the threat posed under project management by one of the negative factors. Literature findings have shown that the project management framework will be effectively developed with the provided value of each purpose brought by project progress control and will endure as efficiency creation from progress controlling tools. The result from a literature review has identified three progress methods of project control and one project progress management tool, all of which contributed to the development of the exploratory study. The major findings are ; from a theoretical perspective, it was found that there was a high level of project abandonment in housing projects aligned with insufficient knowledge management in managing a project among project teams. This will be the foundation to conduct the exploratory analysis in form of interviews with the practitioners. It was found to be far more significant than most theorist purport as the adoption process requires systematic adjustment at all levels within the project organization, based on a unified version. This stems from individual and organizational practices in project management, which in turn focus on different project progress. The literature study also identified that critical path controlling is the most basic control method for construction schedule management. It reverts to the main function whereas simplifying complex problems in construction progress. Finally, the study will provide project consultants with guidelines in a holistic overview of the benefits necessary to integrate information technology to support the progress control level maturity and ultimately successful outcomes.

### TGNS 11 - ACHIEVING MODELLING MECHANISM AND SIMULATION PARAMETER THROUGH SUSTAINABILITY STUDY IN A SINGLE RESIDENTIAL HOUSE IN KEDAH

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Architects and other design consultants have paid a thorough attention during design process to achieve a sustainable design. Sustainability in a building allows high efficiency in energy management, achieving thermal comfort among residents and ensuring an optimum expenditure level on construction cost. However, there is a difference in building performance between post-occupancy phase and designing phase. The research was focusing on a single residential building in Jitra, Kedah as the case study. The interview session was conducted with the dwellers to identify their experience through post-occupancy evaluation (POE) questionnaire, as well as the application of building performance simulation through quantitative approach in the designing phase. The simulation software used is *Sefaira* where the values obtained from the software and the feedback from the dwellers were correlated. Indicators such as Average Daylighting Factor (ADF) and Window-to-Floor Ratio (WFR) were reflected to Malaysian Standard MS 2680 to identify the daylighting level of the building. Based on the feedback, most of the room inside the house manage to provide high thermal comfort to the building owners. Three-dimensional modelling and simulation mechanism were adjusted to ensure the readings obtained from the simulation were reflected to the feedback and experience from the dwellers. The adjusted modelling parameter and the simulation mechanism could be a reference for the architects to design a high-performing building in the future.



## TGNS 12 - SENSORY STIMULATIONS IN THE SALUTOGENIC DESIGN OF CAMPUS GREEN SPACES: A REVIEW OF THE LITERATURE

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Many professionals have taken advantage of a multi-sensory environment for various therapeutic and educational purposes. In the environmental context of high education, sensory stimulation is a human-catering intervention which creates appealing campus green spaces for interactive participation. Stimulated perceptions of landscape elements are essential to explaining salutogenic design strategies of campus green spaces. Yet recent sensory stimulation investigations focus more on studio design and teaching interventions in the educational environment of universities. Comparatively, fewer satisfaction evaluations have related sensory stimulation to the salutogenic design of green spaces. Therefore, this review paper aims to systematically explain the role of sensory stimulation in green space design to optimise outdoor experiences on university campuses. It includes three objectives. The first is to define the attributes of users' multi-sensory experiences in green spaces on the university campus. Secondly, to explain the sensory perception during outdoor participation in conjunction with affordance theories. Thirdly, to analyse the applications of salutogenic design in the current behaviour settings. Relevant studies are selected from the ProQuest Dissertations & Theses Global database and cited references from the Web of Science.

As a result, the author has defined the landscape attributes and affordances in the environmental context of campus green spaces. It facilitated the interpretation of salutogenic behaviour settings from the perspective of campus users. Additionally, research methods conducted in previous studies were classified for further investigations of multisensory-designed green spaces in universities. In conclusion, the influential variables of sensory stimulation are likely to facilitate beneficial outdoor experiences by improving the salutogenic design strategy. However, the tangible manifestation of sensory design elements contributing to environmental perception remains uncertain. Further recommendations are to discuss users' sensory stimulation in the outdoor environment and relevant landscape strategies for optimising campus green spaces.

## TGNS 13 - ENVIRONMENTALLY SUSTAINABLE DESIGN: A CASE STUDY OF MASJID ARA DAMANSARA, PETALING JAYA

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This paper primary purpose is to evaluate the environmental sustainability design of Masjid Ara Damansara. Many mosques today disregard the environment factors that contribute to unnecessary energy waste while failing to provide necessary comfort levels for the users. Masjid Ara Damansara was selected as case study emphasizing the study of form and space. Thus, this study summaries new ways of designing environmentally sustainable mosque using structural and paradigms as a methodological approach to study the relationship between mosque design and environmentally sustainable characteristic. Finding shows that this Masjid Ara Damansara can be the example of environmentally sustainable design that give comfort and save energy consumption. The evaluation of this mosque can serve as a resource for the designers, architects, builders, developers and relevant authorities to design and built an environmentally sustainable mosque in the future.

## TQSP 01 - IMPROVING UNSAFE BEHAVIOUR IN CONSTRUCTION PROJECT SITES: A DEMATEL BASED MODEL

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The construction sector, which is one of the most important industries contributing to a country's economy and plays a vital part in addressing human development needs, is making tremendous progress with profitability. Because of the construction industry's significant economic impact, its safety has become a major source of concern for many countries. The construction field is renowned as a risky sector due to its strategic nature and complexity. The biggest cause of mishaps on construction sites is widespread unsafe behaviour among workers. Previous studies looked into the factors causing the unsafe behaviour in construction project sites as well as solutions to improve unsafe behaviour on construction sites. These studies, on the other hand, give little attention to the interdependencies among the causes that affect the unsafe behaviour in construction project sites and the interdependencies among the strategies to improve unsafe behaviour in construction project sites. Despite this, no study has yet been conducted to map the interrelationships between the causes of unsafe behaviour and to propose proactive strategies to improve unsafe behaviour. To improve safety performance and increase project success rates, it is critical to identify the main proactive strategies for addressing the causes and minimising the impact of unsafe behaviour. The aim of this study is to develop a model that will explore interrelationship between the causes of unsafe behaviour in construction project sites and propose proactive strategies to improve unsafe behaviour by using DEMATEL algorithm. The study elicited responses from 20 construction experts. It was discovered that there are substantial connections between all strategies and causes of unsafe behaviour on construction project sites.

## TQSP 02 - SYSTEMATIC REVIEW FOR IDENTIFICATION OF THE BUILDING AND CONSTRUCTION QUALITY FACTORS FOR QCLASSIC BUILDING QUALITY ASSESSMENT SYSTEM

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The aim of this study is to examine, review and analyse the current literature on building and construction quality and to determine the related factors and gaps which will be used as the basis for a further research on identifying the predicting factors for QCLASSIC Building Quality Assessment System. A systematic review methodology was adopted on the building construction quality literature for a thorough review of the of Google Scholar, Scopus, and Web of Science databases. Articles filtered by title, abstract and keyword relevance were found in the databases. The time period for the search was within the last 20-year period, i.e. 2002-2022. Recurring themes under the headings of client, project environment, project management, project characteristics, project actions and project procedure variables were analysed based on the comprehensive descriptive, thematic and gap analysis methodology throughout the literature. The expected result of this study will be the identification the building construction quality factors for a further research on predicting the QCLASSIC building construction quality performance.



## ABSTRACTS

### TQSP 03 - THE POTENTIAL OF EMERGING TECHNOLOGIES FOR SAFETY AND HEALTH MANAGEMENT IN THE MALAYSIAN CONSTRUCTION INDUSTRY

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Traditional safety and health management are no longer adequate for modern and complex construction projects. Despite the emergence of new technologies that can enhance the current safety environment on construction sites, most construction practitioners still maintain a traditional approach to safety and health management. Due to the lack of research on the possibility of adopting emerging technologies in safety and health management, and the fact that past studies have analysed emerging technologies for safety and health management in isolation, with a lack of linkage between the variables. This study is initiated to explore the potential of implementing emerging technologies for safety and health management in the Malaysian construction industry by establishing a link between the adoption benefits, adoption barriers and willingness to use emerging technologies. A closed-ended questionnaire was adopted, 392 completed questionnaires from Grade 7 main contractors in Malaysia were collected. According to the findings, the adoption benefits of emerging technologies have more influence on the willingness to use emerging technologies than the adoption barriers. According to the results of the mean ranking, the most significant benefits contractors perceive to gain from using emerging technologies for safety and health management were enhance hazard identification, improve safety planning and intensify safety inspection. It was also discovered that the most significant barriers to use emerging technologies in safety and health management were extra costs, additional trainings and lack of top management support. Finally, the emerging technologies that G7 contractors willing to use to improve safety and health in the construction industry were building information model, wearable safety technology and unmanned aerial vehicle. Therefore, it could be concluded that there is great potential for implementing emerging technologies in safety and health management. Furthermore, the benefits and types of emerging technologies identified in this study can serve as information and motivation for the use of emerging technologies by the construction industry. Lastly, the public and private sectors must provide incentives to remove the adoption barriers of emerging technologies mentioned in this study to facilitate the rapid development of emerging technologies in safety and health management.

### TQSP 04 - REVIEWING MALAYSIAN BUILDING STANDARDS TO INTEGRATE DISASTER-RESILIENCE STRATEGIES

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The Malaysian Uniform Building By-Laws (UBBL), 1984, are an integral part of the building industry. Whether the building is built on different scales, the purpose of adoption is to improve the safety and health of the people in and around the buildings. General buildings must follow the designated building standards authorised in the UBBL based on the different purpose groups. However, the frequent disaster events reveal a need for building standards compliance in the built environment. Moreover, not all parts of Malaysia are equally prone to disasters, so buildings in disaster-prone areas may need to enhance their disaster resilience strategies. The paper aims to identify the building standards stated in the UBBL that have elements of disaster resilience through the document review method. This paper primarily investigates the 4R resilience framework introduced by the Multidisciplinary Centre of Earthquake Engineering Research (MCEER) to conceptualise disaster resilience strategies in general buildings. The 4R resilience framework is being studied to adopt and adapt the four resilience measures (robustness, redundancy, resourcefulness, and rapidity) into existing building standards. For example, evacuation centres in Malaysia are similar to other buildings because they are selected among general buildings such as public schools and community halls. However, the nature of an evacuation centre needs more than an empty hall. A centre requires additional building capacity to run for 24 hours daily during a disaster event. Therefore, disaster resilience strategies must be incorporated not only into the spaces but also into the structural and constructional requirements. Through the findings of the UBBL, only two sections on fire hazard regulations have embedded elements of disaster resilience. In addition, other disasters, such as floods and landslides, need to be properly addressed in the building standards. Hence, the UBBL should be revisited to incorporate disaster-resilience elements, and the enforcement can be developed through a framework of disaster resilience strategies in building standards.

## TQSP 06 - UNIVERSAL DESIGN IN HOUSING FOR PEOPLE WITH DISABILITIES: A CASE STUDY

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In Malaysia, one of the minority groups that is the most vulnerable is the group of people with disabilities (PWDs). Housing standard for disabled people is a new dimension in quality of life. For disabled persons who are housebound, their home is the central of existence. The housing industry needs to be adaptive to the demands of the special groups. The aim of this paper is to study PWD interior architectural design considerations in residential blocks in Selangor in order to provide interior architectural design strategies for PWD living in residential blocks. A case study was conducted for an in-depth understanding of PWD interior architectural design considerations in its real-life context. This case study was conducted in a 3-bedroom unit stayed by a PWD named Tony Lean with his family at OUG Parklane service residence in Jalan Old Klang Road, Selangor, Malaysia. Interview sessions were administered with Tony Lean and his family members too. The outcome of this study shows that PWD's living condition could be improved by some minor design effort and decision within a limited space. Universal design guidelines could be used as a basic layout set up that gives efficient and optimum space to ease PWD's living condition. Universal homes use universal design concepts to provide a living space that can be adapted for almost any user's long-term comfort, safety, and convenience. It concludes by providing interior architectural design strategies for people with disabilities that make a habitat in space feel worth living in.

## TQSP 07 - ANALYSIS OF FACTORS IMPROVING THE PRODUCTIVITY OF IBS PROJECTS: FROM MANUFACTURERS' PERSPECTIVE

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The construction industry is taking another level by adopting the Industrialized Building System (IBS), in line with Malaysia's Construction Industry Transformation Plan (CITP) 2016-2020. The benefits of implementing IBS such as shortening the duration of construction, ensuring a safer working environment, and minimizing the labour cost on site are undeniable. However, as successful as IBS can be, the adoption of IBS as a fabrication technique has been slowly implemented. The manufacturers are impacted as a result and they are in a difficult position to prove their ability to meet the project's need for IBS components. The improvement of productivity among IBS manufacturers is highly needed to ensure the success of the IBS project. Hence, this paper aims to investigate the main factors contributing to the low productivity of IBS manufacturers in producing the IBS components and recommend suggestions to improve the IBS manufacturers' productivity. The semi-structured interviews were conducted among the IBS manufacturers within Selangor to gain an in-depth understanding of that matter. The findings identified the factors as inflexible design based on product, lack of integration between the manufacturers and contractors, and inadequate technical skills and knowledge. The following strategies were suggested by the respondents; improving site management and workforce, enhancing government support, and establishing the procurement process. The outcomes of these findings will hopefully help to improve the IBS project's productivity and quality by improving manufacturers' knowledge, skill, and awareness and boosting confidence in producing more IBS components.

## TPPM 02 - CRITICAL SUCCESS FACTORS OF THE RELOCATION, CONSERVATION, AND PRESERVATION IMPLEMENTATION OF KAMPUNG LAUT OLD MOSQUE, TUMPAT, KELANTAN, MALAYSIA

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Construction is an important sector to develop other sectors including tourism because it is able to supply physical buildings and maintain a building so that it remains good and perfect until the end of its life. One of the high value buildings but needs to be relocated to re-assimilate this building with its original culture and landscape is the Kampung Laut Old Mosque. Apart from wanting to be recognized as one of the world heritage sites by UNESCO, its relocation to the original location is also expected to repeat its fame as one of the tourist hot-spots of the local community and the world. Therefore, the purpose of this paper is to identify the critical success factors of the implementation of relocation, conservation and preservation procedures of the Kampung Laut Old Mosque. Structured interviews were conducted with 14 parties directly involved in this outstanding project. This study revealed six (6) critical success factors of the implementation of the relocation, conservation and preservation procedures of the Kampung Laut Old Mosque. The critical success factors are: 1) A historic building morphology; 2) A method of construction on conservation; 3) Information; 4) Work planning and scheduling; 5) Financial resources; and, 6) Communication. These critical success factors are dominated by the main contractor organizational category, followed by consultants and clients; and suppliers.

## TPPM 04 - ASSESSING THE FUNCTION OF HISBAH AND MUHTASIB IN RESOLVING CONTEMPORARY CONSTRUCTION DISPUTES

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While shariah has been generally perceived as the law of Islam, from the scholarly standpoint, it is a moral code that governs the daily conduct of every Muslim. There are arrays of activities under the shariah that are exercised regularly and accepted as norms in the modern world including the procedures for mitigating and resolving disputes. Shariah has embodied such practice through the role of Muhtasib (superintendent) and Hisbah institution. Traditionally, a Muhtasib acts as a superintendent who was tasked to verify the transaction and regulate the general conduct of human being in marketplace. The existence of Hisbah was derived from the Islamic legal maxim of enjoining the good and forbidding the wrong. The institution of Hisbah has then departed from merely supervising the market to become a fact-finding-based dispute resolver in which a Muhtasib provides a prompt decision to the disputing parties. This study aims to assess the application of Hisbah and Muhtasib in the construction industry in resolving dispute, offering an alternative to the present conventional dispute resolution mechanism in the construction industry. This paper adopts the secondary research methodology and content analysis. The findings from the study shows that the Hisbah and Muhtasib, possess some advantages over the present roles of superintendent and could become a mechanism for rapid dispute resolution in a construction project.



## TPPM 05 - SOCIAL IMPACTS FROM THE ECONOMIC AND ENVIRONMENTAL VALUES IN ONSHORE PROJECTS: A THEMATIC REVIEW

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The increasing number of petroleum production from onshore fields had negative and positive influences on the local social stake. With such evolvement of onshore projects, it had also affected the environment due to the hazardous project activities, plus, the economic interest that influence the organisational decision-making process. However, in ensuring the right issue be addressed during the decision-making process, identifying gaps between economic and environmental concerns that influence the social values are important. In corresponding to such gap, this paper aimed to identify the potential risks as critical factors based on these three main values; Economic Values, Environmental Values, and Social Values. This paper conducted searches from Scopus, Web of Science, and Emerald databases, from the year 2017 until 2021. Specifically, a thematic review was performed in deliberating the contemporary literatures and analysed by using ATLAS.ti 8, with exclusion and filtering criteria. The findings firstly deliberated the economic and environmental values, in respective to their risks identified. Next, on how they influenced the social values that were addressed accordingly in recommending the prevention and mitigation controls by focusing on the needs of local communities. Having a clear understanding of these three values and their impacts will provide the decision-maker a real and better picture of what they are dealing with, thus contribute to the smooth project's execution, objectives successfully met, and stakeholders' satisfaction. Besides, early risk acknowledgment in every project is vital for project triple constraints which are crucial to the project's ultimate success.

## TPPM 06 - DRIVING SUSTAINABILITY IN BIM-BASED CONSTRUCTION PROJECTS THROUGH SYNERGIZING RELATIONAL CONTRACTING ELEMENTS (RCE) IN BUILDING INFORMATION MODELLING (BIM) PROTOCOL FRAMEWORK

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Myriads of parties with different roles are involved in a construction project, which leads to fragmentation, thus adding to the complexity of construction management. The emergence of Building Information Modelling (BIM) is said to be a catalyst for fostering integration and collaboration among the project stakeholders. However, the relationship and engagement among the parties are challenged by the additional contractual risks brought by BIM, where failure to address these risks could render inefficient use of BIM that could potentially lead to more disputes. As construction projects rely on contracts to regulate the stakeholders, the present study attempts to achieve better social sustainability in contracts for BIM-based construction projects through the infusion of relational contracting elements (RCE) in BIM Protocol. From the data gathered using research survey conducted through questionnaire distribution among the industry players and analyzed with factor analysis, the study identified sixteen (16) BIM contractual risks that are critical to be addressed, and twenty-five (25) factors categorized under 3 RCEs which are considered important to be addressed, thus significant to be included in the BIM Protocol. This paper is part of the on-going research in developing relational BIM Protocol framework and the findings are considered significant to engrain sustainability in BIM-based construction projects.

## TPPM 08 - CURRENT PROJECT DELAY FACTORS IN MALAYSIAN CONSTRUCTION INDUSTRY

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The conundrum of project delays in the construction sector have hampered the growth and the advancement of this critical industry globally; Malaysia is not an exception. Although extensive prior research has been conducted on project delays, this enduring issue continues to plague the construction industry. As such, this research strives to assess the current contributory factors of delay in project delivery in the Malaysia construction industry. A questionnaire was administered in the Klang Valley area to solicit the standpoints of 144 construction stakeholders. The five most significant factors of project delays in the Malaysia construction industry were revealed as (1) variation orders/change of scope during construction; (2) improper planning and scheduling; (3) poor site management and supervision; (4) mistakes and discrepancies in drawings; and (5) lack of control over and causing delays in subcontractor's work. The analysis also demonstrated that there was significant difference in perspectives between the responder groups on the factors of the project delays in the construction projects. This study attempts to have an in-depth examination of the project delays in the Malaysia construction sector, in order to aid in the development of effective project delay mitigation techniques. It offers valuable insights and raises awareness among the construction community about project delays in the Malaysia construction sector to ensure the timely delivery of projects.

## TPPM 11 - IMPORTANCE OF DATA PRIVACY AND DATA PROTECTION IN THE DIGITAL CONSTRUCTION AGE: THE QUANTITY SURVEYING CONSULTANT PERSPECTIVE

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The construction industry is undergoing digital transformation in line with Industrial Revolution 4.0, making it a target for cyber-attacks and data breaches due to high capital cash flow and profitability. Hence, data privacy and data protection are vital in the digital construction age due to the utilisation of digital applications, which are vulnerable to cyber-attacks and data breaches. This paper aims to investigate the roles of data privacy and data protection along with its benefits; to investigate the severity of the effects of a data breach and to determine the factors affecting the degree of confidence towards a company's data privacy and data protection. Online questionnaires were distributed to quantity surveying firms in Klang Valley. 53 responses were received. Resulting from the questionnaire survey, quantity surveying consultants have an average level of confidence towards their organisations practices and government data protection act. Promoting clients' trust plays the most significant role in data privacy and protection and the severity of the effects of a data breach is related to loss in tender bid. Therefore, the outcome of this research paper is expected to provide an overview of the importance of data privacy and data protection to the construction industry from the quantity surveying consultants' perspective. The result will be crucial in determining the best strategy to protect their personal and organisational data in the future once they understand the effects of not doing so or doing enough.



## TPPM 12 - THE PERSPECTIVE OF QUANTITY SURVEYORS ON THE IMPLEMENTATION OF LIFE CYCLE COSTING

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Life Cycle Costing (LCC) is a technique used to evaluate the total cost of the building throughout its entire life cycle. As compared to the traditional cost estimation and planning method, it assesses both construction and future costs such as operation, maintenance, and demolitions costs of the building. Thus, it helps to enhance cost effectiveness of the building for long term perspective. Quantity surveyors, who is a cost expert, particularly has viewed it as an extended role to offer this service in the industry. As a building's maintenance and operating expenditure contributes major of its total cost, quantity surveyors are no longer enough to only consider the initial cost when preparing cost estimation and planning. However, numerous researchers documented the limited usage of LCC in the construction industry, especially in Malaysia. Therefore, this study carries the purpose to encourage the usage of LCC to identify the benefits and barriers of implementing LCC in building cost planning. In addition, the possible solutions to overcome the barriers of implementing LCC will also be identified to enhance and encourage the practice. In this study, quantitative method is adopted by a way of distributing questionnaire to the Professional Quantity Surveyors who works in the registered QS consultant firm in Klang Valley, Malaysia. These findings will enhance the understanding of LCC among construction stakeholders and serve as a complete guideline to encourage the utilization in the construction industry.

## TPPM 14 - APPLICATION GLODON SOFTWARE DURING THE PRE-CONTRACT STAGE

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BIM (Building Information Modeling) is a digital tool that may increase the efficiency of building projects. BIM has been implemented to ensure that the planning, design, and construction of buildings are collaborative and highly efficient. With the widespread use of BIM, several model-based software applications have been developed. Glodon, as one of the model-based software with well-developed and mature software for cost estimating, has been used in Malaysian construction projects. This research aims to identify the satisfaction level of the Glodon software in the pre-contract stage. A structured questionnaire has been used and 85 respondents who used the Glodon software in Klang Valley were analyzed. The result shows that the draw function, identify the function, and import and export BIM model is satisfactory functions in the Glodon software during the pre-contract stage. The findings of this article will help organizations that are not currently using the software in their business to learn more about Glodon software inside and out.

## TPPM 15 - A GUIDELINE TOWARDS PROFITABILITY STRATEGIES FOR QUANTITY SURVEYING CONSULTANCY FIRMS IN MALAYSIA

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The construction industry has been devastated by the COVID-19 pandemic. Consultants continued to face disruption even after the lockdown was lifted, with project suspensions and delays, as well as cost overruns. Such disruption has prevented them from carrying out their original tasks and achieving profitability. This study aims to model profitability strategies and develop a questionnaire to identify the strategies adopted by quantity surveying (QS) consultancy firms to mitigate the effects of COVID-19 and achieve profitability. The data for this study will be gathered through a questionnaire containing the five major profitability strategies: (1) Porter's generic competitive strategies, (2) The Art of War by Sun Tzu, (3) marketing strategies, (4) network and communication strategies, and (5) health and safety strategies. Respondents for this study are QS consultancy firms in Klang Valley, Malaysia's industrial heartland. Data analyses using advanced statistical techniques such as factor analysis and structural equation modelling will reveal significant profitability strategy groupings for QS consultancy firms. It is anticipated that a model of profitability strategies will help QS consultancy firms increase their profits in the new era.

## TPPM 16 - BRIDGING THE GAP: THE RELATIONSHIP BETWEEN CONTRACTOR SELECTION CRITERIA AND CONTRACTORS' COMPETITIVENESS

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In a high competition industry, winning tender is an important goal for contractors in running their businesses. To survive and grow, local contractors need to be aggressive in responding to their rivals' actions and gain a competitive advantage against their business competitors. To outperform competitors in winning tender, knowing what matters to the clients is important. Thus, knowing the contractor selection criteria is important in matching the clients' requirements with contractors' competitiveness. Contractors need to compare themselves with competitors to know their competitiveness and also to know what matters to the ones who award the contracts. In other words, knowing the contractor selection criteria is essential. This study aims to examine the relationship between contractor selection criteria and contractors' competitiveness using Resource-based view (RBV) as underlying theory. PLS-SEM was adopted to analyse the data collected from a survey conducted to CIDB G7 building contractors within Klang Valley, Malaysia. The study found a link amongst contractor selection criteria (CSC), contractors' competitiveness (CC) and competitive strategy (CS), which was not explored before in prior studies. Though not all constructs in these three variables are correlated to one another, there are some confirmed relationships between CSC and CC (e.g. price-marketing capability) as well as the relationship between CSC and CS (e.g. finance criteria in contractor selection criteria-differentiation strategy). The empirical results also shown that there are some indirect relationships between CSC and CS, which are mediated by CC (e.g. technical expertise-technology & innovation-growth strategy). In summary, this study helps contractors to reposition themselves in bridging the gap between the requirement from the contract

## TPPM 17 - TACKLING THE GENDER INEQUALITIES IN THE CONSTRUCTION WORKPLACE

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Traditionally, all industries are mostly male-dominated and male candidates can easily get hired and eventually promoted to managerial roles. Although the disparities between men and women are reducing in many fields, however, in the construction workplace, gender inequality still exist as a serious problem. To address this need, this study identify the barriers faced by the women in the current construction workplace and the impact of gender inequality towards the performance of women in the industry. Also, the solutions towards the gender inequality problems are being explored. Qualitative interview findings from eleven (11) construction industry professionals reveal that that gender stereotype and sexual harassment are the most significant problems faced by the women in the workplace. Most of the industry professionals observe that women are facing limited job promotional opportunities as compared to men, and may even face awkward situation in which the on-site unskilled workers would not obey to the instructions given. However, other believe that the women are findings ways to stand out in this tough environment. Eventually, it is showed that the employers are, in fact, in a strong position to reconcile issues of gender in the workplace. The findings provide novel insight to the construction practitioners, especially the women and employers, on how to tackle gender inequality issue. This will, in turns, create a positive impact towards the development of the entire industry.

## TPPM 18 - RISKS OF REGULATORY NON-COMPLIANCE ON ONSHORE PROJECTS: A THEMATIC REVIEW

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Refinery Explosion, and The Petronas Pengerang Integrated Complex Fire and Explosion are examples of undesirable onshore occurrences to every project and their organisation. With the same goal, the professionals as well as the contemporary scholars had been deliberating on the room for improvement for improved future project execution. Also, with the existence of numerous studies done by scholars, a systematically review of the scholarly articles is appropriate as a start in looking on the potential risks for onshore projects. Hence, this paper aimed to ascertain the risks of non-compliance to petroleum regulations on the onshore projects discussed among contemporary scholars from the year 2017 until 2021. A thematic review on the literatures from Scopus and Web of Science databases was conducted, and then analysed using ATLAS.ti 8 with exclusion and filtering processes. The approach had identified the potential risks and further discussed in five main themes, namely; Environmental Hazards, Operational Processes, Parent Organisation, Public Society, as well as Safety and Health. The review revealed the risks as impacts of petroleum regulatory non-compliance which had affected the petroleum companies at the most, and indicated the necessity for the key players in the industry to pay more attention and take actions for improvement. Understanding the key influencing factors on the issue of regulatory non-compliance will be beneficial for further assessment of preventive actions whichever is necessary and the strategies to bring improvements to the current practices.

### TPPM 19 - EXPLORING THE DETERMINANTS OF THE LEADERSHIP SKILLS IN THE CONSTRUCTION INDUSTRY

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The construction industry involves numerous professionals, which resulted in a complex enigma during all stages of construction itself. Leadership is one of the crucial skills required by a competent leader in a construction project. Even though there has been a lot of earlier research on leadership, the construction industry is still plagued by this persistent problem that will result to project performance. This study aims to explore the determinants of leadership skills among industry players in order to enhance project performance. 250 personnel involved in the construction industry were asked to respond to a questionnaire in the Klang Valley. In this study, a mixed-method paradigm is utilized to collect extensive, worthwhile feedback in order to assess whether leadership skills result in improved efficiency and more effective project performance. A total of (10) respondents were split primarily into two groups: a focus group picked from the construction business and a random group. Both an in-person interview and an online survey were carried out. Five-point Likert scales were used to analyze the feedback. The findings demonstrated that there was a determinant. The following points highlight the five important determinants of leadership skills. The determinants are 1. Communication 2. Attitude 3. Behaviour (Social Influence) 4. Technical Knowledge 5. Experience. This study makes an effort to conduct an extensive relationship analysis between personality factors and attitudes is indirect and complex of leadership determinants in the Malaysian construction industry in order to enhance project performance.



## TEDU 02 - FACILITIES PROVISION & ACADEMIC CHALLENGES FOR DISABLED STUDENTS IN TERTIARY EDUCATION INSTITUTIONS IN MALAYSIA

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This paper discusses the provision of facilities and academic challenges faced by disabled students in Higher Education Institutions (HEI) concerning the Sustainable Development Goals (SDGs) in Malaysia. The facility in higher education settings is any auxiliary utility, structure, or site enhancement that is essential to the function. Facilities are not limited to classrooms, libraries, and administrative buildings. HEI's facilities have an influence on the general learning process as well as the student's learning development. SDGs are a series of 17 interconnected international objectives that are meant to serve as a blueprint to establish a sustainable future. The UN General Assembly (UN-GA) established 17 SDG goals with each separate target in 2015 to achieve by 2030. The study focuses on 2 main issues which are, (i) challenges faced while using the spaces by disabled students, and (ii) issues and effects of facilities on learning development. The main goal is "Quality Education" which is the 4th goal in SDGs: Ensuring good quality of education to make a better world as well as promoting lifelong learning opportunities for every individual. The goal contains specific targets which are related and discussed in this paper. The other SDGs goal discussed is the 10th goal: "Reduced Inequalities". A focused group survey and observation method have been conducted for data collection. Several findings are found related to facilities issues and an unexpected learning environment. Opportunities for early intervention and overall improvement are suggested and can be further discussed for future studies in this field.

## TEDU 03 - BRIDGING THE GAP BETWEEN INDUSTRY AND EDUCATION THROUGH INTERDISCIPLINARY COLLABORATION

Ida Marlina Mazlan<sup>1,2</sup>, Zairra Mat Jusoh<sup>1</sup>, Nor Zalina Md Nor<sup>1</sup>, Nor Syawallina Azman<sup>1</sup>, Saidatul Haziah Ramli<sup>3</sup>

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The construction industry consists of a team of consultants working on a project at a time. Due to the diverse backgrounds of consultants involved, interdisciplinary collaboration is standard practice in the construction industry. Industry players have addressed the lack of interdisciplinary collaboration and knowledge as a real issue in the industry. While education institutional tries to replicate this by initiating teamwork in assignments, this has not been able to fill the gap due to the nature of the key player, which is not reflected in teamwork. Educational models in learning institutions have not been imitating the same nature of interdisciplinary collaboration in practice. This resulted in a gap between practice and education. This paper explores the need to address this gap and to have a better understanding of implementing integration collaboration in education. A collaboration between interior architecture and quantity surveyor students was initiated and a questionnaire survey was distributed to the students involved. A total of 72 responses were obtained and analyzed. Analysis of the data collected shows that there are positive views on interdisciplinary collaboration in bridging the gap between industry and education. Thus, the outcome of this study may assist the sustainability of education in the built environment by enhancing knowledge, skills, and attitude to improve teaching and learning in the built environment.

## TEDU 04 - COVID-19: SALARY COMPARISON, CHALLENGES AND FUTURE DIRECTIONS AMONG QUANTITY SURVEYING (QS) GRADUATES

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In 2020, the world was hit by the COVID-19 pandemic where it affected 562 million people and cause 6.3 million deaths. Malaysia is also affected by this pandemic with a total of 4.6 million cases of infection had been reported until July 2022. As a result of this outbreak, Malaysia had imposed a MCO in line with the Prevention and Control of Infectious Diseases Act 1988. As a result of this implementation, the country's economy had collapsed in 2020 and many employees in Malaysia faced salary cuts. This salary reduction caused employees in Malaysia to face financial and mental stress. This study was conducted to understand the extent of which quantity surveying (QS) employees in Malaysia were affected by the COVID-19 pandemic; and its repercussions; and how they overcame it. To achieve the objectives of this study, quantitative research was conducted through an online survey. A total of 105 QS graduates who are working in various industries participated in this research. The results proved that QS graduates in Malaysia faced a salary reduction in 2020. However, their average salary seemed to increase in 2021 and 2022. The results also show that QS graduates experienced stress and depression due to financial problems during the pandemic. Based on the survey, among other strategies to overcome the financial challenges, most respondents suggested to find ways to increase savings and plan for debt in the future. This study could help QS graduates to understand the impact of the economic situation on their salary. In addition, this study also helps QS graduates to decide what action they can take to survive and choose the industry that they will work in the future.

## TEDU 05 - RELATIONSHIP BETWEEN VARIATION OF LEARNING STYLE PREFERENCES AND CONSTRUCTION QUANTIFICATION ACHIEVEMENT

**Norhafizah Yusop<sup>1</sup>, Wan Norizan Wan Ismail<sup>1</sup>, Siti Sarah Mat Isa<sup>1</sup>, Nur 'Ain Ismail<sup>1</sup>, Suhaila Ali<sup>1</sup>**

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This study explored the learning style preferences of the students (n=370) and the relationship between the learning style preferences and the construction quantification achievement of students at public institutions. Findings discuss a detailed learning style preference of individual differences and their learning effects on the construction quantification achievement. The study relies on quantitative research, where the questionnaire technique was chosen as the data collection method. The questionnaire was used to measure students' learning style preferences. The data were analysed using descriptive and inferential statistics using SPSS. Descriptive statistics were carried out to identify specific differing learning style preferences of the respondents in the sample. Inferential statistical analysis was used to test the hypotheses and draw conclusions about the relationship between students' specific learning styles preferences and construction quantification achievement. Based on the findings acquired from the questionnaire data analysis, the results indicated that the most preferred learning style was group learning (GL), followed by categories of auditory (A), visual (V), kinaesthetic (K), reading (R), individual learning (IL) and writing (W). Furthermore, it can be concluded from the results that the learning style significantly related to construction quantification achievement was from the auditory, visual, and kinaesthetic categories.

### TEDU 07 - AN INVESTIGATION ON ACOUSTIC COMFORT OF CLASSROOM USERS IN THE SECONDARY SCHOOLS

**Kenn Jhun Kam<sup>1</sup>, Qian Zhi Lim<sup>1</sup>, Tze Shwan Lim<sup>1</sup>, Lam Tatt Soon<sup>1</sup>, Myzatul Aishah Kamarazaly<sup>1</sup>**

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The building design, the building arrangement, the characteristics of different materials used in the building, or the behavior of building occupants will cause impact the acoustic performance of the building. The thesis will study the importance of acoustic comfort to different related parties to secondary school in Malaysia, and the factors that will affect low acoustic comfort to them. Besides, the solution will also be investigated in the thesis to solve the problems caused by the factors. Questionnaires will be given to different individuals from two different parties to look from different perspectives, which are from students' perspectives and teachers' perspectives, to have a more understanding of different views of the point. The results collected through questionnaires will be analyzed and grouped by Likert Scaling implementation. Solutions are investigated and determined from the data analyzed, together with locations. For example, locations must be improved to reach the ideal level of comfort that will raise the productivity of related parties. By learning the results of the analyzed data, the acoustic comfort level of the building will be presented, monitored, and organized. Various reasons will have different ways to organize and monitor to reach the ideal level of environmental quality.

### TEDU 08 - UNDERLYING ATTRIBUTES FOR COMMUNITY-BASED DESIGN PROJECTS WITHIN HIGHER EDUCATION INSTITUTIONS

**Maliza Ismail Jamail<sup>1</sup>, Nadzirah Zainordin<sup>2</sup>, Chia Lin Lin<sup>3</sup>, Norwina Mohd. Nawawi<sup>4</sup>, John-Son Oei<sup>5</sup>**

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Many Malaysian colleges and universities have included community service and social engagement as part of their course objectives in their learning and teaching pedagogy. In architectural education, this approach has been implemented, known as the community-based participatory design projects, which require students, academic staff, and institutional management teams to collaborate with industry partners and the community in developing solutions to issues the neighbourhood faces. These engagements between the different participants are vital and perceived as new methods in advancing higher education's direction to achieve goal setting. However, research and publications on general guidelines for implementing community projects within the Malaysian educational system still need to be further studied and adapted to our system. Therefore, it is necessary to determine the attributes of community-based participatory design projects to provide clearer direction for well-delivery and leads to impactful community-universities engagement projects. The research methodology involves conducting a systematic literature review with 25 index journals published from 2012 to 2022 to analyse the common principles and methods incorporated into the various community-universities engagement projects worldwide. The findings further identified the common attributes associated with institutions, academicians or researchers, and students, which can be developed as a conceptual framework for community-based participatory design projects within architectural higher institutions.



## TEDU 10 - CHALLENGES IN IMPLEMENTING COMMUNITY-BASED PARTICIPATORY DESIGN PROJECTS IN HIGHER EDUCATION INSTITUTIONS' ARCHITECTURAL PROGRAM VIA SYSTEMATIC LITERATURE REVIEW

**Chia Lin Lin<sup>1</sup>, Doris Quek<sup>1</sup>, Nadzirah Zainordin<sup>1</sup>, Veronica Ng<sup>2</sup>, Oei Shuen Ming<sup>3</sup>**

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Participatory design is a socially-active, politically-conscious, and values-driven approach to co-creation. The need for participation recognizes that imbalances of knowledge and power exist among different people and groups within an organization. To accomplish this goal, participatory design project establishes a creative space for users and designers where principles such as power sharing, knowledge exchange, and self-representation can be realized and put into practice. However, based on scholars, the implementation faces challenges in creating a common understanding of what community-based participatory project entails, and there is lack of documented evidence of the benefits undergraduates gain from such activities. This may be due to the lack of a valid and reliable instrument to objectively measure these. Therefore, the purpose of this study is to investigate the challengers arising from community engagement in participatory design project within the framework of architectural higher education institutions. This paper is a systematic literature review on adoption of architectural education related to participatory design project pedagogy. The finding of this study would be useful in the decision-making processes of existing and prospective participatory design projects within any architectural higher education institutions. Further the finding of this study communicates the benefits of identifying and understanding the underlying challengers and exploring opportunities to improve its execution for the students' meaningful service and learning experience.

## TEDU 12 - ARCHITECTURE DESIGN STUDIO: SUSTAINABLE LEARNING ENVIRONMENT THROUGH GAMIFICATION

**Nasrul-Arif Mahmud<sup>1</sup>, Azmal Sabil<sup>1</sup>, Nadiyah Noor Hisham<sup>1</sup>, Noor Dina Md Amin<sup>1</sup>, Mohd Jamil Mohd Hamberi<sup>1</sup>**

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One of the United Nations' 17 Sustainable Development Goals (SDGs) for their 2030 Agenda is to ensure inclusive, equal, and excellent education for all and to promote lifelong learning. The purpose of this essay is to examine how gamification is utilised in architecture design studios to teach and learn about the design process and critical thinking. It will be determined if gamification can keep students engaged for longer and improve their comprehension of the design process in architecture. This study was conducted as part of an investigation aiming at incorporating gamification factors into a system created for the evaluation of architecture design studio students. The architectural design studio gamification approach is utilised as a case study to implement design studio learning for Year 1 students enrolled in semester 1 of the Bachelor of Science in Architecture programme at Universiti Tun Hussein Onn Malaysia (UTHM). As a result, student achievement in Architecture Design Studio is marginally higher than with conventional teaching and learning approaches.



# TEDU 13 - SUSTAINABLE DEVELOPMENT GOALS IN INTERIOR ARCHITECTURE EDUCATION: STUDENTS' RECEPTION AND RESPONSE

Nurul Anida Mohamad<sup>1,3</sup>, Tan Han Leong<sup>1</sup>, Raja Haliza Suhaila Raja Abd Hamid<sup>1</sup>, Tee Khay Mee<sup>2</sup>, Baizura Hanim Bidin<sup>1</sup>

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There are several initiatives to emphasize the importance of Sustainable Development Goals (SDGs) in the teaching and learning of interior architecture. The success of the measures for SDGs can be strengthened in three ways i) the design of the curriculum and the methods, ii) the roles and reactions of the academia and students, and iii) the contribution of practitioners. The discourse of the pedagogy, academic accountability, and the industry playmaker's role are all deliberately discussed topics. However, the learners' reciprocal response is not completely achieved. There is insufficient input regarding students' recognition of the SDGs in their learning. Therefore, the paper aims to consolidate the students' receptions and responses towards the effort to strengthen the SDGs in Interior Architecture programme. The objective of the research is i) to incorporate students' views and awareness regarding the application of SDG in design, ii) to congregate the response towards application of SDGs in the students' learning programme, and iii) to validate the reception and response the outcome of SDGs in interior architectural pedagogy. A quantitative method approach is carried out with the second year and third year Interior Architecture students. The data is collected through questionnaire and survey towards applying a sustainable approach in their studies. Data is analysed through descriptive approach and descriptive statistical analysis. The findings reveal a sensible awareness of sustainability among the students. Consequently, proving the significance of the reciprocal responses to contribute to the success of the sustainability in interior architectural education. Ultimately, it culminates efforts to strengthen sustainable learning in the programme for Interior Architecture.

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