

**Sub-Theme: Leading from the Future**

LF1	11.00am to 11.30am	Transforming the Singapore Built Environment	Khoo Sze Boon
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**TRANSFORMING THE SINGAPORE BUILT ENVIRONMENT INDUSTRY**

**Khoo Sze Boon**  
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 Singapore

Singapore government has been pushing to raise the construction productivity level since 2015 and have set aside 2nd tranche of S\$450m of Construction Productivity Capability Fund (CPCF) as part of 2nd Construction Productivity Roadmap. The S\$150m Public Sector Construction Productivity Fund (PSCPF) has also been introduced in February 2017 to spur the adoption of innovative and productivity solutions for public sector projects. This is further push with the Construction Industry Transformation Map (Construction ITM).

The key thrusts of the Construction ITM is to develop the Built Environment Sector into an Advanced and Integrated Sector, with Progressive and Collaborative Firms and to provide Good Jobs for Singaporeans working in this sector.

This paper discusses on key initiatives on the Construction ITM led by the government through collective effort with the Industry Professional Institutions, Institutes of Higher Learning (IHLs) and Unions, coming together to lead the BE Sector transformation.

Through the key thrusts, it drives changes and encourages on adoption of innovation technologies pushing new boundaries such as Design for Manufacturing Assembly (DfMA) – Pre-fabricated Pre-finished Volumetric Construction (PPVC) and Mechanical & Electrical System; Integrated Digital Delivery (IDD); It also promotes Early Contractor’s Involvement, Collaborative Contracting and emphasis on quality and performance instead of price on procurement of construction work and consultancy service. To enhance the BE sector workforce, there is also a comprehensive Manpower Development plan in place, working collectively between the Industry, government and IHLs through this tripartite arrangement.

The Construction ITM has also help shape the evolving roles of quantity surveyors as we embrace on the technology, different procurement approaches, of which the writer will share his perspective on this.

LF2	11.30am to 12.00 noon	Modelling Risk Factors Impacting Construction Project Budget Performance in Nigeria	S.U. Gbate, A.M. Bashir & K.J. Adogbo
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## MODELLING RISK FACTORS IMPACTING CONSTRUCTION PROJECT BUDGET PERFORMANCE IN NIGERIA

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 Nigeria

Studies have shown that the level of accuracy of construction project budgets is significantly affected by the level of risk information available during budget preparation. The aim of this study is to model the risk factors impacting on construction project budget performance in Nigeria. Data were collected via questionnaire survey of design firms operating in the major cities of Northern Nigeria. The responses obtained were analysed using descriptive analysis, mean scores, standard deviation and Statistical Package for Social Sciences version 21 neural network software for the development of neural network models. Results showed eleven risk factors with both high likelihood of occurrence and significant impact on construction project budget required the respondents to estimate the percentage variations between actual and initial “construction project budget” at 30%, 50% and 70% completions of executed projects. The models developed showed that construction project budget prediction vary with the actual expenditure by +25% at 30% completion, +25% at 50% completion and +25% to 40% at the 70% completion stages respectively. Validation of the models showed a 73%, 70%, and 66% accuracy at 30%, 50%, and 70% completion stages respectively. This signifies the need for construction professionals in Nigeria to take into consideration the significant risk factors during the project appraisal so as to ensure optimal budget performance and successful projects delivery.

LF3	12.00 noon to 12.30 pm	Challenges in The Procurement and Costing of Modular Integrated Construction in Hong Kong	Sr Dr Peter Ng Yau Yee and Sr Dr Mandy Ng Man Yan
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Sr Dr. Peter Ng



Sr Mandy Ng

## CHALLENGES IN THE PROCUREMENT AND COSTING OF MODULAR INTEGRATED CONSTRUCTION IN HONG KONG

**Sr Dr. Peter Ng Yau Yee, Sr Mandy Ng Man Yan**  
Beria Consultants Limited and Hong Kong Institute of Surveyors  
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The article shares an experience in one of the pioneering projects in Hong Kong adopting “Modular Integrated Construction (“MiC”)” method from a quantity surveying aspect regarding procurement and cost. The concept of “MiC” is to have the building to be constructed as “factory assembly followed by on-site installation”, in other words, independent prefabricated modules (including decoration works, fitting out and basic building services works) will be completed in factories and then being transported to construction sites for installation. It took about two years for the team to turn a “MiC” idea into an “Intent” solution at the early design stage. In consideration of the present building regulation and ensuring fair competition in the returned biddings, it is a big challenge as a quantity surveyor in preparation of the cost budget, tender documents and the contract administration after the award when no such similar project has been done in Hong Kong. Besides sharing some of the technical problems encountered in incorporating the “MiC” idea, this paper will share how to handle the challenge in the following: -

- Introduction
- Background of Project
- Securing a competitive tender price;
- Assessing the technical capability of the tenderer;
- Contractual relationship with “MiC” specialist;
- Shortened contract period;
- Implementation of off-site works payment;
- Off-site works quality check;
- Costing of “MiC” in Hong Kong;
- Conclusions.

This project was prepared based on achieving the target of “MiC” method which can raise productivity, shorten construction time, enhance construction safety and improve quality of the works. This paper will analyze the cost implication for adopting the advance “MiC” method compared with the traditional cast-in-situ construction method

LF4	12.30 pm – 1.00 pm	Towards Smart Contracts in the Construction Industry 2030	Associate Professor Sr Dr. Noushad Ali Naseem Ameer Ali, Abhinaw Sai Erri Pradeep
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## TOWARDS SMART CONTRACTS IN THE CONSTRUCTION INDUSTRY 2030

**Associate Professor Sr Dr. Noushad Ali Naseem Ameer Ali**  
 Associate Professor and Postgraduate Director  
 School of Built Environment  
 Massey University, New Zealand

The construction industry typically operates in a web of relationships using standard forms of contracts. These include construction contracts and consultancy contracts.

Standard forms of construction contracts abound. Within the Asia Pacific region alone there are over 100 published construction contracts - ironically called 'standard' forms. Moreover, the numbers are still growing. Beyond the Asia Pacific, if the UK is included, the numbers double. But there is no reason to add the UK contracts in the pool of analysis. The infamous JCT series of contracts, which is still used in over 70% of construction projects in the UK, was referred to as a 'farrago of obscurities' by no less than a judge. Also, in the Bickerton case in 1969, the judge suggested the time had come for the entire contract to be completely redrafted 'so that laymen – contractors and building owners alike – can understand what are their own duties and obligations and what are those of the architect'. Fifty years later, that advice is yet to be heeded by the latest JCT contracts. Neither have most construction contracts in the Asia Pacific countries.

Most of these contracts remain written in traditional legal language or legalese. They are often poorly understood by the typical users including clients and contractors, and more worryingly even those administering the contracts, such as architects, engineers, and quantity surveyors. Long, overly convoluted passive sentences, the use of complex words with multiple meanings, and in many cases, redundant words or redundant doublets are typical of legalese. It not only results in poor understanding and confusion but also becomes an impediment to modern transformational technologies such as smart contracts.

A smart contract is an executable software code that can be programmed to reflect any business or engineering logic that is data-driven. It is supposed to help us increase effectiveness (or doing the right thing) and thus minimising unwarranted disputes and increasing efficiency (or doing things right the first time) thus increasing productivity. Since it is essentially a software code, it has the potential to return a logic-based, unbiased and definitive outcome. However, contracts written in legalese are less likely to be accurately

understood by programmers or artificial intelligence, thereby restricting its translation to smart contracts.

As we move towards embracing emerging modern technology such as blockchain technology and artificial intelligence to develop smart construction contracts, it becomes critically important and arguably a necessity that every clause in the contract, including the typical multiple cross-referencing that has become the norm in construction contracts is easily understood. Smart contracts use artificial intelligence to effectively self-administer some of the contract administration functions with minimal or possibly no human intervention – enabling a degree of automation. Before this can be done, the software code needs to recognise and comprehend clauses to then trigger the execution of contract administration instructions. This is where a plain language contract is both a necessity and a pre-cursor to smarter contracts.

Research done using document analysis on common clauses found in construction contracts published in the Asia Pacific region shows most of these contracts are written in traditional legalese style and do not comply with many of the principles of modern legal drafting styles from around the world – typically found in more developed countries like New Zealand, Australia, Canada, the USA, the UK, and more recently, Hong Kong.

Any of these existing contracts – even those steeped in legalese - could be produced in electronic format – such as a fillable pdf file. However, a contract in electronic format is fundamentally different to a smart contract. An example of an electronically formatted Quantity Surveying Consultancy Contract published by the New Zealand Institute of Quantity Surveyors is [<https://www.nziqs.co.nz/Resources-Tools/NZIQS-Resources/Contract-QS-Consultancy-Services>]

A unique feature of this consultancy contract is that in addition to it being in a reusable electronic format, it is written in modern plain language. It complies with all plain language drafting principles. It is the first standard form of quantity surveying consultancy services in the world to be accredited as a Clear English Standard document by the Plain Language Commission, UK. This paves the way for the contract to be potentially developed into a 'smarter' contract.

The development of smart contracts requires contracts to be read, understood and then coded into a language that the computer understands. The more easily and accurately the contract is understood by the programmer or artificial intelligence, the higher the chances of greater accuracy in automated contract administration. On the contrary the more complex the contract, the greater the chances of errors.

A formula on the possibility of errors could be presented as follows:

$$E = M C^2$$

Where E = the possibility of error

M = the 'mass' counted by the length of document or number of words in the contract

C = the number of complex words

Expressing this formula in words:

The chances of error (and consequential disputes) in a construction contract is directly proportional to the number of words or length of the document and the number of complex words used squared.

Research findings from other industries and more recently, the construction industry, show that users prefer contracts that are written in plain language over contracts that are written in traditional legalese. It is encouraging to note that the construction industry is now recognising the importance of and need for construction contracts to be written in modern plain language. One key notable initiative is the proposed white paper outlining the benefits of modernising construction contracts into plain language and a set of guidelines being developed in Malaysia and New Zealand. This initiative can be a catalyst towards Vision 2030 being mooted by the author – where all construction contracts are written or rewritten in modern plain language.

Research in this area is continuing in the Asia Pacific region. Clauses from construction contracts from standard forms of construction contracts have been analysed for readability and comprehensibility against modern plain English principles as defined by leading authorities such as the International Plain Language Federation and drafting guidelines such as the Oxford Guide to Plain English and parliamentary drafting guidelines. Case law is also used to analyse the effective use of modern plain language alternatives to ensure the original legal intent is not lost.

Preliminary results show that most construction contracts are written in traditional legal language or legalese and do not comply with modern legal drafting guidelines – in some cases despite claims that they were written in plain English. Tests also show construction contracts that had accreditation from the Plain Language Commission, UK as a 'Clear English Standard' scored higher. These included both construction contracts such as the Standard Terms of Construction Contract for Renovation and Small Projects 2015 published by the Construction Industry Development Board Malaysia as well as consultancy contracts such as the NZIQS Contract for QS Consultancy Services.

The implications of these findings are that there is a strong argument for all construction contracts to adopt a drafting style that complies with modern plain language drafting guidelines. A modern drafting approach – one that structures construction contracts more logically and using modern plain language is mooted.

As we move towards the inevitability of the advent of smarter contracts in the construction industry, writing or re-writing contracts in modern plain language becomes a necessity and a pre-requisite. For smart contracts to have the ability to use artificial intelligence to automate the administrative duties of the contract with little or no human intervention, they need to be coded effectively. Hence, Vision 2030, where all construction contracts are written or rewritten in modern plain language, is a necessary vision - if smart contracts are to succeed in the construction industry.

**Keywords:** Construction Contracts, Consultancy Contracts, Modern Plain Language, Smart Contracts.

LF5	2.00 pm – 2.30 pm	Workplaces of Future – The Positive Built Workplace Environment	Michael Manikas
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## **WORKPLACES OF THE FUTURE AND THE POSITIVE BUILT WORKPLACE ENVIRONMENT – INTERNATIONAL TOWERS SYDNEY**

**Michael Manikas**

General Manager of DLG Shape  
Australia

The traditional office workplace is ever changing. We have moved on from the traditional offices and high workstations to more of an open plan office layout with very few or no enclosed offices.

The next phase of this was the introduction of hot-desking or activity-based working. Then came along disrupters in the market such as WeWork, JustCo etc that provide shared hotdesking solutions.

At Barangaroo in Sydney Australia the International Towers have developed a new hybrid version of shared office space focused on community.

The focus of the entire International Towers development has been around creating a community and the benefits of this type of community focus is highlighted in the White Paper that was produced in relation to “Positive Psychology of Buildings and Workplace Community: Delineating the Benefits of the Positive Built Workplace Environment”

In this White Paper a comprehensive review of the existing literature and policies as well as in-depth interviews of 16 stakeholders across Tower Two and Tower Three at International Towers were carried out. This produced over 16 hours of interviews and over 450 pages of transcripts.

The aim of this study was to develop a positive psychology of workplace buildings and community and introduce the concept of the Positive Built Workplace Environment (PBWE).

The data indicates that a PBWE does have a significant impact on those who work there, and when positive values are espoused and enacted by the building management and design team, this approach sets a strong foundation for a positive and inclusive culture.

International Towers Development was commenced in 2013 and completed in mid-2016. The office development component comprises 283,900m<sup>2</sup> of office space over three towers. The towers are known as International Towers 1, 2 and 3 and were designed by Rogers Stirk Harbour + Partners and developed by Lendlease Australia. This study will focus on Tower 2 and 3 which is owned by a separate entity to Tower 1 and has a different Fund Manager and building management team.

Anthony (2018) introduced the concept of the Positive Built Workplace Environment. This concept explores the link between the positive physical workplace environment and how they can influence the most important psychological factors including 'positivity, competence, autonomy and relatedness' which in turn creates a workplace environment with sustainable high-performance returns.

There are two key components to the PBWE, being the physical and psychological factors. The physical factors include sustainable design techniques coupled with a building management team that promotes the ideas of inclusivity, wellness and a sense of community. The psychological factors relate to high levels of autonomy, competence and relatedness at work in employees.

It has been proven that a workplace that has a great physical workplace environment can have increases in organisational productivity by 19%, increased individual performance on cognitive tasks by over 61% and reduced respiratory complaints and headaches by 30% as well as helping people sleep better.

The results from the consultation of the building occupants at International Towers revealed five key categories.

1. The impact of the International Towers physical environment on performance, engagement and gratitude
2. The role of values-based leadership in extending the utility of activity-based working
3. Expressions of purpose, pride and wellbeing
4. Issues in making a transition to a new way of working
5. How spatial change (i.e. moving to the International Towers buildings) can be a powerful facilitator of corporate cultural change.

The data indicates that the PBWE does have a significant impact on those who work at International Towers. When positive values are espoused and enacted upon by the building management and design team, their approach sets a strong foundation for a positive and inclusive culture.

LF6	2.30 pm – 3.00 pm	Integrated Digital Delivery - Unmanned Aerial Vehicles (IDD - UAVS)	Jacqueline Chie Sze Huan
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## INTEGRATED DIGITAL DELIVERY - UNMANNED AERIAL VEHICLES (IDD - UAVS)

**Jacqueline Chie Sze Huan**

Singapore Institute of Surveyor and Valuers / Arcadis Singapore  
Singapore

In aiding the built environment to be a digitalize industry, Singapore government introduced the Construction Industry Transformation Map (ITM) in October 2017. One of the three focus areas of the ITM is Integrated Digital Delivery (IDD). IDD is not a total new digital concept but an initiative further enhances from the existing Building Information Model (BIM) roadmap and Virtual Design Construction (VDC) roadmap launched in 2010 and 2015. IDD consists of four components namely:

1. Digital design
2. Digital manufacturing
3. Digital construction, and
4. Digital operation

The presence of Unmanned Aerial Vehicles (UAVs) – commonly known as drones – is inevitable to achieve the digital delivery throughout the construction life cycle, in which it has started to dominate the four construction stages. This paper discusses the potential application of UAVs in construction activities such as:

1. Design and Manufacturing stage: BIM and point cloud scanning
2. Pre-construction stage: Land survey and site inspection
3. Construction stage: Site activities monitoring and tracking; volumetric calculations
4. Operation stage: Routine asset inspections (infrastructure, façade, etc.) and safety measures

This paper also reviews the type of the UAVs and software tested in Singapore, associated with some case studies conducted thus far. It will also share the benefits of adopting the UAVs in construction industry, limitations and challenges currently faced at the initial stage and the various measures implemented by the authorities to facilitate a smooth transition from the traditional to the future-digital delivery.

The learning curve of adopting IDD in the built environment is steep. The supports of both industry partner and academia is certain to reap the full benefits of IDD in which will also help to attract and retain young talents in the built industry.

LF7	3.00 pm – 3.30 pm	Training – A Bridge Between Today and Tomorrow	Agugoesi, Samuel Ifeanyi
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## TRAINING - A BRIDGE BETWEEN TODAY AND TOMORROW

### Agugoesi, Samuel Ifeanyi

Senior Quantity Surveyor of IFEANYI ANAGO & PARTNERS  
Nigeria

**Purpose** This paper is written to spur lecturers, employers, and experienced professionals to the responsibilities of training young professionals. It addresses the practical benefits of real time training and the dangers of lack of or ineffective training of young professionals in the industry. It exhorts young Quantity Surveying professionals to make learning a priority by making themselves available for training.

**Design/methodology/Approach** The paper examines published articles and experience of the researcher and those of other experienced professionals in reaching conclusions.

**Findings/Results** Trainings can be done at formal institutions of learning or informally through apprenticeship programmes and on-the-job.

A research work shows that in Hong Kong for instance, fresh graduates who studied Building and Real Estate (BRE) lack basic knowledge and skills that make them employable. The researcher argued that if institutions of learning interact with professional institutions to keep abreast with latest advancements in professional practice, then in time will ensure that the students will graduate to have high employability values.

If the Quantity Surveying Profession would remain relevant in the future, young Quantity Surveyors of today must be trained effectively with efficiency in mind.

Lack of effective training will ultimately result in loss of interest in the profession by these young professionals.

Research shows that what students are taught in schools constitute only about 40% of the knowledge and skills needed to work after graduation. In Africa, it could be as low as 25 - 30% or even less in very bad instances.

**Implications/Originality/Value** Lack of effective training opportunities for Quantity Surveyors will ultimately result in loss of interest in the profession by young ones.

Knowledge acquired in higher institutions could account for up to 40% of what is required in real life (according to some practitioners). In Africa, using the giant of Africa, Nigeria, as a case study, it could be as low as 25 -30% or even less.

LF8	3.30 pm – 4.00 pm	A Lean Practical Methodology in Integrated Cost and Schedule Control for Warehouse Building project	Zhang Daping
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## **A LEAN PRACTICAL METHODOLOGY IN INTEGRATED COST AND SCHEDULE CONTROL FOR WAREHOUSE BUILDING PROJECT**

**Zhang Daping**

TRUTHS Project Consulting Ltd, Beijing  
China

With the rapid expansion of e-commerce, the market demands the logistics industry to provide more warehouses which is a critical part of the supply chain for e-commerce companies within a short period. Under this content, a lean methodology has been used to integrate cost and schedule control in the warehouse construction. This paper demonstrates the methodology from the perspective of the lean project delivery method, the contract strategy, integrate cost and schedule control process, the cost and schedule risk mitigation. Moreover, show the detail process regarding managing owner’s requirements by BIM and Virtual Client Requirement & Estimate, controlling design and risk mitigation during the construction period to control cost and schedule integration. According to this control process, the project’s cost and construction duration are lower 10% and shorter 10% respectively than that of the average industrial level.

LF9	4.00 pm – 4.30 pm	Way Forward for Green Building Implementations in Malaysia	Leong Boon Tik, Tan Jia San, Soon Lam Tatt, Ang Fuey Lin
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## WAY FORWARD FOR GREEN BUILDING IMPLEMENTATION IN MALAYSIA

**Leong Boon Tik**

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Selangor Darul Ehsan, Malaysia

Recently, there are mounting issues relating the climate change including global warming and deprivation of earth ecosystem caused by high consumption of non-renewable resources particularly in the construction industry. Therefore, green buildings represent design and construction that are sensitive to the environment now and in the future. This study aims to raise the level of understanding regarding the green building concept, together with identifying the factors affecting the implementation of green building and to come out with success factors to implement green building in Malaysia. In this study, quantitative method has been implemented by distributing questionnaire to developers in Klang Valley where data obtained was analyzed by using Relative Importance Index (RII). The results of finding show that the major factors hinder developers to implement green building are the financial factor. Where the most effective method recommended by developers is to improve the municipal factor by providing more incentives and rebates by the government for developing green building.

**Sub-Theme: Human Wisdom**

HW1	11.00am to 11.30am	Emerging Technologies A Threat to The Quantity Surveying Profession?	Sr Chan Kar Leng
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**EMERGING TECHNOLOGIES A THREAT TO THE QUANTITY  
SURVEYING PROFESSION?**

**Sr Chan Kar Leng**

Advocate and Solicitor (High Court of Malaya)  
Kuala Lumpur, Malaysia

Technologies allowed once time consuming measurement being done expeditiously by various computer softwares. These days, technologies pushed the boundary further. The market is now grappling with the emergence of BIM (Building Information Modelling). Should Quantity Surveyors be concerned that their profession will be taken over by these technologies? Or should we embrace technologies and seek meaningful participation in the midst of these advancements.

While we discuss technology advancements in everyday quantity surveying tasks, technology in the fabric of building has advance leaps and bounds. Using example of a recently completed Perth Children’s Hospital Project, artwork is no longer paintings on canvas. Artwork takes the form of interactive screen with images that moves in tandem with the moving object in front. Or it could be hanging tubes of LED lights that changes colour depending on the speed of movement of objects below. If the Quantity Surveyor fails to acknowledge these trends, it cannot perform its role. In the very least, he cannot provide accurate cost estimates for the building.

Emerging technologies also involved new data collection technologies such as Real Time Location System (RTLS) and Radio-Frequency Identification (RFID) used to track movement of medical equipment in the hospital and store important data of the equipment. A combination of both RTLS and RFID used during the construction of Perth Children’s Hospital allows all aspect from cost, delivery date, storage to final hookup date to be tracked to precision. Software such as dRofus and BIM allow information on medical equipment to be collated. Stakeholders are able to know precisely information related to these assets and planned for its maintenance and replacement. These innovations requires data to be extrapolated, analysed and presented in a meaningful way to assist Client in making decisions relating to these equipment.

Clearly, it is only when Quantity Surveyors understands and embrace these new technologies, it can expand its role!

HW2	11.30am to 12.00 noon	A Study on Gender Inequality in Sri Lankan Construction Industry	W.M.U. Wickramasinghe
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## A STUDY ON GENDER INEQUALITY IN SRI LANKAN CONSTRUCTION INDUSTRY



**W.M.U Wickramasinghe**  
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The construction industry is one of the most gender-biased sectors in Sri Lanka, combined with cultural barriers and industry's resistance to change, and female representation remains to be poor, even at middle management level. This gender inequality presents a major barrier to achieve gender balance in the industry, which in turn, exacerbates serious skill shortage and reduces organizational performance. This study focused on identifying key causes for gender imbalance and lack of female contribution in the quantity surveying profession.

An extensive review of the previous research was carried out by the research team, and a qualitative approach was adopted for this study. Strata of 30 female participants were selected and provided a questionnaire, including both current and former practitioners of Quantity Surveying. Additionally, 5 number of industry experts and 5 number of employers were interviewed using semi-structured interviews.

Upon analyzing the data collected through questionnaires and interviews, it was found while the cultural barriers is a key factor in preventing women considering careers in the construction industry, the industry's resistance to change has a detrimental effect in retaining the female workforce. Twenty -nine per cent of female graduates leave the industry within the first five years of their career due to restrained career progression and gender discrimination at work. Twelve per cent of participants believe the salary and other benefits are less compared to other industries.

This research identifies the efforts taken from government and private sectors to appreciate the female professional contribution has not proved to be effective as expected. Therefore, gender imbalance continues to be a serious concern in the construction industry, Sri Lanka, which needs abrupt attention of the concerned parties to address this problem. Furthermore, this research encourages further studies in the subject and highlights these problems should be addressed at a national level to attract more female students and to retain female professionals which in turn will help to achieve the gender balance in the construction industry in Sri Lanka.

HW3	12.00 noon to 12.30 pm	SECOND BUSINESS VENTURE - Surviving industrial revolution 4.0	Chew Siak Kor
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## SECOND BUSINESS VENTURE - SURVIVING INDUSTRIAL REVOLUTION 4.0



**Chew Siak Kor**  
GLODON  
Kuala Lumpur, Malaysia

HW4	12.30 pm to 1.00 pm	Trust eccentricity and commonality in the transaction of construction digital information	Dr. Shamsulhadi Bandi
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## TRUST ECCENTRICITY AND COMMONALITY IN THE TRANSACTION OF CONSTRUCTION DIGITAL INFORMATION



**Dr. Shamsulhadi Bandi**

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Computing technology has changed the way construction parties produce and transact the project's information. In this regard, converting physical information to digital forms for electronic transferal is perceived as a notarize way in exchanging crucial project's information. Known as digitization, it explains the economic and social transformation of the industry triggered by the digital technology in the wake of the Industrial Revolution 4.0 (IR 4.0). Like any other modes of electronic transferal, transacting project's digital information to myriad construction parties is not without setbacks. Data suppression, quality reduction, obliteration and trust issues have brought some negative influences on the information passed around a project's circle. Though there are a fair amount of studies being carried out to investigate on issues concerning digital information in a construction environment, it appears to predominantly cover on the characters, integrity and the state of information as opposed to the trust among parties which is needed to trigger the process of information transferal. This leaves a gap in the on-going discussion on the transferal of digital information and necessitate a study to be carried out. Hence, this study aims to explore the significant issues of trust and the effort to overcome the trust issues in the digital environment among contractors and quantity surveyors. The study outlines two objectives which are: (1) To determine the significant differences in trust issues as perceived by contractors and quantity surveyors; and (2) To determine the significant differences in the effort to overcome trust issues as perceived by contractors and quantity surveyors. Quantitative research design was adapted to conduct the study. For this purpose, a questionnaire was designed based on critical studies of related pieces of literature and distributed among two respective sample groups of contractors and quantity surveyors. Data from the questionnaire was subjected to Cronbach's alpha reliability test and normality test. This will be followed by descriptive analyses and the Mann-Whitney U test to determine the significant differences between contractors and quantity surveyors in conformance to the objectives of the study. Findings from this study offered a connection between the less-distinctive issues of trust in the transferal of digital information which is one of the backbones in the pursuit of IR 4.0.

Key words: Digital Information; Digitization; Industrial Revolution 4.0; Quantity Surveyors; Trust.

HW5	2.00pm to 2.30 pm	Recognition of Differences For Cost Control in Japan Public Infrastructure Project	Eiji Nomura
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## RECOGNITION OF DIFFERENCES FOR COST CONTROL IN JAPAN PUBLIC INFRASTRUCTURE PROJECT

**Eiji Nomura**  
Tokyo City University  
Tokyo , Japan

Infrastructure projects are expected to create "Public Property". The process of evaluation and judgment with high transparency is indispensable for the construction cost. On the other hand, there is a rule for budget setting for Japanese infrastructure projects according to the Public Account Law. And there is also a unique practice for the tendering. The purpose of this paper is to point out the difference of cost management among Japanese Building industry, UK construction industry and Japanese public infrastructure construction industry and to recognize differences in cost control before expanding overseas construction project. This paper examines and analyses how Japanese public infrastructure constructions are growing up and developing cost management system by literature reviewing. As a past research, although there are some papers concerning cost control technic, reform of bidding contract system, social system alteration, etc., there is no papers which considered from the perspective of the cost management system in public infrastructure construction in general in Japan. The research results reveal that there are differences Japanese public infrastructure construction's cost control among two industries.

HW6	2.30 pm to 3.00 pm	Improving 2-Stage Early Contractor Involvement: Lessons from New Zealand	David Finnie, Associate Professor Sr Dr. Noushad Ali Naseem Ameer Ali
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## IMPROVING 2-STAGE EARLY CONTRACTOR INVOLVEMENT: LESSONS FROM NEW ZEALAND

**David Finnie**  
 Otago Polytechnic  
 New Zealand

This study explores the perceptions of two-stage early-contractor involvement (2S-ECI) as used in New Zealand construction. 2S-ECI provides a procurement process for agreeing a construction-only or novated design and build contract, after the contractor has first been employed before or during design development. Prior research into ECI has struggled to identify the actual procurement system being studied (design and build, management contracting, construction management, or 2S-ECI), skewing findings. Twenty-one semi-structured interviews were conducted with senior construction professionals across New Zealand. Findings focused on advantages, project suitability, challenges and opportunities. 2S-ECI may improve design buildability, construction planning, price transparency, risk equity, and reduce industry tendering costs. 2S-ECI appears best suited to projects involving work to existing building operations where the cost of disruption outweighs any premium incurred for the benefit of contractor logistical planning, where the selection of preferred contractors through open-book negotiation is desirable, where securing resources in heated markets is otherwise difficult through competitive tender, and where designers want contractor input for design solutions. Challenges include lack of clear 2S-ECI definition, unclear expectations and difficulty measuring benefits, incomplete design documentation, and amended standard terms transferring risks to contractors. Opportunities for improvement include education, developing a standard form pre-construction services agreement (PCSA) for New Zealand, better application of design coordination and buildability analysis and value management, and agreeing fixed price construction contracts based on finished quality drawings. Risk transfer is a major issue in New Zealand construction. These findings help inform procurement policies that support transparency and risk equity.

HW7	3.00pm to 3.30pm	Research of PPP Project Governance In China From The Perspective OF Social Network Theory: Based On Big Data Analysis	Xiang Wang
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## RESEARCH OF PPP PROJECT GOVERNANCE IN CHINA FROM THE PERSPECTIVE OF SOCIAL NETWORK THEORY: BASED ON BIG DATA ANALYSIS

**Xiang Wang**

Department of Construction Management  
 College of Management and Economics, Tianjin University  
 China

Relevant researches have shown that PPP project is a long-term network organization. From the perspective of social network theory, PPP project has its unique network structure in each stage, and the complex network relationships among all participants in the PPP project network will affect the project management mode, contract structure, relationship governance, risk sharing scheme, performance, etc. In this study, Web Crawler Search will be used to analyze and classify data by taking PPP projects of China's urban underground pipeline corridor as an example. Then the Social Network Analysis method is used to explore the different network density, structure hole, centrality and other characteristics of Chinese PPP projects at different development stages. Specifically, this study will analyze the social networks in different stages, so as to get the relative relations among the project participants in different stages. Will be clarify China on the basis of the PPP projects of urban underground pipeline corridor of the network characteristics, in order to different countries or companies involved in the PPP projects in China to provide a clear and concise analysis perspective, and project participants can according to the different PPP project social network structure, to determine the optimal contract governance structure and relations, in order to further enhance the performance of the PPP project.

HW8	3.30pm to 4.00pm	Applicability of Expert Determination as Alternative Dispute Resolution in Malaysia Construction Industry	Sr Maselawati bt. Shamsuddin
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## APPLICABILITY OF EXPERT DETERMINATION AS ALTERNATIVE DISPUTE RESOLUTION IN THE MALAYSIAN CONSTRUCTION INDUSTRY



**Sr Maselawati Binti Shamsuddin**  
Department of Public Works  
Kuala Lumpur, Malaysia

Alternative dispute resolution (ADR) has been made available in all standard forms of construction contracts in Malaysia where arbitration is the most common dispute resolution method in lieu of litigation. Other commonly available ADR mechanisms are mediation and adjudication. In 15 April 2014, Construction Industry Payment and Adjudication Act 2012, come into effect, providing for statutory adjudication of non-payment issues arising from construction contracts. In 11 April 2018, Malaysian Institute of Architects (*Pertubuhan Arkitek Malaysia* - PAM) introduced Expert Determination (ED) as ADR in the Agreement and Conditions of PAM Contract 2018. This new provision is yet to be tested on its efficacy in providing solution to disputes. The aim of this paper is to explore the applicability of ED mechanism as ADR in the Malaysian construction industry. This paper looks into the current major ADR mechanisms in the Malaysian construction industry with reference to the respective statutes, standard conditions of contract and the institutions dealing with construction disputes. Comparative characteristics and efficacy of each of the ADR methods will be highlighted based on literature reviews. ADR in construction can be improved in terms of speed and cost of settlement of construction disputes. The traditional arbitration and litigation approaches should remain as last resort solutions. Introducing ED as a means of dispute resolution may be a more effective solution to resolve technical disputes as and when it arises. Technical disputes may refer to engineering or construction issues. The construction professionals should be the prime service providers for ED, allowing the experts in the relevant areas to efficiently resolve disputes with the lowest possible costs and within minimal time. ED mechanisms as ADR are widely used in the US, UK and Europe. In the last decade, Hong Kong and Singapore have adopted ED mechanism in their construction industry. Salient aspects to be considered for the inclusion of ED as ADR in the Malaysian construction industry includes the formulation of ED Rules, amendment of current dispute resolution clauses in the Standard Conditions of Contract/ Supplemental to the Contract, identification of the appointing organization (if parties cannot mutually agree to the appointment of an Expert) and reputable organization in establishing and managing the List of Experts. Malaysian construction industry will have a variety of ADR mechanism options for settlement of disputes that arose during the construction period. Immediate dispute resolution mechanism available for use during the currency of the works should be inexpensive, simple, effective and speedy. The industry will benefit in terms of cost and time when suitable mechanism is chosen in accordance to the nature of the dispute.

HW9	4.00pm to 4.30pm	The Need for Human Wisdom in Managing Emerging Technologies in our Profession	Thomas Graham Chatterton
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## THE NEED FOR HUMAN WISDOM IN MANAGING EMERGING TECHNOLOGIES IN OUR PROFESSION



**Thomas Graham Chatterton**  
New Zealand Institute of Quantity Surveyors  
New Zealand

Construction is acknowledged as a sector with low uptake in emerging technologies compared with other sectors globally. We are set to see unprecedented growth in construction markets which coupled with inefficient practices and an increase in emerging technologies provides an opportunity for the adoption and utilisation of new technologies with an aim to meet global demands. Digital advancement specifically building information modelling (BIM) is generally increasing in its uptake. Further use of technologies such as virtual reality, Blockchain, and Artificial Intelligence is becoming increasingly used in global sectors and will be adopted over time. The effectiveness of emerging technologies including BIM utilisation will be determined by the adoption by Quantity Surveyors which in turn will be reliant on the type of training and input of traditional Quantity Surveying methods derived from human wisdom adapted and integrated in a digital environment.

Sub-Theme: **EMERGING TECHNOLOGIES**

ET1	11.00 am to 11.30 am	Construction 4.0: Digital Transformation of Construction Sector via Emerging Technologies	Dr. Muhammad Imran Sarwar
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## **CONSTRUCTION 4.0: DIGITAL TRANSFORMATION OF CONSTRUCTION SECTOR VIA EMERGING TECHNOLOGIES**



**Dr. Muhammad Imran Sarwar**  
Kuala Lumpur, Malaysia

ET2	11.30am to 12.00 noon	New Rules of Measurement Malaysia (NRMM) - Latest Update	Sr Chin Keh Liang
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## NEW RULES OF MEASUREMENT, MALAYSIA (NRMM) – LATEST UPDATE –



**Sr Chin Keh Liang**  
Perunding PCT Sdn Bhd,  
Kuala Lumpur, Malaysia

Under the auspices of RISM initiative, NRMM committee was formed over a year ago with the task to produce the NRMM to replace SMM2. Presently, NRMM committee's progress on the production of the NRMM has entered into its final stage where most of the Works Sections have been completed. In due course, NRMM committee will be organizing a workshop where all NRMM committee will meet to put the necessary finishing touches to the draft NRMM.

The original format and approach of the NRMM has been refined through extensive research as well as through the feedback from the PAQS BIM committee meeting during the 2018 ICEC-PAQS Conference in Sydney.

The main part of the NRMM is the tabulated rules of measurement for building works which are being refined and structured to provide the following information/guidelines:

- (i) Guidelines on rules for describing 'Preliminaries';
- (ii) Guidelines on the relevant specification items related to each of the Work Sections;
- (iii) Guidelines on the information to be shown in the 2D drawings or to be input into the 3D model to facilitate the extraction of 'quantities' for building components / items comprised in each of the Work Section;
- (iv) Specific rules of measurement relevant to each of the Work Sections;
- (v) 'Preambles' for each of the Work Sections; and
- (vi) Guidelines to create standard building components / items descriptions by 'levels' and with 'unit of measurement' comprised in each of the Work Sections.

The key purpose of this paper is to utilize some completed Work Sections to illustrate the rationale and objectives behind the drafting of the tabulated rules of measurement.

It would be cautiously optimistic to say that by the time this paper is presented, the draft NRMM will be ready for the industry's feedback and hopefully, the draft NRMM can be distributed to the participants of this Conference for their feedback as well.

ET3	12.00 noon to 12.30 pm	Literature Review: A Conceptual Framework for Psychology in Lean Construction	Nilmini Thilakarathna, Nicola Naismith, Fei Ying, John Tookey
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## LITERATURE REVIEW: A CONCEPTUAL FRAMEWORK FOR PSYCHOLOGY IN LEAN CONSTRUCTION



**Nilmini Thilakarathna**

College of Engineering, Construction & Living Sciences, Otago Polytechnic  
New Zealand

Construction projects complete with cost and time overruns for various reasons. One of the major hindrances of flow process in construction activities is Non-value adding activities (NVAAs) such as rework, defects and waiting. Lean Construction (LC) is an innovative approach which is linked closely to the overall life of a construction project to ensure its success by eliminating NVAAs. The purpose of this paper is to establish a conceptual framework to reflect the link between lean construction implementation (LCI) and psychology. Literature indicates that the LCI at the operation level is limited. Moreover, LC is still new to many countries in the construction industry globally. Literature suggests many reasons for slow LCI such as lack of organizational elements, integration, training, administration and transparency. However, few addresses the human side, which is the psychology perspective.

A preliminary literature review was carried out to identify the psychological aspects of implementing lean principles in construction flow processes. Findings reveal that there is an evident link between the flow process and psychology in lean construction implementation. A conceptual framework is then developed to demonstrates the relationships between lean, construction and psychology. The activities that do not add any value to the final product are merely a waste and need to be minimized. Only limited efforts have so far been made to improve the flow process in the construction activities. Lean construction is one such attempt made to apply lean production principles to the construction industry to minimize NVAAs in its construction processes and maximize the value provided to clients. Hence it is vital to identify the key reasons for slow LCI to explore the human perspective. This paper recognizes the link between the LC and Psychology in the construction flow process. Furthermore, the conceptual framework is proposed to demonstrate the link between LC and psychology.

ET4	12.30 pm to 1.00 pm	Potentials and Capabilities for Big Data Advancement in Quantity Surveying Profession	Zafira Nadia Maaz
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## POTENTIALS AND CAPABILITIES FOR BIG DATA ADVANCEMENT IN QUANTITY SURVEYING PROFESSION



**Zafira Nadia Maaz**

Faculty of Built Environment and Surveying  
Universiti Teknologi Malaysia, Skudai,  
Johor, Malaysia

Big data is recognised as the technology frontier in the 21st century. Organisations across industries are aggressively exploring and exploiting big data to deliver better value services while maximizing organisation's potential. Within the local front, the Malaysia government through the Construction Industry Transformation Programme (CITP) 2016 – 2020 has called for an advanced technologies implementation to double construction productivity by 2020. This in return has promulgated the big data initiatives spearheaded by the Construction Industry Development Board (CIDB) and the Public Works Department (PWD). Taking the meritorious adoption of big data in other business sectors in Malaysia and elsewhere, a research in big data for quantity surveying is enunciated and prelude a significant big data potential for the profession in Malaysia. Prompted by the findings accrued thus far, this paper aims to report insights on the potential and the capabilities required to harness the big data advancement for the quantity surveying profession. Two objectives were outlined as the steps to achieve the aim which are: (1) To describe the potential of big data for the quantity surveying profession, and (2) To describe the capabilities required to harness the big data potential to quantity surveying profession. Using the semi-structured interview approach, this study had gathered views from eighteen (18) big data expert in quantity surveying profession. Interview data was analysed through the Framework Analysis approach that involved familiarization, identifying thematic framework, indexing, charting and mapping and interpretation. The paper concludes that data maximization, data driven decision making, and service diversification as the potential of big data to the profession while technology, organization and environment are the required milieu to harness the big data potential. The input presented in this paper is significant to create the necessary awareness in recognition on the importance of big data to revolutionise current quantity surveying practice.

ET5	2.00pm to 2.30 pm	The Rise of BIM in Oil and Gas Industry	Roszie Yanty Rahmat, Khaidir B Ariffin
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## THE RISE OF BIM IN OIL AND GAS INDUSTRY

**Roszie Yanty Rahmat, Khaidir B Ariffin**

Petronas

Kuala Lumpur, MALAYSIA

Building Information Modelling (BIM) is no longer a new term in Malaysia, and its gaining momentum within the construction industry all over the world. BIM is a process of creating and managing all of the information on a project – before, during and after construction, that involves the automation using intelligent 3D model-based process that gives architecture, engineering, and construction professionals, improved and digitalized experience to undertake efficient and effective planning and execution of the construction projects. For oil and gas industry, surviving the turmoil due to uncertainty of the oil prices has immediately change the outlook for future investment to focus more on cash efficiency options. Implementing and integrating BIM with Advance Work Packaging (AWP) in oil and gas construction industry is seen to be an alternative solution in raising the productivity and effectivity of the construction thus provide value saving for the company. This paper looks for strategy in implementing BIM/AWP and to provide a roadmap for oil and gas industry used for Non-Building projects especially in the process plants, utilities and offsite facilities, upstream and downstream. In meeting the desired target, a survey will be conducted for various stakeholder within the company as well as interview with subject matter expert that includes the problem statement, barriers and challenges of current situation in managing project without BIM/AWP support and the end state of using the system. The goal is to prepare the company to embark on this BIM/AWP journey in oil and gas industry and track the value realization obtained by implementing the system in one of the pilot project that has been selected and finalized.

ET6	2.30 pm to 3.00pm	Construction Delay Guidelines - A Simplified Protocol	Nicholas Lambert and Associate Professor Sr Dr. Noushad Ali Naseem Ameer Ali
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## CONSTRUCTION DELAY GUIDELINES – A SIMPLIFIED PROTOCOL



**Associate Professor Sr Dr. Noushad Ali Naseem Ameer Ali**

Associate Professor and Postgraduate Director  
School of Built Environment  
Massey University, New Zealand

Delays abound in construction, often resulting in disputes and significant additional cost. Delays can be complex, arising from multiple interwoven or overlapping events, with liability attributed to multiple parties. Identifying cause and effect between individual delay events and the impact on completion can be difficult. As in most other countries, in New Zealand most commercial construction contracts are entered using standard contract terms - such as NZS 3910:2013. Typically however, these standard forms do not directly provide how certain issues, such as concurrent delay, should be resolved. The contract administrator is then faced with the challenge of deciding outcomes, without specific direction from the contract terms. These are then left to open interpretation and (limited) guidance from a myriad of case law.

In order to address this problem, some jurisdictions (most notably the UK through its Society of Construction Law Delay and Disruption Protocol 2<sup>nd</sup> Edition and the modified Malaysian equivalent) have developed delay guidelines that outline how common delay issues should be decided - if not expressly outlined in the contract. These guidelines are however, not widely accepted or used in other jurisdictions outside the UK.

This research investigated the use, potential use and relevance of existing delay guidelines from around the world. A systematic document analysis was undertaken of the Society of Construction Law [UK] Delay and Disruption Protocol 2<sup>nd</sup> Edition. This was followed by a survey using a questionnaire of participants from New Zealand. The document analysis showed the Protocol was very long and unnecessarily complex.

An online survey of 41 participants, including 17 contract administrators and 28 members of the Society of Construction Law [NZ] was subsequently done. It was found that an overwhelming majority (85%) supported the development of a set of delay guidelines for New Zealand.

The feedback obtained from this survey was then used to develop a draft set of New Zealand Delay Guidelines. The core content from the UK Protocol was extracted and redrafted to comply with modern legal drafting standards and style and modified to suit New Zealand laws. These standards included modern plain English drafting principles as defined by leading authorities such as the International Plain Language Federation, drafting guidelines including parliamentary drafting guidelines, and case law. It awaits to be tested for future practical use in the New Zealand construction industry and potential further development for use in other Commonwealth countries as future research.

ET7	3.00pm to 3.30pm	Digitalisation of The Construction Industry: Are We Ready?	Chia Fah Choy, Wong Phui Fung, Felicia Yong Yan Yan, Ooi Kean Thong
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## DIGITALISATION OF THE CONSTRUCTION INDUSTRY: ARE WE READY?



**Chia Fah Choy**

Department of Surveying, Lee Kong Chian Faculty of Engineering and Science,  
Universiti Tunku Abdul Rahman (UTAR)  
Malaysia

Following the conclusion of the G20 Summit recently, the Ministerial Statement on Trade and Digital Economy which recognizes digitalization was issued. Besides empowering individuals and businesses, digitalization also fosters innovation, promotes social and cultural progress as well as development. The construction industry being an integral part of the economy is the second least digitized industries among the 22 industries according to McKinsey studies in 2016. The readiness of digitalization in the Malaysian construction industry remains unclear. Thus, this paper aims to assess the digitalization readiness of Malaysian construction industry. Digital construction is being defined as the use and application of digital tools to improve the process of delivery and operating the built environment, has become increasingly widespread. The adoption of digital technologies not only improve productivity and reduce project delays, but also makes good business sense in the provision of affordable homes, speedy delivery of higher quality infrastructure, offering new services to enhance the quality of lives and enabling environment protection. Hence, the proactive adoption of new digitally based approaches is essential in every industry in order to meet the clients' demand and avoid being left behind. This paper proposes a digital construction framework which consists of three components: big data, connectivity and artificial intelligence. It is practically big data analytics enabled by connectivity and empowered with artificial intelligence. Questionnaire surveys were conducted throughout 2018 to 2019 and the results revealed that more than half of the construction organizations are yet to realize the importance of advanced digital technologies. The self-perceived value and importance of digital transformation are ranked higher by individual respondents as compared to the observation made on their organization practices. The findings serve as a policy direction to enhance the adoption of digital technologies in the Malaysian construction industry.

ET8	3.30pm to 4.00pm	Limitations of Using Revit- BIM Software for Quantification	Cen-Ying Lee, Chang Saar Chai and Bruno Lot Tanko
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## LIMITATIONS OF USING REVIT- BIM SOFTWARE FOR QUANTIFICATION



**Chang Saar Chai**

School of Built Environment, University of Reading Malaysia, Johor, Malaysia

Most of the quantity surveying consultant firms prefer using a cost estimating software to produce a cost estimate or Bills of Quantities. In reality, BIM software has a feature of quantification which allows quantities of building elements to be measured. However, BIM software is mainly developed to model the facility. There are many shortcomings in BIM software to facilitate the process of quantification. The aim of this paper is to identify the challenges faced by quantity surveyors in the quantification of the building elements using BIM software. A case study was conducted using a BIM software to discover the challenges which may be potentially faced by the quantity surveyors in quantifying the common building elements such as frame, staircases, wall and etc. The findings provide valuable insights into the construction industry to improve the existing practices of quantification using BIM software. The results highlighted in this paper could be used as a reference to improve the BIM software for quantification which is one of the essential works in the quantity surveying profession.

ET9	4.00 pm to 4.30 pm	International Classification Systems for Empowering Standardization and Cost Management of Building Services Works in Malaysia	AP Sr Dr. Sarajul Fikri Mohamed
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## INTERNATIONAL CLASSIFICATION SYSTEMS FOR EMPOWERING STANDARDIZATION AND COST MANAGEMENT OF BUILDING SERVICES WORKS IN MALAYSIA



**Associate Professor Sr Dr Sarajul Fikri Mohamed**  
Faculty of Built Environment and Surveying  
Universiti Teknologi Malaysia, Skudai, Johor, Malaysia

The purpose of this paper is to examine a standard framework for the measurement of building services works for managing construction costs by project team. Building Services (BS) is a specialized area of building projects in terms of the scope, nature of works, technicality and the stakeholders involved. The peculiar nature of BS hinders efforts by project team to set a reliable budget in a standardized format, and there is lack of uniformity in practice. In order to develop systematic and detailed Bills of Quantities (BoQ) with industry requirements, it is important to establish common classification of building services components for building projects. A review of literature on the established classification system was carried out. A survey was conducted using structured questionnaire to identify the current practices in measuring building services works as well as to explicate the essential features of building services standard method of measurement. The findings revealed the need to develop standard framework of building services measurement. In total, 23 parameters were identified as important characteristic of standard method of measurement. It is also indicated that the significant parameters are aligned with international classification system. The international classification system comprises of both superficial/floor area method in preliminary estimates and elemental estimating in detailed estimates which are predominantly used by construction firms. There is need to establish a standard framework for uniformity in measurement with local classification system for efficient collaboration of quantity surveyors (QS) for quantity extraction and estimating of engineering services in Malaysia. Therefore, the integration of international classification system into building services quantity extraction for cost management purposes is a major improvement in construction cost estimating processes.

Sub-Theme: **SUSTAINABLE EXCELLENCE**

SE1	11.00am to 11.30am	A Green Project Management Model for Delivering Environmentally Sustainable Construction Projects	Associate Professor Dr. Fadzil Hassan Fadzil Hassan
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## A GREEN PROJECT MANAGEMENT MODEL FOR DELIVERING ENVIRONMENTALLY SUSTAINABLE CONSTRUCTION PROJECTS



**Associate Professor Dr. Fadzil Hassan**  
Universiti Teknologi MARA  
Selangor Darul Ehsan, Malaysia

The introduction of new environmental standards and regulations in the Malaysian construction industry have necessitated a critical review of the current project management process and practices. A research was mooted to establish the ‘green’ elements to be considered, and how these can affect the activities within the project life cycle phases; i.e., Inception, Design Development, Tendering, Construction, Handover and Operations and Maintenance. A qualitative method was adopted using multi-level thematic data analysis was adopted. Data was drawn from (i) Green Building Index (GBI), (ii) GreenRE and Malaysian Carbon Reduction and Environmental Sustainability Tool or MyCREST, the three common green building rating tools used in the industry. The emergent findings suggest that energy use, water use, indoor environmental quality, material selection, quality, health and safety, and the building’s effect on its site are the key elements of the project management processes that needs to be reconsidered. Results from mapping the ‘green’ elements against the project life cycle phases identified how these elements can affect the project management activities.

SE2	11.30am to 12.00 noon	Analysing the Effect of Glazing Material Towards Building Energy Consumption in Different Climate Zone	Siti Birkha Mohd Ali, Johari N.S., Mehdipoor Amirhosein, Md Hasanuzaman, Nasrudin A. Rahim
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## ANALYSING THE EFFECT OF GLAZING MATERIAL TOWARDS BUILDING ENERGY CONSUMPTION IN DIFFERENT CLIMATE ZONE



**Siti Birkha Mohd Ali**

Faculty of Engineering and Life Sciences, Universiti Selangor  
Bestari Jaya, Selangor Darul Ehsan, Malaysia

The purpose of this research is to analyse the effect of glazing materials towards the building energy consumption in different climate zones. A virtual building model is used using ArchiCAD software; one out of numerous tools that is capable of inculcating the Building Information Modelling (BIM) process that is widely gaining its popularity. Three different types of glazing materials are selected to examine their effect towards building energy consumption. In addition, this research further analyses how these three selected glazing materials have contributed differently towards building energy consumption in different climate zones. In short, this research portrays the importance of selecting a proper glazing material during a design or refurbishment process of a building in different countries (with different climate zones) in order to optimize the energy conservation initiative which leads to lesser carbon emissions as well as minimizing the global warming effect. The energy evaluation results are obtained from the simulation process of the virtual building in ArchiCAD. Commonly, higher performance glazing material (based on the u-value of the material) will reduce the energy consumption of one building but practically it acts differently depending on the different environment profile. Theoretically, a cooler environment will reduce the internal heat gain of a building which leads to the unnecessary use of high glazing insulation types of material. In addition, a bigger gap between the indoor and outdoor building temperature has shown a bigger impact towards the energy consumption by a higher performance glazing material. The outcome from this research will assist the respective parties in selecting the most suitable and affordable glazing material for a sustainable building design as well as for a refurbishment need in a specific country/region.

SE3	12.00 noon to 12.30pm	The Effects and Expectations of Measurement & Documentation for 3D Modelling in Quantity Surveying Profession	Lam Tatt Soon, Boon Tik Leong, Voon Fun Liew, Fuey Lin Ang, Hasnanywati Hassan, Zarirah Zainul Abidin
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## THE EFFECTS AND EXPECTATIONS OF MEASUREMENT & DOCUMENTATION FOR 3D MODELLING IN QUANTITY SURVEYING PROFESSION



**Lam Tatt Soon**

School of Architecture Building and Planning, Taylor’s University  
Selangor Darul Ehsan, Malaysia

In the construction industry, 3D modelling has been promoted as a systematic innovation which improves the efficiency of measurement and documentation. However, significant changes in a firm’s business and workflows are required in adopting this advanced technology. Therefore, the effects of measurement and documentation of 3D modelling are always a consideration for the quantity surveying profession in adopting this new technology. Hence, this paper focuses on analysing the effects and expectations of measurement and documentation for 3D modelling in Quantity Surveying Profession. The primary data of this research is collected through semi-structured interviews and eleven respondents accepted the semi-structured interviews to share their 3D modelling experience. The analysis result indicates that quantity surveying job scopes are affected in measurement and documentation when 3D modelling is implemented. Additionally, majorities of the respondents are satisfied with the measurement and documentation in 3D modelling notably the architectural measurement. This research outcome serves as a guidance for quantity surveyors who are interested to adopt the 3D modelling in the future.

SE4	12.30 pm to 1.00 pm	Investigating the Enablers for Higher Risk Management Maturity of Highway Contractors In Nigeria	Aminu Muhammad Bashir
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## INVESTIGATING THE ENABLERS FOR HIGHER RISK MANAGEMENT MATURITY OF HIGHWAY CONTRACTORS IN NIGERIA



**Aminu Muhammad Bashir**

Department of Quantity Surveying, Bayero University  
Nigeria

The level of sophistication in the management of risk portfolios of infrastructure contractors' was found to be generally at low (novice) level. Highway projects are social overhead capital essential to the economic growth of any nation and are prone to numerous macro and micro level risks which require amongst others, contractors' higher risk management maturity (RMM) for effective delivery. As part of an ongoing research, this paper is aimed at investigating enablers for higher RMM of highway contractors through the identification of factors influencing RMM, evaluating the RMM of highway contractors in North-Western Nigeria and the Federal Capital Territory (FCT), determining the factors responsible for the present RMM level, and ultimately investigating the means of overcoming these factors. The methodology involved critical review of existing literature, mixed method approach comprising questionnaire survey of highway contractors and a semi-structured interview with project and risk managers of selected construction firms. Stratified and maximal variation sampling techniques were used to draw samples for the quantitative and qualitative data respectively. Mean scoring ranking and standard deviation were used as the basis of determining the level of implementation of the factors as well as the RMM of the sampled highway contractors while conceptual content analysis technique was used to analyse the transcribed data. The research validated earlier findings that the RMM level of highway contractors was at 'novice' level with low level of implementation of thirty-one factors being responsible and a major barrier to attaining higher RMM. Further findings indicated that this could be overcome by adoption of formal RM practices, implementation of organisation wide policy on RM and engagement of professional staff competent in technical/management aspect of highway construction amongst others. The results further showed proper project planning, strong capital base, established reputation in quality delivery and relationship management are amongst the enablers for higher RMM. The study provides a basis for highway contractors to improve their weakest areas for better utilisation of resources, reduced earnings volatility and competitive advantage in the delivery of highway projects for optimum project performance.

SE5	2.00 pm to 2.30 pm	Life Cycle Assessment of Prefabricated and Conventional Reconstruction After Disaster	Jason Maximino Ongpeng
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## LIFE CYCLE ASSESSMENT OF PREFABRICATED AND CONVENTIONAL RECONSTRUCTION AFTER DISASTER



**Jason Maximino Ongpeng**  
Civil Engineering Department,  
De La Salle University  
Manila, Philippines

The Philippines as a country surrounded by large body of water is highly susceptible to powerful typhoons. In the year 2013, Typhoon “Haiyan” (locally named “Yolanda”) is recorded as the deadliest typhoon in the country’s history with \$4.55 billion worth of damages and 6,329 confirmed casualties. During reconstruction, challenges on the capability and resources to produce the needed post-disaster housing units were experienced due to many factors including material selection and methodology of construction. This paper focuses on the use of two types of houses during reconstruction. It compared prefabricated housing (PH) against conventional housing (CH). Instead of using three parameters in construction (time, quality, and cost), this study uses the 4<sup>th</sup> dimension which is the environmental aspect through Life Cycle Assessment (LCA) from “Cradle-to-gate”. It includes the material extraction, manufacturing and transportation phases and excludes the construction until the disposal phase. SimaPro was used to simulate the scenarios and derived the outputs using different environmental assessments. Material quantities as input were extracted from construction drawings from a locally-approved plans for CH with typical cast-in-place concrete construction, while PH data were extracted using aluminum members and Expanded Polystyrene Sandwich (EPS) Panels. A functional unit of one square meter of construction floor area is considered. A case study is introduced from past flash flood event in the town of Infanta, Quezon Province. The CH method used locally sourced materials from a town 80.3 km away, while the PH method used locally sourced materials with imported special materials from China. Analyzing each method individually, results show that the main contributors for environmental damage is cement for CH and EPS Panels for PH. Transportation of materials is shown to be insignificant. Comparison of the two methods shows that CH consistently contributed more environmental damage across three categories mainly Human Health, Ecosystems, and Resources. On the average, the environmental impact of PH is 47.73% that of CH, which means that PH has lower environmental impact in reconstruction projects.

SE6	2.30pm to 3.00 pm	Pre-Fabricated Pre-Finished Volumetric Construction (PPVC) For Residential Projects	Max Shea Wai Hoh
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## PRE-FABRICATED PRE-FINISHED VOLUMETRIC CONSTRUCTION (PPVC) FOR RESIDENTIAL PROJECTS



**Max Shea Wai Hoh**  
Threesixty Cost Management Pte Ltd  
Singapore

Over the last 2 years, in response to BCA's roadmap for construction productivity, the industry has seen an upsurge of game-changing technologies and the adoption of innovative building methods. Perhaps one of the more talked about is PPVC (pre-fabricated pre-finished volumetric construction), or more commonly known as “Lego” building. The perceived benefits are well documented, but a common misconception about PPVC is the overall time savings that it can achieve. Generally, construction on-site takes comparatively lesser time because many wet trades are shifted off-site where the modules are constructed, but consideration of the additional time required up-front for detail planning and co-ordination are often overlooked. PPVC does come with its own set of challenges and at a cost premium; however, the additional cost can be off-set by a reduction in construction time and savings on labour cost. With PPVC modules manufactured and fitted-out off-site, majority of the costs are up-front, and contractors may have cashflow issues if a payment mechanism for materials off-site is not in place. As each PPVC supplier works with their own Professional Engineer, issues pertaining intellectual property might arise. There are cases where contractors engaged their own QP and this might affect the novation of consultants in modified Design and Build projects. As with most systems, there is no ‘one size fits all’ solution and PPVC is still at a very infant stage. This article will further look into the pros and cons of PPVC, the element driving PPVC costs, and the challenges from a procurement perspective.

SE7	3.00pm to 3.30 pm	Pointers for Social Sustainability and Opportunities for the Construction Industry in The Application of Emerging Technologies	Hubert Hiew
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## POINTERS FOR SOCIAL SUSTAINABILITY AND OPPORTUNITIES FOR THE CONSTRUCTION INDUSTRY IN THE APPLICATION OF EMERGING TECHNOLOGIES



**Hubert Hiew**  
Beria Consultants Limited  
Hong Kong

The onslaught of emerging technologies appropriately embraced under the term “4<sup>th</sup> Industrial Revolution” (4IR), have already been affecting us increasingly. This paper, by research of papers and observations of the characteristics of the human body, sets out to review the pointers for the social sustainability of 4IR whilst highlighting the tremendous potential for the construction industry in riding the crest of 4IR.

The top emerging technologies are identified, together with their respective advantages/benefits and disadvantages/fears. Whilst the potential advantages/benefits provide justifications for pursuing 4IR and thus overcoming or mitigating its fears, it is equally important that 4IR is socially sustainable. The preceding industrial revolutions 1IR, 2IR and 3IR have not been socially sustainable, considering that today there are still more than 1 billion people who have no ready access to electricity. Hence, the meaning and fulfillment of social sustainability are studied in the context of pursuing 4IR.

The urgent need for the construction industry to adopt 4IR is highlighted including the new opportunities and potentialities which can be brought about.

Pointers for ensuring the social sustainability of 4IR are reviewed to see how effective they are vis-à-vis the sustainability of the human body, the characteristics of which are discussed, notably the control and unity of the various members by the head.

Generally, the pointers reviewed are acceptable except that there seems to be lack of emphasis on humanization of people conditioned by exposure to “cold” technologies and provision of back-ups in the event of break-down of the technologies. Furthermore, the author has reservations on the effectiveness of those pointers concerning public bodies, governments and international cooperation via the United Nations, taking the role of the “head of the body”.

SE8	3.30pm to 4.00pm	Quantity Surveying Aspects in Cost Management of Conservation Projects / Building – What End User Need From Consultant Quantity Surveyor	Sr Saravanan Subramaniam
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## QUANTITY SURVEYING ASPECTS IN COST MANAGEMENT OF CONSERVATION PROJECTS / BUILDING - WHAT END USER NEED FROM CONSULTANT QUANTITY SURVEYOR



**Sr Saravanan Subramaniam**  
 SG Contract Services Sdn Bhd  
 Penang, Malaysia

Being involved in various Building conservation and Cost Management consultancy service with Government and private sector, the writer wish to share the End user expectation from Consultant Quantity Surveyor such as approach in providing initial cost estimation, selecting the most viable option and tender procurement, format of documentation, selecting the right contractor and post contract cost management in order to accomplish the intended investment within the reasonable cost and getting the building with restored heritage element and fulfilling the Heritage management plan. Further, the application of GBI (Green building index) in conservation projects will be explored in reference to completed and ongoing conservation project in Penang. In view of the size, availability and various constraints faced in conservation projects the challenges faced by Consultant Quantity Surveying firm in providing cost management services, financial remuneration and resources will be shared.

SE9	4.00pm to 4.30pm	A Preliminary Study on The Relevance of Quantity Surveyors in the Shipbuilding Industry	Dr. Ahmed Mohammed Kamaruddeen, Wahida Wahi, Esther Wong Siaw Wei
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## A PRELIMINARY STUDY ON THE RELEVANCE OF QUANTITY SURVEYORS IN THE SHIPBUILDING INDUSTRY



**Dr. Ahmed Mohammed Kamaruddeen**

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While the services provided by the quantity surveyors cut across various industries such as construction, oil & gas, and banking industry, their roles in the shipbuilding industry has not received considerable attention. This research, therefore, explores the relevance of quantity surveying services to shipbuilding in Sarawak, Malaysia. The objectives of this study are three. Firstly, to determine the relevance of quantity surveyors to the shipbuilding companies. Secondly, to identify the skills required of a quantity surveyor by the shipbuilding companies. Thirdly, to identify the services quantity surveyors can provide to the shipbuilding companies. This study adopted an exploratory research design, mixed-method, sequential data collection, and the simple random sampling technique to select samples of shipbuilders operating in Sarawak State. The target population for this study consist of the shipbuilding companies operating in Sarawak. The qualitative data was obtained through an interview held with the Executive Director of a big-sized shipbuilding company in Sibu town. A questionnaire survey was also carried out among the shipbuilding companies operating in Sibu town. Descriptive statistics were obtained with the use of the Statistical Package for Social Science (SPSS) software. It was found that quantity surveyors are relevant to the shipbuilding industry.

Furthermore, the shipbuilding companies require quantity surveyors to be familiar with shipbuilding design, materials, process, and contract. The essential services that the shipbuilding companies need from the quantity surveyors are estimating, cost planning, and preparation bill of quantities. This study has complemented the existing literature on the shipbuilding industry and provided a direction for the advancement of the quantity surveying profession.