

## THE PAQS-IWATA FOUNDATION 2019 – TRAVELLING SCHOLARSHIP COMPETITION

Entrant name	Thomas Graham Chatterton BSc (Hons) MRICS Reg. QS MNZIQS
Member Institute/Association	New Zealand Institute of Quantity Surveyors
Essay Title	The Need for Human Wisdom in Managing Emerging Technologies in our Profession

### **Abstract**

*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.*

## **THE NEED FOR HUMAN WISDOM IN MANAGING EMERGING TECHNOLOGIES IN OUR PROFESSION**

### **Introduction**

The tagline for the 2019 23rd Annual PAQS Conference in Malaysia highlights the importance of human wisdom amidst emerging technologies (PAQS, 2019) within Quantity Surveying. Noting that by 2025, worldwide construction output will jump from \$8 trillion in 2016 to \$15 trillion. This increase, primarily driven by development in Asia and North America (Global Construction Perspectives, 2015), results in social, economic, and environmental challenges poised to affect the global construction industry at every level. This growth, coupled with the industry wide acknowledgement that, as a sector, our practises are inefficient and wasteful (Furst, 2012), demonstrates potential for emerging technologies to increase efficiency. As the industry's cost managers, Quantity Surveyors must develop skillsets to succeed with managing emerging technologies by utilising human wisdom.

### **Unprecedented Construction Growth and the Need for Emerging Technologies**

Global Construction Perspectives (2015) forecasts that the volume of construction output will grow at a faster rate than global GDP, increasing by 85% to \$15.5 trillion worldwide by 2030; with considerable growth occurring in the Pacific region. Three countries (China, US and India) are singled out as key contributors, accounting for 57% of all global growth alone.

The South East Asia construction market is set to grow to \$1.1trillion (Global Construction Perspectives, 2015). Indonesia looks to rise, becoming the world's 4th largest construction market (Global Construction Perspectives, 2015).

This growth further demonstrates the need to reduce waste and increase efficiencies to help with the demand of rapid scale urbanisation and reduced environmental impact, particularly in

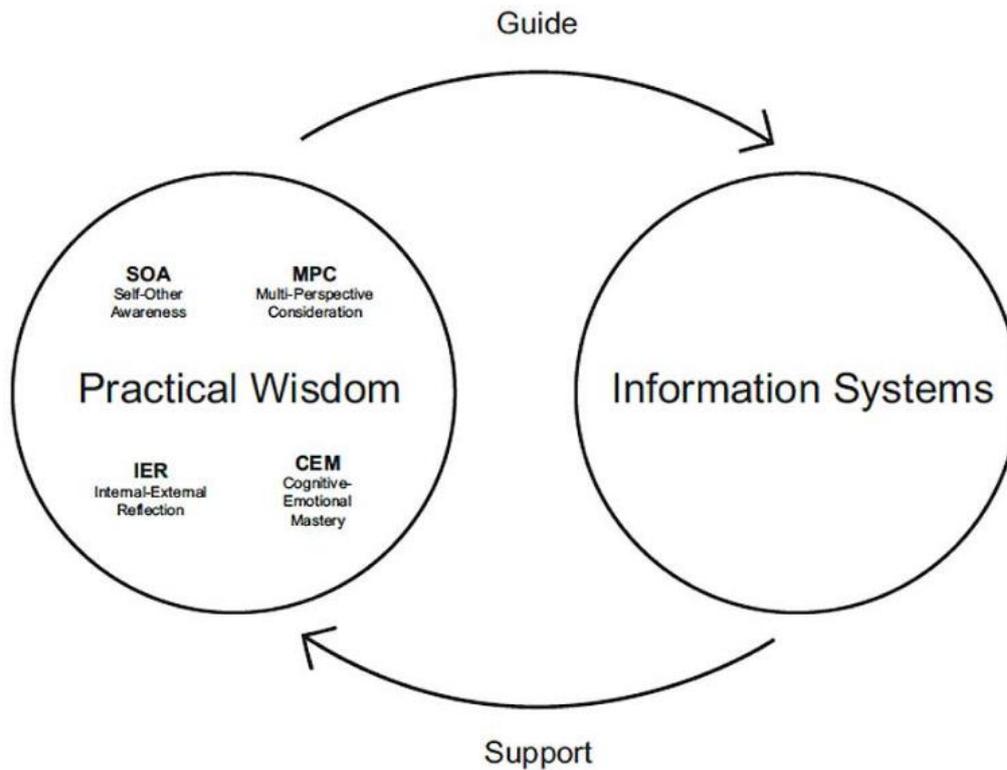
emerging economies. Of relevance to the PAQS forum is the Pacific region, comprising of the largest and highest growth construction markets (Global Construction Perspectives, 2015), delivering the ideal stage for the utilisation of emerging technologies and the incorporation of human wisdom.

### **The Importance of Human Wisdom in the Adoption of Emerging Technologies**

Traditionally we, as professionals, train through a mix of mediums delivered from industry professionals, expert individuals in a work place, in an academic institution, or professional institutes in the form of Continued Professional Development (CPD). The common denominator of these mediums is human wisdom. Human wisdom, in the form of creative thinking coupled with experience, to train the next generation of Quantity Surveyors is the key to adopting emerging technologies.

Human wisdom brings creativity and the capability to think outside the boundaries of the primary focus, providing unique and powerful thoughts and reasoning (Natapoff, 2018). In contrast, computers rely on logic with the ability to deliver calculations at speed without tiring or losing focus and excelling at multi-tasking in comparison to the human mind.

The notion that computers will render human input redundant (Coombes, 2018), should be disregarded. We should be designing the two to complement each other and work cohesively, with human wisdom guiding Information Systems and Information systems supporting human wisdom (Pauline & Dalal, 2018) (Diagram)



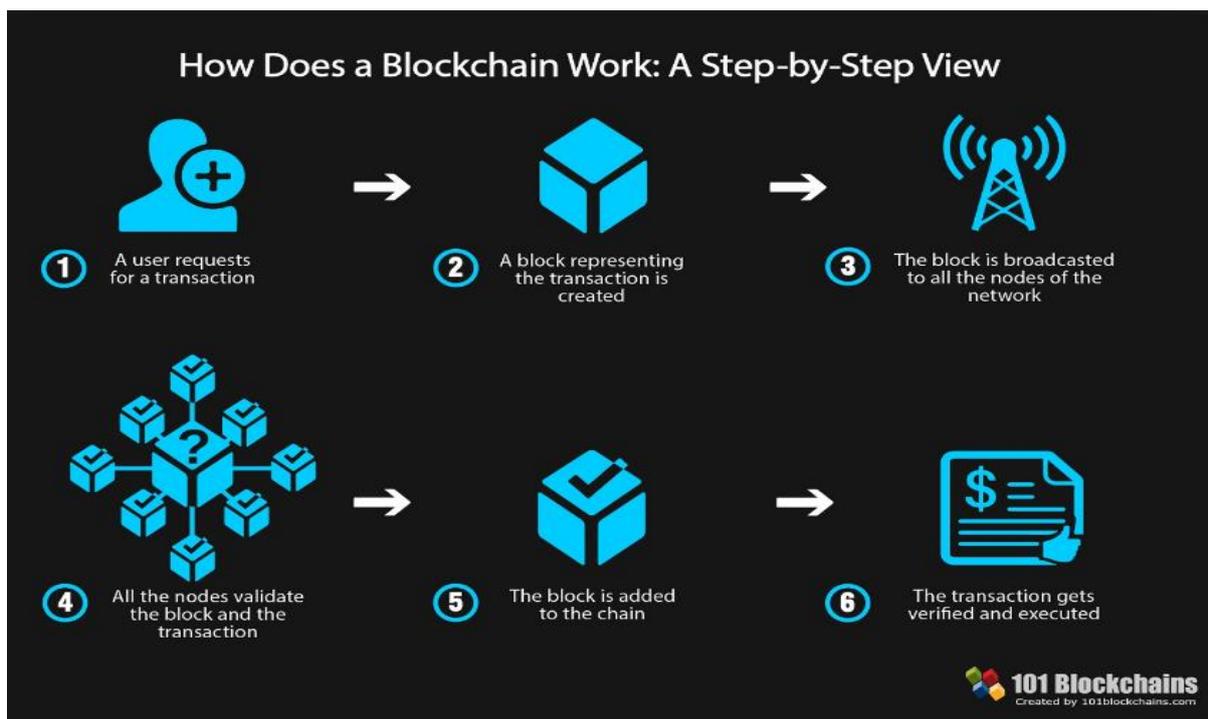
The emergence of technologies such as BIM, Blockchain, Virtual Reality, and Artificial Intelligence into the construction sector relies on traditional Quantity Surveyor skillsets to utilise and implement these technologies. Implementation in the appropriate context enhances the traditional role and is an essential development to meet global construction demand. Effective management of this sources from the human wisdom previously imparted on the Quantity Surveyor by other industry professionals.

### **Emerging Technologies in the Construction and Building Sectors**

On a global scale, Project Federated BIM is already utilised by Architects and Engineers. Quantity Surveyors are involved in this process; however, full capabilities of BIM are still emerging and being understood.

Quantity Surveyors are increasingly extracting quantitative information from models with varying levels of accuracy, rather than the interconnected approach of parametric cost modelling or writing scripts in software within native files.

Another emerging technology to note is Blockchain, promoted by Cryptocurrencies such as Bitcoin. Blockchains have peaked the interest of many sectors, due to the reliable and robust verification process (mining). The benefits associated with a trusted public ledger are obvious, although its adoption is hindered by the volatility and lack of confidence. As this is the equivalent of a financial transaction, it is only natural that the Quantity Surveyor is interested in this emerging technology.



(Anwar, 2018)

Virtual Reality (VR), advertised by the gaming community, is interconnected with BIM and the construction sector. Allowing walkthroughs of projects prior to construction occurring has benefits, such as increased collaboration within the design team,

reduced geographical boundaries, increased Visualisation and improvement of customer experience (Sharifi, 2018).

Artificial Intelligence (AI) exists as a significant feature in our lives today (Coombes, 2018) demonstrated by Autonomous Vehicles, Amazon Alexa, Spotify, Alpha Go Zero. AI will be increasingly investigated and implemented by the construction sector soon, due to it's potential to reduce or remove repetitive tasks (Coombes, 2018)

### **The Challenge for Human Wisdom When Managing Emerging Technologies**

There are three broad categories to consider when managing emerging technologies and human wisdom – Integration, relevancy and maintaining value.

- Integration of systems and technologies used.

Data released in the 2018 Construction Industry Survey: Technology and Skills Edition, conducted by Teletrac Navman and Civil Contractors New Zealand (CCNZ), indicates over half surveyed (57%) said they would get more value if the technology was better integrated with other systems (Teletrac Navman, 2018)

- Relevant and quality training in a rapidly changing technology market.

The 2018 Construction Industry Survey: Technology and Skills edition survey indicated that well over half (59%) surveyed said they would get more value if the staff better understood the capabilities of the technology.

- Maintaining value of Quantity Surveyor services.

The Quantity Surveyor's role and their ultimate analytical approach is vital to the success of any project, with their assessments often influencing the Client's decisions at multiple stages of a project. In order to provide a 'best cost solution' within this everchanging environment, Quantity Surveyors must upgrade their skills, including those of current construction technology and market price levels. This ensures they are prepared to diversify their services with the inclusion of emerging technologies in order to achieve an excellent outcome for their clients (Lodetti, 2018).

### **The Challenge for the Construction Sector**

BIM, an emerging technology subject to diverse and comprehensive review, is a prime example of the challenges the construction sector faces with the adoption of emerging technologies.

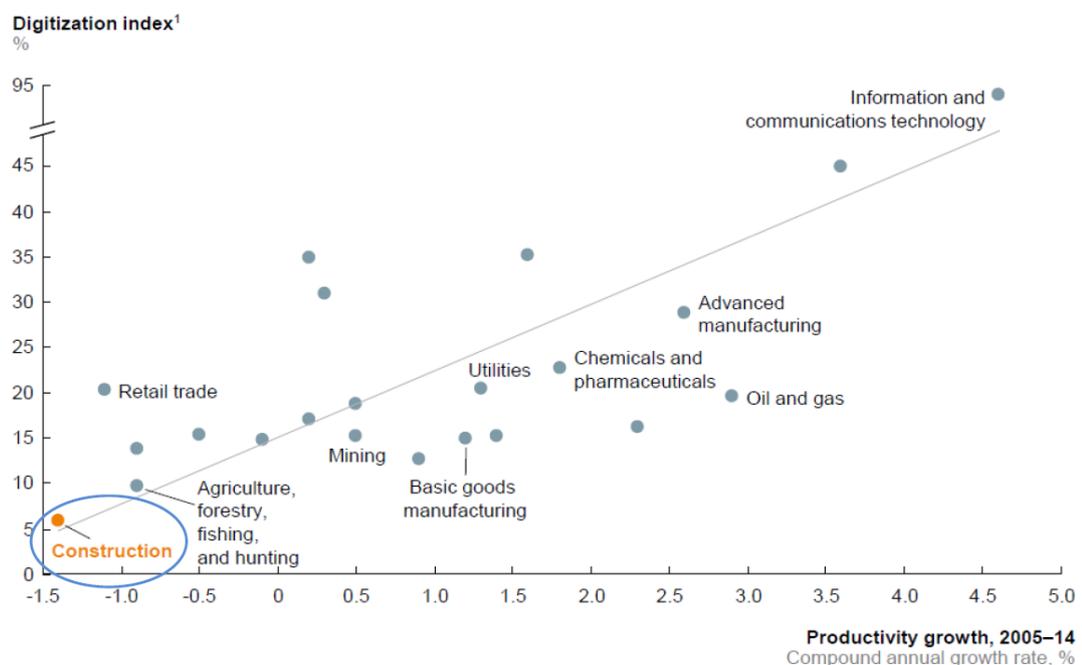
In Sri Lanka, BIM utilisation is low, with only 25% industry uptake (Abeywardhana, 2016). UK based studies found that BIM adoption has increased from 10% in 2011 to over 70% in 2018, with a 12% increase in the last year alone (NBS, 2018). Similar studies in New Zealand found 95% of industry participants used BIM within the 2017 – 2018 period, and 97% plan to use BIM in the coming year. When New Zealand client groups were surveyed, it was found that only 38% of clients utilised BIM within the 2016 – 2017 period, but 59% of all commercial projects in New Zealand utilised BIM to some extent (BIM Acceleration Committee, 2018).

The utilisation and implementation of 5D BIM practices internationally is much lower, a recent survey determined the use of BIM for cost estimating internationally only sat

at 24% (McCuen & Miller, 2017). A similar study of the New Zealand AEC industry found that, in the past twelve months, the use of BIM for cost estimating has decreased from 53% to 46% (BIM Acceleration Committee, 2018). The adoption of BIM, which is a relatively older emerging technology, evidently varies between locations.

Construction remains one of the slowest sectors in which technology adoption is implemented, and Quantity Surveying is slower still. (Wilson, 2017)

## Adoption of Digital Technology



### The Challenge for the PAQS Regions

The key issues for Quantity Surveyors to consider is summarised to these critical challenges:

- How can we maintain construction output demand in the medium and long-term period, with the help of emerging technologies?
- How can high-performance buildings be delivered on a cost-effective, efficient and reduced waste basis within in the digital arena?
- How do we integrate the of development with technology and human wisdom?

- What robust training methods need to be developed to cater ever-evolving technologies?
- How is confidence delivered for the adoption of emerging technologies?

Four critical capability areas for adding human wisdom to the management of emerging technologies can be identified, as potentially meaningful contributors to developing solutions to these challenges:

1. Academic Institutions teaching traditional Quantity Surveying skills and techniques in a digital environment.
2. Software and technology adoption in industry, coupled with regular and relevant training
3. Professional Institutions and Associations integrating emerging technology with CPD.
4. Leveraging traditional Quantity Surveying skills with emerging technologies.

The increasing global demand for construction means the ability for the Quantity Surveyor to increase efficiency and maintain sound and quality financial advice is imperative. Quantity Surveyors that respond to emerging technologies will be ideally positioned to expand their services beyond traditional cost management (Exactal, 2018). The pacific region's high construction sector growth forecasts mean Quantity Surveyors in the PAQS region will be uniquely positioned to play a key role in adopting this new era of emerging technology. Their effectiveness will be determined by the extent to which they embrace and up-skill to suit this changing business environment.

## References

- Abeywardhana, R. (2016). *Quantity surveying practice with the adoption of BIM applications in Sri Lanka*. (Dissertation, Sheffield Hallam University, Sheffield, England). <https://doi.org/10.13140/RG.2.2.28792.85762>
- Anwar, H (2018). *The Ultimate Blockchain Technology Guide: A Revolution to Change the World*. <https://101blockchains.com/ultimate-blockchain-technology-guide/>
- Australian Institute of Quantity Surveyors (AIQS) & New Zealand Institute of Quantity Surveyors (NZIQS). (2018). *Australia and New Zealand BIM Best Practice Guidelines*. Retrieved from <https://www.nziqs.co.nz/Resources-Tools/NZIQS-Resources/BIM-Best-Practice-Guidelines>
- Aibinu, A. & Venkatesh, S. (2014). Status of BIM adoption and the BIM experience of cost consultants in Australia. *Journal of Professional Issues in Engineering Education and Practice*, 140(3), [https://doi.org/10.1061/\(ASCE\)EI.1943-5541.0000193](https://doi.org/10.1061/(ASCE)EI.1943-5541.0000193)
- BIM Acceleration Committee. (2017). *BIM Benchmark Survey 2017*. Retrieved from <https://www.eboss.co.nz/assets/Uploads/BIM-Benchmark-Survey-2017pdf>
- BIM Acceleration Committee. (2016). *The New Zealand BIM Handbook*. Retrieved from <https://drive.google.com/file/d/0BxFZLs2lq3GoUIJBa3poQ0t5YkE/view>
- Coombes, A (2018). *Could technology make my job redundant?* <https://drive.google.com/file/d/0BxFZLs2lq3GoUIJBa3poQ0t5YkE/view>
- Exactal. (2018). *A QS Future: Quantity Surveying Predictions for 2018*. Retrieved from <https://www.exactal.com/en/company/blog/a-qs-future-quantity-surveying-predictions-for-2018/>
- Furst, P. (2012) International Risk Management Institute. (2016). *Ineffective Construction Management Practices and Their Impact on Project Safety*. <https://www.irmi.com/articles/expert-commentary/ineffective-construction-management-practices>

Global Construction Perspectives. (2015). Global Construction 2030:  
<<http://www.globalconstruction2030.com/>>.

McGraw Hill Construction. (2014). *The business value of BIM in Australia and New Zealand: How building information modelling is transforming the design and construction industry*. Retrieved from <http://www.consultaustralia.com.au/docs/default-source/bim/the-business-value-of-bim-in-australia-new-zealand.pdf>

McCuen, T., & Miller, K. (2017). *BIM estimating in the classroom*. Paper presented at the Academic Interoperability Coalition 11th BIM Academic Symposium, Boston, MA. Retrieved from [https://www.researchgate.net/publication/318381121\\_BIM\\_Estimating\\_in\\_the\\_Classroom](https://www.researchgate.net/publication/318381121_BIM_Estimating_in_the_Classroom)

NBS. (2018). *National BIM report 2018*. Retrieved from <https://www.thenbs.com/knowledge/the-national-bim-report-2018>

PAQS (2019). *Website for the 2019 Annual PAQS Conference*:  
<https://www.paqs2019.com/>

Pauline, P, & Dalal, N (2018). Where wisdom meets technology. Retrieved from [http://www.massey.ac.nz/massey/about-massey/news/article.cfm?mnarticle\\_uuid=1DFBB485-9793-4846-9FC4-FC68ABE066EC](http://www.massey.ac.nz/massey/about-massey/news/article.cfm?mnarticle_uuid=1DFBB485-9793-4846-9FC4-FC68ABE066EC)

Lodetti, L (2018). *The Evolving Role of the PQS 'Professional Quantity Surveyor'*  
<https://www.prendos.co.nz/the-evolving-role-of-the-pqs-professional-quantity-surveyor/>

Rodgers, C., Hosseini, R., Chileshe, N. & Rameezdeen, R. (2015). *Building Information Modelling (BIM) within the Australian construction related small and medium sized enterprises: Awareness, practices and drivers*. *Construction Law Journal*, 32, 691–700. Retrieved from [https://www.researchgate.net/publication/280709730\\_Building\\_information\\_modelling\\_BIM\\_within\\_the\\_South\\_Australian\\_construction\\_related\\_small\\_and\\_medium\\_sized\\_enterprises\\_Awareness\\_practices\\_and\\_drivers](https://www.researchgate.net/publication/280709730_Building_information_modelling_BIM_within_the_South_Australian_construction_related_small_and_medium_sized_enterprises_Awareness_practices_and_drivers)

- Natapoff, S, (2017). *Where wisdom meets technology*. Retrieved from <https://www.salon.com/2018/11/17/the-future-of-artificial-intelligence-depends-on-human-wisdom/>
- Teletrac Navman, (2018). *Construction Industry Survey: Technology and Skills Edition*.  
[https://www.teletracnavman.co.nz/construction-industry-survey-technology-edition2018\](https://www.teletracnavman.co.nz/construction-industry-survey-technology-edition2018/)
- Wilson, S. (2015). *Construction industry still slow to adopt new technology*:  
<https://one.arch.tamu.edu/news/2017/5/2/construction-adopt-technology/>
- Zhao, X., Gao, S., & Pienaar, J. (2016). What hinders the BIM adoption in Singapore: an empirical study. *Proceedings of the CIB World Building Congress 2016*, 4, 153–164.  
Retrieved from [https://tutcris.tut.fi/portal/files/6186967/WBC16\\_Vol\\_4.pdf](https://tutcris.tut.fi/portal/files/6186967/WBC16_Vol_4.pdf)