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## 5D BIM IN A CONSULTING QS ENVIRONMENT

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BIM is triggering a revolution in the construction industry, and the concept known as 5D BIM, which ultimately concerns the automatic quantification of 3D objects contained within a BIM model in order to become the primary source of information for cost planning services, has the potential to be used by consultant quantity surveyors (Qs) to streamline their workflows and increase the quality of the services they provide.

Semi-structured interviews with consultant Qs from one large global practice, experienced with use 5D BIM, on their perceptions of the benefits and barriers of 5D BIM implementation were carried out. The sample was limited to New Zealand and Australian offices of the practice.

The findings suggest that 5D BIM provides numerous benefits to professional quantity surveyors over traditional methods, mainly through increased efficiency and visualization. Furthermore, other benefits could be achieved such as improved value management services to the client and rapid identification of design changes. However, as currently practised, these perceived benefits were only being achieved to a limited extent, due to a number of barriers limiting 5D BIM implementation. These barriers were mainly associated with incomplete design in the BIM model, lack of standards to facilitate electronic measurement, legal issues, lack of knowledge of construction methods and a lack of government support. As a consequence, the use of 5D BIM appears to be limited, and professional quantity surveyors are still heavily reliant on using traditional methods. Despite this, there was a strong indication that 5D BIM implementation will achieve these benefits to a greater extent in the future.

Further research should be carried out to identify the BIM skills which Qs will need in the future to reach the full potential of 5D BIM as described in the literature, and in this research.

### References

- Abbansnejad, B. & Moud, H.I. (2013). BIM and basic challenges associated with its definitions, interpretations and expectations. *International Journal of Engineering Research and Applications*, 3(2), 277-294.
- American Society of Heating Refrigeration and Air Conditioning Engineers. (2009). *An introduction to building information modeling (BIM)*, Georgia, USA. Retrieved from [http://cms.ashrae.biz/bim/pdf/BIMGuide\\_Rev\\_110309.pdf](http://cms.ashrae.biz/bim/pdf/BIMGuide_Rev_110309.pdf)
- Appleby, S. (2012). *Let it flow*. RICS Construction Journal, Feb-Mar 2012, 14. Retrieved from [http://www.rics.org/site/download\\_feed.aspx?fileID=11129&fileExtension=P](http://www.rics.org/site/download_feed.aspx?fileID=11129&fileExtension=P) DF
- American General Contractors of America. (2006). *The contractors' guide to BIM*. Retrieved from <http://www.agcnebuilders.com/documents/BIMGuide.pdf>
- Aranda-Mena, G., Crawford, J., Chevez, A., & Froese, T. (2009). Building information modelling demystified: Does it make business sense to adopt BIM? *International Journal of Managing Projects in Business*, 2(3), 419.

- Australian Institute of Architects. (2010). *BIM in Australia*: Report on BIM/IPD forums. Australia.
- Azhar, S., Khalfan, M, & Maqsood, T. (2012). Building information modeling (BIM): Now and beyond. *Australian Journal of Construction Economics and Building*, 12(4), 15-28.
- Azhar, S., Nadeem, A., Mok, J. Y., & Leung, B. H. (2008). Building Information Modeling (BIM): A new paradigm for visual interactive modeling and simulation for construction projects. In *Proc., First International Conference on Construction in Developing Countries* (pp. 435-446).
- Barlish, K., & Sullivan, K. (2012). How to measure the benefits of BIM—A case study approach. *Automation in Construction*, 24, 149-159. doi:10.1016/j.autcon.2012.02.008
- BIM Industry Working Group. (2011). Strategy paper for the government construction client group. *Department of Business, Innovation and Skills*. London, UK. Retrieved from <http://www.bimtaskgroup.org/wp-content/uploads/2012/03/BIS-BIM-strategy-Report.pdf>
- Boon, J. (2009). *Preparing for the BIM revolution*. Paper presented at the 13th Pacific Association of Quantity Surveyors Congress (PAQS 2009). 17 - 18 August 2009, Kuala Lumpur, Malaysia. Retrieved from: [http://ismwiki.vms.my/images/7/72/PREPARING\\_FOR\\_THE\\_BIM\\_REVOLUTION.pdf](http://ismwiki.vms.my/images/7/72/PREPARING_FOR_THE_BIM_REVOLUTION.pdf)
- Boon, J., & Prigg, C. (2012). Evolution of quantity surveying practice in the use of BIM – the New Zealand experience. *Proceedings of the Joint CIB International Symposium of W055, W065, W089, W118, TG76, TG78, TG81 & TG84*, Montreal, Canada, 26-29 June 2012.
- buildingSMART. (2010). General questions about buildingSMART, IAI, and IFC. Retrieved from [www.iai-tech.org](http://www.iai-tech.org)
- buildingSMART. (2012). 'National Building Information Modeling Initiative, Vol. 1'. Retrieved from [http://buildingsmart.org.au/nbi-folder/NationalBIMInitiativeReport\\_6June2012.pdf](http://buildingsmart.org.au/nbi-folder/NationalBIMInitiativeReport_6June2012.pdf)
- Department of Building and Housing. (2009). *Building and Construction Sector Productivity Taskforce*. Retrieved from <http://www.dbh.govt.nz/building-construction-sector-forum-2009>
- Eastman, C, Teicholz, P., Sacks, R. and Liston, K. (2011). *BIM Handbook: A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers and Contractors*, John Wiley, New York.
- Fatt, C. (2012). Singapore BIM roadmap. Retrieved from <http://www.bimmepaus.com.au/libraries/resources/BMA%20Forum%202012/singapore%20bim%20roadmap%202012-rev.pdf>
- Firat, C.E., Arditi, D., Hamalainen, J.P., Stenstrand, J., & Kiiras, J. (2010). Quantity take-off in model-based systems. *Proceedings of the CIB W78 2010: 27<sup>th</sup> International Conference*, 16-18 November, Cairo, Egypt.
- Forgues, D., Iordanova, I., Valdivieso, F., & Staub-French. (2012). Rethinking the cost estimating process through 5D BIM: A case study. *Proceedings of the Construction Research Congress 2012*, p.779.
- Foster, L. L. (2008). *Legal issues and risks associated with Building Information Modeling Technology*. ProQuest.

- Gable, G. (1994). Integrating case study and survey research methods: an example in information systems. *European Journal of Information Systems* 3(2): pp. 112-126.
- Klein, R. (2012). 'A work in progress'. RICS Construction Journal, Feb-March 2012, Retrieved from [http://www.rics.org/site/download\\_feed.aspx?fileID=11129&fileExtension=PDF](http://www.rics.org/site/download_feed.aspx?fileID=11129&fileExtension=PDF)
- Khemlani, L. (2006). Visual Estimating: Extending BIM to Construction. *AECbytes*. Retrieved from <http://www.aecbytes.com/buildingthefuture/2006/VisualEstimating.html>
- Macdonald, J.A. (2012). A framework for collaborative BIM education across the AEC disciplines. In *37<sup>th</sup> Annual Conference of the Australian Building Educators (AUBEA)*, p.223 – 230.
- Masterspec (2012). New Zealand National BIM Survey 2012, Retrieved from <http://www.masterspec.co.nz/news/reports-1243.htm>
- Matipa, W. M., Kelliher, D., & Keane, M. (2008). How a quantity surveyor can ease cost management at the design stage using a building product model. *Construction Innovation: Information, Process, Management*, 8(3), 164-181.
- McCuen, T. L. (2008). Scheduling, Estimating, and BIM: a Profitable Combination. *AACE International Transactions*, pp BIM11-19. Retrieved from <http://www.2385.a.hostable.me/CIV1299/Readings/07/Scheduling,%20Estimating,%20and%20BIM%20a%20Profitable%20Combination.pdf>
- McGraw Hill Construction. (2008). *Building information modelling (BIM)*. New York: McGraw Hill Research and Analytics.
- National BIM Report. (2013). *NBS National Report*. United Kingdom.
- National Building Information Modeling Standard. (2007). National Institute of Building Sciences, buildingSMARTalliance. United Kingdom.
- Olatunji, O.A., Sher, W., Ogunsemi, D.R. (2010). The impact of building information modeling on construction cost estimation. *Proceedings of the W055 – Special Track 18<sup>th</sup> CIB World Building Congress*, May 2010, 193 – 201, Salford, UK. Retrieved from [http://cibworld.xs4all.nrl/dl/publications/w055\\_pub341.pdf#page=198](http://cibworld.xs4all.nrl/dl/publications/w055_pub341.pdf#page=198)
- Olatunji, O. A. (2011). Modelling the costs of corporate implementation of building information modelling. *Journal of Financial Management of Property and Construction*, 16(3), 211-231.
- Popov, V., Migilinskas, D., Juocevicius, V., & Mikalauskas, S. (2008). *Application of building information modelling and construction process simulation ensuring virtual project development concept in 5d environment*. Vilnius: Insitute of Internet and Intelligent Technologies.
- Quek, J. K. (2012). Strategies and Frameworks for Adopting Building Information Modelling (BIM) for Quantity Surveyors. *Applied Mechanics and Materials*, 174, 3404-3419.
- Roberts, B. (2012). 'Team BIM', *RICS Construction Journal*, Feb-Mar 2012, Retrieved from [http://www.rics.org/site/download\\_feed.aspx?fileID=11129&fileExtension=PDF](http://www.rics.org/site/download_feed.aspx?fileID=11129&fileExtension=PDF)

- Sabol, L. (2008). Challenges in cost estimating with building information modeling. *IFMA World Workplace*. Retrieved from [http://dcstrategies.net/files/2\\_sabol\\_cost\\_estimating.pdf](http://dcstrategies.net/files/2_sabol_cost_estimating.pdf)
- Sattineni, A. and Bradford, R., H. (2011). Estimating with BIM: A survey of US construction companies. *Proceedings of the 28th ISARC*, Seoul, Korea.
- Shen, Z. and Issa, R.R.A. (2010). 'Quantitative evaluation of the BIM-assisted construction detailed cost estimates'. *Journal of Information Technology in Construction*, 15, 234-257.
- Smith, D. (2012). 'Question time'. *RICS Construction Journal*, Feb-Mar 2012, 14. Retrieved from [http://www.rics.org/site/download\\_feed.aspx?fileID=11120&fileExtension=PDF](http://www.rics.org/site/download_feed.aspx?fileID=11120&fileExtension=PDF)
- Smith, P. (2009). *Trends in the Australian quantity surveying profession 1995:2008*. Paper presented at the 13<sup>th</sup> Pacific Association of Quantity Surveyors Congress (PAQS 2009). 17 – 18 August 2009, Kuala Lumpur, Malaysia. Retrieved from [http://rismwiki.vms.my/images/e/e6/TRENDS\\_IN\\_THE\\_AUSTRALIAN\\_QUANTITY\\_SURVEYING.pdf](http://rismwiki.vms.my/images/e/e6/TRENDS_IN_THE_AUSTRALIAN_QUANTITY_SURVEYING.pdf)
- Smith, D. K., & Tardif, M. (2012). *Building information modeling: a strategic implementation guide for architects, engineers, constructors, and real estate asset managers*. John Wiley & Sons.
- Stanley, R & Thurnell, D. (2013). *Current and anticipated future impacts on cost modelling in Auckland*. Submitted paper for AUBEA 2013 37<sup>th</sup> Annual Conference, November 2013, The University of Auckland, New Zealand.
- Thurairajah, N, Haigh, R and Amaratunga, R.D.G. (2006). Cultural transformation in construction partnering projects. *Proceedings of the Annual Research Conference of the Royal Institution of Chartered Surveyors*, 7-8 September. University College London.
- Thurairajah, N & Goucher, D. (2013). Advantages and challenges of using BIM; a cost consultants perspective. *Proceedings of the 49<sup>th</sup> ASC Annual International Conference*.
- Tran, V., Tookey, J. E. and Roberti, J. (2012). Shaving BIM: Establishing a framework for future BIM research in New Zealand. *International Journal of Construction Supply Chain Management*, Vol. 2, No. 2 (pp. 66-79)
- Whatmore, L. (2012). 'Adding value'. *RICS Construction Journal*, Feb-Mar 2012, 14. Retrieved from [http://www.rics.org/site/download\\_feed.aspx?fileID=11120&fileExtension=PDF](http://www.rics.org/site/download_feed.aspx?fileID=11120&fileExtension=PDF)
- Yan, H., & Damian, P. (2008). *Benefits and barriers of building information modelling*. Loughborough University: UK.
- Zhiliang, M., Zhenhua, W., Wu, S., & Zhe, L. (2011). Application and extension of the IFC standard in construction cost estimating for tendering in China. *Automation in Construction*, 20(2), 196-204.
- Zhiliang, M., Xiude, Z., Song, W., Zhenhua, W. & Zhe, L. (2010). Framework design for BIM based estimating software. *Proceedings of the CIB W78 2010: 27<sup>th</sup> International Conference – Cairo, Egypt*, 16-18 November.

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