UNIVERSITY OF CAMBRIDGE
Centre for Digital Built Britain

2017/18 Mini-Project

The Edge, Amsterdam

Showcasing an exemplary IoT building

Final Report

Author 1 Aftab Jalia, Department of Architecture, University of Cambridge
Author 2 Ron Bakker, PLP Architecture, London
Author 3 Dr Michael Ramage, Centre for Natural Material Innovation, Department of Architecture, University of Cambridge Email: mhr29@cam.ac.uk

Abstract

The Edge is an office building in Amsterdam that was built with the Internet of Things (IoT) as its foundational principle. Despite not having used BIM in the initial stages of its planning and construction, The Edge showcases many of BIM's post-occupancy benefits; serving as a unique example that operates to a predicted BIM Level 3 standard.

As digital built environments gain momentum, this paper seeks to develop a model case study template by considering a wide range of issues arising out of deploying IoT and BIM processes. By articulating emerging themes of big data, systems integration, risk sharing and building capacity for cross-disciplinary exchange, the report shares lessons from The Edge over its three-year operation period.

The success of The Edge was found to go beyond its use of cutting-edge technologies and was instead traced to effective communication between key drivers who championed and co-operated to realise diverse and original ideas.

This report identifies those key drivers, elucidates the synergy of their communication and presents lessons and limitations of this pioneering building in the context of digital built Britain.

Research Question

How can case studies of built examples incorporating smart technologies help further the adoption of BIM in building and industry?

Methodology

A mix of research methodologies was used for studying The Edge.

The research team comprising Dr Michael Ramage, Aftab Jalia and The Edge's architect Ron Bakker, visited the building in January and March to study its facilities first hand.

Interviews were conducted with various persons associated with the design, planning and occupancy of The Edge and other smart buildings. The purpose of this was to understand the approach and experiences of key people at each stage of the project and identify challenges in rolling out IoT and BIM processes.

In order to contextualise The Edge's achievements, parallels were drawn between similar software services across different geographies, such as Spacefinder at the University of Cambridge, as well as other international buildings, such as The Crystal in London, that also uses smart technologies and sustainable architectural solutions.

Secondary sources of literature were examined to understand the direction of BIM worldwide and in the UK industry through the various PAS 1192 documents and international publications proposing BIM's benefits.

Conclusion

Despite not following BIM-prescribed processes in its planning and construction phases, The Edge is an exemplary showcase of an IoT building. Through its incorporation of technologies and successful use over

the past three years, it offers unparalleled lessons in big data management, building energy visualisation and performance, user profiling, building capacities across disciplines, systems integration and risk-sharing. These themes echo with those of BIM users thus showcasing a live example of possible benefits and challenges in BIM's uptake.

Related and Further Work

This paper seeks to articulate the many features born out of pursuing an IoT building. There is scope to further examine The Edge through quantitative metrics against similar operations such as: energy visualisation, monitoring and management, predictive facilities management.
The developers of The Edge are on schedule to inaugurate two new buildings in 2018 which they eventually wish to connect to compare with The Edge. As The Edge stood unchallenged in its capabilities when completed in 2015, metrics from new buildings will help researchers compare its relative performance for post-occupancy and energy usage.

Acknowledgements

This project was supported by a mini-projects award from the Centre for Digital Built Britain, under InnovateUK grant number 90066

The authors are grateful to the following people who shared their experiences and expertise:
- Erik Ubels, CTO, OVG and previously CIO, Deloitte, Amsterdam
- Rogier van Griensven, Deloitte, Amsterdam
- Lisa Kuijpers, Deloitte – Real Estate, Amsterdam
- Anne Wernand, Mapiq, Delft
- André Joubert, Deloite – IT & Workplace Services
- Daryoush Amini, Siemens – Building Technology Manager, The Crystal, London

References

World Green Business Council. *The Business Case for Green Building: A Review of the Costs, Benefits for Developers, Investors and Occupants.* Toronto: WGBC, 2013.

Andy Priestner, David Marshall and Modern Human. *Spacefinder Illuminating study spaces at the University of Cambridge and matching them to user need and activity.* Assessment, FutureLib, Cambridge: University of Cambridge, 2016.

Boston Consulting Group. *The Edge: Creating the world's most sustainable and most connected office building by integrating smart technologies and collaborating with suppliers.* Case Study, Geneva: World Economic Forum, 2017.

Garber, Richard. *BIM design : realising the creative potential of building information modelling.* Chichester, West Sussex: Wiley, 2014.

BIM Design: Realising the Creative Potential of Building Information Modelling. London: John Wiley & Sons, 2014.

Naafs, Saskia. *'Living laboratories': the Dutch cities amassing data on oblivious residents.* The Guardian. March 1, 2018.
https://www.theguardian.com/cities/2018/mar/01/smart-cities-data-privacy-eindhoven-utrecht (accessed March 22, 2018).

Mapiq. *From Smart to Responsive.* Whitepaper Document, Delft: Mapiq , 2018.

Mapiq. *Smart Building Ecosystems.* Whitepaper Document, Delft: Mapiq, 2017.

McGraw Hill Construction. *The market for smart technologies in buildings and BIM is directly related* . SmartMarket Report, Bedford: McGraw Hill, 2014.

Parvin, Alastair. "Data is the answer, but what was the question?" *Architetcure + Urbanism*, November 2014: 126.

Sanguientti, Paola, Pasi Paasiala, and Charles Eastman. "Automated Energy Performance Visualization for BIM." In *Building Information Modeling: In Current and Future Practice*, edited by Karen M. Kensek and Douglas E. Noble, 119 - 129. New Jersey: John Wiley & Sons, 2014.

Randall, Tom. *The Smartest Building in the World: Inside the connected future of architecture.* Case Study, Bloomberg Businessweek, 2015.

Rotterdam Climate Initiative. *Honourable recognition from former president Clinton.* October 4, 2011. http://www.rotterdamclimateinitiative.nl/uk/news/honourable-recognition-from-former-president-clinton?news_id=782&p=5 (accessed March 30, 2018).