

# Sustainable BIM-driven Design through to Post-Occupancy Evaluation of Buildings.

Victoria Fillingham | Dr Milan Radosavljevic | Dr Stephen Gulliver | Adrian Malone | Shahida Rajabdeen

## Introduction

The UK design and construction industry has often been criticised for its failure to adapt to changes in technology, frequently finding itself left behind the fast-paced developments of other industries. Best-practice innovation within the three inter-related issues of sustainability, Building Information Modelling and procurement, will have a transformative influence on the future shape of the industry and its competitiveness around the world. The publication of the UK Government Construction Strategy in May 2011, highlighted the necessity for all publically procured projects to be utilising Building Information Modelling techniques to the extent that the process is a managed, 3-Dimensional, data rich environment. By ensuring all projects reach Level 2 BIM, the Government is striving to dramatically reduce the energy and cost efficiency of its assets – a factor that will drive innovative procedures right across the construction industry.

### BIM Maturity Levels

The Maturity Model illustrates the levels of technical and collaborative working, as should be applied to all projects and contracts in the construction industry.

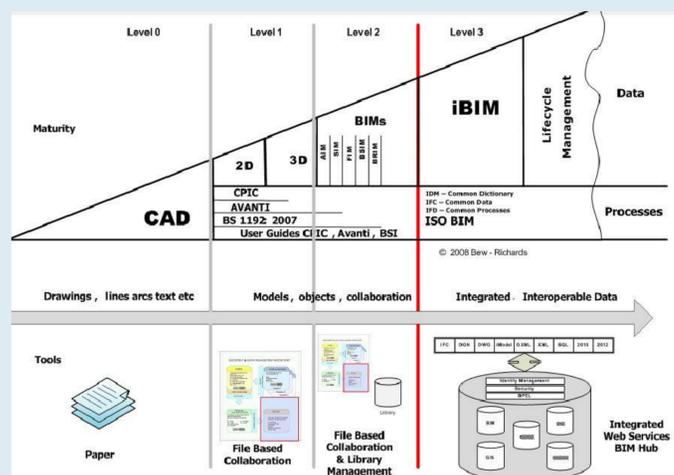


Figure 1. BIM Maturity Level Model (Source: BIM Industry Working Group)

#### Definitions of Levels

1. Managed CAD in 2-Dimensional or 3-Dimensional format using file-based collaborative tools, providing a common data environment.
2. Managed 3-Dimensional environment held in separate discipline BIM tools with attached data, utilising "4D" programming tools and "5D" cost elements.
3. Fully interoperable process and data integration enabled by "web services" compliant with open format standards, managed by a collaborative model server, iBIM.

## What is BIM?

BIM is about information, communication and delivery. It is the acronym widely used for 'Building Information Modelling', commonly defined as a digital representation of the physical and functional characteristics of a facility, combined to create a 'shared knowledge resource' of information that can be used to 'form a reliable basis for decisions during its life cycle, from earliest conception to demolition' (Construction Project Information Committee).

Successful adoption of BIM from the earliest point of conception will lead to a fully collaborative environment with the potential for multi-disciplinary information to be utilised within a single operative model. The opportunity for capturing, analysing and assessing data will result in greater efficiencies within all aspects of the construction process.

## An Industry Response

Faithful+Gould is a world leading construction consultancy, who understands the importance of a collaborative working environment. As a company, Faithful+Gould are striving to integrate BIM within the project delivery process, introducing it as a stimulus to collectively challenge the procedures and strategies adopted throughout a project's life.

Fully integrated BIM will enable construction specialists to offer clients the opportunity to explore solutions with respect to the critical savings that will be achieved in both programme and budget. Structured timeline analysis and cost estimation that are linked directly within the model, adds a further dimension to the Level 2 operation.

However there is a growing requirement for a greater volume of information to be available about an project, earlier on in the delivery of a project. Recognising this fact is key for the successful management of a facility beyond construction and on into its operational life.

To ensure that the industry is well enough equipped to achieve this, Faithful+Gould have undertaken this collaborative research project with the main aim of developing an approach to delivery that puts the Total Cost of Ownership at its very centre.

## Project Objectives

- To provide practically focussed research-led analysis of the service delivery procedures adopted by Faithful+Gould, to support the integration of cost and project management services.
- To critically evaluate current interfaces between project and cost consultancy and the wider construction supply chain around the four key metrics of cost, quality, time and carbon; identifying how existing arrangements are challenged by the adoption of BIM.
- Evaluate the use of open and propriety information, software standards and formats with regards to achieving government set targets.
- To propose 'commercially-evaluated' changes, introduced as a part of Building Information Modelling process delivery model.
- Analyse the scalability of potential changes with regards to policy, client behaviour and investment criteria.

## Methodology

- Review of the current state of Building Information Modelling development through existing publications and peer-reviewed papers.
- Mapping the processes within the cost consultancy sector and the supply chain as a whole, as well as the requirements for achieving BIM maturity levels, systematically categorising the stages of the delivery process.
- Develop a carbon reduction prioritisation plan, identifying the carbon intensity of each stage within the delivery process, completing a carbon data case study.

## Industry Profile

### Faithful+Gould, Atkins Group

Adrian Malone, HR Business Partner and Head of Commercial Research, has been responsible for the development and implementation of Faithful+Gould's Building Information Modelling strategy for the UK and for embedding BIM into overall business practice. Faithful+Gould have a number of advisory roles within industry boards such as the Royal Institute of Chartered Surveyors BIM Working Group, the Construction Industry Council and the Government BIM Protocol Steering Group.

[www.fgould.com/uk/topics/bim](http://www.fgould.com/uk/topics/bim)

## Importance of Research

This research project will be a driving factor towards meeting the targets set by the UK Government Construction Strategy, which has challenged the industry to reduce project cost by 20% whilst improving asset quality. It will propose adaptations to the method of service delivery that will ensure the complete life cycle of a project is documented by all members of the supply chain, within a single interoperable representation of data, pushing the UK into the position of being one of the leading industrial bodies for project delivery and facility management across the globe.

## References

1. A. Malone, "Realising the Potential of BIM" January 2013
2. BuildingSMART, 2010 'Strategy Paper for the Government Construction Client Group', BIM Industry Working Group, March 2011.
3. B/555 Roadmap, "Design, Construction & Operation Data & Process Management for the Built Environment", BSI, January 2012.
4. M. Muzvimwe, "5D BIM Explained" September 2011
5. D. Sinclair, "BIM Overlay to the RIBA Outline Plan of Work" May 2012

## Contact information

- Technologies for Sustainable Built Environments Centre, JJ Thomson Building, University of Reading, Whiteknights, RG6 6 6AF.
- [v.l.fillingham@pgr.reading.ac.uk](mailto:v.l.fillingham@pgr.reading.ac.uk)
- [www.reading.ac.uk/tsbe](http://www.reading.ac.uk/tsbe)