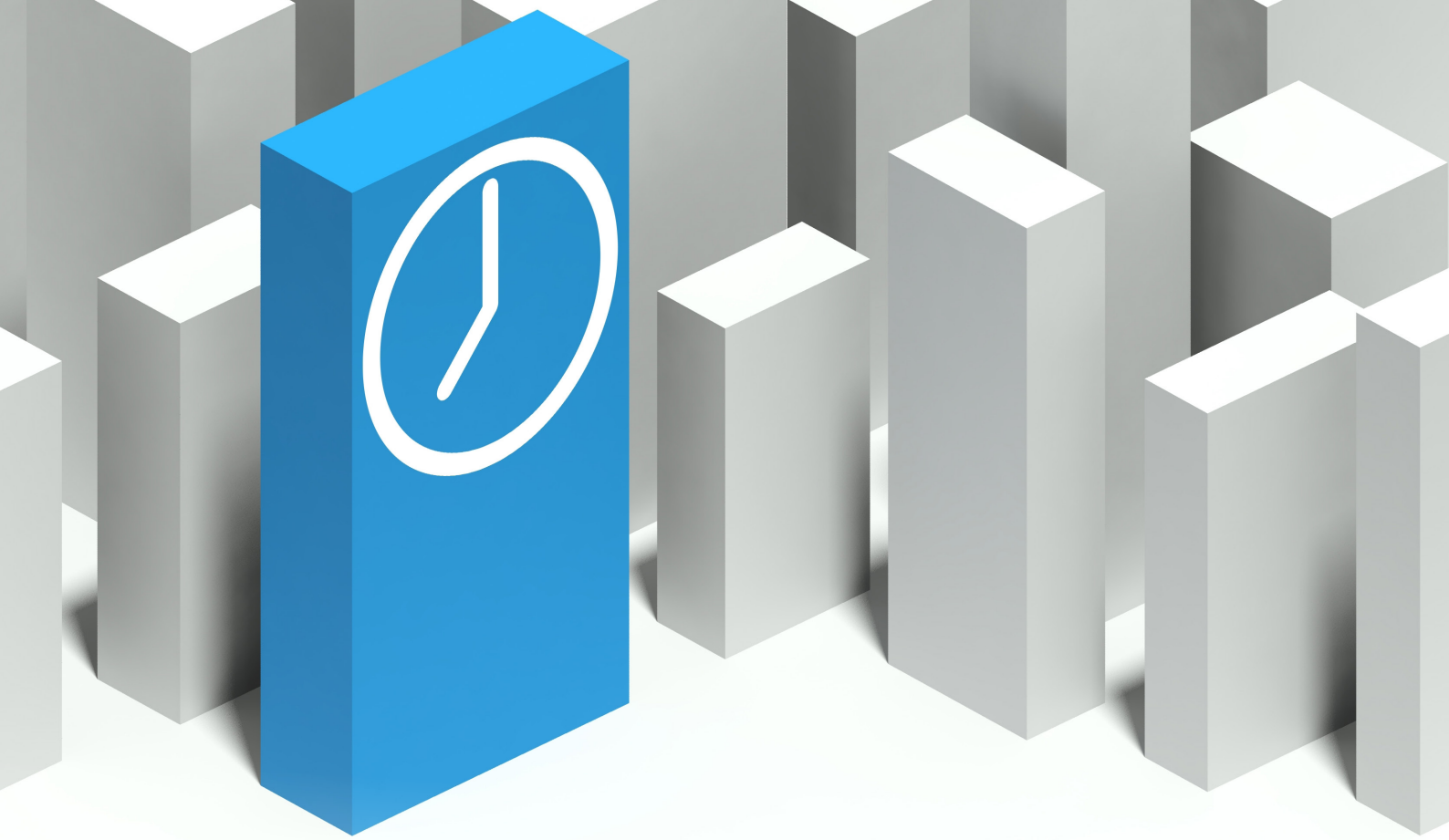

Deriving Meaningful Data from FM Software & BIM Integration

White Paper from Service Works Group

Introduction

From April 2016, it will be mandatory for all public sector projects in the UK to use fully-collaborative 3D Building Information Modelling (BIM). Which means that both public sector FMs, and their private sector partners, should already be embracing the technology. While the design, construction and engineering sectors have welcomed BIM, the FM sector still faces some challenges in terms of adopting BIM in time for the 2016 deadline.

Many public sector FMs consider that the deadline is still months away, and they will start to look at the technology early next year; while private sector service providers – with some notable exceptions – seem to find the whole process too challenging. Many have complained that the data is simply too rich and detailed for FM use and they don't see its benefits and any return on investment is too long-term.

This white paper provides an overview of BIM in relation to FM, and discusses how integrating BIM with existing computer-aided facilities management systems (CAFM), can provide real, meaningful data which supports the FM function and wider organisation. It is targeted at the practising facilities professional with some knowledge of FM software and BIM who is interested in improving their knowledge on this important topic.

A useful glossary at the end of this white paper explains some of the commonly-used abbreviations and acronyms in the field together with some areas for further reading on the topic.

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1. What is Building Information Modelling (BIM) and how did it come about?

Building Information Modelling (BIM) is both a process and a software solution. It is a way of designing, constructing, running and maintaining a building as a collaborative process using one, coherent and up-to-date system of computer models, rather than several sets of different tools and documents.

BIM provides a rich, 3D experience which includes digital simulations and rehearsals of all stages of the design, build and operate process. But while it is a digital toolset, it is also a way of working: information modelling and information management in a collaborative team environment. The information within BIM allows better-informed decision-making, clarity, improved communication and, overall, better business outcomes.

History: Egan, Latham and Government Soft Landings

The processes and technologies behind BIM have been evolving for several decades. In 1975 Chuck Eastman, now a professor in the colleges of architecture and computer science at Georgia Institute of Technology, wrote a paper around the use of computers instead of drawings in building design and, in doing so, described an early model of BIM. Development and discussion continued throughout the 1970s and 1980s with the phrase Building Information Model first mentioned in a 1992 paper by GA van Nederveen and FP Tolman from Delft University of Technology in the Netherlands. But it was not until the early 2000s that BIM became part of the construction and design lexicon.

Although Sir Michael Latham's 1991 Constructing the Team report largely predates the wide adoption of BIM, it includes many of the same thought processes: that the construction industry is ineffective, adversarial, fragmented and incapable of delivering for its customers. Latham proposed that there should be greater partnering and teamwork. Sir John Egan's 1998 Rethinking Construction report built on these conclusions and encouraged the project implementation team to work together from design to construction and commissioning using computer modelling to predict the performance for the end-user and minimise construction issues on site. Egan also focused on the need for health and safety improvements, an area where BIM has made a considerable impact. What is different now is that the industry has the technology tools to deliver Latham and Egan's visions.

In 2011, the Government Construction Strategy document was as damning as Latham and Egan, claiming that the UK does not get full value from public sector construction and that it has failed to exploit the potential for public procurement of construction and infrastructure projects to drive growth.

The strategy aimed to change that, calling for a profound change in the relationship between public authorities and the construction industry to ensure the Government consistently secures a good deal and the country gets the social and economic infrastructure it needs for the long-term. It included a detailed programme of measures to reduce costs by up to 20 per cent each year on publicly-funded construction projects by the end of the 2015 Parliament. This included the adoption of BIM on all public construction projects by April 2016.

The strategy also launched the concept of Government Soft Landings, the process of aligning the interests of those who design and construct an asset with the interests of those who go on to use and manage it. Based on the Soft Landings framework, pioneered by the Building Services Research and Information Association (BSRIA), GSL integrates the design and construction elements with the operational and maintenance phase to provide a building that better meets and performs to client expectations. The designers have delivery and operation in their mind throughout the project, without that being a vague notion in the future. And designers and contractors cannot simply walk away from a project once it's completed. Post-occupancy evaluation and feedback to the design and build teams is an inherent part of GSL to ensure that lessons are learned and mistakes not repeated. In addition to mandating BIM in all centrally-procured Government projects, GSL will also become mandatory for central government projects in April 2016.

GSL supports the concept of collaborative working designed by BIM and ownership of GSL quickly moved to the BIM Task Group, which brings together expertise from industry, Government, institutes and academia, supported by the Department for Business Innovation and Skills and the Construction Industry Council. The group provides a consistent message to the supply chain and establishes best practice.

In Construction 2025 (a strategy document, published in July 2013 under the coalition Government) the Government reinforced its position around BIM and GSL. Only through mandating BIM for all centrally-procured Government contracts from 2016 will the UK be able to deliver more sustainable buildings, more quickly, and more efficiently, it said. BIM is also critical to the successful implementation of a wider offsite manufacturing strategy.

There are considered to be four levels of BIM which refer to the level of compliance from no collaboration to full collaborative working.

Level 0 BIM indicates that there is no collaboration between the different parties in the design, construction, maintain and operate process. 2D CAD drawings are used and material is shared in hard copy or emailed documents. Only a minority of the industry remains at this stage.

Level 1 BIM is still fairly basic comprising a combination of 3D CAD at concept stage and 2D drafting. There may be some sharing of data in a common data environment (CDE) but there is no collaboration between the different disciplines and each manages its own data. The majority of the industry is at this stage.

Level 2 BIM is a step up with all groups using 3D CAD models, but not necessarily working on a shared model. However there is a vast improvement in how the data is shared between the different parties. This is typically through a common file format, which allows partners to combine the data with their own and interrogate it. This is the minimum target set by the Government for all centrally-procured public sector work by April 2016.

Level 3 BIM, also known as Open BIM, signifies full collaboration between all parties through a single, shared project model which is held centrally. Everyone can access and modify the same model, and there is no risk of conflicting information. The Government is aiming to have all public sector projects operating at this level between 2016 and 2025 with 2019 floated as a target date.

4D BIM and Beyond

Various future levels of BIM are in discussion including 4D BIM which would use data to measure time, 5D which includes cost management and 6D aimed at the facilities management sector.

Of particular relevance for FM professionals is managing the very detailed data coming out of BIM systems. Construction Operations Building Information Exchange (COBie) is an information exchange specification developed by the US Corps of Engineering to manage BIM data, particularly the information needed by FMs for the management of the facility.

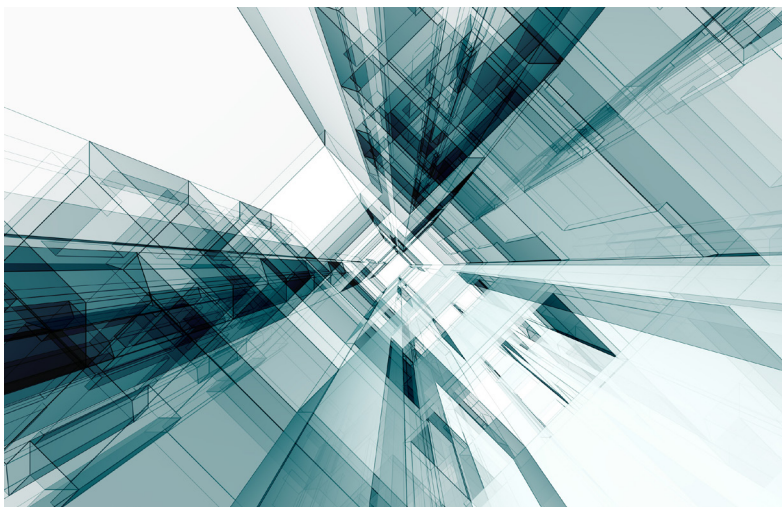
The original system has been extended by the BIM4FM task group to become COBie UK 2012. This now includes four 'data drops' – product data, as-built layout, tag and serial number warranties, and spares – during the delivery stage of the project to manage cost and carbon. The provision of COBie data in spreadsheet format now forms a mandatory part of BIM, although some BIM systems also offer it in a database format.

An FM would expect a full COBie (the FM Handover Model View Definition Summary) to be made at handover process but interim deliveries can help the FM plan the management and operation of the facilities well in advance of handover contributing to the soft landings process.

There are more than 700 COBie templates and they can be used to guide the detailed data and contact information produced by manufacturers and suppliers about their products. Manufacturers would typically include product information such as: cost, service life, carbon impact, maintenance, spares, re-ordering, substitution, There is an opportunity to include other information needed to allow the FM to create 3D representations of products for maintenance and repair purposes.

A number of parties will be responsible for filling in the COBie: designers will provide space and equipment locations; building contractors will provide manufacturer information and installed product data; and other groups such as M&E commissioners will provide warranties, parts and maintenance data to provide the FM with a holistic view of the facility.

Construction Operations Building Information Exchange **(COBie)** is an information exchange specification developed by the US Corps of Engineering to manage BIM data



Benefits of BIM for facilities professionals and the wider organisation

When the Minister for the Cabinet Office Francis Maude launched the UK Government's BIM strategy in 2011 he said it would "change the dynamics and behaviours of the construction supply chain, unlocking new, more efficient and collaborative ways of working. It will put us at the vanguard of a new digital construction era and position the UK to become world leaders in BIM". But what are the key benefits to date?

Cost savings at both delivery and operational stages:
BIM's primary purpose is to save the Government money. By mandating the use of BIM to Level 2 by 2016, the Government hopes to have achieved savings of up to 20 per cent from construction budgets by the end of the previous Parliament. BIM and GSL are a key factor in this target. The costs benefits increase year on year, as around 80 per cent of an asset's cost is incurred during its operational phase.

There are also benefits for the supply chain partners. BIM helps organisations to strip waste from their processes as they can virtually build the facility as many times as necessary until they create the perfect model. Some estimates say that this could be a 20-30 per cent saving.

BIM also provides early cost certainty. For example, the BIM Task Group, cites the example of how the Ministry of Justice has demonstrated significant savings in the design and procurement stages of the £20 million Cookham Wood prison reporting an 18 per cent saving through effective use of BIM. Other key early adopters with solid savings stories include: Palace Exchange, Enfield; Festival Place, Basingstoke; Endeavour House, Stansted; Terminal 5, Heathrow; Portcullis House, London; and St. Bart's Hospital, London.

BIM is also improving the reputation of UK Plc to the wider world and will open up new opportunities for all partners in the supply chain as the UK becomes a centre of BIM excellence.

Improved efficiency and faster project delivery:
BIM speeds up the project delivery as all parties work together collaboratively, mistakes, discrepancies and duplicate work are avoided, and the snagging list reduced. One estimate is for a 50 per cent reduction in the overall project time, from inception to completion.

Improved client outcome:
The client receives a building which matches their expectations and needs. Using one 3D model allows the potential trouble spots between the different construction elements to be identified and resolved at design stage eliminating the cost and time issues of redesigning certain elements.

Reduced safety risk:
BIM allows crowd behaviour to be analysed and fire modelling capability to be predicted to enable designs to be optimised for public safety.

Greater predictability:
Projects can be visualised at an early stage, giving owners and operators a clear idea of design intent and allowing them to modify the design to achieve the outcomes they want. In advance of construction, BIM enables the project team to 'build' the project in a virtual environment, rehearsing processes and procedures and planning procurement of materials, equipment and people.

A greater role for FM:
BIM allows the professional FM to get involved at the design stage and have a real impact on the building outcome which both improves the outcome and raises the profile of the FM function.

A survey carried out by the BIM4FM task group in summer 2013 revealed a reasonable level of support for BIM among the FM community – 62 per cent believe that BIM can support the delivery of facilities management. The same survey identified the key opportunities for BIM are around lifecycle management (75 per cent), with other specific comments noting that early FM involvement in design and performance for facilities would support this. Other broad opportunities identified were improved efficiencies (68 per cent), and better reporting data (62 per cent).

Barriers to BIM implementation, and FM engagement with BIM

The BIM4FM survey also revealed several key concerns around BIM in the FM community. Cost of implementation and involvement was cited by half of the respondents as a key barrier, with a similar number mentioning integration with current technology and FM software systems being an issue. Training, data management and the time taken to implement it were mentioned by a third of respondents with legal issues cited by 17 per cent. Just 11 per cent had no concerns at all about BIM.

Cost is undoubtedly an issue and there are plenty of product providers claiming to the only BIM provider in the marketplace. The reality is that organisations will need to invest in technology, but the Government is not mandating specific platforms or products in order to create a competitive marketplace. BIM is a new way of working more than anything else, which will change an organisation's systems, processes and attitude. Organisations should ask themselves what is the cost of NOT implementing BIM in terms of lost business and opportunities. According to the 2014 NBS National BIM Survey, 70 per cent of BIM users believe it gives them competitive advantage.

At a British Institute of Facilities Management (BIFM) Leaders Forum on the topic of public procurement, held in 2014, several facilities professionals argued that FM software systems already provide the type of information that BIM provides, although they acknowledged that the FM sector is behind the curve when it comes to BIM.

The role of BIM in existing buildings

The vast majority of the discussion around BIM is for new projects. However new buildings account for only a fraction of the building stock and an increasing number of building owners and occupiers are recognising the benefits in existing buildings. Over the past year there has been a substantial increase in the number of existing buildings scanned and converted to 3D models. This allows FMs to look at the impact of remodelling, refurbishment or extension options.

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2. Why integrate BIM with FM software?

FM software systems already provide numerous benefits to a business including:

- increased efficiency of the FM helpdesk operation
- improved planned maintenance scheduling
- optimised asset performance
- rigorous contractor and SLA management
- administrative savings
- fully managed and auditable health and safety risk
- improved stock control
- improved facility bookings
- transparency of departmental performance

As discussed above, facilities management professionals, both client and supply side, have numerous reasons to use BIM to increase their operational efficiency, reduce costs and generate more useful, and standardised data. BIM and FM software together are even more powerful.

Better quality and standardised data: Integrating BIM with existing facilities management software systems is the holy grail in terms of better quality and standardised data. As soon as a facility is operational, BIM provides an accurate source of asset and building data, thereby reducing the time taken to establish a fully functioning, live FM software system.

BIM also provides **more reliable data** to report to the board. Data can be received, stored, combined with other data and analysed seamlessly. It allows FMs to take informed decisions through the whole lifecycle of the facility around areas such as space use, floor planning, equipment and asset maintenance, energy consumption, and cost efficiencies.

One source of information: An integrated BIM and FM software system creates one version of the truth, so long as the BIM data is kept up to date when there are additions/amendments and deletions from the FM system. Key data is embedded in one digital document rather than several paper-based, out-of-date documents that aren't integrated.

Reduced costs: By introducing BIM into the operational part of the building's lifecycle, the cost benefits achieved during the design and construction cycles can be extended into the whole lifecycle, which makes up 80 per cent of the entire cost. And by having accurate, up-to-date and complete data ready when the building is handed over to the facilities and maintenance team, the cost of the traditional data capture from design/construction information to FM data is reduced. Integrating BIM data into FM software is a great deal simpler than other forms of data from design and construction documents which often need redesigning or reformatting or manual inputting. The COBie interface is designed to bring the data into FM systems in a far more seamless, and less expensive, way other methods.

Improved performance: Such is the holistic, and 3D, nature of the BIM and FM integrated data, that problems can be diagnosed quickly and performance predicted resulting in fewer equipment and asset failures. Maintenance engineers can also see a 3D visualisation of the asset and its location, together with all service history and specification, and contract information in advance of a maintenance visit, reducing repeat visits and improving response times. It also reduces disruption for the client.

3. How to integrate BIM with FM software

Many leading FM software providers, including Service Works Group, have developed interfaces for their software which can be used to import BIM data.

Via the COBie interface, BIM data can be imported into QFM, Service Works' facilities management software, to pre-populate the system's asset register and streamline planned and reactive maintenance management. This improves the quality and accuracy of data and delivers time and cost savings in terms of data collection.

As the use of 3D BIM models increases in the run-up to the Government's April 2016 deadline for Level 2 BIM adoption, Facilities Managers should also be aware of how BIM data can be leveraged to maintain asset and spatial data.

QFM Space, Service Works' suite of space planning and move management software tools, provides integration with the market-leading BIM building design software, Revit® from Autodesk. This offers the ability to overlay BIM data onto dynamic graphical floor plans, to support accurate move management and scenario planning. Assets and equipment imported from Revit are automatically assigned to floors and rooms based on their physical position within the BIM model.exported to QFM Space without the need for system customisation or configuration.

Bi-directional links ensure that changes made within QFM Space can be imported back into Revit. The system offers complete flexibility, allowing users to securely control which building and asset properties can be imported to and from the BIM model, to ensure data is accurately maintained within both the FM system and the BIM model.

Challenges for integrating BIM with FM software

Lack of knowledge:
The main challenge for integrating BIM with FM software is a fundamental lack of knowledge within the facilities management and occupier markets about the benefits of the process. This makes an investment into BIM a challenge. BIM is also seen by some as a silver bullet for all data issues, but it requires time and investment, and the setting of achievable goals, for it to succeed.

Lack of content portability:
There are issues around the portability of BIM content out of BIM systems. Some BIM manufacturers have been slow to develop this side of the offering. There is also a lack of standards around how this data should be presented. But this is improving. There are also some critics of the open nature of the COBie standard, describing it as the lowest common denominator approach and calling for a better way of doing things. BIM is still relatively new and the market is developing and changing all the time.

Security concerns:
BIM lies in the Cloud and some organisations and individuals have security concerns about the Cloud.

4. The future of BIM and FM software

While BIM and GSL will become mandatory in public sector projects next year, the real future lies in their adoption in the private sector. Construction and FM firm BAM has made much of its use of BIM as an FM tool, and its work was recently featured by the Royal Institution of Chartered Surveyors as a strategic FM case study. The company has BIM as a standard part of its design offering and it is fast become intrinsic to its construction tender and project implementation processes. Many others are beginning to follow suit.

Once the April 2016 deadline passes, more organisations with public (and private) sector clients will start moving towards BIM Level 3, which signifies full collaboration between all parties through a single, shared project model which is held centrally in the Cloud. Early adopters are already looking beyond towards 4D and 5D BIM in relation to time and cost management with concepts such as augmented reality also discussed. It's clear that the concept, which may have had a slow start in FM circles, has yet to demonstrate its full potential.

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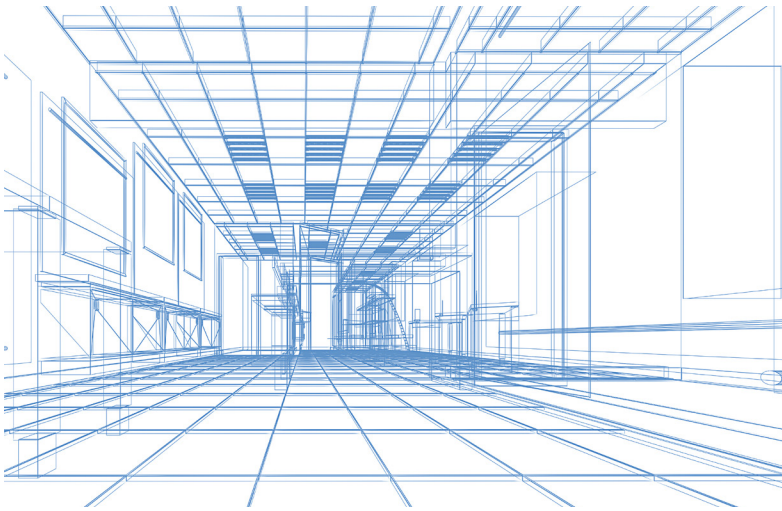

Glossary

AIM:
Asset Information Model. Term to describe the set of information (documentation, graphical model and non-graphical data) accrued in the project operation/ in-use phase

BEP:
BIM Execution Plan. Written plan to integrate BIM tasks and information with all stakeholders and processes

BIFM:
British Institute of Facilities Management

BIM:
Building Information Modelling

BIM Implementation Plan:
A blueprint for integrating BIM into an organisation's working systems and processes

CAD:
Computer Aided Drawing/Drafting. Architects' software tools that feed into the BIM model

CAFM:
Computer-Aided Facilities Management

CDE:
Common Data Environment

CIM:
Construction Information Modelling. BIM during the construction process

COBie: Construction Operations Building Information Exchange is an information exchange specification for the life-cycle capture and delivery of information needed by FMs

GSL: Government Soft Landings. A UK government framework that creates a graduated handover for new and refurbished buildings where the project team is contracted to watch over the building, support the occupant and fine-tune the building's systems, for up to three years post-completion.

Levels 0-3 BIM: terms to describe the Government's requirements for BIM in publicly funded projects.

LIM: Landscape Information Modelling. BIM for landscape design and construction

Revit: Building design software specifically created for BIM

Further Reading

- **BuildingSMART UK:** www.buildingsmart.org.uk
- **ThinkBIM:** www.ckegroup.org/bim.html
- **BIM Diary:** www.bimopedia.com
- **Construction Industry Council (CIC) was tasked with setting up a network of BIM Regional Hubs:** www.bimtaskgroup.co.uk
- **Government Construction Strategy: One Year On Report and Action Plan Update:** www.gov.uk/government/uploads/system/uploads/attachment_data/file/61151/GCS-One-Year-On-Report-and-Action-Plan-Update-FINAL_0.pdf
- **COBie 2012 UK Template Repository:** www.bimtaskgroup.org/cobie/
- **BAM's work on BIM:** www.rics.org/Documents/RICS%20Strategic%20FM%20Case%20Studies.pdf

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