

BIM Building Information Modelling

Summary of current ICE position

The capabilities of systems that are being termed BIM (Building Information Modelling), recent developments in Geospatial Engineering combined with wireless communication, internet connectivity cloud computing, plus ever more powerful user devices such as smart phones, interactive tablets and personal computers, have the capacity to significantly improve the way we design, deliver and maintain infrastructure assets.

The Institution of Civil Engineers (ICE) is committed to working with Government, clients and all parts of the supply chain to deliver greater Whole Life Value from new and existing infrastructure assets. Working with the Chartered Institution of Civil Engineering Surveyors (ICES) and enlisting the assistance of the Association for Geographic Information (AGI) the ICE is supporting the work of the Chief Construction Advisor and the Cabinet office's BIM Strategy implementation group. It is involved in the work being undertaken by the Construction Industry Council (CIC) BIM Forum developing a common industry Work Stage Process, represented on the steering group developing the CAPEX BSI PAS 1192 processes and protocols, continuing to work with CPIC to develop Production Information practice and UNICLASS plus working on other strands including Infrastructure UK to speed up the adoption of BIM across the construction industry and its clients.

Background

In the last decade and a half, many industry initiatives and studies including Latham, Egan and more recently Infrastructure UK's "*National Infrastructure Plan 2011*" study into the sources of cost and delay in infrastructure delivery and the Government's "*Climate Resilient Infrastructure: Preparing for a Changing Climate*" report have identified a number of key drivers for reducing excessive waste and poor performance in this area. They include the widespread use of technology (including ICT as an enabler of integration), information management and modelling, collaborative working, offsite manufacturing and lean techniques. Sectors such as retail have demonstrated that the effective capture and re-use of information delivers dramatic improvement in the development and prime utilisation of assets.

Developments in communication and technology are both enabling and driving the requirement for the delivery of intelligent infrastructure. The construction industry and the infrastructure owners increasingly recognise the benefit of gathering the right levels of data throughout the lifecycle of the asset base. The technology, management, methods and processes for delivering and utilising this information are rapidly evolving but are yet to be fully embedded in common industry practices and standards. The work of the Cabinet Office is focused on achieving a 'Level 2' adoption, will be defined in the Publicly Available Specification: PAS 1192 part 2 and 3; and the Construction Industry Council 'Work Stage Deliverables. These 'Early Adopter', documents will enable the delivery of HMG BIM strategy projects to the Level 2 maturity indicator, which requires the definition of information drops needed at different stages through the project lifecycle and the preparation of electronic information that can be reused and handed over into the maintenance and operations.

The roll out of these changes will have a significant impact on the broad engineering profession and the delivery of engineering expertise in the construction industry. BIM and its integration with geospatial engineering will change the way Best Practice is delivered throughout the life cycle of all Built Environment assets from buildings through to infrastructure. Clients and asset owners involved in new build, refurbishment and operational maintenance are increasingly aware of the benefits of BIM and are making demands on the industry. In particular Government and regulated clients are including data from BIM processes as a deliverable requirement from their supply chains.

Benefits of BIM

A report commissioned by the department for Business, Innovation and Skills (BIS) and the Cabinet Office in 2008 suggested that a BIM approach to asset life cycle management, if extended to all major projects, would account for between £1 to 2.5 billion per annum savings in the construction phase alone. In addition BIM will potentially deliver value in the post construction phase through improved ongoing management of assets, portfolios and the modelling of Infrastructure and its resilience, allowing optimization of running costs and identifying the most effective opportunities for improving energy efficiency and reducing carbon emissions.

ICE and ICES action to date

The ICE and ICES has recognized the importance of creating and managing data throughout the asset lifecycle and has:

- Produced a best practice paper in 2007 on Information Management for Major Projects
- Participated in the development of standards and codes of practice most notably the British Standard 1192:2007, 'Collaborative production architectural, engineering and construction information'.
- Prepared and published briefing notes on Data Management for Major Projects and Progressive Data Management.
- Sponsored and steered research at the University of Reading on the data requirements at project handover and published the results as a Briefing Note.
- Participated in establishing collaborations such as the National Underground Asset Group, (NUAG) the Centre of Excellence for defining information standards and their exchange
- Critical National Infrastructure modeling with Infrastructure UK.
- Contributed to the Construction Production Information Committee (CPIC) along with RIBA, CIBSE, RICS, CIAT and the UKCG and through this grouping manages and publishes Uniclass Unified Classification for the Construction Industry. CPIC has also been responsible for publishing 'Building Information Management – A Standard Framework and Guide to BS 1192:2007. CPIC provides a collaborative setting for developing cross industry understanding and the necessary standards and codes of practice.
- Contributed to the British Standards Institution B/555 Committee that is steering the development of design, modelling and data exchange standards for BIM and Geospatial information and provide clear guidance to the UK industry dedicated to the delivery and operation of built assets.
- Contributed to the BIS Government Construction Client Group Building Information Modelling (BIM) Working Party Strategy Paper and working groups on the implementation plans.
- Contributing to Infrastructure work of IUK

What ICE would like to see happen

- Extension of the principles of BIM throughout the construction industry including for Infrastructure
- Development of necessary guidance on BIM protocols and deliverables to determine if any amendments are actually necessary to any NEC3 Contracts. At this stage, it is not envisaged when using the NEC3 Engineering and Construction Contract (ECC) that amendments will be required as a combination of correctly completed Works Information, Key Dates and sectional Completion will be sufficient.
- International collaboration on developing a global view of standards such as the Construction Operation Building information exchange (COBie) specification and common best practice. The UK construction industry increasingly plays on the global stage and multiple standards and practice are counterproductive.
- The incorporation of appropriate BIM deliverables into public procurement
- A framework and definition of appropriate BIM deliverable definitions for projects through each stage of an assets life cycle.
- Supply chain and asset owners to collaborate on a definition of ideal BIM deliverables at key stages of the process leading to handover which can form a basis for improved operational asset management.
- A development of current classification systems that fit BIM 'Level 2' requirements across the whole built environment including infrastructure.
- Active development of buildingSMART® Industry Foundation Classes (IFC) to encompass infrastructure assets.
- Work with the Association for Geographic Information (AGI).

- Promote Whole Lifecycle cost management.

ICE/ICES Position on current live issues

- ICE/ICES supports the conclusions of the BIS Government Construction Client Group BIM Working Party Strategy and its implementation programme of 'Level 2'; NEC has been a corresponding member in this Government BIM Implementation and Mobilisation Group.
- ICE/ICES supports the work of Building Smart in developing interoperable standards for IFCs (BIM Level 3) but recognizes that these standards are incomplete, not robust and require further development to encompass the requirements particularly in the case of infrastructure assets. This includes the work on City GML (Integration of BIM 'Level 3' and Geospatial engineering).
- ICE/ICES supports the Construction Industry Council's (CIC) initiative to foster collaboration across industry bodies and institutions in order to develop and promote the necessary, standards, protocols, practices, legal frameworks, knowledge and educational tools.
- ICE/ICES continue to support and promote the efforts of CPIC as a cross institutional contributing body to the overall 'body of knowledge' and practice of BIM.
- ICE/ICES Supports the adoption of the PAS 1192:Parts 1 to 3
- Support on Infrastructure UK work on Data Management and improvement

Further Reading

"BIM – Management for value, cost and carbon improvement. A report for the Government Construction Client Group - Building Information Modelling (BIM) Working Party Strategy Paper" March 2011.

Government Cabinet Office; "Government Construction Strategy". May 2011

What is BIM – A Definition

BIM is a managed approach to the collection and exploitation of information across the life cycle of a built environment asset. At its heart are computer-generated models connecting all graphical and tabular information about the design, construction and operation of the asset and associated documents. BIM allows design options to be explored digitally. Design changes are quicker and cheaper to enact when compared to traditional design tools. It is the technological and process successor to CAD and 2/3D drawings and creates data files or 'objects' of physical components and spaces to produce a sophisticated 3D models, which contain both graphical representation of the asset, but more importantly details of all its associated information that can be reused.

It is important to note that BIM itself is not a single software application but is the use of software tools embedded in a process to manage data throughout the lifecycle of an asset from procurement through operational management and changes. For this reason there is often controversy over what the 'M' in BIM means – we recognise that it covers two interchangeable aspects Modelling and Management of the key component Information.

The term Building often gives rise to confusion limiting the application of BIM to Architecture and physical buildings however in the context of the industry Building should be taken as the verb to build rather the noun a building.

Data generated by the BIM process can contain information on detailed dimensions, component-placement, material specifications, structural performance, fire rating, "U" values, and carbon content (both embedded and operational), cost, maintenance schedules and performance etc. In effect, the asset is built 'virtually' using these exact data-rich objects from which plans and drawings can be extracted. It is a distinguishing feature of BIM that no traditional 'drawings' are involved in the creation of the model and the data related to the model - which is not present in static representations of the structure - can be analysed and selectively made available to meet demands and function across the whole life cycle of the structure. Drawings are a reporting output of the process, not the inherent process itself (although the model will supersede 'drawing' over time). A BIM model provides clear accessible information which can then be exploited and used to manage the construction and management of structures which – if exploited correctly – can lead to significant efficiencies and improved delivery of client 'value' in construction and, in particular, cost saving.

ICE BIM Conference

The ICE annual BIM conference takes place every October, see www.ice-bim.com for further details. Collaborating with all of the professional bodies as well as the technology vendors this event presents the most up to date and informative case studies on BIM. The ICE regularly supports other BIM events and welcomes input into the development of this event as well as the wider BIM programme.

Contact

For any further information or comments about this policy statement please contact the Information Systems Panel secretariat richard.armstrong@ice.org.uk