Guest Editorial Preface

BIM Strategies in the UK Public Sector

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INTRODUCTION

The Building Information Modelling (BIM) report (BIS, 2011) published as an integral part of the UK Government Construction Strategy (Cabinet Office, 2011) was released in July 2011. It is the work of a cross industry working group brought together to examine the benefits of BIM to the UK public sector from a commercial and strategic point of view in both the building and infrastructure markets. The significance of the Government's commitment and the fact that BIM now forms an integral part of the Construction Strategy is due to the fact that the BIM story is now being articulated on a commercial rather than technical basis with tangible financial and carbon targets.

This paper highlights the significance of the strategy and points to key opportunities in many areas integral to the delivery of a safe, economic and socially effective built environment. The introduction of standard data structures is enormously significant in terms of releasing the latent value of information and BIM is centre stage in the production and use of these data sets. However this strategy is an intermediate stage to enable a fully integrated interoperable world. The definition of the Bew - Richards maturity "wedge" (Bew & Underwood, 2010) has enabled the market to form a clearer view as to what can be delivered and how. The opportunities for research and innovation both at Level 2 and 3 are vast, the opportunities that common data provides supports the widespread development of intelligent well performing environments of the right quality and cost. However, the data delivery infrastructure remains a challenge. Who is going to emerge with the appropriate model?

STRATEGIC OVERVIEW

The strategy's headline recommendation is for all public procurement to be carried out at Level 2 or above within the next five years. Consideration was given to the use of a project minimum or maximum value threshold, but this was avoided as the view was taken that any project or asset has the ability to perform badly or emit carbon. It was also indicated that all projects would be developing the same data sets in the course of project delivery so it would not present a significant cost penalty to apply the same standards to all projects.

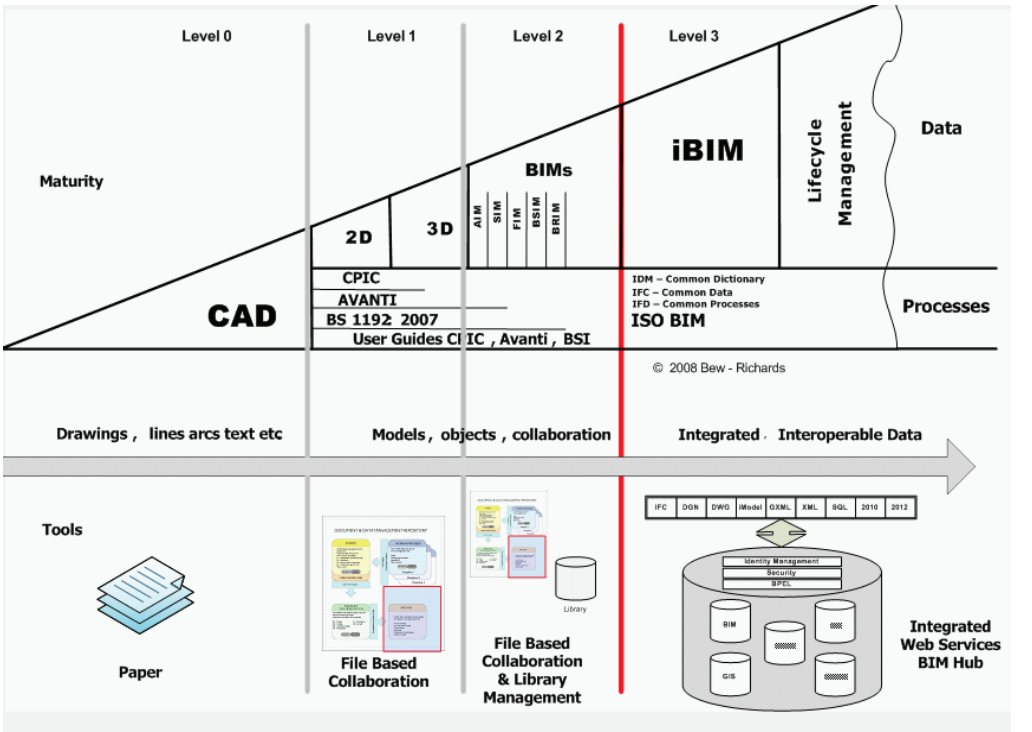
The concept of Levels (or maturity levels) was introduced to articulate the complexity and capability of the available technologies with respect to the various restrictions or enablement of business process.

Figure 1 illustrates the principles of this progressive maturity both from a data production / delivery and process management point of view. The Maturity Levels can be defined as:

0. Unmanaged CAD, probably 2D, with paper (or electronic paper) as the most likely data exchange mechanism.
1. Managed CAD in 2D or 3D format using BS 1192:2007 (BSi, 2007) with a collaboration tool providing a common data environment, possibly some standard data structures and formats. Commercial data managed by standalone finance and cost management packages with no integration.
2. Managed 3D environment held in separate discipline "BIM" tools with attached data. Commercial data managed by an Enterprise Resource Planning (ERP). Integration on the basis of proprietary interfaces or bespoke middleware could be regarded as "pBIM" (proprietary). The approach may utilise 4D Programme data and 5D cost elements.
3. Fully open process and data integration enabled by IFC (Building Smart, 2008b) and IFD (IFD 2008-11), managed by a collaborative model server, can be regarded as iBIM or integrated BIM potentially employing elements of concurrent engineering processes as discussed in Anumba (2007).

The strategy calls for the adoption of Level 2 BIM by 2016. Level 2 was selected for two key reasons. The first is to align to the strengths of the available technologies. Whilst many vendors are keen to sell capabilities the true definition of Level 3 has yet to be achieved in practice. The second and certainly as important is the maturity

Figure 1. Bew-Richards BIM maturity model (© 2008 Bew Richards. Used with permission.)

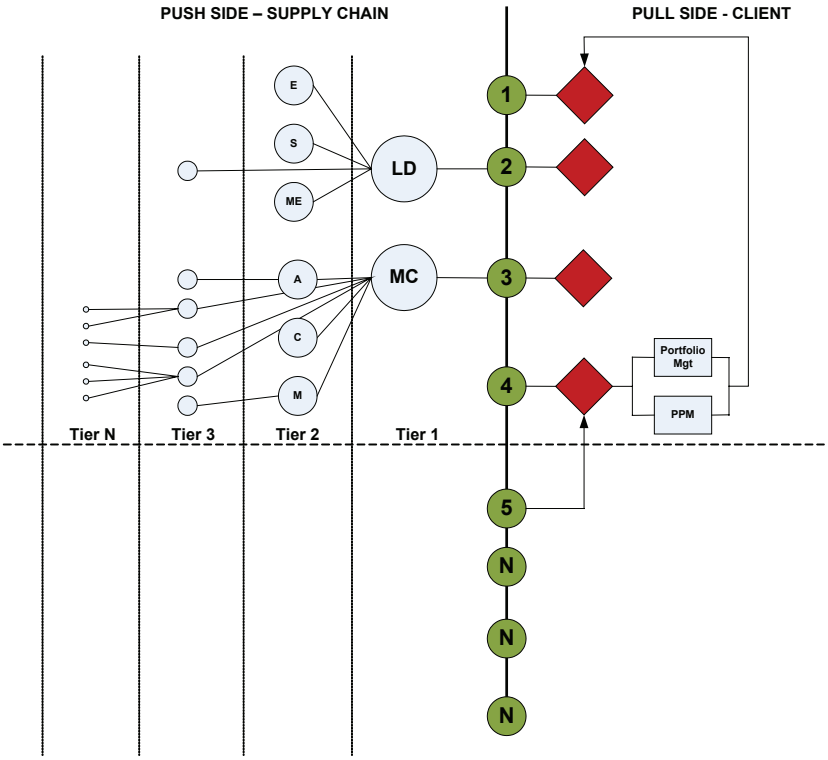


of the current commercial models. The existing trading rules of engagement (contracts) have yet to grasp basic electronic trading and the very concept of cloud processing leaves the existing contract models far short of what is required. The transactional nature of Level 2 whilst on the surface appearing rather basic, allows us to maintain the existing contracts and arrangements with only minor amendments. This is very attractive as it allows the industry on both the supply and client side to concentrate on the cultural and business change programmes that will be required to deliver quality, coordinated project information.

The opportunity for both commercial and technical innovation and potential market advantage are clearly visible on both the client and supply chain sides of the contract. Clear guidance in the form of contracts and Publicly Available Standards (PAS 1192:2) (in preparation) will be made available to ensure clear process and contractual advice, leaving the supply chain free to apply the specific business processes as they see fit. Key to the controls will be the requirement for periodic delivery of model and COBie 2.4 (East, 2010) data. The requirement for standard datasets drives the requirements for data to enable the client to answer key business questions quickly and accurately and has the added advantage of ensuring collaboration and coordination through the supply chain. This also ensures that the supply side data is delivered effectively and on time without any significant rework requirements.

The challenge will however not be the provision of data. The industry has little problem creating data, the proliferation of unstructured data and documents has long been the Achilles heel of IT solutions in the sector. The issue is consistent process and management of that data into a coordinated single model environment. This is new; the delivery of process driven

Figure 2. Supply chain delivery model (© 2011 Bew. Used with permission.)



Enterprise Resource Management (ERP) solutions faced similar scenarios, generally without the need to federate across disparate organisational boundaries. The task of implementing automated process management at Level 3 in the construction sector should not be underestimated. The method of integrating the supply side of the industry is illustrated in Figure 2. The left side depicts the supply chain tiers and the right side indicates the summarised client side decision processes.

Each supply side tier requires appropriate intervention to ensure best value approaches are applied to each tier. Too much control and innovation is stifled and costs are loaded, too little intervention and no control is apparent. The contracts will clearly layout the single point of accountability of the lead design and main contractor roles for the effective delivery of compliant coordinated data.

KEY SPECIFICS

The selection of COBie as the data exchange dataset at Level 2 is significant. It is not a solution for interoperability between systems; however it is a dataset that is mature enough to enable a very useful interim step towards Level 3 and full transparent interoperability. It also allows one off transfers of data to post occupancy systems and offers key data to manage the client side governance process. Work has been undertaken in a number of government departments to develop generic client side processes and data requirements and this discovery process has fed into the development of the COBie 2.4 standard for the specifics of the UK market. The standard is forward compatible with the IFC dataset to ensure future proofing of all legacy data.

From a process point of view the UK market has been dominated by the various Plans of Works delivered by the institutional organisations, including the RIBA (2011) and GRIP (Network Rail, 2011) publications. Work undertaken for the UK Government BIM strategy identified the poor relationships between the various Plans of Work and the key issues that affect clients, which of course are the outcomes and deliverables (in this case specifically the COBie datasets). Work is now underway to align these processes and the delivery of the PAS 1192:2 will define both the procurement and delivery requirements of the client.

As with any change programme, especially with process control changes, the key challenges are to do with "people" issues. The three million or so employees, operatives and professionals in the industry will all need some level of briefing, training or coaching. This poses a significant time and quality challenge as well as the need to develop the next generation of skilled resources both from a vocational and academic viewpoint.

WHAT HAS TO CHANGE?

The need to deliver collaborative cultures, contracts and technologies continues to challenge the industry. How can the skeptics be comforted by their need to maintain market tension, by the need to drive out waste? Are the savings of waste reduction greater than the effect of market tension? These are all significant challenges the market faces to deliver these strategies without layering additional cost and process burdens. Technology has changed our lives and our businesses, how do we embed these new capabilities into the way we do business and how do the contracting entities master mind these new relationships?

Clearly one significant driver is the intervention of a significant client such as the public sector as is the case in the UK, but as with all of these changes businesses must ask the question; "what does it mean to me?" "Where are the upsides and benefits?" The UK Government's strategy is to ensure all public construction related procurement uses these processes by 2016. The key focus is the trailing edge of the industry; this is where the significant costs and waste accrues. Level 2 has been selected on the basis of its technical capability, but also the limitations of the existing contractual

frameworks. The challenges of defining Level 3 processes and embodying them in a contractual framework will represent a very significant transformational enabler.

LEVEL 3 POTENTIAL

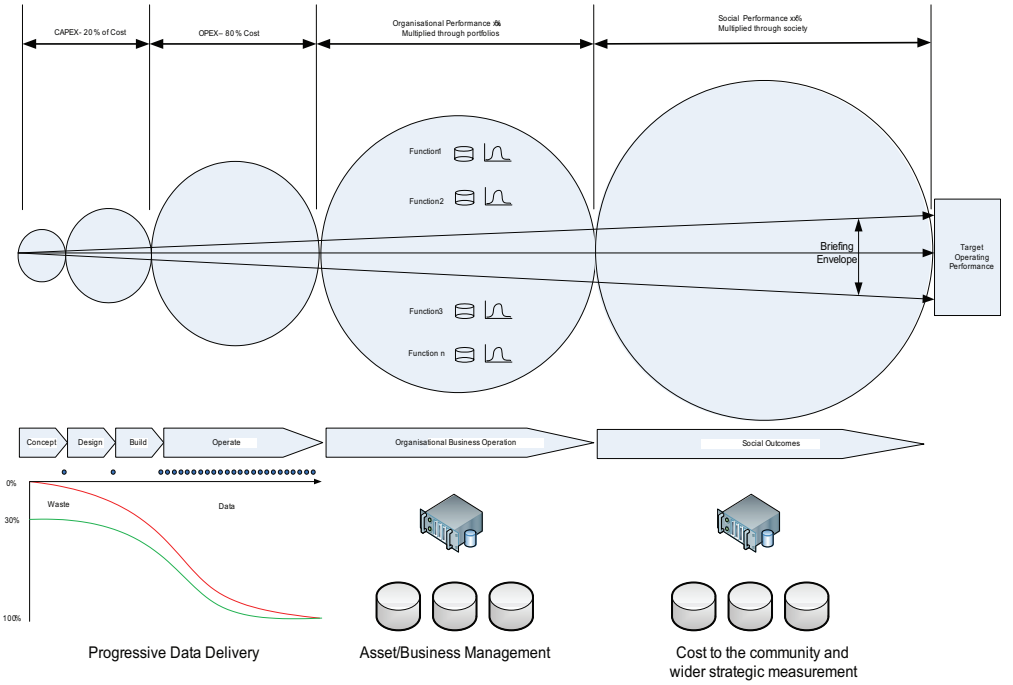
The latent potential of Level 3 becomes clearer the more we progress to a data centric model. The ability for the built environment to become part of the digital community provides endless opportunity. The iPad/Pod generations will expect to have access to information through the infrastructure, it needs to be robust and compliant as well as secure and integral. Work carried out by Building SMART to develop the IFC's and associated processes and dictionaries needs to be demonstrated and validated against new commercial models to protect trading entities but also to enable transparency and efficiency.

Key to enabling the world of Level 3 are technologies such as linked data and processing. Tools that provide our data objects with lifecycle provenance to enable audit trails and assurance of the validity and use to which processes and data can be made. Federated or un-owned processes are conceptually difficult to comprehend in the current environment, but we need to legislate both technically and commercially for these eventualities. Examples of this may include third party Part L accreditation or material sourcing across the markets.

RESEARCH OPPORTUNITIES

So where does this lead us to in terms of research opportunities in the digital built environment over the next few years? Good quality data and clients being presented consistently with much higher quality digital data set will drive demand. An understanding of the asset cost base during its operational stages is potentially significant, often approaching 80%. How can savings and transparency be driven into the non

Figure 3. Briefing envelope and digital value chain (© 2011 Bew. Used with permission.)



glamorous operational stage to drive cost and carbon efficiency?

As the datasets grow and aggregate trend comparisons begin to deliver more useful outputs what other composite entities can we expect to begin to model in ways that were never possible without standardised datasets? The concept of delivering assets that are truly aligned to business outcomes begins to become a realistic potential model with significant opportunity to look at the interdependencies and relationships between assets, infrastructure, business operations and the impact on the social fabric of the wider community.

Business performance and the impacts of productivity can be dramatically affected by the built environment. The performance of the asset is proportionally driven by the quality of the briefing process and the specification of the asset. Why do we fail to understand the customer requirements so often? Can BIM tools be used to shape and explain the operational and aesthetic aspects of the asset more effectively? Are we going to use the power of semantic searching to discover leading edge solutions? Will this form of briefing lead to the Holy Grail of true performance specification driven outputs within the measured constraints of the asset as well as the business and the social and infrastructure fabric of the built, social and economic environment?

Figure 3 illustrates the percentage cost impacts of the various stakeholder operations and the constraints of the theoretical briefing envelope in each of the stakeholder domains as described by Bew (2011) and Kiviniemi (2005). Also indicated is the progressive data delivery model as described by Jackson (2010) and Whyte, Lindkvist, and Ibrahim (2010).

CONCLUSION

The publication of the UK Government strategy and the associated Infrastructure UK and Construction Strategies mark a significant shift in government policy. The combination of the austere market conditions, maturing of the technical infrastructure, growing clarity regarding our environmental and carbon commitments (FIDIC, 2011; RAE, 2010), as well as an overwhelming need to adopt better practices to deliver better products at home and to remain competitive abroad has lead to an unprecedented shift.

The foundations are in place to develop new and innovative ideas to fuel the expectations of the market and the aspirations of the next generation.

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