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# Article for RIBAJ: October 2009. Richard Saxon*
# BIM: Enabling the Future. (Keynote address to RIBA-BSRIA Conference on 29th June 2009.)

Building Information Modelling (BIM) is without doubt one of the most significant recent technological advances in the construction industry. It can be immediately useful to designers, builders and owners but it potentially opens up the industry to huge, collective leaps in productivity and service quality, enabling many of our long-standing issues to be tackled.

By BIM I mean the holding of all information about a building in an intelligent, multi-dimensional computer model: a virtual version of the building. Compared to 2D CAD, which simply automates the drawing function, it is a step change in capability. Its how cars, planes and ships are designed, and have been for some time.

The long term challenges to the industry have been defined after wide consultation by the National Platform for the Built Environment, the successor to nCRISP as the UK steering group for research and development for the 10-15 year horizon. The three key challenges are seen as:

1. To become customer-centred, knowledge-based and value-driven;
2. To become sustainable;
3. To harness ICT and automation to achieve the other two challenges.

BIM supports customer centred working by providing more scope to get the customer's brief right, simulating concepts to communicate better, moving design work forward which allows better satisfaction of needs and managing customer changes well. It allows the team to design and build faster, with less risk and far fewer errors or defects. Most of all it provides a platform for the owner and occupier to operate the building far better than is now typical. The as-built model provides ready access to all the operating instructions, maintenance requirements and safety information. US building owners report savings in their operating cost which are many times the cost of making the model.

Sustainability is assisted by BIM's creation of more time for design, the ease of simulating performance to refine ideas, the reduction of waste, support to offsite production with all its

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economic, social and environmental benefits, and the payback from good facilities management in lower energy and water use.

So how does a mere computer application deliver so many gains compared to established CAD ways of working? Where CAD files could provide a basis for the team to share up-to-date information on an intranet, BIM used as a shared resource polices the roles of team members, managing out differences between professional versions of the design, clashes in structure, services and door swings, creating schedules automatically, supporting the detailed design of each contributor and the flow of information to build. The model becomes the heart of the team. It can work right around the life cycle of the built asset, supporting briefing, visualisation and other simulations, design applications, sequencing of construction, regulation checking, health and safety planning, documentation provision, integration of specialist proposals, importing of components, CAD-CAM for fabrication, construction rehearsal, answering site enquiries, providing the as-built record, manuals and FM tools required and guidance on deconstruction.

There are three phases in BIM use and it is possible that separate versions of BIM will be best for each, with the data moved on from one to the next. At the concept stage a lightweight BIM is useful, able to deal with volumes, surfaces and energy modelling without real construction detail. Once the concept is set, a full BIM is needed, based on construction detail and allowing all consultants and constructors to get fully engaged. Once the building is handed over, much of that detail can be archived to allow an FM-oriented BIM to support the use of the building.

Many architects are reluctant to engage with BIM, seeing it as an avoidable expense in hard times and a challenge to their established work pattern. Let me run through reasons why you should engage, both for your own ‘bottom-up’ advantage and for ‘top-down’ reasons of advantage to client, team and community.

I believe that BIM represents an opportunity for architects to regain some leadership of the design team and the client relationship. This is because it simplifies a design-management workload which was getting out of hand and was unattractive to many architects, opening the door to project and construction managers to take the lead. The promise is also a threat: if architects don’t seize upon BIM and own the model, others will.

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The first effect of working with BIM is to move the hump in the workload graph forward. The conventional workload pattern on a project is tail-heavy, requiring architects to conserve fees to cover the inevitable cost of production information and site support and leaving only a fraction for the value-adding early stages. BIM largely automates production information and answers site questions itself. It does however need a 'Stage E' level model to emerge where a 'Stage D' sign-off would have been used previously to complete customer approval. Realistic construction detail has to be used early, with supplier inputs where appropriate. There is less work to do overall but it comes sooner. That also makes it more affordable to do design iteration to solve problems or meet client changes. More customer value can be created for less design cost.

Change management by BIM is a major boon. A change in layout or specification rattles automatically through all affected information without intervention, making the architect more willing to respond to client wishes or constructor ideas. The consultants' BIM can be used directly by suppliers to drive the making of components on NC machines: CADCAM. Steelwork fabricators already do this. Timber systems can use it too, as Nick Willson's work demonstrates. In future buildings might be 'printed' as one can now make a stereo-lithographic model from a BIM. Components are being offered as models in online catalogues. You can import these into your BIM as architects once traced in details from catalogues. Custom-designed assemblies can be imported too, from your supplier. The difference is that the imported item brings all its requirements and database with it, fitting in so that there are no interface surprises on site when the real components arrive.

Now to the top-down benefits: 'Smart Codes' is a term we don't use in UK but might seek to have. Our building regulations are un-smart in that they don't exist as rules to be run through your BIM. They do exist like this in Singapore, Norway and several other places now. You can test your design against the code automatically and be sure that you will get approval when you do submit. The Singapore system includes planning permission too as its also rule-based. Turnaround is inside a day. For US code compliance a product now exists to allow you to enter the location of your project and have your design vetted automatically for the appropriate code; there are 40,000 jurisdictions in the USA. Would it not be great to recast the UK regulations for BIM use, saving routine workload and freeing overworked BCOs to deal with unusual proposals and enforcement? The UK government doesn't see the opportunity yet.

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Clients are the people who will drive BIM take-up. Owner occupiers are in the lead in the USA. Private sector clients who build regularly are demanding BIM for its client advantages and the US Government requires it for its facilities. FM savings are convincing, plus the risk reduction experienced. 'Integrated Project Delivery' (IPD) is the Holy Grail for activist US clients, using a client-led, design-build team and a BIM to improve quality and speed whilst reducing risk and defects. BIM is made for integrated teamwork. So keen is the American Institute of Architects on IPD that it has published guidance on its website.

Not everything about BIM is wonderful or oven-ready: BIM is still evolving. The vendors have not helped by trying to capture users in proprietary systems which can't fully exchange with others, instead of providing interoperability. Construction is not like car or aerospace design where dominant manufacturers can dictate the system suppliers must use. Vendors also sell separate versions for each profession. Interoperability is the goal, and it's based on a software concept called IFCs, Industrial Foundation Classes, devised by the enthusiasts of the worldwide BuildingSmart club who want to see BIM rule. The dominant clients want interoperability so they don't get dependant on any vendor and can use any supplier. There is also no intellectual property solution yet for BIM: if a supplier uses a consultant's model to make his component, is he really responsible? Yet avoiding redrawing cuts error and is a huge saving. There is no project insurance product which supports Integrated Project Delivery. Yet devotees see it as reducing risk so much they go bare.

There are signs that even imperfect BIM is winning over users. A tipping point can be discerned. Revit sees a 50% growth in users year-on-year; McGraw Hill is reporting users finding payback builds up the more they use BIM; US contractor Mortensen reports site requests for information have gone down 74% on BIM projects. UK consultants HOK and BDP now use BIM as standard. Building Design held a webinar recently at which two thirds of participants saw momentum building.

BIM is the design medium of the 21st century, with the chance for architects to regain control of the process and spend more time on design. I urge you to go for it.

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