Realising BIM savings in D&B contracting

STUART MACDOUGALD-DENTON – DIALES EXPERT, LOOKS AT THE PREDICTION THAT BIM USAGE WOULD INTRODUCE COST SAVINGS TO DESIGN AND BUILD CONTRACTS; AND THE APPLICATION METHODS AND REALITIES THAT NEED TO BE MET TO ALLOW THIS TO HAPPEN.

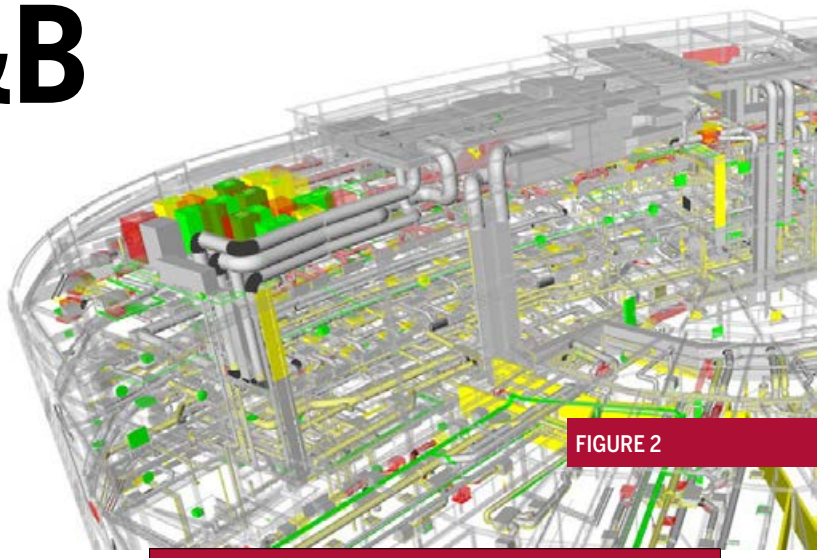
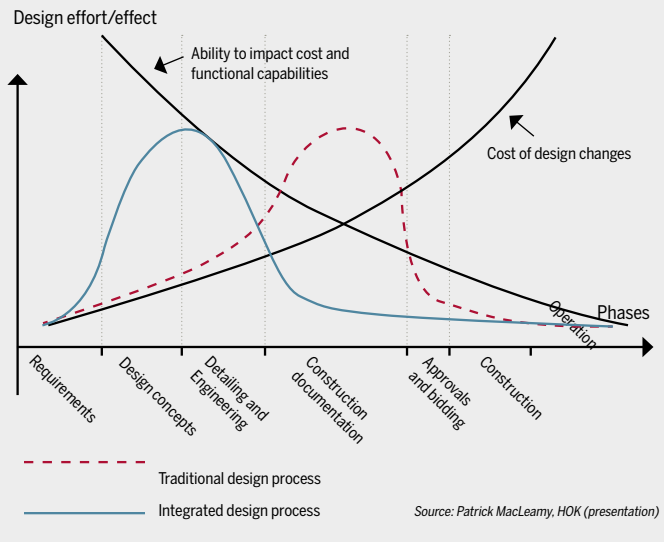


FIGURE 2

FIGURE 1

	Approximate cost as % of project		
	Traditional D&B	BIM	Saving
Detailed Design Fees (Arch, SE & MEP post RIBA Stage 3)	5.0 – 6.0	4.0 – 4.5	1.0 – 1.5
Improved coordination, reduction in ambiguity, no clashes, less change, reduced rework	2.0 – 4.0	0.5	1.5 – 3.5
Contingency, quants risk, design development, claims and prolongation	4.0	2.0	2.0
MEP package costs (risk, contingency, quants, coordination allowance, improved value engineering [VE])	10.0 – 15.0	5.0 – 8.0	5.0 – 7.0
Programme Saving	4 – 6 weeks per year of programme		
	15.0	13.5	1.5
Reduced waste due to design discipline, rationalisation and prefabrication	15.0	10.0	5.0
Total	**51.0 – 59.0**	**35.0 – 38.5**	**16.0 – 20.5**

FIGURE 3 MACLEAMY CURVE



In the early days, BIM evangelists promised us savings (Fig. 1 above). They said that the designing in BIM would result in the design being substantially complete earlier in the project process (Fig. 3 below).

But what happened?

Designs were produced in BIM, fully detailed and all inclusive, but we failed to recognise a key element of design and build (D&B) contracting: the subcontractor's design. For example, fully designing a curtain walling installation ties us down to one particular window system and means specialist input is needed to design the window sections, which will need to be bought in. For mechanical, electrical, and plumbing (MEP) systems; fully designed ductwork, pipework and cabling routes, sizes, and hierarchy of installation leaves little for the MEP subcontractor to work with and deliver best value. Alternatively, if, like some, you failed to tie your subcontractors down properly in their subcontracts, they may well have gone away and value engineered their works without regard for the impact that might have on adjacent elements of work.

For example, Fig. 2 (top) shows part of a tender MEP BIM overlaid with the as-built MEP BIM model. The MEP items in red are those that were in the tender but have been deleted (8,376 in all), which have been replaced by the green coloured items (7,183 in all); and the yellow coloured items are ones where the size or technical data has been changed (12,204 in all).

The most obvious end result of all these changes to the MEP systems was

FIGURE 4 UNPLANNED CONSEQUENCES (OVERLAID ON MACLEAMY CURVE)

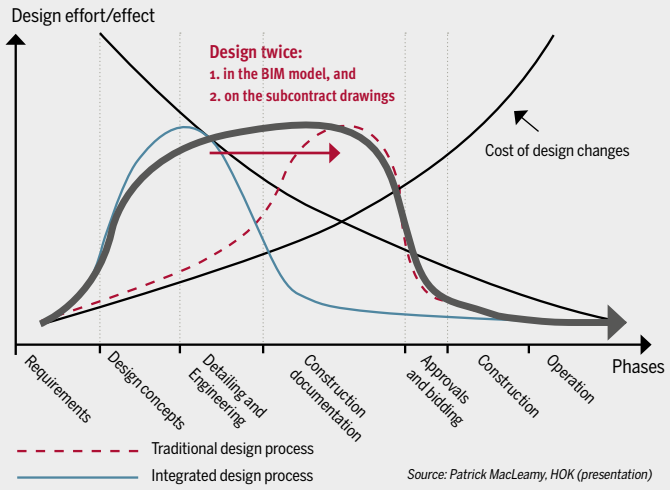


FIGURE 5 DESIGN TASKS SHARE (OVERLAID ON MACLEAMY CURVE)

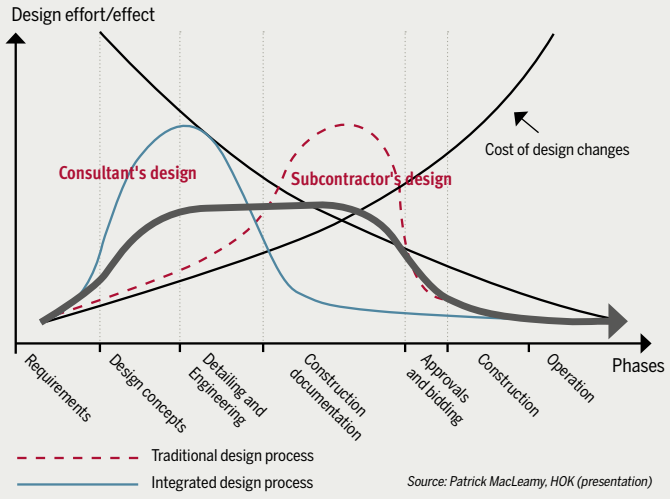
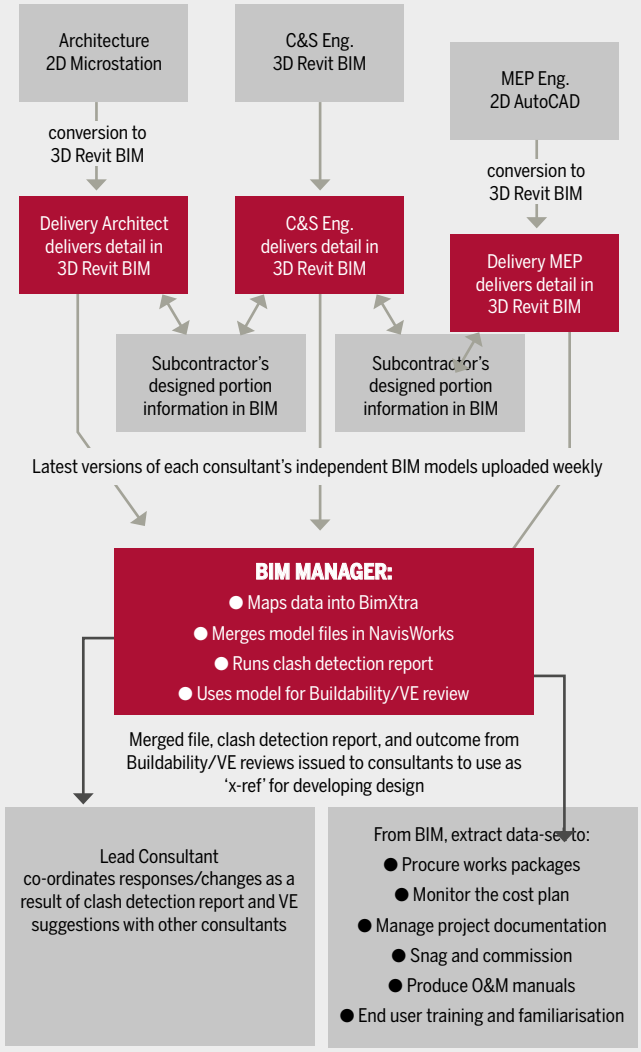


FIGURE 6 TENDER ROUTE MAP FROM 2D CAD TO BIM



that holes that had been pre-formed in walls, floors, and some beams had to be partially or wholly sealed up and new openings made. Some other, less significant, modifications were needed too. However, what the MEP subcontractor had done was allowed under his non-BIM aligned subcontract. So who picked up the costs? – the main contractor. In reality, the work distribution curve now looked like Fig. 4 (below):

So what's the answer?

There is a significant amount of detailed design work that can happen early, but there are some items that need to be left to the subcontract designers. The work package, or work elements where subcontract design is to be allowed, needs to be clearly defined at the outset, so the consultant designers (architects, structural engineers [SE], MEP, etc.) don't waste time on this element of the design. The selected items need to be easily substituted into the BIM model, so that the architect, for example, will simply design the curtain walling as a thin rectangular box, occupying the position where the curtain wall will sit. This should allow the curtain walling abutment design and details to be substantially completed before the subcontract is let; with the curtain walling designer swapping its specific system design into the BIM model, which meets the design intent and performance specification. In this way, we can hopefully get closer to a work distribution curve like Fig. 5 (bottom right).

However, this means that the product from subcontract designers needs to be in BIM. This will also be important if the D&B requirements include the production of a BIM operation and maintenance (O&M) manual. But not all subcontract designers currently work in BIM, especially not at the smaller end of contract values. So a strategy needs to be adopted to create a level tendering playing field. Work package subcontracts will need to be let on an 'either/or' basis. Either the subcontractor prices for delivering the design in BIM, or the subcontractor prices for delivering the design in some other format and the D&B contractor has to add-on the cost of converting this information into BIM to create a like-for-like price.

Accordingly, with the right strategy defined at the outset, each part of the Works only gets designed once, by the person best able to complete the design and mitigate the risks; and an all-inclusive price can be provided for working in BIM and delivering a BIM O&M manual. Ultimately, with the right strategy, some of the promised project savings can be realised, even if the D&B tender arrives in 2D CAD. Fig. 6 (below) is the tender strategy that was used to take a (mostly) 2D CAD, RIBA Stage 4, £90 million tender forward in BIM.

Despite the cost and delay incurred converting the 2D CAD information into BIM, the savings allowed a conservative £2 million (2.25%) reduction in the tender and a further £4 million (4.5%) realised by the end of construction. Whilst this was still short of the 16-20% saving mentioned at the start of this article, I now believe we'll get there, with the right strategy, of course! ■