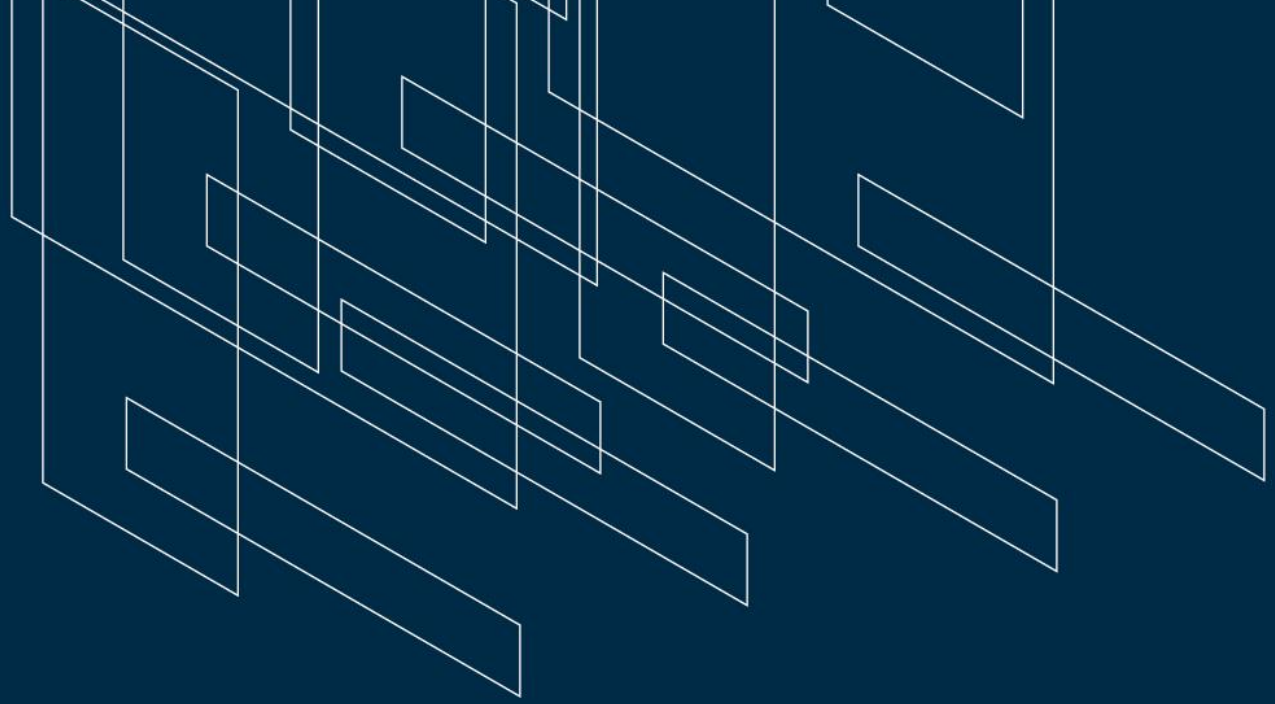

BIM – Potential Risks

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CHARTERED ARCHITECTS . DISPUTE RESOLUTION

Government:	Taking initiative. Defining deliverables. Developing standards.
Architects:	Some now at level 2 BIM. RIBA now gearing up.
Dispute Resolution:	Several concerns. No BIM-specific UK case law. What will be “normal”?

RIBA Role

Working with Government and Construction Industry Council

BIM Overlay to the RIBA Outline Plan of Work

		RIBA Work Stage	Description of Key Tasks	Core BIM Activities
Preparation	A	Appraisal	Identification of client's needs and objectives, business case, sustainability, life cycle and Facilities Management aspirations and possible constraints on development. Preparation of feasibility studies and assessment of options to enable the client to decide whether to proceed.	• Advise client on purpose of BIM including benefits and implications. Agree level and extent of BIM including 4D (time), 5D (cost) and 6D (FM) following software assessment. Advise client on Integrated Team scope of service in totality and for each designer including requirements for specialists and appointment of a BIM Model Manager. • Define long-term responsibilities, including ownership of model. • Define BIM Inputs and Outputs and scope of post-occupancy evaluation (Soft Landings). • Identify scope of and commission BIM surveys and investigation reports.
	B	Design Brief	Development of initial statement of requirements into the Design Brief by or on behalf of the client, confirming key requirements and constraints. Identification of procurement method, project sustainability and BIM procedures, building design lifetime and project organisational structure and range of consultants and others to be engaged for the project, including definition of responsibilities.	• Data drop 1.
Design	C	Concept	Implementation of Design Brief and preparation of additional data. Agreement of Project Quality Plan including BIM and Change Control protocols. Preparation of Concept Design including outline proposals for structural and environmental strategies and services systems, site landscape and ecology, outline specifications, preliminary cost and energy plans. Review of procurement route.	• BIM pre-start meeting. • Initial model sharing with Design Team for strategic analysis and options appraisal. • BIM data used for environmental performance and area analysis. • Identify key model elements (e.g. prefabricated component) and create concept level parametric objects for all major elements. • Enable design team access to BIM data. • Agree extent of performance specified work. • Data drop 2.
	D	Design Development	Development of concept design using project BIM data to include structural and environmental strategies and services systems, site landscape and ecology, updated outline specifications and cost and energy plans. Completion of Project Brief. *Application for detailed planning permission.*	• Data sharing and integration for design co-ordination and detailed analysis including data links between models. • Integration/development of generic/bespoke design components. • BIM data used for environmental performance and area analysis. • Data sharing for design co-ordination, technical analysis and addition of specification data. • Export data for Planning Application. • 4D and/or 5D assessment.
	E	Technical Design	Preparation of technical design(s) and specifications, sufficient to co-ordinate components and elements of the project, BIM data and *information for statutory standards, sustainability assessment and construction safety.*	• Data drop 3.
Pre-Construction	F	Production Information	F1 ~~Preparation of production information~~ Development of BIM data in sufficient detail to conclude co-ordination of design team inputs, to enable performance specified work to commence and enable a tender or tenders to be obtained. *Application for statutory approvals.* F2 ~~*Preparation of further information for construction required under the building contract.*~~ *Development of BIM data to integrate performance specified design work into model.* Review of BIM information provided by contractors and specialists, including integration into project BIM data.	• Export data for Building Control Analysis. • Data sharing for conclusion of design co-ordination and detailed analysis with subcontractors. • Detailed modelling, integration and analysis. • Create production level parametric objects for all major elements (where appropriate and information exists this may be based on tier 2 supplier's information). • Embed specification to model. • Final review and sign off of model. • Enable access to BIM model to contractor(s). • Integration of subcontractor performance specified work model information into BIM model data. • Review construction sequencing (4D) with contractor.
	G	Tender Documentation	Preparation and/or collation of tender documentation in sufficient detail to enable a tender or tenders to be obtained for the project.	• Data drop 4.
	H	Tender Action	Identification and evaluation of potential contractors and/or specialists for the project. Obtaining and appraising tenders; submission of recommendations to the client.	

		RIBA Work Stage	Description of Key Tasks	Core BIM Activities
Construction	J	Mobilisation	Letting the building contract, appointing the contractor. ~~Issuing of information to the contractor.~~ Arranging site handover to the contractor.	• Agree timing and scope of 'Soft Landings'. • Co-ordinate and release of 'End of Construction' BIM record model data. • Use of 4D/5D BIM data for contract administration purposes. • Data drop 5.
	K	Construction to Practical Completion	Administration of the building contract to Practical Completion. ~~Provision to the contractor of further information as and when reasonably required.~~ Clarification and resolution of design queries as they arise. ~~Review of information provided by contractors and specialists.~~ Assist with preparation for commissioning, training, handover, future monitoring and maintenance.	
Use	L	Post Practical Completion	L1 Administration of the building contract after Practical Completion and making final inspections. L2 Assisting building user during initial occupation period.	• FM BIM model data issued as asset changes are made. • Study of parametric object information contained within BIM model data. • Data drop 6.
R&D	M	Model Maintenance & Development	L3 Review of project performance in use and comparison with BIM data. Analysis of BIM data for use on future projects following feedback and research.	

Current Plan of Work

The current version of the RIBA Outline Plan of Work is available to download at:

http://www.ribabookshops.com/plan-of-work

Green Overlay

To allow the BIM Overlay to sit alongside the Green Overlay to the RIBA Outline Plan of Work, the suggested amendments to the 'description of key tasks' included in the Green Overlay have also been included in the BIM Overlay. The Green Overlay text is highlighted in green, and to avoid confusion the BIM Overlay text is shown in purple.

In reality, many of the changes in the Green Overlay are pertinent to the BIM Overlay. For example, subjects such as Soft Landings are relevant from both a sustainability and BIM perspective. The Green Overlay of the Outline Plan of Work, that also contains additional valuable guidance on green issues, can be downloaded from:

http://www.ribabookshops.com/plan-of-work

"Data Drops" (in RIBA BIM Overlay)	Latest full description at each stage – "milestone" record - will probably comprise:- - Combined BIM 3D model as a navigable electronic file. - 2D drawing outputs – plans, elevations etc. - Cobie information set

New obligations for Architects?	Architects may now already be obliged to raise with clients the potential for BIM in any new project where the client might benefit from it – and to do so as early as possible.

Integration of professionals' design:

Entangled professional liabilities?

- Probably not a major concern while BIM is at level 2 and each professional has charge of own model.
- Skill and care of any distinct party can still be traced through the process.
- But responsibility for monitoring/ checking the composite model must be clear.

BIM management role:

BIM client wants:-

- Smooth construction process. BIM process both encourages and enables a higher standard of checking than otherwise normal or possible.
- Reliable and accessible structured information about the delivered building for occupier reference.
- Ideally all design changes made during construction should be fed back into the model and its element data.

Architect as BIM manager?

Currently:-

- Some larger / more BIM-advanced firms taking this on.
- Otherwise reasonable to recommend a specialist.
- BIM management may already be in place if architect is appointed after the design phase.
- Trend may be towards architects providing BIM management as a natural extension of their lead co-ordination role.

BIM readiness?

- Hardware
- Software
- Training
- Budget c.10K/desk (anecdotal).
- At least one person who is both experienced in building construction and can navigate the software.

BIM workload:

- BIM tends to require more architect effort earlier in the design process, and less during the construction phase (as long as all professionals are keeping up).
- Ensure that any staged fee structure reflects this or, if competing, ensure that the high early value of BIM-structured work is appreciated.
- Initiating BIM from the outset may generate a disproportionate amount of early work prone to risk of redundancy due to unforeseen factors such as planning consent difficulties, tenant reconfigurations etc.

Appointment terms for BIM?

US precedents for contract supplements:-

- AIA E202 form.
- ConsensusDocs 301 form.

No commonly established UK equivalent yet, but illustrative draft for a protocol is in Appendix 20 of the Government's March 2011 BIM strategy paper.

BIM Standard or Execution Plan

- To be cited by the BIM protocol as the project's common standard for production, monitoring and exchange of information.
- Several established standards developed in US and elsewhere – e.g. Penn State.
- For UK: AEC (UK) BIM Standard – follows BS 1192:2007 guidance. Generic, Revit or Bentley versions.
- Upcoming PAS 1192:2.

2011 Lawsuit in US

- Architect and Services Engineer had produced coordinated 3D model.
- 2D print-offs failed to convey intricate positioning / sequencing to services installer.
- Installer proceeded pragmatically – but ran out of room inside ceiling.
- Multi-million settlement out of court shared between contractor, architect and services engineer.

2011 Lawsuit in US - Lessons:

- Not enough merely to achieve a self-consistent static model.
- Designers will have to think more/sooner about a fully coherent and buildable end product – BIM "right to left" thinking.
- Effective communication needed alongside the BIM outputs – sketches, meetings, visits.
- Services integration always has been a potential source of late/unforeseen disruption, and remains a relatively wild area under BIM.

BIM potential problems (1)

Major/multiple technical errors due (or allegedly due) to faulty BIM software, or imperfect interaction between different parties' specialist software.

- But there has been recent and continuing effort by BIM software industry to improve interoperability.
- Issue will never entirely fade – upgrades and add-ons.

BIM potential problems (2)

Conflict between the non-visible properties or requirements of different elements in the model, for instance:-

- Most mechanical units require a clearance zone for access and maintenance – must be drawn for adequate clash coordination.
- Door swings – draw them or check them.
- Adequate user space around fittings.

BIM potential problems (3)

Status of specialist information attached to the model's elements or components.

- Who should check adequacy/compatibility? – and how assiduously?
- Did the BIM protocol or standard make this adequately clear?

BIM potential problems (4)

Who owns the BIM-structured model/information and what it contains?

- Confidentiality and rights of access.
- No radical change while BIM remains at level 2.
- Government envisages that Cobie dataset information generated by the combined BIM process will be owned by the client at all times.

BIM potential problems (5)

Contractual status of the BIM model and its structured information?

- Probably not a major concern given current software's ability to generate conventional printable 2D plans, details etc from the model.
- But skill and care needed in setting up this type of output.
- All electronic media and storage prone to accident and obsolescence.
- 2D drawings will probably remain "bedrock" medium for legal and contract purposes.

BIM potential problems (6)

Architects' duty of design coordination.

- BIM has the potential - and is expected - largely to pre-empt coordination errors or omissions.
- The expected professional standards will therefore tend to rise - both for BIM and non-BIM architects.
- Non-BIM architects may have to raise skill and care in design coordination – exceeding the standard that might previously have been acceptable for non-BIM projects.

Insurance

- Some PI insurers now conversant with BIM.
- Premiums not necessarily higher if protocols and standards are properly set up.
- Potential for Integrated Project Insurance – not commercially attractive at present (anecdotal) – may become more attractive/necessary if or when Level 3 BIM becomes normal.

The Future

- Level 3 BIM integration will tend to be inhibited by the desire to preserve legal separation of parties' liabilities.
- May add impetus to the formation of "multi-disciplinary" professional building design practices.
- BIM transparency may tend to erode typical client-professional-contractor project structure - as long as the client retains a proficient BIM monitor.
- Planning permission hurdle will still favour architects' early and defining involvement.

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