A presentation by

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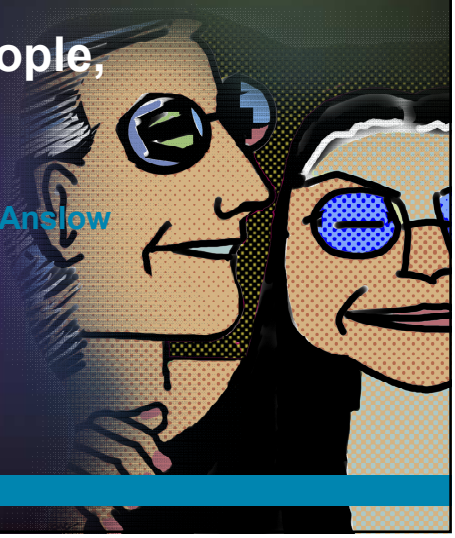
BIM-agine all the people, working in harmony



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The meaning of BIM in the UK

How is it defined?

- BIM = 'Building Information Modelling'
- No universally accepted definition of BIM

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The Cabinet Office BIM Task Group define it as:

- '…constructing a managed digital information 3D model of an asset, be it a building or an infrastructure project (both new-build and retained estate) that is infused with data. This information model can be used to inform the decision making process and answer questions throughout the entire project lifecycle'

NBS, the publishers of the National Building Specification, define it as:

- 'A rich information model consisting of potentially multiple data sources, elements of which can be shared across all stakeholders and be maintained across the life of the building from inception to recycling'

Keith Snook, RBA Director of Research and Technical, defines it as:

- '….digital representation of physical and functional characteristics of a facility creating shared knowledge resource for information about it forming a reliable basis for decisions during its life cycle, from earliest conception to demolition'

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So BIM is:

- A managed digital information model
- Representing the physical and functional characteristics of a facility
- Infused with data from potentially multiple data sources
- Which can be shared across all stakeholders; and
- Used to inform the decision making process and answer questions throughout the entire project lifecycle from earliest conception to demolition

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BUT it is not just software. It's a combination of:

- Software
- Technology
- People
- Processes; and
- Workflow

BIM has various levels of sophistication – the BIM maturity levels.

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What are the BIM maturity levels?

Level 0

- Unmanaged CAD in 2D; with
- Paper (or electronic paper) as the most likely data exchange mechanism

Level 1

- A managed CAD in 2D or 3D format; with
- A collaboration tool providing a common data environment; and
- Possibly a standardised approach to some data structures and formats
- Commercial data is managed by standalone finance and cost management packages with no integration

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Level 2 (sometimes referred to as proprietary or pBIM):

- A managed 3D environment
- Held in separate discipline BIM tools with attached data
- Commercial data is managed by enterprise resource planning software; and
- Integrated by proprietary interfaces or bespoke middleware
- It may utilise:
  - 4D construction sequencing and/or
  - 5D cost information

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Level 3 (sometimes referred to as integrated BIM or iBIM):

- A fully integrated and collaborative process enabled by 'web services'
- Utilising:
  - 4D construction sequencing
  - 5D cost information and
  - 6D project lifecycle management information
- We do not currently have the technology for level three

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How will BIM utilise 4D, 5D and 6D?

4D – time

The BIM model will include tools to visually depict the space utilisation of the job site throughout a project's construction, enabling:

- Site logistics and yard operations to be verified
- The improved planning and monitoring of H&S precautions needed on site; and
- The construction schedule to be visualised

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5D – cost

- The BIM model will:
  - Be able to include information that allows a contractor to accurately and rapidly generate essential estimating information e.g. materials quantities and costs, size and area estimates and productivity projections
  - Allow cost data to be added to each object:
    - Enabling the model to automatically calculate a rough estimate of material costs
    - Facilitating value engineering

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6D facilities management

- The model will be able to:
  - Contain all of the specifications, O&M manuals and warranty information, useful for future maintenance
  - Use sensors to capture data during the operation of a facility that can be used to:
    - Model and evaluate the energy efficiency of a facility
    - Model and evaluate the life cycle costs of a facility
    - Optimise the cost efficiency of a facility; and
    - Enable the cost-effectiveness of any proposed upgrades to be evaluated

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The future of BIM in the UK

Public sector

- Spends around £44billion per annum on construction
- The Government, has committed itself to requiring:
  - a minimum of Level 2 BIM Operation
  - on all centrally procured government projects
  - regardless of value
  - by the end of the current parliament in 2016
- Local Government is increasingly using BIM e.g. Manchester City Council has been using BIM:
  - in school building (Old Moat)
  - house building (West Gorton); and
  - building renovation and refurbishment (Central Library)

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Private sector

- Spends around £66 billion per annum on construction.
- Does not always follow the public sector e.g. much lower uptake of the NEC in the private sector
- BUT the feedback from the industry – the private sector is taking the lead.

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What is the motivation?

- Primary motivation = **MONEY**

The theory:

- It is part of the government's strategy to reduce capital expenditure on construction by 20%
- The BIM Task Group estimates that BIM could save organisations 20-30% by stripping waste from their processes

In practice:

- The Ministry of Justice reports saving c.£1M due to using BIM on a new young offenders' institution (Cookham Wood) valued at £20 million
- BAM, on its first major scheme to use BIM, declared:
  - cost savings of £350,000
  - a reduction of 15,000 man hours
  - an 8% reduction in material wastage and
  - estimated savings of £400,000 because of identified design problems

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The good news for PI insurers

Clash detection

Traditionally:

- Design drawings had to be co-ordinated;
- Clashes were often identified on site
- Expensive delays/claims.

BIM enables:

- Potential problems to be identified early in the design phase; and
- Resolved before construction begins
- Avoiding (or at least considerably reducing the quantum of) potentially expensive claims

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The technology

Two types of clash detection technology:

- Clash detection within modelling design software
- Separate BIM integration tools that perform clash detection

At BIM maturity level 2, separate BIM integration tools will be the norm as:

- It will be common for different disciplines to do their work on different software platforms; which
- Cannot speak directly to each other; and
- Cannot alert each other to clashes

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The detail

Clash detection in BIM modelling looks for three classes of clashes:

- **Hard clashes:**
  when two objects are occupying the same space.
- **Soft clashes:**
  when two objects are in closer proximity than permitted.
- **4D/workflow clash:**
  project timeline clashes.

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The impact in practice

In America:

- It is estimated that each identified clash saves an average of $17,000 with;
- 2,000-3,000 clashes not being unusual on large projects (the BIM Journal)
- On one project:
  - BIM found 7,213 conflicts
  - Traditional plan reviewers found one

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Other risk management benefits

- Automatic low level correction when changes are made to the design ('intelligent objects')
- Generation of consistent 2D drawings at any stage of the design
- Earlier visualisations of a design in 3D allowing:
  - Easier verification of consistency to the design intent
  - Easier identification of design errors (e.g. constructability problems) and omissions before construction
  - On one project in America:
    - BIM found 257 constructability issues
    - Traditional plan reviewers found six

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The main potential pitfalls for PI insurers

Blurring responsibilities

The theory

- In a collaborative model it may be difficult to identify who is responsible for the particular aspect of the design
- Exacerbated by 'intelligent objections'

The reality

- Much less of a problem at level 2 BIM
- NOT a new problem.
- With BIM, the model should provide a record of who did what, acting as a 'black box'

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The contract documents can be used to adequately define:

- Change management processes; and
- The roles and responsibilities of the different parties to the BIM:
  - For BIM Level 2 – achieved by amending standard form contracts (e.g. the JCT Public Sector Supplement 2011) to refer to a BIM Protocol (e.g. CIC BIM Protocol and the AEC (UK) BIM Protocol)
  - For BIM Level 3 – significant changes may be required to contract structures and terms

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Liability to others involved in the design

The theory

- Designers could be directly liable to others involved in a collaborative BIM project

The reality

- **NOT** a new problem
  A person who gives wrong information to another person, knowing that person is likely to rely on it may be held to have owed a duty of care to that other person
- **BUT** such a duty in respect of economic loss – rarely held to arise between non-contracting participants in a building project

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- The policy of the law – recovery through the contractual route
- With increasingly collaborative BIM, the law may change – but doubtful
- In any event, the contract documents (e.g. a BIM Protocol) could be used to manage this risk by:
  - Clearly defining the level of reliance to be placed on another's contributions
  - Limiting liability to direct losses connected with the project

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A new role: the Model Manager

What does it involve?

- The powers and responsibilities of the Model Manager should be set out in the contract documents (e.g. a BIM Protocol)
- The role of Model Manager at BIM levels 2 and 3 is expected to include responsibility for:
  - co-ordinating the use of BIM on a project
  - model management
  - integration of individual designs (level 2 only)
  - user access to the BIM model
  - Data security
  - Maintaining a data archive

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What are the risks for insurers?

- No established risk profile
- Could have inadequate:
  - Training
  - Understanding of their responsibilities and/or
  - Appreciation of the resources required
  - E.g. Project Manager role in NEC3 contracts
- Could potentially have strict liability for data corruption or loss

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Over reliance on BIM Technology

- Some professionals have expressed concern that:
  - No human judgement will be applied after the fundamental construction components have been selected by computer programs based on the design parameters
  - The new breed of professionals may lack field experience and 'street sense'
- Only time will tell whether these concerns are warranted – **BUT** systems and training could prevent these concerns materialising

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The evidence so far

- Feedback from US/Canada – not affected claims so far/no impact on premiums
- November 2012 – Nunelah Design Consultants – no disputes in its 22 BIM projects in the UK and five overseas