BUILDING INFORMATION MODELLING (BIM)

- GLOBAL MATURITY IN ADOPTING BIM

FIG ACCO Meeting, Athens 24 Jan 2015

By See Lian Ong, Chair – Commission 10

What is BIM ?

- "At its simplest level, BIM provides a common environment for all information defining a building, facility or asset together with its common parts and activities. This including building shape, design and construction time, costs, physical performance, logistics and more."

(RICS "What is BIM")

- BIM model is the primary tool for the whole project team
- It is a shared information model

WHAT ?

- What is a Building Information Model (BIM)?

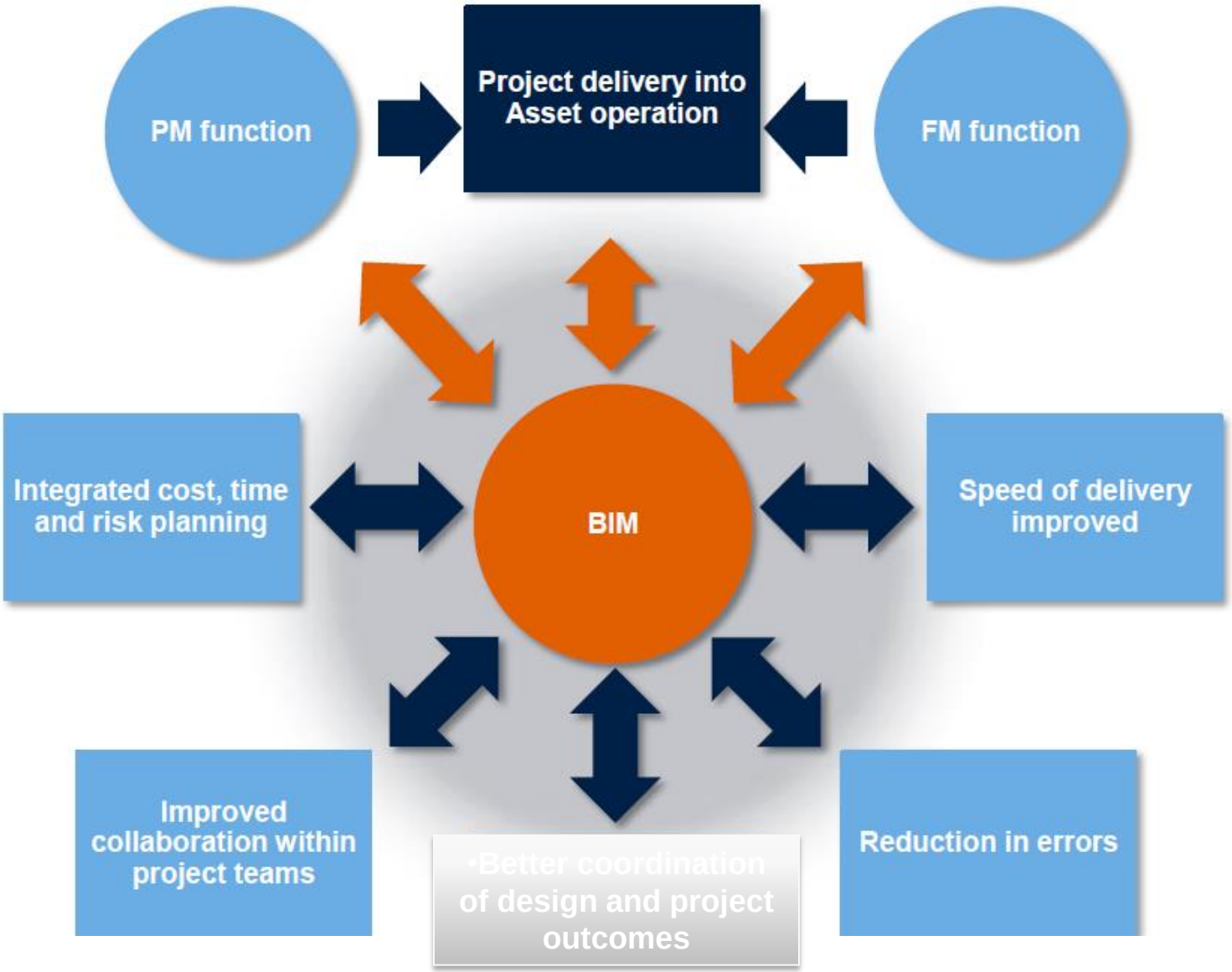
3D visualisation

- 1D Architecture
- 2D Mechanical Electrical Plumbing
- 3D Structure

Plus information

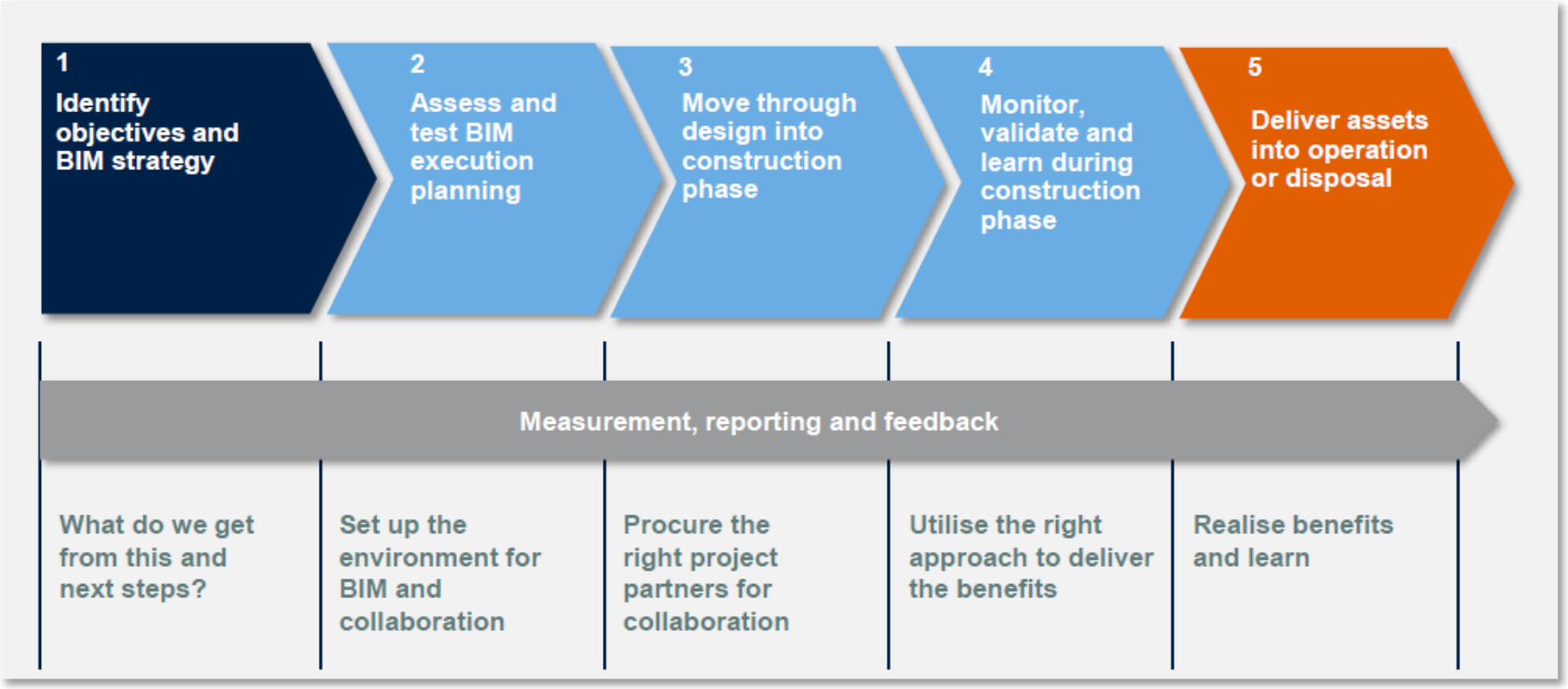
- 4D Time planning
- 5D Capital expenditure CAPEX
- 6D Operation expenditure OPEX

Why would we use BIM – Push and Pull?



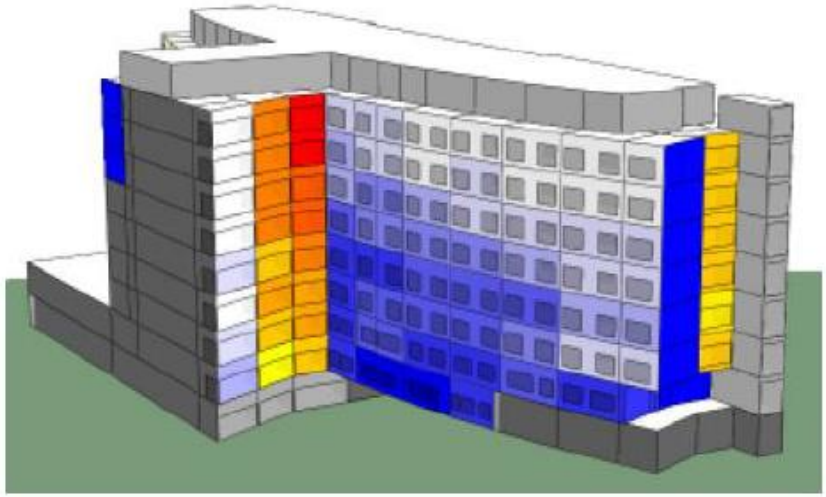
How?

BIM Service Map



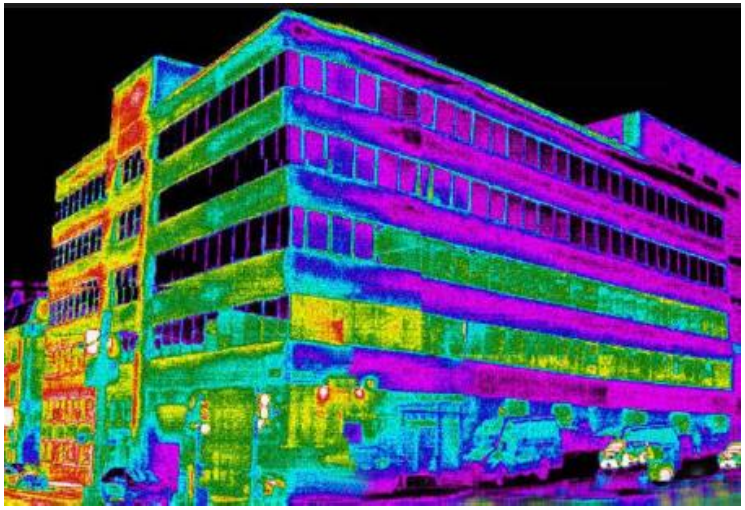
Design

- Thermal performance analysis
- Energy analysis



Result:

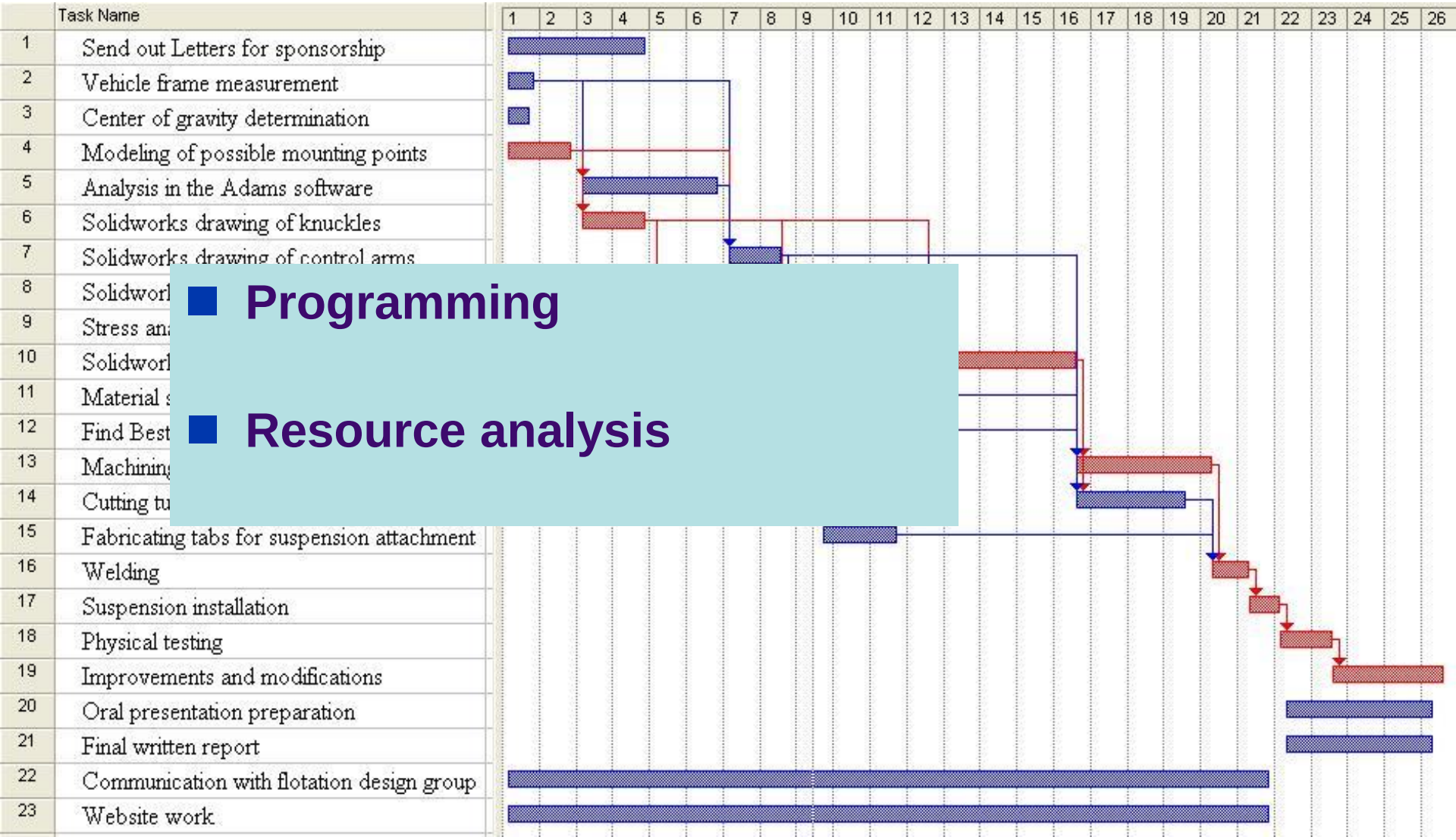
- **Reduced running cost**
- **Improved building performance**



Cost

- Quantity generation
- Pricing
- Whole life

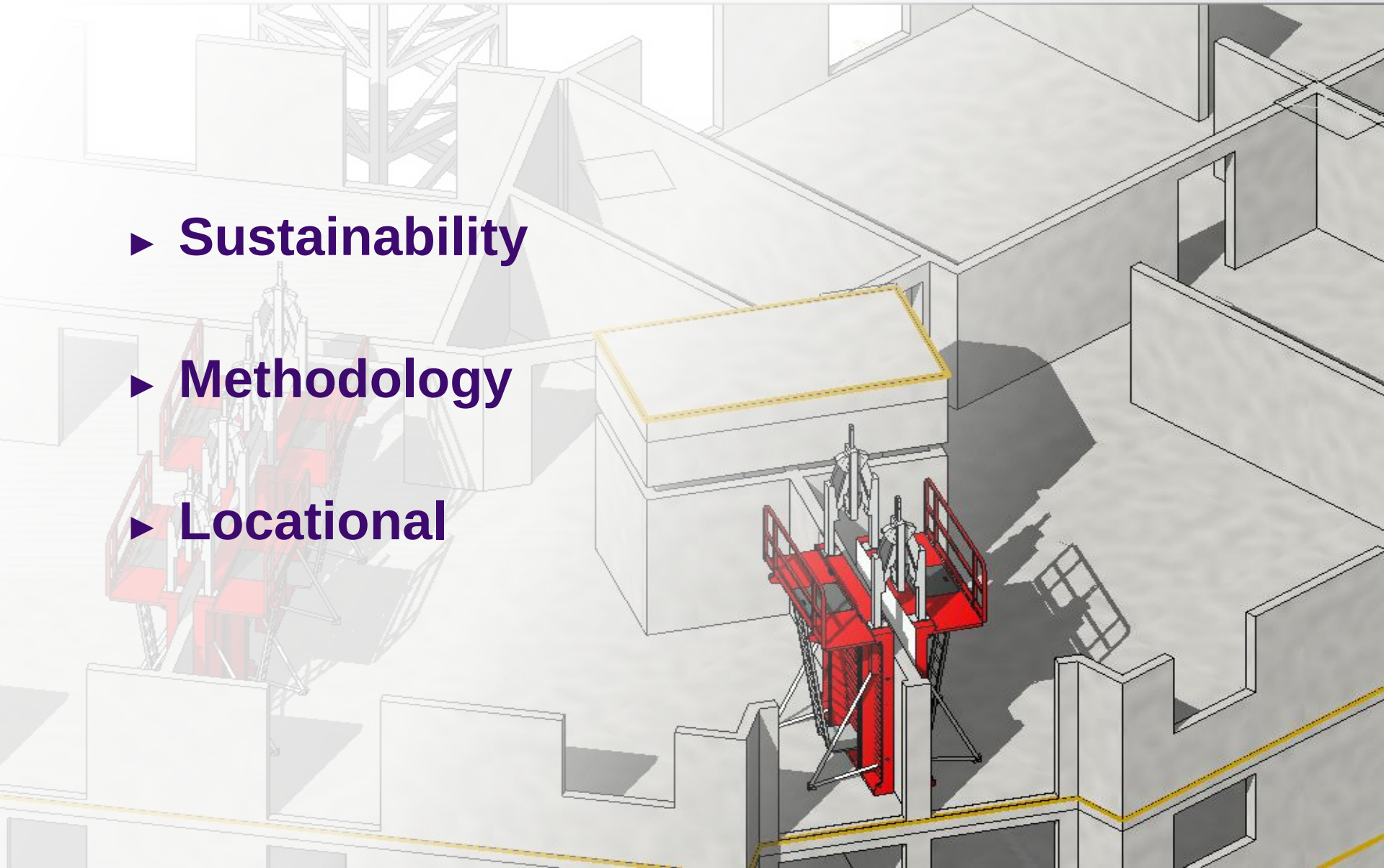
Time



- **Programming**
- **Resource analysis**

Other data

- Sustainability
- Methodology
- Locational



Connections

- Land
- Construction
- Property
- Digital economy

Benefits

BIM - Return on Investment

- Up to 40% elimination of unbudgeted change
- Up to 80% reduction in time taken to generate a cost estimate
- Cost estimation accuracy within 3%
- A savings of up to 10% of the contract value through clash detections
- Up to 7% reduction in project time

Benefits

Delivery team workflow

Definition of asset

- Enhanced understanding
- Better decisions
- Scenario testing
- Increased certainty of proposed solution
- Stakeholder engagement
- Assist with planning applications
- Assist with development appraisals

Construction of asset

- Greater collaboration
- Enhanced coordination of asset delivery
- Increased cost, time and performance certainty
- Reduced risk in construction
- Better quality outcomes

Operation of asset

- Digital asset data captured for use
- Baseline for KPI
- Understanding of the asset enabling efficient hard and soft FM
- Complete definition of the asset for transfer or 3rd party operation
- Re-use / remodelling can be planned easily

Benefits

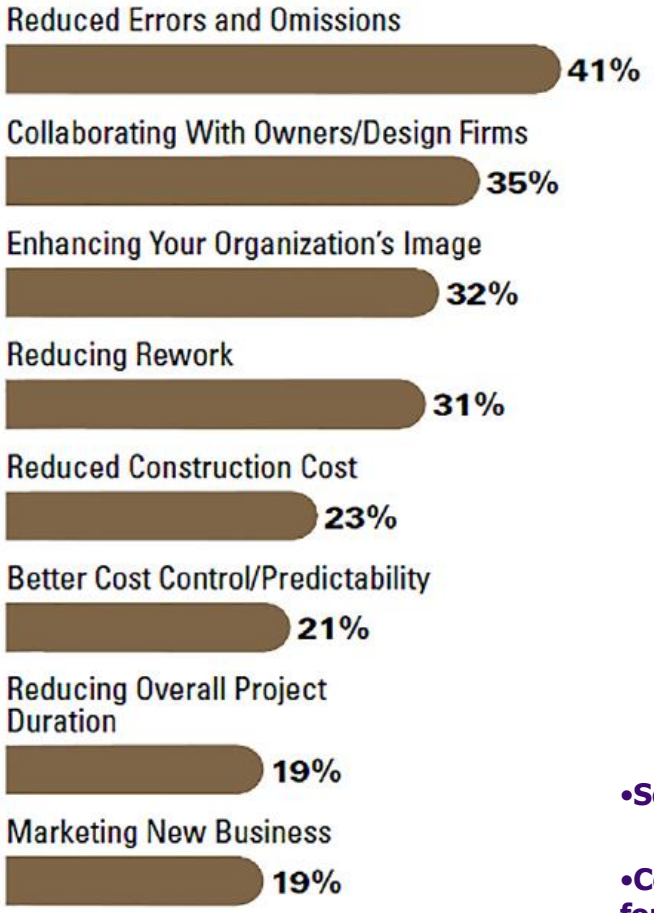
- Genuine collaboration
- Better "joined up" design
- Greater control of information, change and cost
- Less risk of project failures, delays and cost overruns
- Better understanding and control of lifecycle costs
- Better accessibility to facilities management information and operation costs – replacing traditional O & M manuals

Benefits

- Powerful value engineering tool
- Should result in savings in construction and operation costs
- Gives bidders real competitive edge
- Less likelihood of disputes

Benefits of BIM

- **Contractors Citing BIM Benefit Among Top Three for their Company**

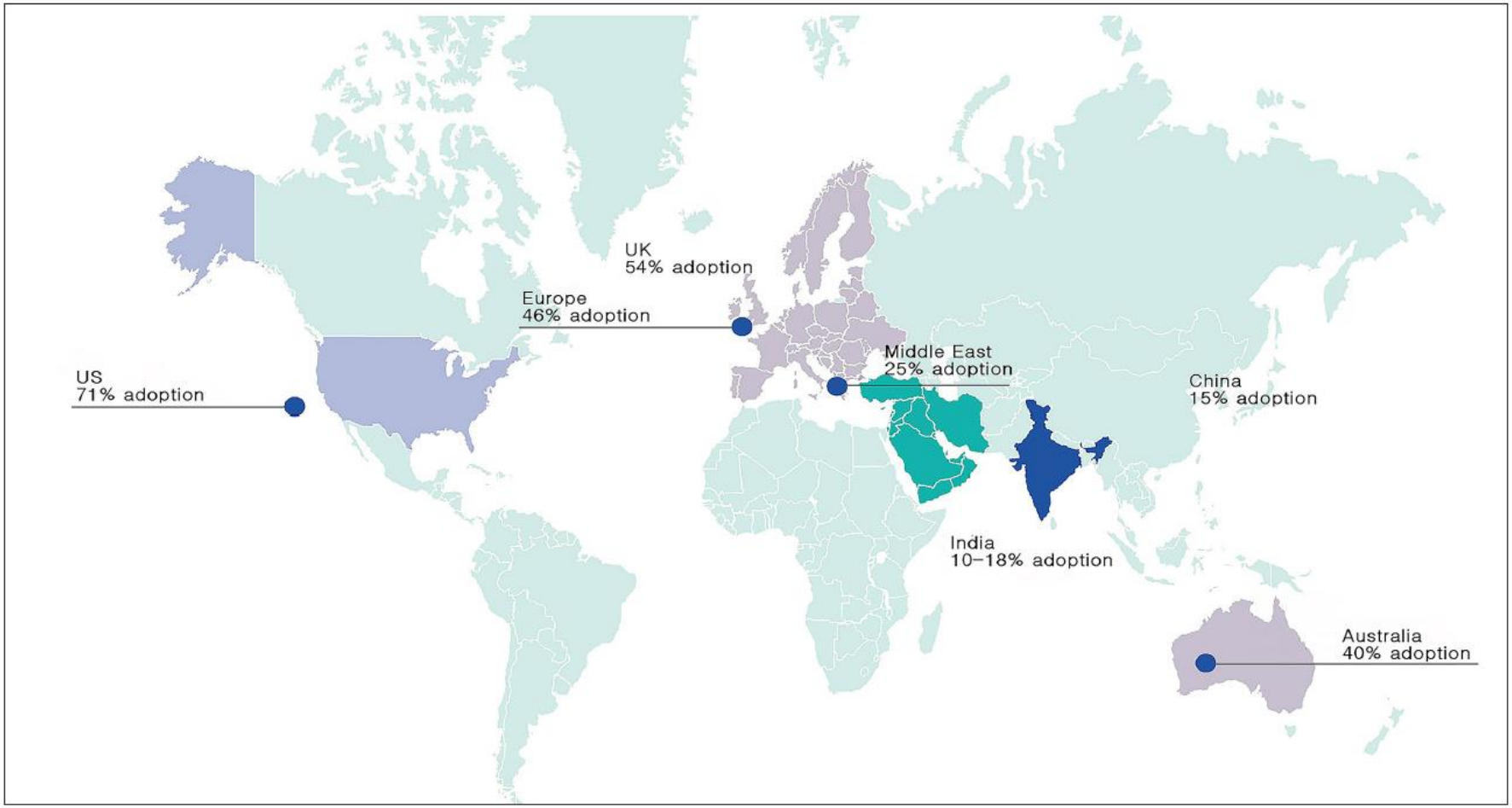


- **Source: McGraw Hill Construction 2013**

- **Courtesy of McGraw Hill Construction, The business value of BIM for construction in global markets, New York, 2014**

Global Maturity

- **Status of BIM adoption globally**

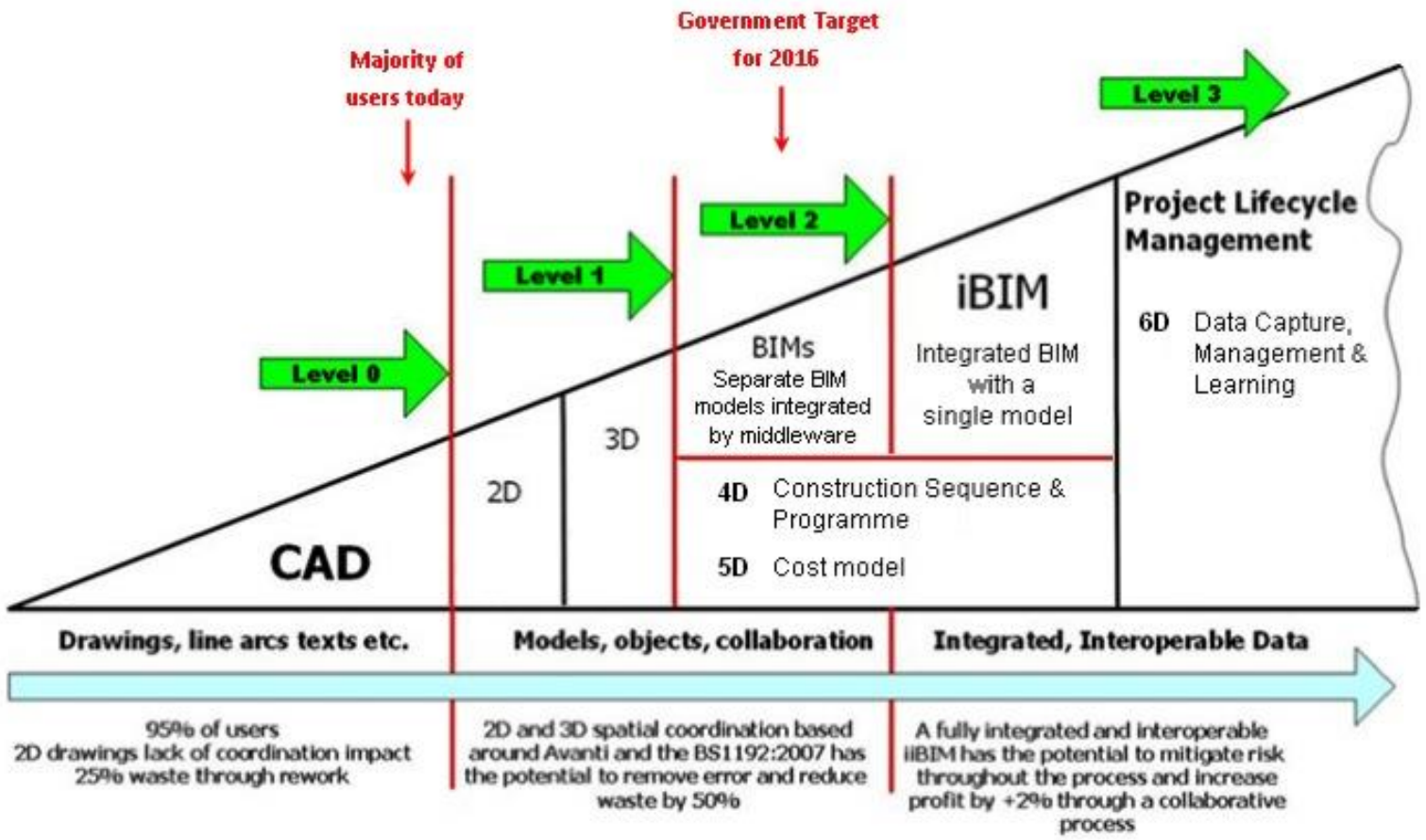


Global Adoption

- Increasingly **private sector clients** require suppliers to apply a BIM approach
- **Public sector clients** - BIM either has been, or will soon be, formally adopted by Governments in:

- Netherland
- Denmark
- Finland
- Norway
- UK
- European Union
- USA –
- UAE – Dubai Municipality
- Singapore
- Hong Kong
- Australia
- South Korea

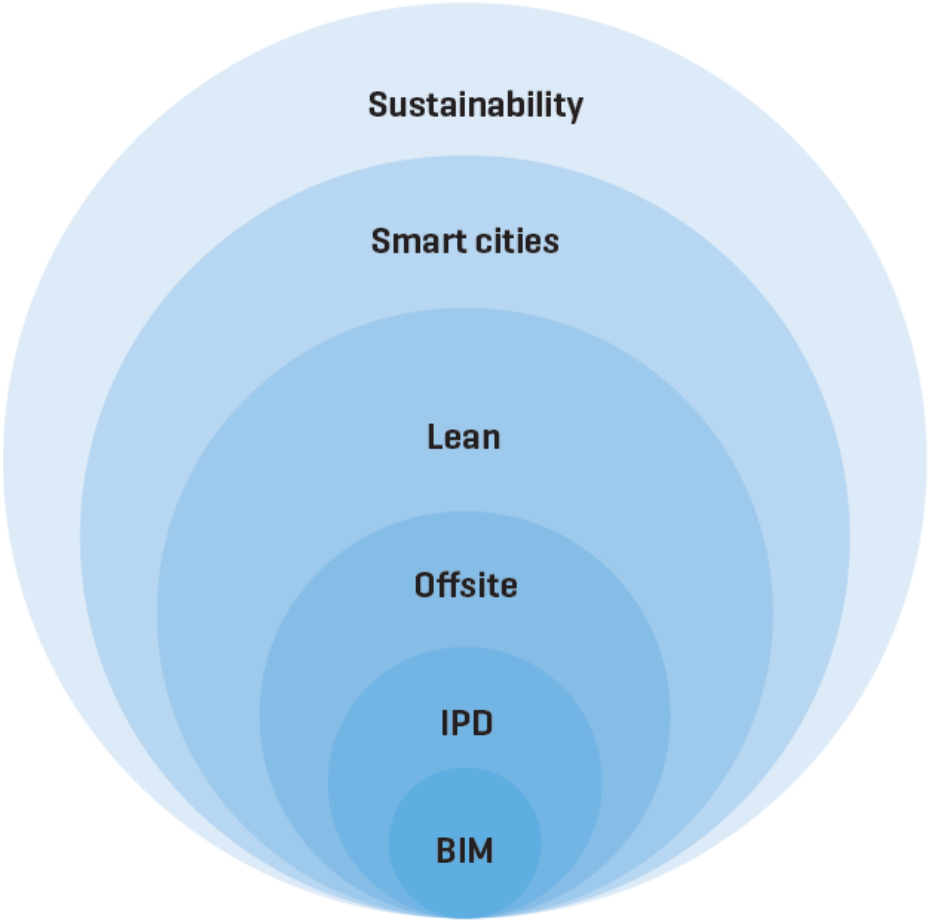
Growth of BIM in UK



Based on a diagram created by Mark Bew of BuildingSmart and Mervyn Richards of CPIC (2008)

BIM Connections

- BIM and other complementary paradigms

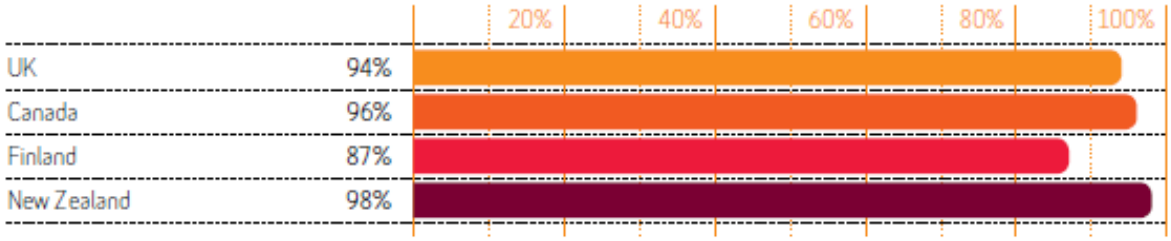


BIM Awareness

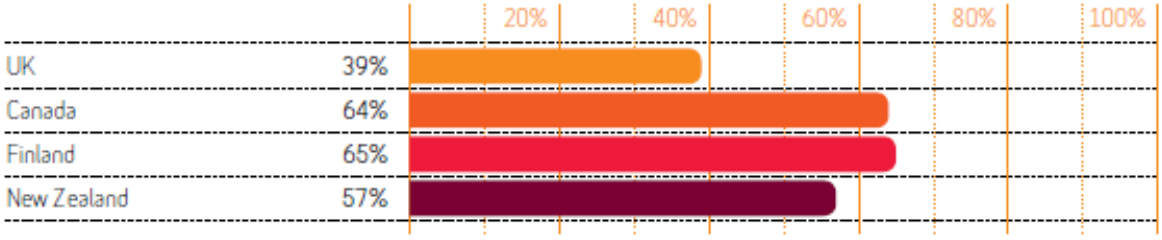
- **International BIM report**

"It's worth bearing in mind that the survey did not give a definition of BIM. This opens up the possibility that 'BIM' has come to mean different things, or to have different nuances of meaning in different countries."

Awareness of BIM



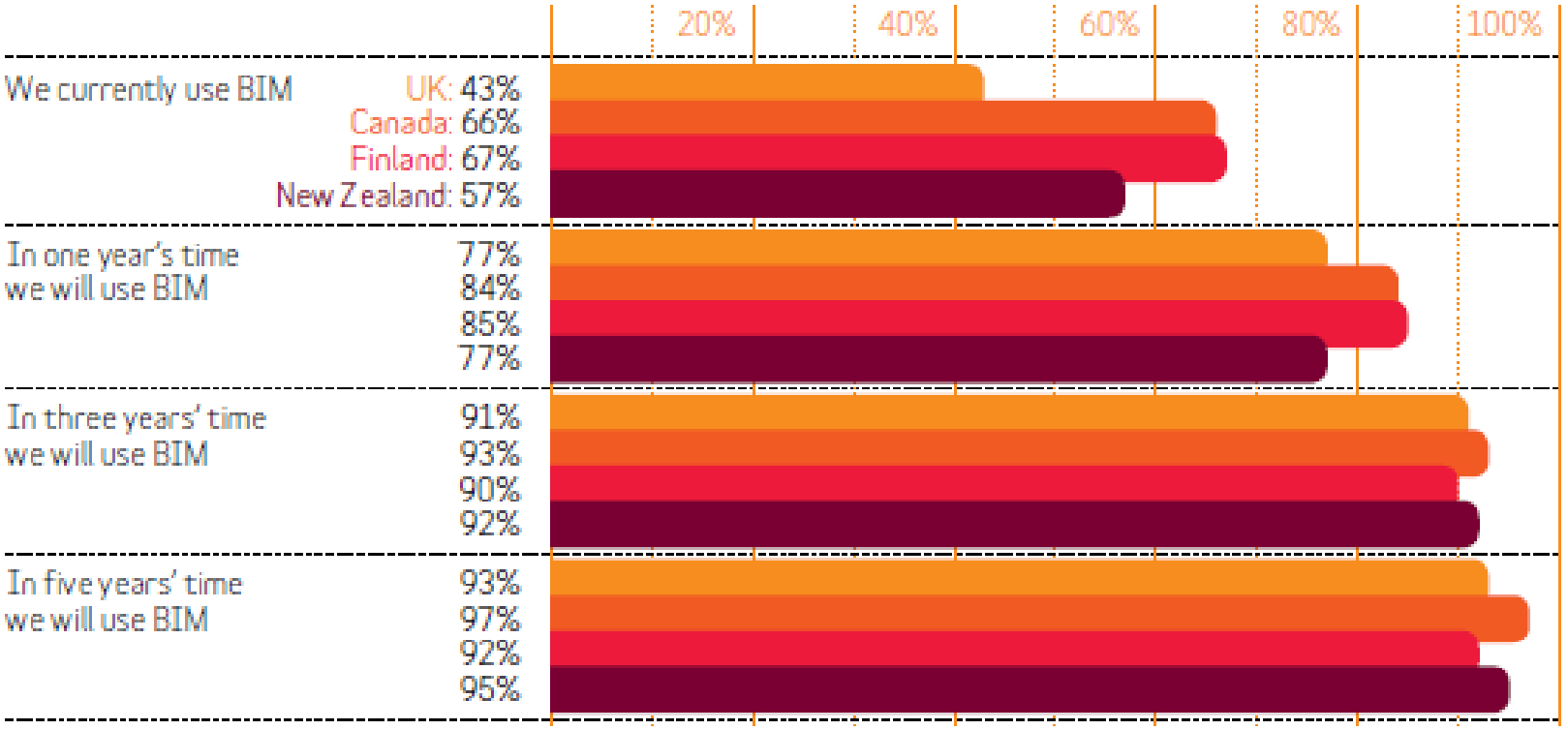
Respondents aware of and currently using BIM



Source: NBS

BIM Future Adoptions

- **International BIM report**



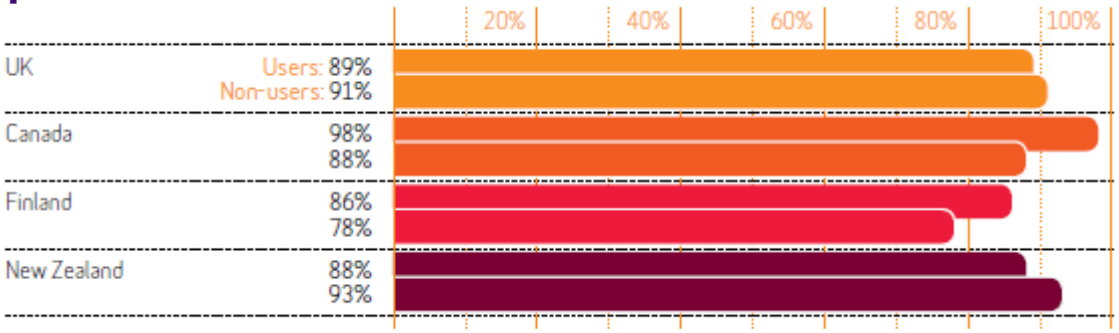
Source: NBS

BIM and Change

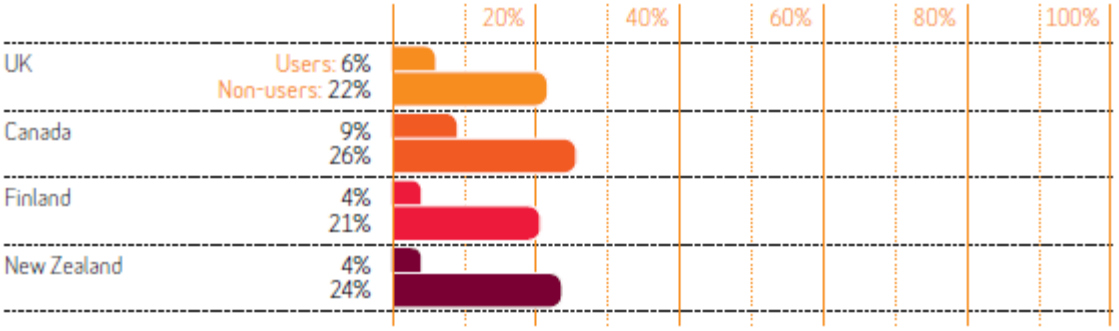
International BIM report

"Across the countries we surveyed, we can see that there is strong agreement that BIM is much more than purchasing and using a piece of software. BIM requires changes... The data suggests these changes are worthwhile."

BIM required changed in our workflow, practices and procedures



I'd rather not adopt/ I wish we hadn't adopted BIM



Source: NBS

BIM Standards

- Building Smart and ISO
- UK Standards
- RICS Guidance

Case Studies

The Bridge Academy, Hackney

- The 3D model was used to convey the **visual** element of the design and provide the client confidence that the final building would suit their requirements.
- **Analysing the Design-** Designing the building in the virtual environment meant that the team could be confident that the design was structurally sound
- **Manufacturing-** Use of the model saved on time and materials wastage – model tested before work began on site
- Complicated design would have been extremely difficult and time consuming (hence expensive) without the use of the BIM.
- Awarded a Bentley BE Award for the Best Use of BIM.

Ref: Construction Excellence 2010

Blackfriars Road

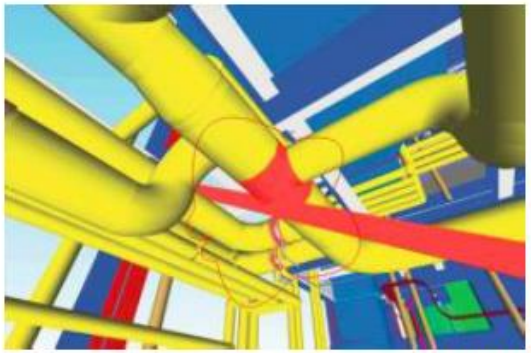
BIM approach not adopted until Stage C

Faster design and construction. The use of BIM accelerated the development of the design.

De-risking construction. Achieving fully coordinated design at Stage E – reduction in design risk

Improved building performance. The overall net-to-gross area of the building has been improved

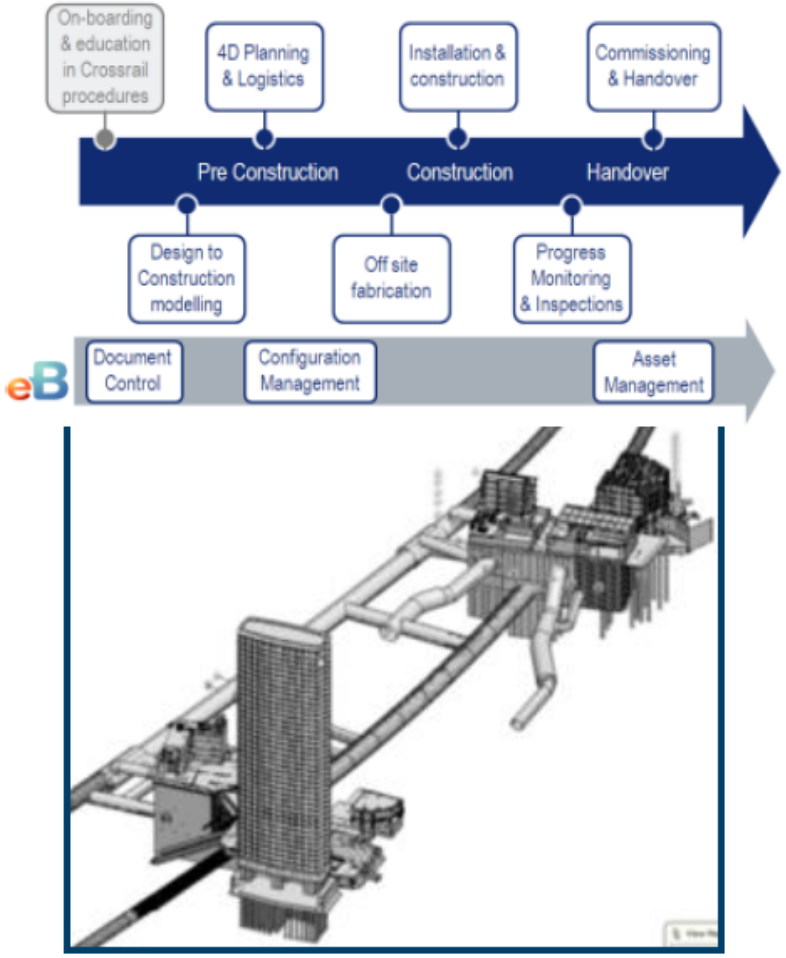
Operation and maintenance. Identified information that will support the operation and maintenance phase



Ref: BCO May 3013

Crossrail – Asset Management

- As part of Programme Partner, effective use of project information is vital to successful delivery
- Established common cost and work breakdown structures for **consistent reporting**
- BIM model is being developed within Engineering for **Asset Management**
- Discussions with Bentley Academy and other stakeholders to **integrate** Programme Partner role into model
- Vital that integration is achieved early to realise full dimensional functionality of BIM



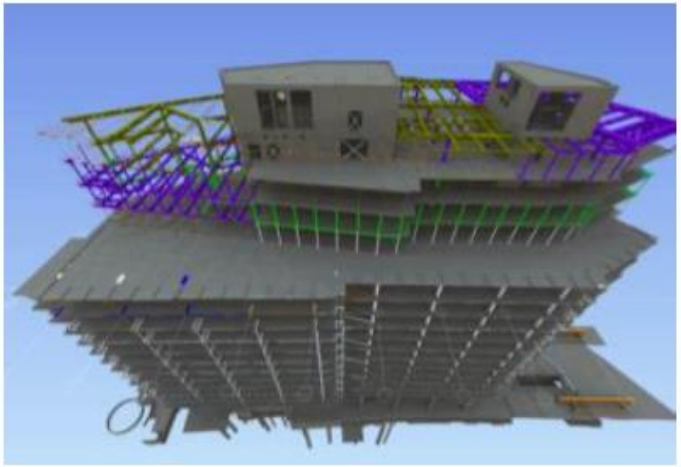
Ref: Turner & Townsend 2013

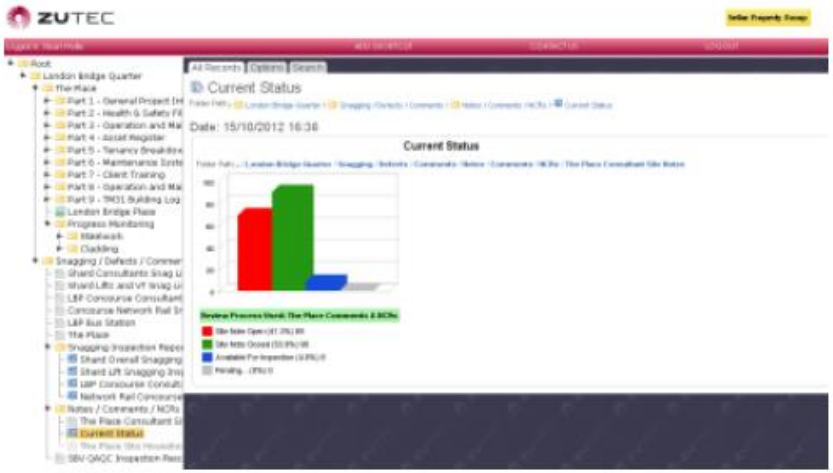
The Place, London Bridge Quarter –

Schedule Management

BIM

- Programme Managers for LBQ, Project Managers for The Place
- **Bar coding** to track component delivery & installation, updating status within model
- Use of **iPad technology** to allow track progress in real time, with corresponding reporting
- **As built information** fed into the model, improves quality process and rectification of snags
- Generating **built asset data** bank for use by landlord, tenant and FM company





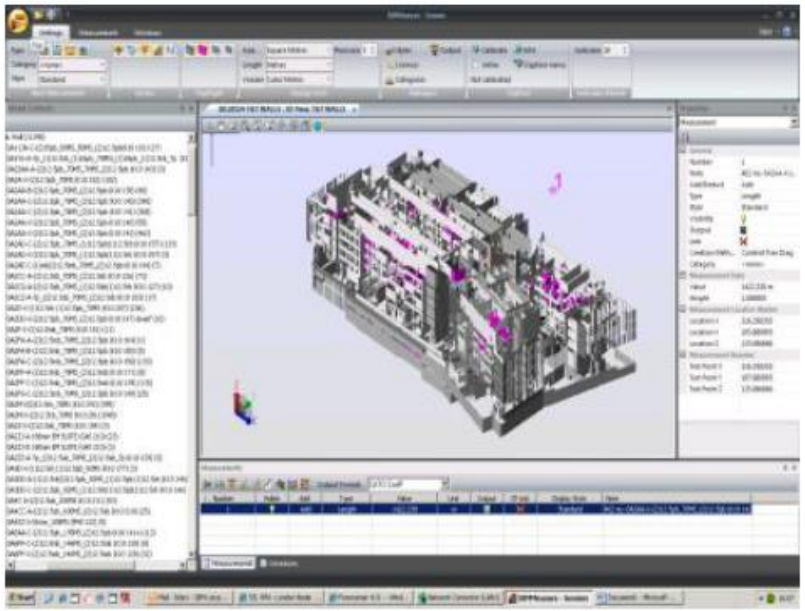
Ref: Turner & Townsend 2013

The Crick – Cross Management

BIM

- CADMeasure BIM enabled measurement from Model
- **Quick analysis of quantities** for BoQ checks, scheme options and changes
- Size of model v. hardware required elemental slices – **increased dialogue**
- Potential to accelerate cost plan process on future projects
- **Integrating whole life and FM data** into model

Below: CAD Measure BIM Screenshots

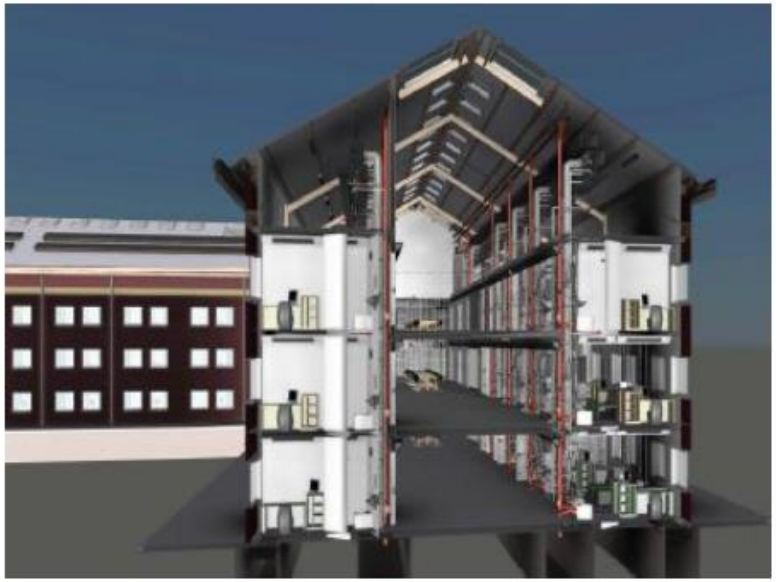


Above: All K10/135 partitions coloured and quantity measured with two clicks

Ref: Turner & Townsend 2013

HMYOI Cookham Wood

- Planning submission as a 3D model allowed the planner to more easily **understand** the impact of the proposed scheme
- Use of 3D model in design meetings allows us to focus and **visualise the issues** quickly and accurately leading to efficient resolution
- **Early project scoping and stakeholder engagement**, aided by the use of the BIM model as a visual tool, has assisted the operations phase
- The contractor linked the model to their construction programme to **effectively simulate the construction sequence**
- The model was used in BIM workshops to identify and remove these mis-coordinated elements ahead of construction

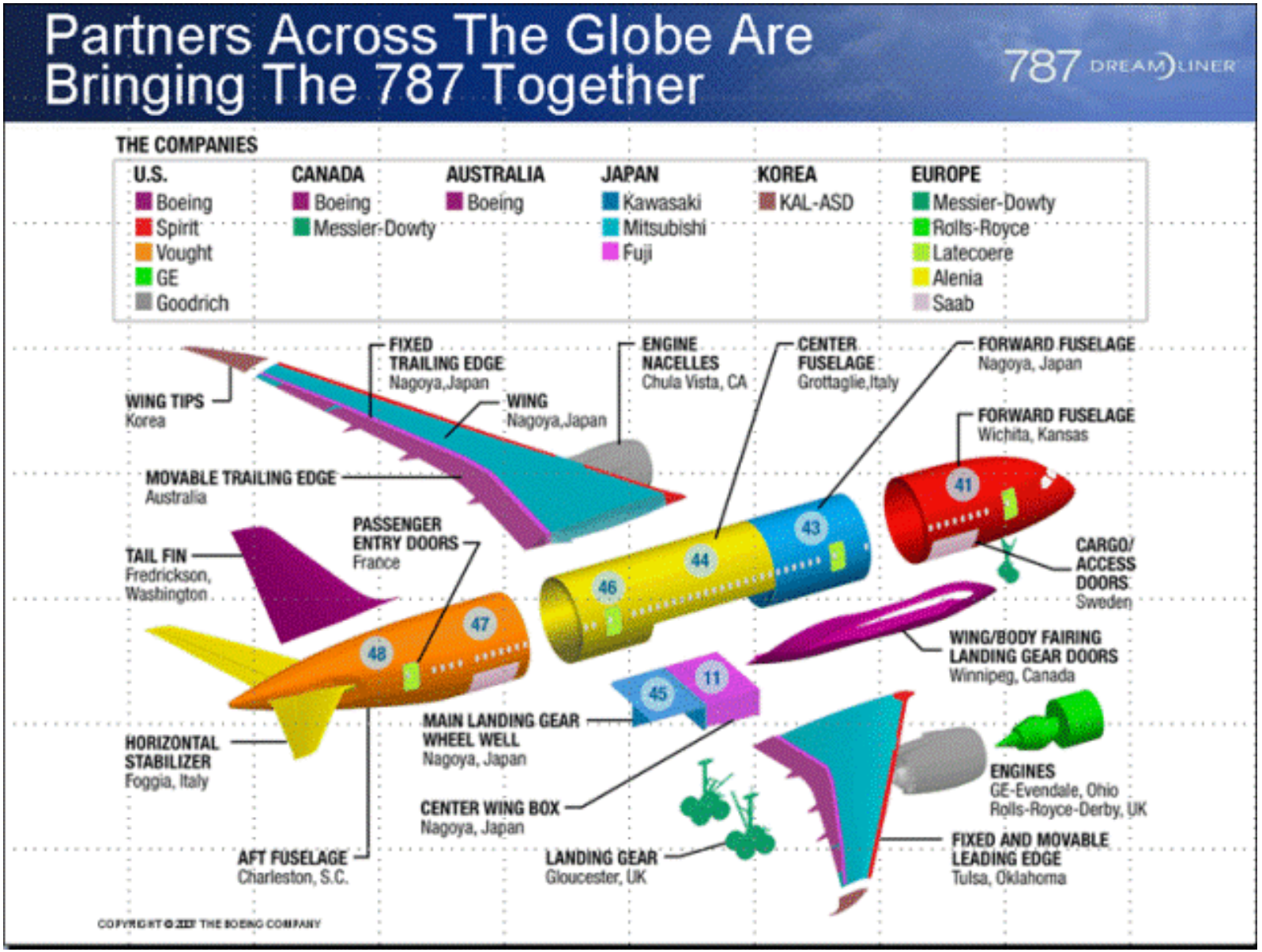


The developed models for the buildings allowed me to present to my Senior Management Team and Staff Managers a walk-through of the buildings highlighting views into and out of areas that normally I couldn't do until completion. All before anything started!".

Emily Thomas
Governor HMYOI Cookham Wood

Ref: MoJ July 2013

BIM Future


Partners Across The Globe Are Bringing The 787 Together
787 DREAMLINER
THE COMPANIES
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Vought
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CANADA
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Boeing
JAPAN
Kawasaki
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KAL-ASD
EUROPE
Messier-Dowty
Rolls-Royce
Latecoere
Alenia
Saab
WING TIPS
Korea
FIXED TRAILING EDGE
Nagoya, Japan
WING
Nagoya, Japan
ENGINE NACELLES
Chula Vista, CA
CENTER FUSELAGE
Grottaglie, Italy
FORWARD FUSELAGE
Nagoya, Japan
FORWARD FUSELAGE
Wichita, Kansas
MOVABLE TRAILING EDGE
Australia
PASSENGER ENTRY DOORS
France
TAIL FIN
Fredrickson, Washington
CARGO/ ACCESS DOORS
Sweden
WING/BODY FAIRING LANDING GEAR DOORS
Winnipeg, Canada
MAIN LANDING GEAR WHEEL WELL
Nagoya, Japan
HORIZONTAL STABILIZER
Foggia, Italy
ENGINES
GE-Evendale, Ohio
Rolls-Royce-Derby, UK
CENTER WING BOX
Nagoya, Japan
FIXED AND MOVABLE LEADING EDGE
Tulsa, Oklahoma
LANDING GEAR
Gloucester, UK
AFT FUSELAGE
Charleston, S.C.
41
43
44
46
47
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45
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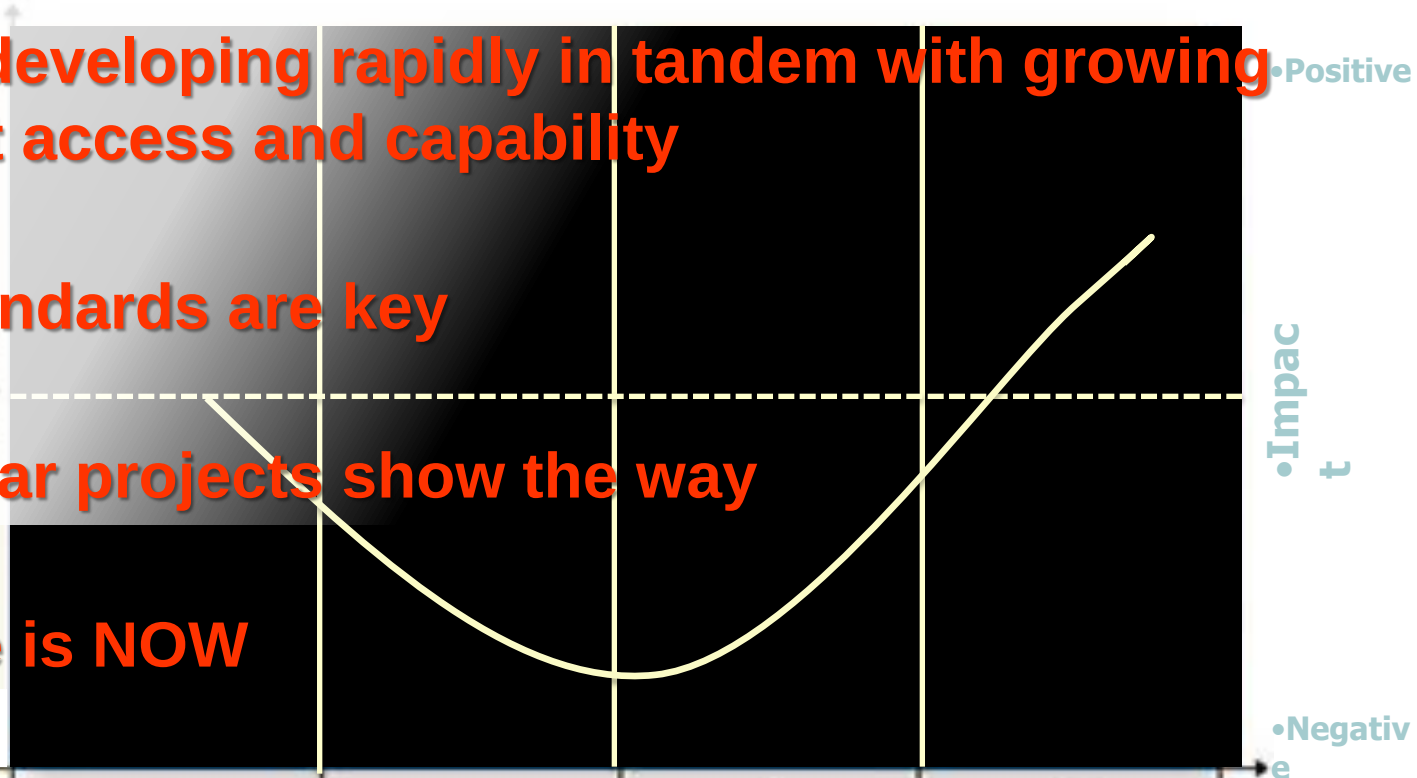
Conclusions

- BIM is developing rapidly in tandem with growing internet access and capability
- BIM standards are key
- Exemplar projects show the way
- Change is NOW



Stage	1	2	3	4
State	Status Quo	Disruption	Exploration	Rebuilding
Reaction	Shock, Denial	Anger, Fear	Acceptance	Commitment

End

THANK YOU