CONSTRUCTING EXCELLENCE
in the built environment

BIM4HOUSING

Andrew Carpenter

Chairman BIM4Housing

Building Information Modeling

What is BIM ?

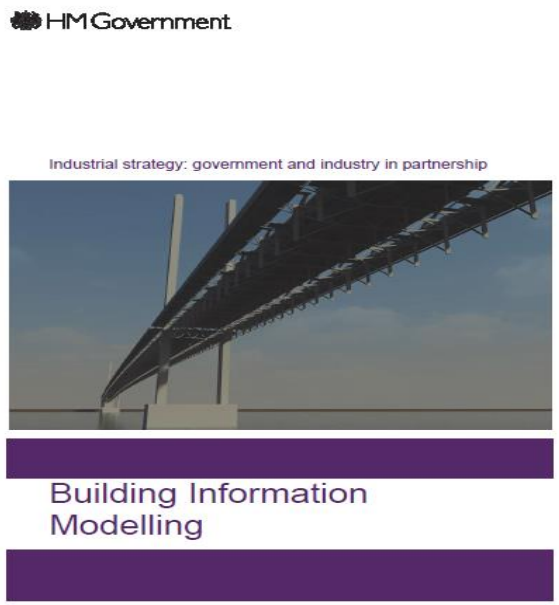
BIM uses latest information technology - but is not simply three dimensional design or the development of a data rich model.

It is a method of working and a process of **generating, managing and using** project data throughout the lifecycle of an asset.

It is worldwide and more advanced in USA, China, Australia etc

Government Construction Strategy

- Published by the Cabinet office May 2011
- Target: Reduce capital cost and the carbon burden from the construction and operation of the built environment by 20%
- Collaborative 3D BIM on all Government projects by 2016 (Level 2)
- Homes England (Housing) not included
- BIS BIM Strategy published Nov 2012



Government Construction Strategy

Homes England has a key role in reducing costs by 20% through working with their partners on procurement efficiency and innovation

Homes England funded projects not part of the 2016 BIM target (as they are developed by others) BUT they are:

- Consulting with their partners on attitudes and take-up of BIM
- Collating and sharing case studies on their website
- Hosting events to highlight innovation and promote wider adoption
- Active members of BIM4Housing

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HM Government Reasons

BiM

Lower Emissions

50%

Reduction in greenhouse gas emissions in the built environment

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Why BIM – in simple terms?

Reduce Costs

- Wasted time - productivity
- Wasted material – mistakes
- Wasted material – over ordering
- Wasted material – ordering the wrong stuff

Improve delivery

- Predicable completion
- Asset owner gets what they ordered
- Standardisation

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Why BIM4Housing?

- Building Information Modelling (BIM) is widely seen as the construction industry's answer to greater efficiency and improvement.
- Dept. of Business, Innovation & Skills launched BIM4Communities seven years ago.
- BIM4Housing was launched in 2014 and now looking to accelerate take-up
- Whilst some house builders & housing associations are starting to realise the benefits of BIM, others are taking a more cautious approach.
- The housing sector needs to ‘catch up’.
- Created to accelerate the take up of BIM.
- Collaborative culture is essential – therefore Constructing Excellence is the obvious home.

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Make –up of BIM4Housing

- **Cross-industry group**
  - **Clients/Developers**
  - **Affordable Housing Providers**
  - **Contractors/House Builders**
  - **Consultants**
  - **Suppliers**
  - **Sub-contractors**
  - **Manufacturers**
  - **Industry Bodies/Stakeholders**
- **Private and affordable housing**

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Objectives

- To identify areas where there are unresolved development issues for BIM in the housing industry and drive their resolution
- To liaise with BIM4Housing organisations in other countries to swap best practice and ensure international standardisation (e.g. Norwegian BIM Assoc.)
- To liaise with BIM4 organisations in other sectors where cross-over, integration or information standardisation is required (e.g. BIM4FM, BIM4Manufacturing) either directly or through the broader BIM4Communities group

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Objectives

- **Build an evidence base (case studies etc.) and make it accessible to members**
- **To spread knowledge and awareness of BIM standards, information and best practice across the home building industry through events and training**
- **To encourage all industry parties to work more collaboratively together, utilising BIM as the vehicle to improve how interested organisations contribute, interface and take advantage of the benefits offered throughout the process.**

Hackitt Review

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- **Chapter 8 - Golden thread of building information**

- **8.2** As mentioned in Chapters 2 and 3, there are currently significant issues in the production, maintenance and handover of building information by those responsible for the design, construction and refurbishment of the building to the duty holder in the occupational stage

Hackitt Review

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- The BIM4Housing Steering Group believe that there are significant benefits to be realised through the use of BIM during the occupation and maintenance phase by providing improved:
- decision making based on robust data;
- quality and compliance assurance as a result of structured record keeping and contract management; and
- efficiency, through collaboration and innovation.

Quote from BIM4Housing in Hackitt Review

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- **“For these benefits to be realised there needs to be wider adoption by industry and the supply chain, requiring parties to be bought into the approach and recognise the benefit…embracing BIM in an open, consistent and transferable way is essential to achieving this.”**

FM The numbers

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Study	Traditional elapsed time taken	BIM2FM time taken	Man hour saving	Inconvenience saving	Link
Faulty fan	4 weeks	1 day	11 hours	27 days	http://www.bimtaskgroup.org/wp-content/uploads/2013/09/CASE-STUDY-1-Vent-Motor-Replacement-V4.pdf
Lamp Replacement	6 weeks	1 day	8 hours	5 weeks six days	http://www.bimtaskgroup.org/wp-content/uploads/2013/09/CASE-STUDY-2-Lamp-Replacement-V4.pdf
Water in duct	12 weeks	1 day	13 hours	92 days	http://www.bimtaskgroup.org/wp-content/uploads/2013/09/CASE-STUDY-3-Ex-Duct-Basement-Leak-V4.pdf
Lift repair	5 weeks	2 days	10 hours	4 weeks 5 days	http://www.bimtaskgroup.org/wp-content/uploads/2013/09/CASE-STUDY-4-Public-Lift-Repair.pdf
Water leak through ceiling	3 days	1 day	11 hours	No data	http://www.bimtaskgroup.org/wp-content/uploads/2013/09/CASE-STUDY-5-Ceiling-Leak-V4.pdf

Source: www.BIMtaskgroup.org

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BIM Worldwide
Early Adopters - Norway

What is BIM for Norway?

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- BIM is open, shared information in an geometric structure
- BIM is based on open international standards
- BIM is effective collaboration
- BIM is better project results
- BIM is buildingSMART
- BIM is an opportunity to make more money

- **BIM is only an enabler - most benefits require changes in processes**

…and what it is not

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- BIM is the opposite of the situation in conventional building projects:
  - Errors in procurement
  - Errors in drawings and descriptions
  - Exceeded deadlines due lack of project control
  - Exceeded budget – too many change orders and errors on building site
- BIM is not proprietary BIM
  - True BIM is based on open international standards

BIM User Manual for Home Builders

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BIM-manual with guidelines
- modelling in open BIM
- export in open BIM

BIM-Manual covers
- energy simulations
- cost calculations
- ventilation design
- roof trusses

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How to increase productivity and profitability through the use of BIM

- All projects are designed (architect and structural) in BIM (ArchiCAD)
- IFC export to other domains
- In some projects they make complete models (all domains)
- BIM quantity take off – cost calculation

Norgeshus "concept homes"

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- BIM is a success
- 20% reduction in building cost with detailed BIM-design
  - Less conflicts and clashes
  - Better procurement
  - Better material deliveries
- 100 concept homes built in 2013.

Examples
what BIM has improved

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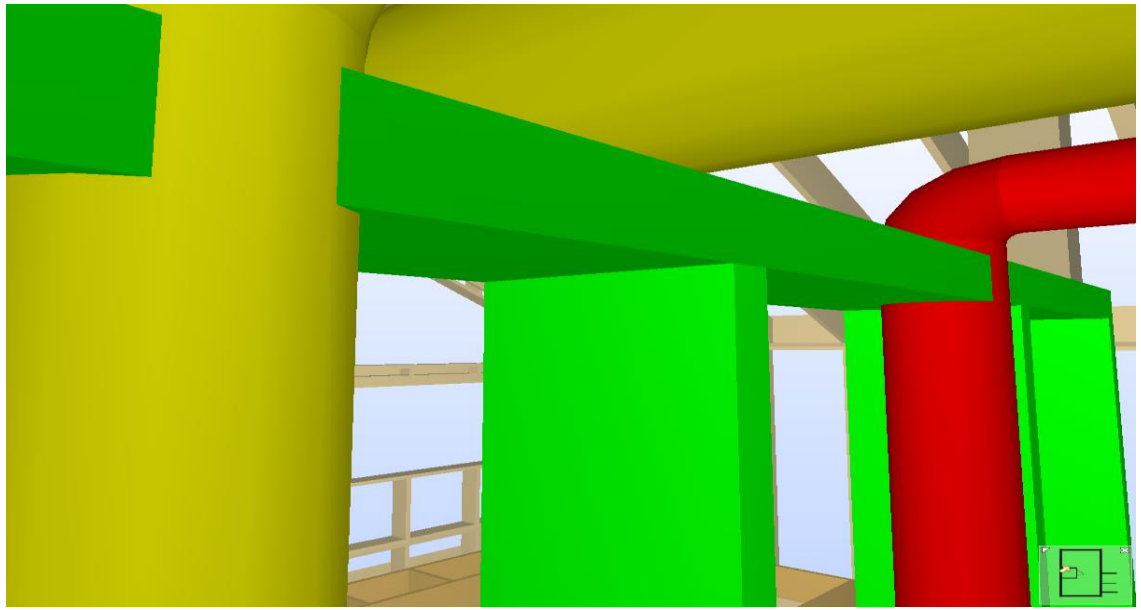
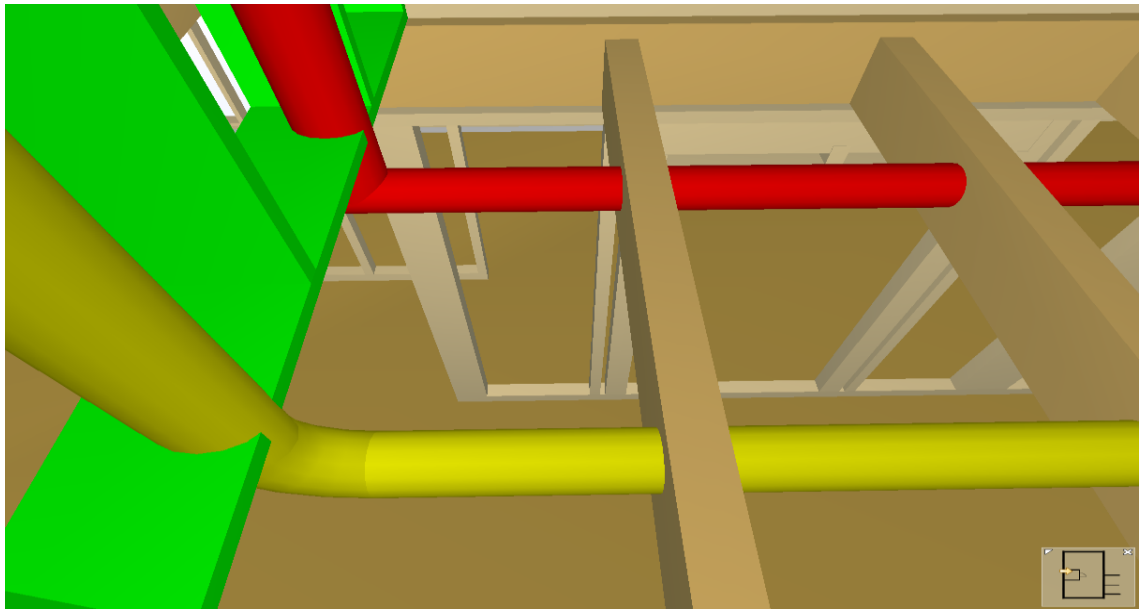
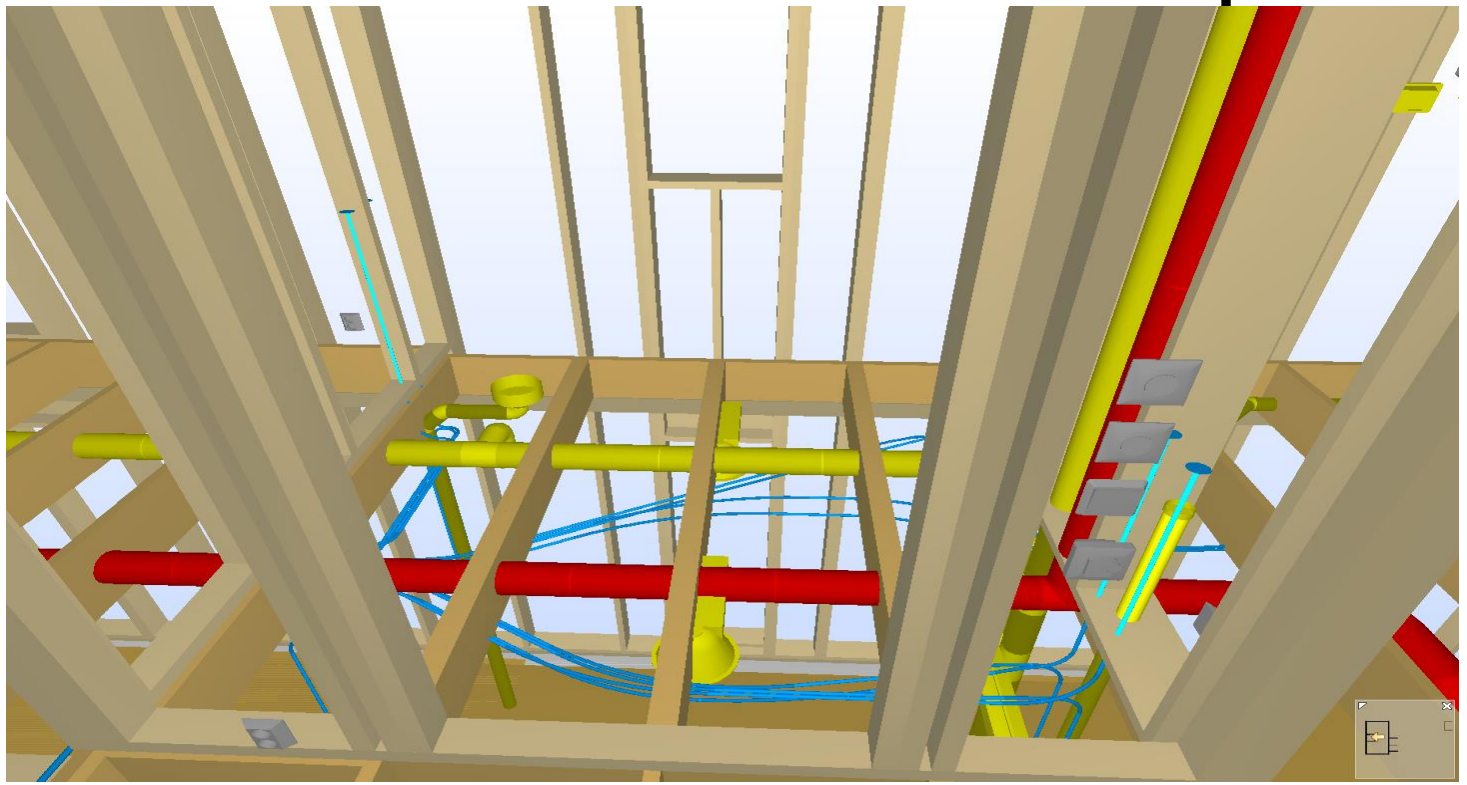




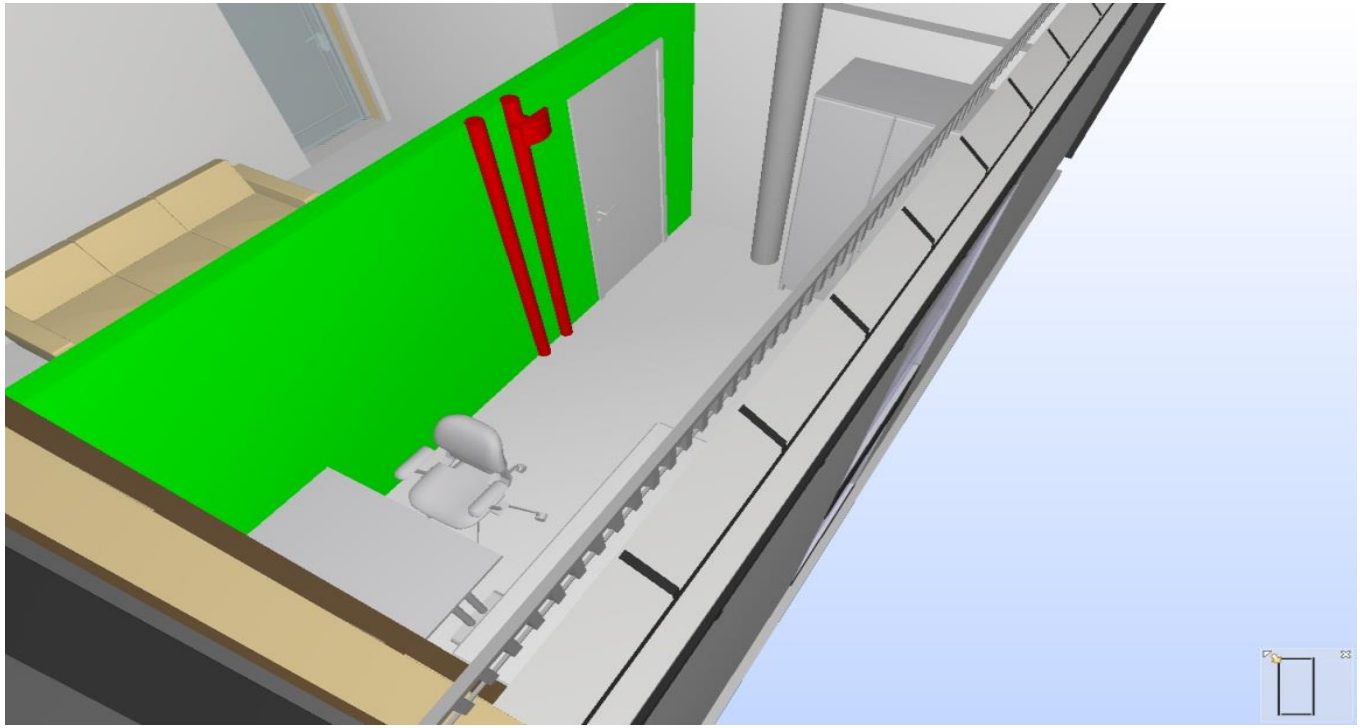
- Clash detections: exhaust and supply air ducts misplaced in wall
- Action: Extending air ducts to fit in wall
- Profit: Correct quantities, avoid stop in production on building site

Examples
what BIM has improved



- Clash detection: Downlights clash with ventilation, beams and air ducts
- Action: LED-box moved
- Profit: The correct choice of product, avoid encasing and stop in production

Examples
what BIM has improved



- Clash detected. Ventilation pipes 98mm
- Action: increase wall to 148mm
- Profit: Avoid thicker walls and space adjustments

Procurement

Building Site

Building permit

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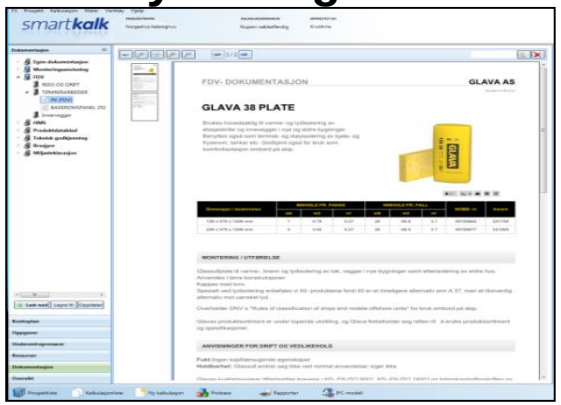
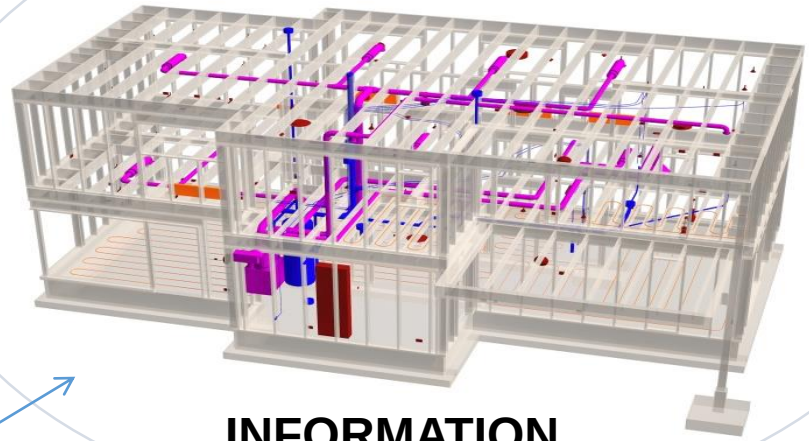
Drawings

Facility management

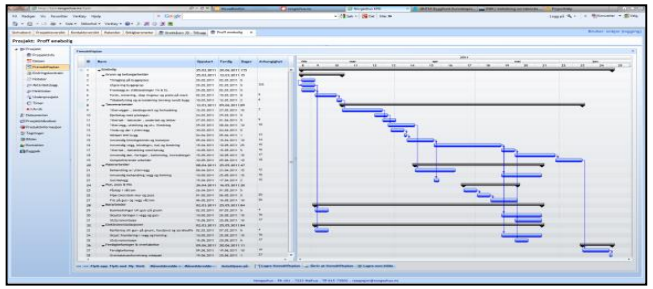


BIM MODEL



Construction

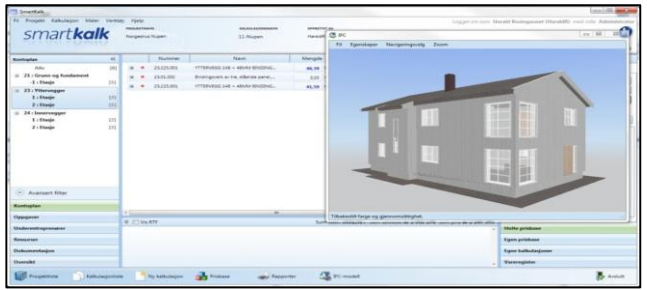
Project management

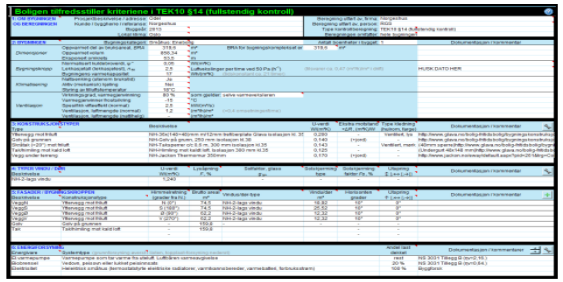


INFORMATION

Laws and regulations

Cost calculation





Energy calculation

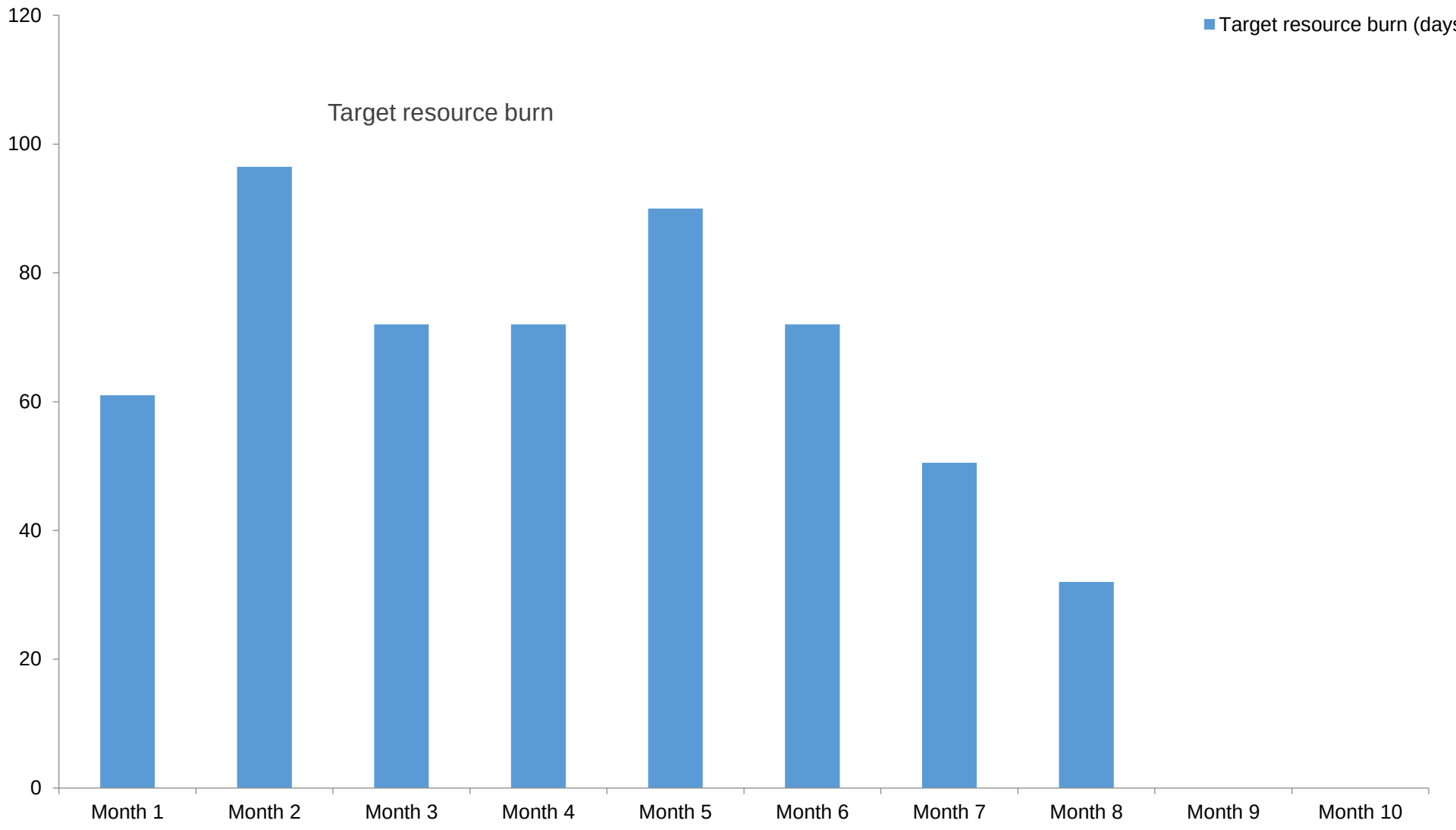
Lessons learned – Home Builders - Norway

- Start with owners and motivate them by seeing the potential for improved sustainability (less energy consumption, less construction material usage, less waste…)
- Motivate government to see the potential for efficiency and freeing up resources for more value adding activities
- BIM is possible today – and it is profitable
- A change in your business processes are needed
- Demand *IFC import/export* from your software vendor
- Focus on knowledge and education
- Domain status
  - Many architects are working with BIM
  - Structural engineers know BIM
  - Ventilation design is done in BIM
  - Electrical- and plumbing design are not BIM in small projects
  - Big contractors and builders are using BIM
  - SME contractors and builders are starting utilizing BIM
  - Plumbers and electricians are behind
- Support buildingSMART - www.buildingsmart.org

BIM Challenges

- Smaller supply chain contractors undertaking limited design, currently do not have the BIM capabilities
- Manufacturing software does not easily link with design authoring software e.g. timber frame required some coding from software engineers to bring through all the data (but this was overcome by Clearbox writing some code)
- Lots to learn on "first" projects
- Not used to providing more detailed information earlier which enables design issues to be resolved. Procurement needs to be reviewed to engage teams earlier in the process
- Not all families of objects available with intelligent data

Measuring performance



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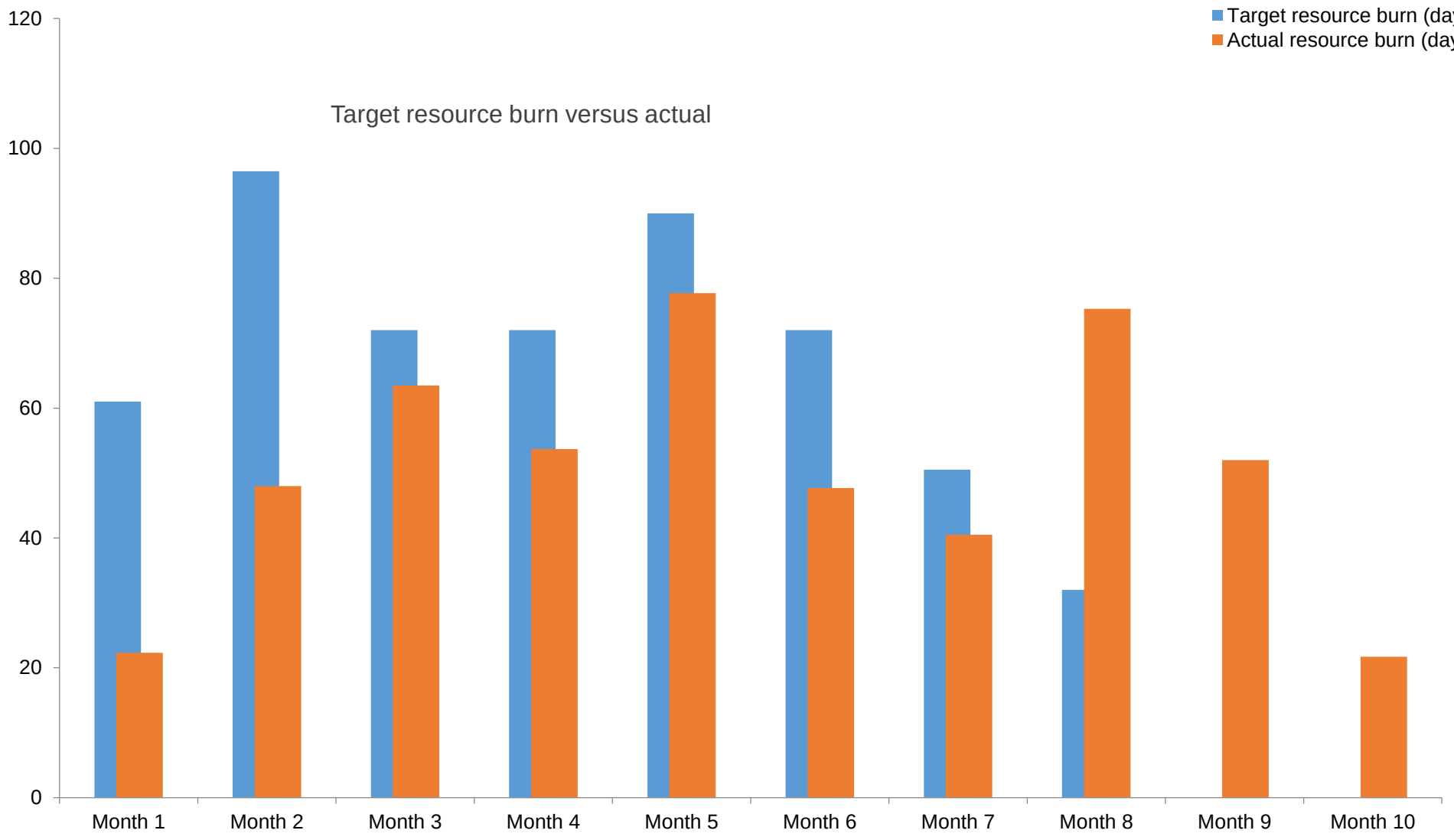

Measuring performance

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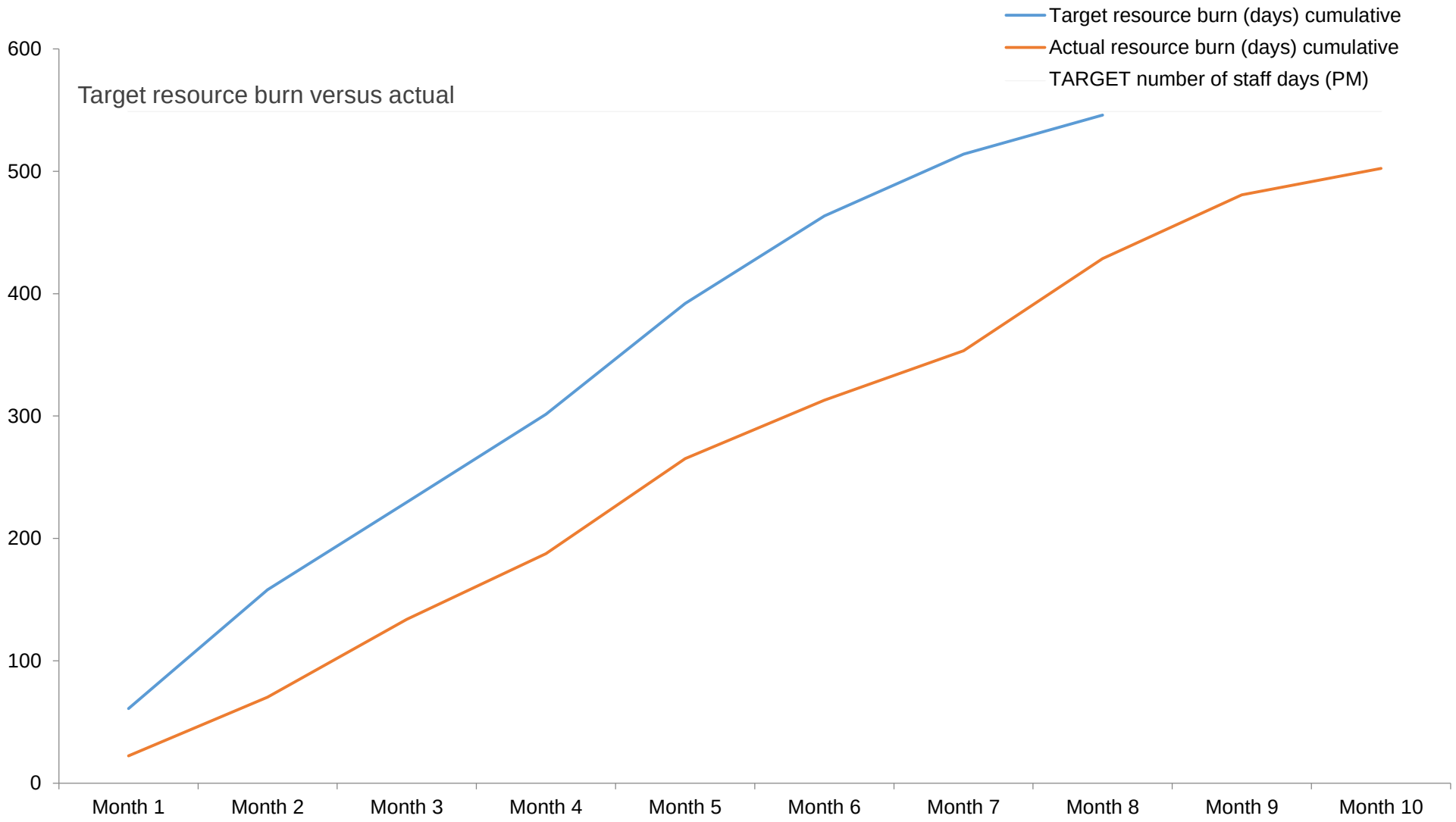

Measuring performance

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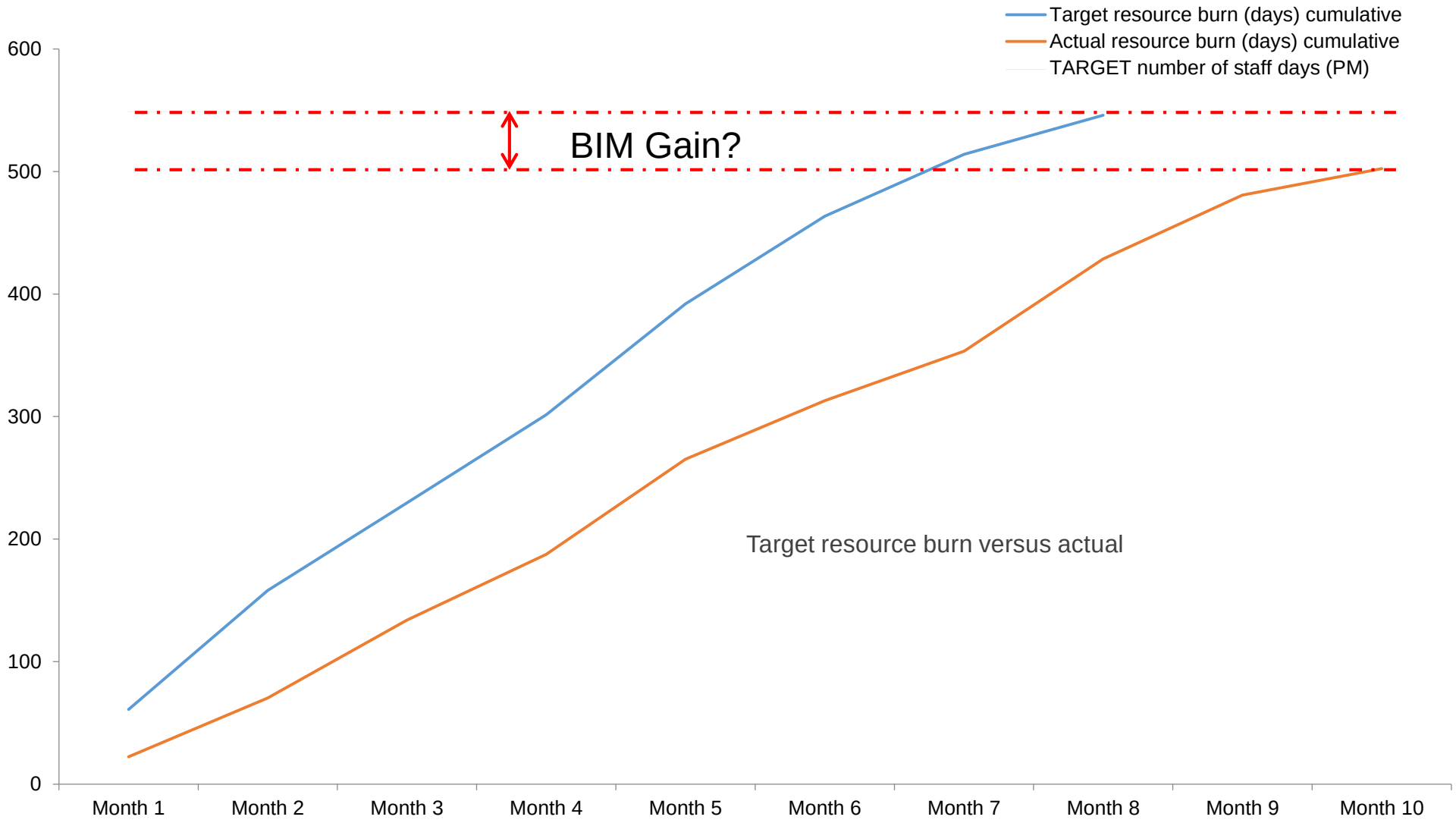
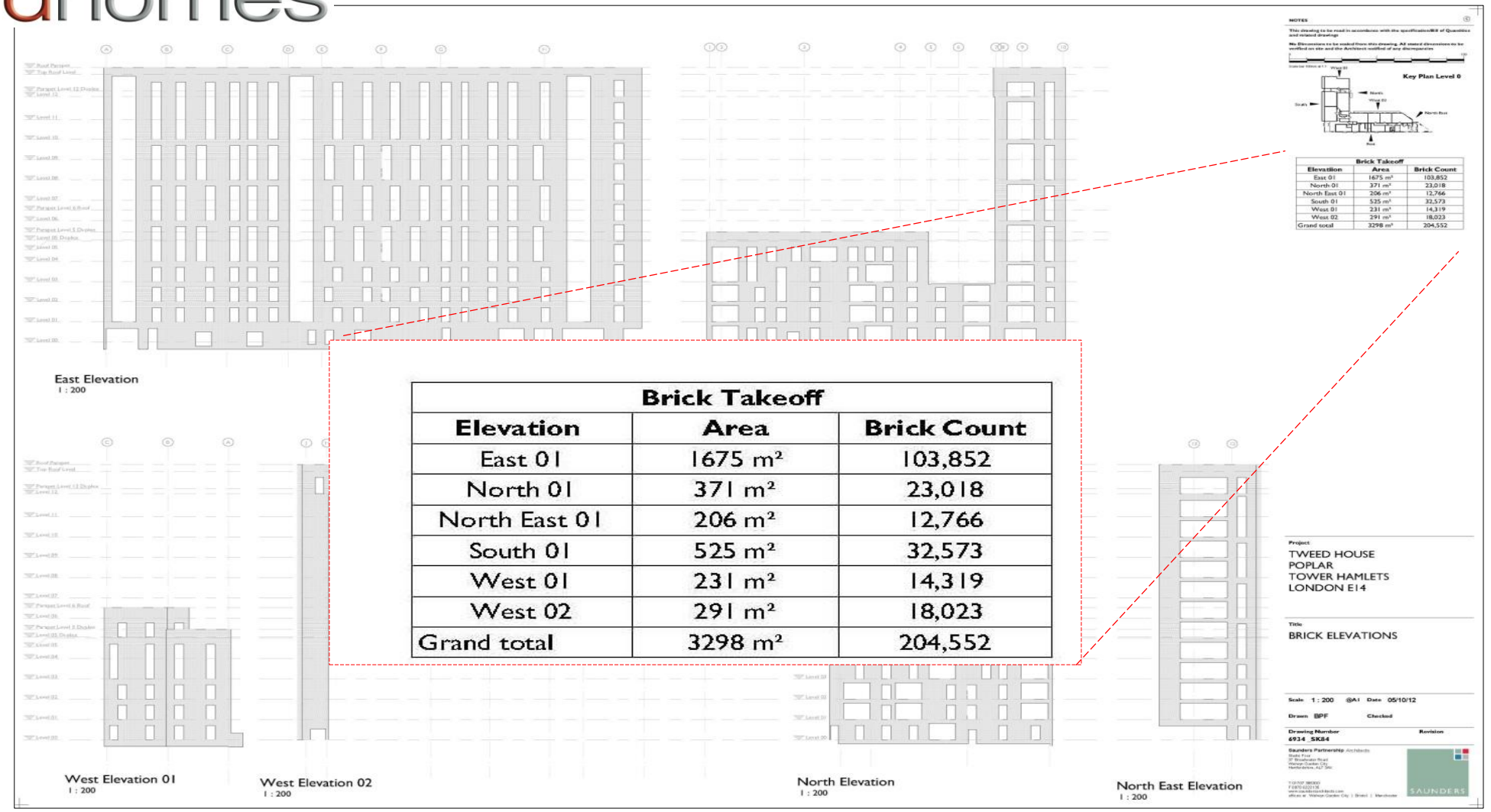


BIM Developments

1. **Creating the Standard "Kit of Parts"**
   - Standard Model Created containing "Kit of Parts"
   - Standard Specification Codes Created for "Kit of Parts"
   - Standard Specification Codes Embedded in "Kit of Parts".
2. **Automated Quantity Take Off**
   - QTO WBS Created from Standard Specification and Linked to Model
   - Materials and Products Linked to Model
   - Model View by Product and Part Number
   - Export Quantities to Excel.
3. **Remote Design Management for Scalability and Delivery of Full Standard Range**
   - Remote and Real Time Design Management
   - Live Links to Design Updates, Asset Info and Site Data.
4. **Linking the Standard Model to Site Operations**
   - Standard Parts Remote viewed via Web and Tablet for on site use
   - Quality and Safety Checks linked to Parts.
   - Progress Photos Linked to Parts
   - Specification Codes linked to Detailed Drawings
   - Supplier and Install Info Added to Parts.
5. **Additional Steps:**
   - Incorporating Augmented Reality into our interactive Brochure – WIP July Demo.



Brick Takeoff

Elevation	Area	Brick Count
East 01	1675 m²	103,852
North 01	371 m²	23,018
North East 01	206 m²	12,766
South 01	525 m²	32,573
West 01	231 m²	14,319
West 02	291 m²	18,023
Grand total	3298 m²	204,552

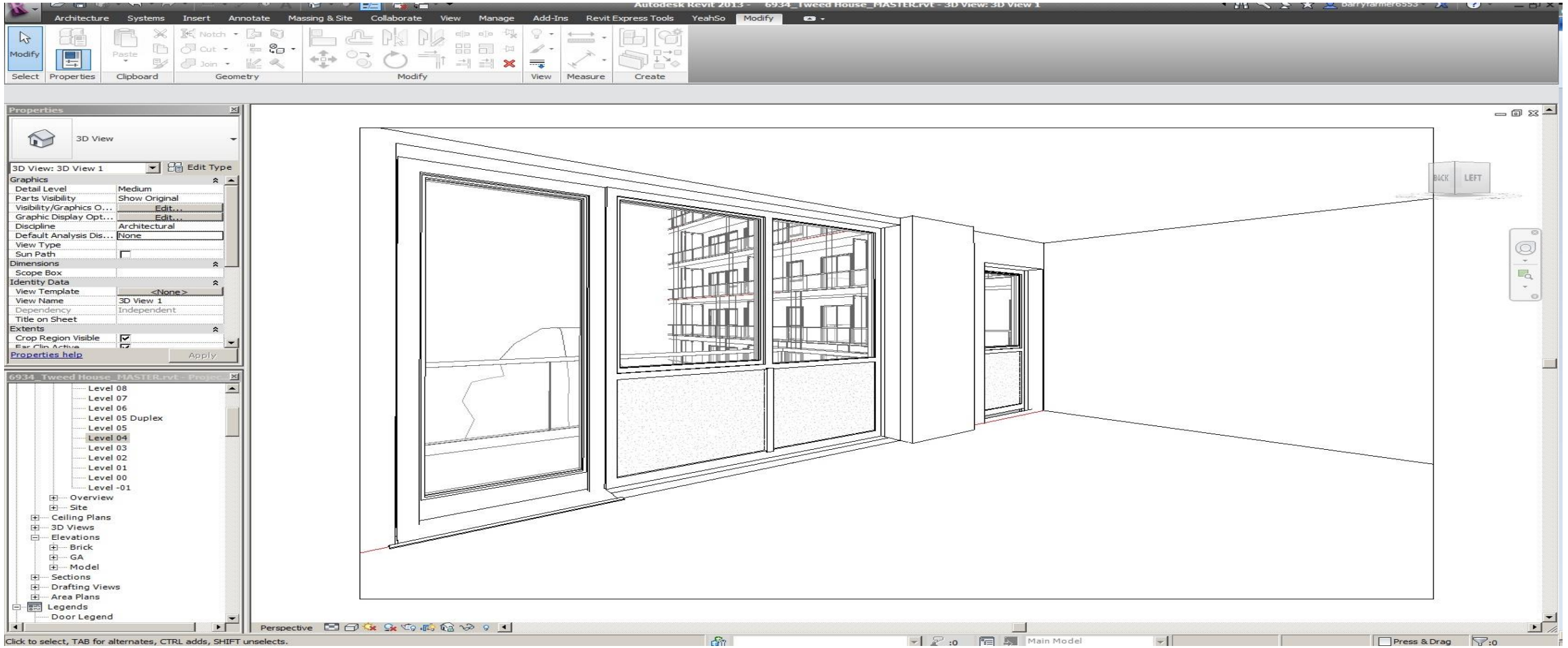
MATERIAL TAKE OFF

telfordhomes

Revit

Saunders Partnership Architects

SAUNDERS

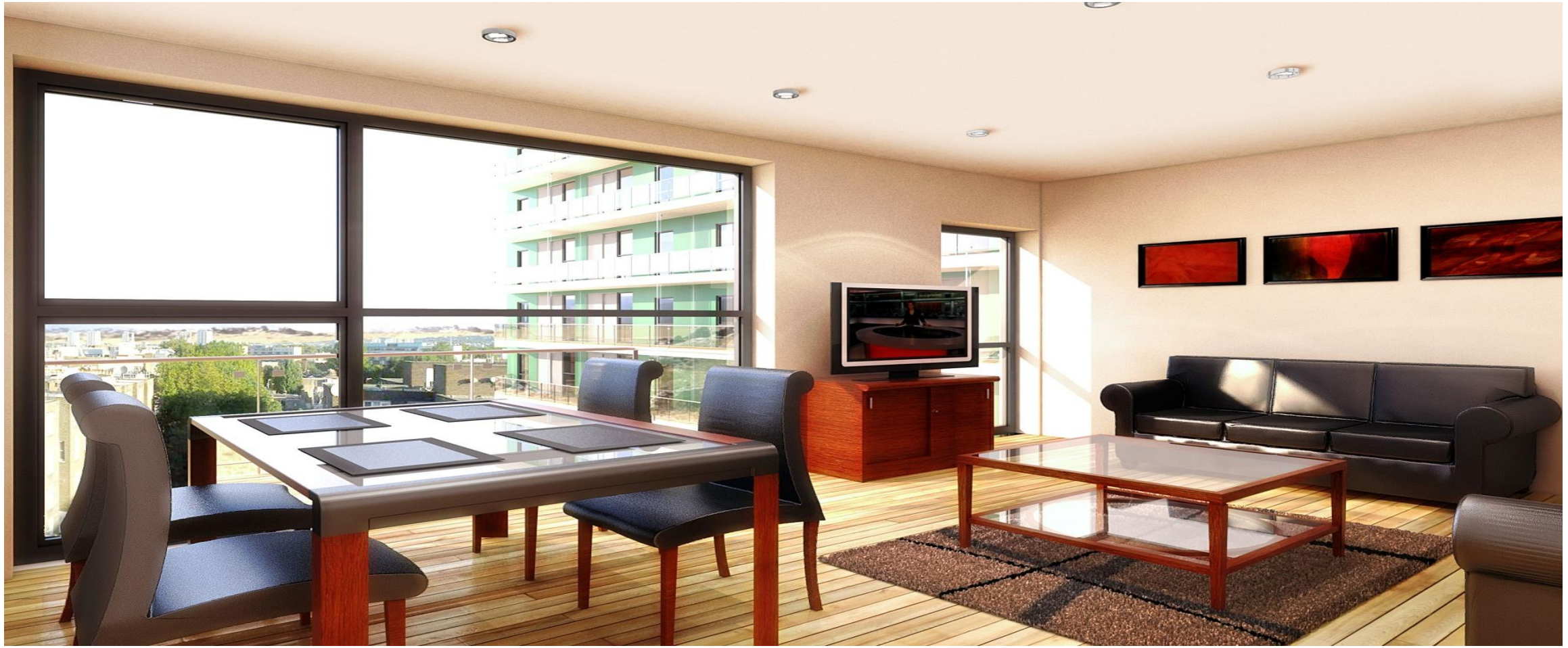


3D VIEW REVIT MODEL

telfordhomes

Revit
Saunders Partnership Architects

SAUNDERS



RENDERED VIEW FROM REVIT MODEL

Building a Better Nottingham

BIM4Housing National Case Study

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Accurate design and material schedules

Reduces up front design costs

Accurately model the life of a building

Benefits in terms of design repetition

Quick and efficient changes at planning stage

Much more detailed interactive view of the plans at consultation stage

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Planning

- Reduce planning cycle by 30%
- 50% increase in the likelihood of securing planning
- 25% increased support for community consultations
- 100% sites consented in Y1
- £600/plot saving in cost securing planning

Design

- £500/plot saving in abnormal costs through 3D land design
- 30% reduction in site architectural design time
- 35% productivity gain for technical users
- £300/plot saving in RFI

Sales

- £250/plot saving in marketing costs
- 20% increase in sales rates 0.84/week to 1.1/week
- £600/plot saving in development finance costs
- Move towards a build to order business model
- £500/plot premium for early sales interaction & home personalization

Construction

- £250/plot saving in defects and snagging
- 20% increase in handovers on time
- £350/plot saving in cost of missed handovers & NHBC resolutions
- £150/plot saving in reworks and making good, due to early clash detection
- 30% improvement in safety performance

Customer Care

- 30% increase in recommendations and referrals, retention of 5 *
- OTIF handovers & digital move in packs & aftercare
- Higher likelihood of customers buying off plan
- Brand differentiation due to visualization and potential personalization
- Potential for early deposits, easing cash flow

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The Business Case for Digital

- Digital working could save £3,500 per plot, £3m per year
- Digital working will fuel business growth, through a new digital way
- Many wider benefits – brand, value, consumer, productivity, safety
- Digital will drive integration & collaboration, with a shift to OSM
- Digital working will be the new norm

It’s about leadership

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It’s about a collaborative culture

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It’s a leap of faith

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Carpe Diem: *Andrew Carpenter, Chair BIM4Housing*

BIM4HOUSING

2018

Thought for the day:

The opportunity of a lifetime has to be grasped in the lifetime of the opportunity