



# A Practical Approach to BIM

January 2015



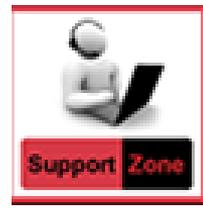
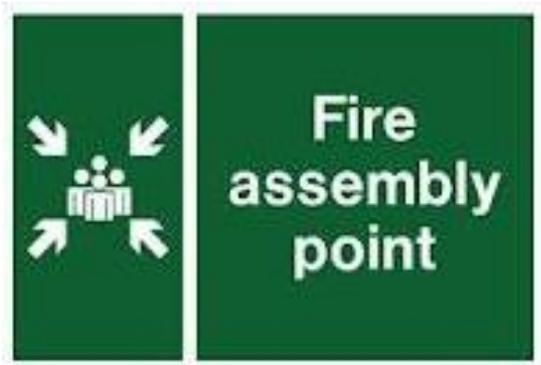
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# House-Keeping



# Your Hosts

- Nick Harris – Cadline
- Darren Cox – Cadline
- Stuart Tanfield – Cadline
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- Shan Chaudri- Cadline
- Cathy Tero - Cadline
- Alan Jones - EDSL
- Neil Barnett - Faro

The logo for Cadline, featuring the word "cadline" in a lowercase, sans-serif font. The letter "i" is stylized with a purple dot and a pink leaf-like shape extending from its top.The logo for FARO, featuring the word "FARO" in a bold, blue, sans-serif font with a registered trademark symbol.

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# Agenda for Today

10:00 – 10:10	Welcome and Introductions
10:10 – 10:40	BIM - A Model Centric Approach
10:40 – 11:30	Design and Data in Digital Construction
11:30 - 12:00	Coffee
12:00 – 12:30	Data Management – A Vital BIM Component
12:30 – 13:15	Lunch

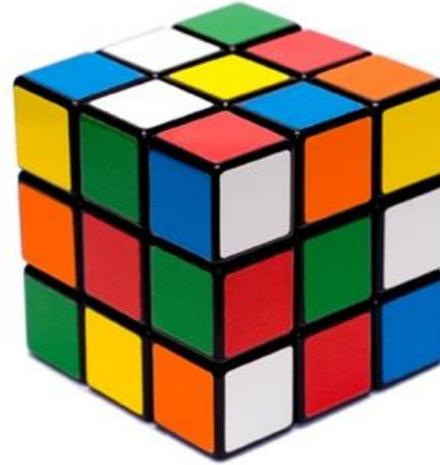
13:15 – 14:15	Energy Compliance for Architects with EcoBIM	<b>OR</b>
13:15 – 14:15	Building Services in a BIM Environment	

14:15 – 14:45	Implementing BIM - Choosing the Right Partner
14:45	Questions and Close



# Construction Challenges – Lack of Information?

- Cost Overruns
- Unknowns
- Safety & Insurance
- Ability to forecast productivity
- Control Waste
- Schedule conflicts
- Field Connectivity
- RFI
- Project Control Process
- Machine Maintenance
- Design Conflicts



**So many wasted hours**



# BIM –Leveraging a Model Centric Approach

*Building Information Modelling is about creating and using a 3D, intelligent model for planning, designing, building and managing infrastructure.*

## Clarity

Better understand and communicate project risk, intent, and options before project is built

## Continuity

Maintain consistent data, context and processes across lifecycle

## Agility

Respond quickly to project changes – smarter and faster processes



# BIM For Buildings

An intelligent, model-based process that provides insight for creating and managing building projects faster, more economically, and with less environmental impact.



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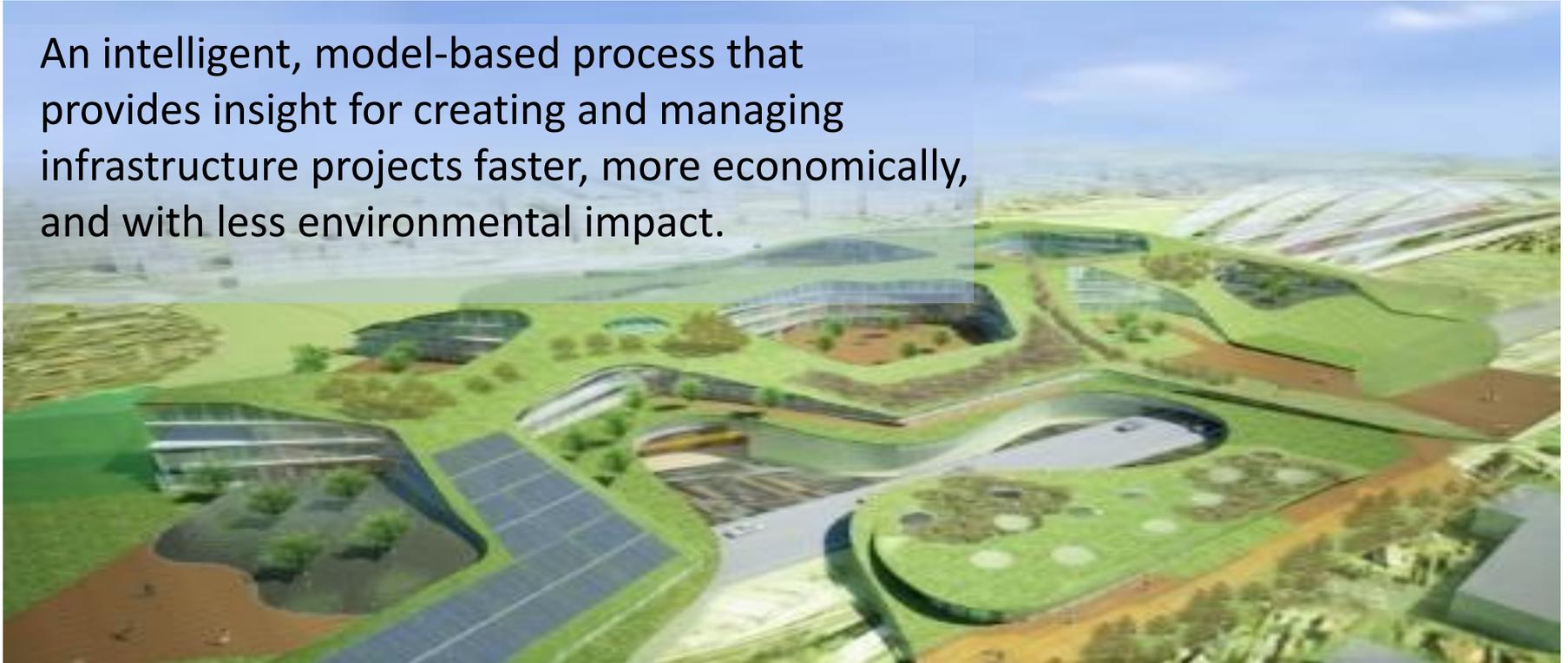


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# BIM For Infrastructure Is Different?

An intelligent, model-based process that provides insight for creating and managing infrastructure projects faster, more economically, and with less environmental impact.



# How is a model based design different?

- Model Based design beyond 2D in construction
- Digital models developed using intelligent, data rich digital components
- Centralised repository of building information for use throughout its lifecycle
- Collaborative workflows facilitated by access to detailed building data
- Requires closer co-operation through the supply chain
- Virtual construction using real site conditions
- A catalyst for change

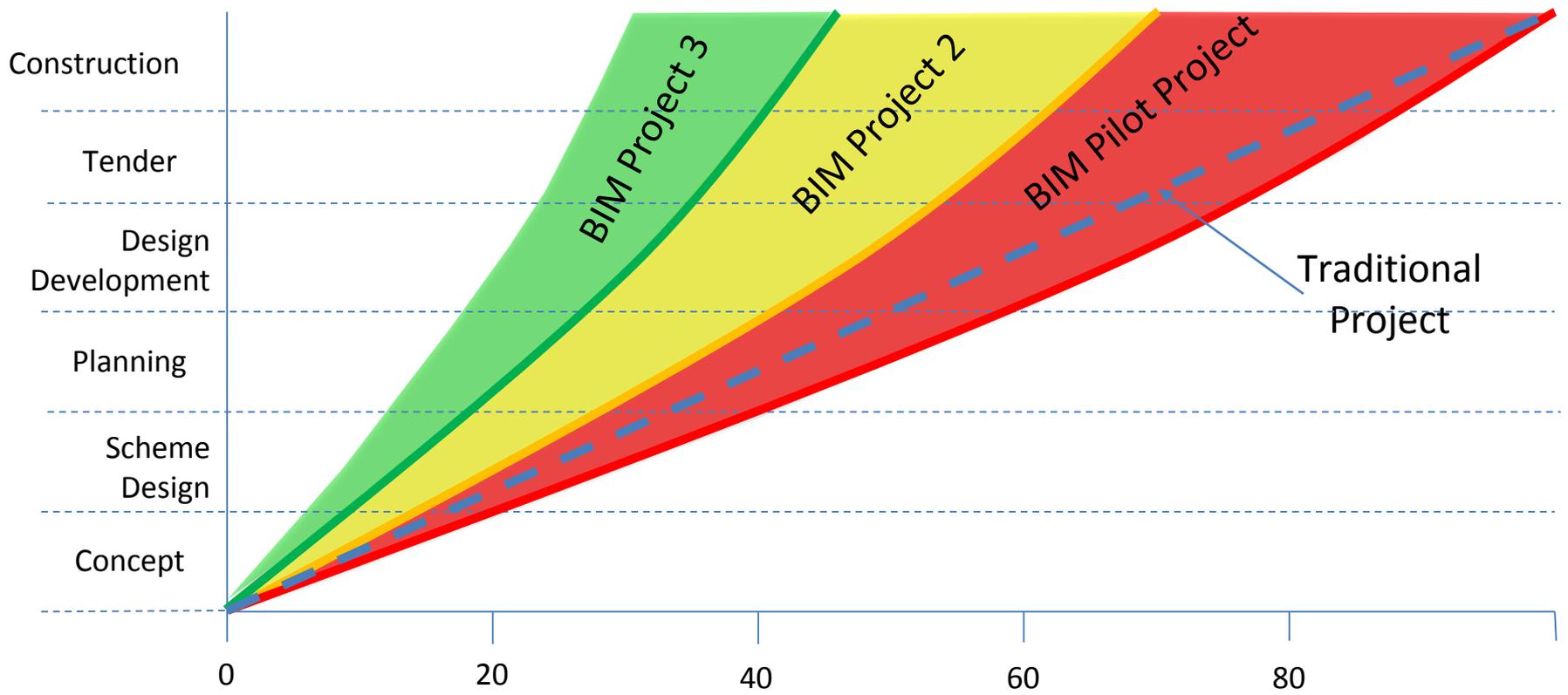


# A model centric approach delivers:

- Automation of design and construction documentation and deliverables
- Multiple design iterations informed by detailed analysis and simulation
- Sustainable design and energy regulation compliance
- Realistic, compelling visualizations including images and animations
- Construction site simulation and management.
- Accurate quantity take off and cost planning.



# AEDAS – Finding Success With BIM



# How scalable is BIM?



Hinkley Point C – £16Billion

- Main Civils - £2Billion
- Earthworks - £100Million
- Temporary Jetty - £30 Million
- 25000 Construction Jobs



HS2:

- 2 Phases
- Total network including London and Birmingham, links to Manchester and Leeds; and a Heathrow spur will be around 330 miles of track
- £43.6 Billion
- 9000 Construction Jobs



# The Appropriate Level of Detail

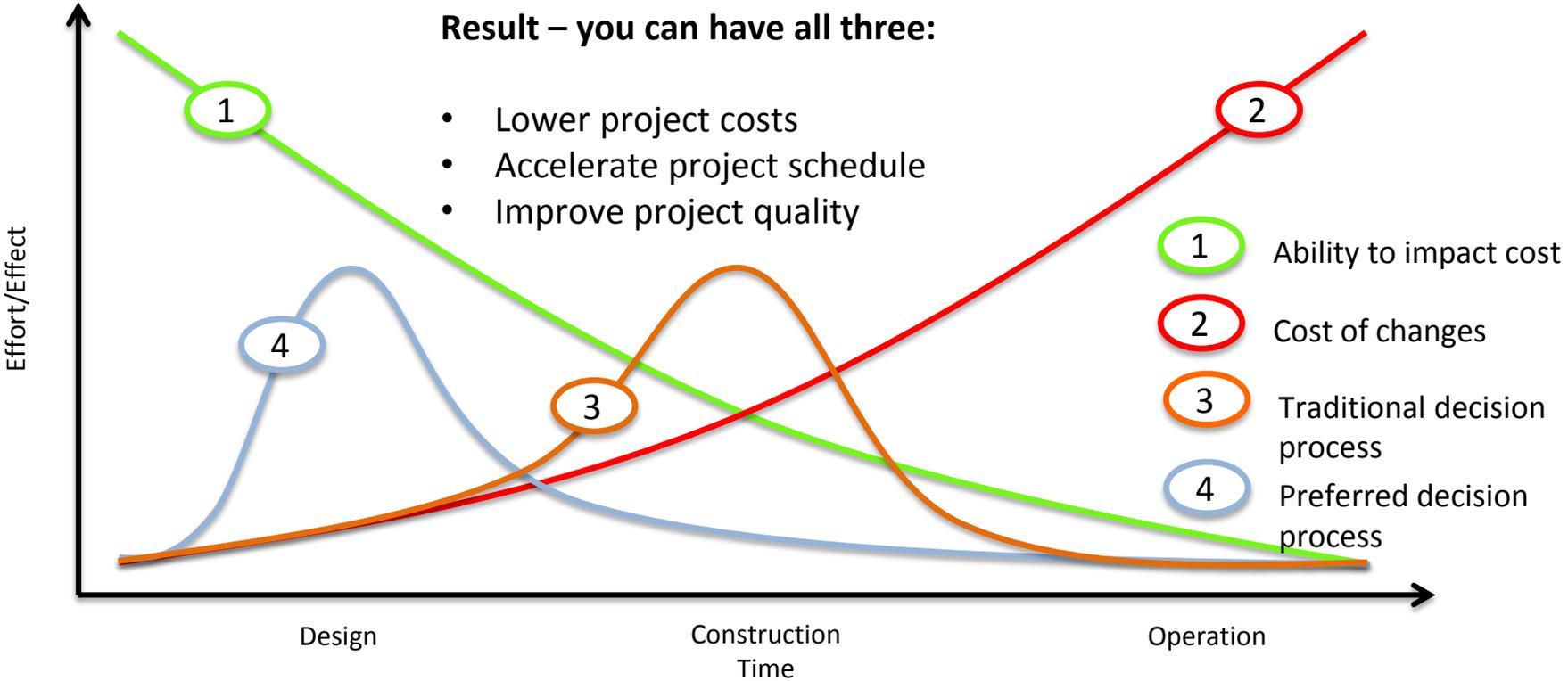
Number of Objects



Degree of Precision



# The Real Value Of Model Based Design



# What Is The Problem With The Process?

“The basic decisions of construction control are often incomplete or unduly rushed because necessary information is not available sufficiently ahead of time, or is not complete enough. **On many occasions members of the construction team could, but do not, ease this problem by supplying the data that would facilitate the preparation of fuller and more useful information by others. Building construction is remarkable among industrial activities for the lack of detailed information about how it proceeds.** Until more is known there can be no basis for improvement.”

*Communications in the Construction Industry by Guerth Higgin and Neil Jessop, 1965*



# What Is The Problem With The Process?

**Higgin + Jessop (1965)** – required information is not readily available

**Latham (1994)** - industry inefficiencies, condemning existing industry practices as 'adversarial', 'ineffective', 'fragmented', 'incapable of delivering for its clients' and 'lacking respect for its employees'

**Egan (1998)** – committed leadership, a focus on client, integrated process and teams, quality driven agenda, commitment to people

**Morrell (2010)** - work more collaboratively and to use information technology - notably building information modelling (BIM) - to support the design, construction and long-term operation and maintenance of its built assets.



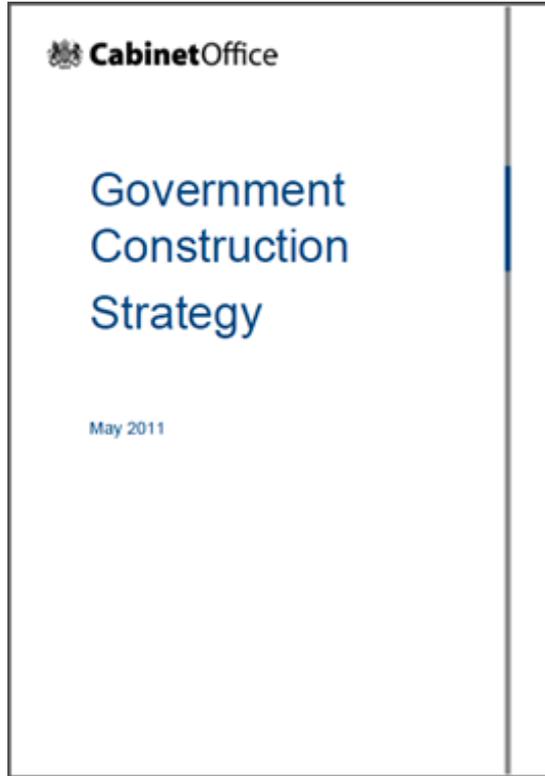
# The Government Construction Strategy



Paul Morrell  
Government's Chief Construction Adviser



# The Government Construction Strategy



2.31 The Cabinet Office will co-ordinate Government's drive to the development of standards enabling all members of the supply chain to work collaboratively through **Building Information Modelling (BIM)**.

2.32 Government will require fully collaborative **3D BIM** (with all project and asset information, documentation and data being electronic) as a minimum by 2016.

1.32 Specific actions will be developed in relation to Government's construction strategy for sustainability and carbon following the publication of Government's response to The IGT Report: **Low Carbon Construction**, to be published in June 2011.



# The Government Targets

<b>Capital Cost</b>	<b>-10%</b>
<b>Construction Time</b>	<b>-10%</b>
<b>Predictability</b>	<b>+20%</b>
<b>Defects</b>	<b>-20%</b>
<b>Accidents</b>	<b>-20%</b>
<b>Productivity</b>	<b>+10%</b>
<b>Turnover and Profits</b>	<b>+10%</b>



# The BIM Task Group

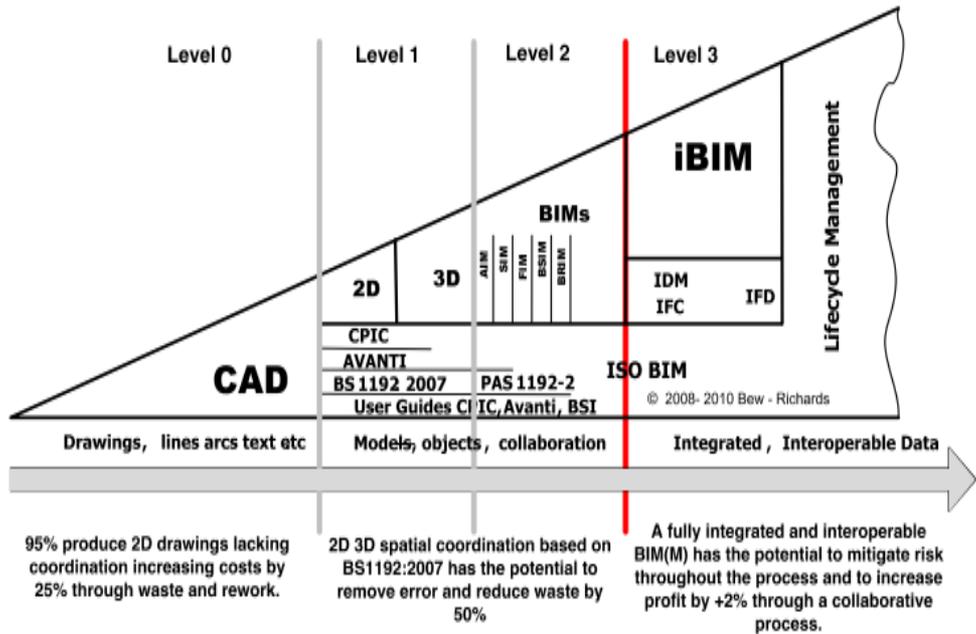


‘Government as a client can derive significant improvements in cost, value and carbon performance through the open use of open shareable asset information.’

- **All asset information, documentation and data is developed and delivered using BIM workflows that meet maturity level 2 conditions.**
- **component data is published at specific phases or drops using the COBie UK 2012 building information exchange schema.**
- **All 2D drawings are derived from the model and not in isolation**



# BIM Defined In The UK

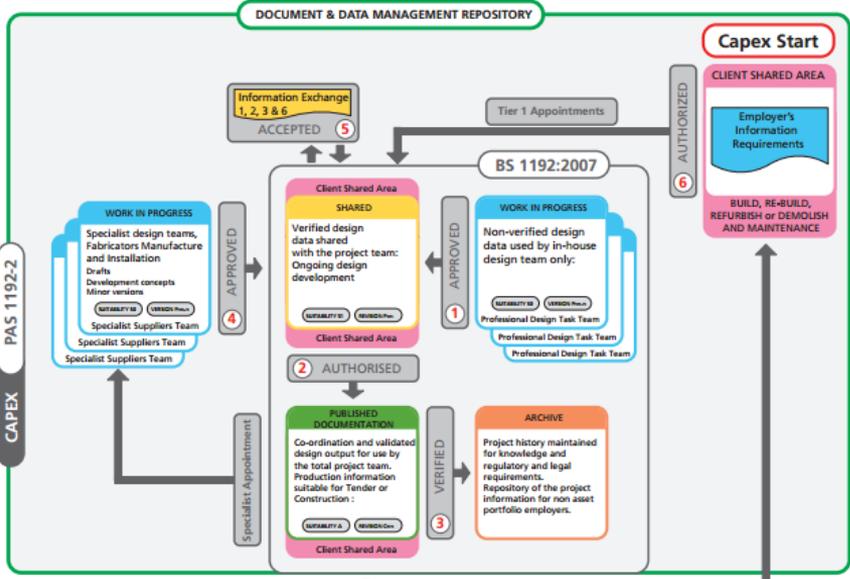


Source: Mark Bew and Mervyn Richards

Level 2: Managed BIM environment for what a single BS1192:2007 with BIM tools with intention of producing a Commercial data management possibly ERP integration data structures and formats. Open interfaces data exposed by the software firm be regarded as 'paving' (people package) with approach integration 4D programme data and 5D cost elements as well as feed operational systems.



# CAPEX - BS1192:2007 and PAS1192-2



## The Common Data Environment:

- Stages for WIP, Shared, Published, Archived
- Approval Gates to move between stages
  - Model Suitability
  - **COBie Completeness**
  - **Co-ordinated documentation check**
  - Appropriate sign off
- Ownership
- **Status Codes and Nomenclature**

# BS1192:2007 and PAS1192-2 – Managing Design Data

Figure 16 – Architect's issue to SHARED

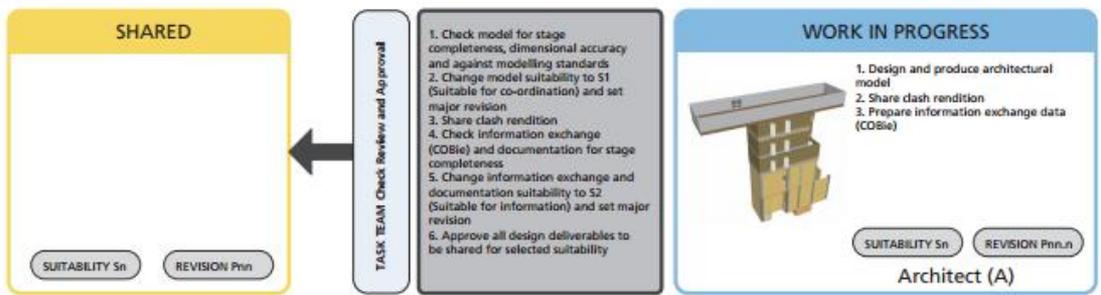


Figure 17 – Structural engineer's issue to SHARED

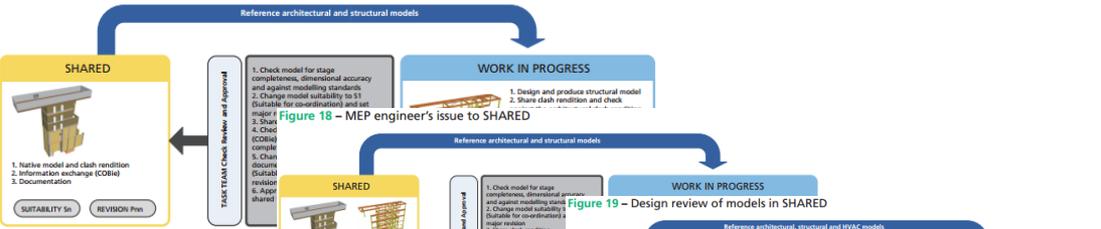


Figure 18 – MEP Engineer's issue to SHARED

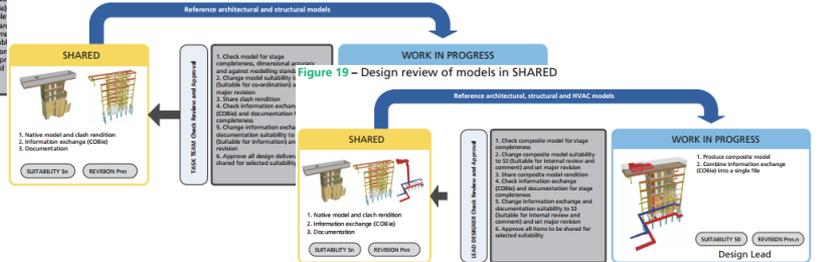
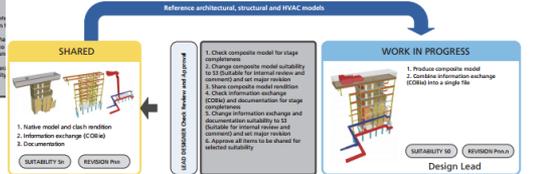


Figure 19 – Design review of models in SHARED



Status	Description
<b>Work in Progress (WIP)</b>	
S0	Initial status or WIP Master document index of file identifiers uploaded into the extranet.
<b>Shared</b>	
S1	Issued for co-ordination The file is available to be "shared" and used by other disciplines as a base
S2	Issued for information
S3	Issued for internal review and comment
S4	Issued for construction approval
S5	Issued for manufacture
S6	Issued for PIM authorization (Information Exchanges 1-3)
S7	Issued for AIM authorization (Information Exchange 6)
D1	Issued for costing
D2	Issued for tender
D3	Issued for contractor design
D4	Issued for manufacture/procurement
AM	As maintained
<b>Published documentation</b>	
A	Issued for construction
B	Partially signed-off: For construction with minor comments from the client. All minor comments by the insertion of a cloud and a statement of "in abeyance" until the resubmitted for full authorization.
AB	As-built handover documentation, PDF, native models, COBie, etc.

# PAS1192-2 –Level of Development

Stage number	1	2	3	4	5	6	7
Model name	Brief	Concept	Definition	Design	Build and commission	Handover and closeout	Operation
Systems to be covered	N/A	All	All	All	All	All	All
Graphical illustration (building project)							
Graphical illustration (infrastructure project)							
What the model can be relied upon for	Model information communicating the brief, performance requirements, performance benchmarks and site constraints	Models which communicate the initial response to the brief, aesthetic intent and outline performance requirements. The model can be used for early design development, analysis and co-ordination. Model content is not fixed and may be subject to further design development. The model can be used for co-ordination, sequencing and estimating purposes	A dimensionally correct and co-ordinated model which communicates the response to the brief, aesthetic intent and some performance information that can be used for analysis, design development and early contractor engagement. The model can be used for co-ordination, sequencing and estimating purposes including the agreement of a first stage target price	A dimensionally correct and co-ordinated model that can be used to verify compliance with regulatory requirements. The model can be used as the start point for the incorporation of specialist contractor design models and can include information that can be used for fabrication, co-ordination, sequencing and estimating purposes, including the agreement of a target price/guaranteed maximum price	An accurate model of the asset before and during construction incorporating co-ordinated specialist sub-contract design models and associated model attributes. The model can be used for sequencing of installation and capture of as-installed information	An accurate record of the asset as a constructed at handover, including all information required for operation and maintenance	An updated record of the asset at a fixed point in time incorporating any major changes made since handover, including performance and condition data and all information required for operation and maintenance The full content will be available in the yet to be published PAS 1192-3

## Model Information Defined:

- From Brief to Operation
- Starting with generic objects through to manufacturers objects and as built
- The minimum level of detail needed by the team or the employer for each model's purpose.
- Conform to the EIR, CIC Scope of Services and **Uniclass**

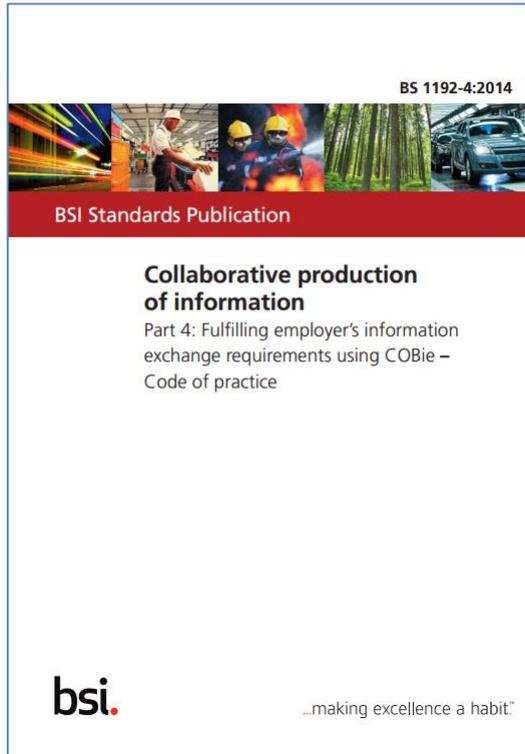


# COBie – Communicating Asset Maintenance Data

	A	B	C	D	E	F	G
	Name	CreatedBy	CreatedOn	TypeName	Space	Description	ExtSystem
1							
4	TFT Monitor:TFT Monitor:TFT Monitor:211790	jjohnston@t	2012-01-19T12:27:24	TFT Monitor	L0-02B	TFT Monitor:TFT Monitor:TFT Monitor:211790	Autodesk Revit Architecture 20
5	Mirror:Mirror:Mirror:211826	jjohnston@t	2012-01-19T12:27:24	Mirror	L0-02B	Mirror:Mirror:Mirror:211826	Autodesk Revit Architecture 20
7	Generic Int D Cell Door:790 x 2110mm 3:790 x 2110mm 3:211814	jjohnston@t	2012-01-19T12:27:24	790 x 2110mm 3	L0-02B	Generic Int D Cell Door:790 x 2110mm 3:790 x 2110mm 3:211814	Autodesk Revit Architecture 20
12	WC Pan:510 x 510mm 2:510 x 510mm 2:211807	jjohnston@t	2012-01-19T12:27:24	WC Pan 510 x 510mm	L0-02B	WC Pan:510 x 510mm 2:510 x 510mm 2:211807	Autodesk Revit Architecture 20
13	Wallgate ALS180 Basin:470w x 300d:470w x 300d:211808	jjohnston@t	2012-01-19T12:27:24	Wallgate ALS180 Basin 470w x 300d	L0-02B	Wallgate ALS180 Basin:470w x 300d:470w x 300d:211808	Autodesk Revit Architecture 20
18	Safer Seat:Safer Seat:Safer Seat:211803	jjohnston@t	2012-01-19T12:27:24	Safer Seat	L0-02B	Safer Seat:Safer Seat:Safer Seat:211803	Autodesk Revit Architecture 20
19	Cell Bed family:Cell Bed family:Cell Bed family:211804	jjohnston@t	2012-01-19T12:27:24	Cell Bed family	L0-02B	Cell Bed family:Cell Bed family:Cell Bed family:211804	Autodesk Revit Architecture 20
20	Cell Desk:Desk Whitewood:Desk Whitewood:211805	jjohnston@t	2012-01-19T12:27:24	Desk Whitewood	L0-02B	Cell Desk:Desk Whitewood:Desk Whitewood:211805	Autodesk Revit Architecture 20
21	Cell Locker:Cell Locker:Cell Locker:211806	jjohnston@t	2012-01-19T12:27:24	Cell Locker	L0-02B	Cell Locker:Cell Locker:Cell Locker:211806	Autodesk Revit Architecture 20
27	Basic Wall:Generic Ext - 150mm:211797	jjohnston@t	2012-01-19T12:27:24	Basic Wall:Generic Ext - 150mm	L0-02B	Basic Wall:Generic Ext - 150mm:211797	Autodesk Revit Architecture 20
30	Basic Wall:Generic Ext - 80mm:211801	jjohnston@t	2012-01-19T12:27:24	Basic Wall:Generic Ext - 80mm	L0-02B	Basic Wall:Generic Ext - 80mm:211801	Autodesk Revit Architecture 20
31	Basic Wall:Generic Ext - 80mm:211802	jjohnston@t	2012-01-19T12:27:24	Basic Wall:Generic Ext - 80mm	L0-02B	Basic Wall:Generic Ext - 80mm:211802	Autodesk Revit Architecture 20
34	Basic Wall:Generic Ext - 150mm:211830	jjohnston@t	2012-01-19T12:27:24	Basic Wall:Generic Ext - 150mm	L0-02B	Basic Wall:Generic Ext - 150mm:211830	Autodesk Revit Architecture 20
36	Safer Cell 7 Bay FF:1275x1200h:1275x1200h:211811	jjohnston@t	2012-01-19T12:27:24	1275x1200h	L0-02B	Safer Cell 7 Bay FF:1275x1200h:1275x1200h:211811	Autodesk Revit Architecture 20
37							
38							
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# COBie - PAS1192-4



PAS1192-4 contains:

- Business process suggestions
- Nomenclature and terminology.
- Structure definitions
- Examples of use



# OPEX - PAS1192-3

PAS 1192-3:2014

Specification for information management  
for the operational phase of assets using  
building information modelling



bsi.

## PAS1192-3 Introduces:

- Relationship to PAS55-1:2008 – Asset Management
- Asset Information Model (AIM)
- Asset Information Requirements (AIR)
- Organizational Information Requirements (OIR)



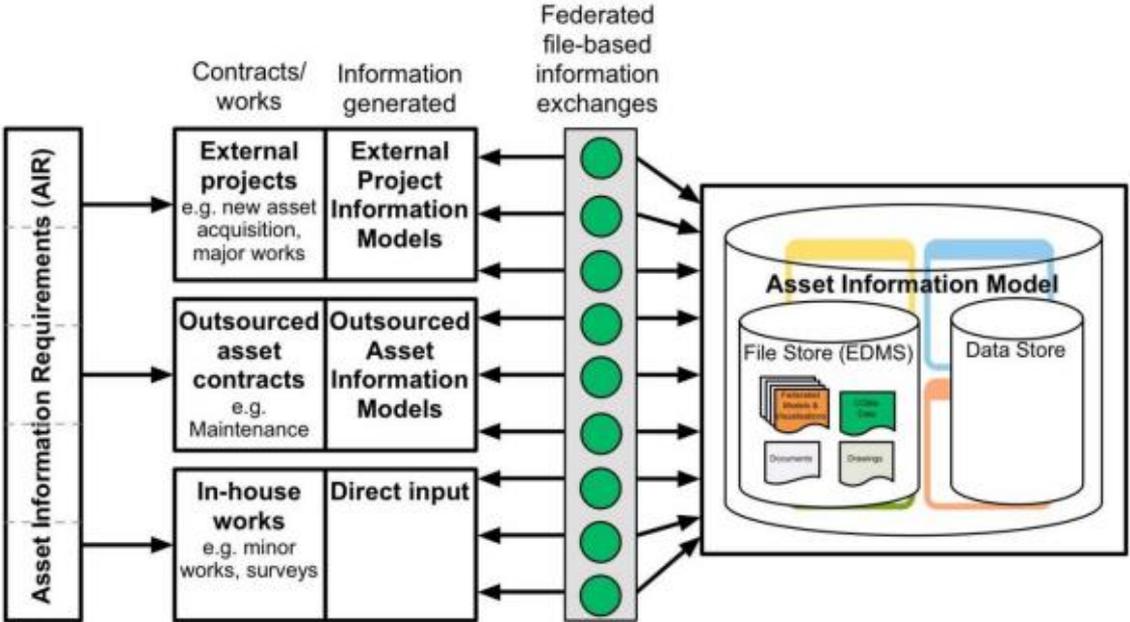
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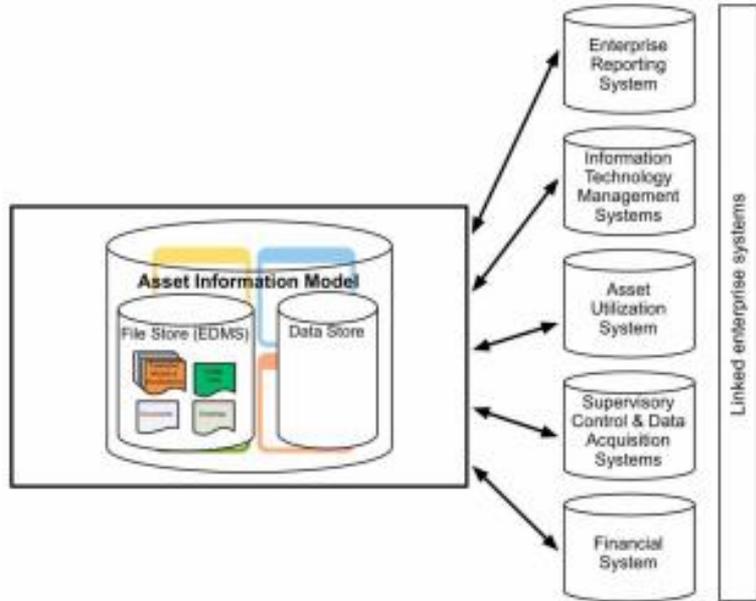
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# Asset Information Model – Federated Data



All data and information related to or required for the operational phase of an asset shall be contained in the AIM. **At BIM Level 2, the AIM shall be a federated model consisting of a number of discrete parts.** The extent and nature of these parts shall be related to the complexity, purpose and scale of the asset.

# Asset Information Model – Information Requirements



- Information concerning the original brief, specification, design intent and analysis relating to the original installation of the asset and any subsequent changes
- An object-based model of the 3D environment and location of the asset
- Information concerning the ownership or property rights associated with the asset
- Information concerning the data obtained from the maintenance or other work carried out on the asset during its lifetime
- Information concerning and data obtained from the monitoring of the asset, for example through a SCADA (Building Management System)

# CIC Document Suite



## BIM Protocols Introduce:

- Guidance for PII
- The Information Manager
- Employer's Requirements
- Data Drops
- **Level of Detail**
- Common Data Environment



# CPIx Document Suite



## CPIx on Line

Post Contract-Award Building Information Modelling (BIM) Execution Plan (BEP)

Project Name:  
Project Address:  
Project Number:  
Date:

Document No: March 2013  
Revision: R1  
Status: Published

Supporting the HMG Construction Strategy



### CPIx - BIM ASSESSMENT FORM (Based on working documentation provided by Skanska)

#### 1 - Standard Information

Company BIM Representative Name		Interviewee/Person Completing the Form	
Telephone No	Mobile No	E Mail Address	Web Site URL

#### 2 - BIM Gateway Questions

If the answer to any of the following questions is 'No', contact 'Project Team Leader, 'name', 'telephone number', 'email address'

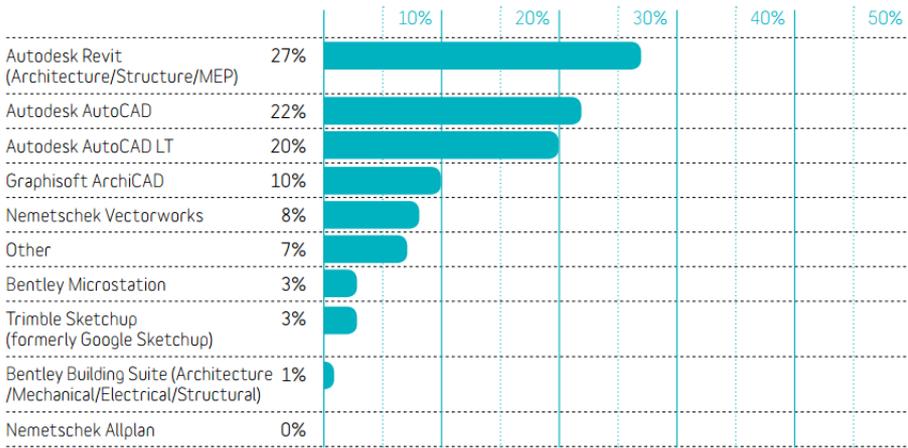
Ref.	Question	Answer	Evidence (if applicable)	Decision (By Team Leader)
G1.1	Are you prepared to issue your native CAD / BIM format files?			
G1.2	If you are not prepared to issue native CAD / BIM format files. Why not?			
G2.1	Do you work to a CAD / BIM Standard?			
G2.2	If you do not work to a CAD / BIM Standard. Why not?			
G2.3	Do you work to the national standard BS 1192: 2007?			
G2.4	If your Standards are not BS 1192: 2007, what are they based upon?			
G2.5	Do you produce a BIM model as an iterative process? E.g. BIMBA Plan of Work stages.			
G2.6	Do you understand the Model Progressive Strategy?			
G2.7	Do you understand the 'Level of Information' required at each of the project delivery stages?			
G2.8	Do you understand the 'Level of Detail' required at each of the project delivery stages?			
G3	How do you demonstrate or what measures do you have in place to ensure compliance with your CAD / BIM Standard?			

## BIM Documents Include:

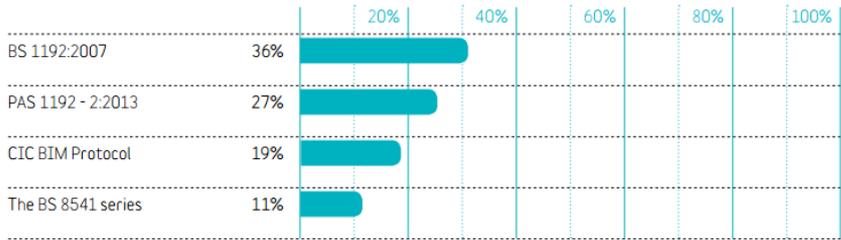
- BIM Assessment Form
- IT Assessment Form
- Resource Assessments
- Pre-Contract BEP
- Post-Contract BEP
- Uniclass

# BIM Adoption – NBS National BIM Report 2014

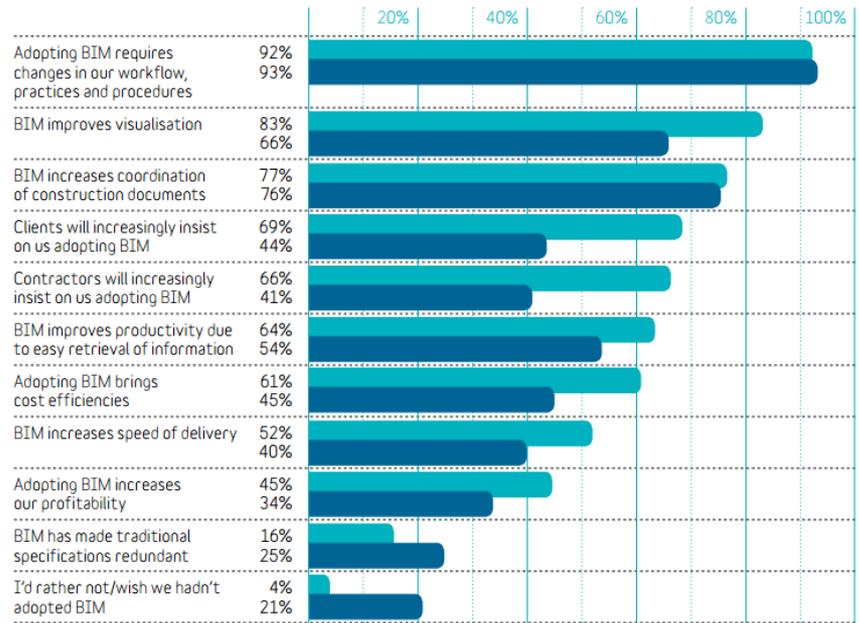
When producing drawings, which of the following tools do you mainly use?



Which of the following standards/publications does your organisation use?

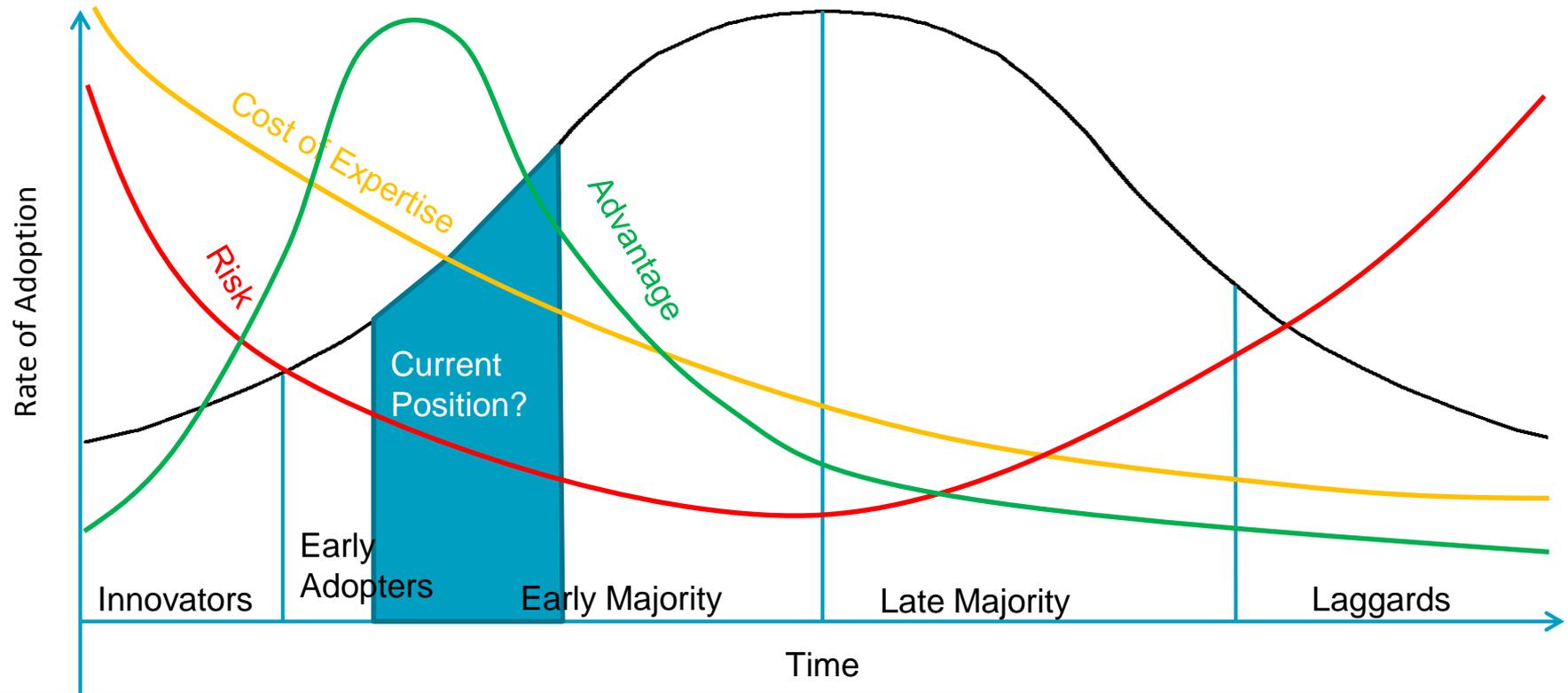


Attitudes towards BIM: A comparison of those who use it and those who don't



● Agree user ● Agree non-user

# BIM Adoption



# Interesting Reading



## Outstanding considerations for level 2 BIM :

- Interoperability standards – IFC?
- Product Information Standards – Uniclass2
- Preference for stable teams – build capability
- Maturity checks and competence qualification
- Level of Detail – definition and clarity
- Statutory Approvals – automation of BIM checking



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# Coffee



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Lunch



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12:30 – 13:15	Lunch

13:15 – 14:15	Energy Compliance for Architects with EcoBIM	OR
13:15 – 14:15	Building Services in a BIM Environment	

14:15 – 14:45	Implementing BIM - Choosing the Right Partner
14:45	Questions and Close



# Cadline Community



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**"Pop-up" homes plan for south London site**  
Lewisham Council has unveiled plans for a pop-up housing scheme on the site of a former leisure centre. The temporary homes will sit on the site...

**20/01/2015 @ 03:00pm**  
Webinar: Global eTraining Overview Webinar

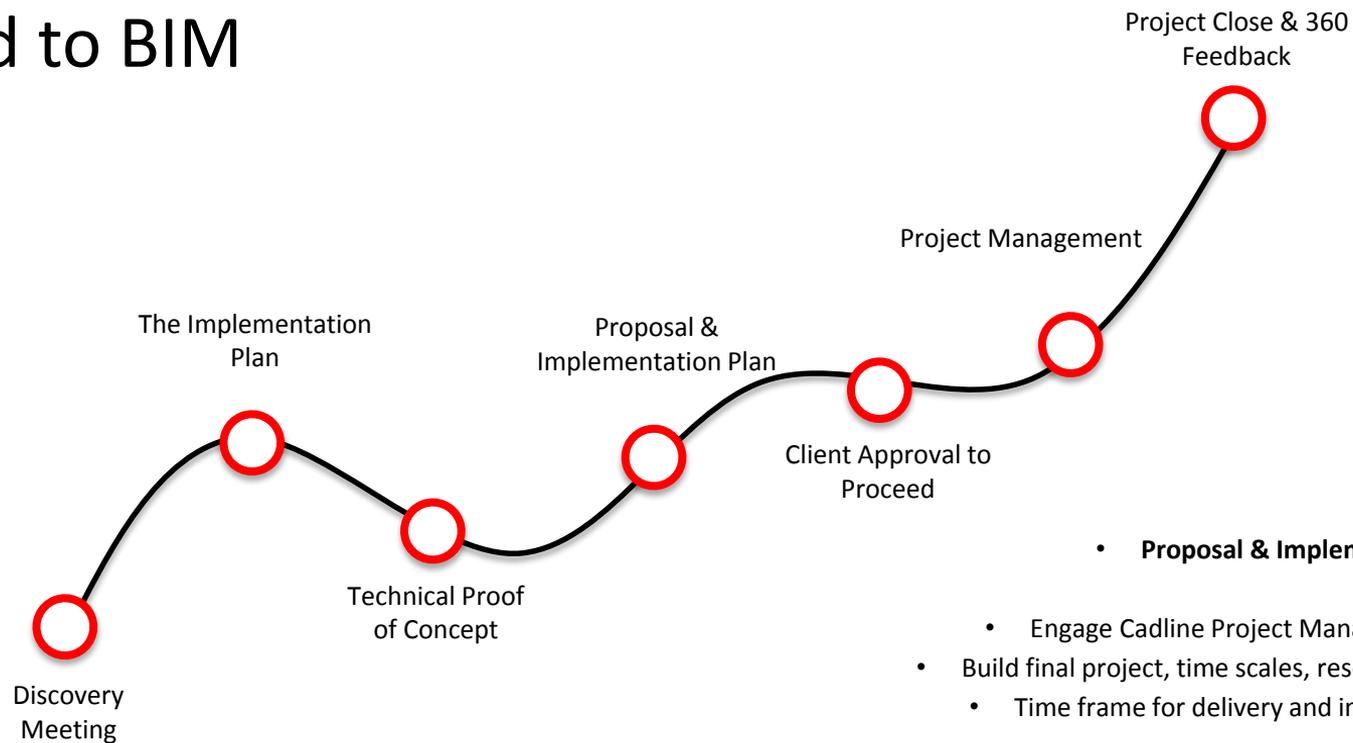
**22/01/2015 @ 09:30am**  
Seminar : Practical Approach to BIM Seminar

**Autodesk Inventor 2015 - Export High Resolution Images**  
By David Gate Autodesk Inventor 2015 - Export High Resolution Images If you need a quick image to show someone your modelling work there is

Telephone: 01784 419922 | Fax: 01784 252555 | Email: [sales@cadline.co.uk](mailto:sales@cadline.co.uk)



# The Road to BIM



- **Proposal & Implementation Plan**

- Engage Cadline Project Management Team
- Build final project, time scales, resource required
- Time frame for delivery and implementation



# Delivered as a Project

- Documentation Deliverables
  - Production of Scope of Works (SOW)
  - Production of Project Initiation Document (PID)
  - Project Plan – Gantt Chart
- Project Management & Assurance
  - Project Kick Off Meeting
  - Milestone Reviews
  - Project Status Reporting
  - Change Request & Management
  - Project Closing Meeting (Inclusive of:)
    - Lessons Learned Session
    - Project Closure & Sign off
    - Documentation Hand Over



# 360 Project Feedback



This document is verification that the listed documents have now been purged. Data belonging to <Customer Name> on the Cadline SharePoint site has now been removed in accordance with the signed Non Disclosure Agreement (NDA).

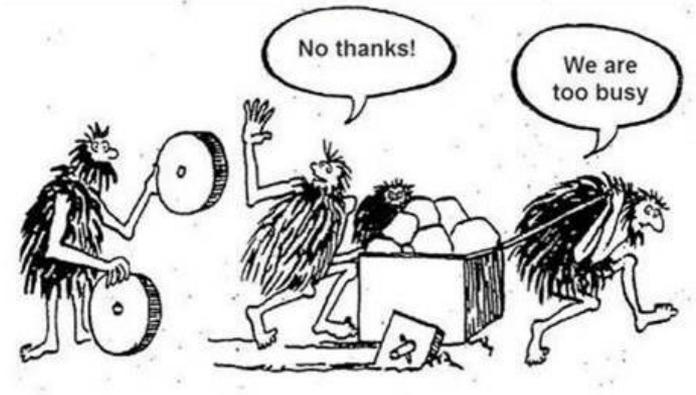
**Note:- (Copy of the SharePoint deletion screen to be attached to this document)**

Site Id	Count of Occurred	Event	Document Location	Delete	Grand Total
technical\IT\rest.xlsx	1			1	1
<b>Grand Total</b>	<b>1</b>			<b>1</b>	<b>1</b>



# Next Steps

- Do Nothing
- Wait and see
- Patch up an old system
- Speak to Cadline



PAS 1192 Data Management

Concept Design

BIM Compliance

Q&A, Close and Thank You

Sustainable Design



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# Agenda for Today

10:00 – 10:10	Welcome and Introductions
10:10 – 10:40	BIM - A Model Centric Approach
10:40 – 11:30	Design and Data in Digital Construction
11:30 - 12:00	Coffee
12:00 – 12:30	Data Management – A Vital BIM Component
12:30 – 13:15	Lunch

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