Lecture: Future Systems: ITC (CAD BIM APPs)

Advanced Technology
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Module Coordinator: Kenny Fitzmaurice
Technology Campion: Brian Murphy

Lecturer: Brian Murphy

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Presented: 19th March 2019
Updated:

>40 years into 1 Hour won't go

- So I am providing links to other information if you want to know more
  - I offer you the doors, you open them and see where it takes you
- Question Everything
  - Use what you know, join up your thinking, keep learning and refining what you know
- Don't assume that I know everything
  - (I know a lot but not everything)
- Don't assume I have cherry picked the best bits
  - (new stuff keeps appearing)
- Don't assume what your being told is the whole story
  - Some will hide what they don't want you to know
  - And tell greenwash porkies
- Do your best with what you know
  - When you know better
  - Do better

This Presentation on GBE:

- Find this file on GBE website at:
- https://GreenBuildingEcyclopaedia.uk/?P=20897
- Find related image folders on Pinterest
- https://www.pinterest.co.uk/bmurphy1390/BIM
- Schedule of related pages:
- https://GreenBuildingEcyclopaedia.uk/?P=17699

BIM on GBE 1 of 2

- BIM Jargon Buster Theme
- https://greenbuildingencyclopaedia.uk/?p=1409
- BIM Periodic Table
- https://greenbuildingencyclopaedia.uk/?p=12691
- Communicating Product Data BIM4M2
- https://greenbuildingencyclopaedia.uk/?p=11309
- Sustainable Design & Manufacturer's Information
- https://greenbuildingencyclopaedia.uk/?p=2046
- Specifications within BIM
- https://greenbuildingencyclopaedia.uk/?p=4394
- Whole Building Calculators
- https://greenbuildingencyclopaedia.uk/?p=600

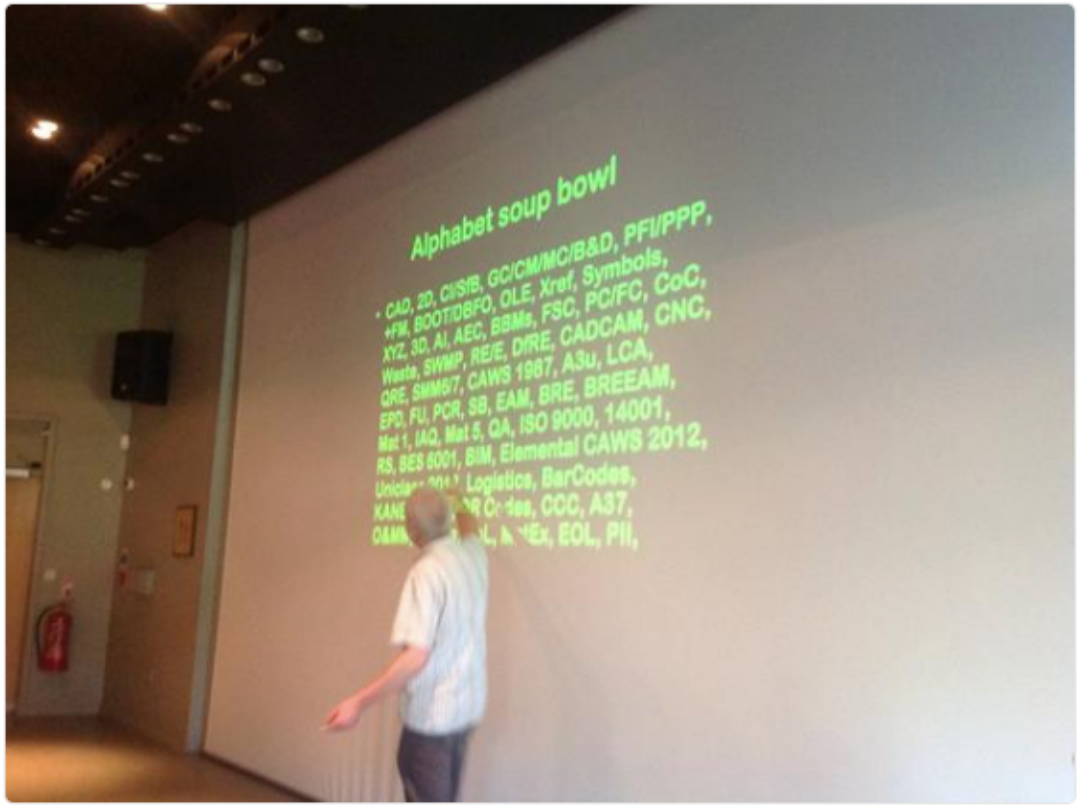
Another GBE CPD/Lecture to download

And https://greenbuildingencyclopaedia.uk

Robert Klaschka
@robertklaschka

Following

#bim @EdinburghNapier Brian from Greenspec



RETWEET
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10:47 AM - 23 Nov 2012

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Reply to @robertklaschka @EdinburghNapier

Another GBE CPD/Lecture to download
And https://greenbuildingencyclopaedia.uk

BIM on GBE 2 of 2

- Specification Development RIBA Plan of Work 2013
- https://greenbuildingencyclopaedia.uk/?p=1339
- National BIM Report 2013
- https://greenbuildingencyclopaedia.uk/?p=1003
- Product Data Templates (PDT)
- https://greenbuildingencyclopaedia.uk/?p=8097
- Digital Object Identifiers (DOI)
- https://greenbuildingencyclopaedia.uk/?p=7314
- Green BIM Building Conference Leeds
- https://greenbuildingencyclopaedia.uk/?p=1867
- Blockchain Timber Chain of Custody
- https://greenbuildingencyclopaedia.uk/?p=20312
- EUTR EU Timber Regulations NEPCon Hub
- https://greenbuildingencyclopaedia.uk/?p=16016

UofH Part 1 Year 2 Schedule

GBE

Green Building Encyclopaedia

https://greenbuildingencyclopaedia.uk/?P=17699

Task	Topic	Lecture/CPD	Books	GBE Website pages
0	The Whole Year	Principles of Element Design (Lecture)	Architects Pocket Book	G#17699 (this page)
		Fixings Fastenings	Environmental Design Pocket Book (Book)	Pinterest Z20 Connectivity (folders)
		Adopt a material (Lecture)	Principles of Element Design (Book)	
		Future Systems (Lecture)	Designed to perform (Book)	
1	Site Survey	Site / Existing Building Survey Test Analysis (CPD/Lecture)	Survey Site Analysis (Navigation)	
2	Sustainable Strategy	HERACEY® (Jargon Buster CPD)	TBH Designer's Handbook	HERACEY® (Jargon Buster)
		Matrix (Navigation)	Building Regulations AD L – Conservation of fuel and power	Healthy (Jargon Buster)
			PHPP Passivhaus & EnerPHit	Environmental (Jargon Buster)
			AECB Carbon Lite & Retrofit	Resourceful (Jargon Buster)
			CIBSE TM60 2018 Good Practice In the Design of Homes (Book)	Appropriate (Jargon Buster)
				Competent (Jargon Buster)
				Effective (Jargon Buster)
				Yardstick (Jargon Buster)
3	External walls and openings	Timber External walls – External wall Opening Window Door (Lecture)	Principles of Element Design (Lecture)	Calculators (Navigation)
		Masonry External walls – External wall Opening Window Door (Lecture)	IBO Passive Houses New Build	Elemental Building U value calculator
		Glass External walls – External wall Opening Window Door (Lecture)	Designed to perform (Book)	Elemental Assemblies Spreadsheet
		Other External walls	Building Regulations	Windows (Checklist)
		External wall Opening Window Door (Lecture)	AD L – Conservation of fuel and power	
		Windows – External wall Opening Window Door (Lecture)		Rooflights (Checklist)
		Doors – External wall Opening Window Door (Lecture)		
		Rooflights		
		Solar Shading (CPD)		
4	Roof & Floor	Pitched Roof	Principles of Element Design (Lecture)	Calculators (Navigation)
		Flat Roof	IBO Passive Houses New Build	Elemental U value calculator
		Ground Floor	Designed to perform (Book)	Elemental Assemblies Spreadsheet
		Upper Floor	Building Regulations AD L – Conservation of fuel and power	
5	Access Stairs	Stairs Ramps Lifts Escalators (Lecture)	Building Regulations AD K	Checklist (Navigation)
	Stairs Ramps Balustrades Walkways	Stairs Ramps Lifts Escalators (Lecture)	Building Regulations AD K	
	Lifts Escalators	Stairs Ramps Lifts Escalators (Lecture)		
6	Internal Linings Elevations and Reflected ceiling Plans	(22) Internal partitions,	Principles of Element Design (Lecture)	
		(23) Upper Floors,	IBO Passive Houses New Build	
		Interior Linings	Designed to perform (Book)	
		(40) Finishes (CPD/Lectures)		
7	Axo, Build ups, thicknesses	Principles of Element Design (Lecture)	Principles of Element Design (Lecture)	Calculators (Navigation)
			IBO Passive Houses New Build	Elemental Building U value calculator
			Designed to perform (Book)	
8	Drawings + Model			Calculators (Navigation)
				Whole Building U value calculator
9	3D Design	Intro to BIM	BIM A Spec Writers Perspective (Shop)	GBE BIM (Jargon Buster)
10	Wall Roof Junctions	Principles of Element Design (Lecture)	IBO Passive Houses New Build	Calculators (Navigation)
			Designed to perform (Book)	Psi value calculator
11	Wall Floor Foundation Junctions	(16.4) Foundation (Lecture)	Principles of Element Design (Lecture)	Calculators (Navigation)
		(16.4) Groundworks RC Raft Foundation (Lecture) G#2114	IBO Passive Houses New Build	Psi value calculator
			Designed to perform (Book)	
12	Model			

Today's Lecture

- **Future Systems: ITC Technology CAD BIM & APPs**

Quotes for the Day

- CAD is not BIM BIM is not CAD
- Excel killed the development of BIM for a 40 years
  - (Paul Fletcher: “Beyond BIM” 2012)
- All the CAD software providers helped suppress it too


BIM
Building
time
aware
well
design
work
coordination
things
lifetime
wrong
models
Modeling
require
gave
thermal
identifying
process
systems
concepts
Information
project
integrated
asset
facility
less
CAD
Burrell
UK
provides
future
electronic
experiences
data
waste
information
documentation
useful
communication
part
BS1192:2007
shared
PassivHaus
based
spent
Lonely
building
construction
Snook
BREEAM
Just
just
standards
collaborative
using
Elrond
doesn
AdaptCBE
progression
event
government
accurate
projects
February
objective
insights
digital
key
errors
specifications


BIM
IS NOT
CAD

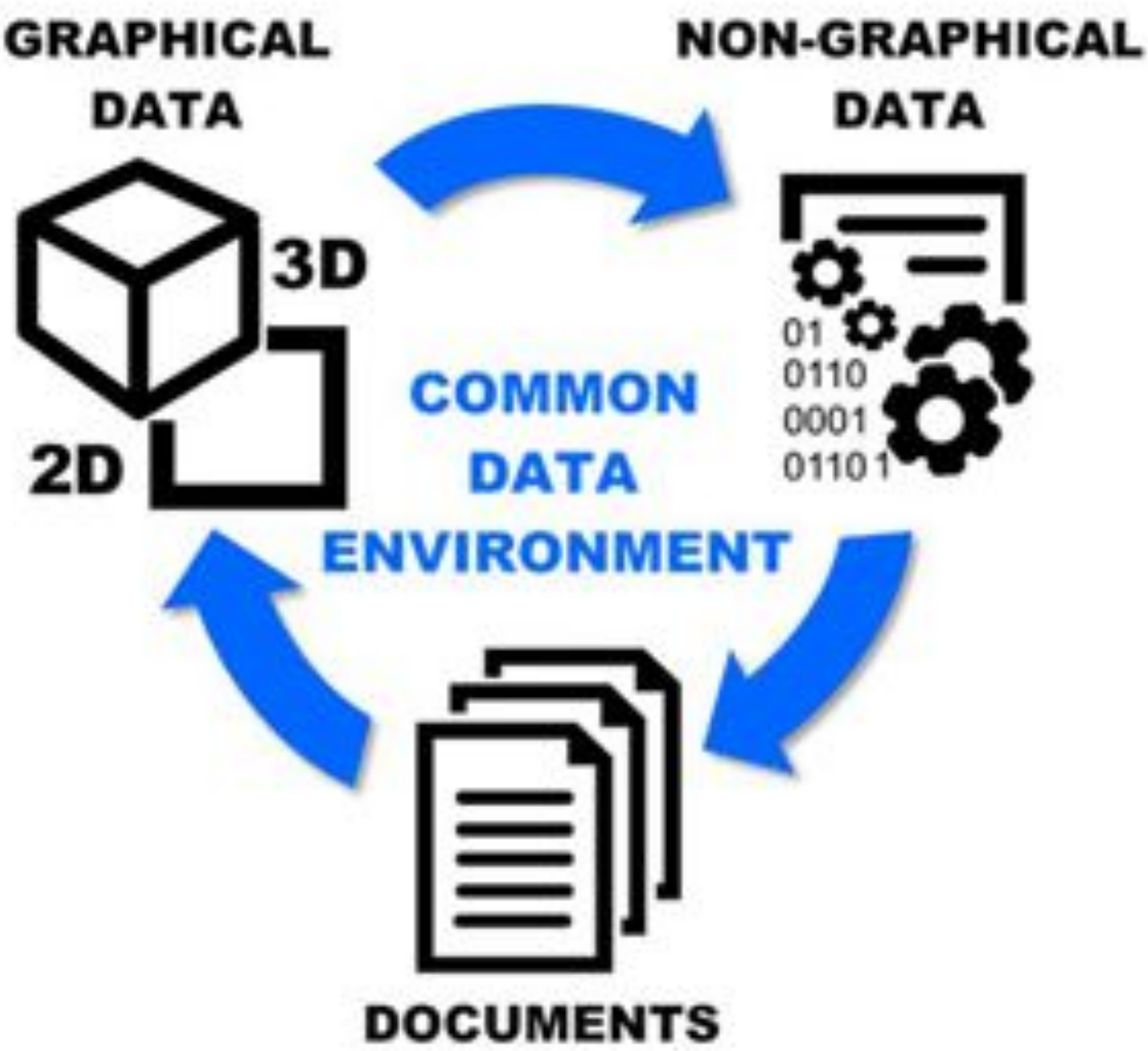
"THE ARCHITECT SAYS YOU DON'T NEED DIMENSIONS ON THE DRAWING WHEN YOU CAN SIMPLY QUERY THE COMPUTER MODEL"

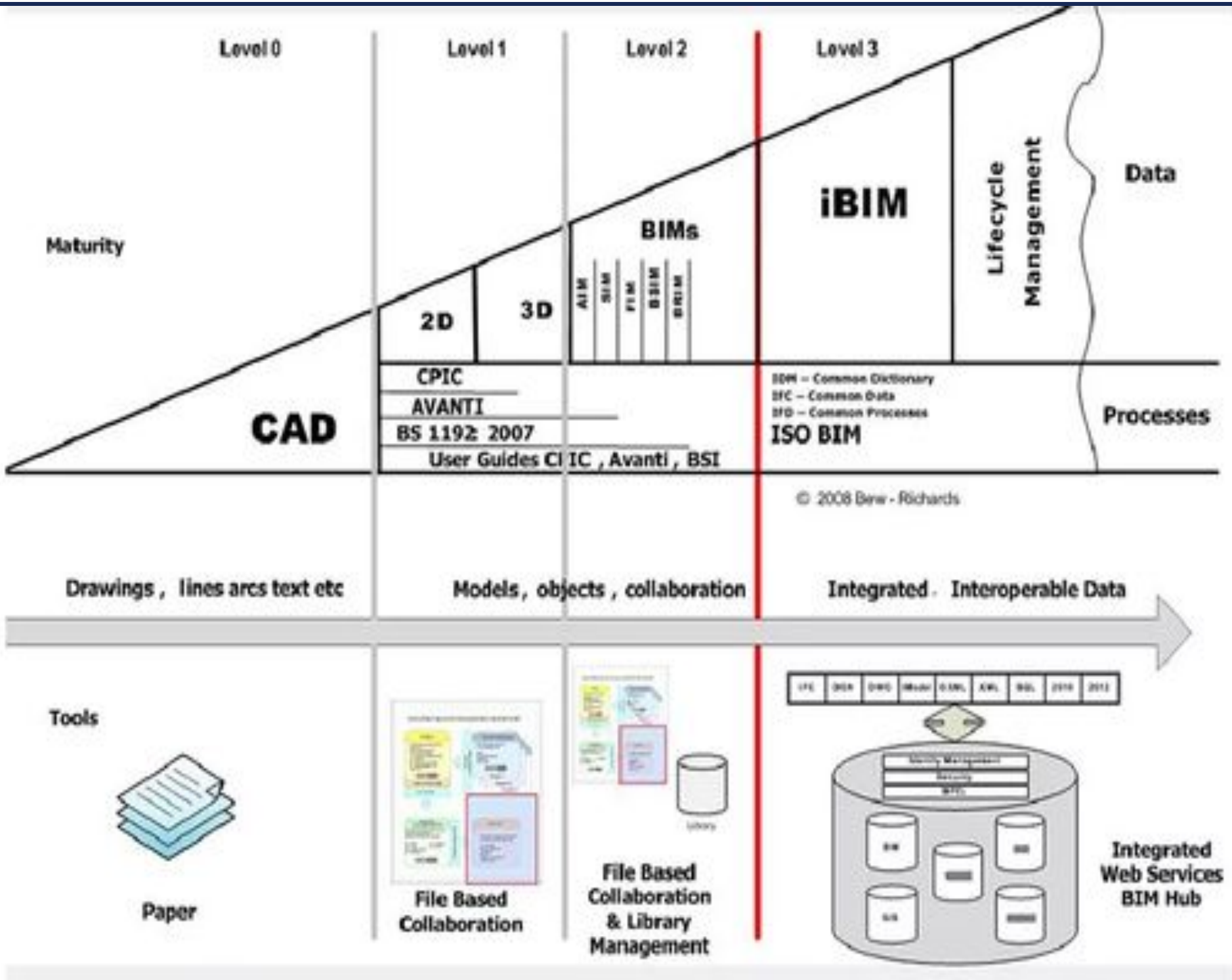
BIM Past and Future:

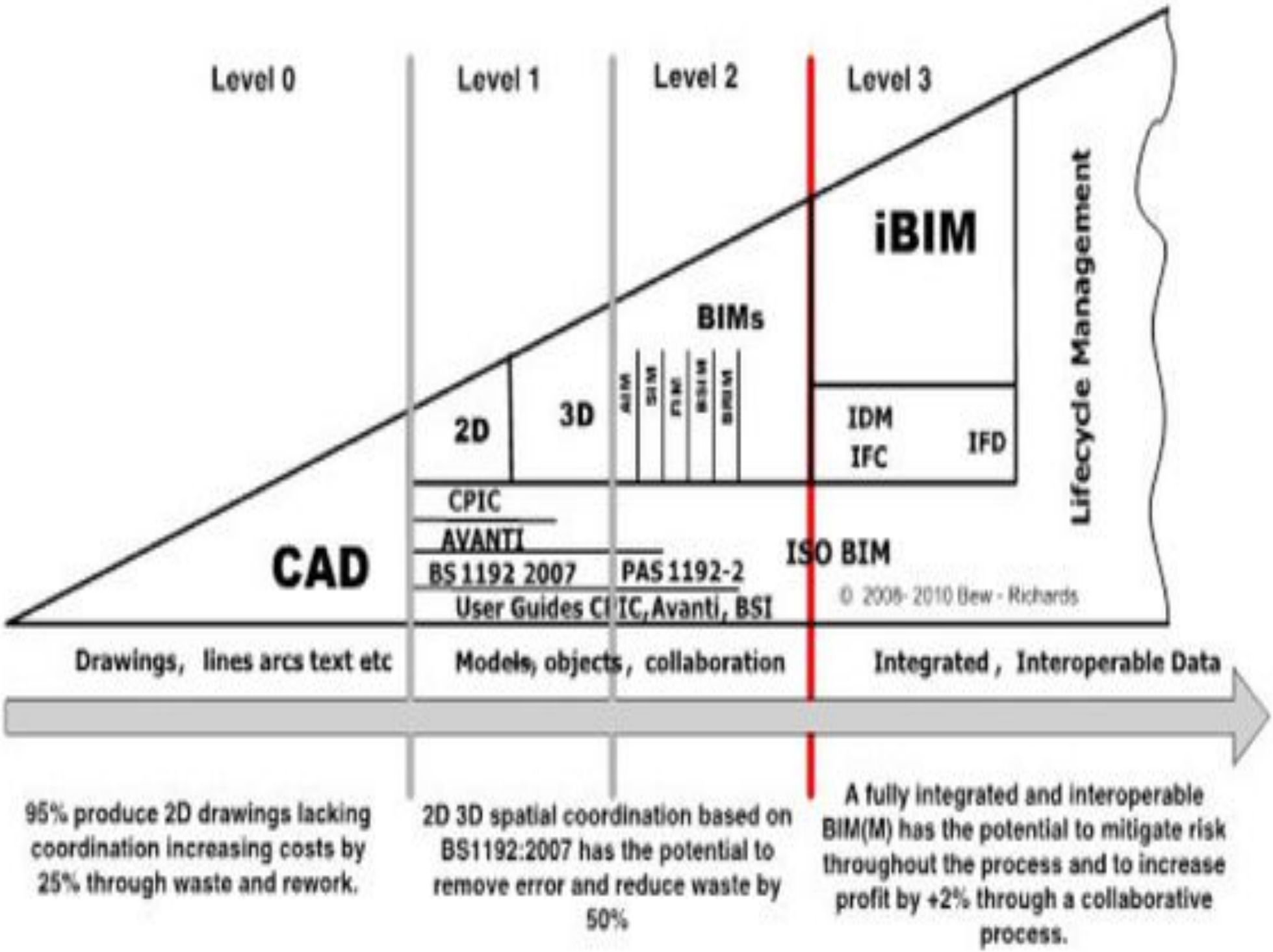
- Jules May started programming 3D intelligent CAD
  - Bridge Software
  - CAD companies tried to destroy his Software
  - Brian Murphy helped develop an early prototype specification output
- For BIM to become really intelligent:
  - It needs current data, lots of it,
    - about products & materials
  - BOM Bills of Materials generated from BIM model
  - APPs to interrogate BOM and data:
    - Datasets + equations = calculators
  - Neither are well developed yet
    - Some will arrive when you join the profession

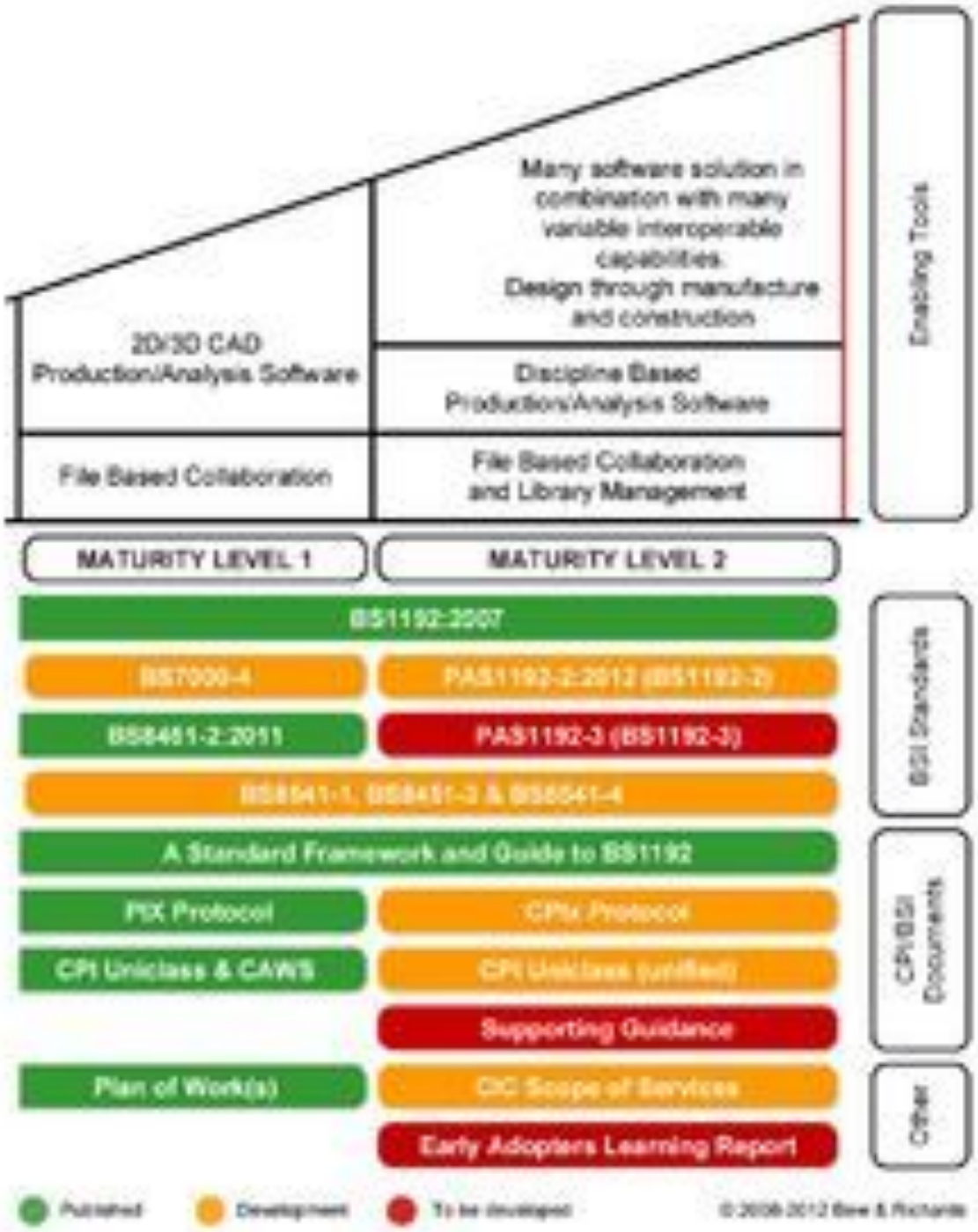
BIM & 2016

- Government in a review of the state of the construction industry decided yet again the industry competency was still not up to par
- They determined Intelligent CAD = BIM Building Information Modeling was the way forward for future Government Procurement
- 2016 was set as the threshold date by which all future projects will be delivered with BIM Level 2
- And they want to see 10% price reductions year on year

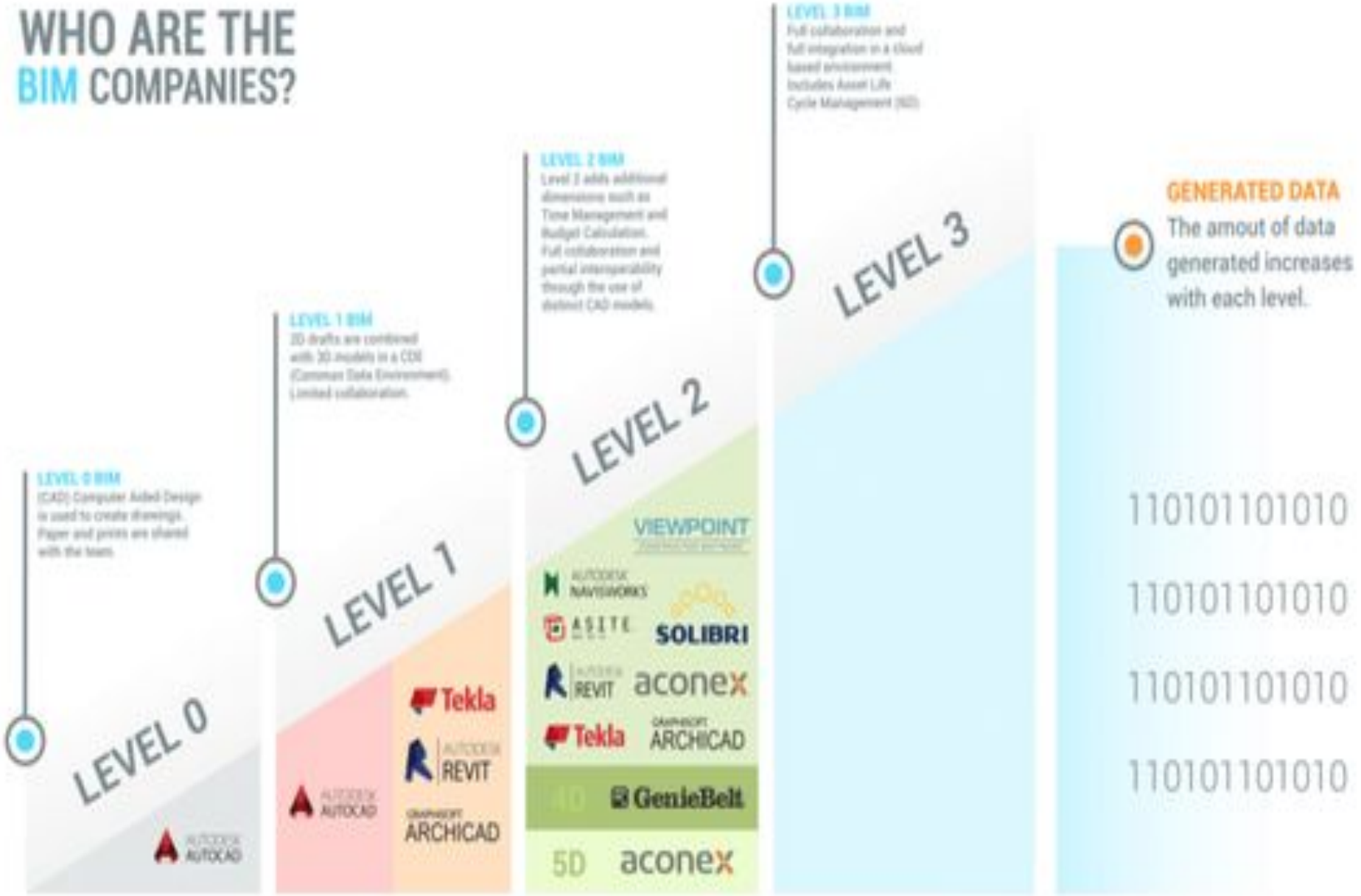

GRAPHICAL
DATA
NON-GRAPHICAL
DATA
3D
2D
01
0110
0001
01101
COMMON
DATA
ENVIRONMENT
DOCUMENTS


Level 0
Level 1
Level 2
Level 3
Maturity
2D
3D
BIMs
iBIM
Lifecycle Management
Data
CAD
CPIC
AVANTI
BS 1192: 2007
User Guides CPIC , Avanti , BSI
IDM – Common Dictionary
IFC – Common Data
IFD – Common Processes
ISO BIM
Processes
© 2008 Bew - Richards
Drawings , lines arcs text etc
Models , objects , collaboration
Integrated . Interoperable Data
Tools
Paper
File Based Collaboration
File Based Collaboration & Library Management
Integrated Web Services BIM Hub


Level 0
Level 1
Level 2
Level 3
iBIM
BIMs
2D
3D
AIM
SIM
NIM
BSIM
BREM
IDM
IFC
IFD
Lifecycle Management
CPIC
AVANTI
CAD
BS 1192 2007
PAS 1192-2
ISO BIM
User Guides CI IC, Avanti, BSI
© 2008- 2010 Bew - Richards
Drawings, lines arcs text etc
Models, objects, collaboration
Integrated, Interoperable Data
95% produce 2D drawings lacking coordination increasing costs by 25% through waste and rework.
2D 3D spatial coordination based on BS1192:2007 has the potential to remove error and reduce waste by 50%
A fully integrated and interoperable BIM(M) has the potential to mitigate risk throughout the process and to increase profit by +2% through a collaborative process.


Many software solution in combination with many variable interoperable capabilities
Design through manufacture and construction
2D/3D CAD Production/Analysis Software
Discipline Based Production/Analysis Software
File Based Collaboration
File Based Collaboration and Library Management
Enabling Tools
MATURITY LEVEL 1
MATURITY LEVEL 2
BS1192:2007
BS7000-4
PAS1192-2:2012 (BS1192-2)
BS8541-2:2011
PAS1192-3 (BS1192-3)
BS8541-1, BS8541-3 & BS8541-4
BSI Standards
A Standard Framework and Guide to BS1192
PDX Protocol
CPIx Protocol
CPI Uniclass & CAWS
CPI Uniclass (unified)
Supporting Guidance
CPI/BSI Documents
Plan of Work(s)
CIC Scope of Services
Early Adopters Learning Report
Other
Published
Development
To be developed

WHO ARE THE BIM COMPANIES?



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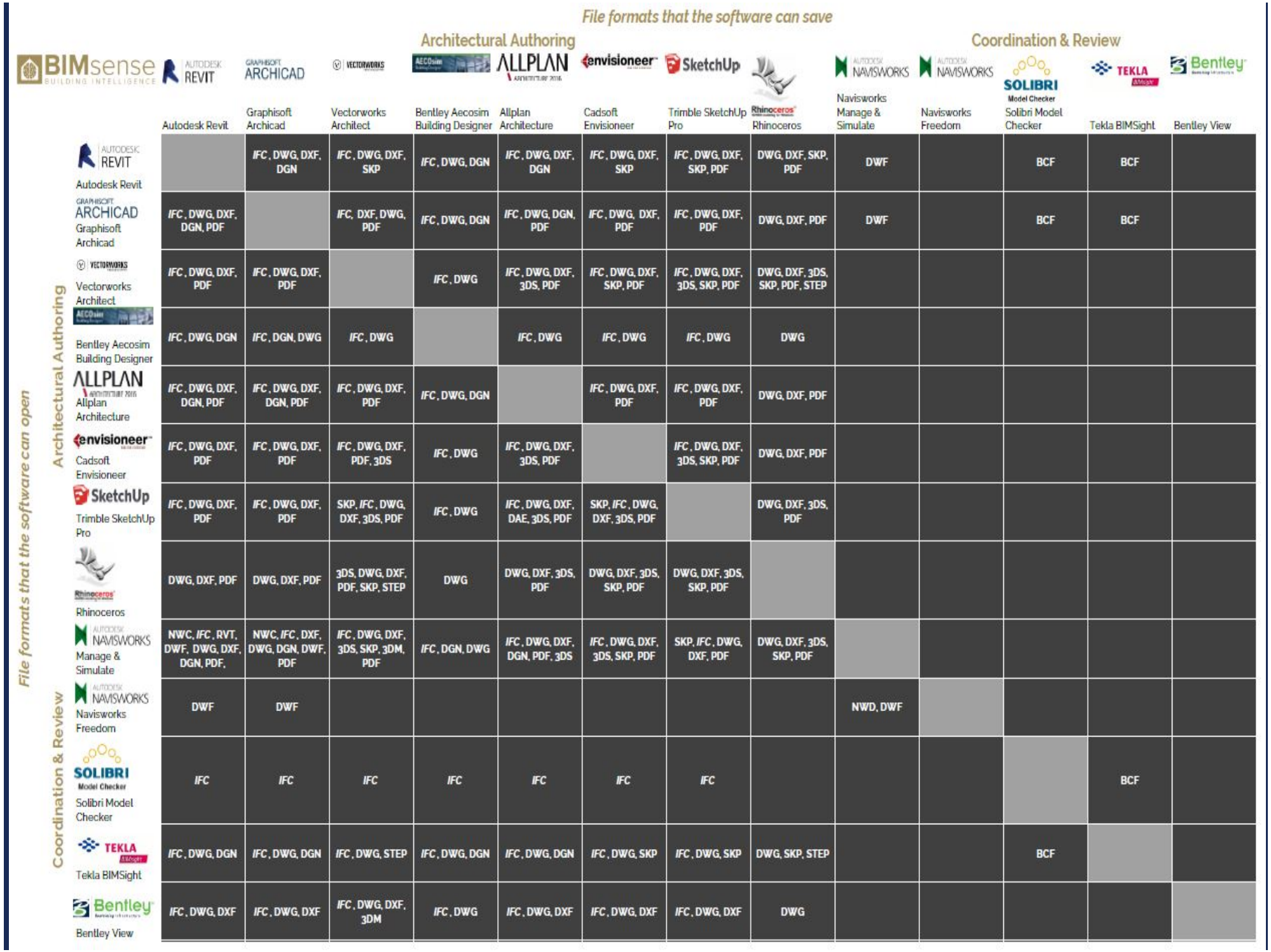
File formats that the software can save
Architectural Authoring
Coordination & Review
File formats that the software can open
Architectural Authoring
Coordination & Review
Autodesk Revit
Graphisoft Archicad
Vectorworks Architect
Bentley Aecosim Building Designer
Allplan Architecture
Cadsoft Envisioneer
Trimble SketchUp Pro
Rhinoceros
Navisworks Manage & Simulate
Navisworks Freedom
Solibri Model Checker
Tekla BIMSight
Bentley View
IFC, DWG, DXF, DGN
IFC, DWG, DXF, SKP
IFC, DWG, DGN
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IFC, DWG, DXF, SKP
IFC, DWG, DXF, SKP, PDF
DWG, DXF, SKP, PDF
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IFC, DWG
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IFC, DWG, DXF, SKP, PDF
IFC, DWG, DXF, 3DS, SKP, PDF
DWG, DXF, 3DS, SKP, PDF, STEP
IFC, DWG, DGN
IFC, DGN, DWG
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IFC, DWG
IFC, DWG, DXF, 3DS, PDF
IFC, DWG, DXF, 3DS, SKP, PDF
DWG, DXF, PDF
IFC, DWG, DXF, PDF
IFC, DWG, DXF, PDF
SKP, IFC, DWG, DXF, 3DS, PDF
IFC, DWG
IFC, DWG, DXF, DAE, 3DS, PDF
SKP, IFC, DWG, DXF, 3DS, PDF
DWG, DXF, 3DS, PDF
DWG, DXF, PDF
DWG, DXF, PDF
3DS, DWG, DXF, PDF, SKP, STEP
DWG
DWG, DXF, 3DS, PDF
DWG, DXF, 3DS, SKP, PDF
DWG, DXF, 3DS, SKP, PDF
NWC, IFC, RVT, DWF, DWG, DXF, DGN, PDF,
NWC, IFC, DXF, DWG, DGN, DWF, PDF
IFC, DWG, DXF, 3DS, SKP, 3DM, PDF
IFC, DGN, DWG
IFC, DWG, DXF, DGN, PDF, 3DS
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SKP, IFC, DWG, DXF, PDF
DWG, DXF, 3DS, SKP, PDF
DWF
DWF
NWD, DWF
IFC
IFC
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IFC
BCF
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IFC, DWG, DGN
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IFC, DWG, DXF
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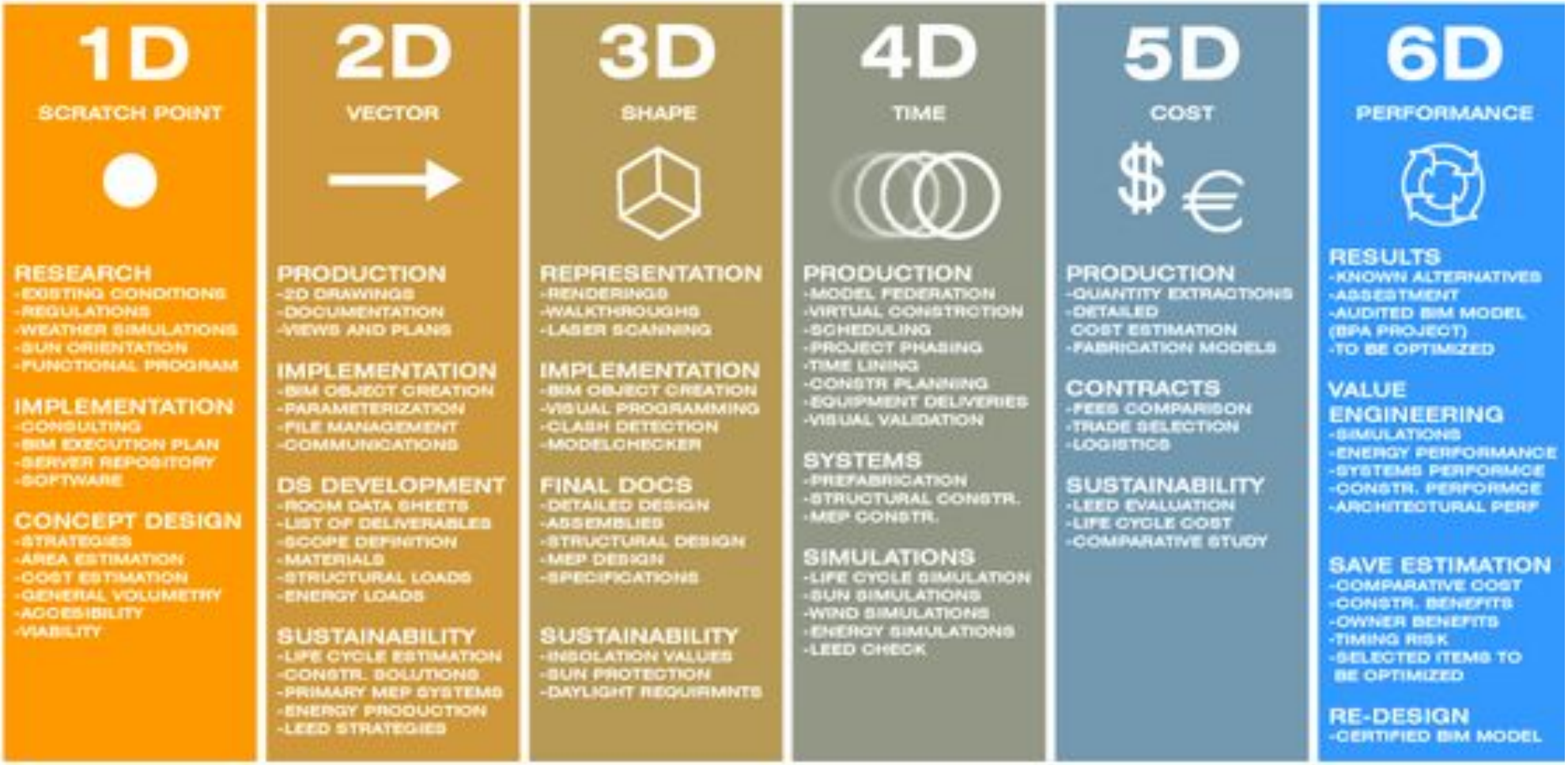
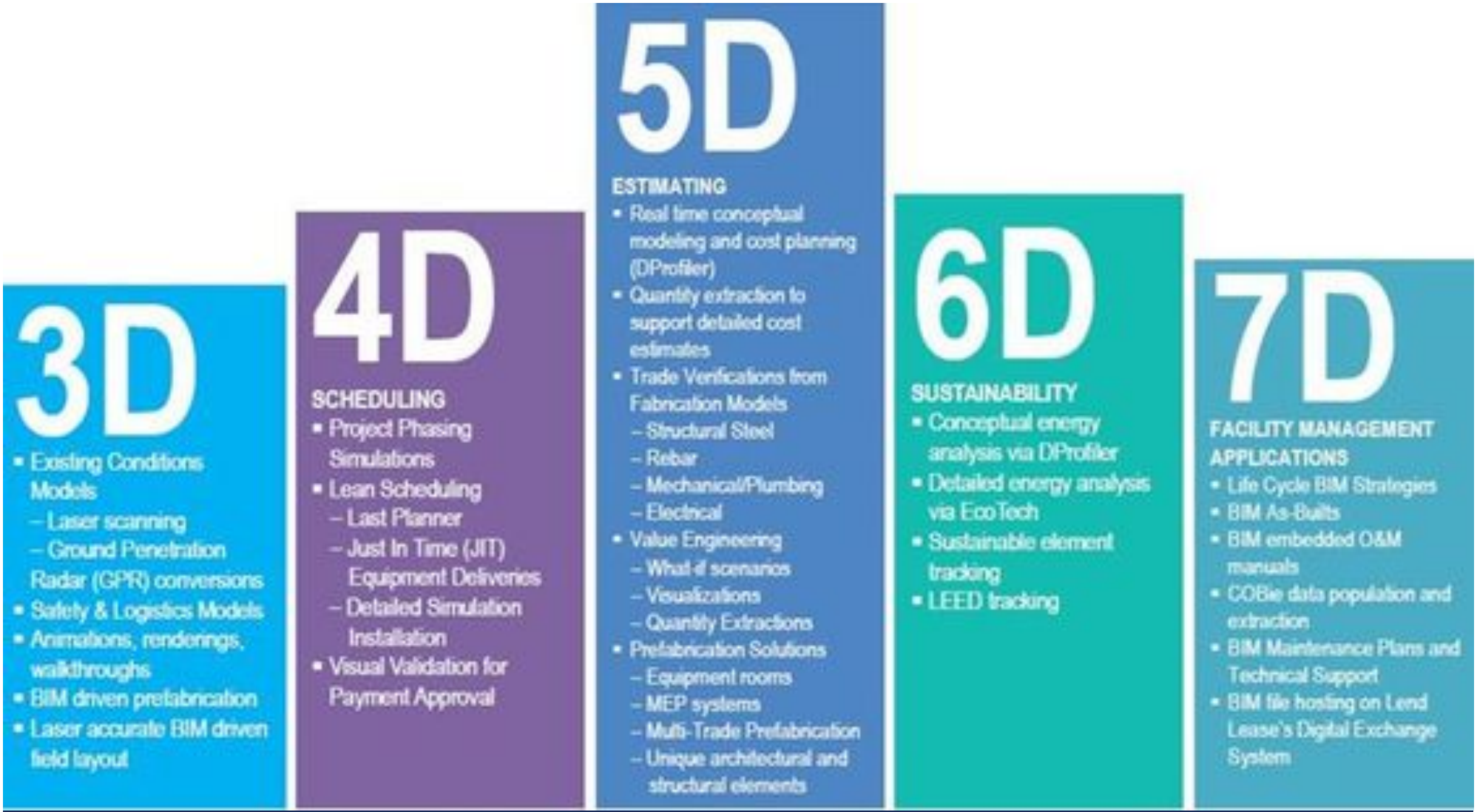
DWG

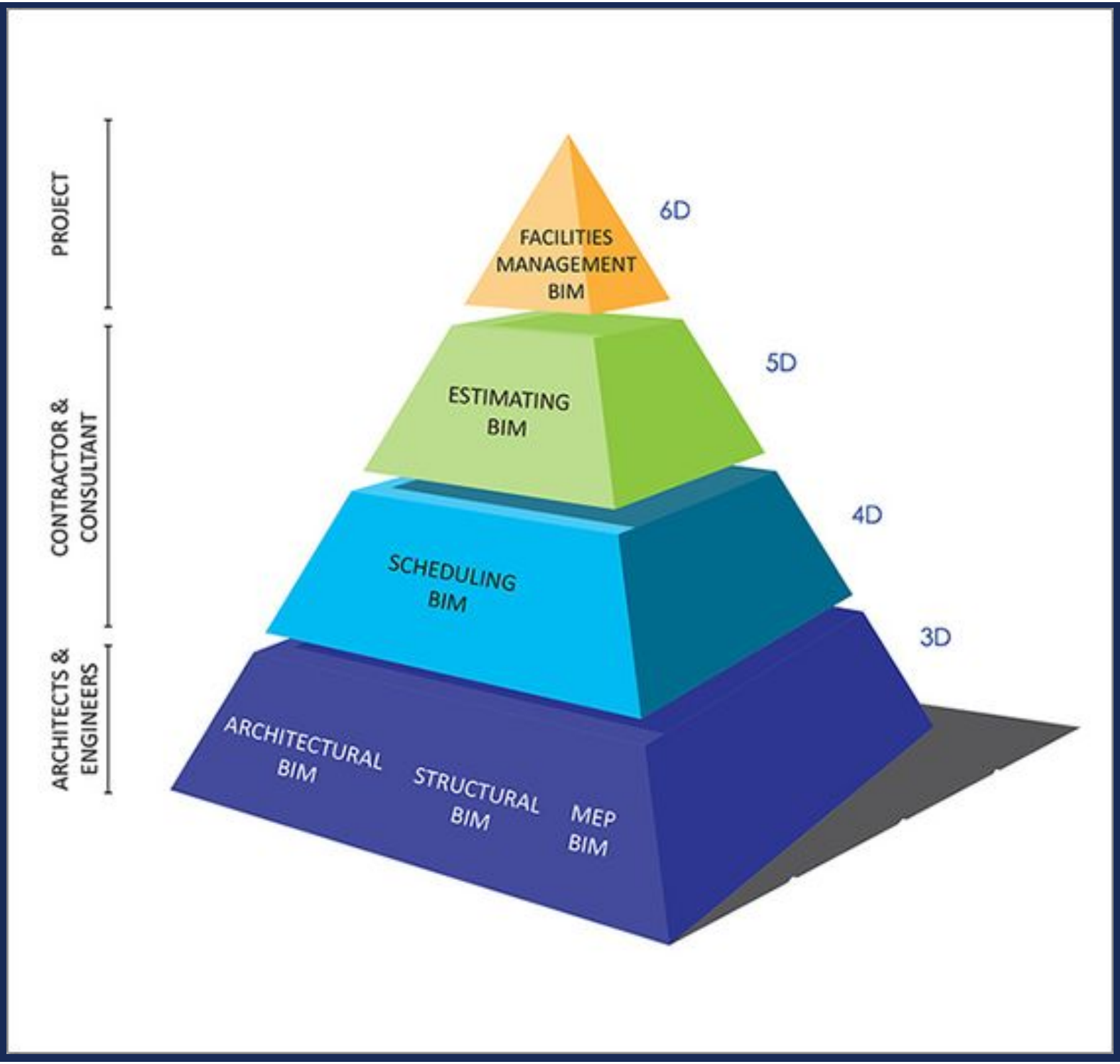

1D
SCRATCH POINT
RESEARCH
-EXISTING CONDITIONS
-REGULATIONS
-WEATHER SIMULATIONS
-SUN ORIENTATION
-FUNCTIONAL PROGRAM
IMPLEMENTATION
-CONSULTING
-BIM EXECUTION PLAN
-SERVER REPOSITORY
-SOFTWARE
CONCEPT DESIGN
-STRATEGIES
-AREA ESTIMATION
-COST ESTIMATION
-GENERAL VOLUMETRY
-ACCESIBILITY
-VIABILITY
2D
VECTOR
PRODUCTION
-2D DRAWINGS
-DOCUMENTATION
-VIEWS AND PLANS
IMPLEMENTATION
-BIM OBJECT CREATION
-PARAMETERIZATION
-FILE MANAGEMENT
-COMMUNICATIONS
DS DEVELOPMENT
-ROOM DATA SHEETS
-LIST OF DELIVERABLES
-SCOPE DEFINITION
-MATERIALS
-STRUCTURAL LOADS
-ENERGY LOADS
SUSTAINABILITY
-LIFE CYCLE ESTIMATION
-CONSTR. SOLUTIONS
-PRIMARY MEP SYSTEMS
-ENERGY PRODUCTION
-LEED STRATEGIES
3D
SHAPE
REPRESENTATION
-RENDERINGS
-WALKTHROUGHS
-LASER SCANNING
IMPLEMENTATION
-BIM OBJECT CREATION
-VISUAL PROGRAMMING
-CLASH DETECTION
-MODELCHECKER
FINAL DOCS
-DETAILED DESIGN
-ASSEMBLIES
-STRUCTURAL DESIGN
-MEP DESIGN
-SPECIFICATIONS
SUSTAINABILITY
-INSOLATION VALUES
-SUN PROTECTION
-DAYLIGHT REQUIRMNTS
4D
TIME
PRODUCTION
-MODEL FEDERATION
-VIRTUAL CONSTRUCTION
-SCHEDULING
-PROJECT PHASING
-TIME LINING
-CONSTR PLANNING
-EQUIPMENT DELIVERIES
-VISUAL VALIDATION
SYSTEMS
-PREFABRICATION
-STRUCTURAL CONSTR.
-MEP CONSTR.
SIMULATIONS
-LIFE CYCLE SIMULATION
-SUN SIMULATIONS
-WIND SIMULATIONS
-ENERGY SIMULATIONS
-LEED CHECK
5D
COST
PRODUCTION
-QUANTITY EXTRACTIONS
-DETAILED
COST ESTIMATION
-FABRICATION MODELS
CONTRACTS
-FEES COMPARISON
-TRADE SELECTION
-LOGISTICS
SUSTAINABILITY
-LEED EVALUATION
-LIFE CYCLE COST
-COMPARATIVE STUDY
6D
PERFORMANCE
RESULTS
-KNOWN ALTERNATIVES
-ASSESTMENT
-AUDITED BIM MODEL
(BPA PROJECT)
-TO BE OPTIMIZED
VALUE
ENGINEERING
-SIMULATIONS
-ENERGY PERFORMANCE
-SYSTEMS PERFORMCE
-CONSTR. PERFORMCE
-ARCHITECTURAL PERF
SAVE ESTIMATION
-COMPARATIVE COST
-CONSTR. BENEFITS
-OWNER BENEFITS
-TIMING RISK
-SELECTED ITEMS TO
BE OPTIMIZED
RE-DESIGN
-CERTIFIED BIM MODEL

3D (3D Model)	4D (Schedule)	5D (Cost)	6D (Building Lifecycle Information)
			**eLibrary:** » Who? » When? » Where? » How much?

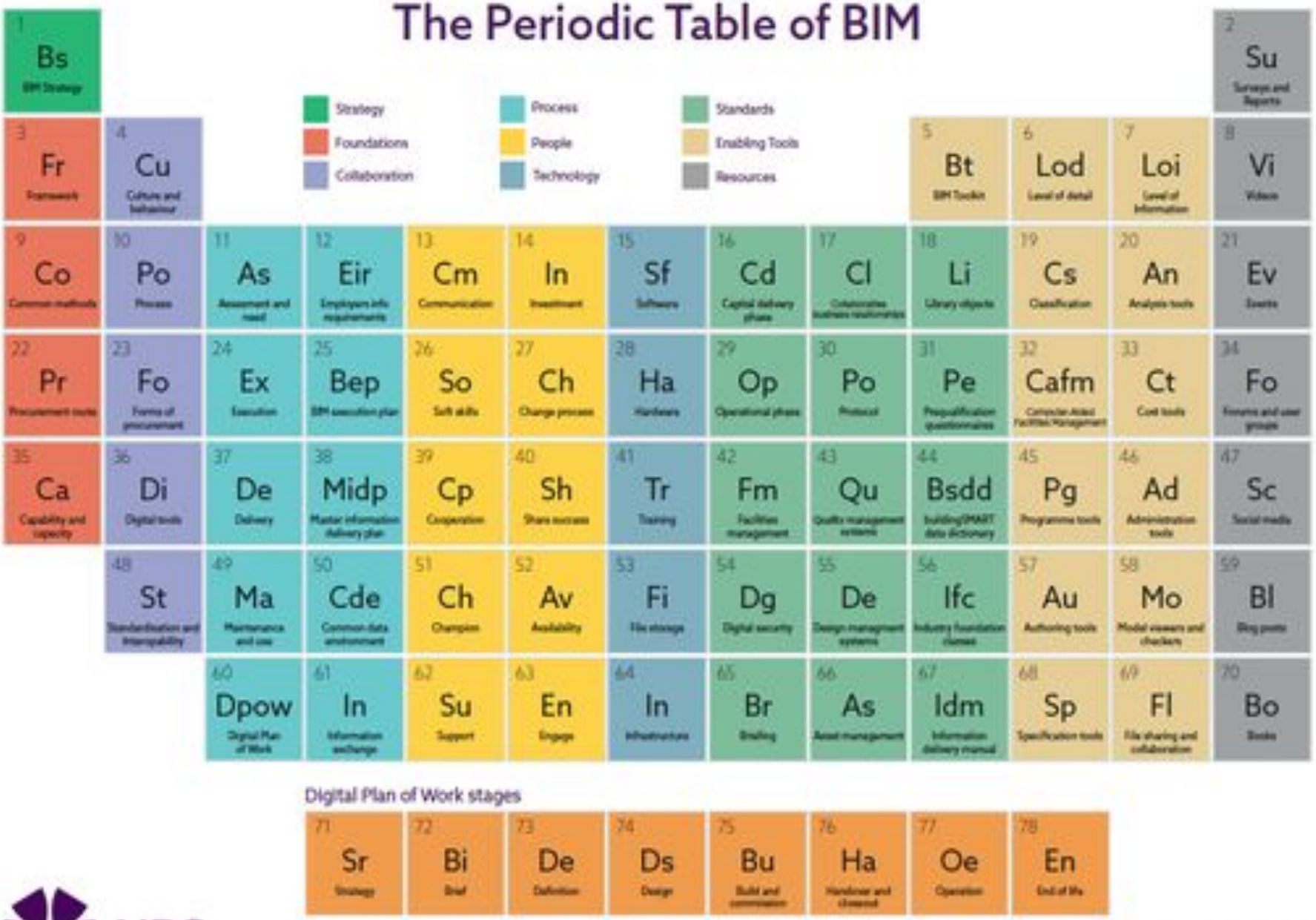
Idealized B.I.M.

Actual B.I.M.


3D
• Existing Conditions Models
– Laser scanning
– Ground Penetration Radar (GPR) conversions
• Safety & Logistics Models
• Animations, renderings, walkthroughs
• BIM driven prefabrication
• Laser accurate BIM driven field layout
4D
SCHEDULING
• Project Phasing Simulations
• Lean Scheduling
– Last Planner
– Just In Time (JIT) Equipment Deliveries
– Detailed Simulation Installation
• Visual Validation for Payment Approval
5D
ESTIMATING
• Real time conceptual modeling and cost planning (DProfiler)
• Quantity extraction to support detailed cost estimates
• Trade Verifications from Fabrication Models
– Structural Steel
– Rebar
– Mechanical/Plumbing
– Electrical
• Value Engineering
– What-if scenarios
– Visualizations
– Quantity Extractions
• Prefabrication Solutions
– Equipment rooms
– MEP systems
– Multi-Trade Prefabrication
– Unique architectural and structural elements
6D
SUSTAINABILITY
• Conceptual energy analysis via DProfiler
• Detailed energy analysis via EcoTech
• Sustainable element tracking
• LEED tracking
7D
FACILITY MANAGEMENT APPLICATIONS
• Life Cycle BIM Strategies
• BIM As-Builts
• BIM embedded O&M manuals
• COBie data population and extraction
• BIM Maintenance Plans and Technical Support
• BIM file hosting on Lend Lease's Digital Exchange System

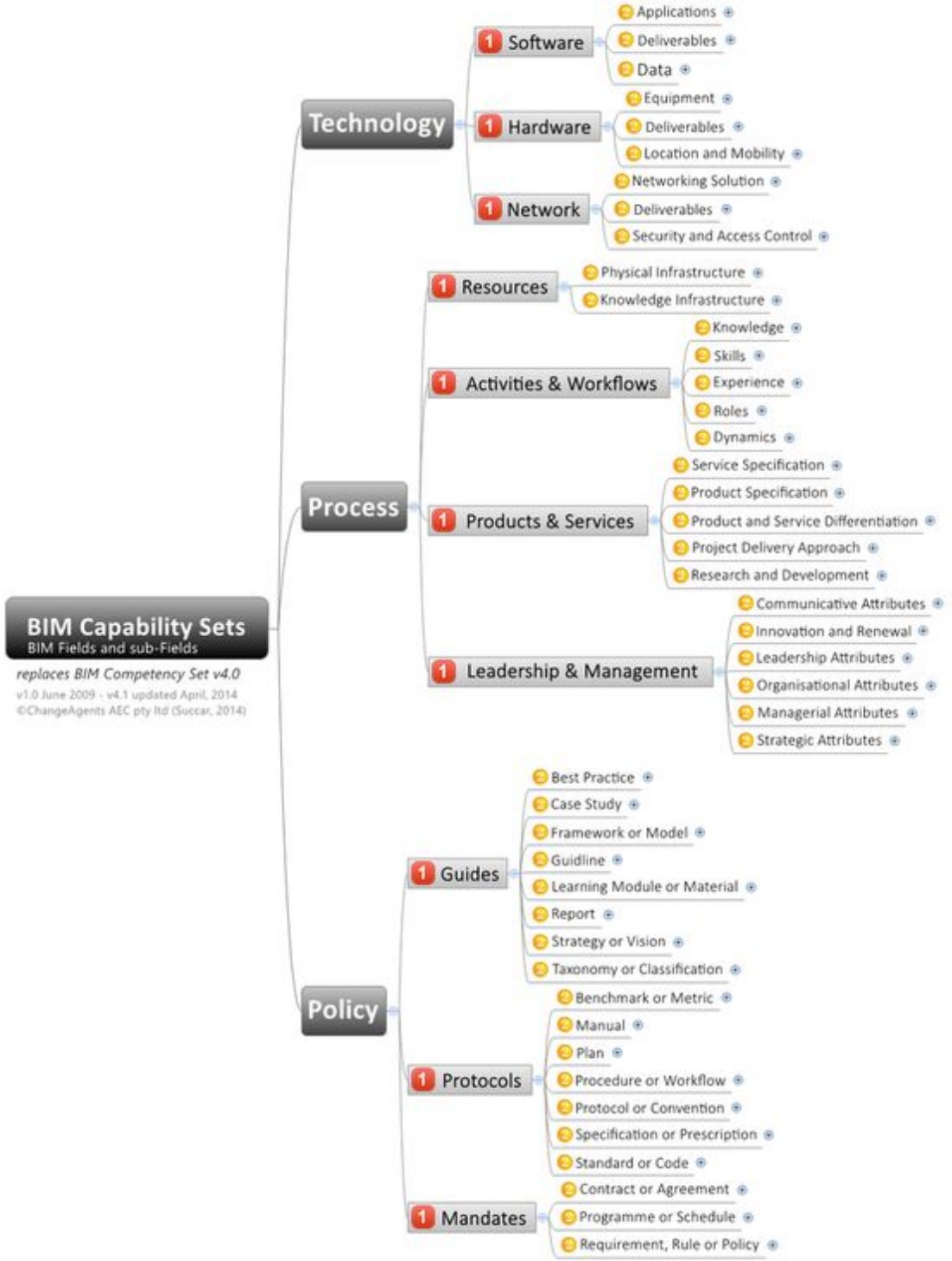

PROJECT
CONTRACTOR & CONSULTANT
ARCHITECTS & ENGINEERS
FACILITIES MANAGEMENT BIM
6D
ESTIMATING BIM
5D
SCHEDULING BIM
4D
ARCHITECTURAL BIM
STRUCTURAL BIM
MEP BIM
3D

The Periodic Table of BIM

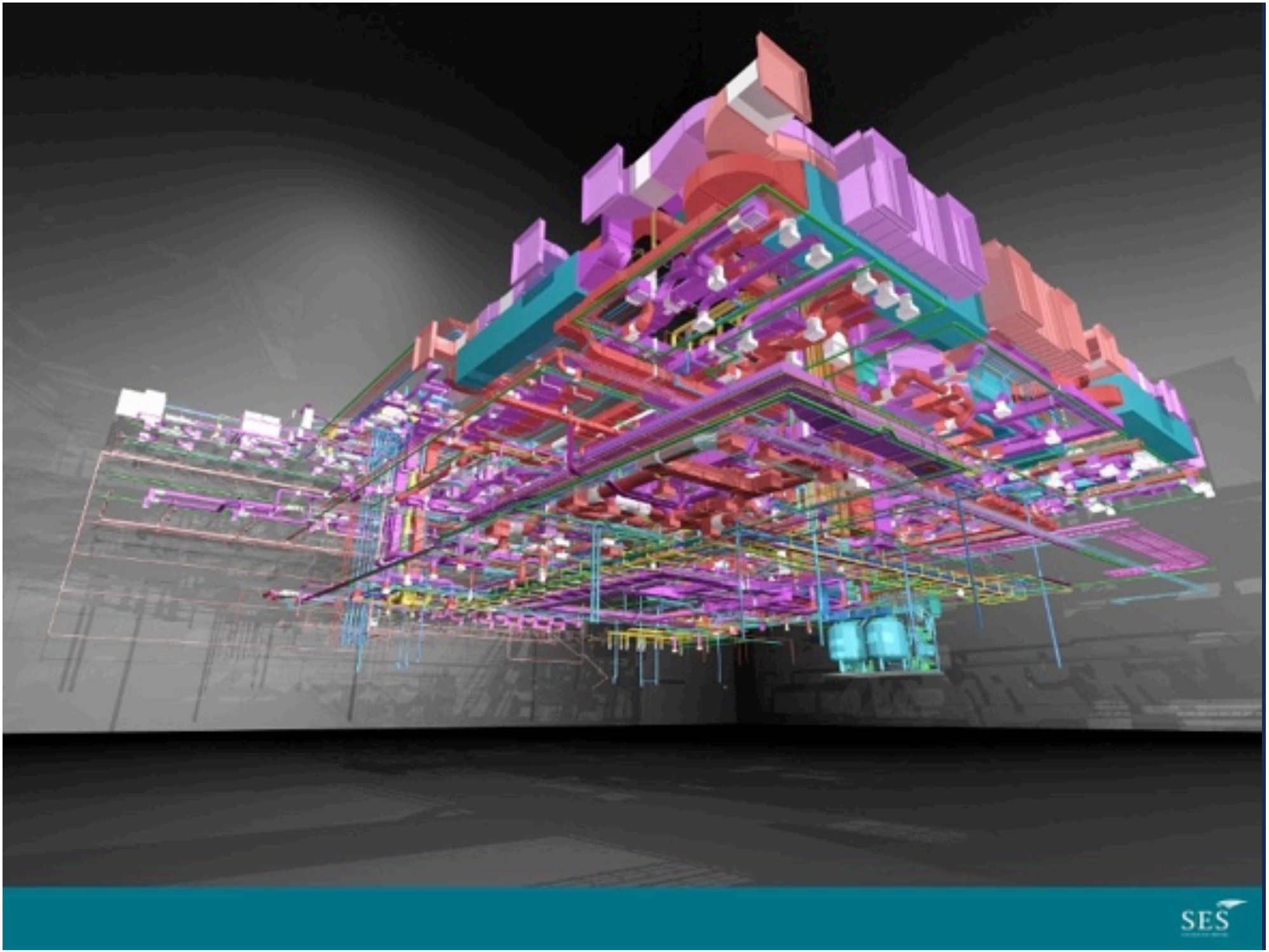


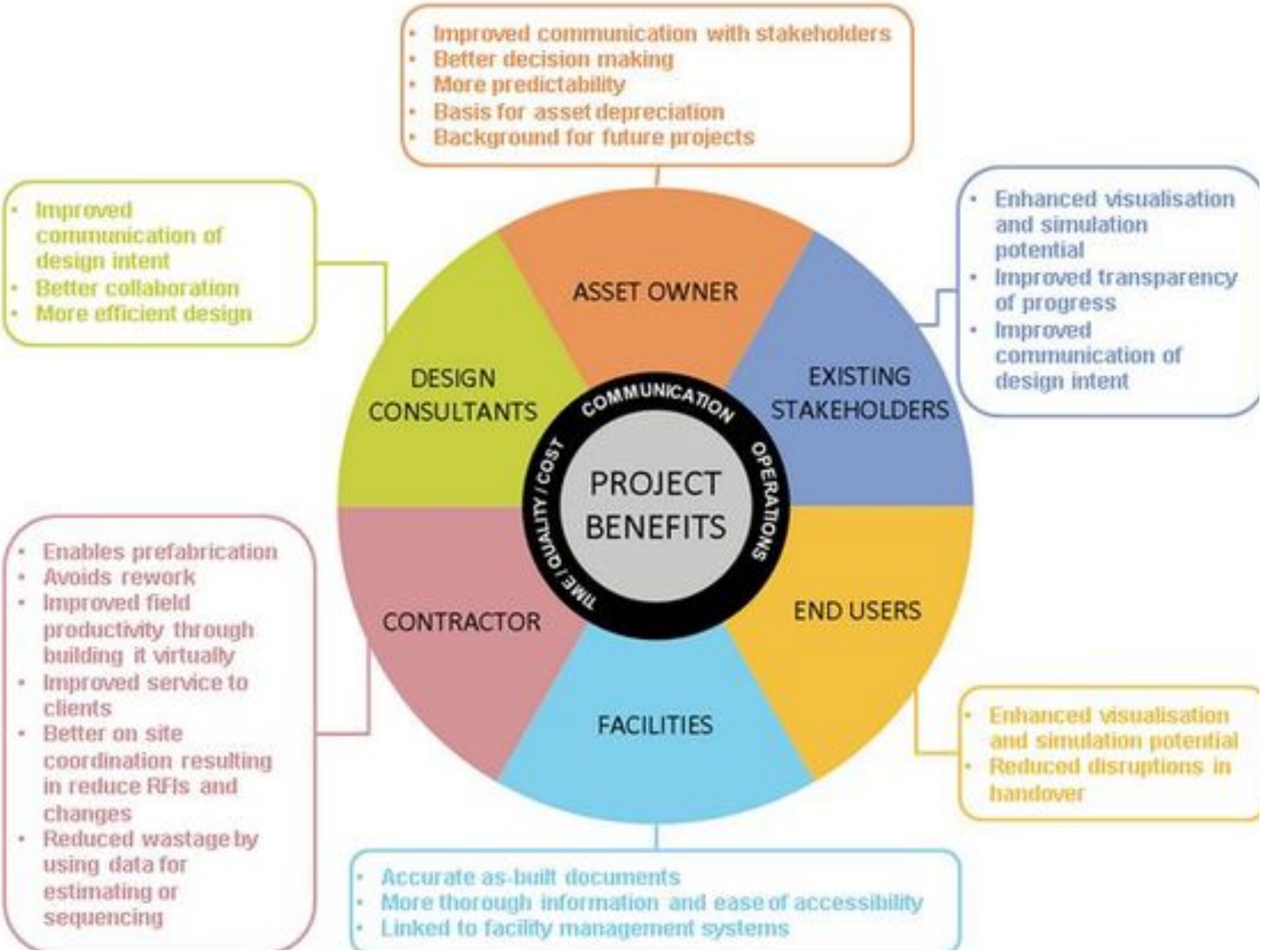
NBS

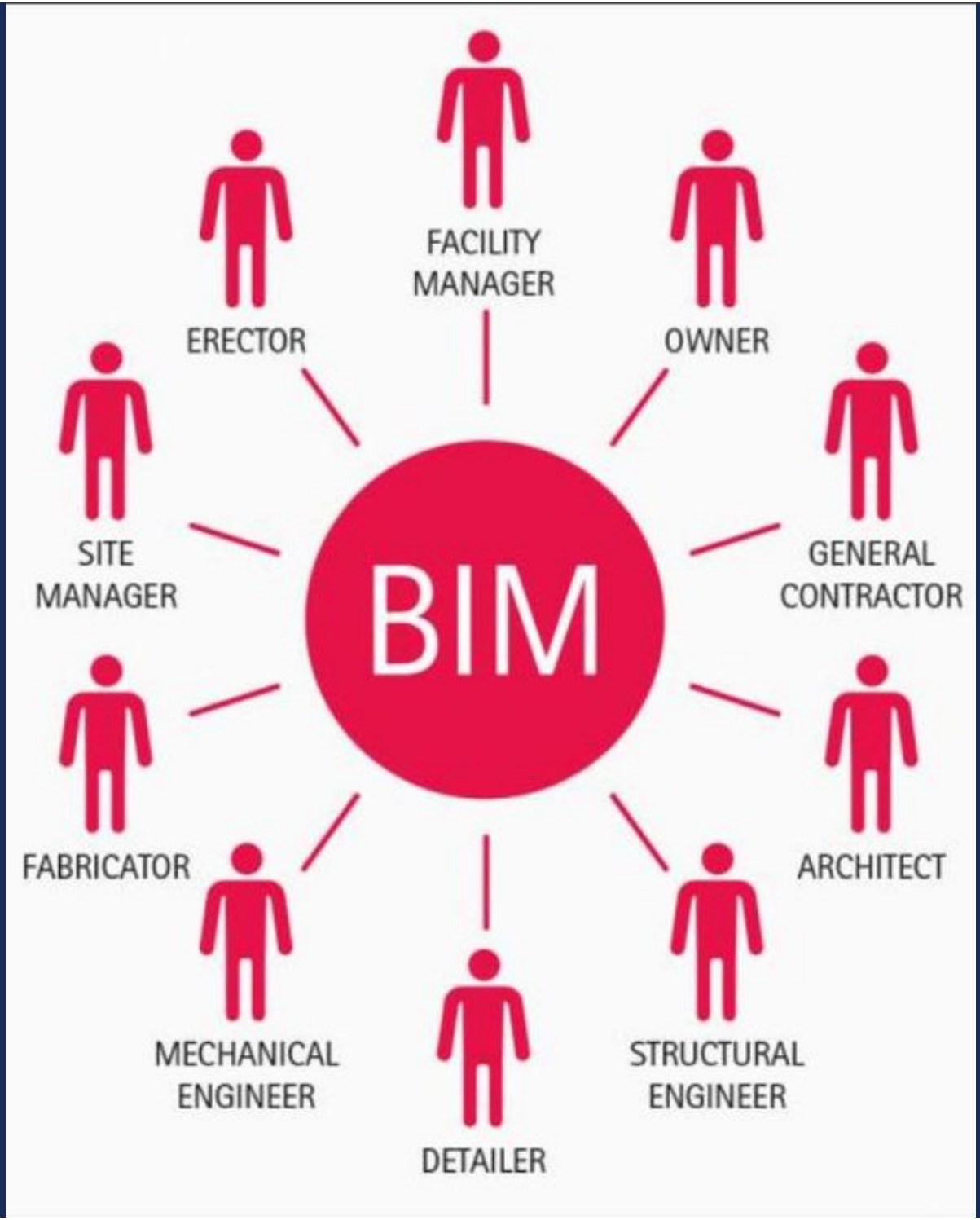
Find support on your BIM journey at **theNBS.com/BIM**

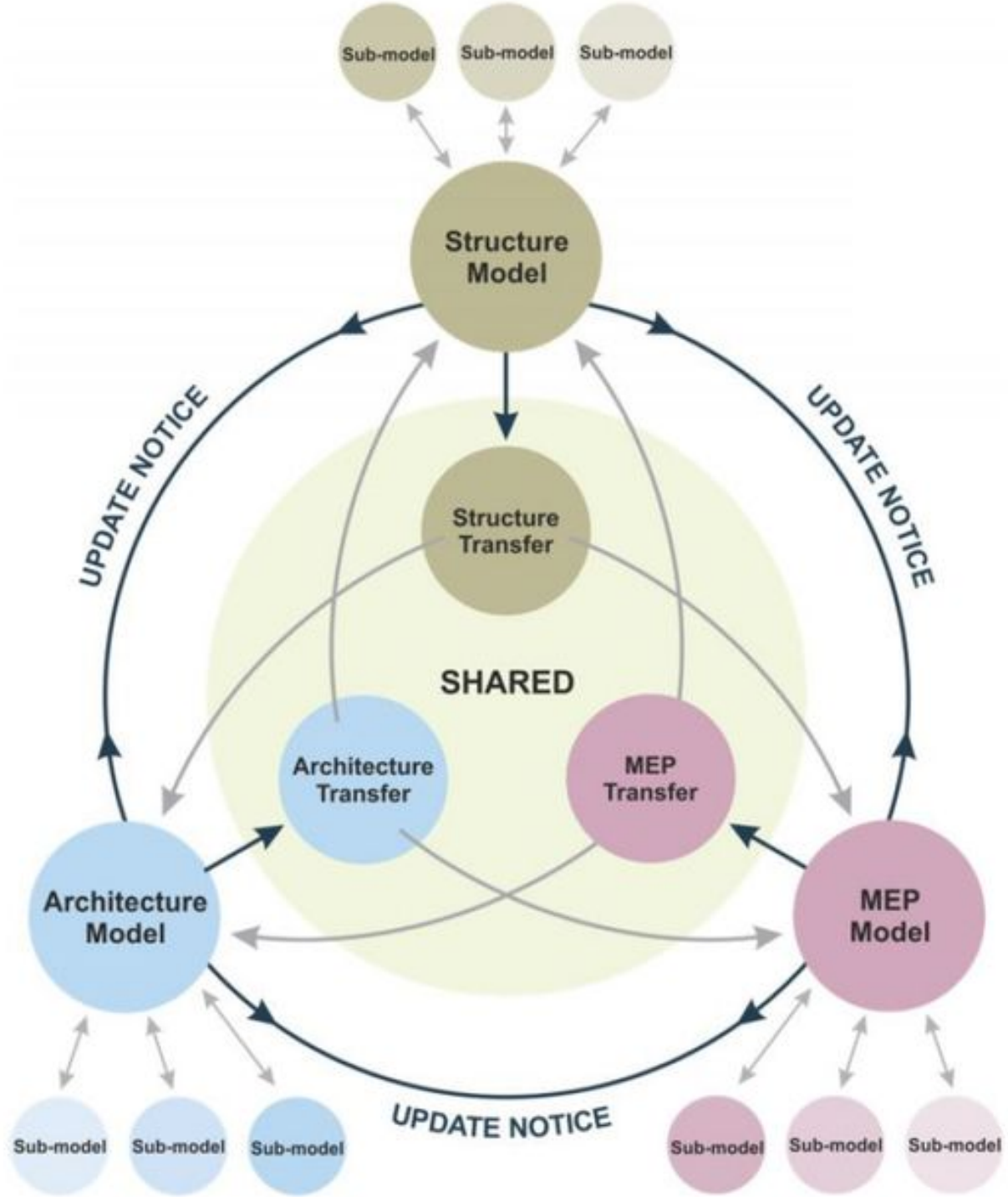

BIM Capability Sets
BIM Fields and sub-Fields
replaces BIM Competency Set v4.0
v1.0 June 2009 - v4.1 updated April, 2014
©ChangeAgents AEC pty ltd (Succar, 2014)
Technology
Software
Applications
Deliverables
Data
Hardware
Equipment
Deliverables
Location and Mobility
Network
Networking Solution
Deliverables
Security and Access Control
Process
Resources
Physical Infrastructure
Knowledge Infrastructure
Activities & Workflows
Knowledge
Skills
Experience
Roles
Dynamics
Products & Services
Service Specification
Product Specification
Product and Service Differentiation
Project Delivery Approach
Research and Development
Leadership & Management
Communicative Attributes
Innovation and Renewal
Leadership Attributes
Organisational Attributes
Managerial Attributes
Strategic Attributes
Policy
Guides
Best Practice
Case Study
Framework or Model
Guidline
Learning Module or Material
Report
Strategy or Vision
Taxonomy or Classification
Protocols
Benchmark or Metric
Manual
Plan
Procedure or Workflow
Protocol or Convention
Specification or Prescription
Standard or Code
Mandates
Contract or Agreement
Programme or Schedule
Requirement, Rule or Policy


Visual Access
Easy Conflict Resolution
Schedule the Process
Manage the Costs
Supports Lean Construction
Improved Coordination
Effective Facility Management
Easy retrofit and renovation
Detailed Documentation
Effective Sustainability


SES


Improved communication with stakeholders
Better decision making
More predictability
Basis for asset depreciation
Background for future projects
Improved communication of design intent
Better collaboration
More efficient design
Enhanced visualisation and simulation potential
Improved transparency of progress
Improved communication of design intent
ASSET OWNER
DESIGN CONSULTANTS
EXISTING STAKEHOLDERS
COMMUNICATION
TIME / QUALITY / COST
OPERATIONS
PROJECT BENEFITS
CONTRACTOR
END USERS
FACILITIES
Enables prefabrication
Avoids rework
Improved field productivity through building it virtually
Improved service to clients
Better on site coordination resulting in reduce RFIs and changes
Reduced wastage by using data for estimating or sequencing
Enhanced visualisation and simulation potential
Reduced disruptions in handover
Accurate as-built documents
More thorough information and ease of accessibility
Linked to facility management systems


FACILITY MANAGER
ERECTOR
OWNER
SITE MANAGER
BIM
GENERAL CONTRACTOR
FABRICATOR
ARCHITECT
MECHANICAL ENGINEER
DETAILER
STRUCTURAL ENGINEER

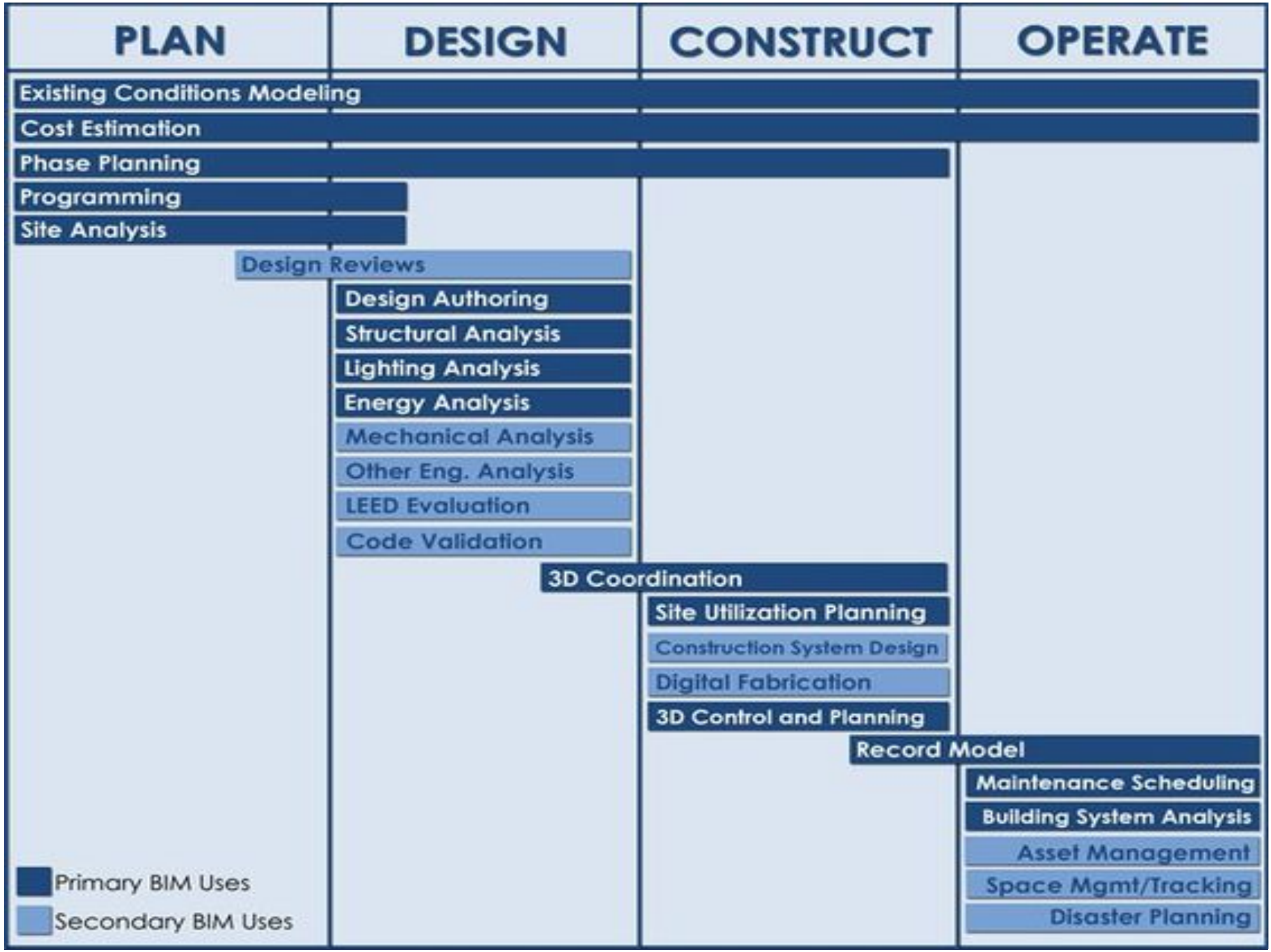

Sub-model
Sub-model
Sub-model
Structure Model
UPDATE NOTICE
UPDATE NOTICE
Structure Transfer
SHARED
Architecture Transfer
MEP Transfer
Architecture Model
MEP Model
UPDATE NOTICE
Sub-model
Sub-model
Sub-model
Sub-model
Sub-model
Sub-model

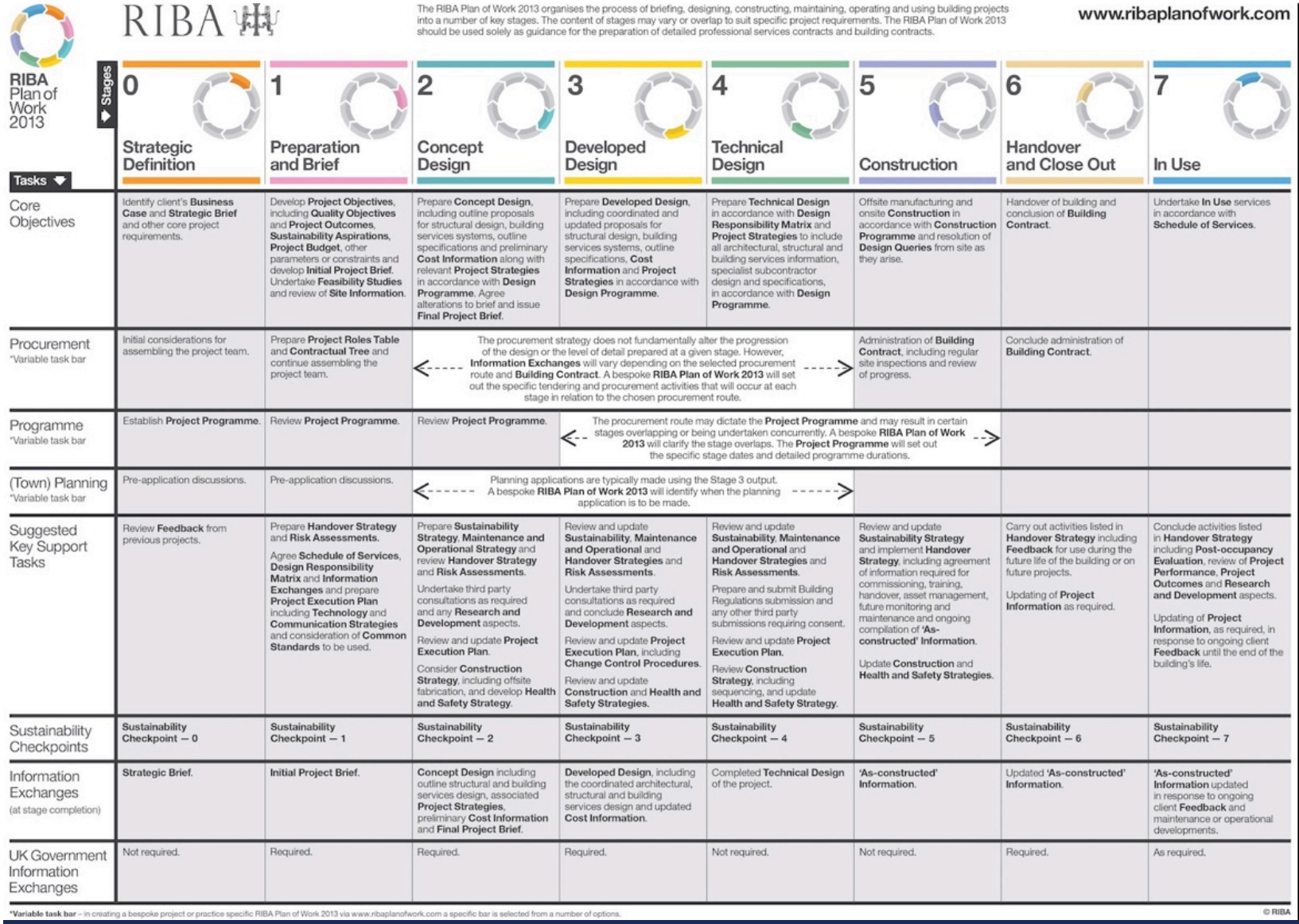
Professional Responsibility

ASSOCIATION OF CONSULTANT ARCHITECTS

- **Shared data in shared environment:**
  - Aim is to resolve issues/clashes and coordinate all disciplines outputs before site
  - But is there a risk of blurred responsibility boundaries?
  - Can you see who is responsible?
  - Needs to carry a time line against all actions
  - Can you extract yourself from the firing line when things go wrong, despite all efforts
- **ACA Newsletter discussed this at length**


GIS & BIM
Conceptual design
Detailed design
Analysis
Docs
Fabrication
Construction 4D/5D
Construction Logistics
Operation and maintenance
Demolition
Renovation
Programming


PLAN
DESIGN
CONSTRUCT
OPERATE
Existing Conditions Modeling
Cost Estimation
Phase Planning
Programming
Site Analysis
Design Reviews
Design Authoring
Structural Analysis
Lighting Analysis
Energy Analysis
Mechanical Analysis
Other Eng. Analysis
LEED Evaluation
Code Validation
3D Coordination
Site Utilization Planning
Construction System Design
Digital Fabrication
3D Control and Planning
Record Model
Maintenance Scheduling
Building System Analysis
Asset Management
Space Mgmt/Tracking
Disaster Planning
Primary BIM Uses
Secondary BIM Uses



RIBA Plan of Work 2013

The RIBA Plan of Work 2013 organises the process of briefing, designing, constructing, maintaining, operating and using building projects into a number of key stages. The content of stages may vary or overlap to suit specific project requirements. The RIBA Plan of Work 2013 should be used solely as guidance for the preparation of detailed professional services contracts and building contracts.

www.ribaplanofwork.com

Stages / Tasks	0 Strategic Definition	1 Preparation and Brief	2 Concept Design	3 Developed Design	4 Technical Design	5 Construction	6 Handover and Close Out	7 In Use
Core Objectives	Identify client's **Business Case** and **Strategic Brief** and other core project requirements.	Develop **Project Objectives**, including **Quality Objectives** and **Project Outcomes**, **Sustainability Aspirations**, **Project Budget**, other parameters or constraints and develop **Initial Project Brief**. Undertake **Feasibility Studies** and review of **Site Information**.	Prepare **Concept Design**, including outline proposals for structural design, building services systems, outline specifications and preliminary **Cost Information** along with relevant **Project Strategies** in accordance with **Design Programme**. Agree alterations to brief and issue **Final Project Brief**.	Prepare **Developed Design**, including coordinated and updated proposals for structural design, building services systems, outline specifications, **Cost Information** and **Project Strategies** in accordance with **Design Programme**.	Prepare **Technical Design** in accordance with **Design Responsibility Matrix** and **Project Strategies** to include all architectural, structural and building services information, specialist subcontractor design and specifications, in accordance with **Design Programme**.	Offsite manufacturing and onsite **Construction** in accordance with **Construction Programme** and resolution of **Design Queries** from site as they arise.	Handover of building and conclusion of **Building Contract**.	Undertake **In Use** services in accordance with **Schedule of Services**.
Procurement *Variable task bar	Initial considerations for assembling the project team.	Prepare **Project Roles Table** and **Contractual Tree** and continue assembling the project team.	The procurement strategy does not fundamentally alter the progression of the design or the level of detail prepared at a given stage. However, **Information Exchanges** will vary depending on the selected procurement route and **Building Contract**. A bespoke **RIBA Plan of Work 2013** will set out the specific tendering and procurement activities that will occur at each stage in relation to the chosen procurement route.			Administration of **Building Contract**, including regular site inspections and review of progress.	Conclude administration of **Building Contract**.	
Programme *Variable task bar	Establish **Project Programme**.	Review **Project Programme**.	Review **Project Programme**.	The procurement route may dictate the **Project Programme** and may result in certain stages overlapping or being undertaken concurrently. A bespoke **RIBA Plan of Work 2013** will clarify the stage overlaps. The **Project Programme** will set out the specific stage dates and detailed programme durations.				
(Town) Planning *Variable task bar	Pre-application discussions.	Pre-application discussions.	Planning applications are typically made using the Stage 3 output. A bespoke **RIBA Plan of Work 2013** will identify when the planning application is to be made.					
Suggested Key Support Tasks	Review **Feedback** from previous projects.	Prepare **Handover Strategy** and **Risk Assessments**. Agree **Schedule of Services**, **Design Responsibility Matrix** and **Information Exchanges** and prepare **Project Execution Plan** including **Technology** and **Communication Strategies** and consideration of **Common Standards** to be used.	Prepare **Sustainability Strategy**, **Maintenance and Operational Strategy** and review **Handover Strategy** and **Risk Assessments**. Undertake third party consultations as required and any **Research and Development** aspects. Review and update **Project Execution Plan**. Consider **Construction Strategy**, including offsite fabrication, and develop **Health and Safety Strategy**.	Review and update **Sustainability**, **Maintenance and Operational** and **Handover Strategies** and **Risk Assessments**. Undertake third party consultations as required and conclude **Research and Development** aspects. Review and update **Project Execution Plan**, including **Change Control Procedures**. Review and update **Construction** and **Health and Safety Strategies**.	Review and update **Sustainability**, **Maintenance and Operational** and **Handover Strategies** and **Risk Assessments**. Prepare and submit Building Regulations submission and any other third party submissions requiring consent. Review and update **Project Execution Plan**. Review **Construction Strategy**, including sequencing, and update **Health and Safety Strategy**.	Review and update **Sustainability Strategy** and implement **Handover Strategy**, including agreement of information required for commissioning, training, handover, asset management, future monitoring and maintenance and ongoing compilation of **'As-constructed' Information**. Update **Construction** and **Health and Safety Strategies**.	Carry out activities listed in **Handover Strategy** including **Feedback** for use during the future life of the building or on future projects. Updating of **Project Information** as required.	Conclude activities listed in **Handover Strategy** including **Post-occupancy Evaluation**, review of **Project Performance**, **Project Outcomes** and **Research and Development** aspects. Updating of **Project Information**, as required, in response to ongoing client **Feedback** until the end of the building's life.
Sustainability Checkpoints	**Sustainability Checkpoint — 0**	**Sustainability Checkpoint — 1**	**Sustainability Checkpoint — 2**	**Sustainability Checkpoint — 3**	**Sustainability Checkpoint — 4**	**Sustainability Checkpoint — 5**	**Sustainability Checkpoint — 6**	**Sustainability Checkpoint — 7**
Information Exchanges (at stage completion)	**Strategic Brief**.	**Initial Project Brief**.	**Concept Design** including outline structural and building services design, associated **Project Strategies**, preliminary **Cost Information** and **Final Project Brief**.	**Developed Design**, including the coordinated architectural, structural and building services design and updated **Cost Information**.	Completed **Technical Design** of the project.	**'As-constructed' Information**.	Updated **'As-constructed' Information**.	**'As-constructed' Information** updated in response to ongoing client **Feedback** and maintenance or operational developments.
UK Government Information Exchanges	Not required.	Required.	Required.	Required.	Not required.	Not required.	Required.	As required.

*Variable task bar – in creating a bespoke project or practice specific RIBA Plan of Work 2013 via www.ribaplanofwork.com a specific bar is selected from a number of options.

© RIBA

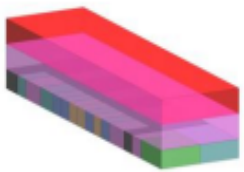
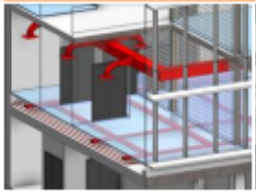
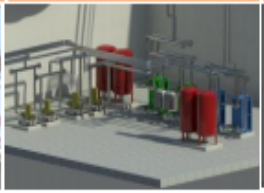
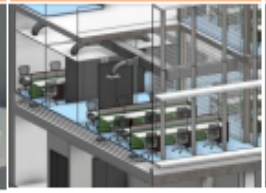
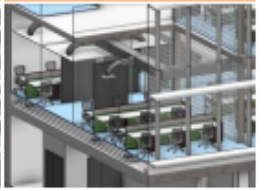
8 Deconstruction Reclaim

9 Reuse

RIBA Plan of Work 2013

The Plan of Work organises the progress of designing, constructing, maintaining and operating building projects into a number of key Work Stages. The sequence or content of Work Stages may vary or they may overlap to suit the procurement method, the project programme and the clients risk profile.

RIBA Work Stages

	1	2	3	4	5	6	7
	Preparation	**Concept Design**	**Developed Design**	**Technical Design**	**Specialist Design**	**Construction**	**Use & Aftercare**
Description of Key Tasks	- Identify **Project Objectives,** the client's **Business Case, Sustainability Aspirations** and other parameters or constraints and develop the **Initial Project Brief.** - Examine **Site Information** and make recommendations for further information, including surveys, required. - Preparation of **Feasibility Studies** and assessment of options to enable the client to decide how to proceed. - Determine client's **Risk Profile** and agree the **Project Programme** and preliminary **Procurement Strategy.** - Assemble **Project Team,** agree **Scope of Service, Contract Relationship** and **Design Responsibilities** for each participant. Develop **BIM** and **Soft Landings Strategies, Information Exchanges** and conclude **Appointment Documents.**	- Preparation of **Concept Design** including outline proposals for structural design, services systems, site landscape, outline specifications and preliminary cost plan along with environmental, energy, ecology, access or other **Project Strategies.** - Agree developments to **Initial Project Brief** and issue **Final Project Brief.** - Review **Procurement Strategy,** finalise **Design Responsibility** including extent of **Performance Specified Design** and take action where required. - Prepare **Project Manual** including agreement of **Software Strategy, BIM Execution Plan** and extent of **Performance Specifed Work.** - Prepare **Construction Strategy** including review of off-site fabrication, site logistics and H&S aspects.	- Preparation of **Developed Design** including co-ordinated and updated proposals for structural design, services systems, site landscape, outline specifications, cost plan and **Project Strategies.** - Prepare and Submit **Planning Application** - Implement **Change Control Procedures,** undertake **Sustainability Assessment** and take actions determined by **Procurement Strategy.** - Review **Construction Strategy** including H&S aspects.	- Preparation of **Technical Design** information to include all architectural, structural and mechanical services information and specifications including the **Lead Designer's** review and sign-off of all information. - **Performance Specified Work** to be developed in sufficient detail to allow development and integration by **Specialist Subcontractors** during **Completed Design** stage. - Take actions determined by **Procurement Strategy** including issuing in packages where appropriate. - Prepare and submit **Building Regulations Submission** - Review **Construction Strategy** including sequencing, programme and H&S asepcts.	- Progression of **Specialist Design** by **Specialist Subcontractors** including the integration, review and sign-off of **Performance Specified Work** by the **Lead Designer** and other designers as set out in **Design Responsibility** document - Review **Construction Strategy** including sequencing and critical path. - Undertake actions from **Procurement Strategy** or administration of **Building Contract** as required.	- Offsite manufacturing and onsite construction in accordance with the **Construction Programme** - Regular review of progress against programme and any **Quality Objectives** including site inspections. - Administration of **Building Contract.** - Resolution of **Design Queries** from site as they arise - Implementation of **Soft Landing Strategy** including agreement of information required for commissioning, training, handover, asset management, future monitoring and maintenance and ongoing compilation of "as-constructed" information.	- Implementation of **Soft Landings Strategy** including **Post Occupancy Evaluation.** - Conclude administration of **Building Contract** - Review of **Project Performance** in use and analysis of **Project Information** for use on future projects. - Updating of **Project Information,** as required, in response to **Asset Management** and **Facilities Management** feedback and modifications.
Procurement	The stage 1, 2, 3 and 4 outputs may be used for tendering and contract purposes depending on the **Procurement Strategy** as influenced by the clients **Risk Profile,** time, cost and quality aspirations and how **Early Contractor Involvement** and **Specialist Subcontractor** input is to be undertaken.						
Programme				Stage 4, 5 and 6 activities may occur concurrently depending on the **Procurement Strategy.** Work may also be undertaken in packages to facilitate its development by **Specialist Subcontractors.** Early package procurement may also occur during stage 3 depending on the procurement route. The **Project Programme** should set out the timescales for these overlapping design and, where appropriate, construction stages.			
Planning		**Planning Applications** typically be made using the stage 3 **(Developed Design)** output, however, certain clients may wish this task to be undertaken earlier. The project or practice specific **Plan of Work** identifies when the **Planning Application** is to be made. Certain aspects of the Technical Design may also be required as part of the application or in respond to planning conditions.					
Key Information Exchanges (at stage Completion)	The **Initial Project Brief**	The **Concept Design** including **Outline Structural and Mechanical Services Design,** associated Design **Strategies, Preliminary Cost Information** and **Final Project Brief.**	The **Developed Design** including the **Co-ordinated Architectural, Structural and Mechanical Services Design** and **Developed Cost Information.**	The **Technical Design** of consultant aspects in sufficient detail to enable construction or **Performance Specified Work** to commence.	The **Specialist Design** including the integration of **Performance Specified Work.**	**"As Constructed" Information.**	**"As constructed" Information** updated in response to on-going client feedback, **Asset Management** updates and **Facilities Management** information.
							
Government Gateway	Information Exchange 1 ●	Information Exchange 2 ●	Information Exchange 3 ●			Information Exchange 6 ●	As Required ● ● ●

RIBA Plan of Work 2013

Figure 1: Mapping the new Plan of Work, and alignment with the current proposed CIC stages

RIBA

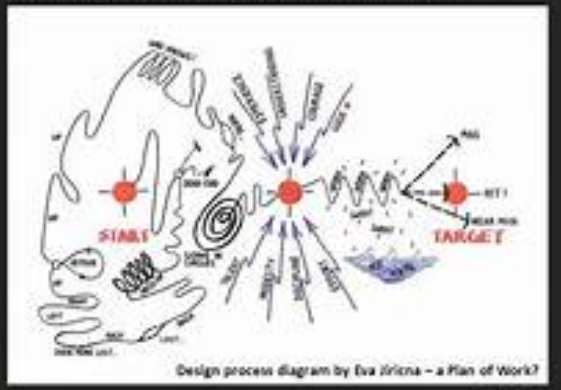
Green Overlay

to the RIBA Outline Plan of Work

Edited by **Bill Gething**

November 2011

The RIBA Plan of Work 2013: an overview



Design process diagram by Eva Jiricna – a Plan of Work?

RIBA Plan of Work 2013

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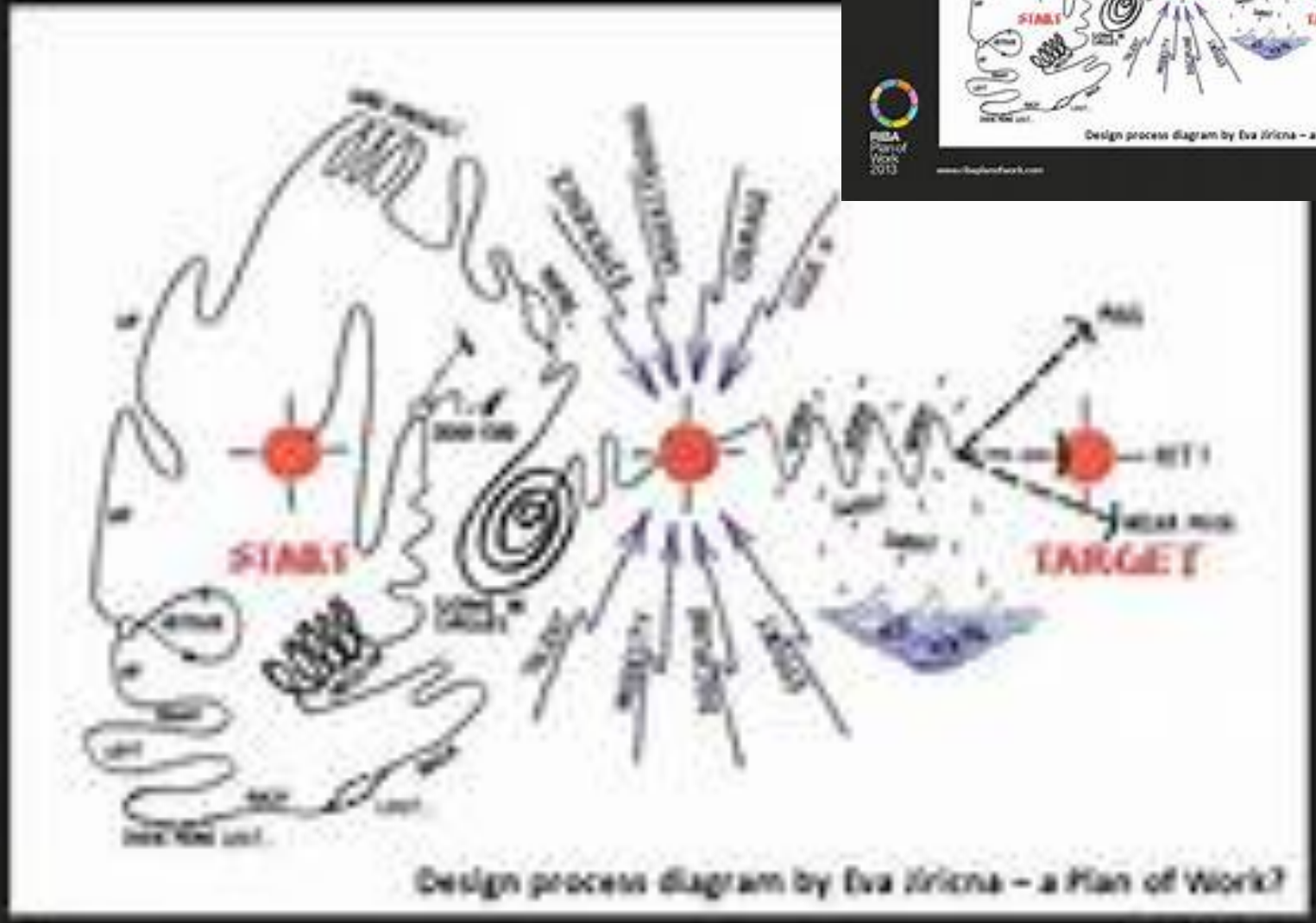
The RIBA Plan of Work 2013: an



Design process diagram by Eva Jiricna – a Plan of Work?

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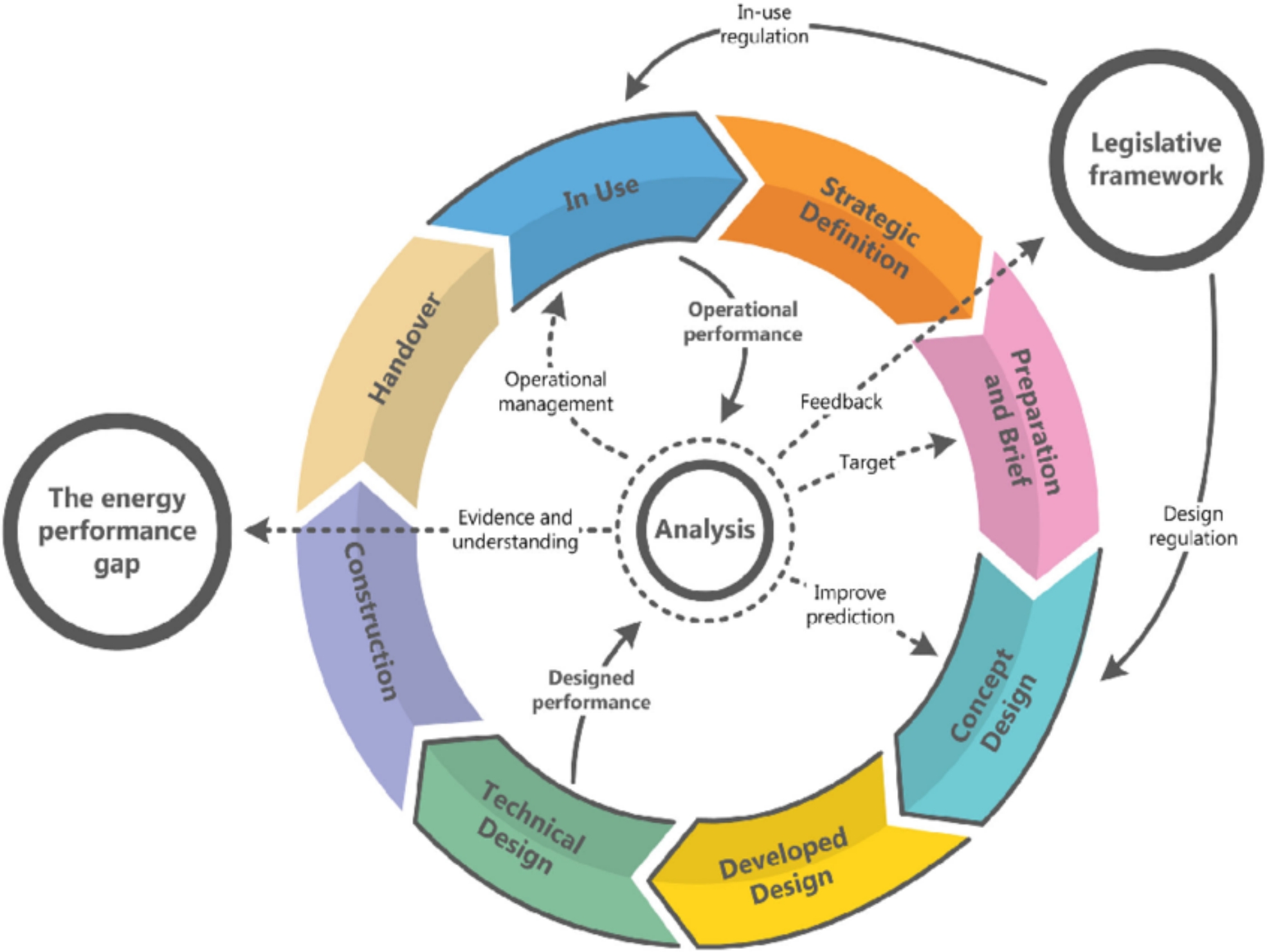
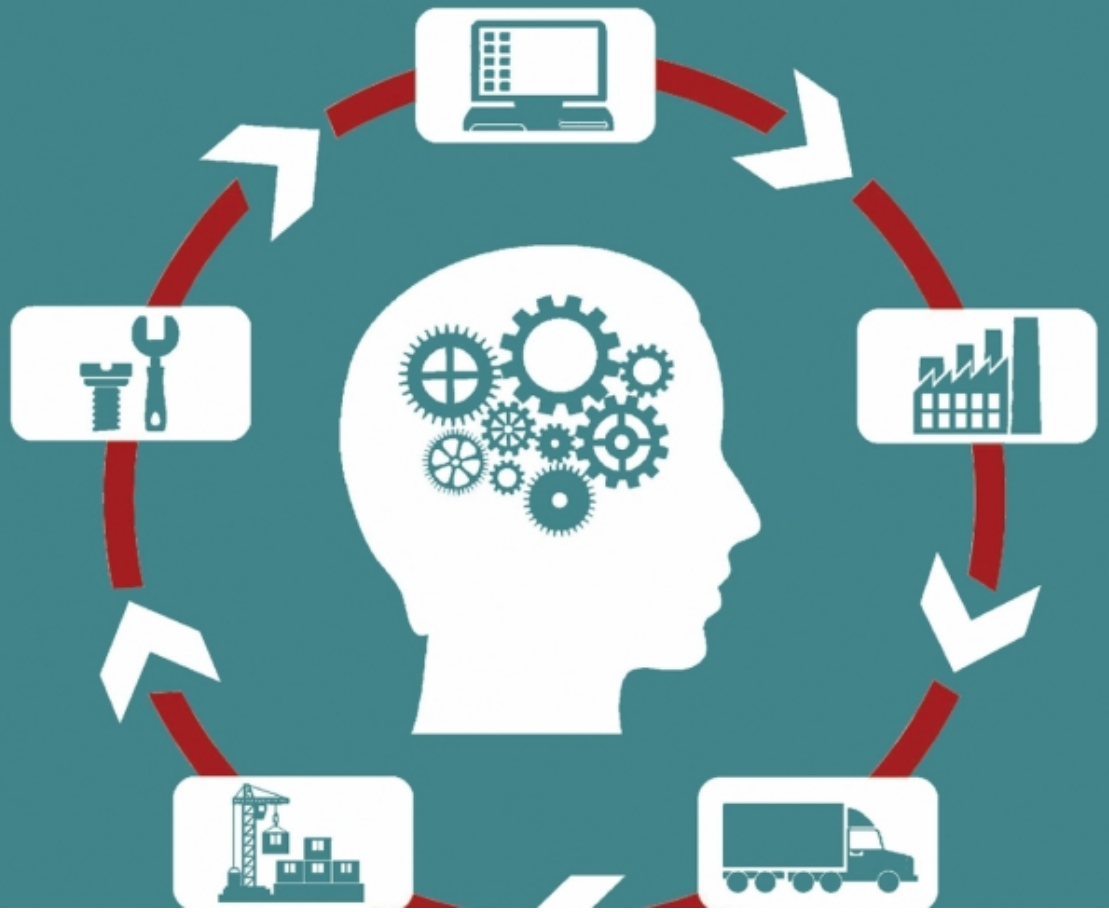

In-use regulation
Legislative framework
In Use
Strategic Definition
Preparation and Brief
Concept Design
Developed Design
Technical Design
Construction
Handover
Operational performance
Operational management
Feedback
Target
Improve prediction
Designed performance
Evidence and understanding
Analysis
The energy performance gap
Design regulation

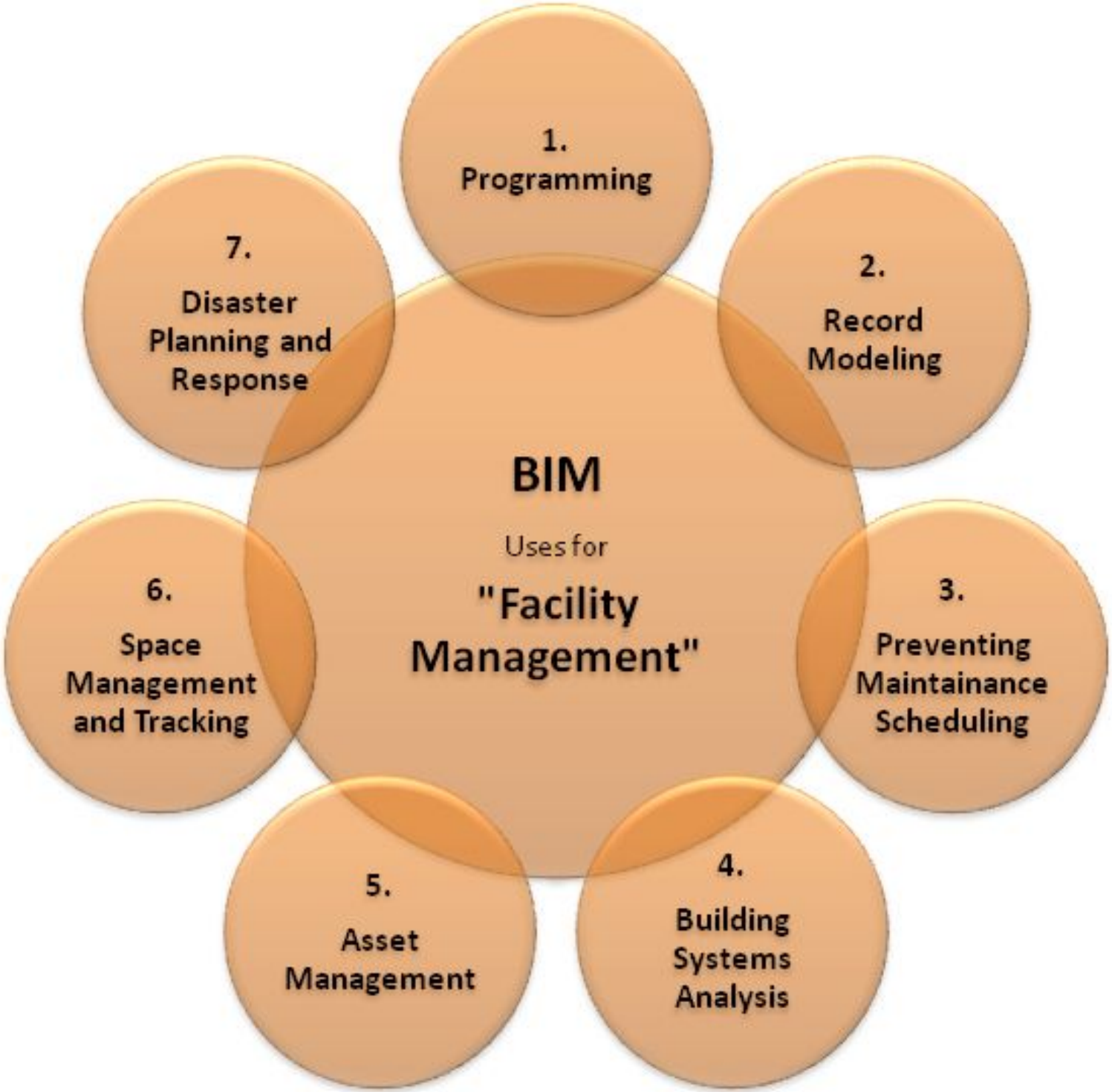

NBS
BIM
Object
Standard

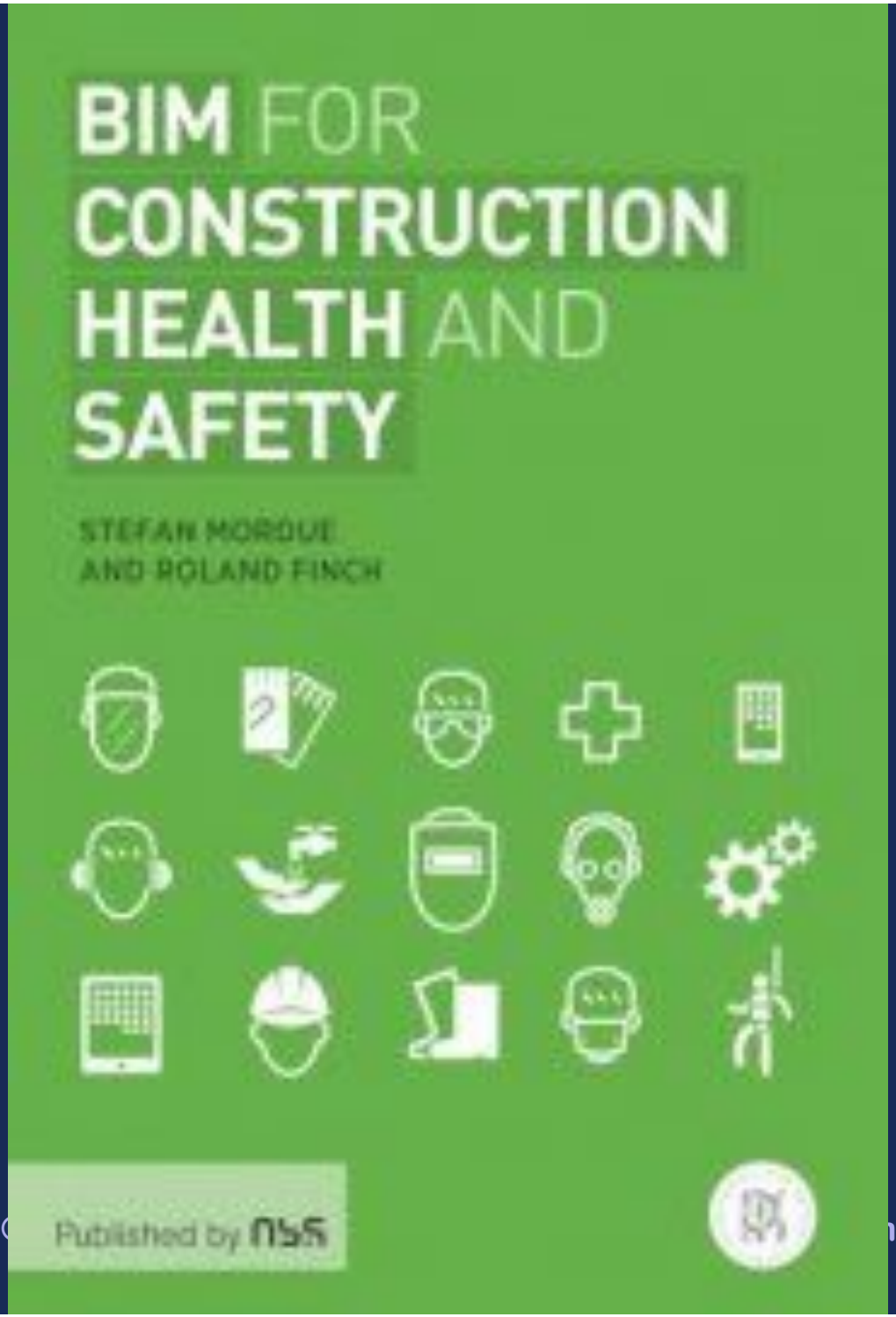

BIM
operate construct design plan
PROJECT EXECUTION PLANNING GUIDE
VERSION 2.0
RELEASED - JULY 2010

RIBA Plan of Work 2013

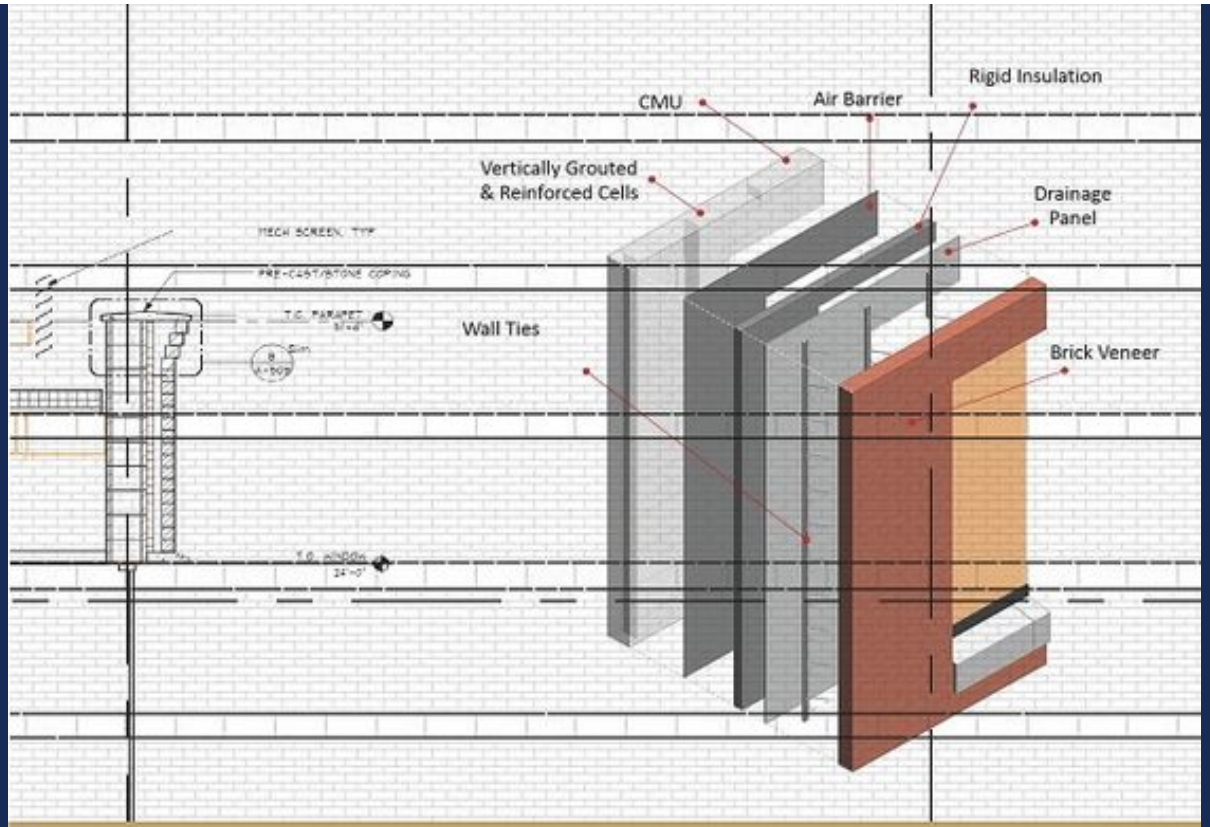
Designing for Manufacture and Assembly




1.
Programming
2.
Record
Modeling
3.
Preventing
Maintainance
Scheduling
4.
Building
Systems
Analysis
5.
Asset
Management
6.
Space
Management
and Tracking
7.
Disaster
Planning and
Response
BIM
Uses for
"Facility
Management"


BIM FOR CONSTRUCTION HEALTH AND SAFETY
STEFAN MORDUE AND ROLAND FINCH
Published by


Beneficial to Building,
Structural and MEP Engineers
BIM for
Fire Safety



BIM for Masonry

Modeling Masonry Buildings in Autodesk Revit

A guide for Autodesk Revit users developed by BIM-M and the TMS BIM Committee.

BIM-M
Building Information Modeling
for Masonry

THE MASONRY SOCIETY

The RIBA Plan of Work 2013: BIM Overlay May 2012

Introduction

This document is the result of a review of the Outline Plan of Work 2007 (Amended November 2008) by a working group under the direction of the RIBA Practice and Profession Committee. A number of clients have assisted in the review, and the RIBA members involved in the UK Government Cabinet Office and CIC BIM working groups have also contributed to the document.

The BIM Overlay builds on the Green Overlay to the RIBA Outline Plan of Work, edited by Bill Gething and recently published by RIBA Publishing. Together these two documents are part of the preparatory work being undertaken prior to a fundamental review of the RIBA Plan of Work that will take place in 2012-13.

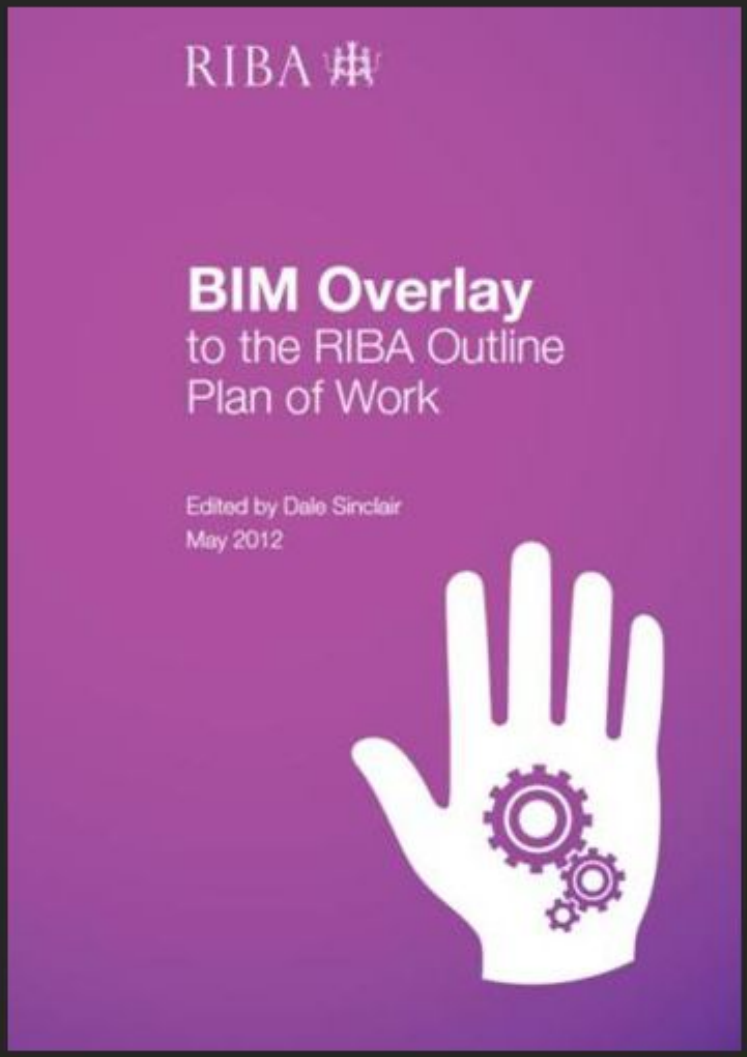
This document also forms part of the response from the construction industry, and in particular the RIBA, to the Government's commitment to have all its projects utilising BIM from the summer of 2012.[1] Needless to say, as a result of this stated intention and the release of other key government documents[2] there has been a growing interest in the subject, and whilst enhanced levels of BIM have successfully been used on a number of completed projects, for many designers the subject is relatively new. This increased interest has resulted in various papers, discussions and conferences on the subject, and although opinions on certain subjects are converging, there is a wide ranging set of views on others.

These varying views make it difficult for those seeking a strategic overview to relate to the subject, to understand clearly what BIM actually is and to consider how they might embrace BIM working methods in their own practices. Conflicting terminologies with differing definitions create further confusion for those researching the subject for the first time. This document provides an Overlay that simplifies the BIM processes and clarifies contradictory terms causing confusion in the industry.

What is clear from the government documents is that BIM is seen as being a key contributor in the drive by the Government for its estate to be more energy and cost efficient from both a capex (capital cost) and opex (operating cost) perspective, and that the construction industry must respond to the challenges that have been set. With this in mind, the working group has evaluated the various strands of knowledge in relation to BIM and has produced an Overlay of the succinct wording of the current 2007 Outline Plan of Work (updated 2008) that is essential to BIM. The working party has also considered what the core BIM activities should be at each stage of the plan. The document is not intended to be a fundamental review of the Plan of Work; rather guidance on the use of BIM in the context of the current Plan of Work.

Dale Sinclair RIBA
Editor

(1) Government Construction Strategy – UK Government Cabinet Office, May 2011
(2) Low Carbon Construction – BIS, Autumn 2010
BIM Working Party Strategy Paper – BIS, March 2011
Government Construction Strategy – Cabinet Office, May 2011



RIBA Plan of Work 2013

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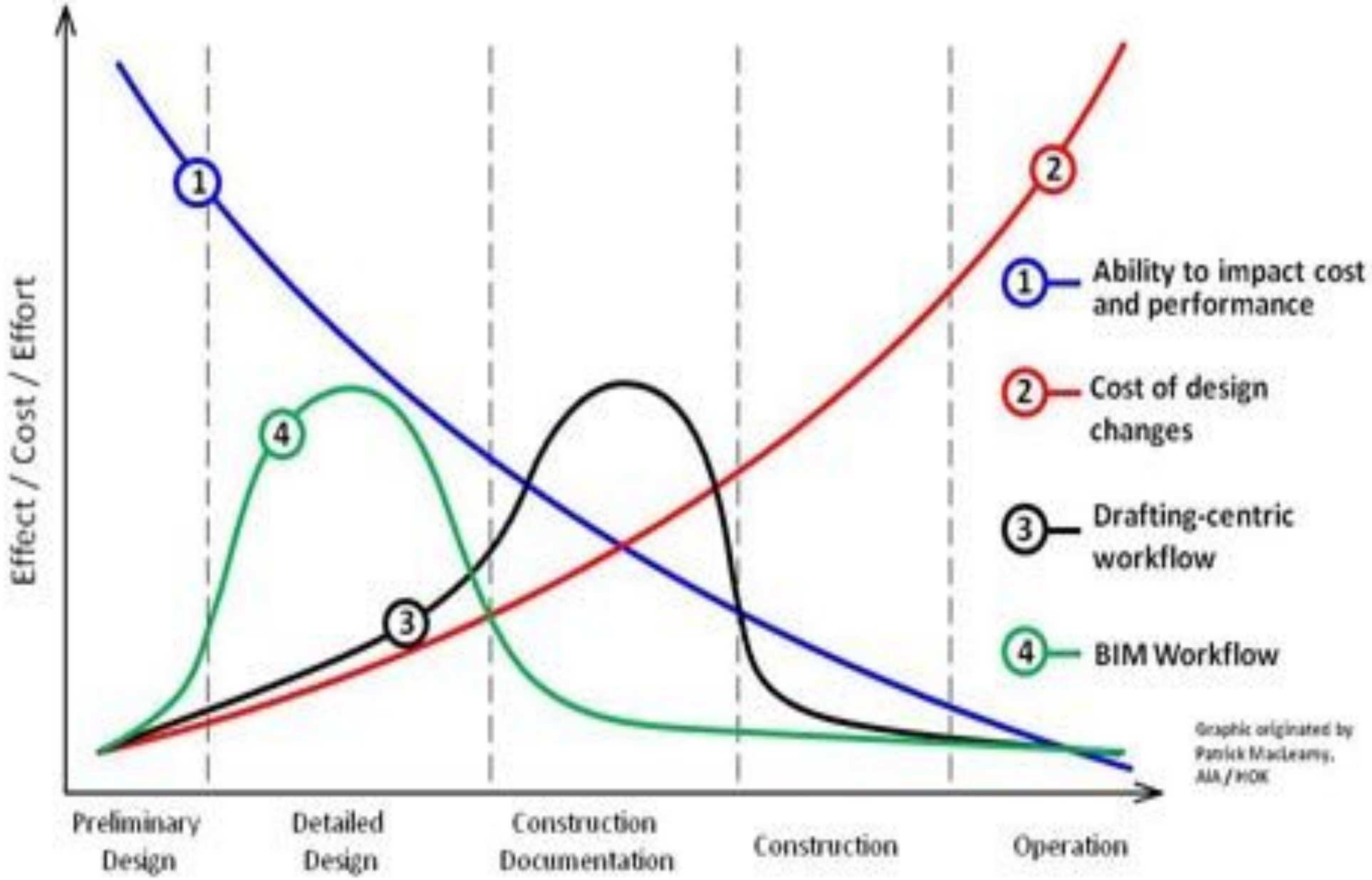
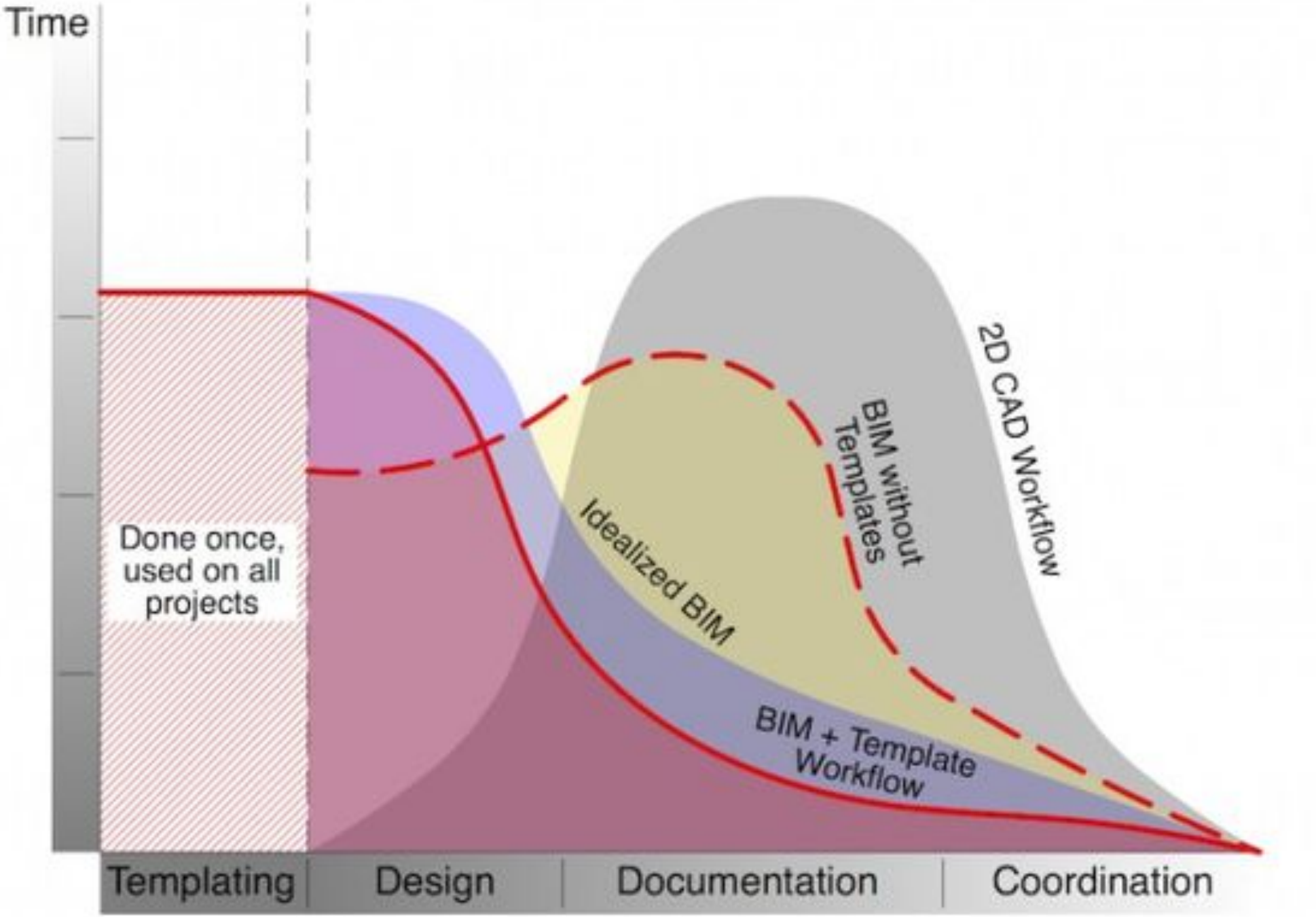
RIBA


RIBA
RIBA Plan of Work 2013 Guide
Handover Strategy
RIBA Plan of Work 2013
Royal Institute of British Architects


BiM
regional
hubs
Yorkshire & Humber


Effect / Cost / Effort
1
2
3
4
Ability to impact cost and performance
Cost of design changes
Drafting-centric workflow
BIM Workflow
Graphic originated by Patrick MacLeamy, AIA / HOK
Preliminary Design
Detailed Design
Construction Documentation
Construction
Operation


Time
Done once, used on all projects
Idealized BIM
BIM without Templates
2D CAD Workflow
BIM + Template Workflow
Templating
Design
Documentation
Coordination

LOD

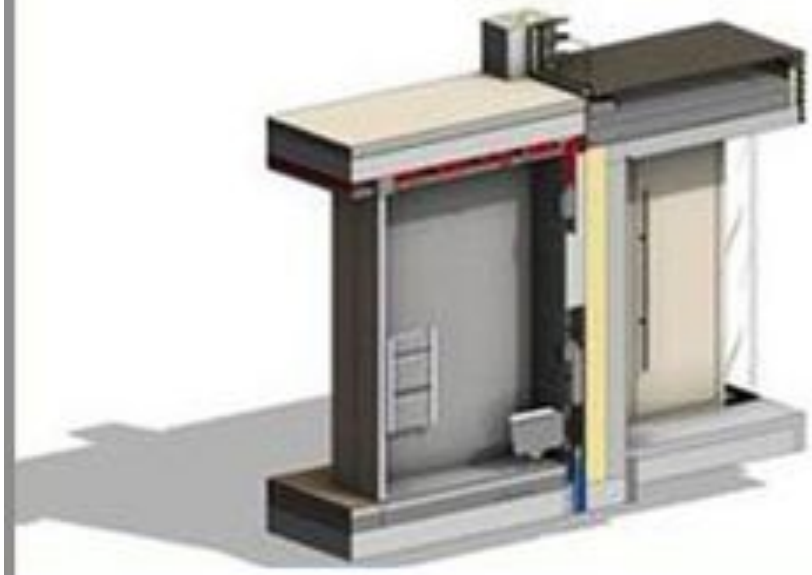
Level of Developement

LoD

Level of Detail

LOI

Level of Information



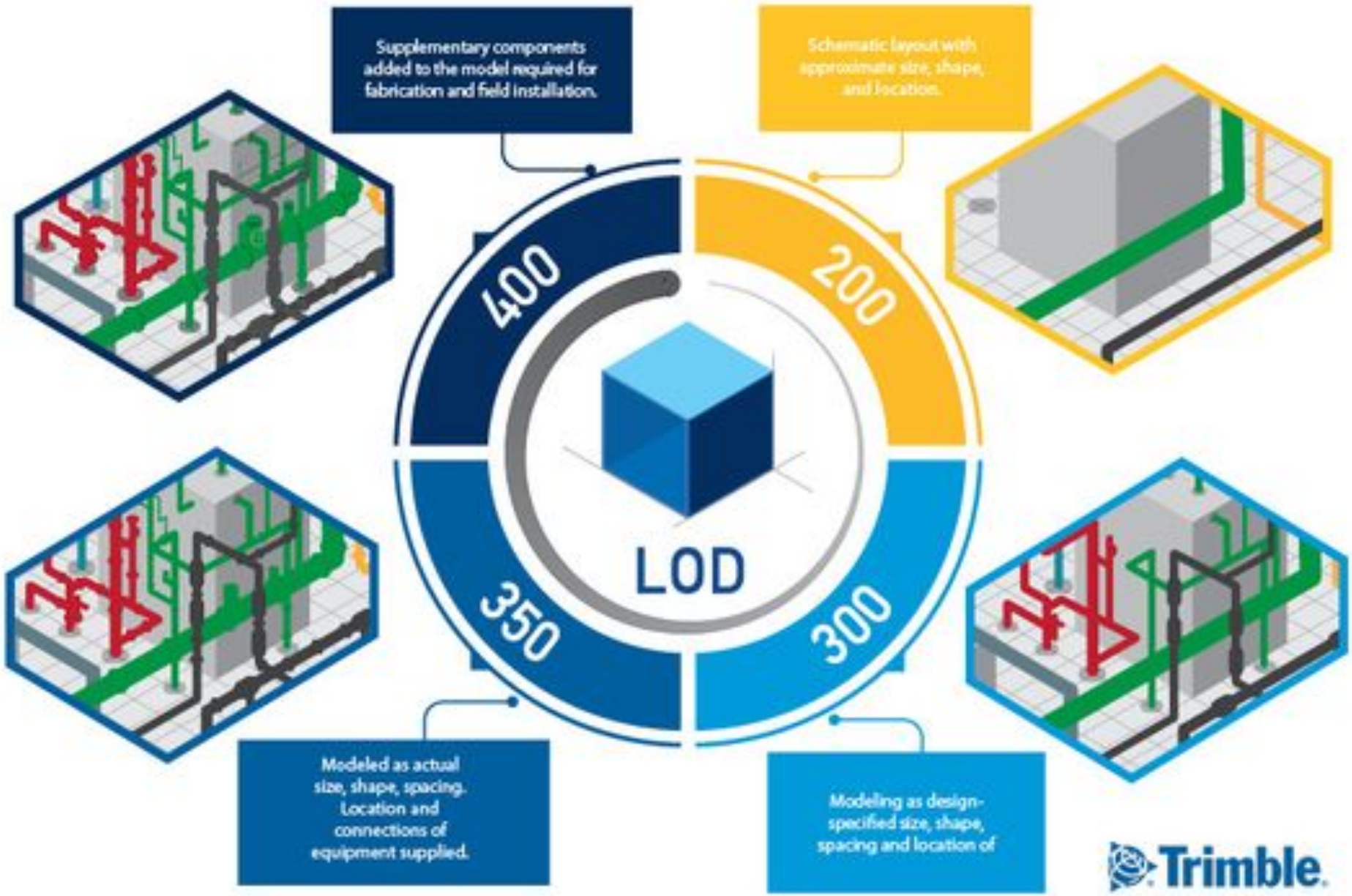
+

LOD 0

LOD 2

LOD 1

LOD 3


Supplementary components added to the model required for fabrication and field installation.
Schematic layout with approximate size, shape, and location.
400
200
LOD
350
300
Modeled as actual size, shape, spacing. Location and connections of equipment supplied.
Modeling as design-specified size, shape, spacing and location of
Trimble.

LEVEL of DETAIL

G0

Schematic

DESCRIPTION:
Office Chair

WIDTH:

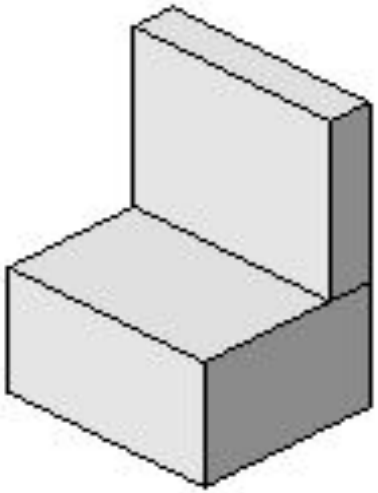
DEPTH:

HEIGHT:

MANUFACTURER:

MODEL:

G1



Concept

DESCRIPTION:
Office Chair

WIDTH:
700
DEPTH:
450
HEIGHT:
1100
MANUFACTURER:

MODEL:

G2

Defined

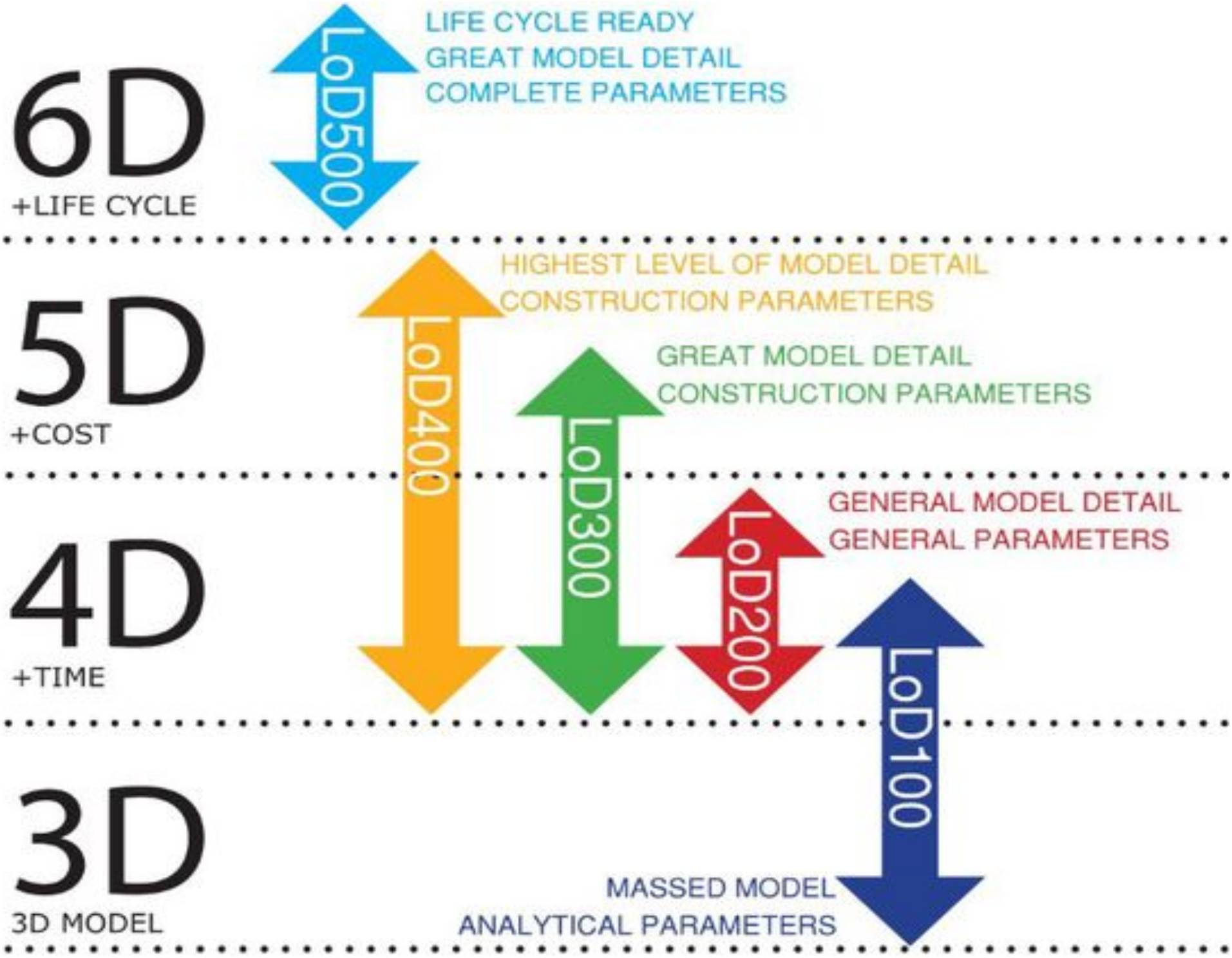
DESCRIPTION:
Office Chair
Arms, Wheels
WIDTH:
700
DEPTH:
450
HEIGHT:
1100
MANUFACTURER:
Herman Miller, Inc
MODEL:
Mirra

G3

Rendered

DESCRIPTION:
Office Chair
Arms, Wheels
WIDTH:
700
DEPTH:
450
HEIGHT:
1100
MANUFACTURER:
Herman Miller, Inc
MODEL:
Mirra

(based on AEC [UK] BIMprotocol v2.0 - Component Grade)


6D
+LIFE CYCLE
LoD500
LIFE CYCLE READY
GREAT MODEL DETAIL
COMPLETE PARAMETERS
5D
+COST
LoD400
HIGHEST LEVEL OF MODEL DETAIL
CONSTRUCTION PARAMETERS
LoD300
GREAT MODEL DETAIL
CONSTRUCTION PARAMETERS
4D
+TIME
LoD200
GENERAL MODEL DETAIL
GENERAL PARAMETERS
3D
3D MODEL
LoD100
MASSED MODEL
ANALYTICAL PARAMETERS

BIM 4M2

BIM 4 Manufacturers and Manufacturing

BIM Adoption by Product Manufacturers

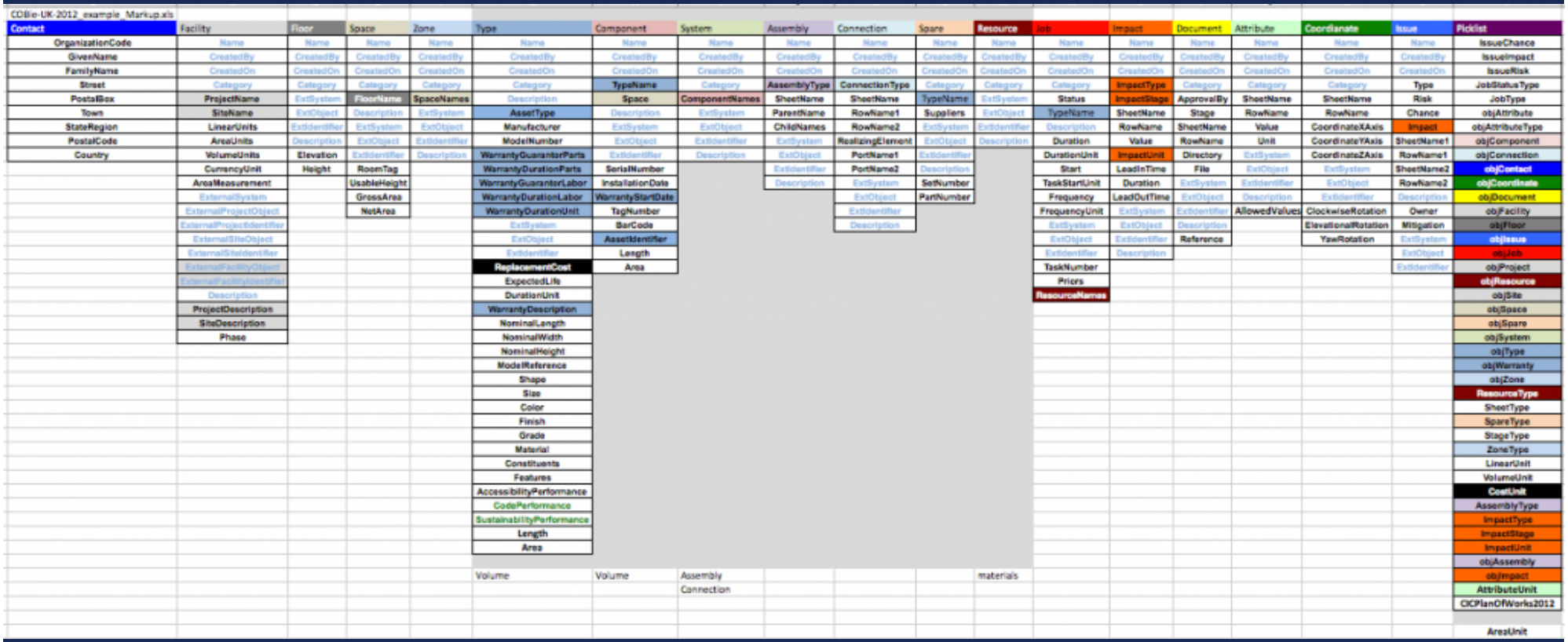
Survey conducted July to October 2014

updated 03 February 2015

Floor System	BIM Object or Element		General Information Use			
	Item Category - Floor		Basic Tool Features	Derived Data	Selection Agent	Building System
	Description: A 2D and 3D element. A horizontal surface element most commonly attributed to the structural support system for a building.		Structural System, Assembly Information	Material Volume, Material Surface Area	Primary Creator: Architect Secondary Creators: Structural Engineer	Item System Category - Unformat

Level of Development AIA Document E202 - 2008 Developed by Graphisoft 2001	Information Category for Information Item (See Master Information Tab)	Information Item (information about the specific object or element)	Model Element Author	Information Classification Origin	Required by Client Data	IFC Support
LOD 100 - Conceptual						
Overall Building Massing Indicative of Area, Height, Volume, Location, and Orientation.	Building Program & Project Meta Data	Facility ID			File Properties	IfcSlab->IfcBuilding.Name
	Building Program & Project Meta Data	Facility Name			File Properties	IfcSlab->IfcBuilding.LongName
	Building Program & Project Meta Data	Facility Description			File Properties	IfcSlab->IfcBuilding.Description
	Physical Properties of BIM Objects & Elements	Overall Length				IfcSlab->IfcQuantityLength.Name
	Physical Properties of BIM Objects & Elements	Overall Width				IfcSlab->IfcQuantityLength.Name
	Physical Properties of BIM Objects & Elements	Overall Height				IfcSlab->IfcQuantityLength.Name
	Physical Properties of BIM Objects & Elements	Overall Area				IfcSlab->IfcQuantityArea.Name="...
	Physical Properties of BIM Objects & Elements	Overall Volume				IfcSlab->IfcQuantityVolume.Name
	GeoSpatial and Spatial Location of Objects &	Position Type				IfcSlab.ObjectPlacement
	GeoSpatial and Spatial Location of Objects &	Location Constraint				(clarify) - IfcConstraint
	GeoSpatial and Spatial Location of Objects &	Code Constraint				(clarify) - IfcConstraint
	Costing Requirements	Conceptual Cost			X	IfcSlab->IfcCostValue.CostType="...
	Costing Requirements	Conceptual Unit Cost			X	IfcSlab->IfcCostValue.CostType="...
	Costing Requirements	Future Cost Assumptions				IfcSlab->IfcCostValue.CostType="...
	Sustainable Material LEED or Other Requirements	Green Assumptions				IfcSlab->IfcEnvironmentalImpactV...
	Sustainable Material LEED or Other Requirements	Green Strategies				IfcSlab->IfcEnvironmentalImpactV...
	Sustainable Material LEED or Other Requirements	LEED Initiatives Bronze,Silver,Gold				IfcSlab->IfcEnvironmentalImpactV...
	Project Environmental & Site Conditions	Utility Data				
	Phases Time Sequencing & Schedule Requirements	Phasing (OmniClass Table -32)				IfcProject->IfcTask.Name [object...
	Phases Time Sequencing & Schedule Requirements	Overall Duration				IfcProject->IfcTask->IfcTaskTime.D...
LOD 200-Approximate Geometry						
Generalized Systems or Assemblies with Approximate Quantities, Size, Shape, Location, , and Orientation.	Physical Properties of BIM Objects & Elements	Length				IfcSlab->IfcQuantityLength.Name
	Physical Properties of BIM Objects & Elements	Width				IfcSlab->IfcQuantityLength.Name
	Physical Properties of BIM Objects & Elements	Height				IfcSlab->IfcQuantityLength.Name
	Physical Properties of BIM Objects & Elements	Area				IfcSlab->IfcQuantityArea.Name="...
	Physical Properties of BIM Objects & Elements	Volume				IfcSlab->IfcQuantityVolume.Name
	Physical Properties of BIM Objects & Elements	Maximum Size				
	GeoSpatial and Spatial Location of Objects &	Story Number				IfcSlab->IfcBuildingStorey.N...
	GeoSpatial and Spatial Location of Objects &	Zone/Space Name				IfcSlab->IfcZone.LongName (wa...
	GeoSpatial and Spatial Location of Objects &	Zone/Space Number				IfcSlab->IfcZone.Name
	GeoSpatial and Spatial Location of Objects &	Room Name				IfcSlab->IfcSpace.LongName
	GeoSpatial and Spatial Location of Objects &	Room Number				IfcSlab->IfcSpace.Name
	GeoSpatial and Spatial Location of Objects &	Floor ID				IfcSub->IfcBuildingStory.Name
	GeoSpatial and Spatial Location of Objects &	Floor Name				IfcSlab->IfcBuildingStory.LongNam...
	GeoSpatial and Spatial Location of Objects &	Floor Description				IfcSlab->IfcBuildingStory.Descripti...
	GeoSpatial and Spatial Location of Objects &	FloorElevation				IfcSlab->IfcBuildingStory.Elevation
	GeoSpatial and Spatial Location of Objects &	FloorElevationUnits				IfcUnitAssignment -> assignment
	GeoSpatial and Spatial Location of Objects &	FloorTotalHeight				IfcBuildingStorey->IfcQuantityLen...
	GeoSpatial and Spatial Location of Objects &	FloorTotalHeightUnits				IfcUnitAssignment -> assignment
	Manufacturer Specific Information Requirements	General Type				IfcSlabType.Name = IfcClassifica...
	Costing Requirements	Value Based Costing (i.e. Cost				IfcSlab->IfcCostValue.CostType=...
	Sustainable Material LEED or Other Requirements	LEED items per Quantity Values				IfcSlab->IfcEnvironmentalImpactV...
	Project Environmental & Site Conditions	Temperature Range Requirement				IfcSlab->IfcSpace->Pset_SpaceTh...
	Project Environmental & Site Conditions	Radiant Heating Requirement				IfcSlab->IfcSpace->Pset_SpaceTh...
	Program/Space Compliance or Validation	Program Room Requirements				IfcSlab->IfcSpace - IfcSpace has ...
	Code Compliance/ Occupant Safety Requirements	Fire Rating Requirement				IfcSlab->Pset_ColumnCommon.I...
	Code Compliance/ Occupant Safety Requirements	Building Type Selection				IfcBuilding->IfcConstraint
	Phases Time Sequencing & Schedule Requirements	Time Sequence				IfcProject->IfcTask->IfcRelSequen...
	Phases Time Sequencing & Schedule Requirements	Order of Project Milestones				IfcProject->IfcTask->IfcRelSequen...
LOD 300-Precise Geometry						
Specific Assemblies that are Accurate in Terms of Size, Shape, Location, Quantity, and Orientation..	Physical Properties of BIM Objects & Elements	Nominal Size				
	Physical Properties of BIM Objects & Elements	Capacity				IfcSlab->Pset_ColumnCommon.e...
	Physical Properties of BIM Objects & Elements	Perimeter				IfcColumn->IfcQuantityLength.Nam...
	Physical Properties of BIM Objects & Elements	Cross Section				IfcColumn->IfcQuantityArea.Name...
	Physical Properties of BIM Objects & Elements	Depth				
	GeoSpatial and Spatial Location of Objects &	Elevation				use height, sum up to IfcSlab.Ob...
	GeoSpatial and Spatial Location of Objects &	Elevation to Datum				use height, sum up to IfcSlab.Ob...

Template Category	**Cable Ladder Systems**			
Template Version	**Draft for Public Consultation**			
Category Description	**Cable Ladder Systems used for the support and accommodation of cables and possibly other electrical equipment in electrical and/or communication systems installations**			
Classification System				
Classification	**Value**			
Suitability for Use	**Consultation - draft use only**			
Template Custodian	**CIBSE**			
Information Category	**Parameter Name**	**Value**	**Units**	**Notes**
	Manufacturer Data			
Specifications	Manufacturer		Text	
Specifications	Manufacturer Website		URL	
Specifications	Product Range		Text	
Specifications	Product Model Number		Text	Or Code
Specifications	CE Approval		Text	Number, Yes, No
Specifications	Product Literature		URL	
Specifications	Features		Text	Free text to describe product
	Construction Data			
Specifications	Type		Text	This is a COBie field, other fields will be required in final PDTs
Specifications	Shape		Text	This is a COBie field, other fields will be required in final PDTs
Specifications	Material		Text	This is a COBie field, other fields will be required in final PDTs
Specifications	Colour		Text	This is a COBie field, other fields will be required in final PDTs
Specifications	Finish		Text	This is a COBie field, other fields will be required in final PDTs
Specifications	Fittings / Accessories / Ancillaries		URL	Link to website
Specifications	Configuration		URL	Link to website
	Application Data			
Specifications	Reference Standard		Text	
Specifications	Power Source (if required)		Text	e.g. Integral battery, System-powered, Other, UserDefined
	Dimensional Data			
Specifications	Overall Length		mm	Or Diameter. Minimum and maximum lengths available
Specifications	Overall Internal Width		mm	Minimum and maximum widths available
Specifications	Overall Width		mm	Minimum and maximum widths available - external
Specifications	Overall Height		mm	Minimum and maximum heights available
Specifications	Gross Weight		kg	Equates to Operating Weight
Specifications	Rung Spacing		mm	For standard product ie: 300mm
Specifications	Cabling Area Depth		mm	
Specifications	Material Gauge		mm	Equates to thickness
Specifications	Shipping Weight		kg	Equates to dry weight of unit plus packaging allowance
Specifications	Access Clearance Top		mm	Access required for maintenance of this item
Specifications	Access Clearance Bottom		mm	Access required for maintenance of this item
Specifications	Access Clearance Left		mm	Access required for maintenance of this item
Specifications	Access Clearance Right		mm	Access required for maintenance of this item
Specifications	Access Clearance Front		mm	Access required for maintenance of this item
Specifications	Access Clearance Rear		mm	Access required for maintenance of this item
	Sustainability			
Sustainable Material BREEAM etc	Embodied Carbon		kgCO2	*Awaiting Industry Standard*
Sustainable Material BREEAM etc	Life Cycle Analysis		Number	*Awaiting Industry Standard*
Sustainable Material BREEAM etc	Location of Manufacturer		GridRef	*Awaiting Industry Standard*
Sustainable Material BREEAM etc	Green Guide for Specification		Enumeration	*Awaiting Industry Standard*
Sustainable Material BREEAM etc	Environmental Product Declaration		Text	3rd Party Verification
Sustainable Material BREEAM etc	Responsible Sourcing of Materials		Enumeration	*Awaiting Industry Standard*
Sustainable Material ETL	Energy Technology List		URL	Hyperlink to ETL webpage for product
Sustainable Material LEED v.4	Responsible Extraction of Materials		Text	*Awaiting Industry Standard*
Sustainable Material LEED v.4	Material Ingredient Reporting		Text	*Awaiting Industry Standard*
	Operations & Maintenance			
Facilities/Asset Management	O&M Manual		URL	Hyperlink to Manufacturer O&M Data
Facilities/Asset Management	Daily		Text	Maintenance tasks or SFG20 codes
Facilities/Asset Management	Weekly		Text	Maintenance tasks or SFG20 codes
Facilities/Asset Management	Monthly		Text	Maintenance tasks or SFG20 codes
Facilities/Asset Management	Quarterly		Text	Maintenance tasks or SFG20 codes
Facilities/Asset Management	6 Monthly		Text	Maintenance tasks or SFG20 codes
Facilities/Asset Management	Annually		Text	Maintenance tasks or SFG20 codes
Facilities/Asset Management	Bespoke Timeframe		Text	Maintenance tasks or SFG20 codes
Facilities/Asset Management	Expected Life		Years	
Facilities/Asset Management	Warranty ID		Text	



CDBie-UK-2012_example_Markup.xls

Contact	Facility	Floor	Space	Zone	Type	Component	System	Assembly	Connection	Spare	Resource	Job	Impact	Document	Attribute	Coordianate	Issue	Picklist
OrganizationCode	Name	Name	Name	Name	Name	Name	Name	Name	Name	Name	Name	Name	Name	Name	Name	Name	Name	IssueChance
GivenName	CreatedBy	CreatedBy	CreatedBy	CreatedBy	CreatedBy	CreatedBy	CreatedBy	CreatedBy	CreatedBy	CreatedBy	CreatedBy	CreatedBy	CreatedBy	CreatedBy	CreatedBy	CreatedBy	CreatedBy	IssueImpact
FamilyName	CreatedOn	CreatedOn	CreatedOn	CreatedOn	CreatedOn	CreatedOn	CreatedOn	CreatedOn	CreatedOn	CreatedOn	CreatedOn	CreatedOn	CreatedOn	CreatedOn	CreatedOn	CreatedOn	CreatedOn	IssueRisk
Street	Category	Category	Category	Category	Category	TypeName	Category	AssemblyType	ConnectionType	Category	Category	Category	ImpactType	Category	Category	Category	Type	JobStatusType
PostalBox	ProjectName	ExtSystem	FloorName	SpaceNames	Description	Space	ComponentNames	SheetName	SheetName	TypeName	ExtSystem	Status	ImpactStage	ApprovalBy	SheetName	SheetName	Risk	JobType
Town	SiteName	ExtObject	Description	ExtSystem	AssetType	Description	ExtSystem	ParentName	RowName1	Suppliers	ExtObject	TypeName	SheetName	Stage	RowName	RowName	Chance	objAttribute
StateRegion	LinearUnits	ExtIdentifier	ExtSystem	ExtObject	Manufacturer	ExtSystem	ExtObject	ChildNames	RowName2	ExtSystem	ExtIdentifier	Description	RowName	SheetName	Value	CoordinateXAxis	Impact	objAttributeType
PostalCode	AreaUnits	Description	ExtObject	ExtIdentifier	ModelNumber	ExtObject	ExtIdentifier	ExtSystem	RealizingElement	ExtObject	Description	Duration	Value	RowName	Unit	CoordinateYAxis	SheetName1	objComponent
Country	VolumeUnits	Elevation	ExtIdentifier	Description	WarrantyGuarantorParts	ExtIdentifier	Description	ExtObject	PortName1	ExtIdentifier		DurationUnit	ImpactUnit	Directory	ExtSystem	CoordinateZAxis	RowName1	objConnection
	CurrencyUnit	Height	RoomTag		WarrantyDurationParts	SerialNumber		ExtIdentifier	PortName2	Description		Start	LeadInTime	File	ExtObject	ExtSystem	SheetName2	objContact
	AreaMeasurement		UsableHeight		WarrantyGuarantorLabor	InstallationDate		Description	ExtSystem	SetNumber		TaskStartUnit	Duration	ExtSystem	ExtIdentifier	ExtObject	RowName2	objCoordinate
	ExternalSystem		GrossArea		WarrantyDurationLabor	WarrantyStartDate			ExtObject	PartNumber		Frequency	LeadOutTime	ExtObject	Description	ExtIdentifier	Description	objDocument
	ExternalProjectObject		NetArea		WarrantyDurationUnit	TagNumber			ExtIdentifier			FrequencyUnit	ExtSystem	ExtIdentifier	AllowedValues	ClockwiseRotation	Owner	objFacility
	ExternalProjectIdentifier				ExtSystem	BarCode			Description			ExtSystem	ExtObject	Description		ElevationalRotation	Mitigation	objFloor
	ExternalSiteObject				ExtObject	AssetIdentifier						ExtObject	ExtIdentifier	Reference		YawRotation	ExtSystem	objIssue
	ExternalSiteIdentifier				ExtIdentifier	Length						ExtIdentifier	Description				ExtObject	objJob
	ExternalFacilityObject				ReplacementCost	Area						TaskNumber					ExtIdentifier	objProject
	ExternalFacilityIdentifier				ExpectedLife							Priors						objResource
	Description				DurationUnit							ResourceNames						objSite
	ProjectDescription				WarrantyDescription													objSpace
	SiteDescription				NominalLength													objSpare
	Phase				NominalWidth													objSystem
					NominalHeight													objType
					ModelReference													objWarranty
					Shape													objZone
					Size													ResourceType
					Color													SheetType
					Finish													SpareType
					Grade													StageType
					Material													ZoneType
					Constituents													LinearUnit
					Features													VolumeUnit
					AccessibilityPerformance													CostUnit
					CodePerformance													AssemblyType
					SustainabilityPerformance													ImpactType
					Length													ImpactStage
					Area													ImpactUnit
																		objAssembly
					Volume	Volume	Assembly				materials							objImpact
							Connection											AttributeUnit
																		CICPlanOfWorks2012
																		AreaUnit

Climate change	0.00E+00	kg CO2 eq	Human Health	0.00E+00	DALY
Ozone depletion	0.00E+00	kg CFC-11 eq	Ecosystems	0.00E+00	species.yr
Human toxicity, cancer effects	0.00E+00	CTUh	Resources		$
Human toxicity, non-cancer effects	0.00E+00	CTUh			
Particulate matter	0.00E+00	kg PM2.5 eq			
Ionizing radiation HH	0.00E+00	kg U235 eq			
Ionizing radiation E	0.00E+00	CTUe			
Photochemical ozone formation	0.00E+00	kg C2H4 eq			
Acidification	0.00E+00	molc H+ eq			
Terrestrial eutrophication	0.00E+00	molc N eq			
Freshwater eutrophication	0.00E+00	molc P eq			
Marine eutrophication	0.00E+00	molc N eq			
Freshwater ecotoxicity	0.00E+00	CTUe			
Land use	0.00E+00	kg C deficit			
Water resource depletion	0.00E+00	m3			
		kg Sb eq			
cumulative energy demand	0.00E+00	MJ			

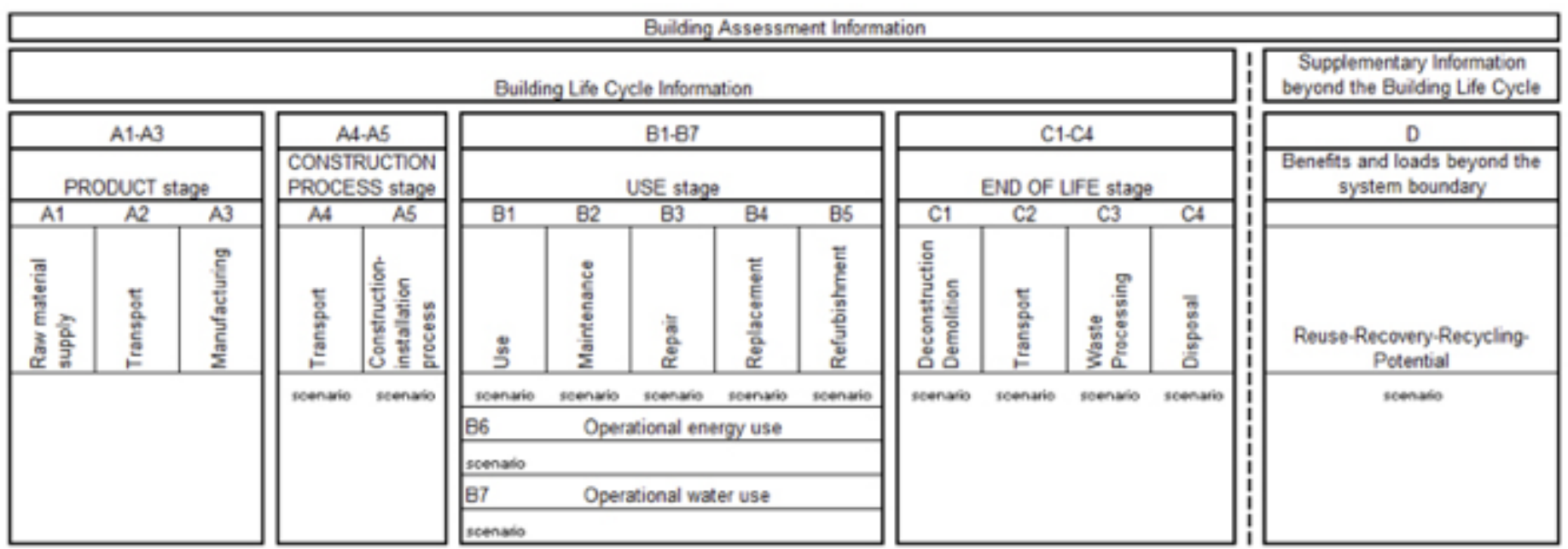


Figure 1: Life cycle stages and modules used in CEN/TC 350 standards such as EN 15804

EN 15804:2012 (E)

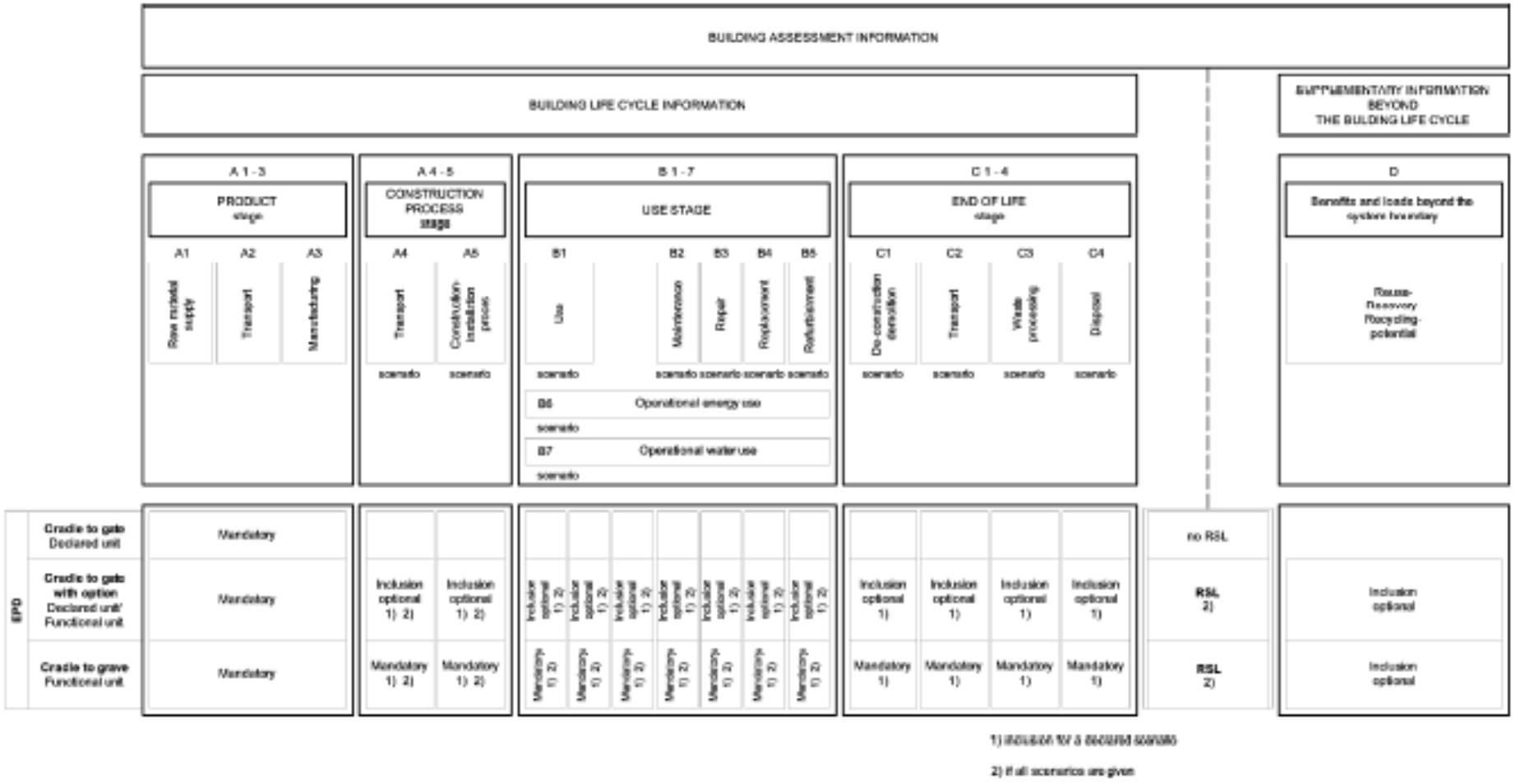
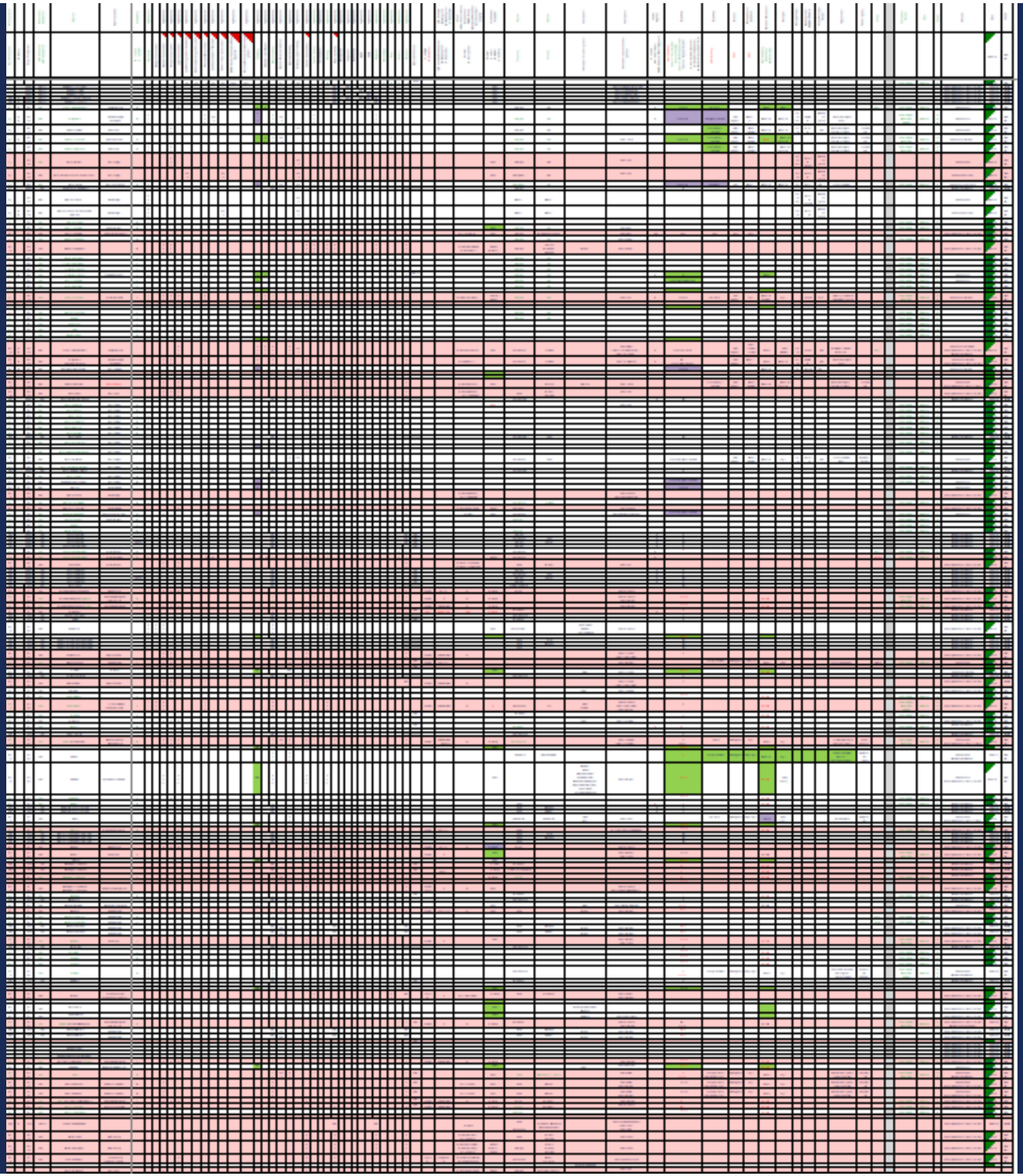
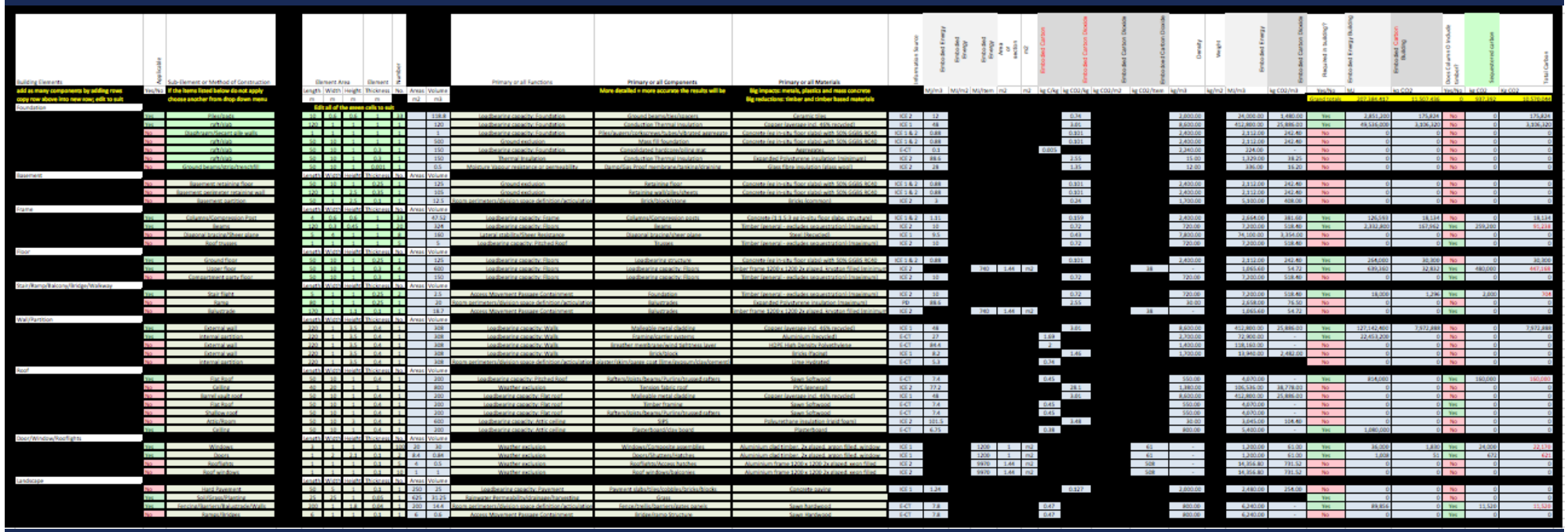


Figure 1 —Types of EPD with respect to life cycle stages covered and life cycle stages and modules for the building assessment



Decrement delay FU : to give a decrement delay (d) of X hours (defined by the user) for 1 m² surface								
Property 2: Decrement delay (d), Approach a: Specific Heat Value = Wh/kg.K						m		
Needed data			DL	Design Life of Building	50	Years	Default	Choose this method not the next one
Needed data			CLE	Component Life Expectancy/Replacement period	50	Years	Default or PDS	
Needed data				Material				
Needed data		1	e	thickness of material layer	0.3	m	PDS	
Needed data		2	p	Rhô (volumic mass) [density]	700	kg/m3	PDS	
Default data		3	S	surface area of wall considered	1	m²	Default	
Needed data		4	λ	thermal conductivity	1	W/m.K	PDS	Be careful with units
Needed data (option 1)		6	c	Specific heat value	0.58	Wh/kg.K	PDS	See Converter if units are: J.kg/K
Defined by User		7	d	Decrement delay (Hours)	12	hours	LookUpTable	Could this be LUT/DDL with options?
Formulas	d=1,38*e*√1/a		d	Decrement delay (Hours)	0.020546475			
Formulas	a=λ/p*C		a	diffusivity				
Formulas	e=d/1.38*√(p*C/λ)		e	thickness of material layer				
Formulas	Q=e*S*p		Q	Quantity				
Calculation	Q=(d/1.38*√(p*C/λ))*S*p*(DL/CLE)		Q	Quantity	302	kg	Calculated	Checked
Converter								
Input from Product Data Sheets				Result				
Specific Heat Value								
from		J/kg.K	to	Wh/kg.K				
2100		J/kg.K	=	0.583333333	Wh/kg.K			



INVENTORY OF CARBON & ENERGY (ICE)

Version 1.6a

Prof. Geoff Hammond & Craig Jones

Sustainable Energy Research Team (SERT)

Department of Mechanical Engineering

University of Bath, UK

This project was joint funded under the Carbon Vision Buildings program by:

Making business sense of climate change

Available from: www.bath.ac.uk/mech-eng/sert/embodied/

Peer Review Source: Hammond, G.P. and C.I. Jones, 2008, 'Embodied energy and carbon in construction materials', *Proc. Instn Civil. Engrs: Energy*, in press.

Interoperability and Integration

- The success of Applications to work with each other is to release the code of one to developers of the other, so they can interrogate it and write code to interoperate seamlessly with each other then test it and have on line updating
- Plugins and Apps become a doddle to load and start using
- All existing building analysis applications must migrate towards BIM APPs so there is no or little file transferring or translating between applications

Built2SpecProject

- EU funded Project
- Avoiding compromise in specification without accountability
- Accountability through Smart Phone
  - All decisions makers recorded against all actions/decisions made
    - All decision points know in advance through templates built from specification review/approval sign off clauses out of NBS Create software
  - Approving: Prototypes, Samples, Mock ups, Control samples
  - Responding to: RFI Requests for Information
  - Recording: works completed
  - Recording: snagging points

BLOCK CHAIN

The distributed ledger of information. In easier words it's a **Record Book.**

THE PROCESS DEFINED

BANK

Decentralised	Centralised
No middleman	Bank is the middleman
Irreversible	Reversible
Secure	Prone to theft

Industries **Disrupted**

SUPPLY CHAIN MANAGEMENT

- Reduced fraud and errors
- Improved inventory services

Book.

06 No activity without permission of members

07 If no objection, the transaction takes place

DIFFERENCE FROM THE BANK

Decentralised	Centralised
No middleman	Bank is the middleman
Irreversible	Reversible
Secure	Prone to theft
Permanent record of data	Records can be deleted
No service fee charged	Service fee charged
Autonomy to participants	Regulated by a central bank

Industries **Disrupted**

SUPPLY CHAIN MANAGEMENT

- Reduced fraud and errors
- Improved inventory services
- Minimized course costs
- Reduced delays from paperwork
- Identification of issues faster
- Increased consumer and partner trust

INSURANCE

RETAIL

PRIVATE TRANSPORT

DIFFER
FRO

No service fee charged	Service fee charged
Autonomy to participants	Regulated by a central bank

Minimized course costs

Reduced delays from paperwork

Identification of issues faster

Increased consumer and partner trust

INSURANCE

Improved trust

Claim processing through smart contracts

Fraud detection and prevention

Enhanced efficiency

RETAIL

Consumer payments with digital money

Product authentication, from manufacturer to delivery

PRIVATE TRANSPORT

Large paper documents for legitimacy of activity

Loyalty points can automatically multiply

Record of auto-repair services

Record of purchases kept

VOTING

Voting through cell phones

Eliminate fraud voters

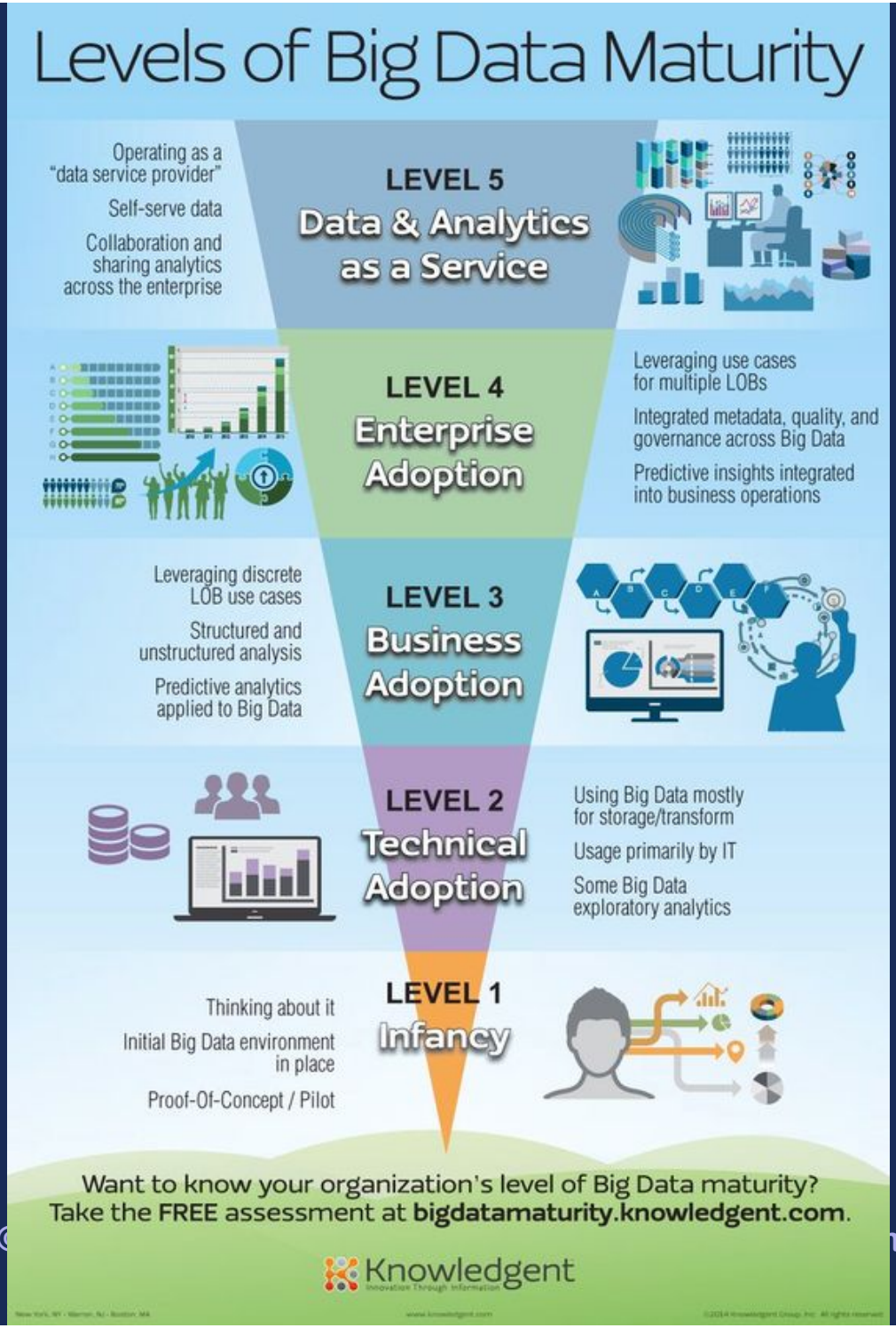
Better accountability

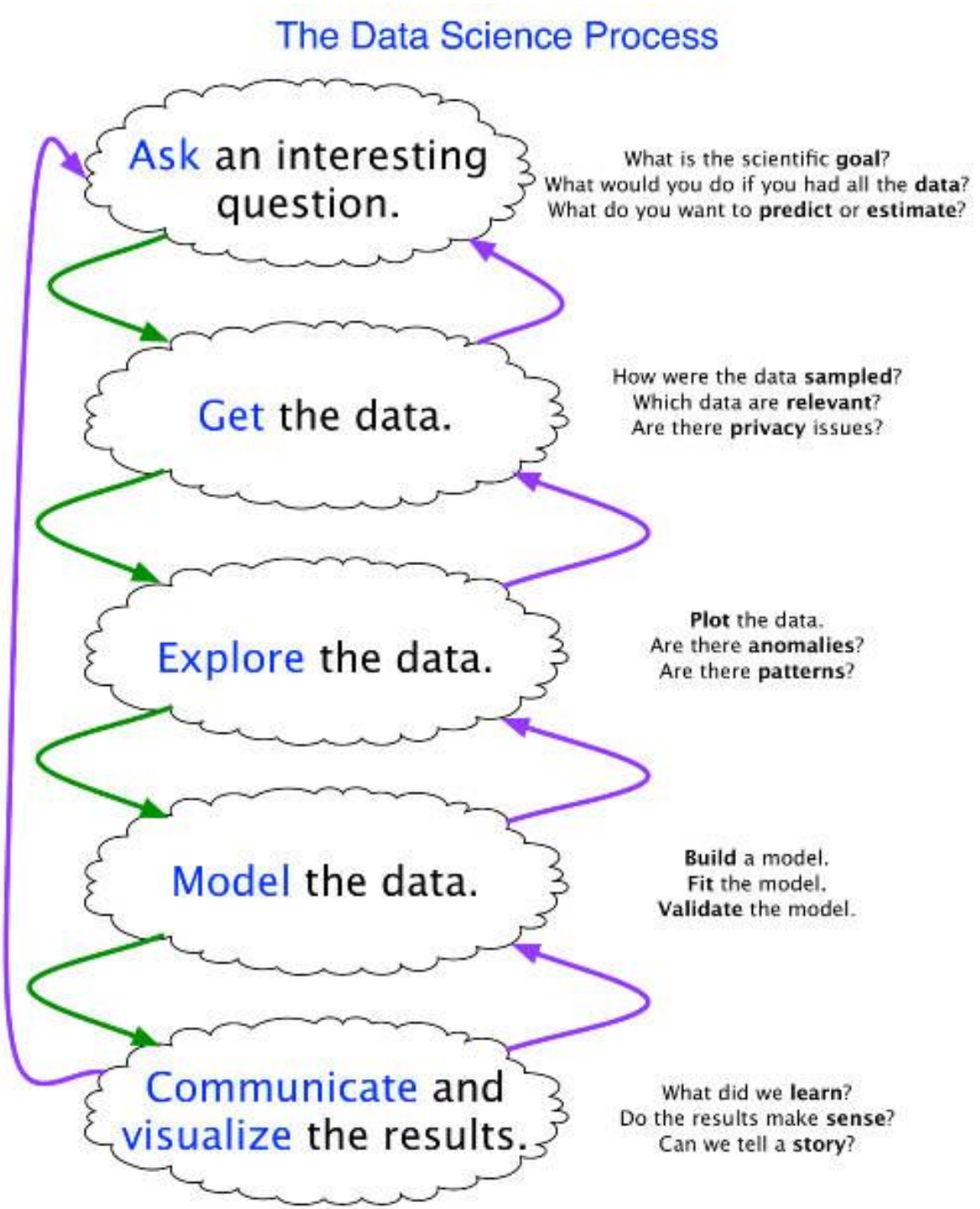
Reduced rigging in elections

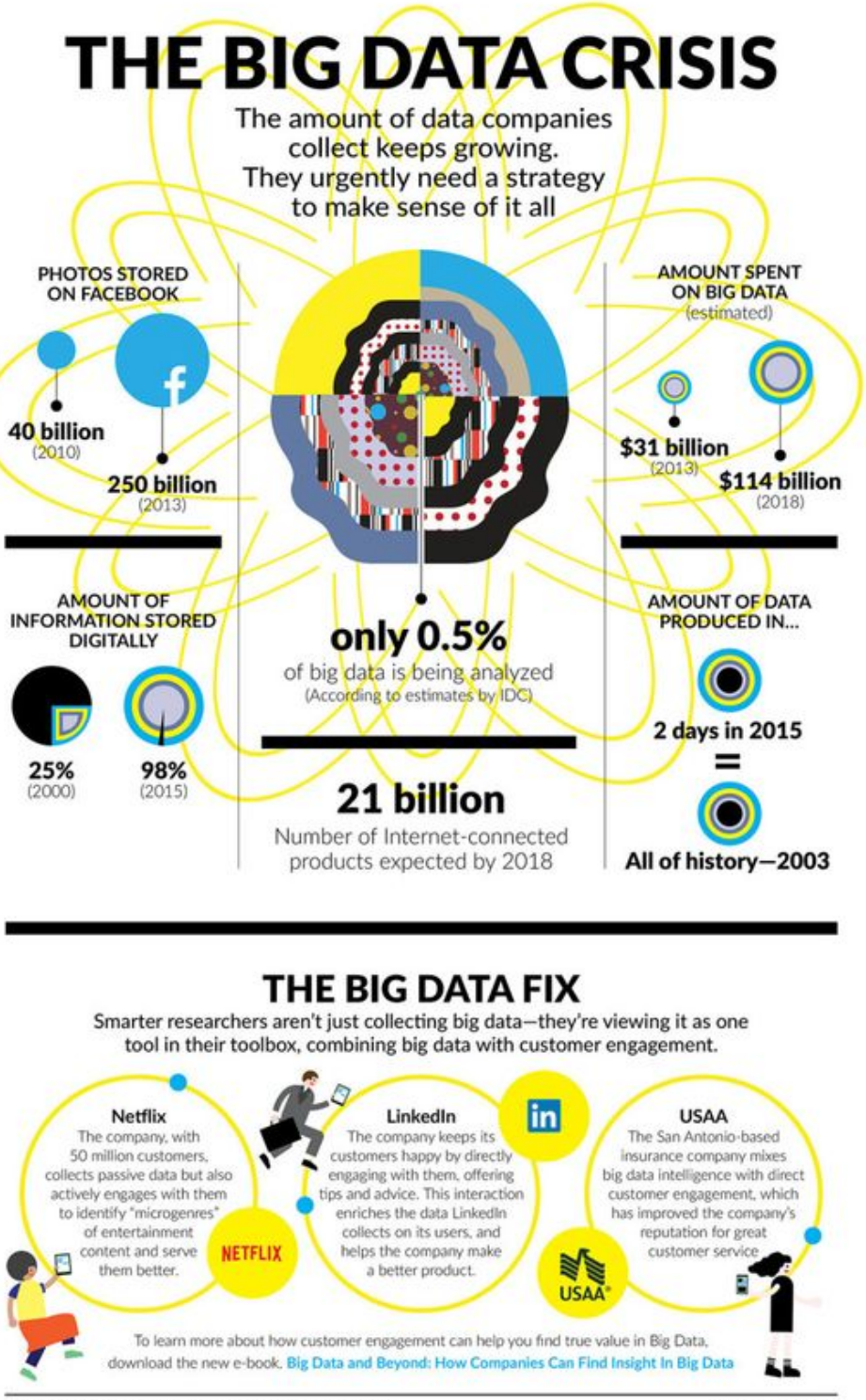
ENERGY

Peer to peer energy trading

Easy Bill payment

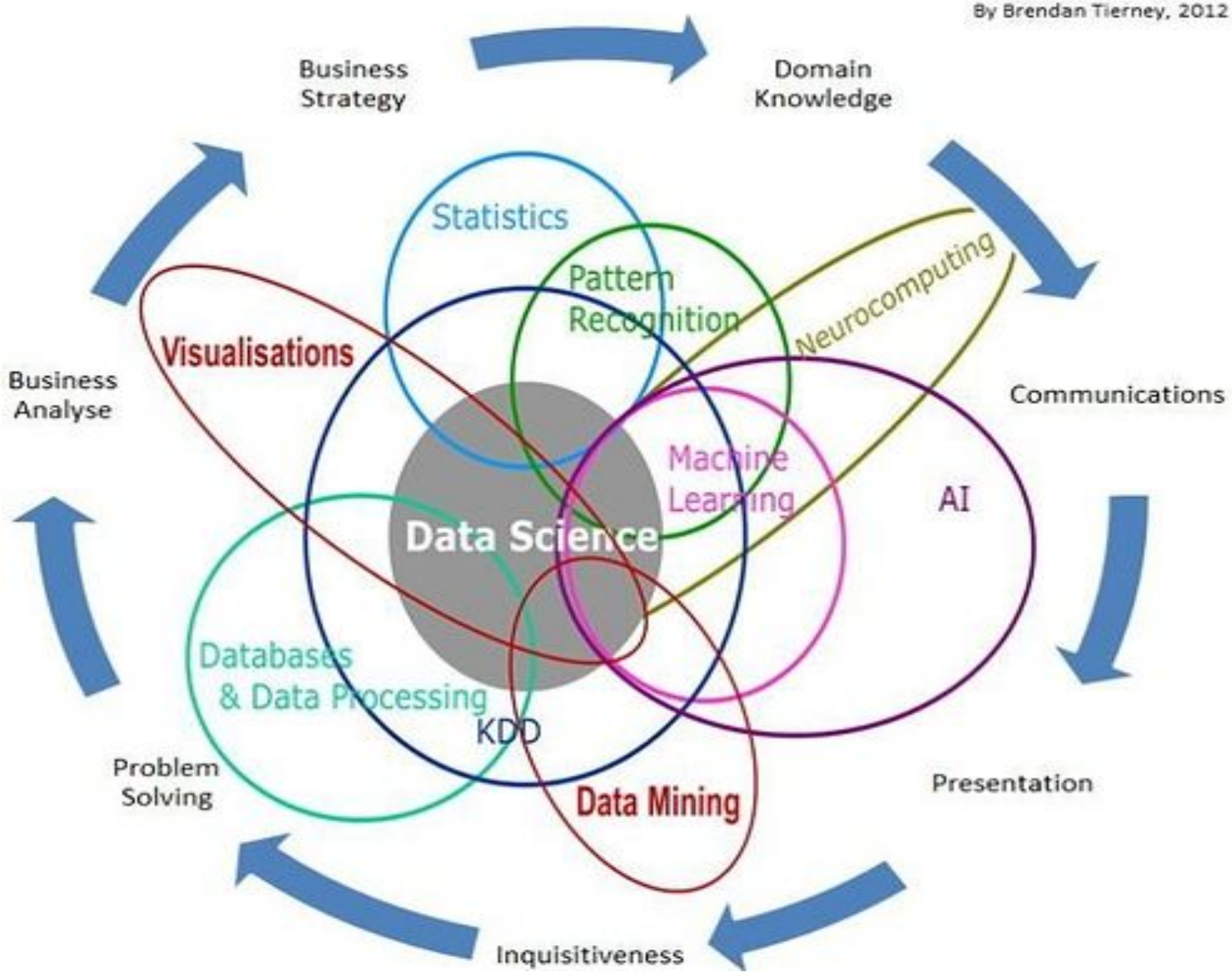

Levels of Big Data Maturity
Operating as a "data service provider"
Self-serve data
Collaboration and sharing analytics across the enterprise
LEVEL 5
Data & Analytics as a Service
Leveraging use cases for multiple LOBs
Integrated metadata, quality, and governance across Big Data
Predictive insights integrated into business operations
LEVEL 4
Enterprise Adoption
Leveraging discrete LOB use cases
Structured and unstructured analysis
Predictive analytics applied to Big Data
LEVEL 3
Business Adoption
Using Big Data mostly for storage/transform
Usage primarily by IT
Some Big Data exploratory analytics
LEVEL 2
Technical Adoption
Thinking about it
Initial Big Data environment in place
Proof-Of-Concept / Pilot
LEVEL 1
Infancy
Want to know your organization's level of Big Data maturity?
Take the FREE assessment at bigdatamaturity.knowledgent.com.
Knowledgent


The Data Science Process
Ask an interesting question.
What is the scientific goal?
What would you do if you had all the data?
What do you want to predict or estimate?
Get the data.
How were the data sampled?
Which data are relevant?
Are there privacy issues?
Explore the data.
Plot the data.
Are there anomalies?
Are there patterns?
Model the data.
Build a model.
Fit the model.
Validate the model.
Communicate and visualize the results.
What did we learn?
Do the results make sense?
Can we tell a story?
Joe Blitzstein and Hanspeter Pfister, created for the Harvard data science course http://cs109.org/.


THE BIG DATA CRISIS
The amount of data companies collect keeps growing. They urgently need a strategy to make sense of it all
PHOTOS STORED ON FACEBOOK
40 billion (2010)
250 billion (2013)
AMOUNT SPENT ON BIG DATA (estimated)
$31 billion (2013)
$114 billion (2018)
AMOUNT OF INFORMATION STORED DIGITALLY
25% (2000)
98% (2015)
only 0.5%
of big data is being analyzed
(According to estimates by IDC)
21 billion
Number of Internet-connected products expected by 2018
AMOUNT OF DATA PRODUCED IN...
2 days in 2015
=
All of history—2003
THE BIG DATA FIX
Smarter researchers aren't just collecting big data—they're viewing it as one tool in their toolbox, combining big data with customer engagement.
Netflix
The company, with 50 million customers, collects passive data but also actively engages with them to identify "microgenres" of entertainment content and serve them better.
NETFLIX
LinkedIn
The company keeps its customers happy by directly engaging with them, offering tips and advice. This interaction enriches the data LinkedIn collects on its users, and helps the company make a better product.
USAA
The San Antonio-based insurance company mixes big data intelligence with direct customer engagement, which has improved the company's reputation for great customer service
USAA
To learn more about how customer engagement can help you find true value in Big Data, download the new e-book. Big Data and Beyond: How Companies Can Find Insight In Big Data

Data Science Is Multidisciplinary

By Brendan Tierney, 2012




"The Comfort Zone"
by @thewealthhike
Find purpose
Deal with challenges and problems
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Lack self-confidence
Comfort Zone
Fear Zone
Learning Zone
Growth Zone
Feel safe and in control
Find excuses
Acquire new skills
Set new goals
Be affected by others' opinions
Extend your comfort zone
Conquer objectives
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CPD
CODE Patterns
Jargon Busters
Links Information Library
GBE Information hierarchy
Checklists
GBE Products Information
Robust Specification
PASS Product Accessory System Screening
PACT Product Application Competency Test
CAP'EM Product Data Sheets
Other Sustainability Data
BIM CAD Models
Big open data
Generic Material Datasets
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Properties data
Big Open Data
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2D VIEW Interface
IFC COBIe Uniclass Classification
2D View Interface
User options
Display options
Search Engine
2D Model
2D View Scenarios
Design
Elements
Design Tools
3D Studio
CAD Parameters Resource Efficiency
Interoperability
IFC COBie Uniclass Classification
GBE WasteCost Lite Resource Efficiency
Case Studies
Design
Performance Data
Performance Hierarchies
Performance Requirements
Environmental Assessment Methods
Regulation or Design Standards
Elements
BEACON Elemental Hierarchy
Building Element Code Number
BEST Building Element Sustainability Test
Methods of Construction
Thickness
Perimeter Junction design

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