

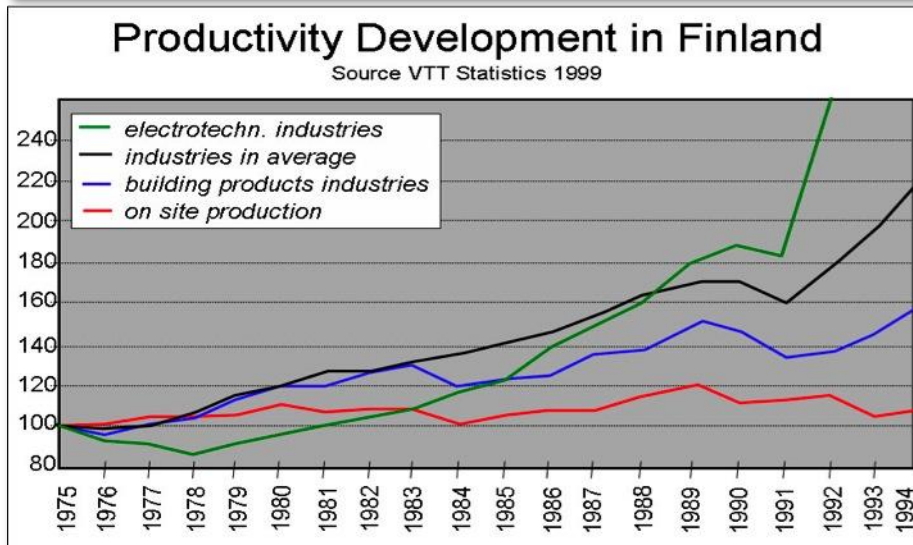
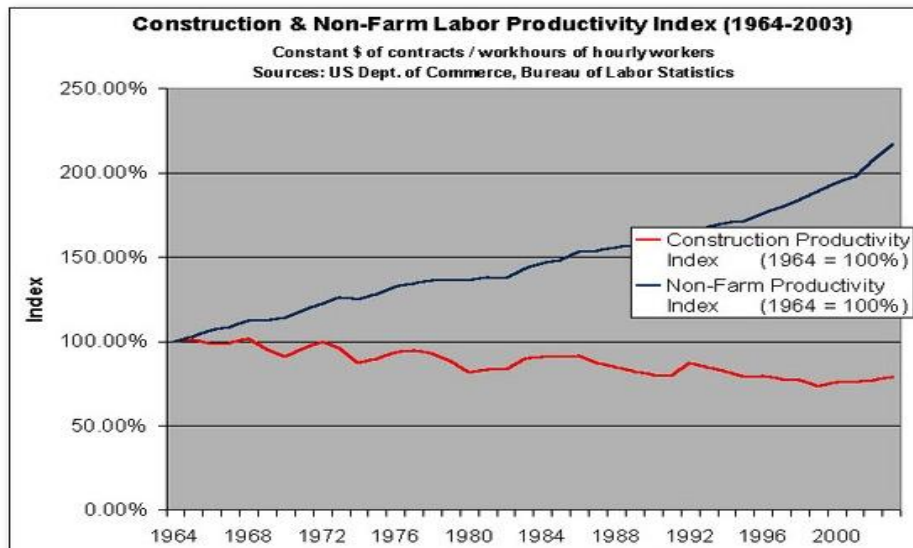
Public Clients as the Driver for BIM Adoption – Why and how UK Government wants to change the construction industry?

Professor Arto Kiviniemi
Digital Architectural Design
School of Built Environment
22nd April 2013

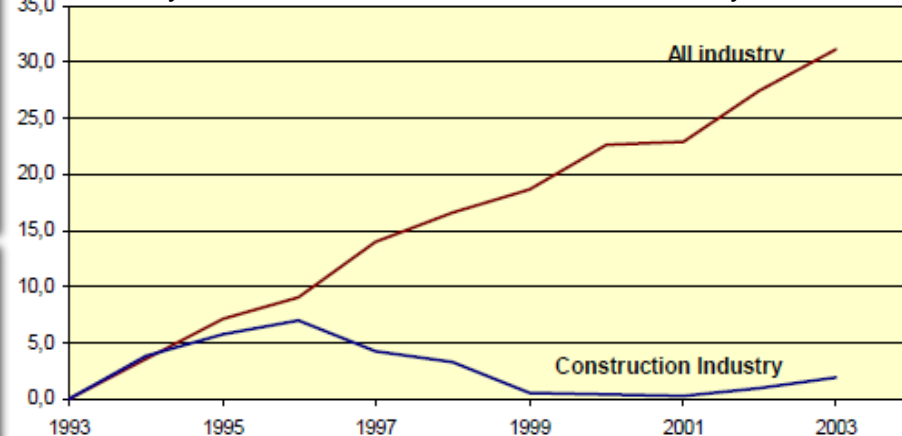
Our basic problem: Construction
industry is difficult to change



Poor development of productivity

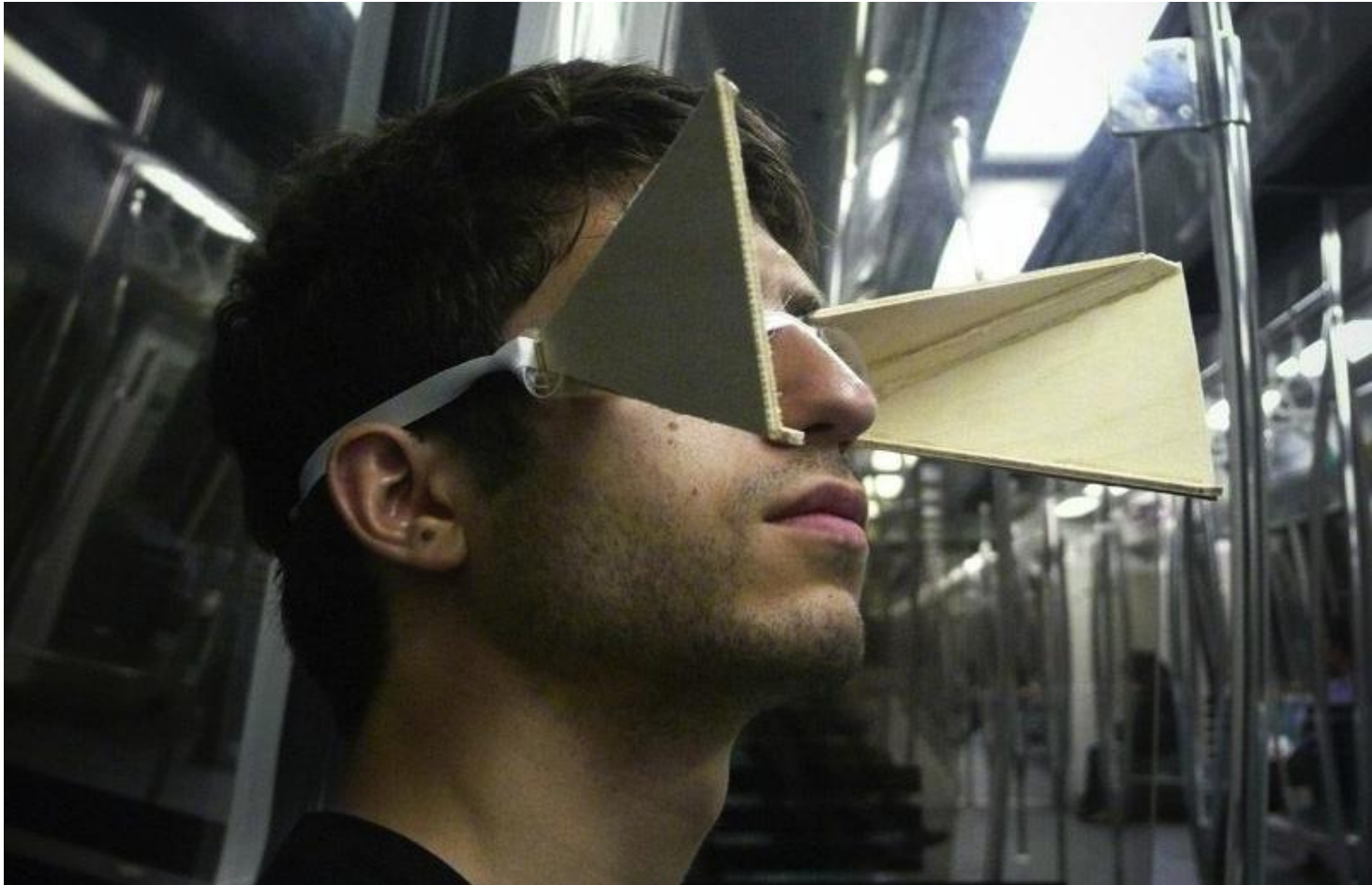


Productivity Growth in the UK Construction Industry 1993-2003



Silos and blinkers

- Standardised roles, but poor understanding of the information flows and needs in the process

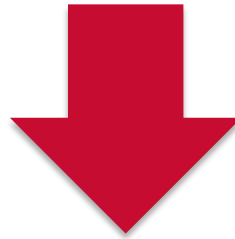


Business models and work processes

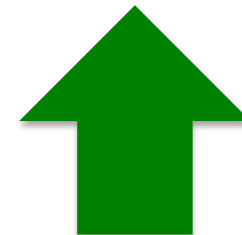
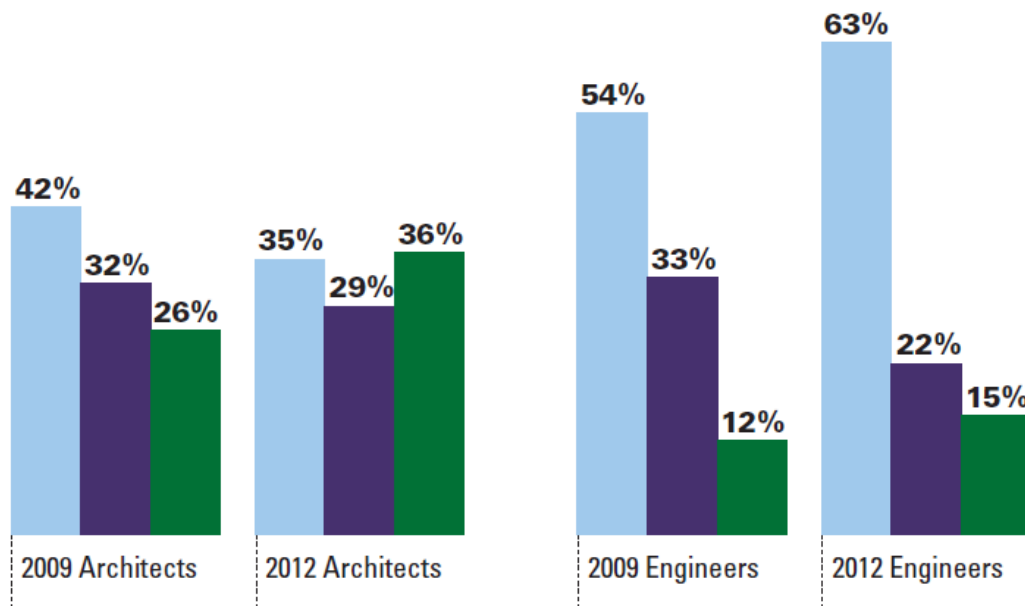
- **Systemic Innovations**, i.e. product and process innovations that require changes in multiple firms, are difficult to implement in project based industries.
- Low bid ad-hoc teams
 - Clients select the services based on the lowest price – in design this basically means selecting the least effort
- Sub-optimisation
 - Because of the low-bid business model, everyone must minimise their own workload, despite of the fact that the consequent mistakes increase total costs.
- Missing business benefits for upstream partners
 - Why would they produce more or better information?
- Legal responsibilities
 - Fear that new methods increase uncertainty and risks

Perceived BIM ROI by domain – what is the incentive for designers?

Less perceived benefits in the “upstream” – i.e. design and engineering



■ Negative or Break-Even ■ Moderately Positive (Up to 25%) ■ Very Positive (Over 25%)



More perceived benefits in the “downstream” – i.e. construction

Biggest challenge:
Resistance to change

“It will not slice a pineapple”

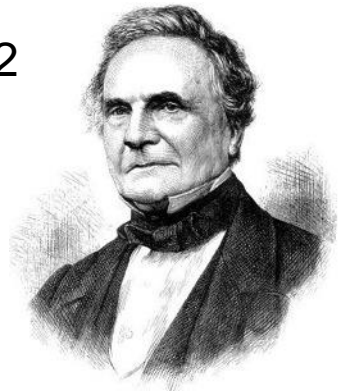
“Propose to any Englishman* any principle, or any instrument, however admirable, and you will observe that the whole effort of the English mind is directed to find a difficulty, a defect, or an impossibility in it.

If you speak to him of a machine for peeling a potato, he will pronounce it impossible: if you peel a potato with it before his eyes, he will declare it useless, because it will not slice a pineapple.

Impart the same principle or show the same machine to an American, and you will observe that the whole effort of his mind is to find some new application of the principle, some new use for the instrument.”

Charles Babbage, 1852

Many people try to **invent excuses** why not accept changes – such as BIM – but the **real** reason is that **they do not want** to change!



The industry needs a wake up call...



Most important factors to increase the use of BIM

Most Important Factors for Increasing BIM Benefits (2009 and 2012)

Source: McGraw-Hill Construction, 2012

2012
2009

Improved Interoperability between Software Applications



Improved BIM Software Functionality



More Clearly-Defined BIM Deliverables Between Parties



More Owners Asking for BIM



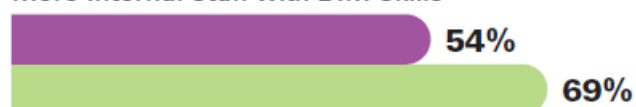
More 3D Building Product Manufacturer Content



Reduced Cost of BIM Software



More Internal Staff with BIM Skills



More Use of Contracts to Support BIM



More External Firms with BIM Skills



More Entry-Level Staff with BIM Skills

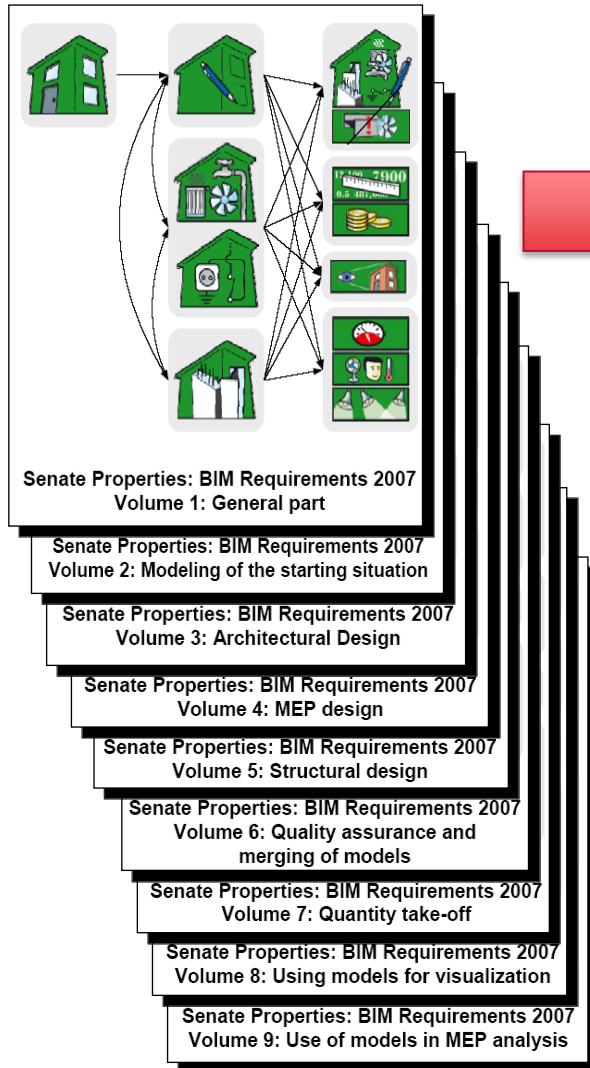


Some public owners demanding BIM

- GSA (General Services Administration, USA) 2007
 - First only Spatial Programme Validation, later expanded to Energy Performance & Operations and Circulation & Security Validation
- Senate Properties (Finland) 2007
 - Models mandatory through the whole design process
 - COBIM 2012 national BIM requirements covering the whole information lifecycle
- USACE (US Army Corps of Engineers) 2008
- USCG (US Coast Guard, USA) 2009
- Danish Enterprise and Construction Authority 2009
- Statsbygg (Norway) 2010

COBIM 2012

2007 Senate Properties BIM guidelines



National BIM requirements in Finland:

1. General Requirements
2. Modelling of the Starting Situation
3. Architectural Design
4. MEP Design
5. Structural Design
6. Quality Assurance
7. Quantity Take-off
8. Use of Models for Visualisation
9. Use of Models in MEP analyses
10. Energy Analysis
11. Management of a BIM Project
12. Use of Models in Facility Management
13. Use of Models in Construction
14. *Use of Models in Building Permitting*

What about UK...



Point of the Departure – May 2010

- Most people in UK – also in the universities – felt that modelling is not, and will not be, important for AEC professionals in the future:
 - *“The industry needs people who can make drawings with CAD and our task is to provide those skills. There is no industry demand for BIM and we cannot start teaching it. 3D modelling is too expensive for the industry and too complicated for our students.”*

Paul Morrell on 1st October 2010

1 October 2010 | By Anna Winston

The government's chief construction adviser Paul Morell has indicated that Building Information Modelling (BIM) will become a key part of the procurement of public buildings.

Speaking at Autodesk's BIM Conference yesterday, Morrell indicated that bidders and contractors on future public building projects would be asked to use BIM.



...and a quick response from the industry...



Simon Kaufman | 11 October 2010 11:06 am

Hold on a second! the Politicians are telling us how to DRAW our buildings now?
Telling us what CAD software to use?!?!?

Apart from the majority of architects not yet using BIM, it is far from tried and tested – no matter how appealing the Autodesk Sales representative's spiel seems when he visits your office – there are several major drawbacks to using it.

You do your Job, Mr. Morell, and I will do mine – and as building designer I will decide how and when I will use BIM.

...but industry associations got active immediately

The Construction Industry Council (CIC) is the representative forum for the professional bodies, research organisations and specialist business associations in the construction industry.

Launch Event

BIM4SME Launch

The BIM4SME group was launched on Monday 15 April 2013 at the Building Centre in London to a packed auditorium containing a broad cross section of built environment SMEs...
[\[read more\]](#)

RIBA Insight

Menu

- Solutions
- Products
- Monthly Briefing**
 - BIM (Building Information Modelling) for manufacturers
 - Five SEO tips for beginners
 - Give your CPD profile a boost in 2014

BIM: what is it, and how does it affect you?

BIM stands for 'Building Information Modelling' (or 'model') and is already common terminology in the US and parts of Scandinavia. Without doubt it represents the future of construction documentation. Dr Stephen Hamil, director of design and innovation and Head of Building Information Modelling at NBS, explains what it's all about.

RICS

Home / BIM

BIM

21 Mar 2012

Building information modelling (BIM) is an essential tool for property professionals and is revolutionising the surveying industry.

The delivery of new buildings has been revolutionised with BIM with rapid developments in the design and construction of more intelligent buildings across the globe. It is a technology and a way of working that the UK government has included in its Construction Strategy in a drive to cut down costs on public sector projects.

CIOB

EVENTS

Introduction to BIM

Thursday 15th November 2012

BiM

Building Information Modelling (BIM) Task Group

BiM regional hubs

Regional Hubs

- CIC BIM Regional Hubs
- Regional Hub Champions
- Regional Map
- North East
- South West
- Wales
- Yorkshire & Humber

CIC was tasked with setting up a network of BIM Regional Hubs to help ensure that the most up-to-date and consistent information on the UK Government Level 2 BIM programme was disseminated across the UK, and allowing for a local feedback mechanism to the Government BIM Task Group at a grass roots level.

Paul Morrell on 20th May 2011

Construction chief Paul Morrell dismissed other 'unambitious' plans at the London KBB conference

The use of Building Information Modelling will be made mandatory on virtually all government projects within five years, according to Paul Morrell, the government's chief construction adviser.

A report by the Innovation and Growth Team last year, which recommended BIM being used on projects over £50m, was dismissed by Morrell as "unambitious".

He said the only exceptions would be when using BIM made the project more expensive. He said: "Within five years, all government procurement will be within 3D collaborative BIM, with specific exceptions where the cost might exceed the benefit, although I have to say I'm struggling to think of obvious examples of that."

BIM requires firms to conform to a set of standard processes and 3D modelling of projects. A formal announcement on the five-year roll-out of BIM will be made by the government in June.

The move to widen the net below £50m projects to catch all firms working for the government marks a radical departure from previous government thinking.

At the KBB conference in London on Tuesday, run by Building's parent company UBM, Morrell said: "There's no lower limit."

<http://www.building.co.uk/news/all-government-projects-to-use-bim-within-five-years/5018349.article>



Related Articles

BIM: Designing tomorrow
27 May 2011

BIM could cost Qs £2k per person
27 May 2011

Morrell: Five year plan to roll out BIM
17 May 11

BIM roll-out for public projects hits three-month delay
21 April 2011

The legal implications of using Building Information Modelling

Francis Maude on 31st May 2011



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Government Construction Strategy to reduce costs

31 May 2011

The Minister for the Cabinet Office, Francis Maude publishes the Government's new [Construction Strategy](#) today.

The strategy will reform the way in which government procures construction across all sectors, and in doing so will reduce costs by up to 20% by the end of this parliament, helping both the government and the construction sector.

The Government's [Plan for Growth](#), published alongside [Budget 2011](#), and the [Infrastructure Cost Review Implementation Plan \[PDF, 627KB\]](#), published earlier this year, highlighted the critical importance of an efficient construction industry to the UK economy and the need for reform of public sector construction procurement to improve value for money to taxpayers and enable the construction industry to focus on bringing forward innovative solutions. This strategy sets out the detailed programme of measures Government will take to reform the way in which it procures construction.



Related links

- [Government Construction Strategy](#)
- [Infrastructure UK cost review](#)
- [Growth review](#)

Related News and Media

- [Government to invest £22 billion in construction projects](#)
- [£4 billion to flow directly to SMEs through Government construction projects and a new construction pipeline](#)
- [Taxpayers get more for their money on construction projects](#)

[View all news](#)

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

Francis Maude now in the web...

...adoption of BIM will put us at the vanguard of the new digital construction era and position the UK to become the world leaders in BIM.

Francis Maude
Minister for the Cabinet Office



<http://www.bimtaskgroup.org/>

UK Government ~~BIM~~ has woken the industry up



David Philp 17th April 2012

Why?

Dear Chief Secretary

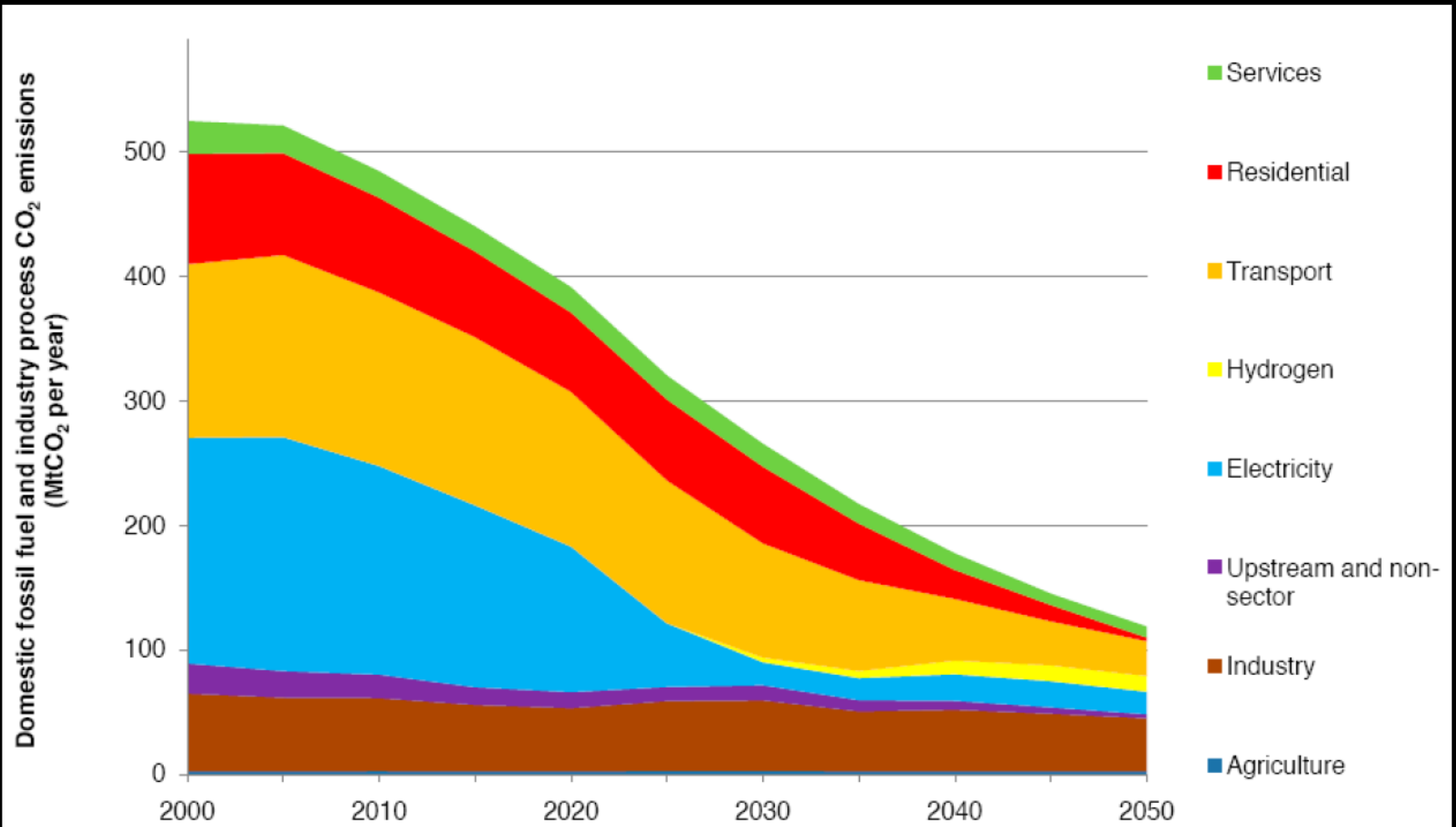
*I'm sorry to tell you
there's no money left.*



Whoops



The end game



Source: Building a low-carbon economy, CCC

Paul Morrell 2nd November 2011

A photograph of a light-colored Weimaraner puppy sitting on a tree trunk. The puppy is looking directly at the camera with its large, floppy ears. The tree bark is light-colored with dark, horizontal lenticels. The background is slightly blurred, showing more of the tree and some foliage.

Cash

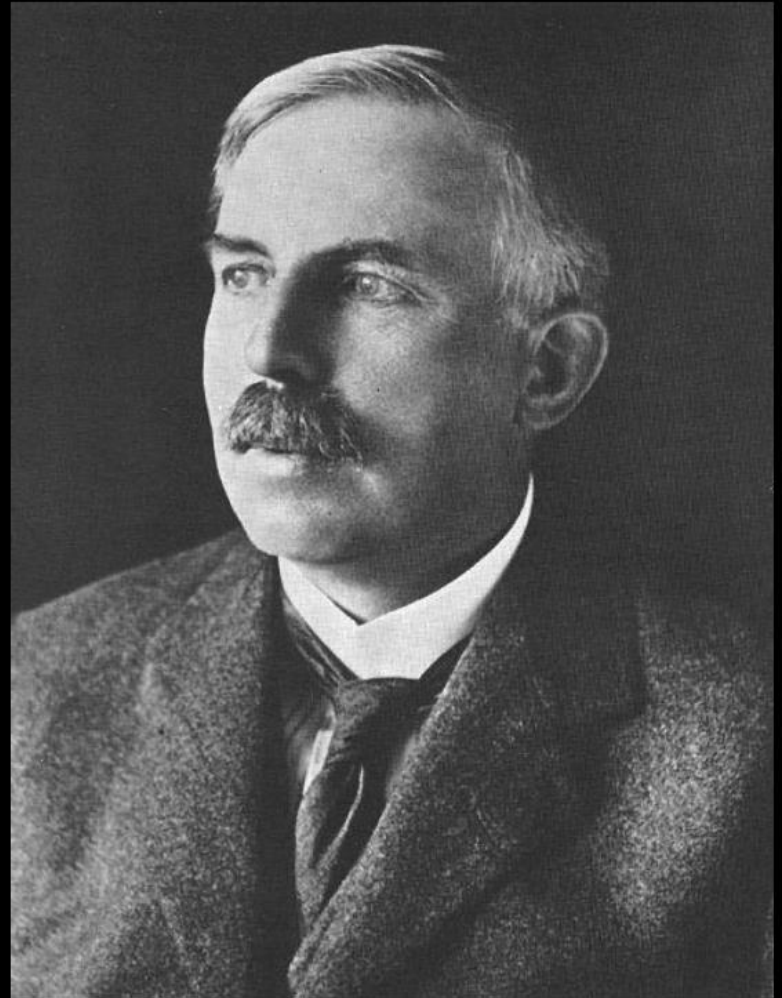
Carbon



***The question which urgently needs answering is:
how can the construction industry most effectively
deliver a low carbon future?***

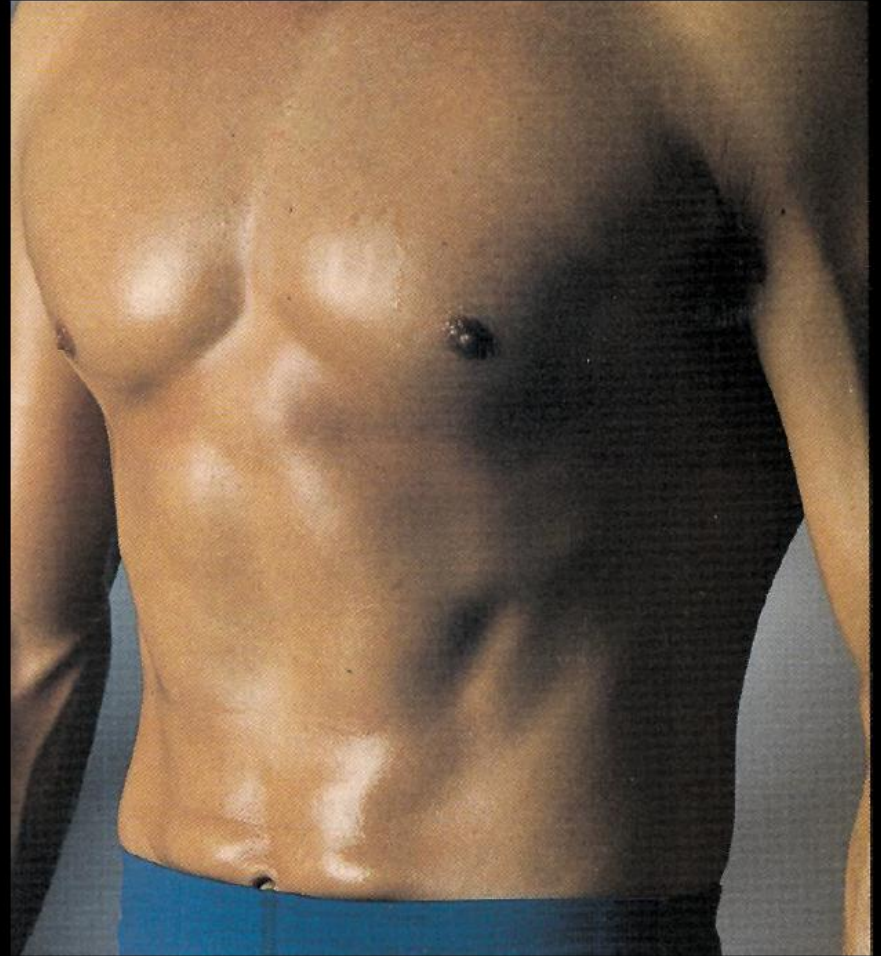
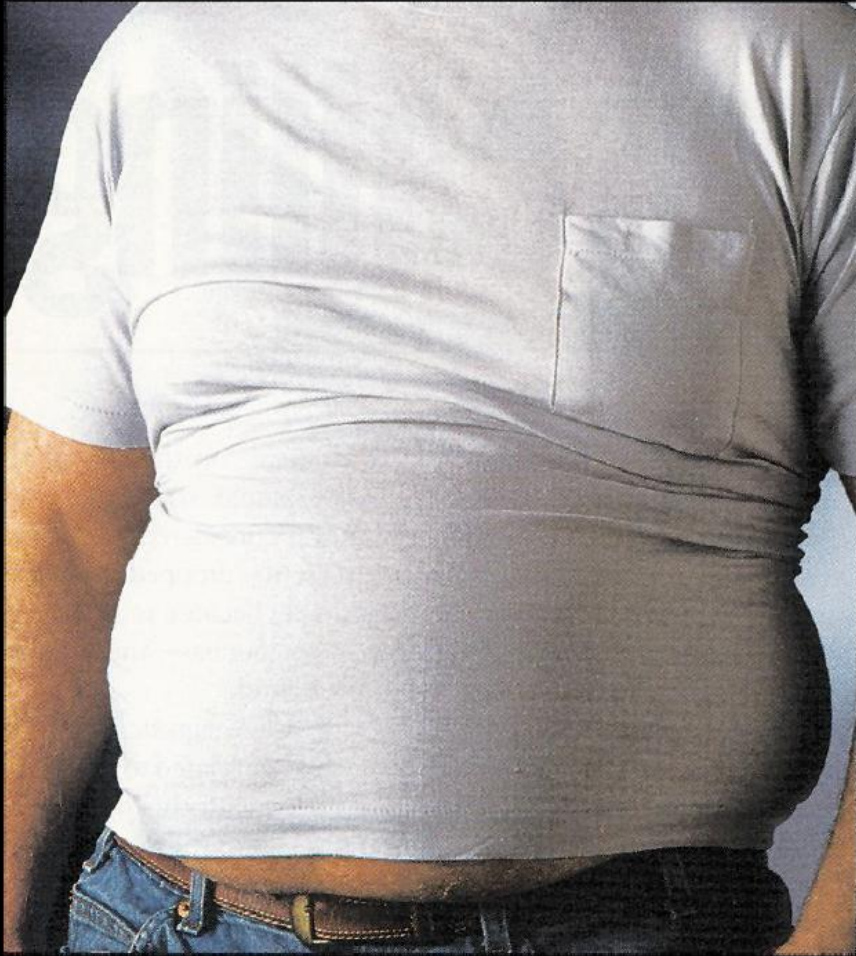
*We haven't got
the money,
so we've got to
think.*

Ernest Rutherford
(Baron Rutherford of
Nelson)

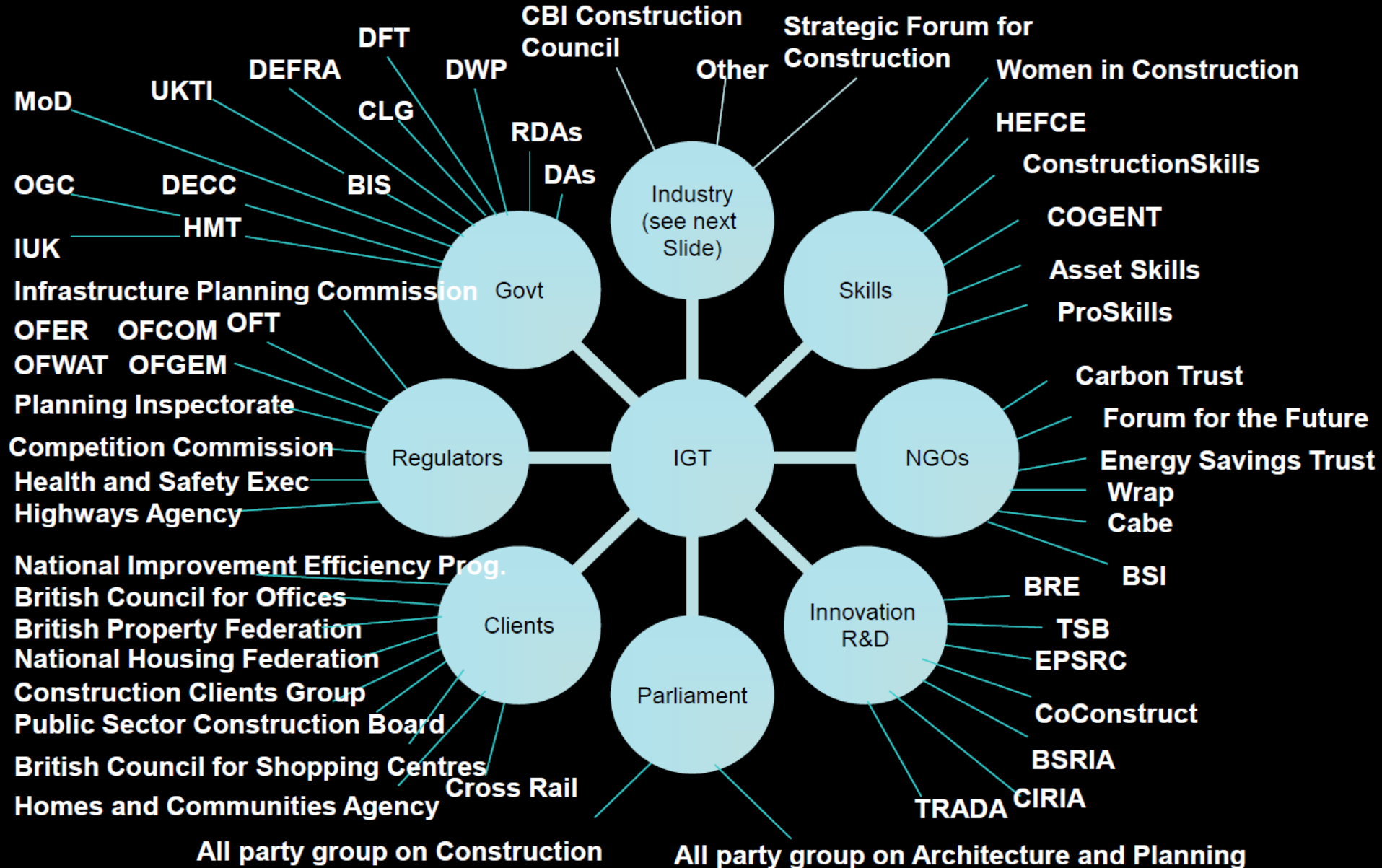


Industry problems?

An industry fit for purpose?



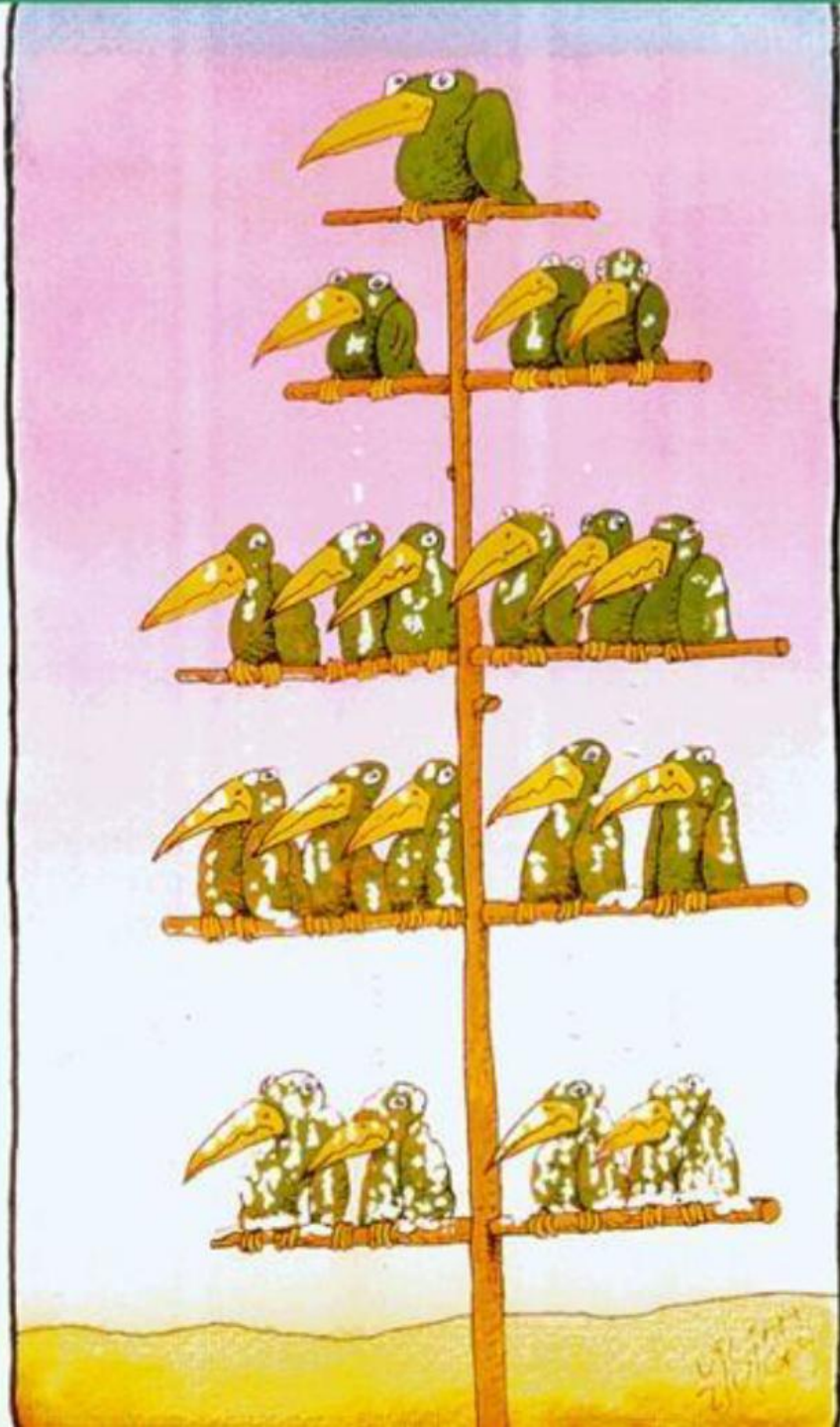
Fragmentation



The silo problem



The hierarchy problem





How can we persuade the industry and its clients that BIM is worthwhile?



Innovation



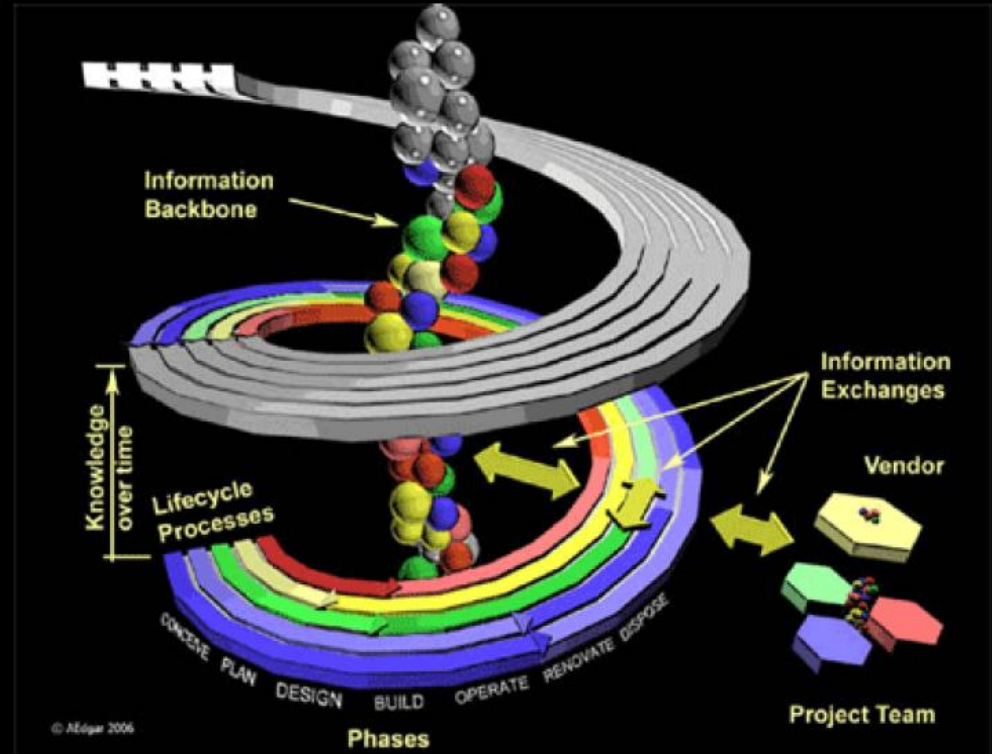
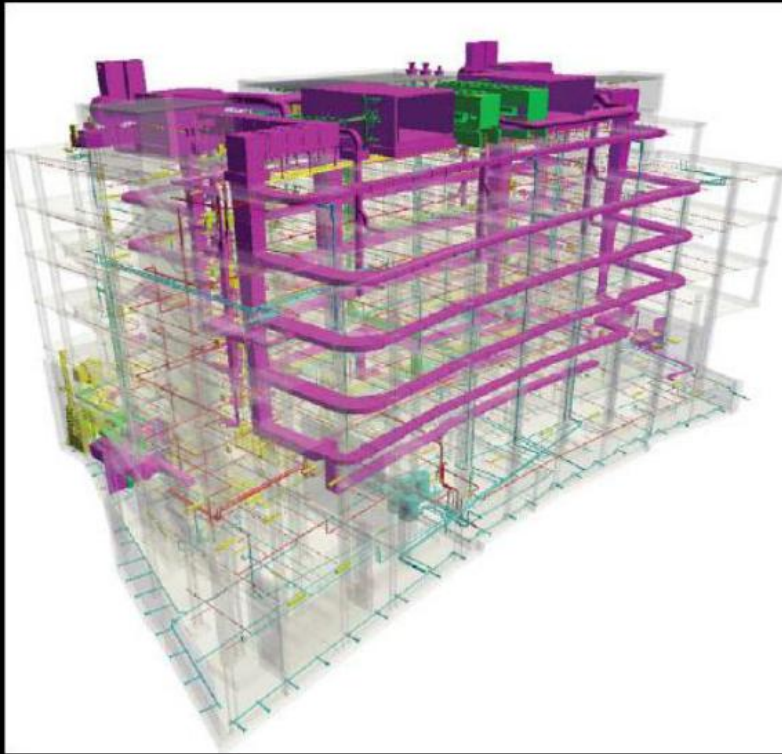
Integration



Collaboration



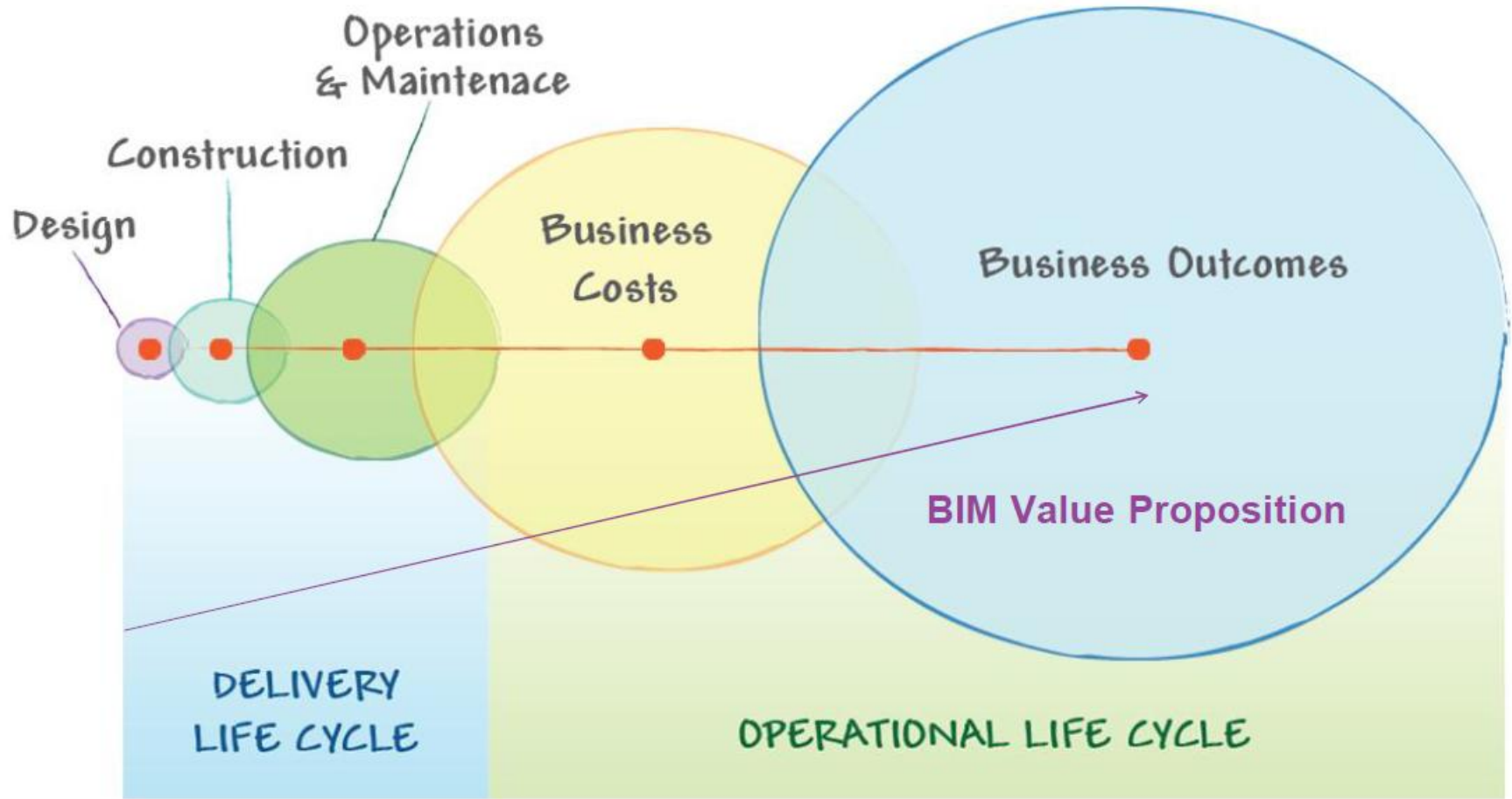
Building Information Modelling (and Management)



Hypothesis

**“Government as a client
can derive significant
improvements in cost,
value and carbon
performance through the
use of open sharable
asset information”**

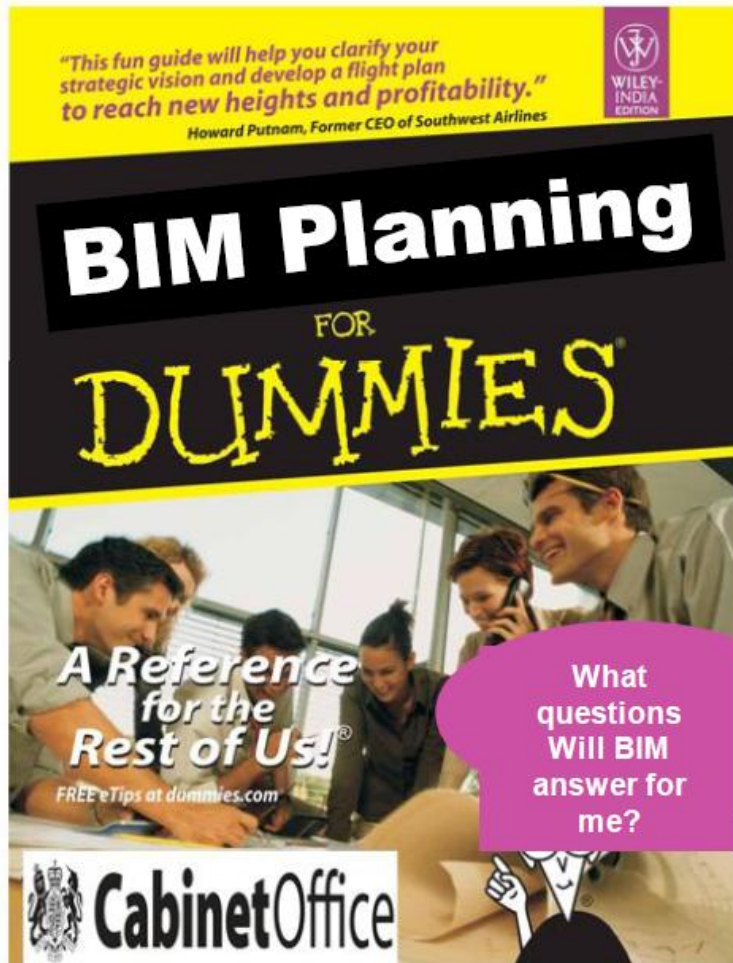
1. Valuable
2. Understandable
3. General
4. Non Proprietary
5. Competitive
6. Open
7. Verifiable
8. Compliant
9. Funded
10. Five Year Programme



David Philp 17th April 2012



David Philp 17th April 2012



**Become
Great at
Articulating
Our desired
BIM
Outcomes**
Clear and simple guidance



**However
Not
becoming
a BIM
Expert**



**But
Understand
Our role
In the BIM
Process**

What is the Strategy?

- Push (Supply Chain)
 - Early Warning to Mobilise
 - Training
 - Methods & Documentation
- Deliver Level 2 BIM by 2016

- Pull (Government)
 - Be good in buying data (as well as assets and services)
 - Do it consistently
 - Leave the “How” to the Supply Chain

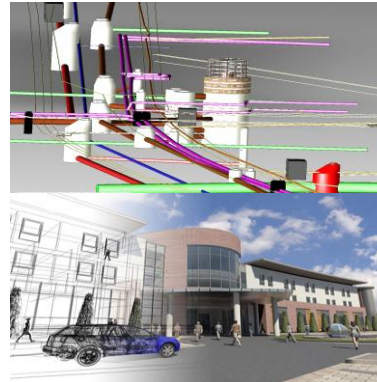
PUSH

How can we make it easier for the supply chain to move forward?

But not force or distort the market?

- Contracts
- Training
- Technology
- Legal's

PROJECT



PULL

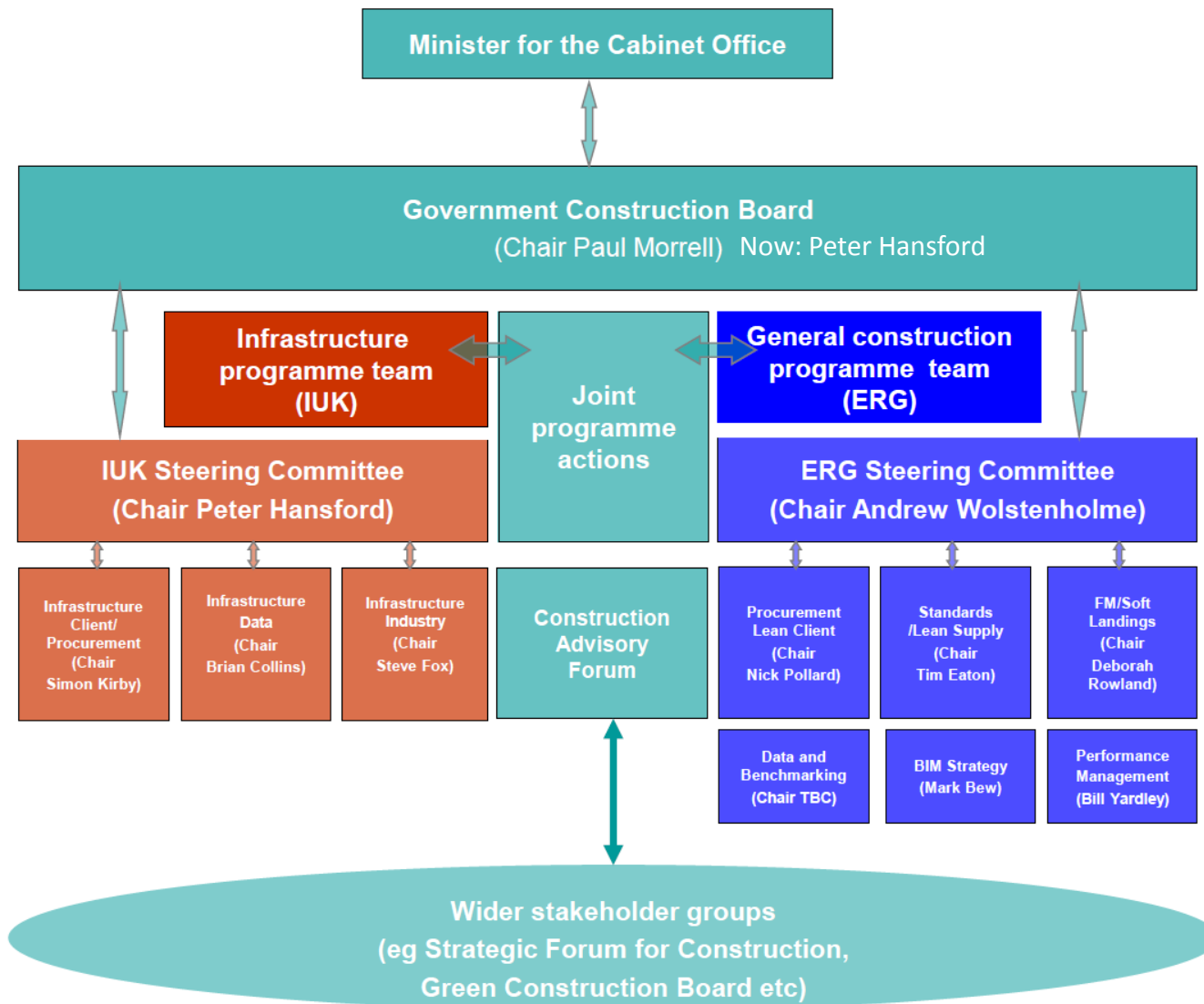
How do we ensure we get the information we need to operate the Asset we have bought?

How do we gather the information we need to manage the asset?

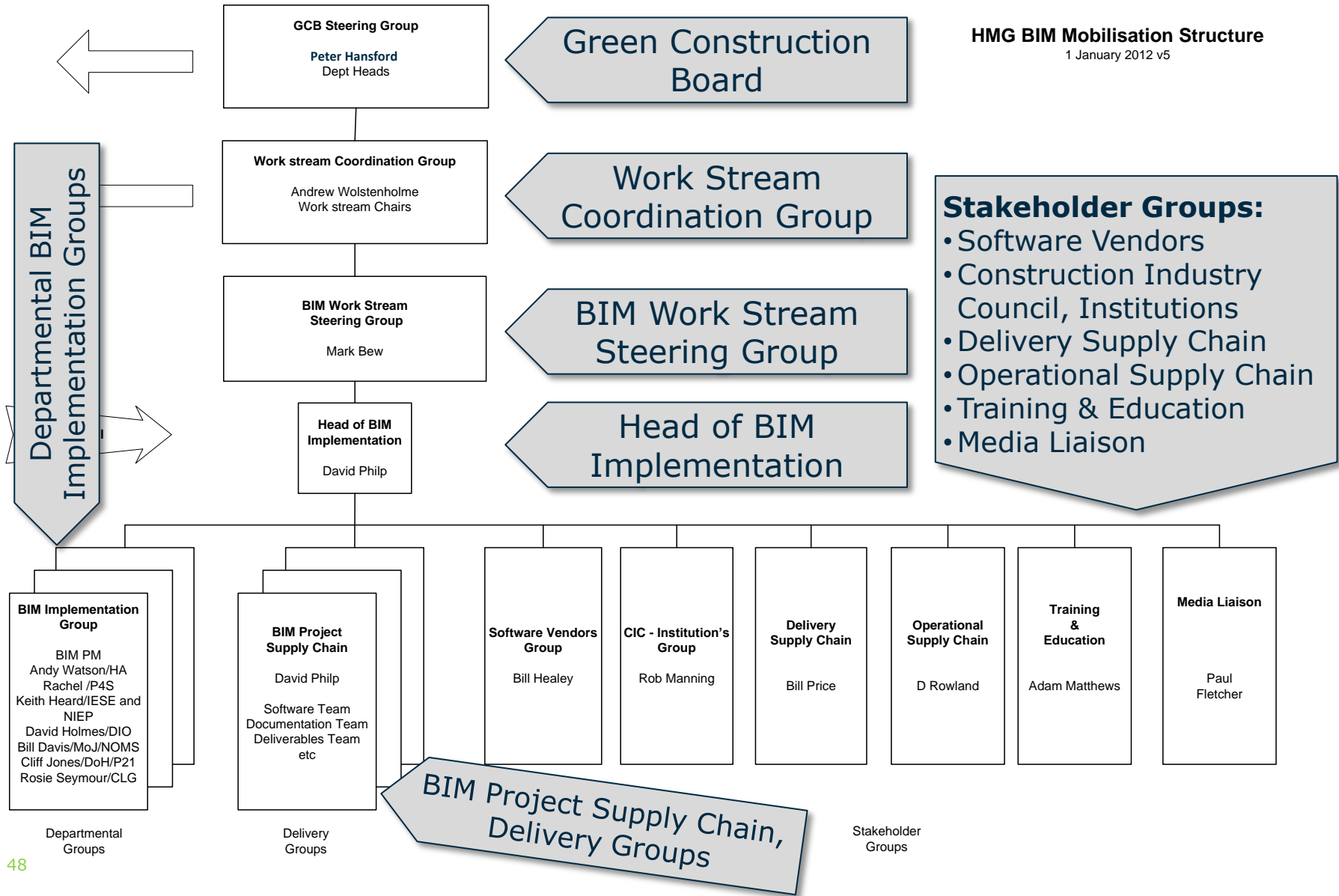
How do we make it fair so we don't force or distort the market?

- Make it clear what we want
- When we want it
- Collect it electronically
- Keep it simple to start

Government Construction Board



HMG BIM Mobilisation Structure



Level of Detail: Data Drop 1

Requirements and constraints

Level of Detail: Data Drop 2

Outline solutions

Level of Detail: Data Drop 3

Construction information

Level of Detail: Data Drop 4

Operation and maintenance information

Data Drop 1
Model represents
REQUIREMENTS and CONSTRAINTS

Data Drop 2
Model represents
OUTLINE SOLUTION

Data Drop 3
Model represents
CONSTRUCTION INFORMATION

Data Drop 4
Model represents
OPERATIONS and MAINTENANCE INFORMATION

Spatial model - simple 'box'

RDS - representing functional



3D model - MEP and FF&E items

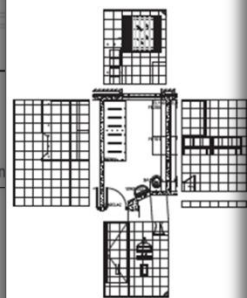
RDS - representing functionality as des



RDS - repre

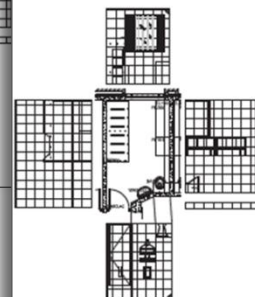


3D model - MEP and FF&E items sh

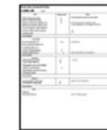


Room Data Sheets - representi

3D model - MEP and FF&E items show as-installed products, plant and equipment



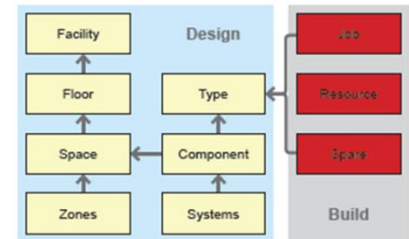
RDS - environmental conditions for O&M



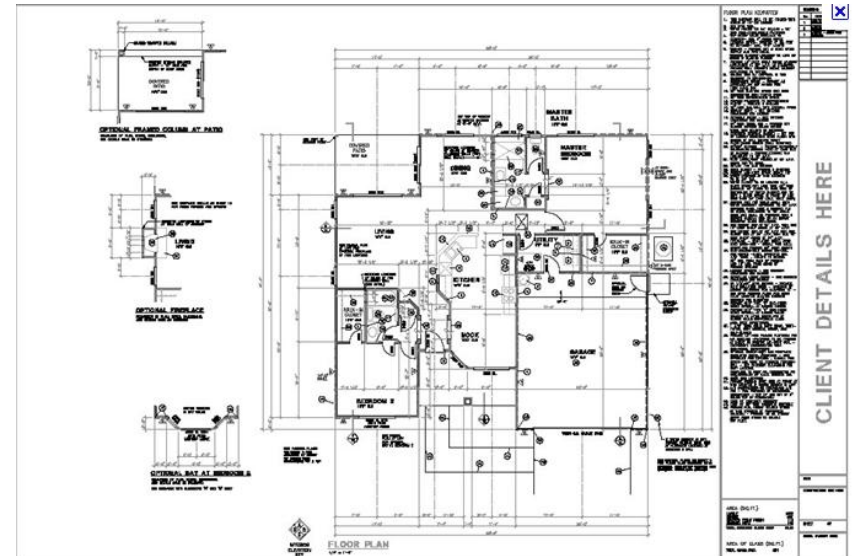
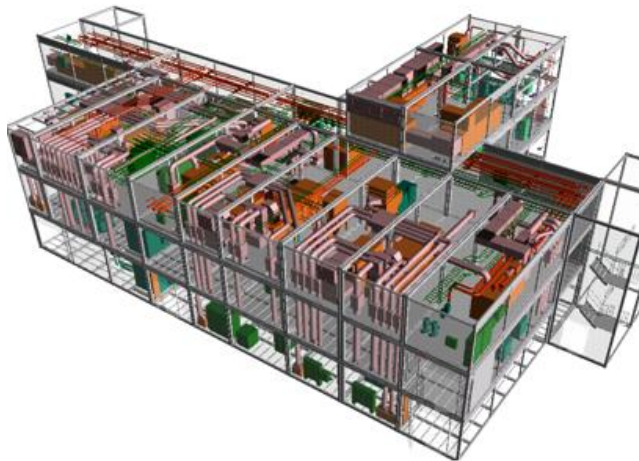
RDS - finishes for O&M



RDS - furniture for O&M



Asset information will be required in COBie format (Construction Operations Building Information Exchange)



Microsoft Excel - Railway

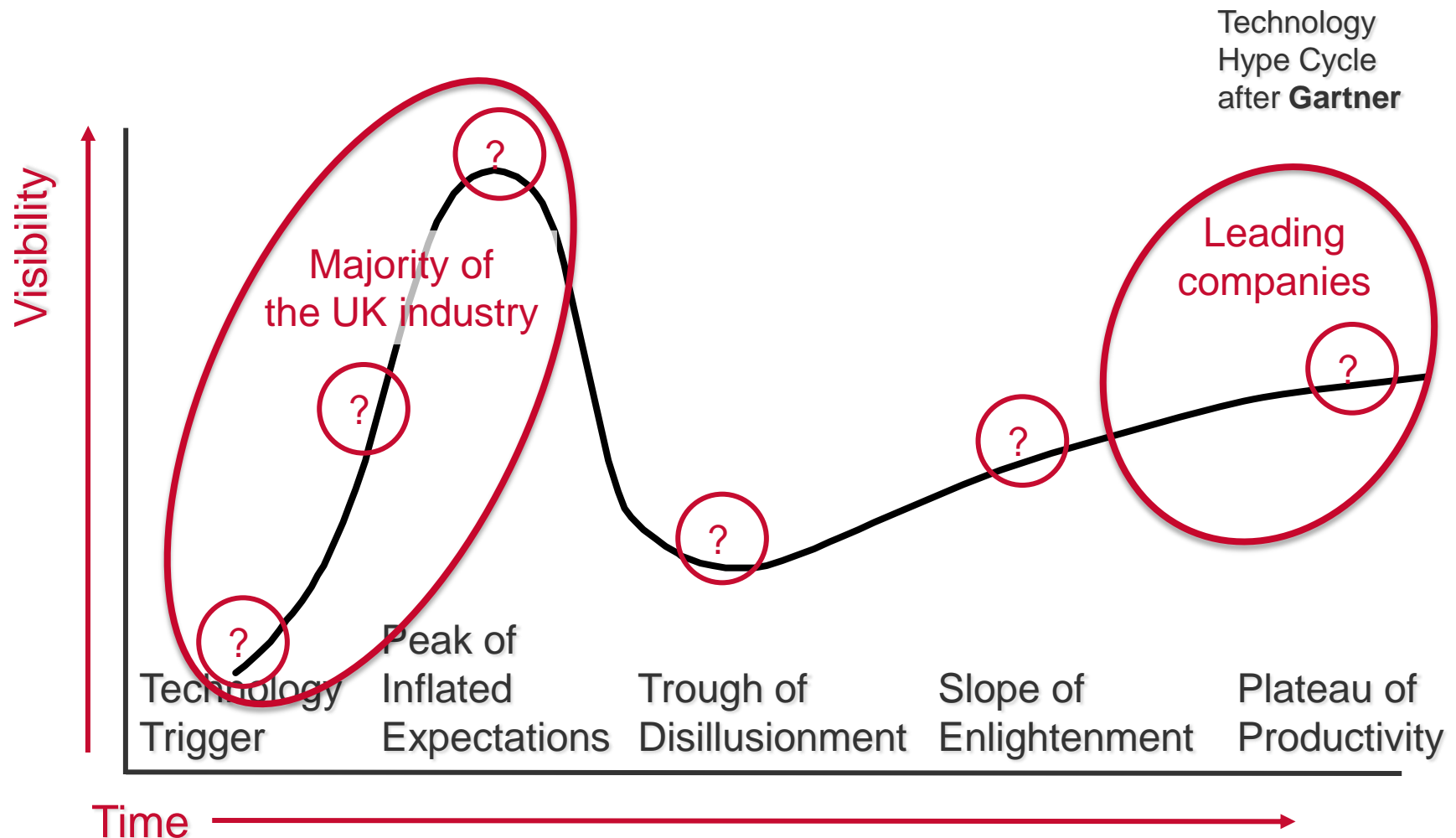
	A	B	C	D	E	F	G	H	I	J	K
	Name	CreatedBy	CreatedOn	Type	SpaceName	Description	EntSystem	EntObject	EntParent	SerialNumber	InstallationDate
1											
2	Door-100A	berol@q.com	2009-11-04T11:08:38	Hardware Items	100A	Door Type D1	100A	Door	000-01-1	2009-03-01	
3	Door-100F	berol@q.com	2009-11-04T11:08:38	Hardware Items	100F	Door Type D1	100F	Door	000-01-2	2009-03-01	
4	Door-100S	berol@q.com	2009-11-04T11:08:38	Hardware Items	100S	Door Type D1	100S	Door	000-01-3	2009-03-01	
5	Door-101A	berol@q.com	2009-11-04T11:08:38	Hardware Items	100A_101	Door Type D1	100A	Door	000-01-4	2009-03-01	
6	Door-102A	berol@q.com	2009-11-04T11:08:38	Hardware Items	100B_102	Door Type D1	100B	Door	000-01-5	2009-03-01	
7	Door-103A	berol@q.com	2009-11-04T11:08:38	Hardware Items	100A	Door Type D1	100A	Door	000-01-6	2009-03-01	
8	Door-104A	berol@q.com	2009-11-04T11:08:38	Hardware Items	100A_104	Door Type D1	100A	Door	000-01-7	2009-03-01	
9	Door-105A	berol@q.com	2009-11-04T11:08:38	Hardware Items	100A_105	Door Type D1	100A	Door	000-01-8	2009-03-01	
10	Door-100C	berol@q.com	2009-11-04T11:08:38	Overhead Cooling Doors Assembly	100A	Overhead Door	100A	Door	C000-012-01	2009-03-01	
11	Door-100D	berol@q.com	2009-11-04T11:08:38	Overhead Cooling Doors Assembly	100A	Overhead Door	100A	Door	C000-012-02	2009-03-01	
12	Door-100E	berol@q.com	2009-11-04T11:08:38	Overhead Cooling Doors Assembly	100A	Overhead Door	100A	Door	C000-012-03	2009-03-01	
13	Door-100B	berol@q.com	2009-11-04T11:08:38	Overhead Cooling Doors Assembly	100A	Overhead Door	100A	Door	C000-012-04	2009-03-01	
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15	RH-1	berol@q.com	2009-11-04T11:08:38	HVAC System Components and Equipment	100A	Radiant Heater	100A	Heat Pump	236S-300-1	2009-03-01	
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27	RH-13	berol@q.com	2009-11-04T11:08:38	HVAC System Components and Equipment	100B	Radiant Heater	100B	Heat Pump	236S-300-9	2009-03-01	
28	RH-14	berol@q.com	2009-11-04T11:08:38	HVAC System Components and Equipment	100B	Radiant Heater	100B	Heat Pump	236S-300-10	2009-03-01	
29	RH-15	berol@q.com	2009-11-04T11:08:38	HVAC System Components and Equipment	100B	Radiant Heater	100B	Heat Pump	236S-300-5	2009-03-01	
30	RH-16	berol@q.com	2009-11-04T11:08:38	HVAC System Components and Equipment	100B	Radiant Heater	100B	Heat Pump	236S-300-11	2009-03-01	
31	RH-17	berol@q.com	2009-11-04T11:08:38	HVAC System Components and Equipment	100B	Radiant Heater	100B	Heat Pump	236S-300-6	2009-03-01	
32	RH-18	berol@q.com	2009-11-04T11:08:38	HVAC System Components and Equipment	100B	Radiant Heater	100B	Heat Pump	236S-300-12	2009-03-01	
33	RH-19	berol@q.com	2009-11-04T11:08:38	HVAC System Components and Equipment	100A	Radiant Heater	100A	Heat Pump	236S-300-13	2009-03-01	
34	RH-20	berol@q.com	2009-11-04T11:08:38	HVAC System Components and Equipment	100A	Radiant Heater	100A	Heat Pump	236S-300-14	2009-03-01	
35	RH-21	berol@q.com	2009-11-04T11:08:38	HVAC System Components and Equipment	100A	Radiant Heater	100A	Heat Pump	236S-300-15	2009-03-01	
36	EF-1	berol@q.com	2009-11-04T11:08:38	HVAC System Components and Equipment	100A	Exhaust Fan	100A	Exhaust Fan	00-1-00-EF	2009-03-01	
37	EF-2	berol@q.com	2009-11-04T11:08:38	HVAC System Components and Equipment	100A	Exhaust Fan	100A	Exhaust Fan	00-2-00-EF	2009-03-01	
38	EF-3	berol@q.com	2009-11-04T11:08:38	HVAC System Components and Equipment	100B	Exhaust Fan	100B	Exhaust Fan	00-3-00-EF	2009-03-01	
39	EF-4	berol@q.com	2009-11-04T11:08:38	HVAC System Components and Equipment	100B	Exhaust Fan	100B	Exhaust Fan	00-4-00-EF	2009-03-01	
40	EF-5	berol@q.com	2009-11-04T11:08:38	HVAC System Components and Equipment	100B	Exhaust Fan	100B	Exhaust Fan	NEF-003-01	2009-03-01	
41	EF-6	berol@q.com	2009-11-04T11:08:38	HVAC System Components and Equipment	100B	Exhaust Fan	100B	Exhaust Fan	NEF-003-02	2009-03-01	
42	EF-7	berol@q.com	2009-11-04T11:08:38	HVAC System Components and Equipment	100A	Exhaust Fan	100A	Exhaust Fan	00-4-01-EF	2009-03-01	
43	EF-8	berol@q.com	2009-11-04T11:08:38	HVAC System Components and Equipment	100A	Exhaust Fan	100A	Exhaust Fan	00-5-00-EF	2009-03-01	



***Only ask for what
you will use***

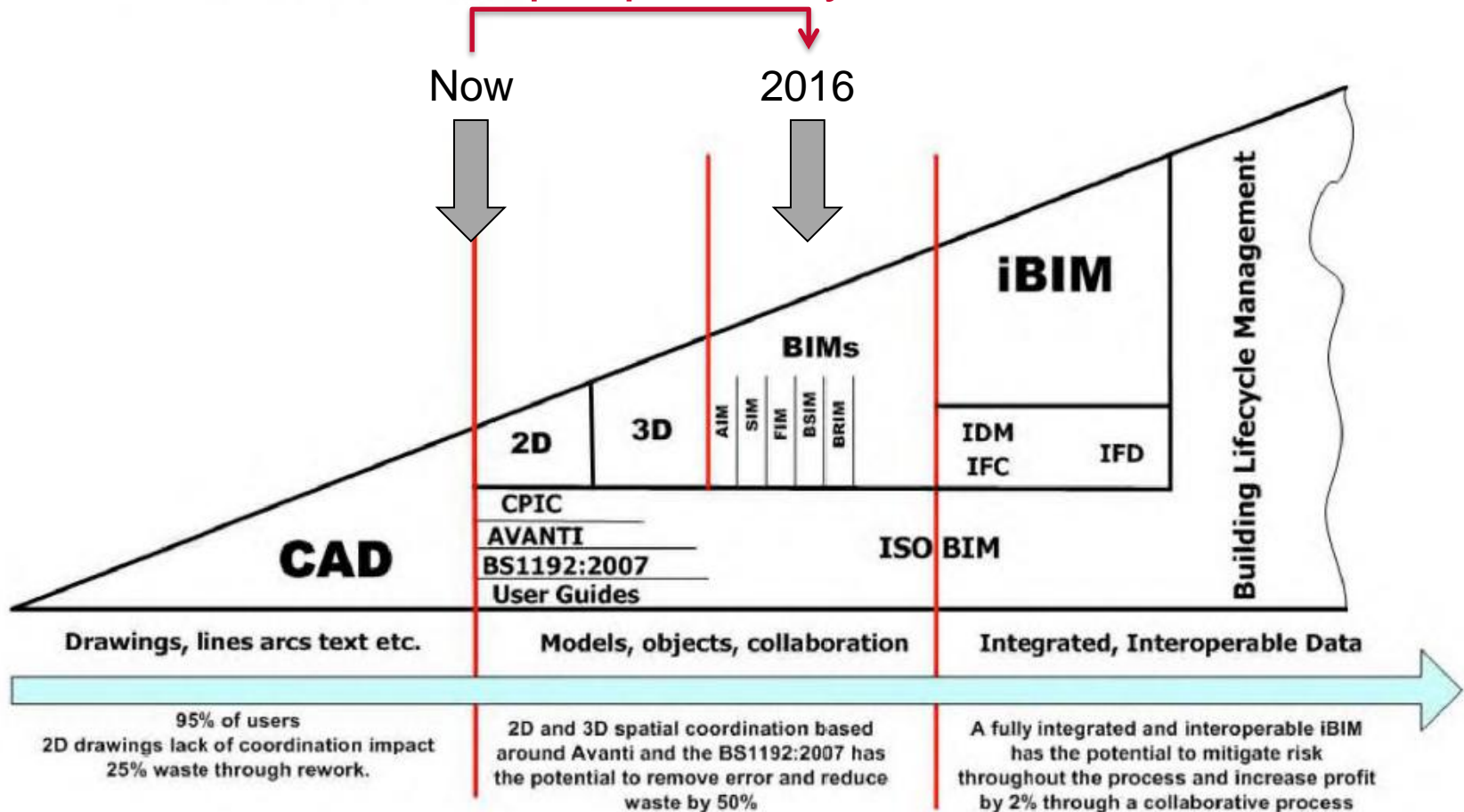
Challenges?

Understanding and management of expectations

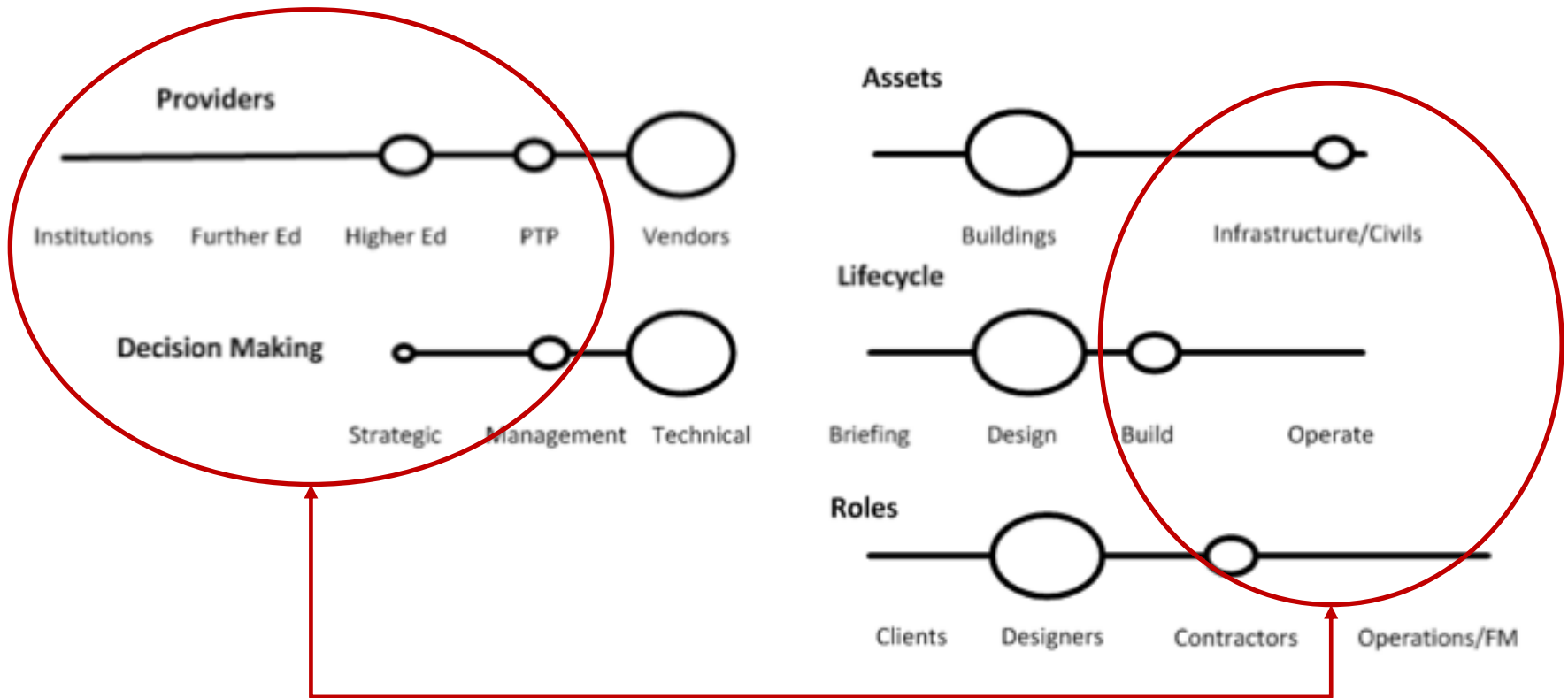


BIM education

How can we educate 150,000 companies & 3,000,000 people in 4 years?



Relative maturity/competences



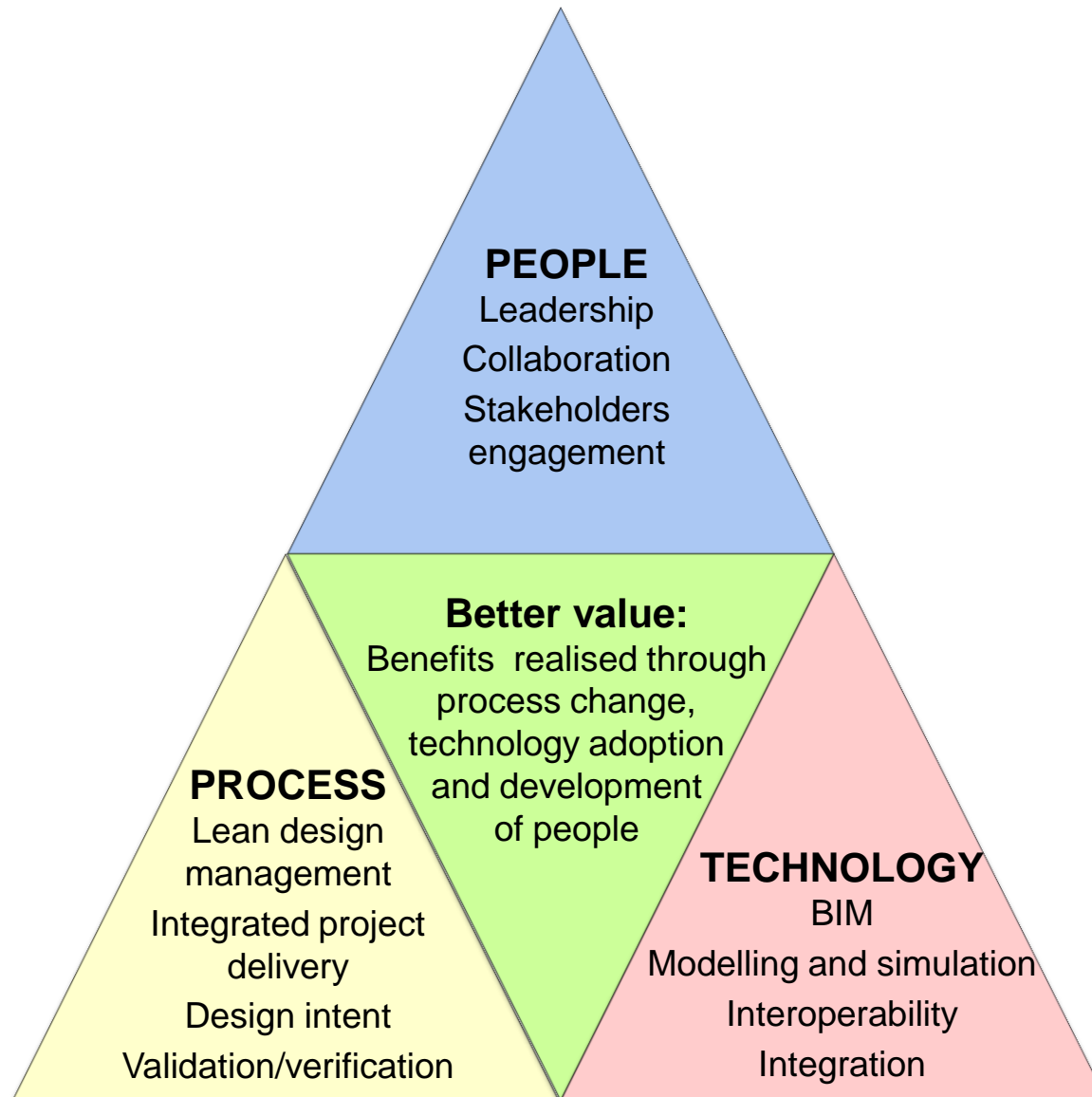
Strong domain specific views

Blind Monks Examining an Elephant

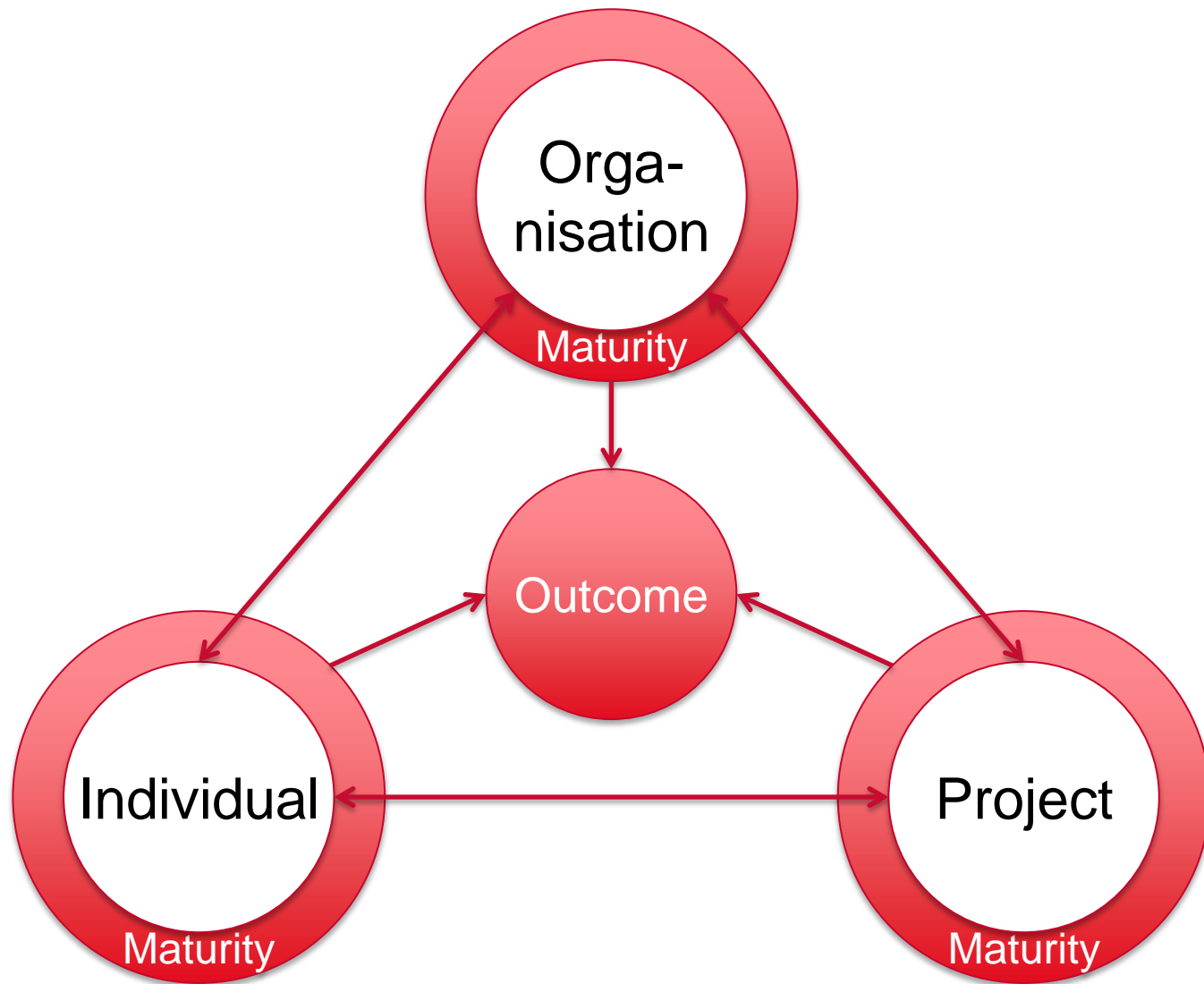
衆瞽
摸象之圖



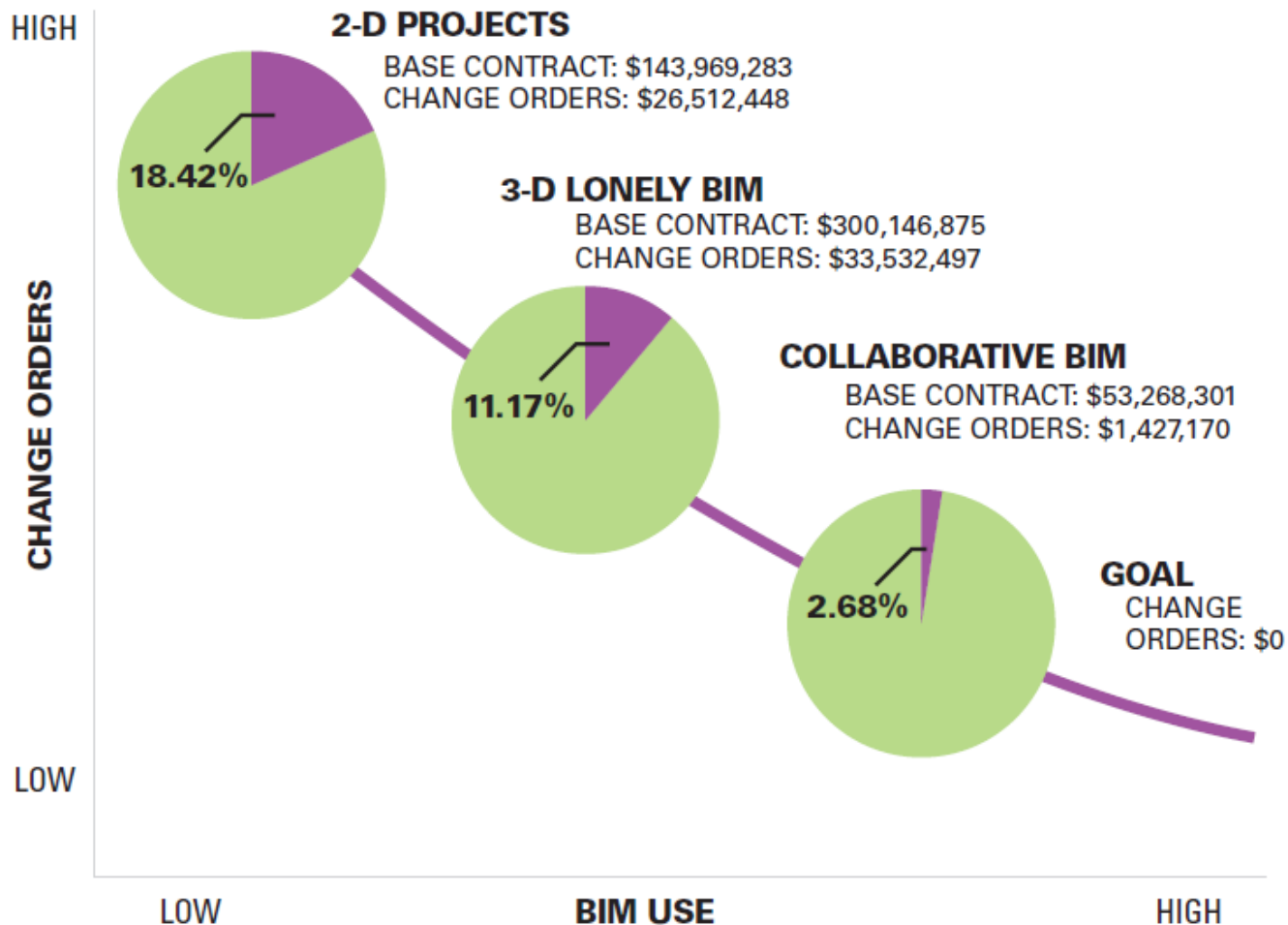
People – processes - technology



Maturity levels



Main benefits require collaboration



A study by J.C. Cannistraro of 408 projects Valued at \$559 million shows how, in the big picture, BIM saves money as the team gets more collaborative.

However, just doing what everyone **must** do is not very good business...



...you must also ask: **What's there for me?**

Vision without action is a daydream.
Action without vision is a nightmare.

Japanese proverb

Key question: What benefits are you trying to achieve with BIM?

BIM is not a goal. It is a tool and to use a tool efficiently you must know the goal

One size does not fit all...

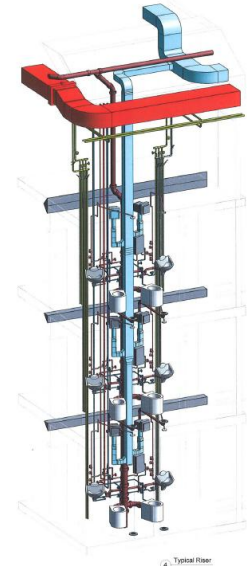
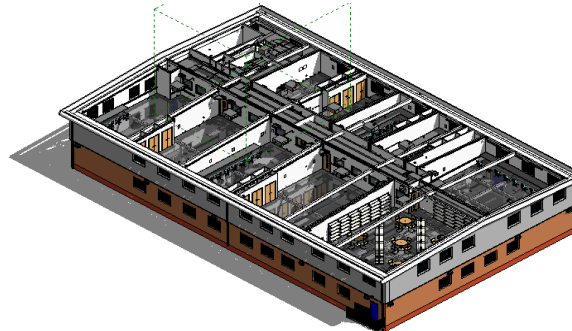
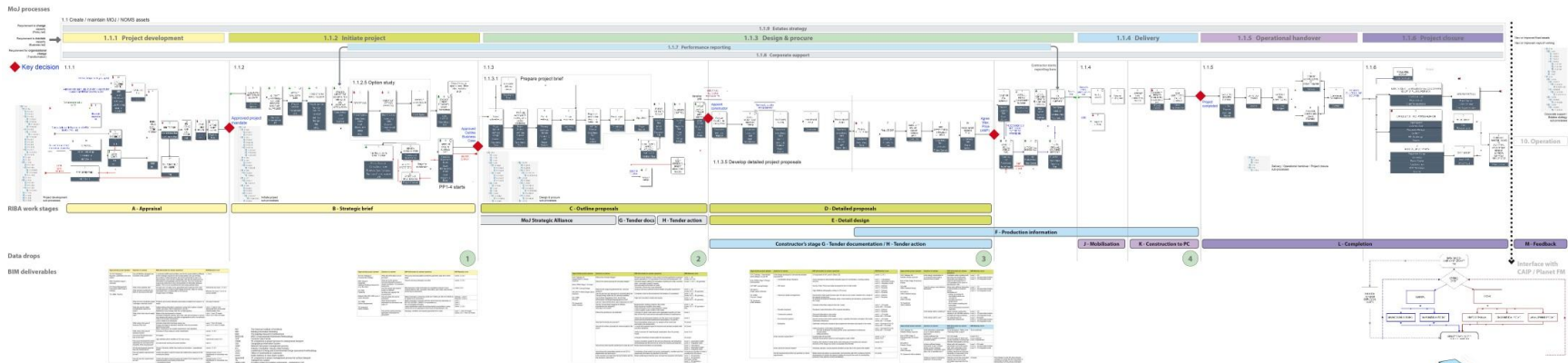


What is **your** business model?

So, where is UK now?

The journey has started. A lot of work has been done and is on-going, but even more has to be done...

Pilot projects to test requirements

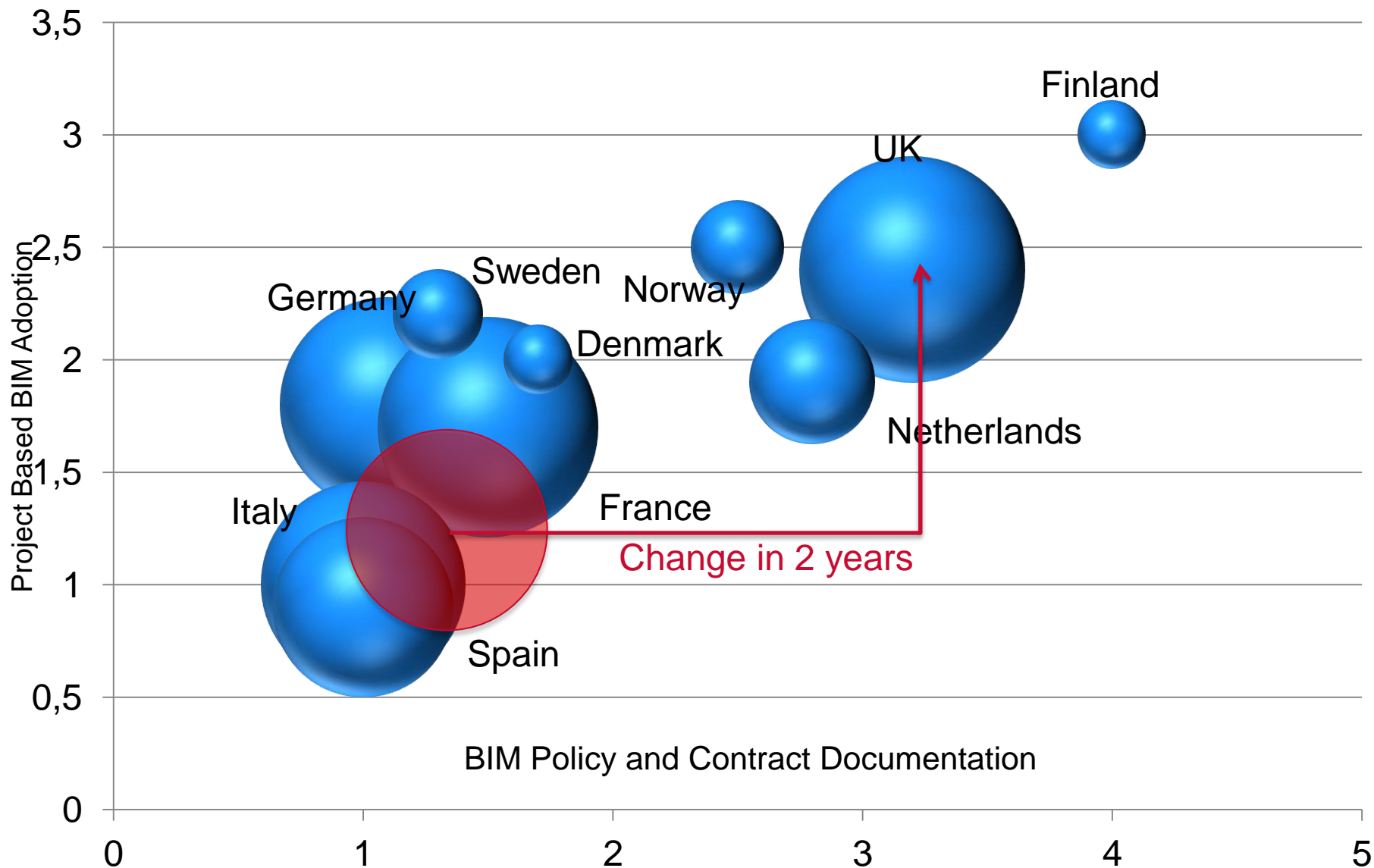


- Implementation Plan
- EIR
- Tender Documents
- Scoring Process
- Framework Training
- Framework Support

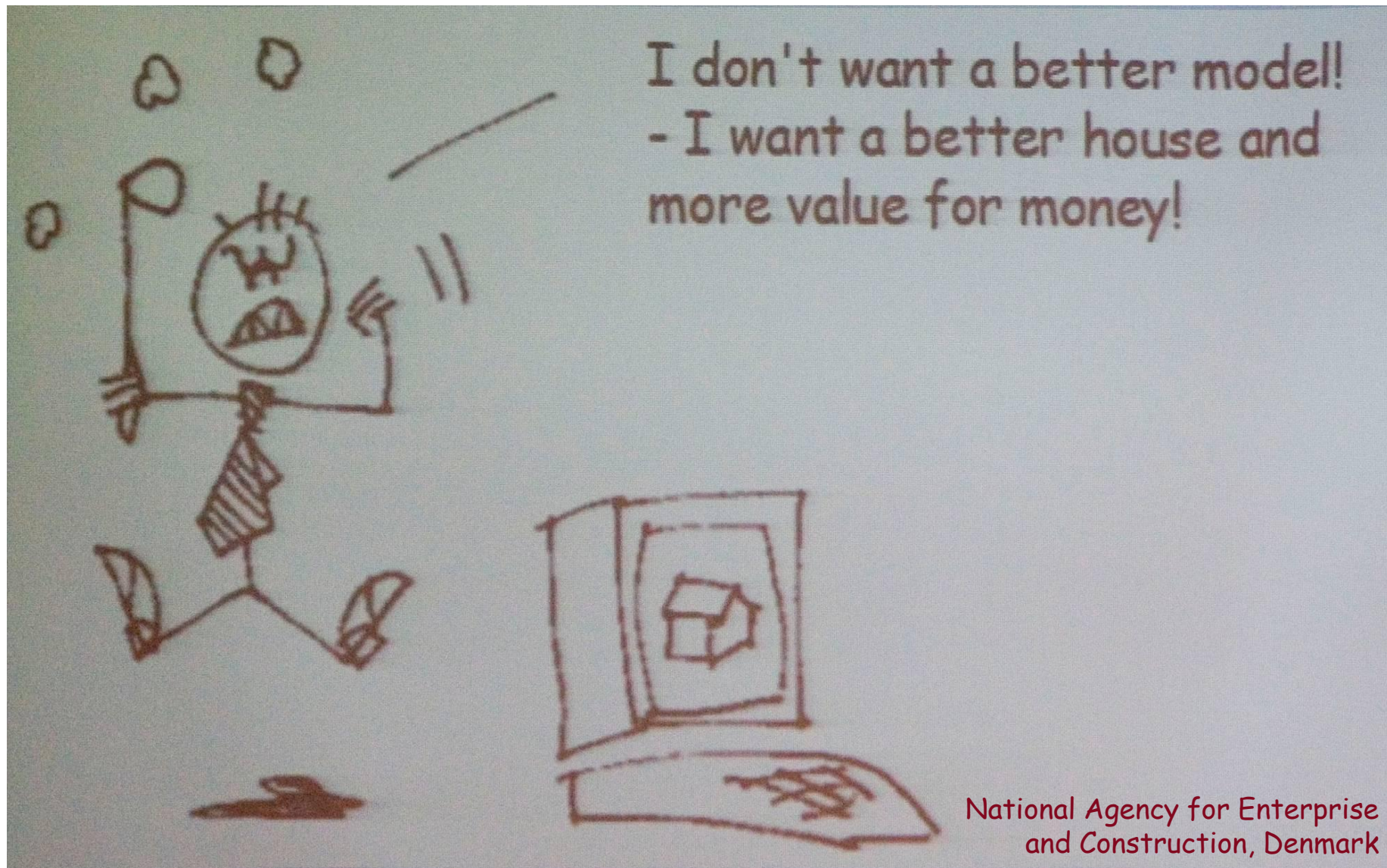
Departmental Engagement

- Departmental Strategies
- Early Adopters
- Sustained Embedded Change

BIM policy stage by adoption rating - EMEA



BIM is a tool – not the goal!



National Agency for Enterprise
and Construction, Denmark