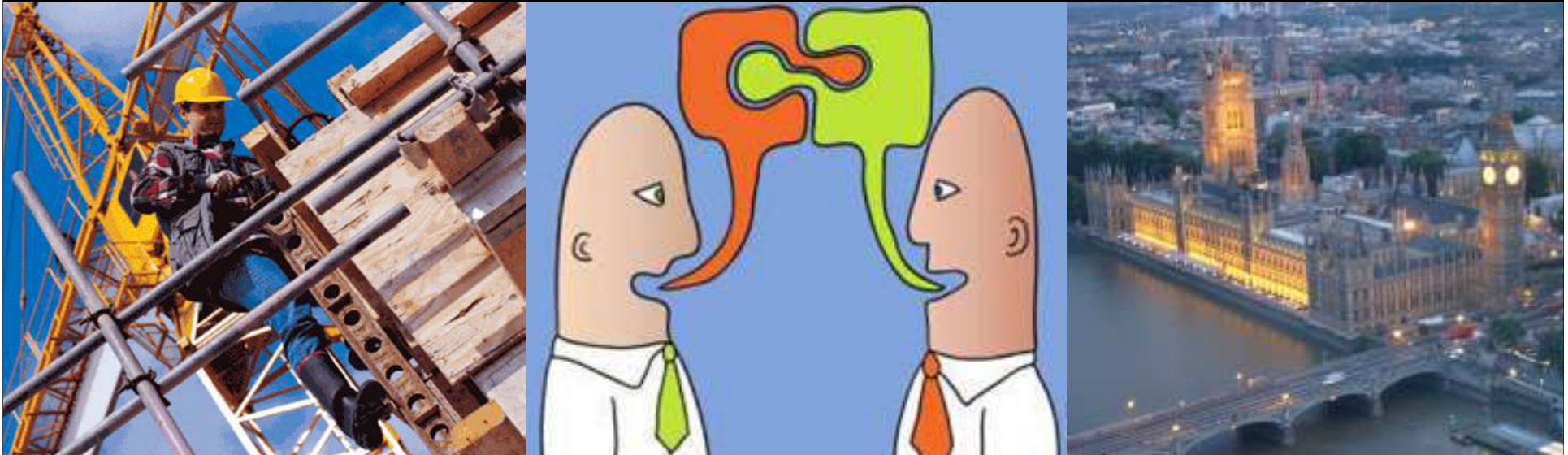


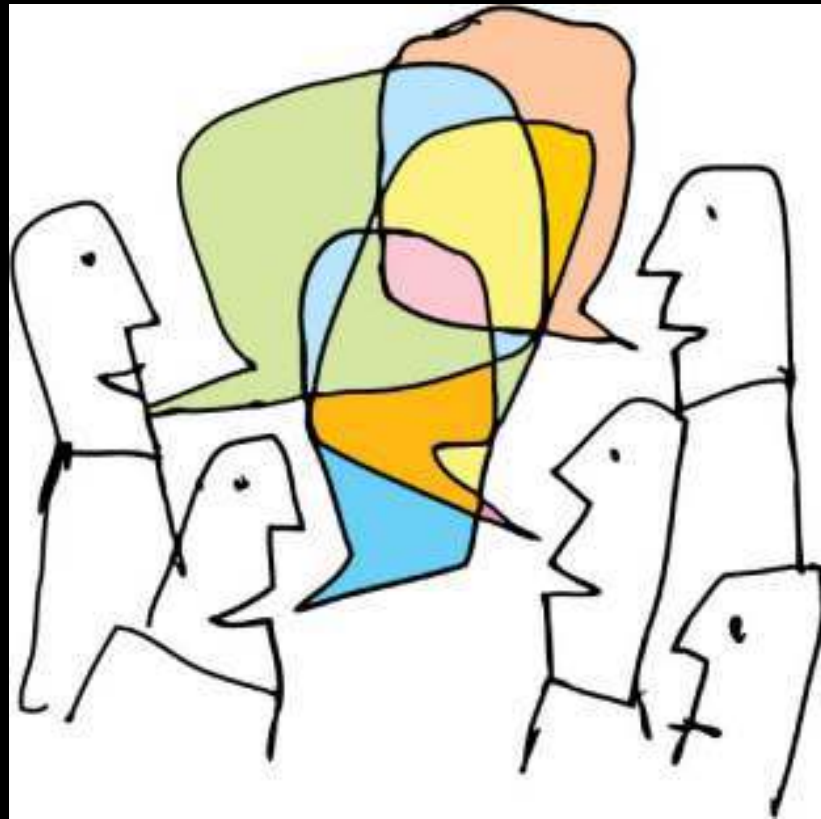
BIM: the role of Government



Paul Morrell
formerly Chief Construction Adviser
to the United Kingdom Government



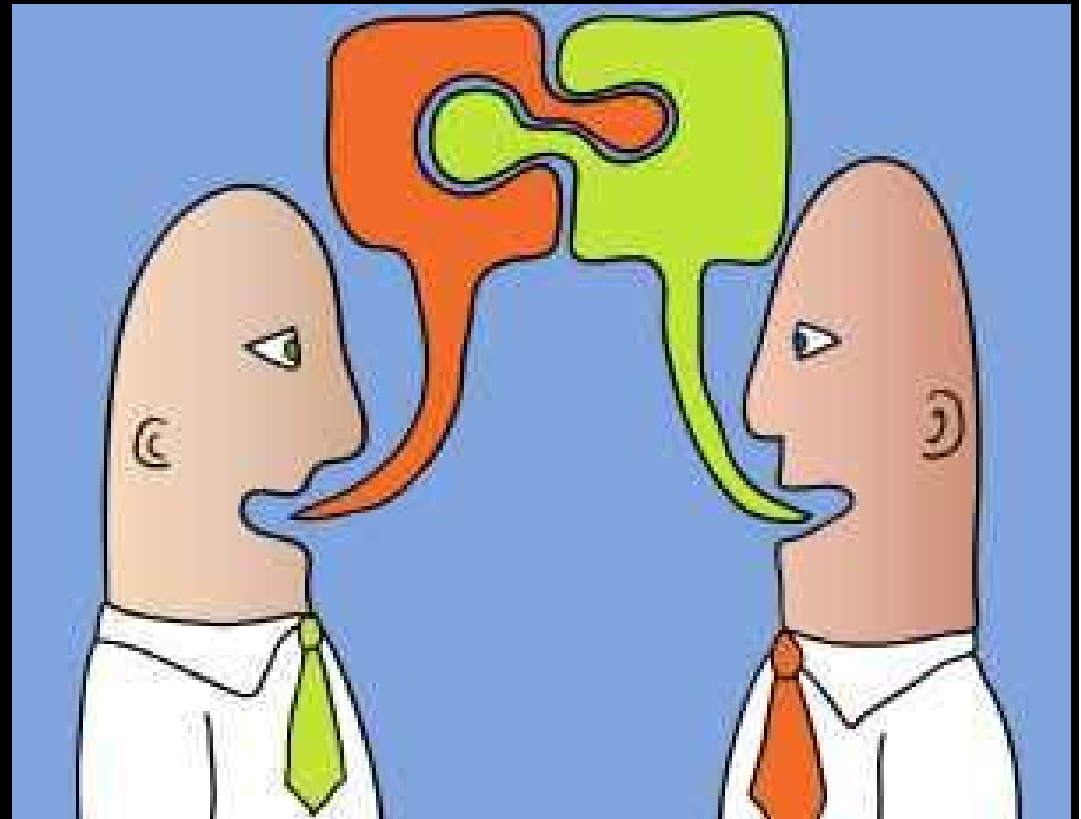
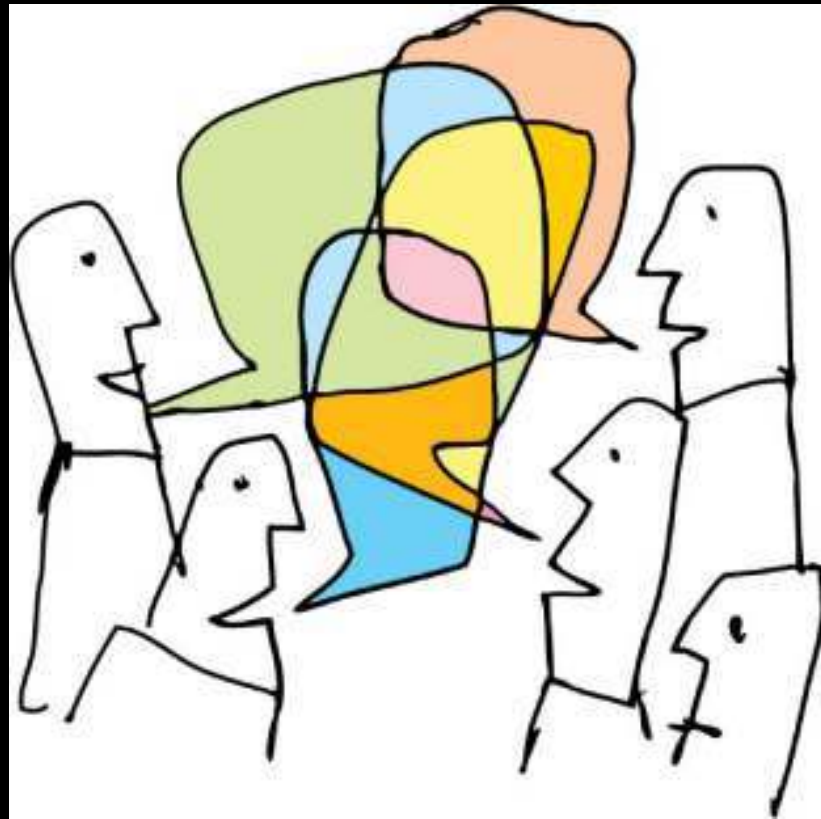














***The question which urgently needs answering is:
how can the construction industry most effectively
deliver a low carbon future?***



I am laying down the challenge to major Government suppliers to ask them what they can do to take costs out.

A photograph of a Weimaraner puppy sitting on a birch tree trunk. The puppy is looking directly at the camera with a neutral expression. The tree bark is light-colored with characteristic lenticels. The background is slightly blurred, showing more of the tree and some foliage.

Cash

Carbon

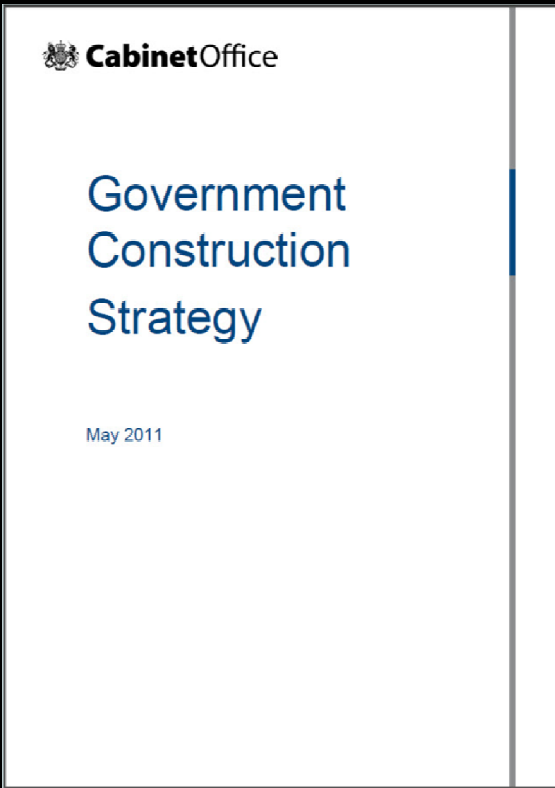
Public
procurement

Sustainable
construction

Public
procurement



Sustainable
construction





**CHANGE
AHEAD**



***Change, change,
all this talk about
change.***

***Things are quite
bad enough
already!***

***Lord Palmerston
to Queen Victoria***





股市有风险 入市须谨慎

涨跌

-0.19
-0.42
-0.39
0.26
-0.42
0.04
-0.07
-0.03
-0.02
-0.20
0.40
-0.37
-0.40
-0.29
-0.27
-0.20
-0.24
-0.38
-0.40
-0.57
-1.19
-0.13
-0.55
-0.40



COMPOSITE			
Open	High	Low	Current
1002.99	1002.99	962.56	963.78(-39.21)



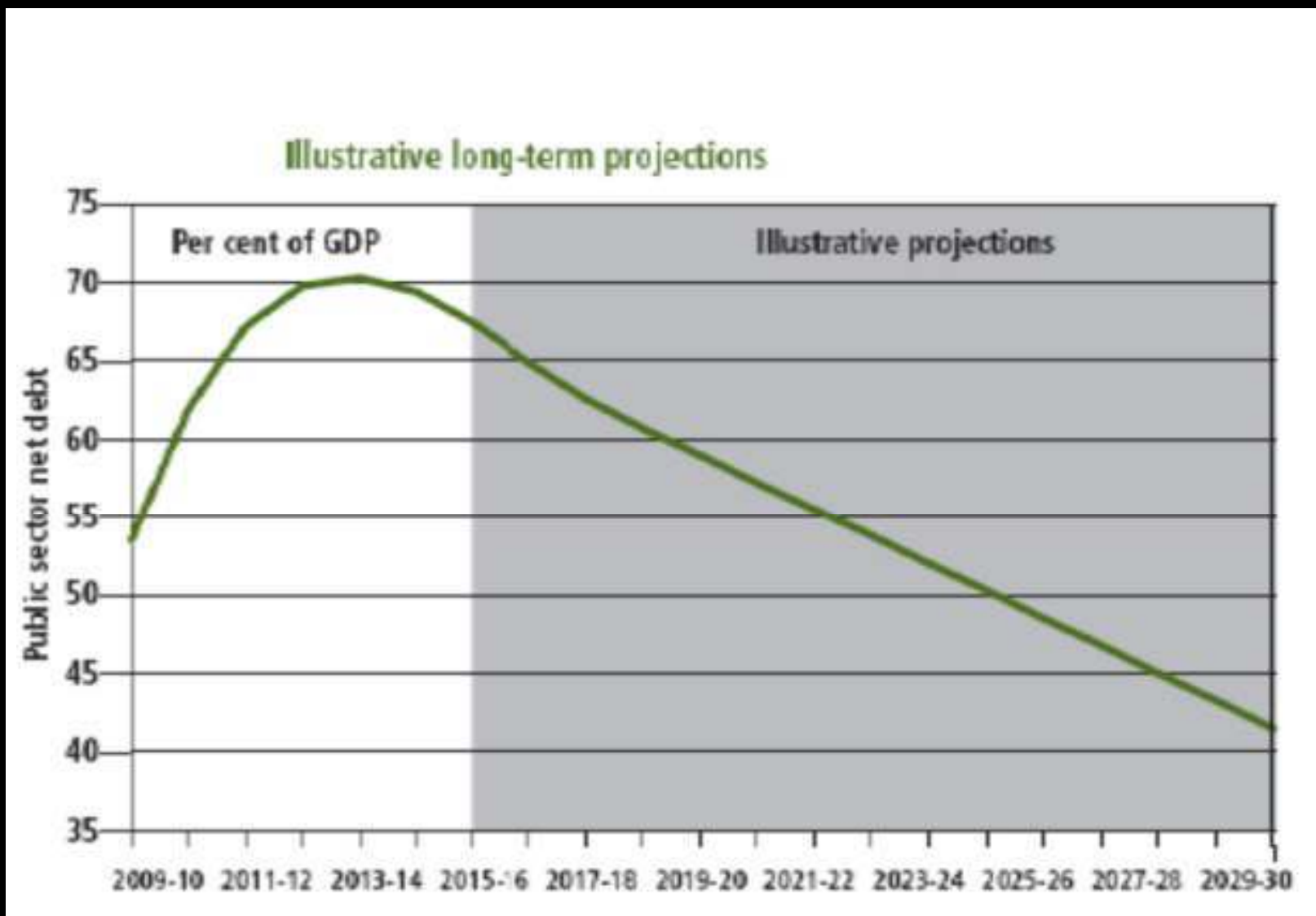


Dear Chief Secretary

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



Liam Byrne, outgoing, Chief Secretary



Source: Office for Budget Responsibility and HM Treasury, per David Smith, Economics Editor, *The Sunday Times*, 2010



HONEST JOE'S PAWN SHOP

HONEST JOE'S
LOANS
BUY-SELL-RENT

Or ANYTHING OF VALUE

WHILE YOU WAIT!

NEED CASH? SEE THE

DRILLS
SAWS
MOTORS
FANS

PISTOLS
RIFLES
SHOTGUNS
Shells

TOOLS

GUNS

MARSHALL CAFETERIA
Coca-Cola

"TOOTS" GOLDSTEIN PAWN SHOP - HONEST JOE

JOE'S GUN
And
LOCK SHOP

LOANS

PAWN SHOP
LOAN RANGER

HONEST JOE
The
LOAN RANGER

PAWN SHOP

NEED CASH
See The
LOAN RANGER

HAVE NO FEARS HONEST JOE IS HERE!
TOOL SHOP
- 3 886-2524 ELM - 5
TOOLS, GUNS

SAVE TIME & MONEY WALK INTO HONEST JOE'S

DON'T PAY FINES USE HONEST JOE'S SAFE CROSSOVER

DIBBENS' The Pawn Shop... CAME TO THE END OF HIS SEARCH AT HONEST JOE'S!

HIGHEST LOANS-ANYTHING! GOLF CLUBS TV RADIOS OUTBOARD MOTORS BOATS

MAKE HIGHEST LOANS HONEST JOE

TOOL JEWELRY LUGGAGE HONEST JOE

WAVE HELLO TO HONEST JOE!

DO IT YOURSELF-WE RENT TOOLS

TRUTHFUL JOE NEVER TELL A LIE

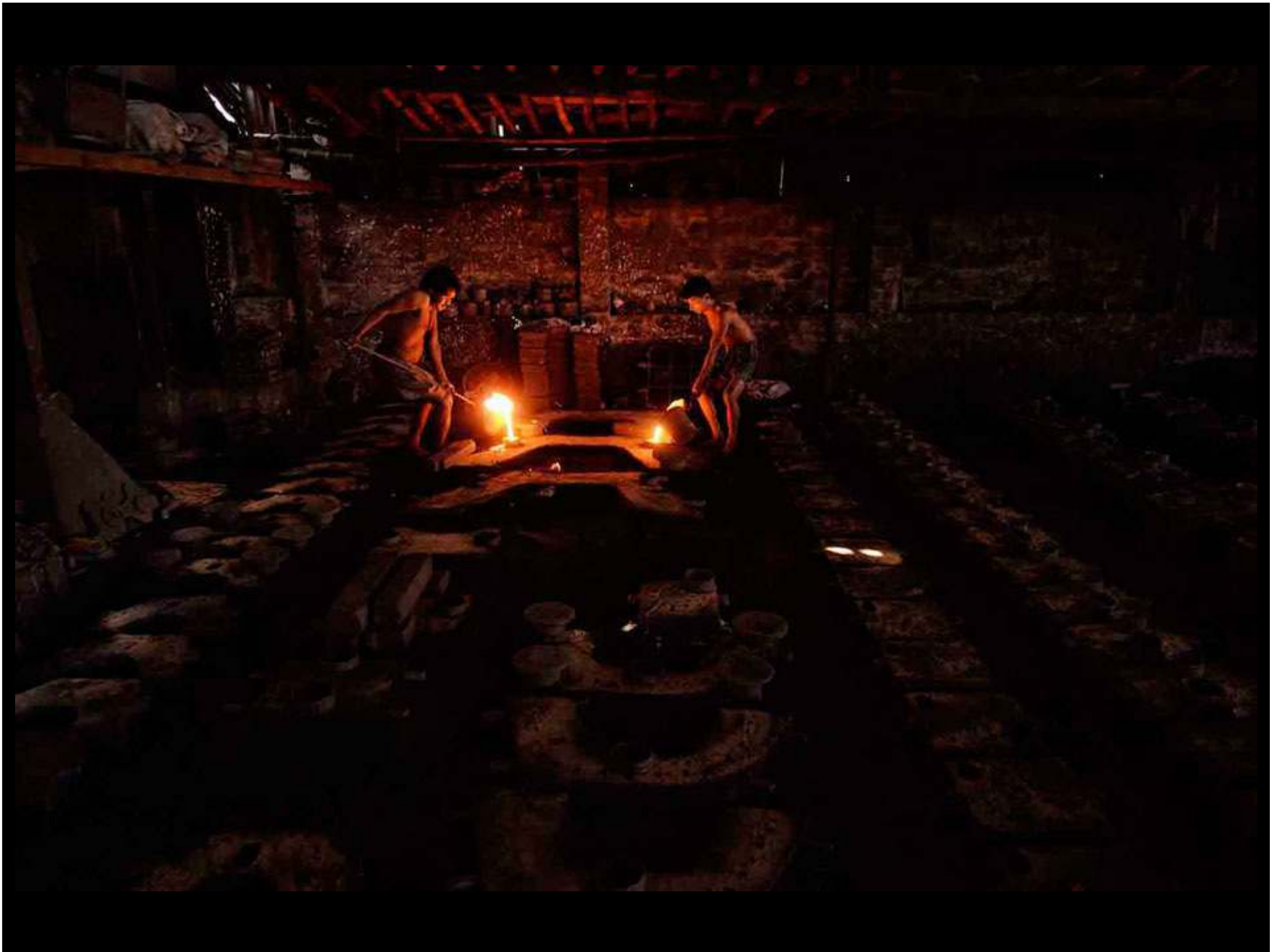


**In times of change, learners
inherit the Earth. . .**

while the learned
find themselves
beautifully
equipped to deal
with a world that
no longer exists.

Eric Hoffer













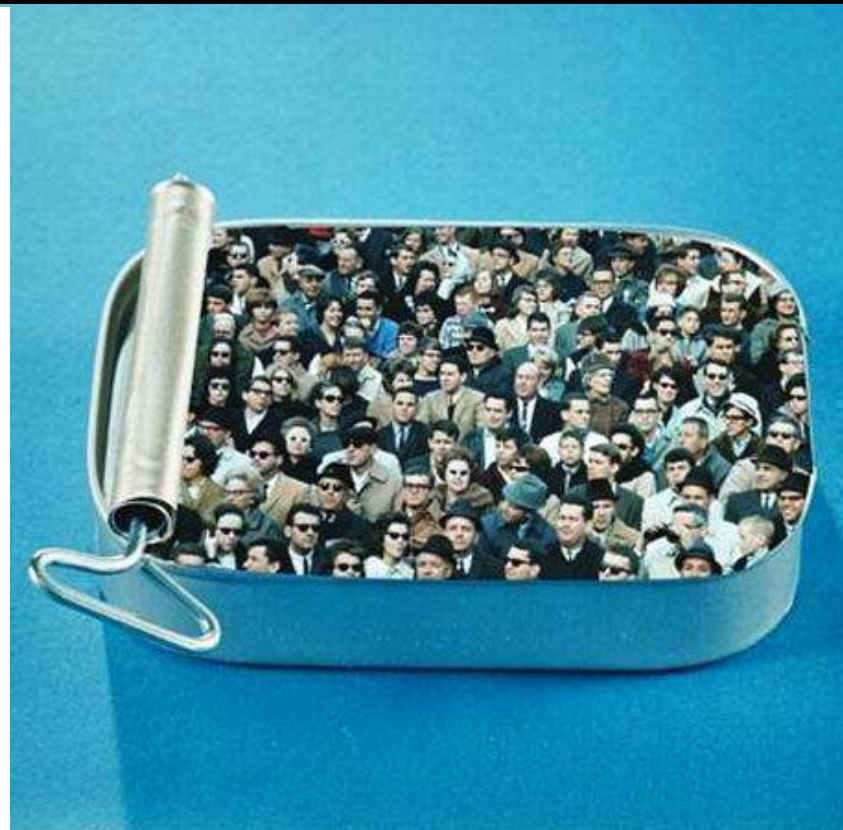
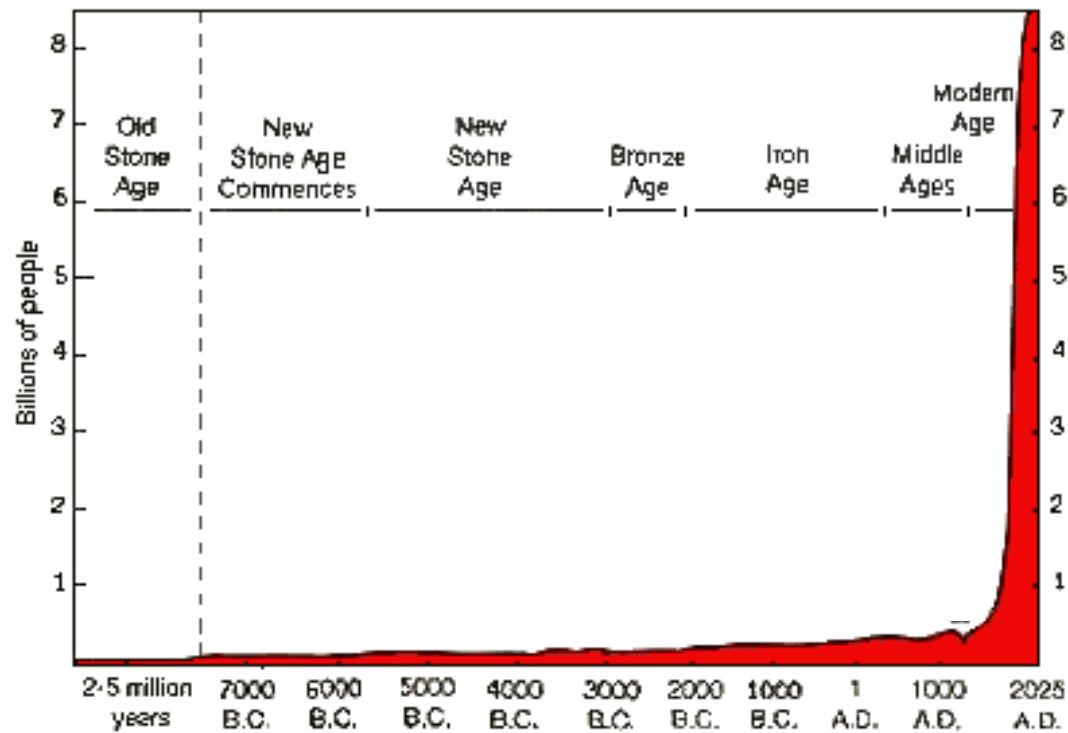
Dairy farm, Inner Mongolia, China

Wang Shu receives the Pritzker Prize, Beijing, May 2012

處處披錦繡恰值政通
和笙歌滿衢人民聲聲
和諧華夏血脉源遠流
燧人取火人猿自此揖別
農播谷文明於茲肇始
立典章克明俊德湯武
命講信脩睦春秋百家
鳴戰國雄才輩出自秦
仇以迄後世人文煥彩光
千秋雖有干戈玉帛
表治亂終歸民族融和
因一家迨乎近世列強
金甌殘缺大地陸沉



World Population Growth Through History



31 October 2011: population = 7 billion





Paraisópolis Favela, São Paulo




Photo: Luiz Arthur Leirao (Tuca) Vieira







An aerial photograph of a massive crowd of people, likely at a large-scale event or festival. The crowd is dense and fills the entire frame. In the center, there is a black rectangular text box with white and yellow text. The text reads: "China aims to increase its urban population from 37% in 2002 to 50% in 2020 – the equivalent of creating 2 Tallinns every month". The background shows a mix of people in various colors of clothing, and some structures or barriers are visible in the distance.

China aims to increase its urban population from 37% in 2002 to 50% in 2020 – the equivalent of creating 2 Tallinns every month



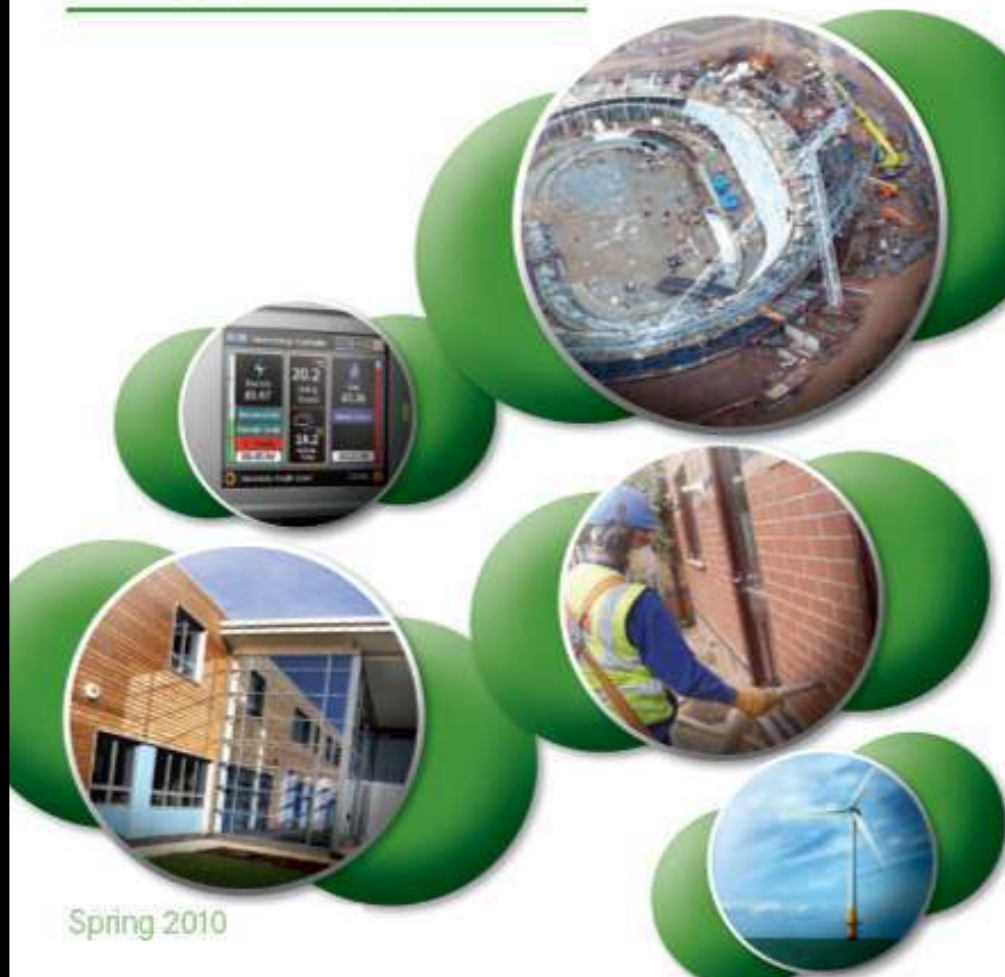




Low Carbon Construction

Innovation & Growth Team

Emerging Findings

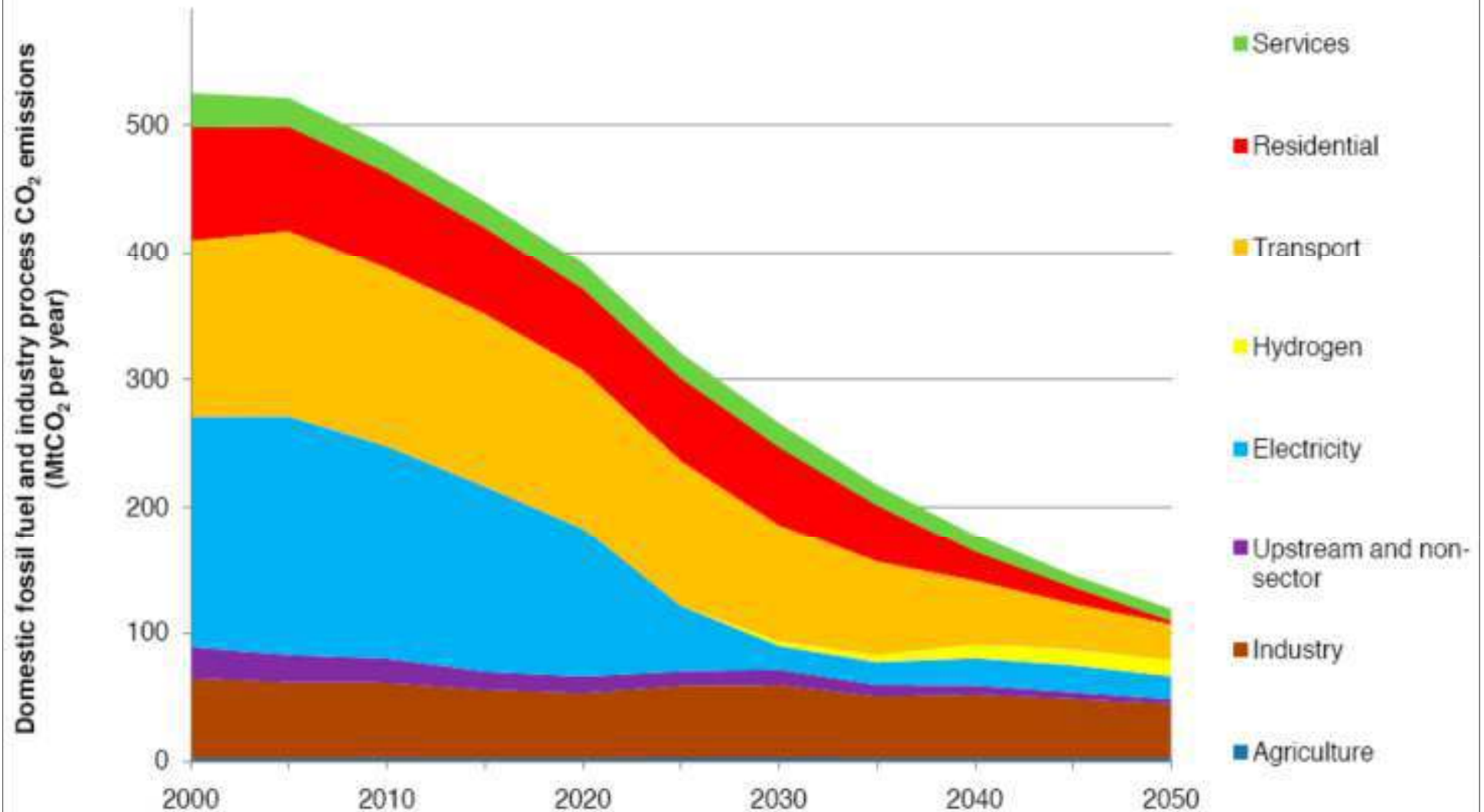


Spring 2010

Climate Change Act



The end game



Source: Building a low-carbon economy, CCC

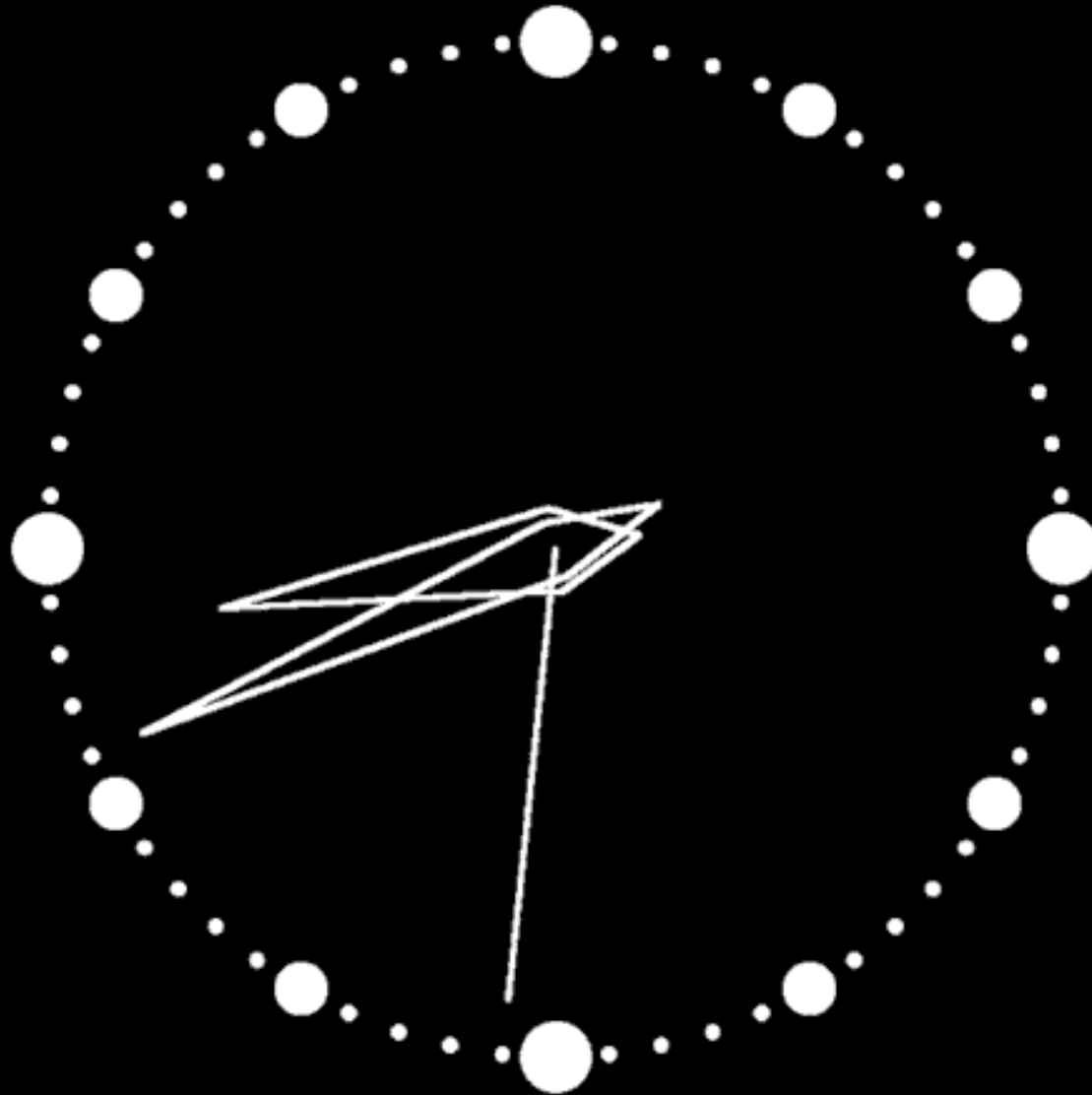


There are 26 million homes in the UK today



25 million of them could still be with us in 2050

Time to 2050: 20 million minutes





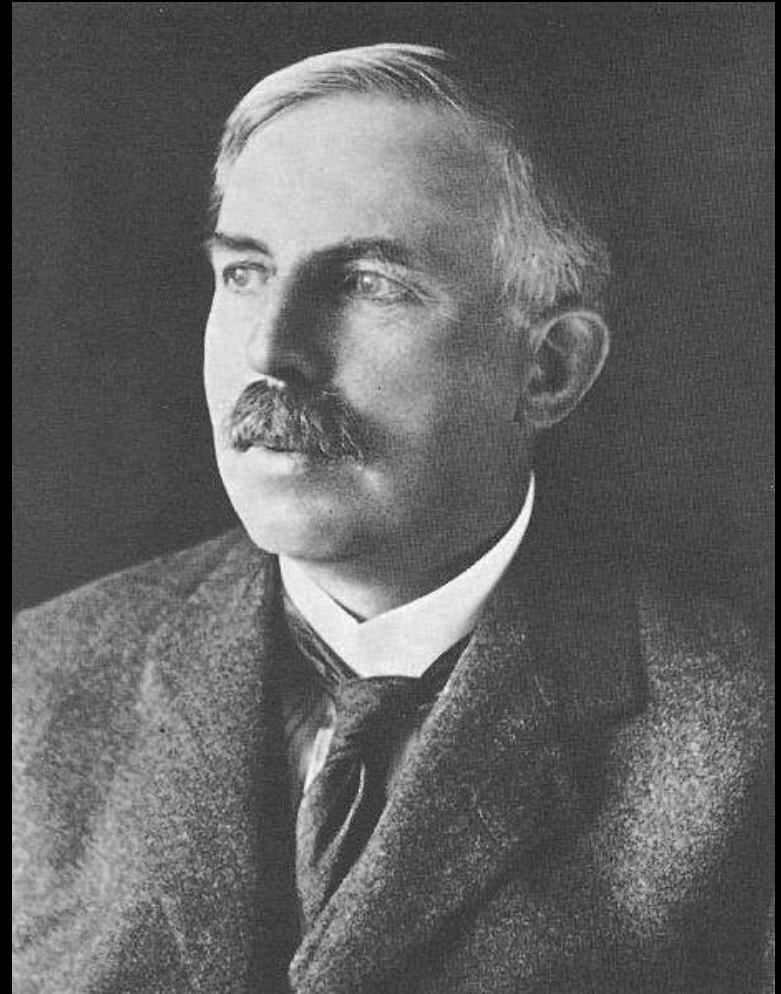


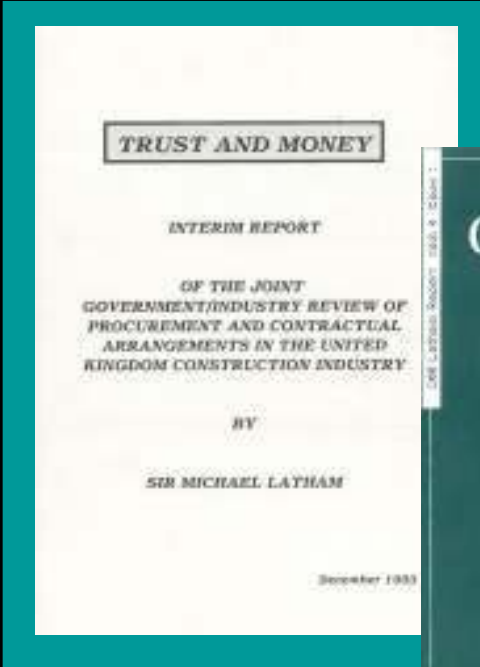




*We haven't got
the money,
so we've got to
think.*

Ernest Rutherford
(Baron Rutherford of
Nelson)





- **Client** at the core of the process, client leadership
- **People**: culture, image, conditions, training and skills
- Better **dispute resolution** procedures
- **Integrated processes and teams**
- **Co-ordinated project documentation**
- Tendering out, **partnering** in (?)
- Choices made on **value-for-money** basis
- **Product** development
- **Standardisation, prefabrication**
- Means of **implementation**

- **Client** at the core of the process, client leadership
- **People**: culture, image, conditions, training and skills
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- **Integrated processes and teams** ←
- **Co-ordinated project documentation** ←
- Tendering out, **partnering** in (?) ←
- Choices made on **value-for-money** basis
- **Product** development ←
- **Standardisation, prefabrication** ←
- Means of **implementation** ←

An industry fit for purpose?



An industry fit for purpose







Great Kanto Highway, Japan



17 March 2011



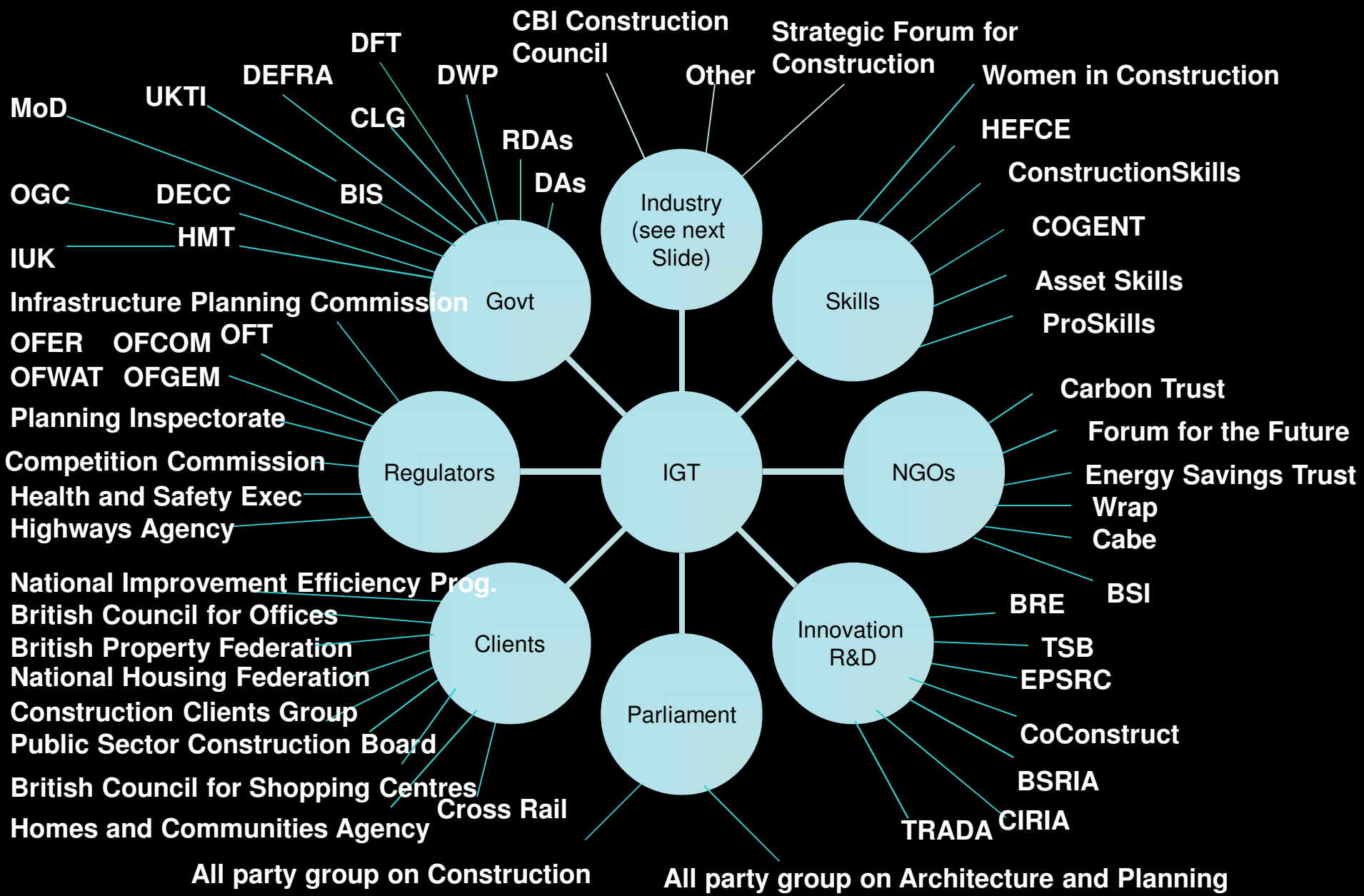
23 March 2011



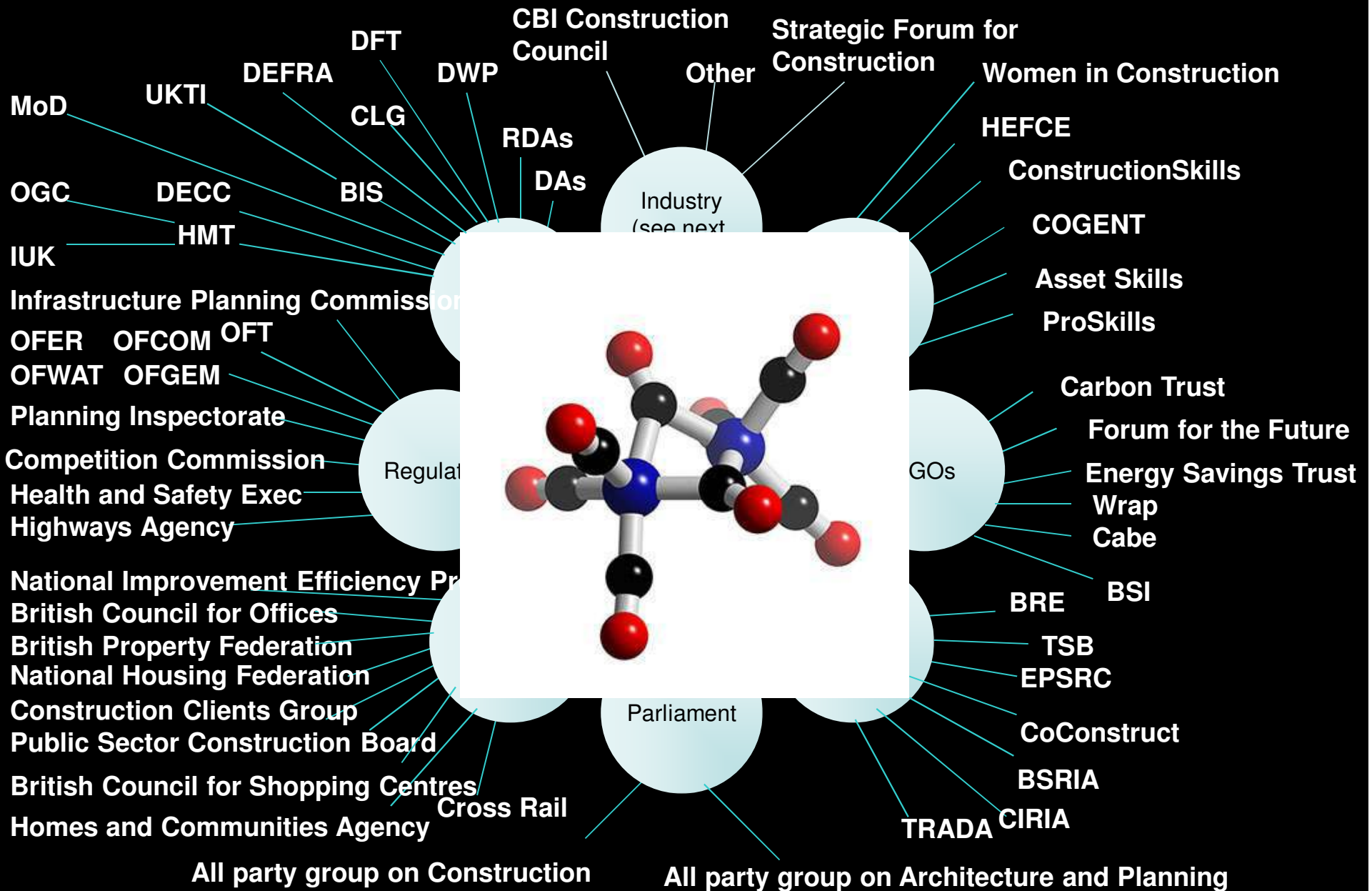


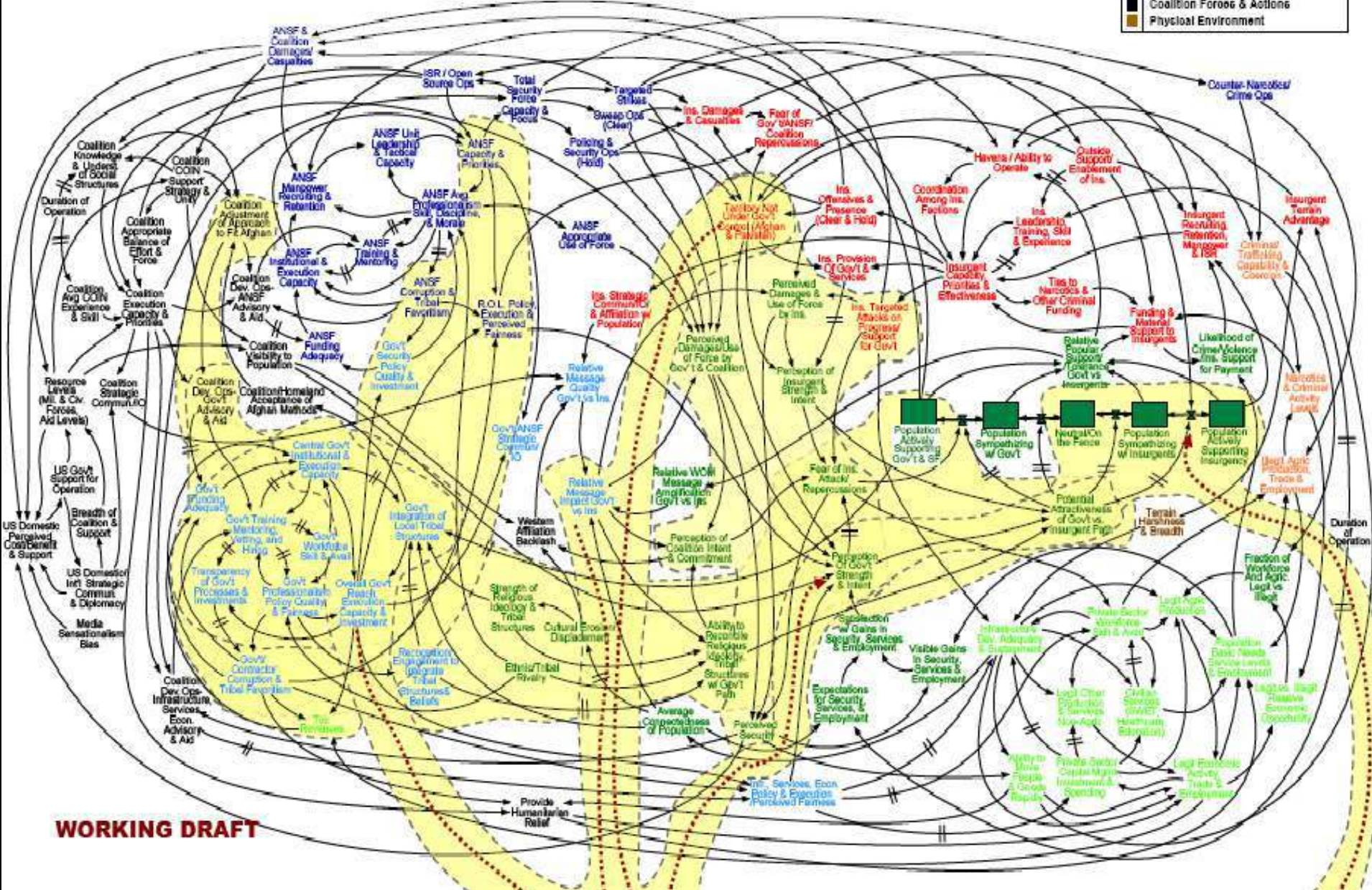
What's
Our
Problem
?

Fragmentation



Stakeholder mapping

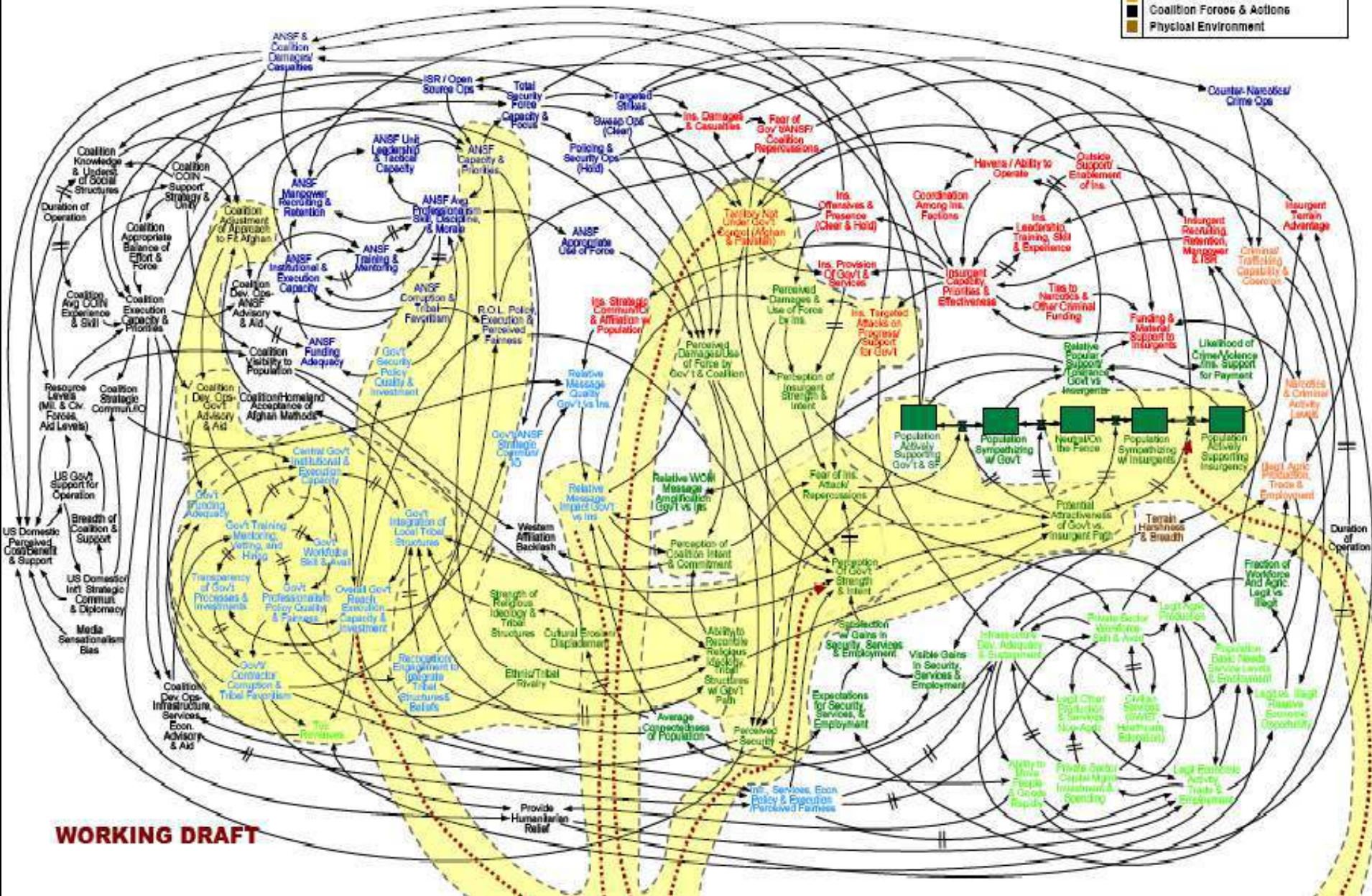




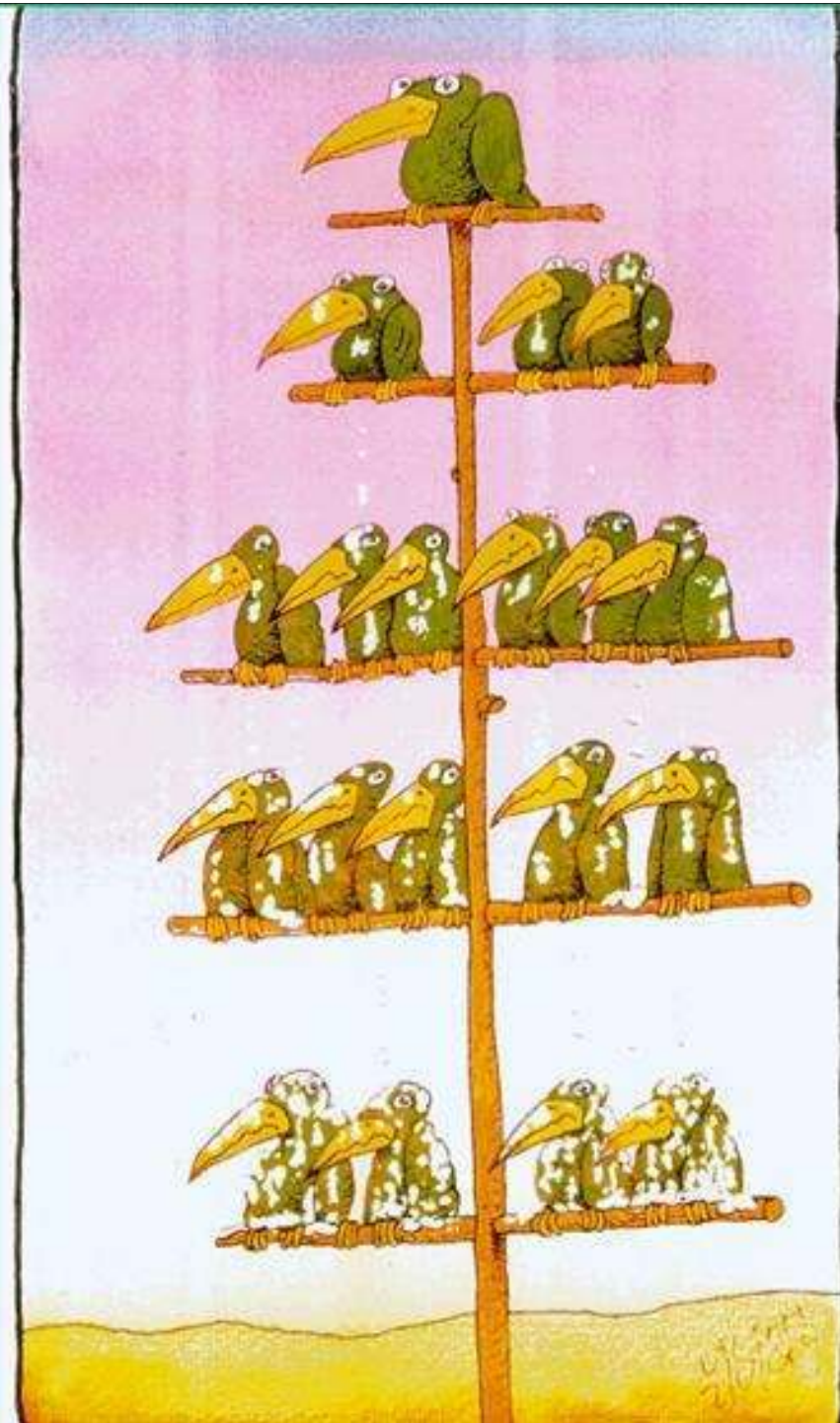
WORKING DRAFT

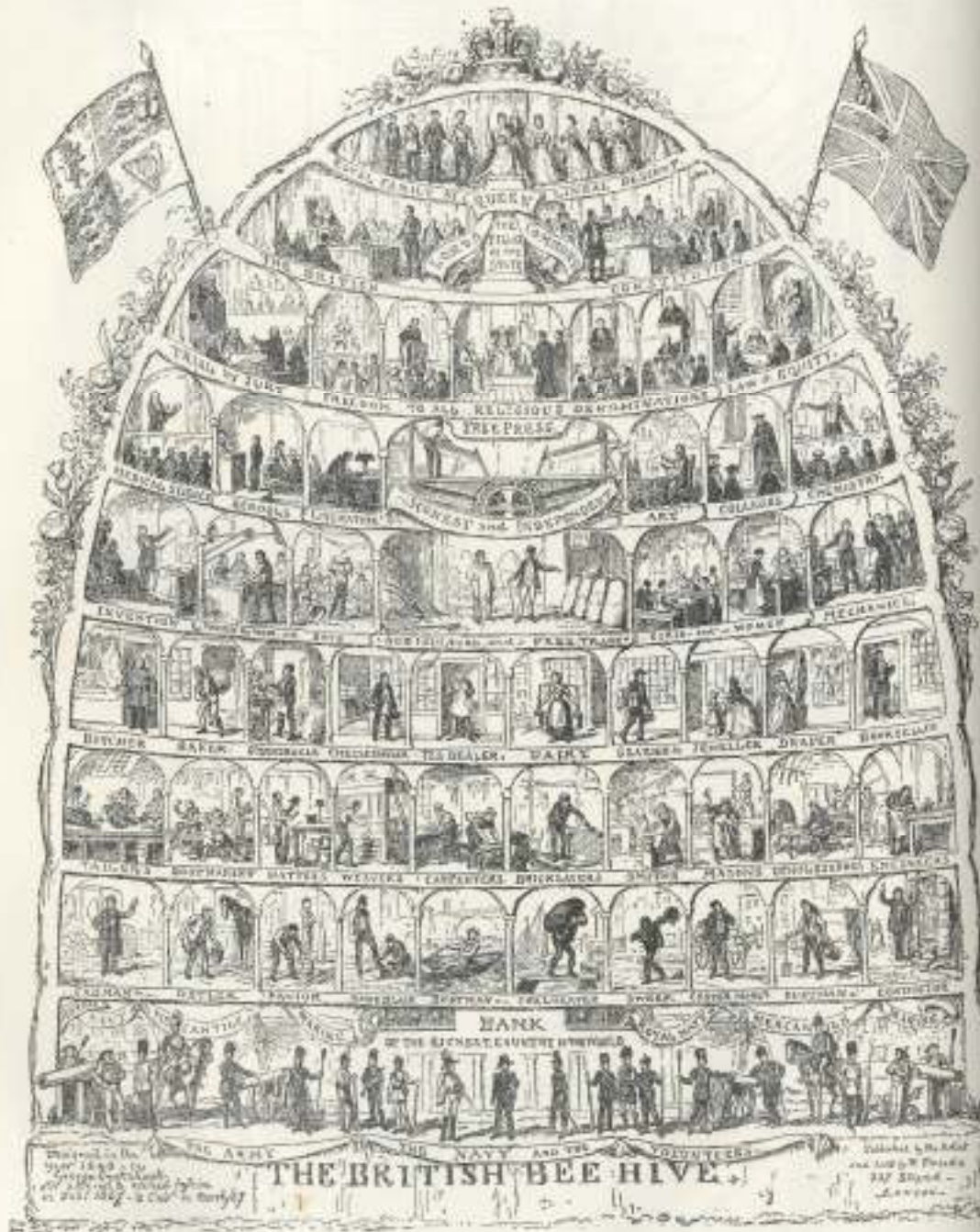
Afghanistan Stability / COIN Dynamics – GOVERNANCE

- Population/Popular Support
- Infrastructure, Economy, & Services
- Government
- Afghan Security Forces
- Insurgents
- Crime and Narcotics
- Coalition Forces & Actions
- Physical Environment



The hierarchy problem







Designed in the Year 1840 - by George Cruikshank and altered & etched by him

THE ARMY THE NAVY AND THE VOLUNTEERS THE BRITISH BEE HIVE

Published by the Artist and sold by W. Tweedie 337 Strand -

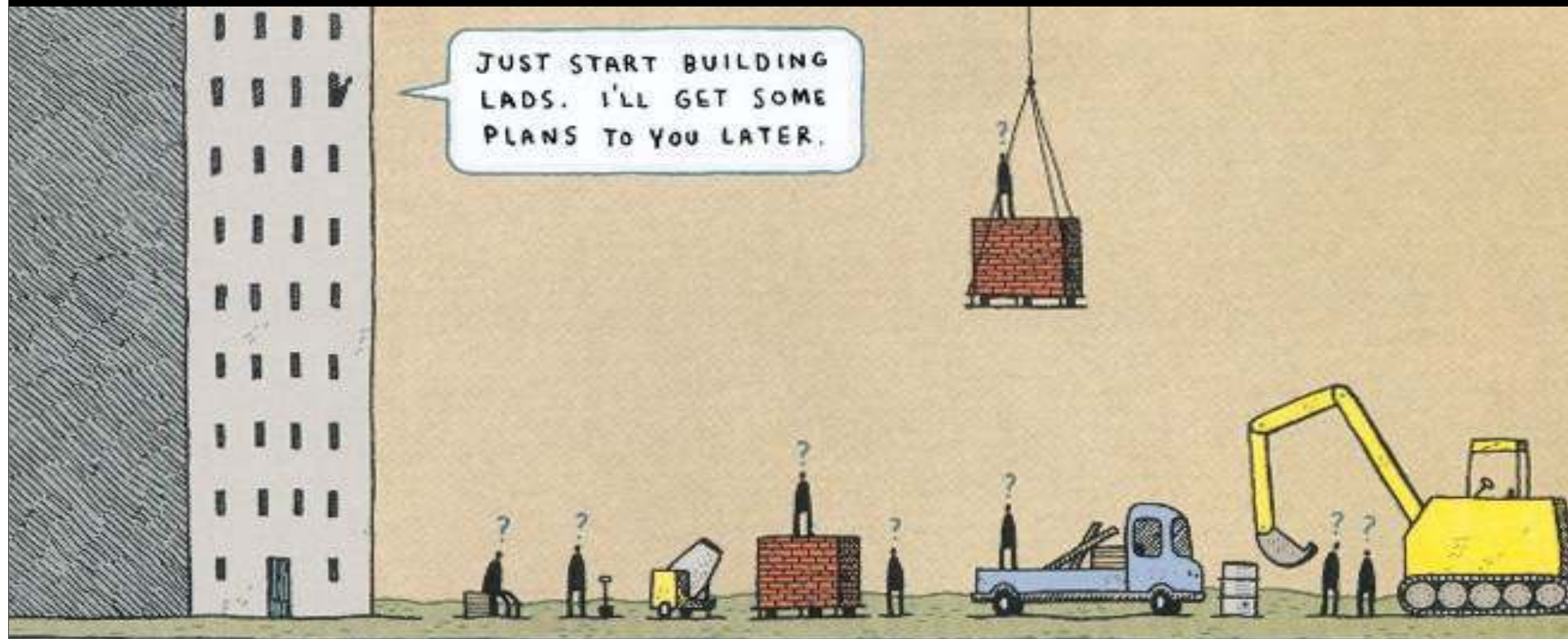
Vested interest

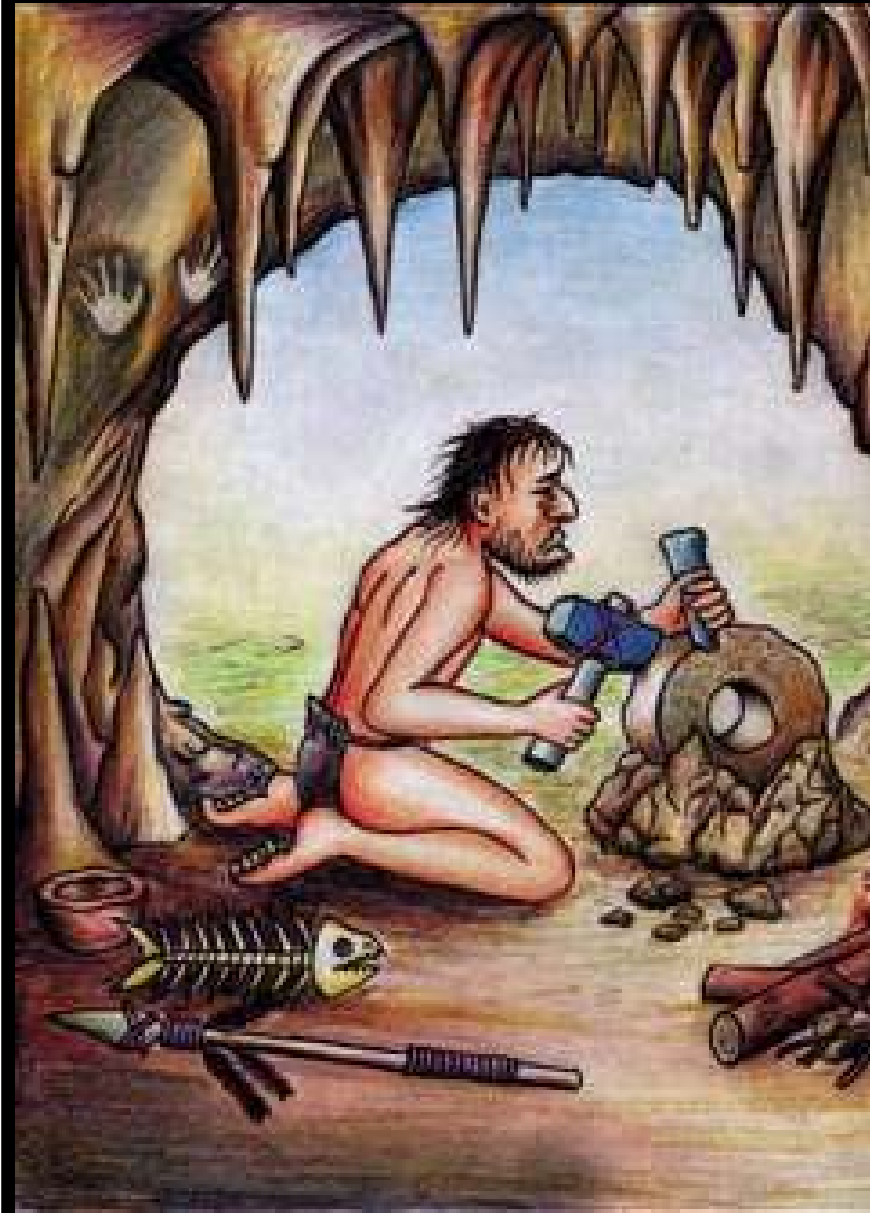


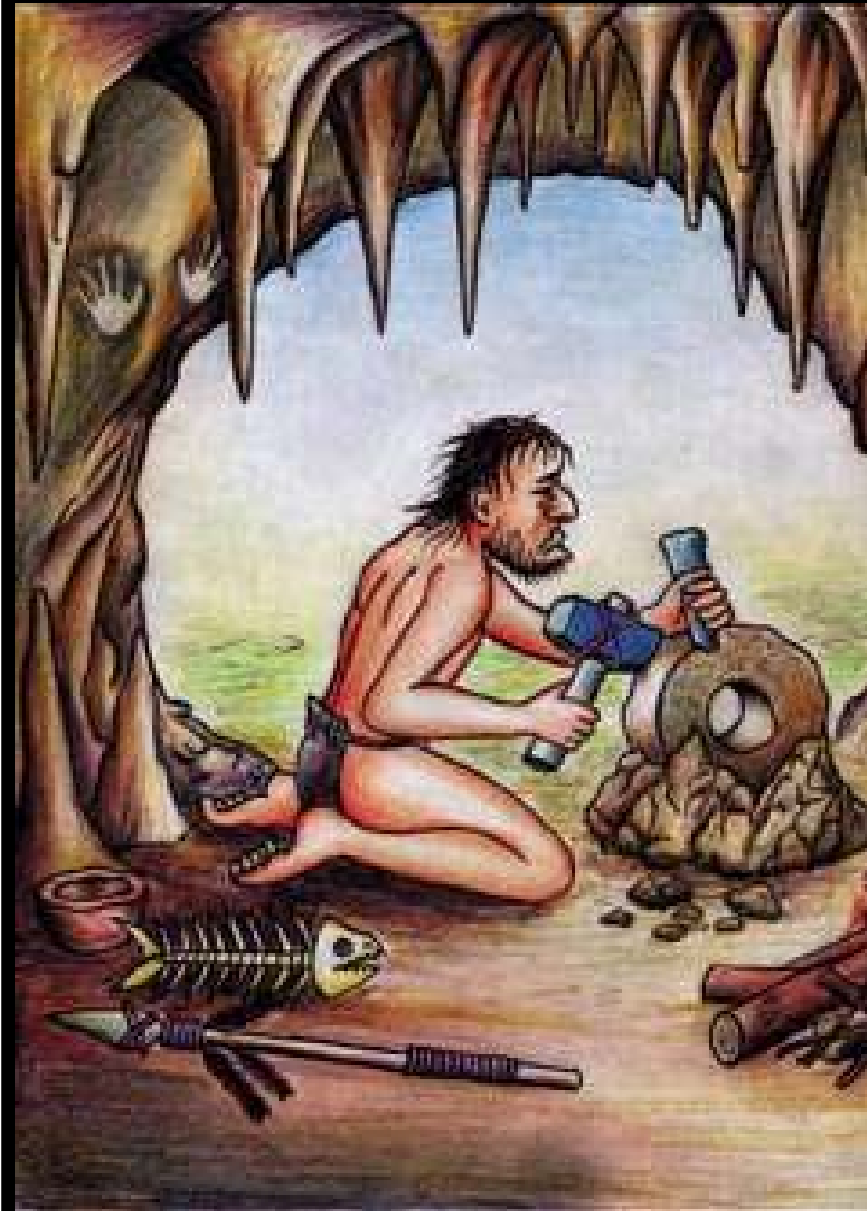


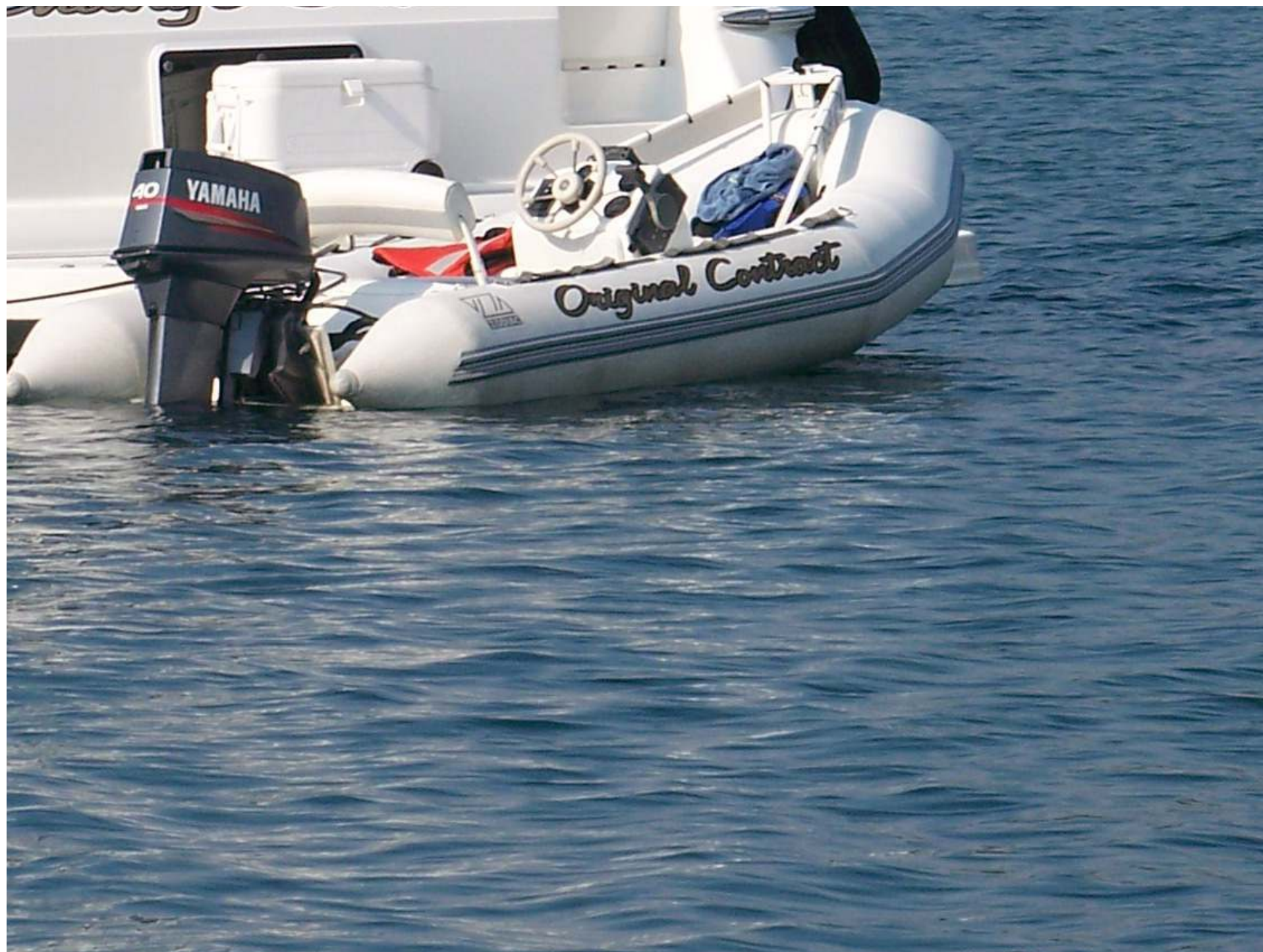


JUST START BUILDING
LADS. I'LL GET SOME
PLANS TO YOU LATER.











A photograph showing a massive, towering pile of waste, primarily plastic bags and debris, filling the background. In the foreground, several people are gathered around a makeshift shack made of wood and tarp. A man in a white shirt stands near a table, while others are seated or standing nearby. The scene illustrates the scale of waste and the living conditions of people in informal settlements.

Incalculable amounts of waste

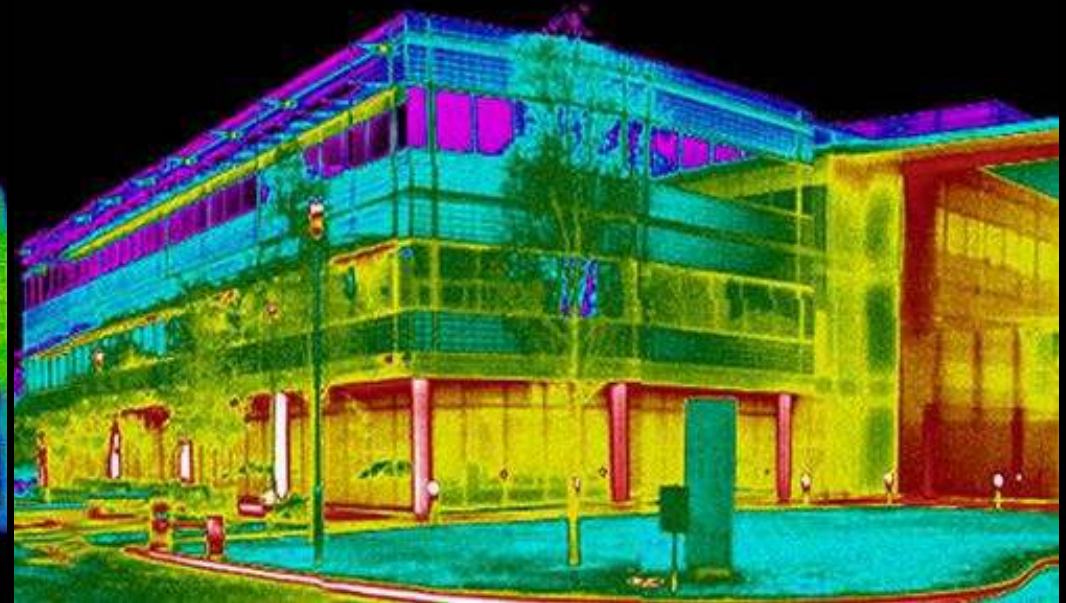
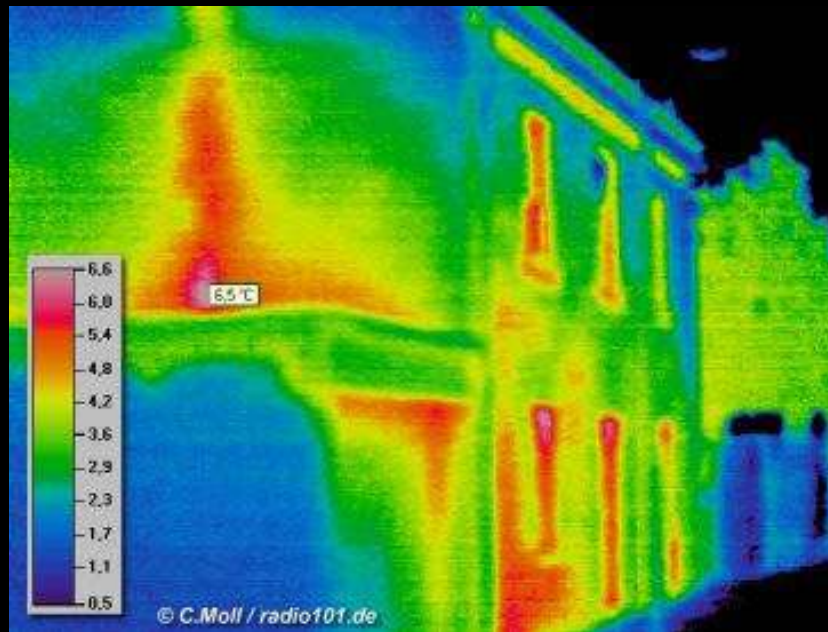








Hard landings







“Loads of money”









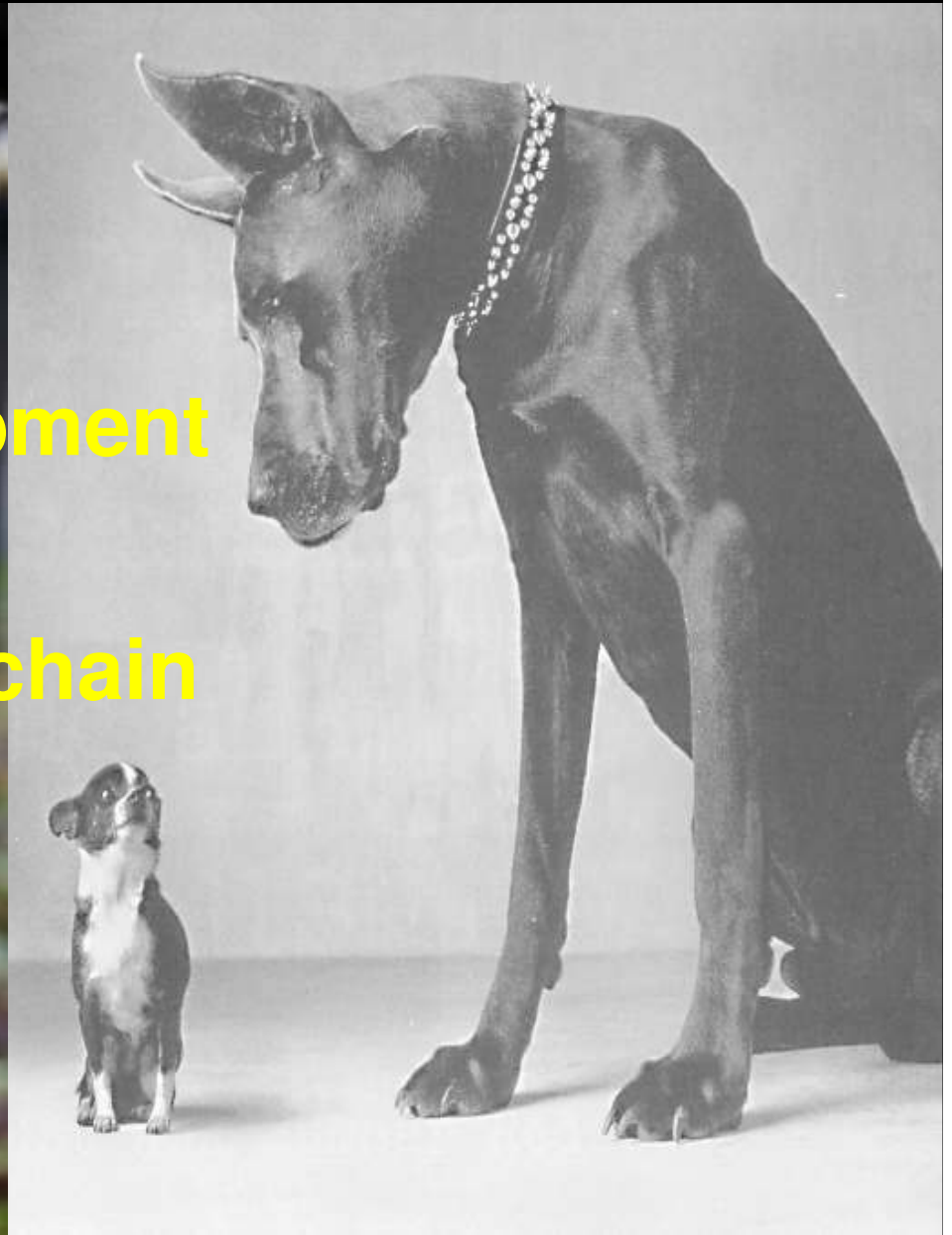








**Development
of the
supply chain**





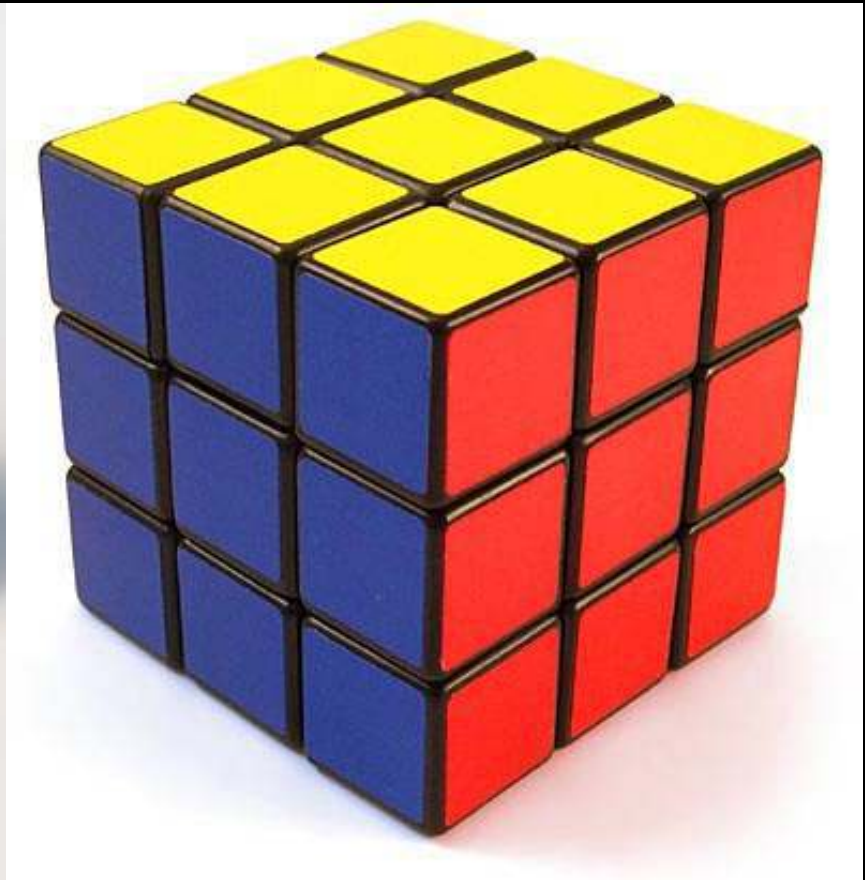
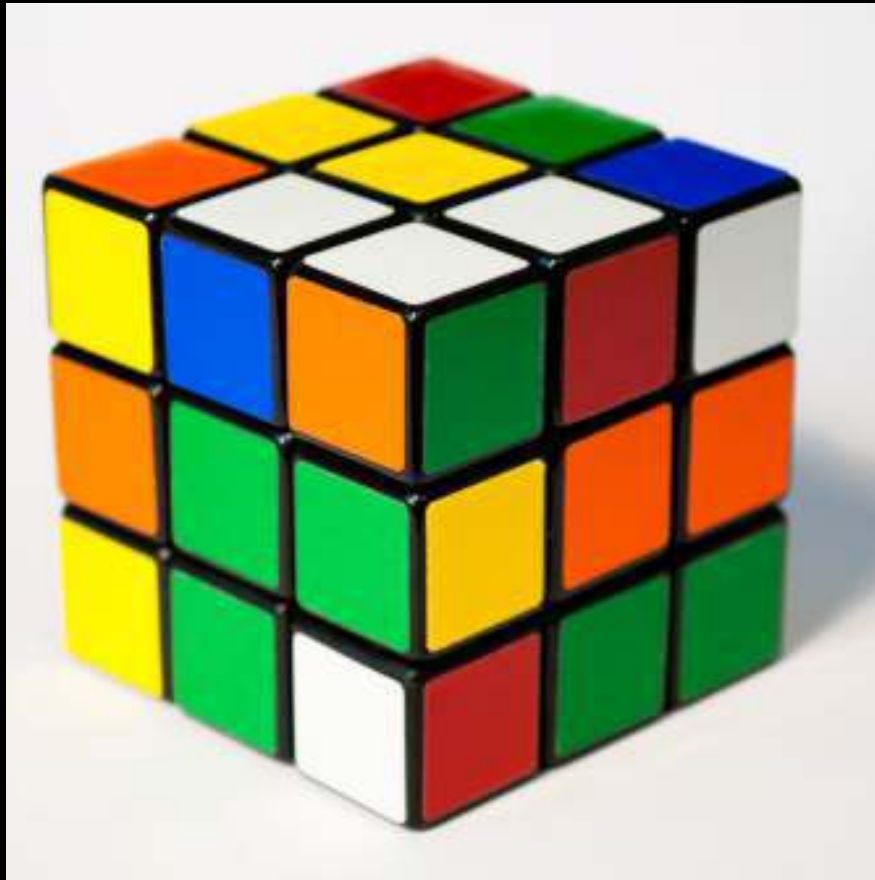


“We became reliant on the framework. Staff’s combative skills became rusty.”

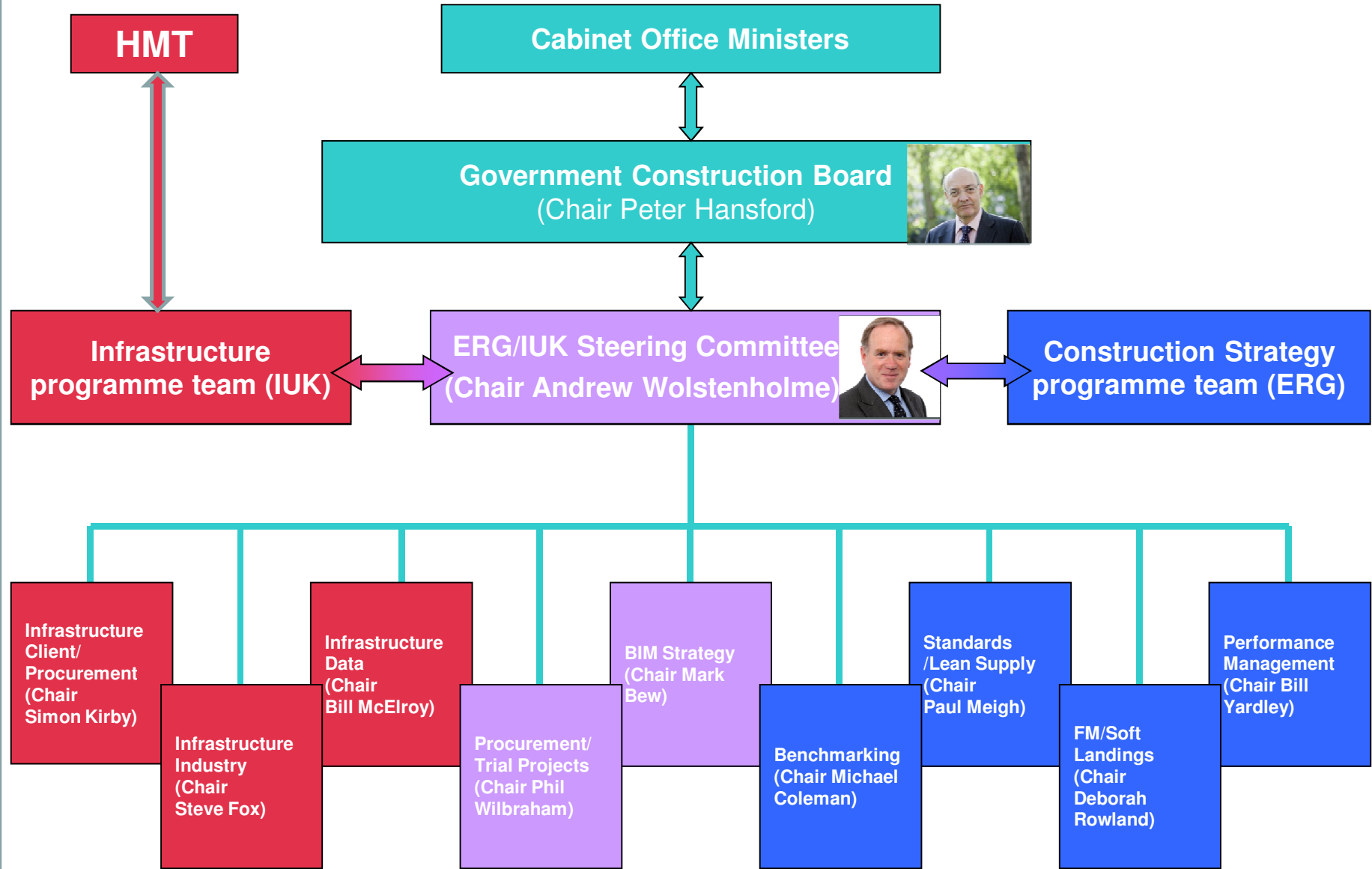


Government Construction Strategy

May 2011



Revised Governance Structure for Government Construction Programme





CabinetOffice



MINISTRY OF DEFENCE



HIGHWAYS
AGENCY



Education
Funding
Agency



Ministry of
JUSTICE



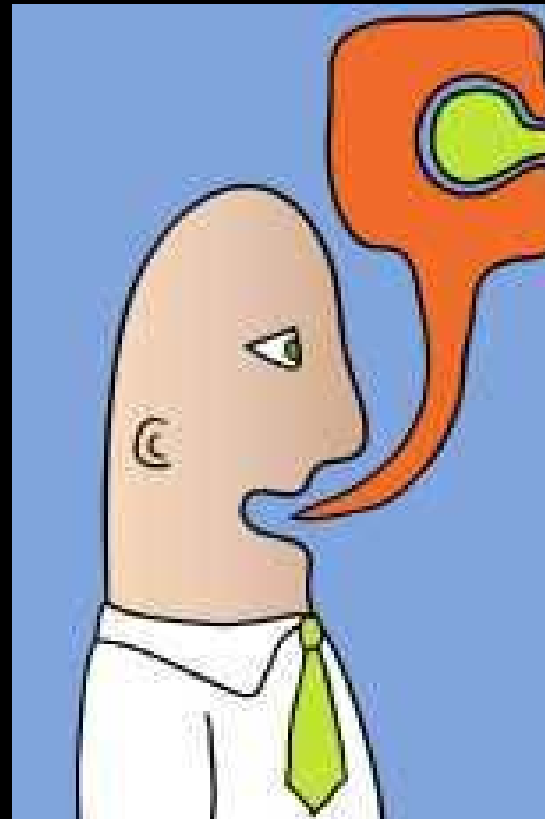
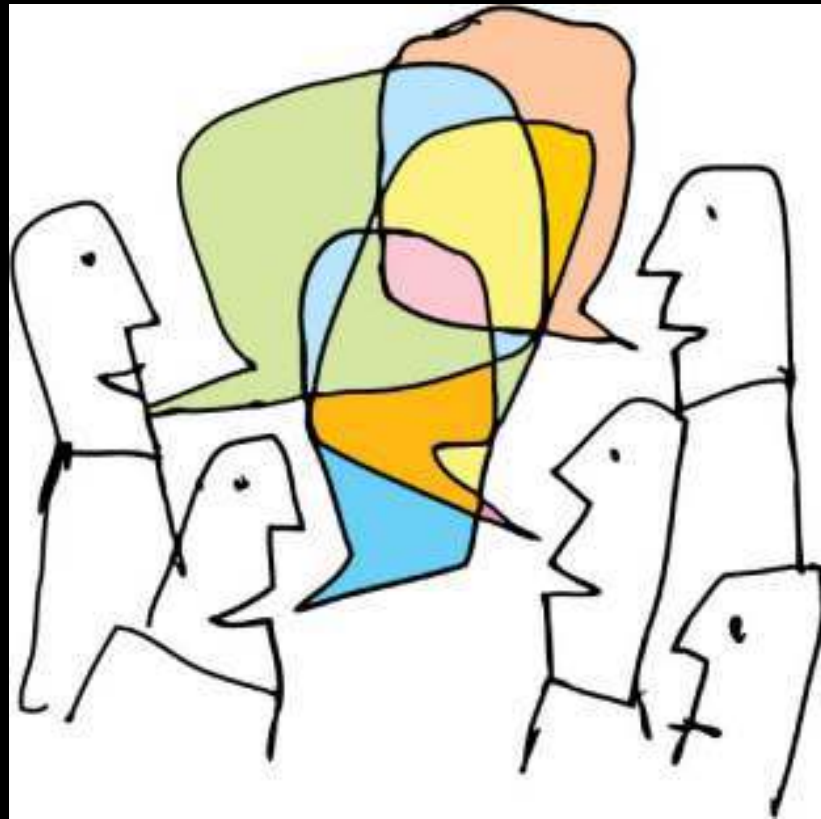
Homes &
Communities
Agency

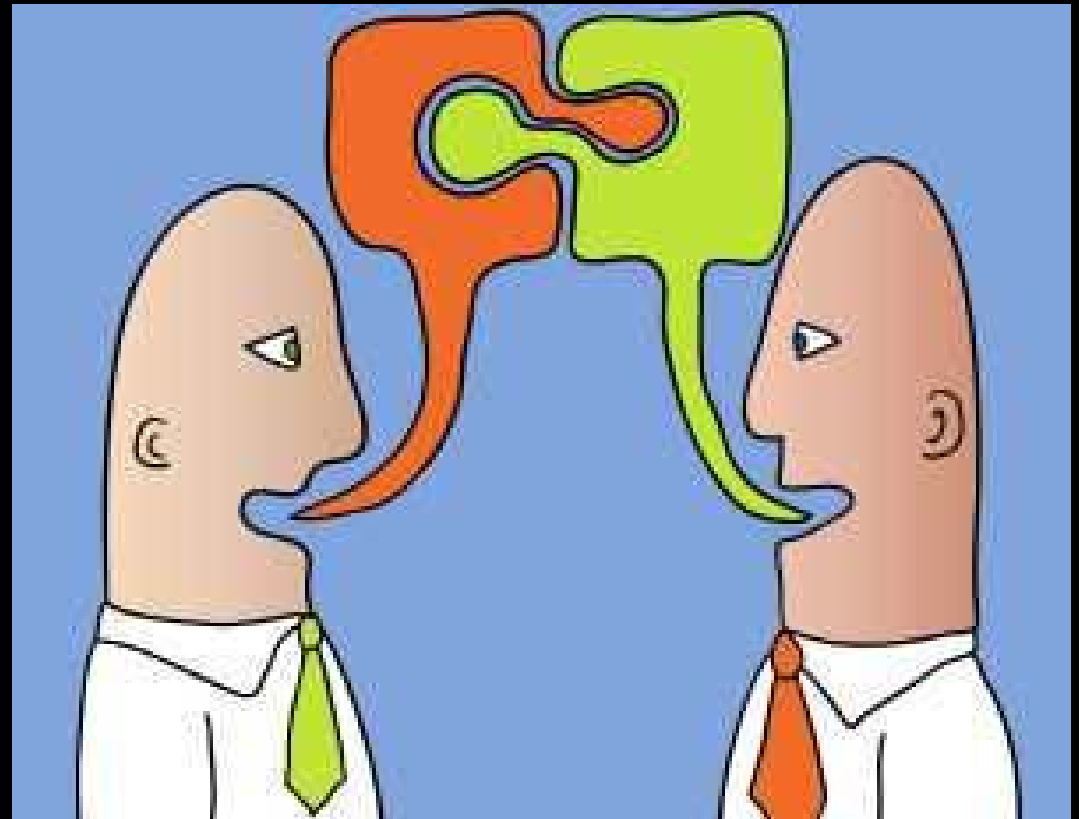
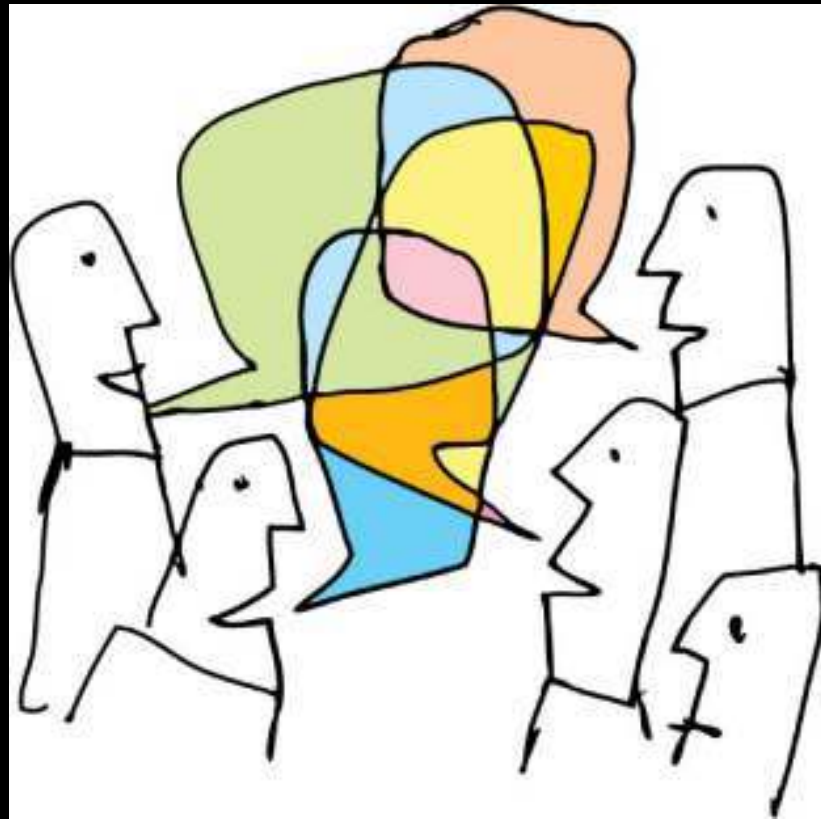


Infrastructure UK



Environment
Agency





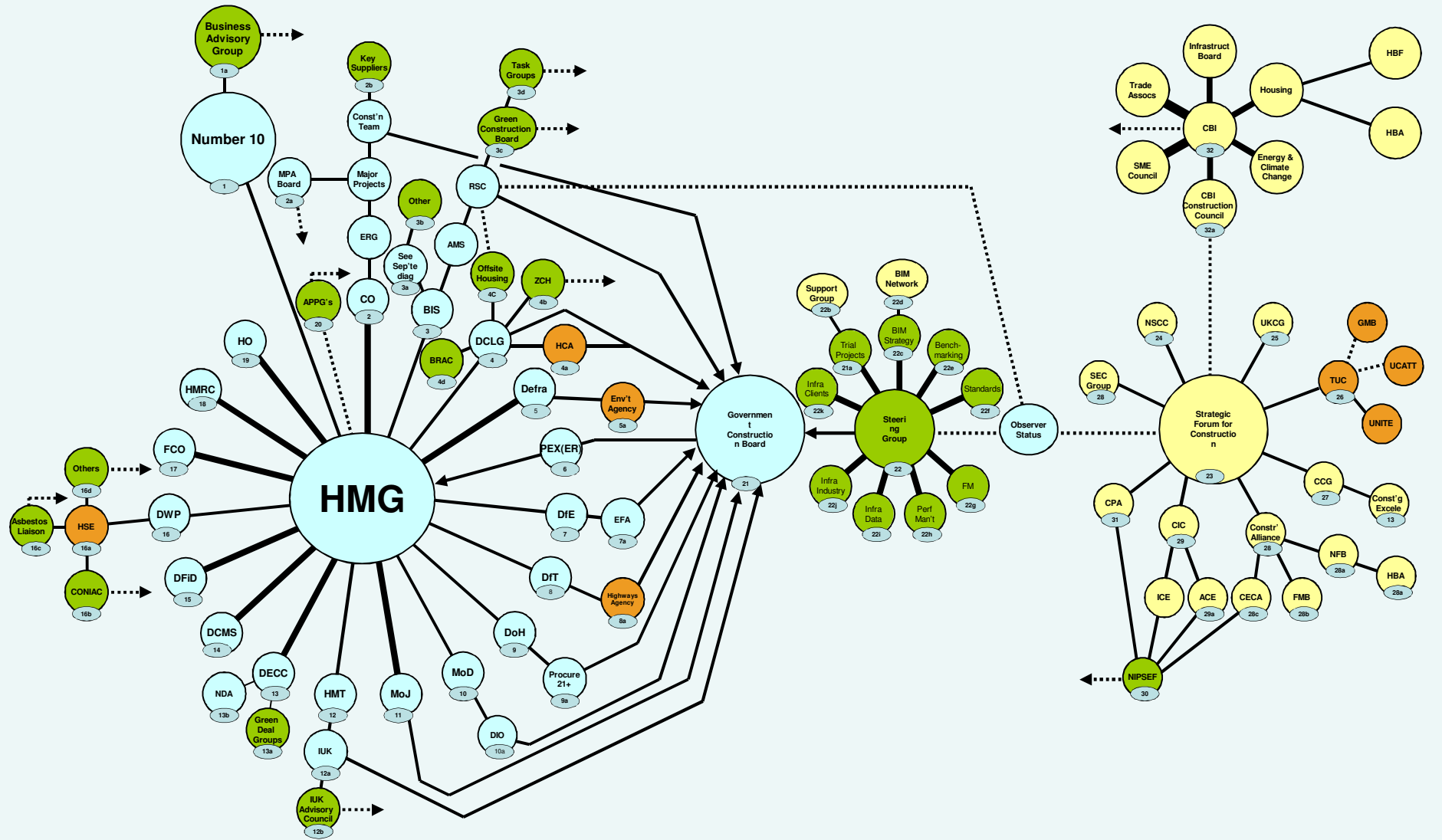






A single voice?

Government / Construction Industry Engagement



- = Hyperlink to membership etc
- = links to industry
- = links within Government
- = links to Government
- = Government Body
- = Government / Industry Body
- = Industry Body
- = NDPB/Other





Client skills


Major Projects Leadership Academy

- launched February 2012





Challenge



**Reduction in waste
and bureaucracy**

PAS 91:2010

Construction related procurement – Prequalification questionnaires



Value in service delivery

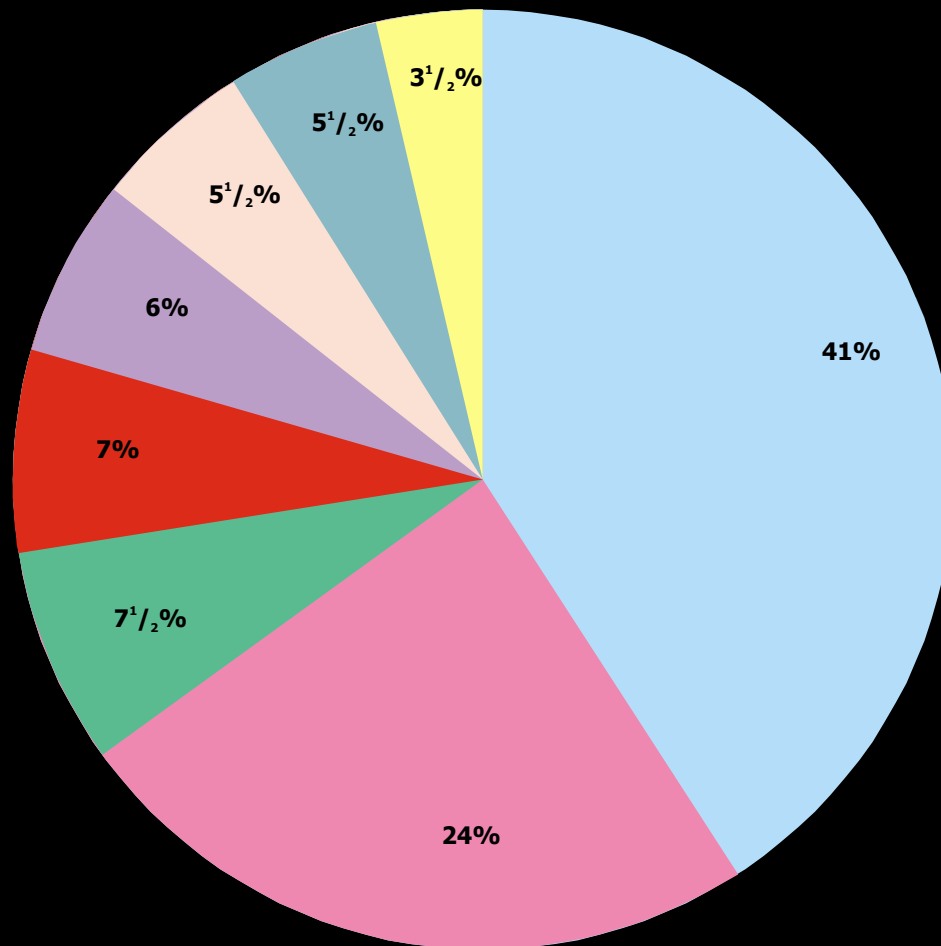






- Wings A, B, C
- Sports Hall
- Art
- Business Studies
- Staff Room
- Reception

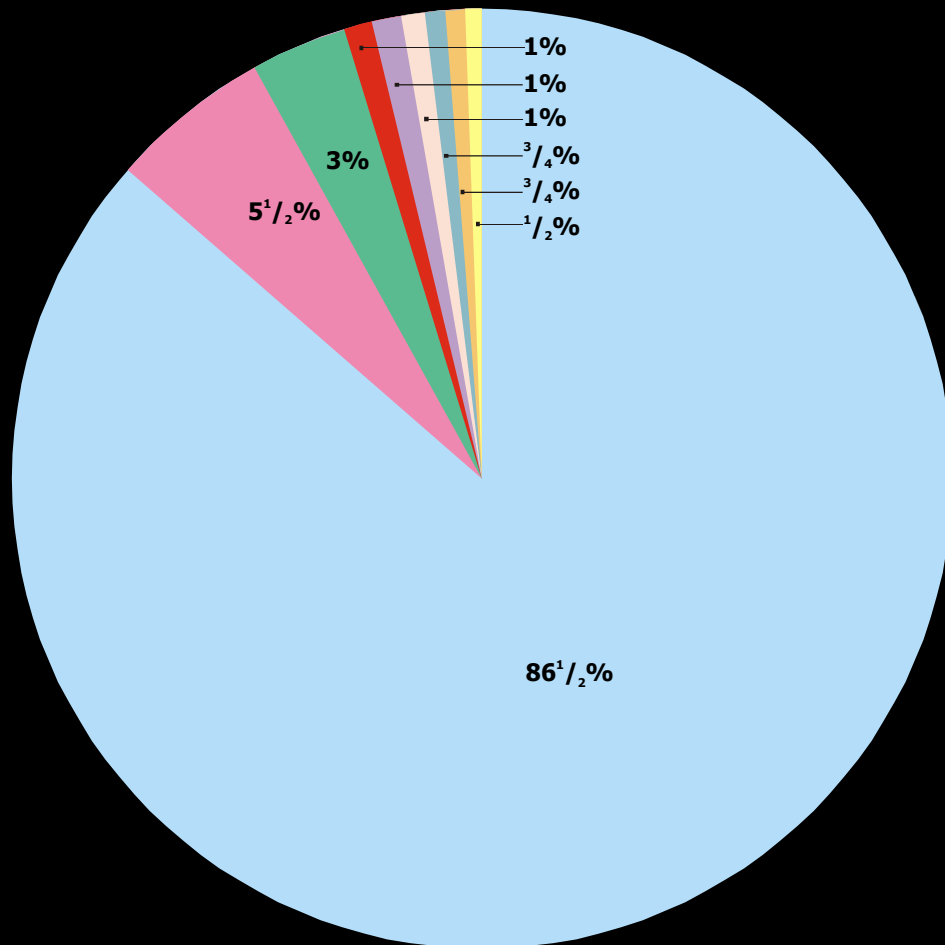
TOTAL INVESTMENT IN OFFICE BUILDING DISCOUNTED TO PV



NOTE: EXCLUDES OCCUPANTS' STAFF COSTS

- 1. Building - construction cost** 41%
- 2. M&E services - running & maintenance** 24%
- 3. Furnishings & furniture - capital cost** 7½%
- 4. Land** 7%
- 5. Building - maintenance** 6%
- 6. Cleaning** 5½%
- 7. M&E services - depreciation** 5½%
- 8. Furnishings & furniture - maintenance & depreciation** 3½%

TOTAL INVESTMENT IN OFFICE BUILDING DISCOUNTED TO PV



NOTE: INCLUDES OCCUPANTS' STAFF COSTS

- | | |
|---|------|
| 1. Salaries of occupants | 86½% |
| 2. Building - construction cost | 5½% |
| 3. M&E services - running & maintenance | 3% |
| 4. Furnishings & furniture - capital cost | 1% |
| 5. Land | 1% |
| 6. Building - maintenance | 1% |
| 7. Cleaning | ¾% |
| 8. M&E services - depreciation | ¾% |
| 9. Furnishings & furniture - maintenance & depreciation | ½% |





Glasgow



Relax

Rooms from only

£59
a night

Glasgow City Centre (Charing Cross) 0870 990 6312
Glasgow City Centre (Argyle Street) 0870 850 6358
Glasgow City Centre (George Square) 0870 238 3320
Glasgow City Centre South 0870 423 6452

book now at premierinn.com

or call 0870 242 8000

7 Day rate for Charing Cross quoted.
Prices may vary by hotel.

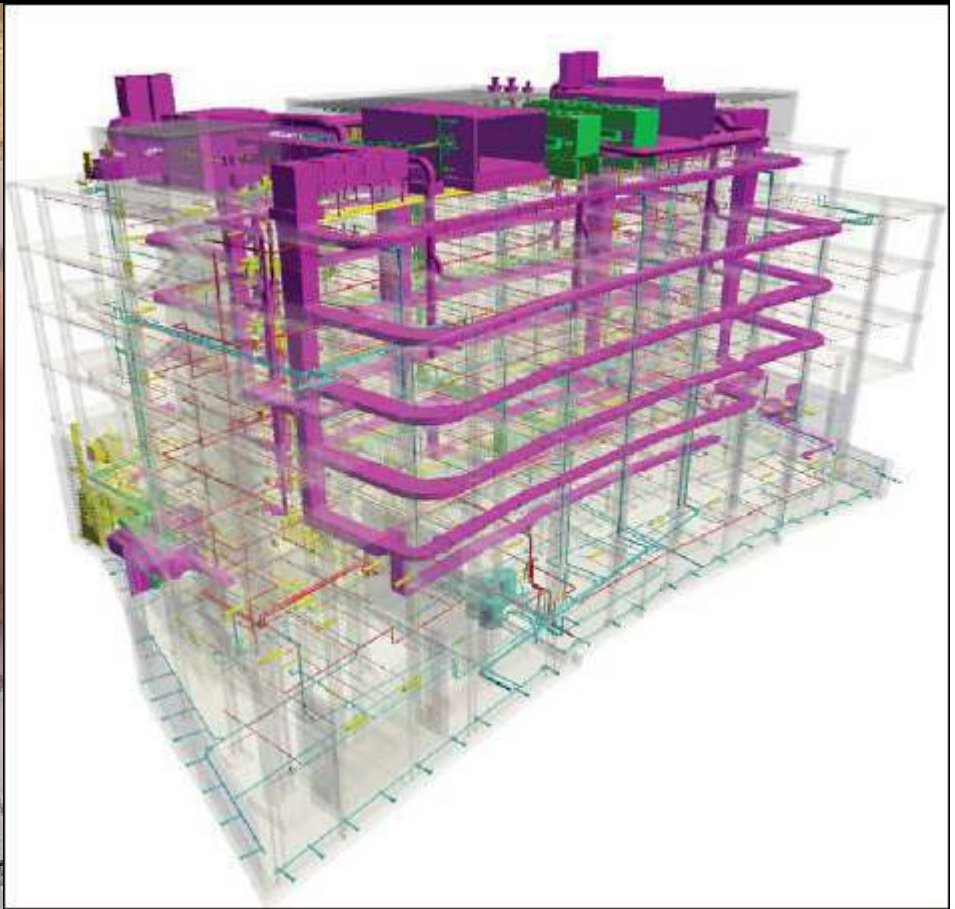
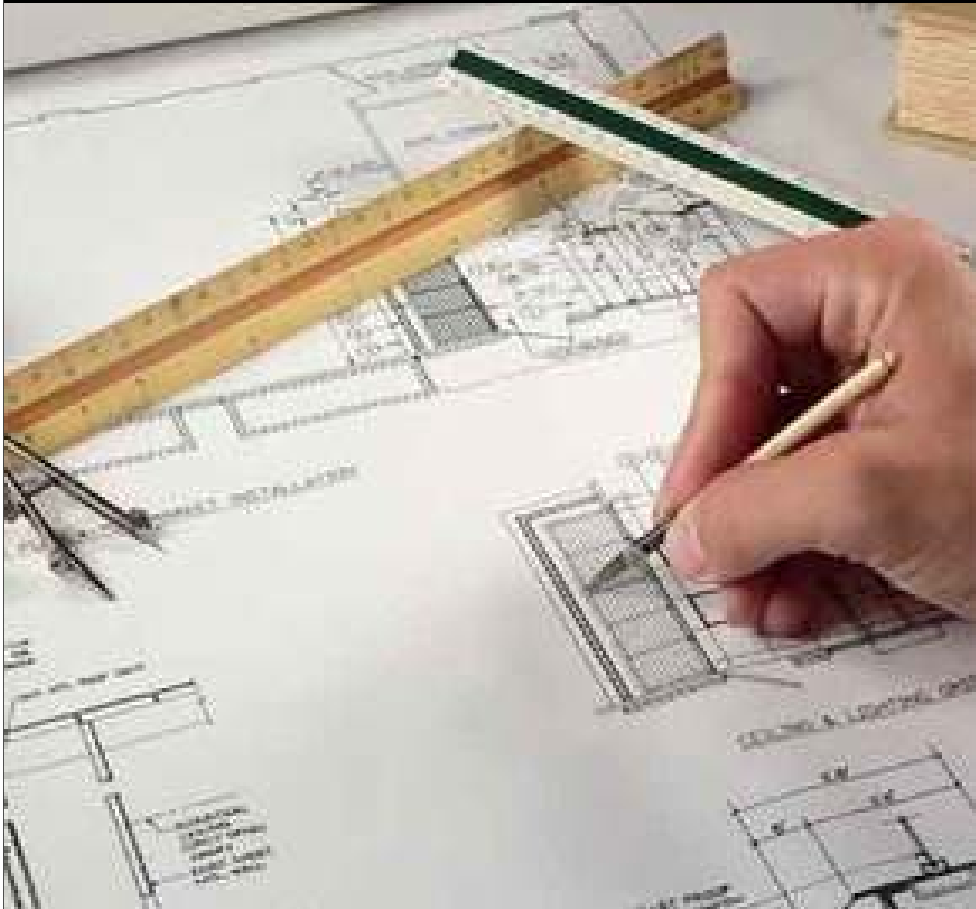
Everything's Premier but the Price











BUT

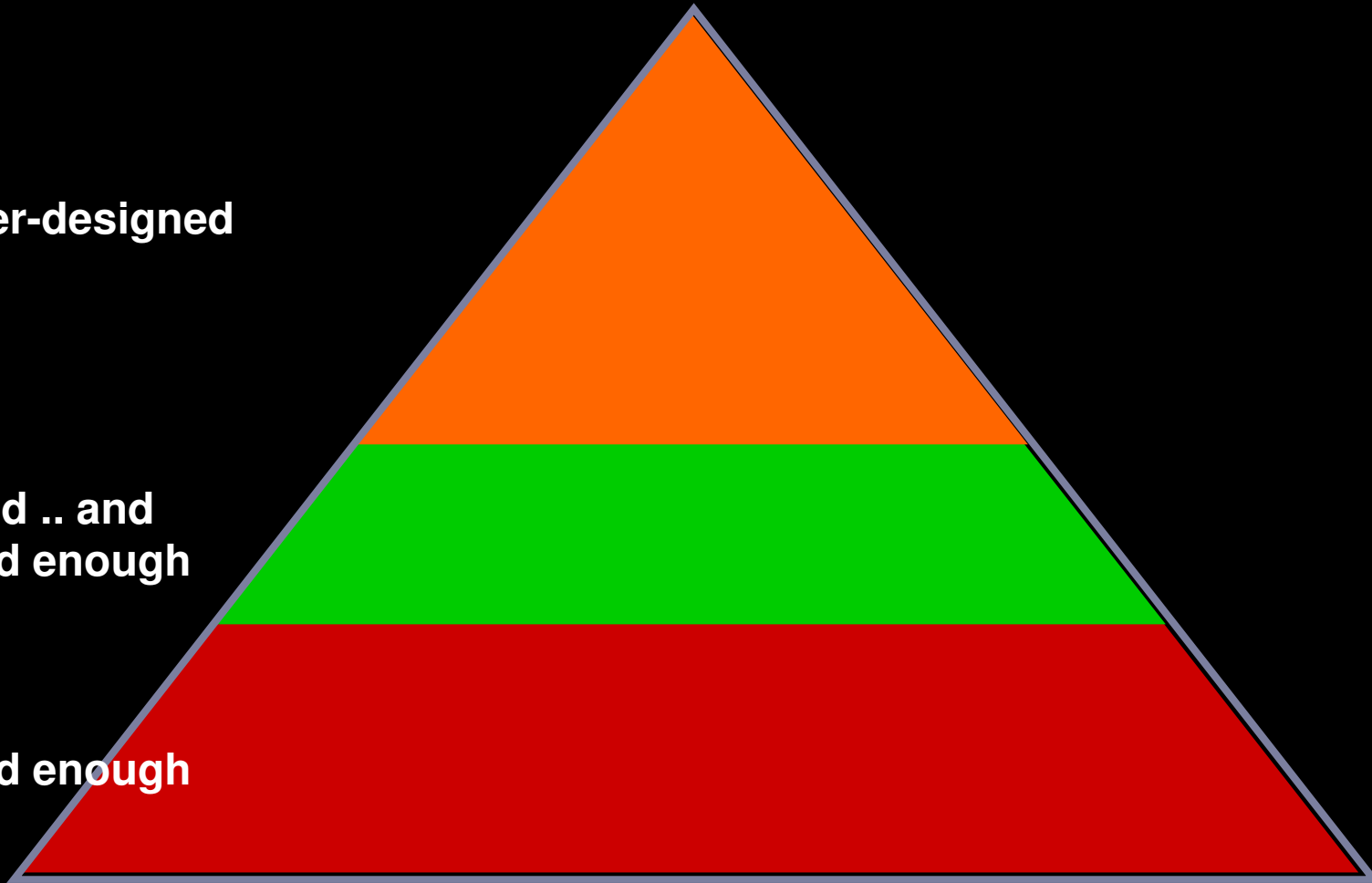


Good .. and good enough

Over-designed

Good .. and
good enough

Not
good enough



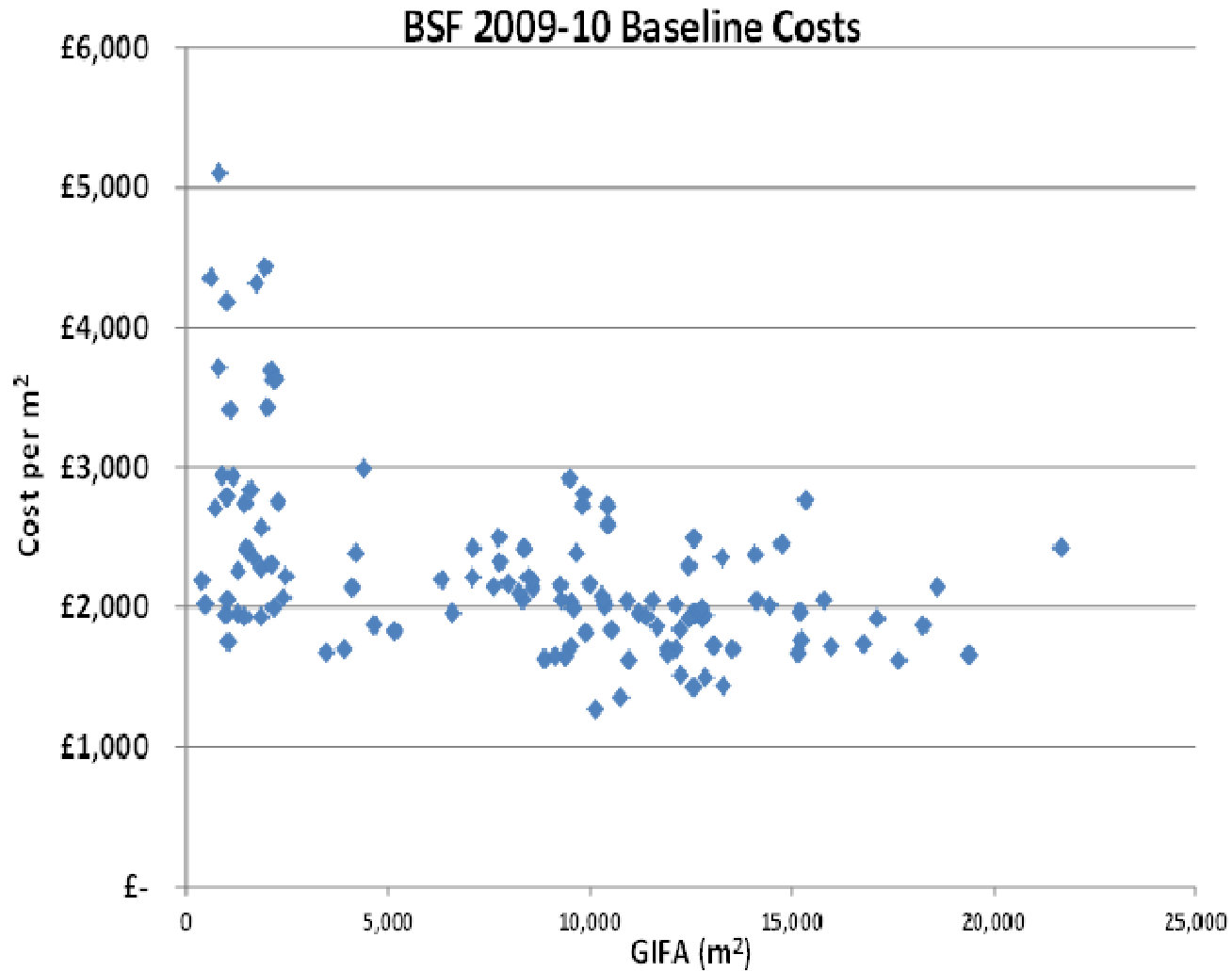




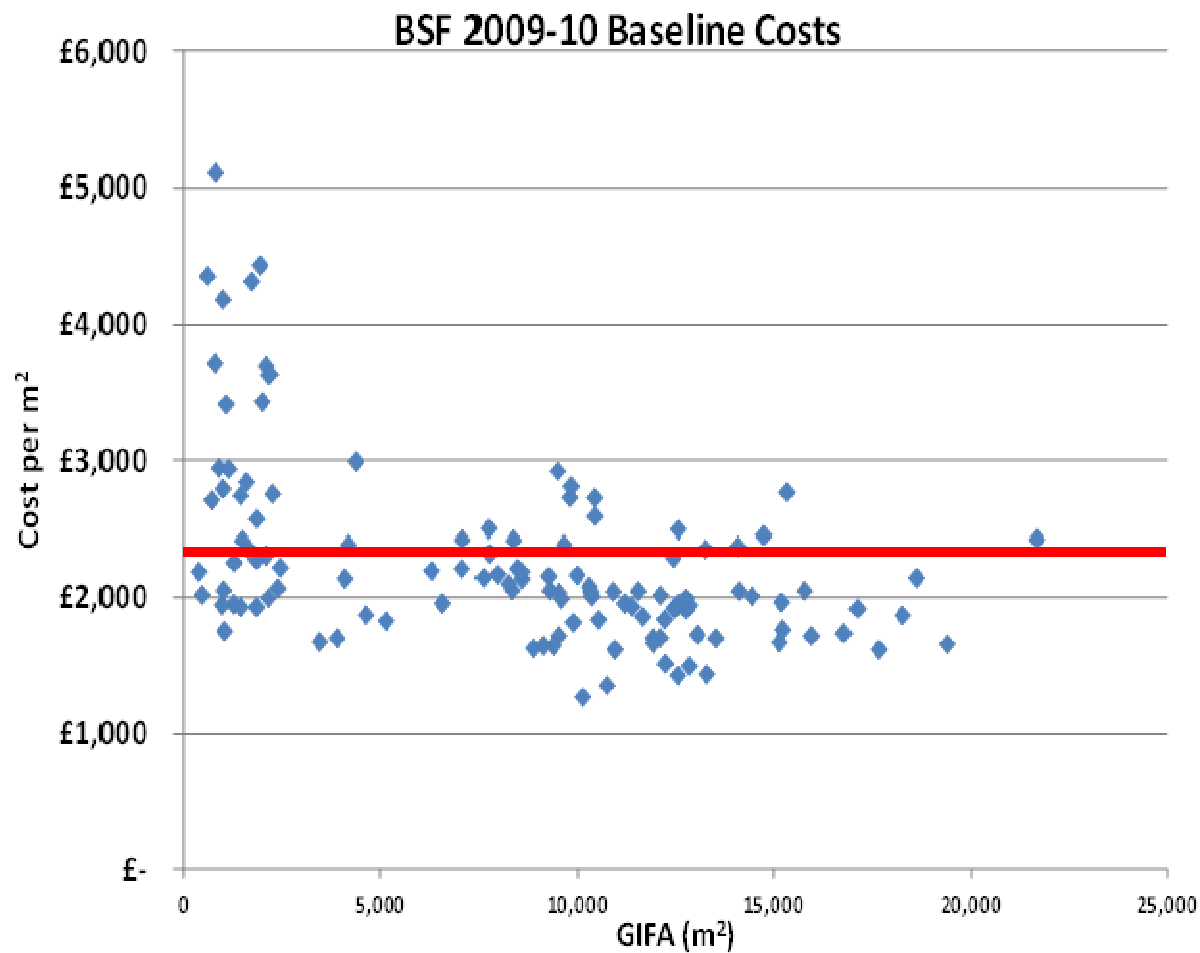


Benchmarking

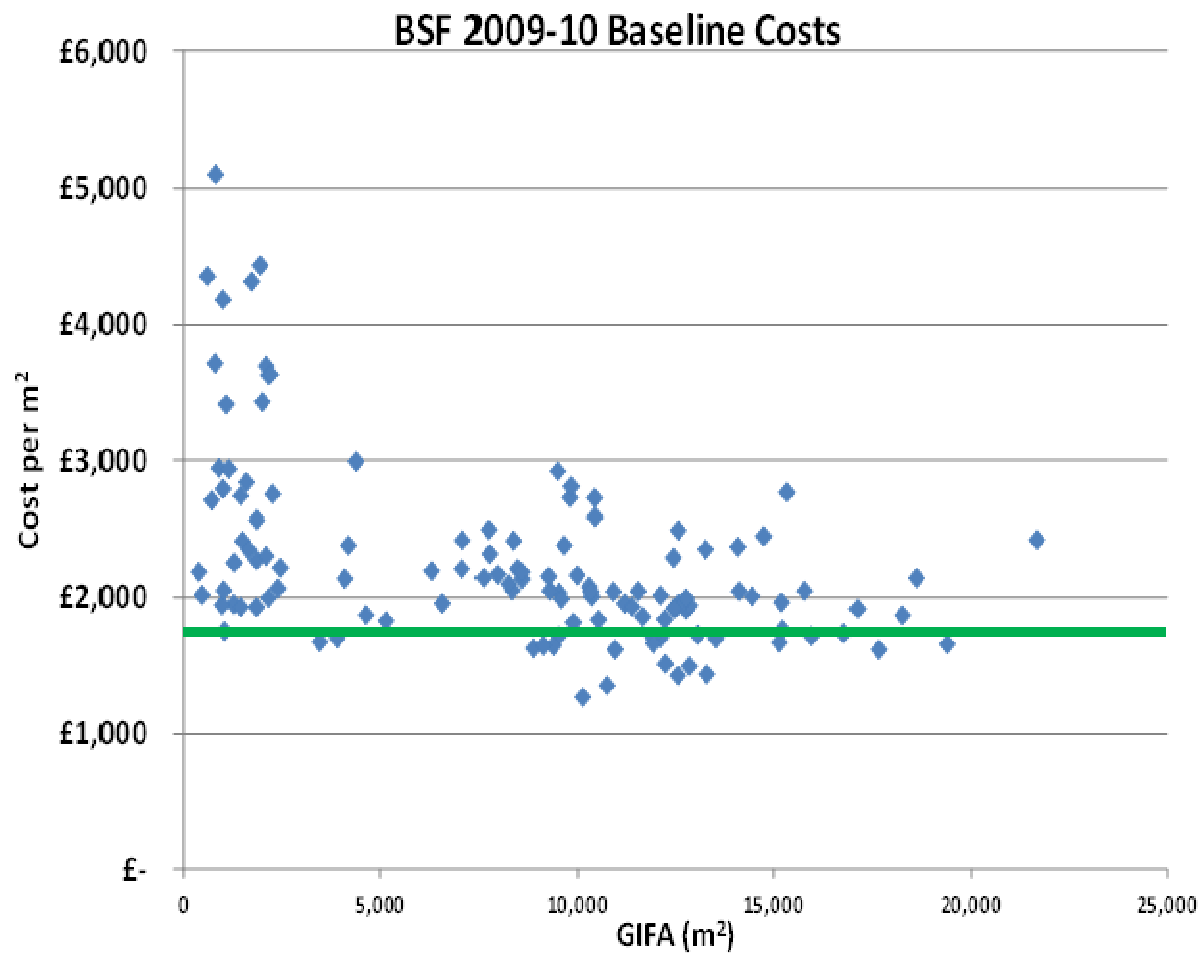
DfE / EFA: New Build Secondary Schools



DfE / EFA: New Build Secondary Schools



DfE / EFA: New Build Secondary Schools



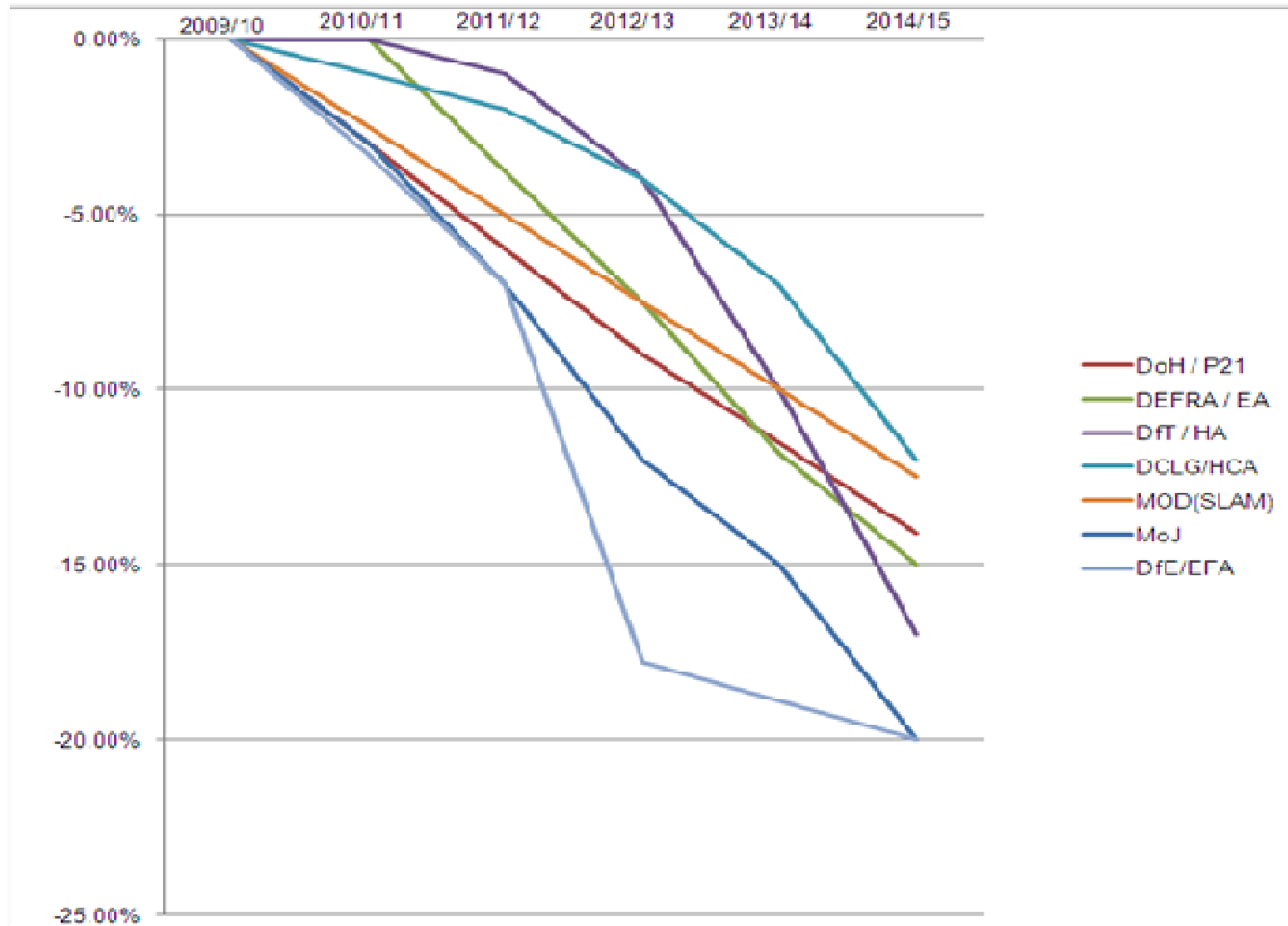


I am laying down the challenge to major Government suppliers to ask them what they can do to take costs out.

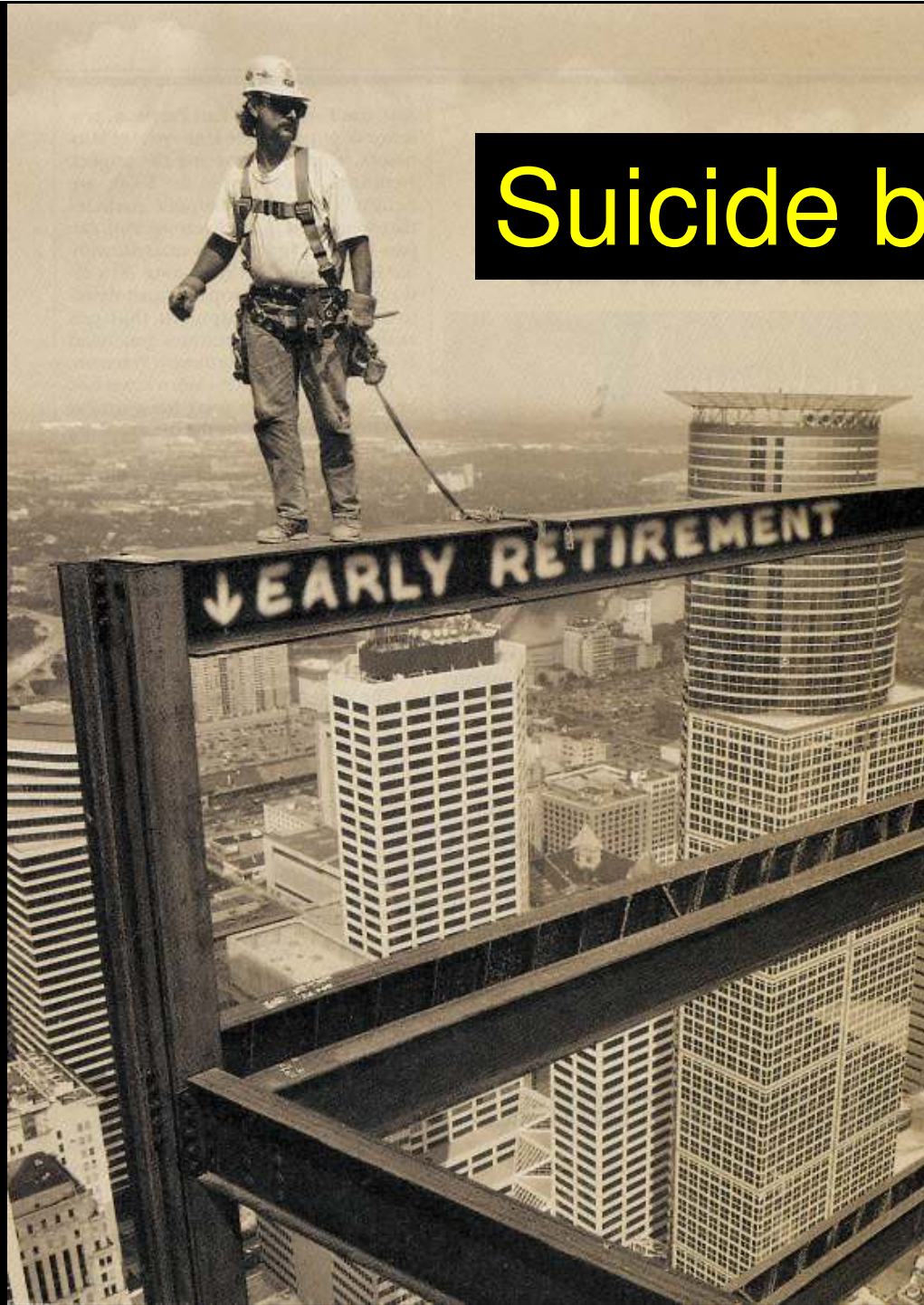


I am laying down the challenge to major Government suppliers to ask them what they can do to take costs out.

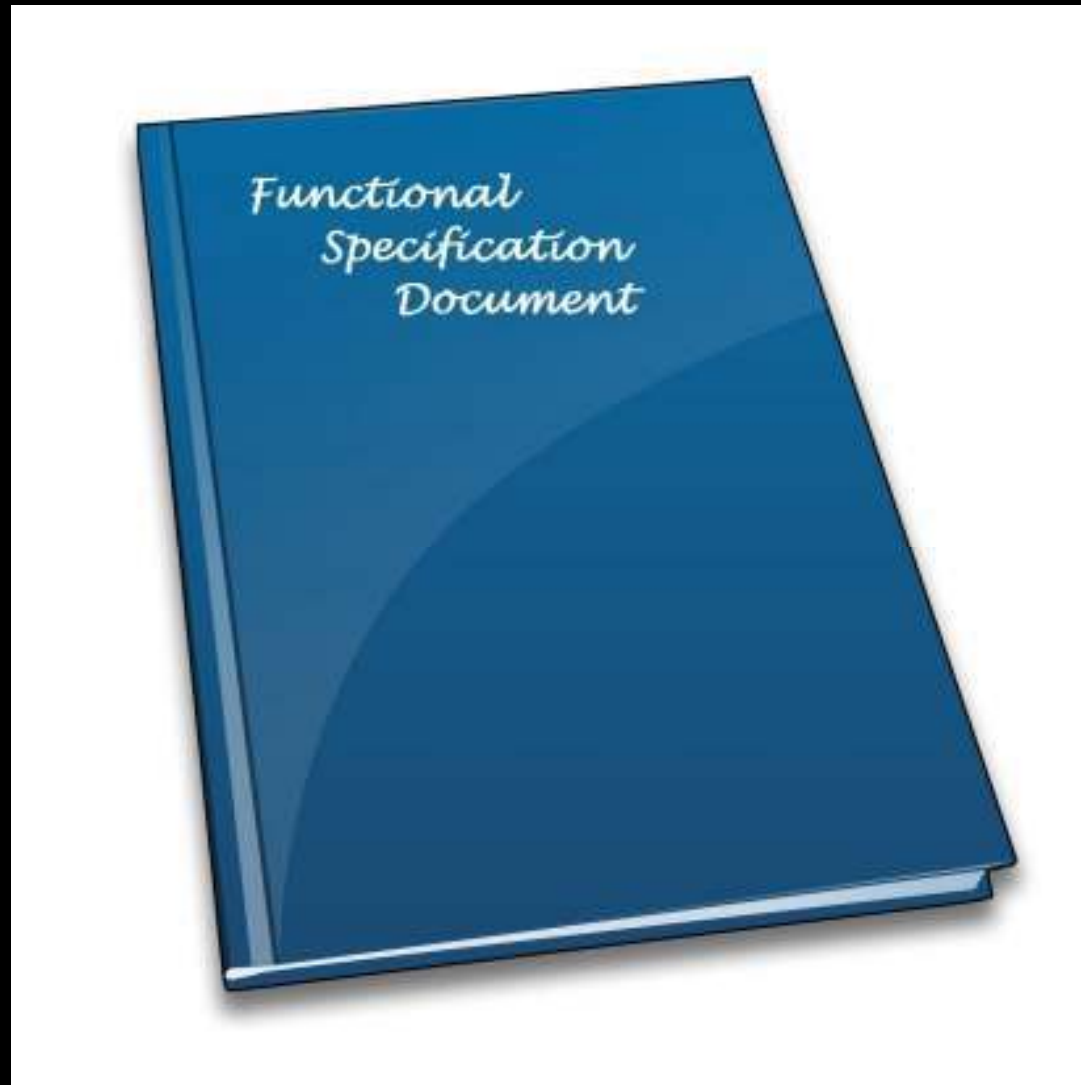
Chart 2: Department Cost Reduction Trajectories



Suicide bidding

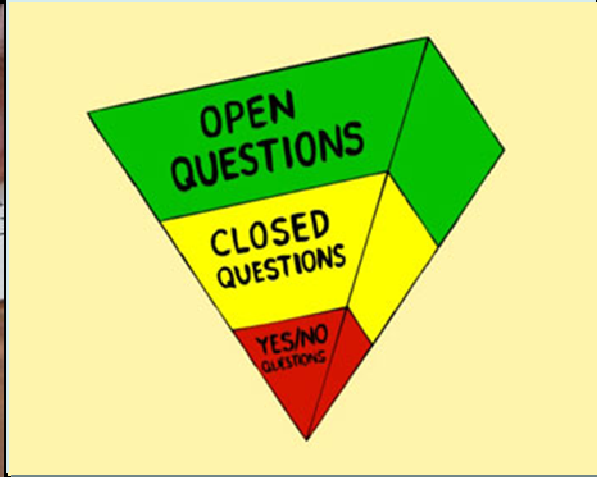


Standards









Edventure
(Bryanston Square)



Learning Barn
(BAM Design)



EcoCanopy
(Bryden Wood/
Ashe Construction)



Nurture Future
(Cartwright Pickard/
Tarmac Building Products)

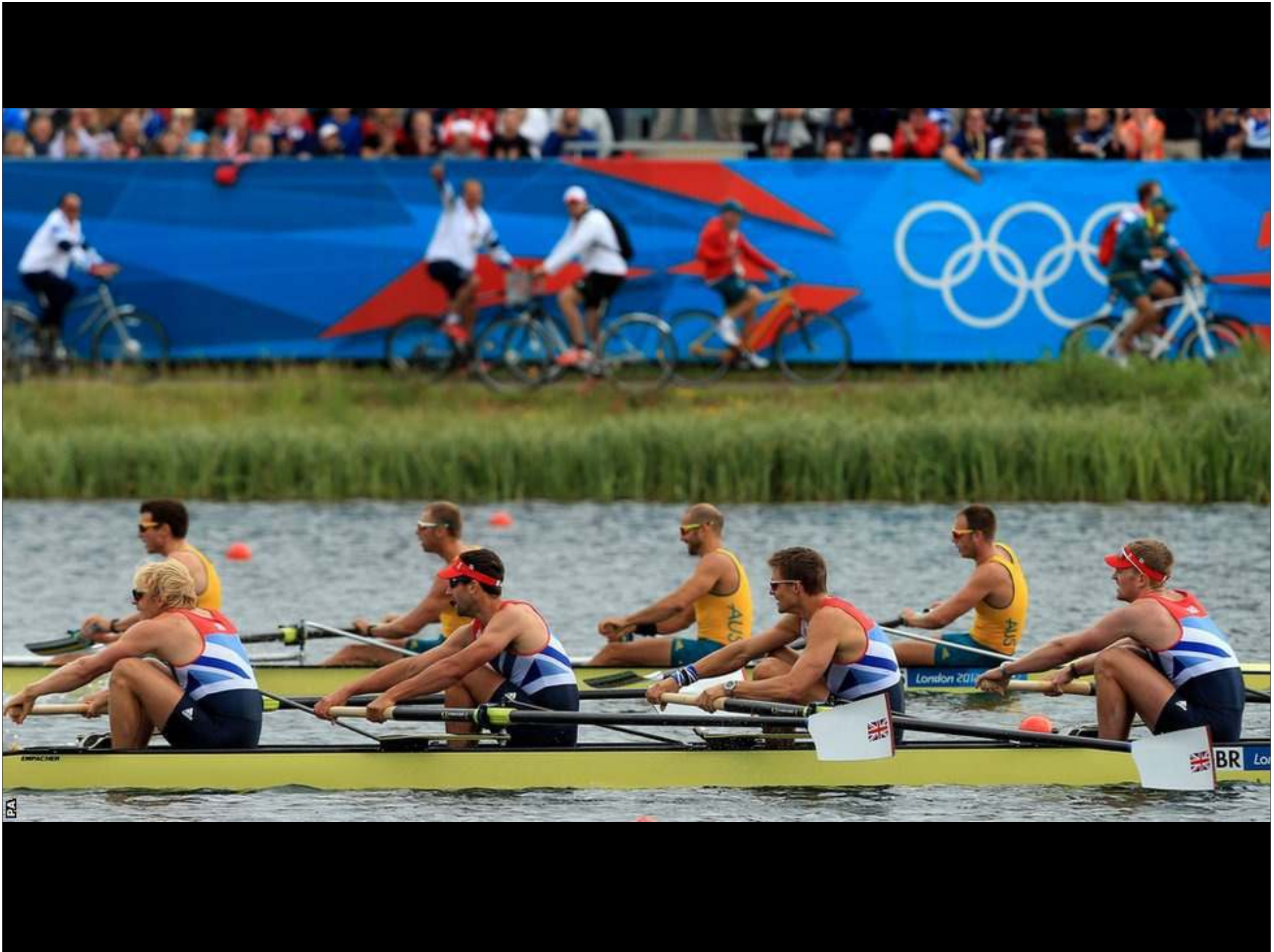
Sunesis
(Scape/Willmott Dixon)



New procurement models







Integration









Pipeline

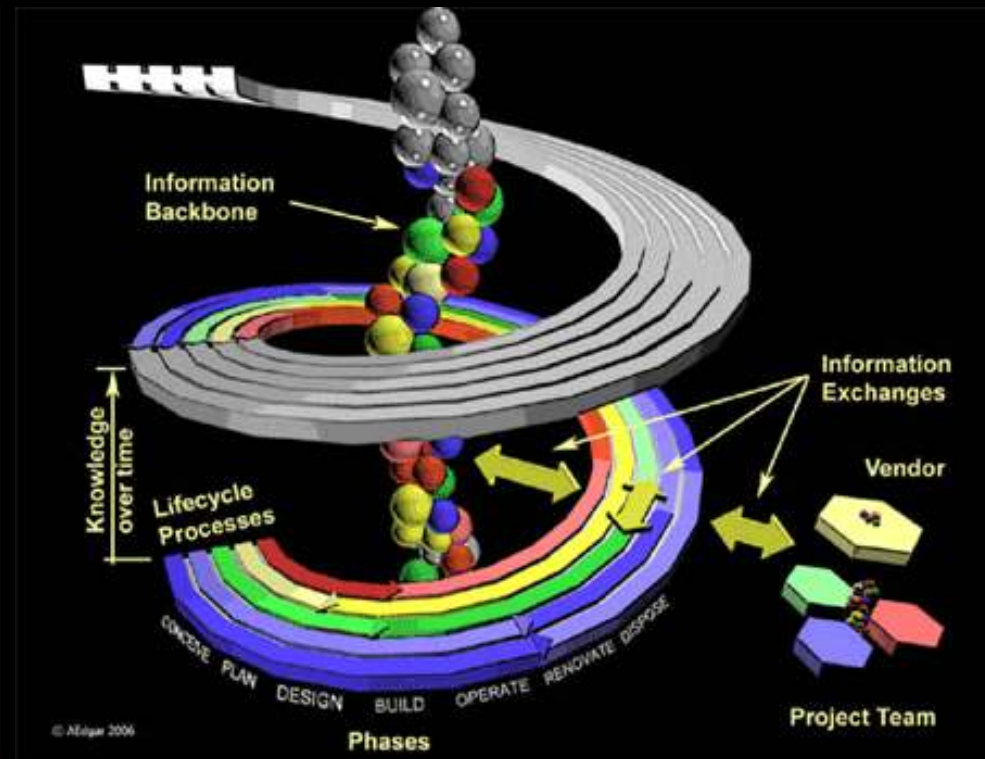


3 Years →





Building Information Modelling (and Management)







2 November 2010



2 November 2010



A large, dense crowd of young people, likely at a concert or event, with many individuals raising their hands in the air. The scene is filled with energy and excitement. A speech bubble is overlaid on the right side of the image.

They've mandated BIM!

16 November 2011



16 November 2011



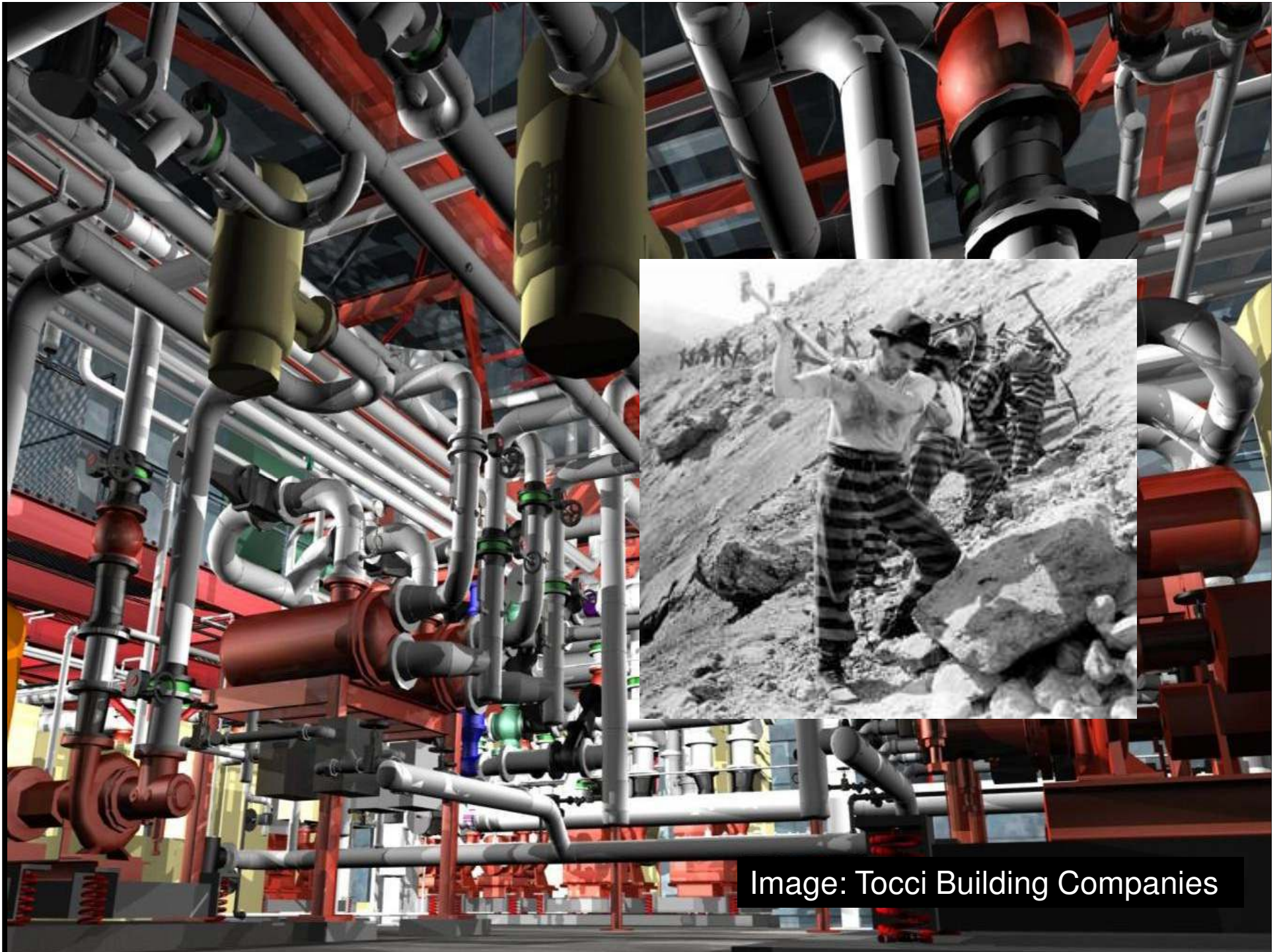
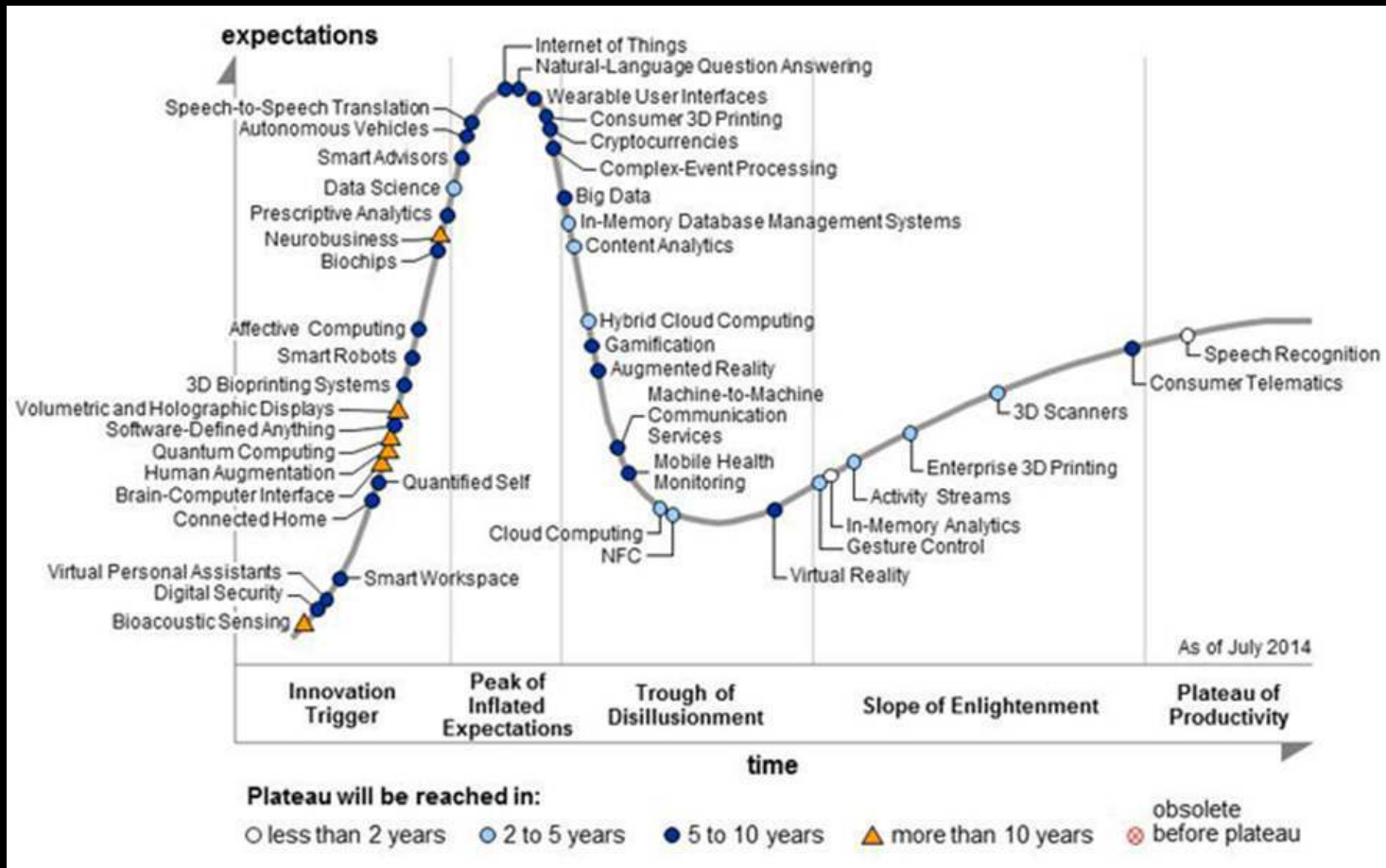


Image: Tocci Building Companies



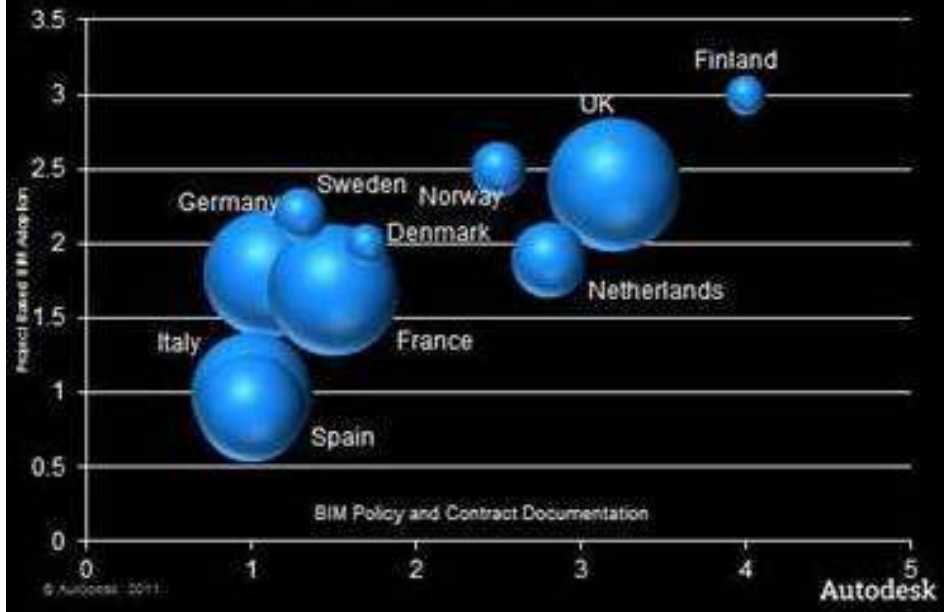


Source: Gartner

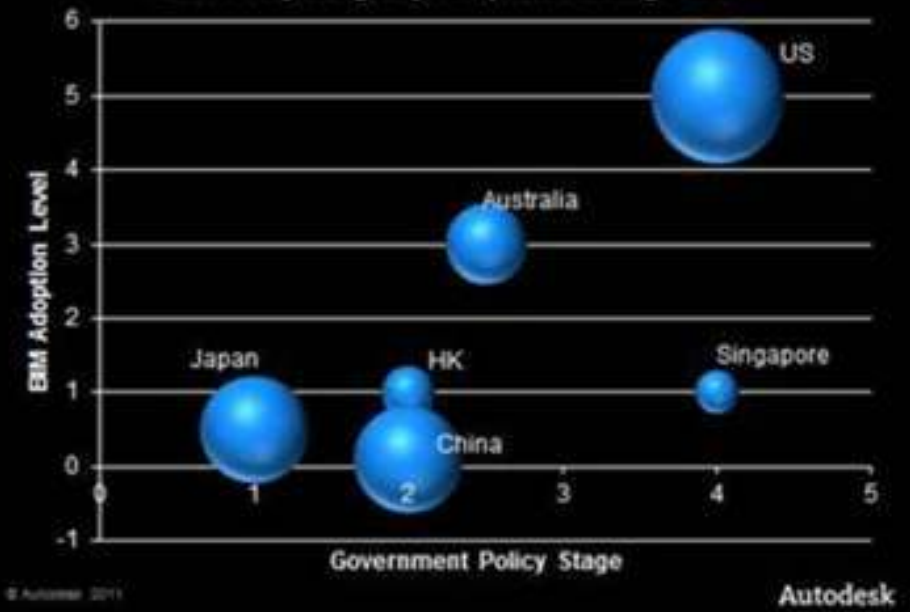
19 November 2012



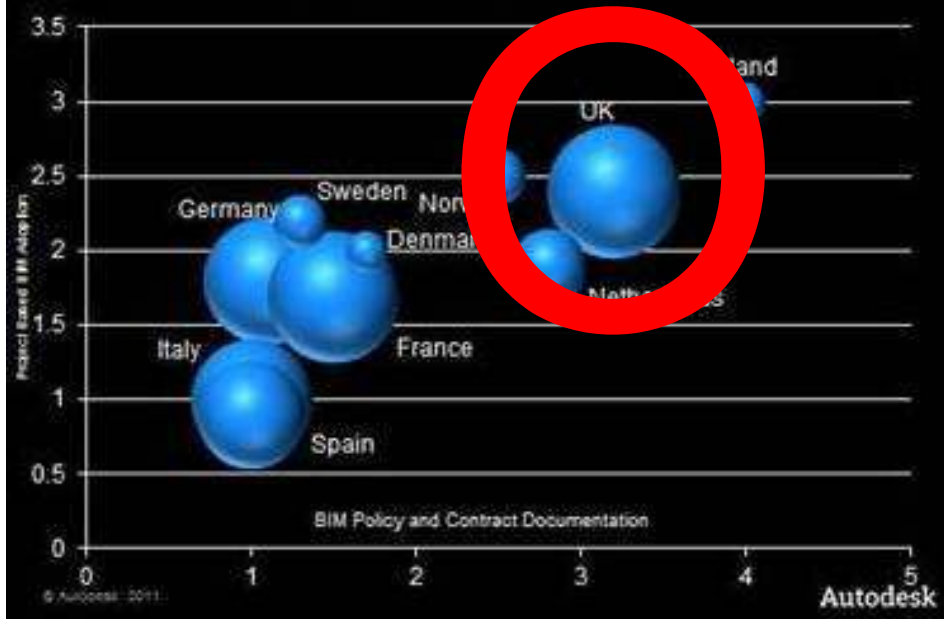
BIM Policy Stage by Adoption Rating - EMEA



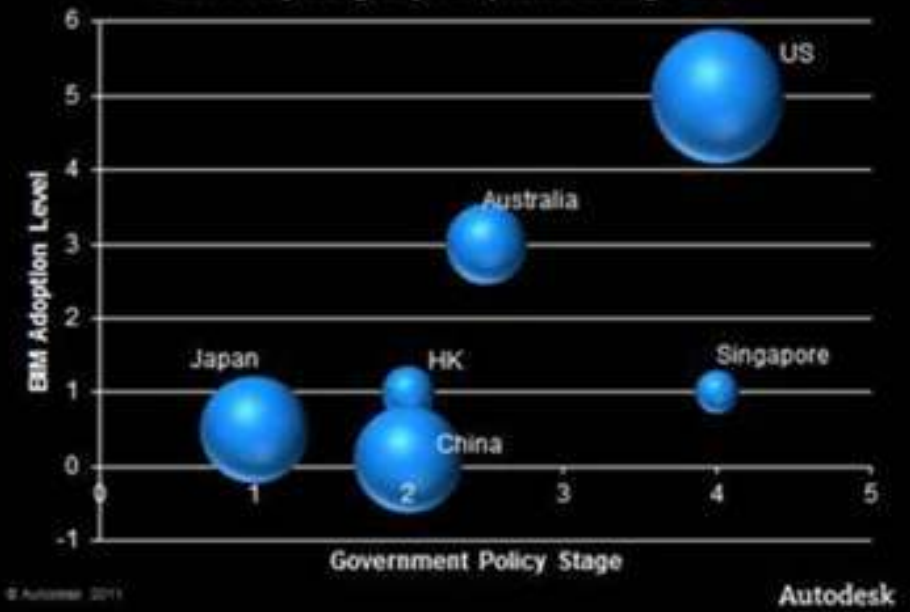
BIM Policy Stage by Adoption Rating-ASIA

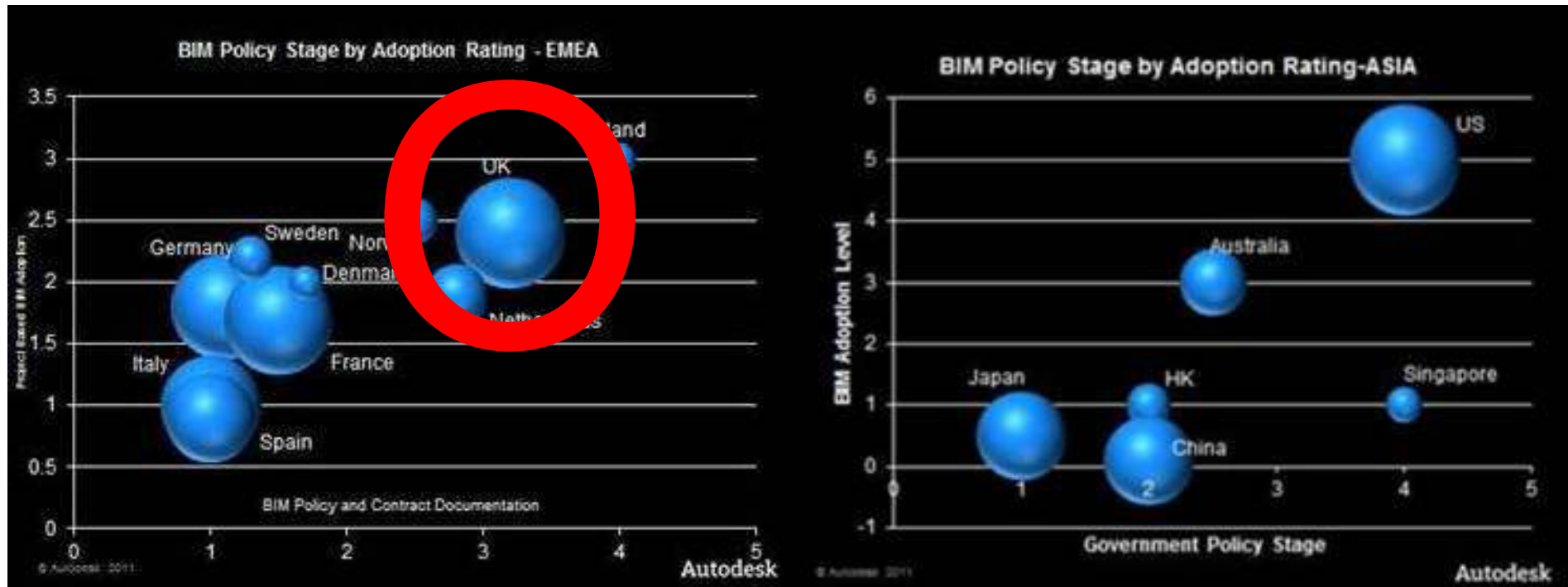


BIM Policy Stage by Adoption Rating - EMEA



BIM Policy Stage by Adoption Rating-ASIA





“I have never seen such speed in BIM adoption as here in UK in the last two years ... and I have closely followed or participated in the development in almost all of the global BIM adoption list - Finland, USA, Denmark, Australia”

Arto Kiviniemi, Liverpool University

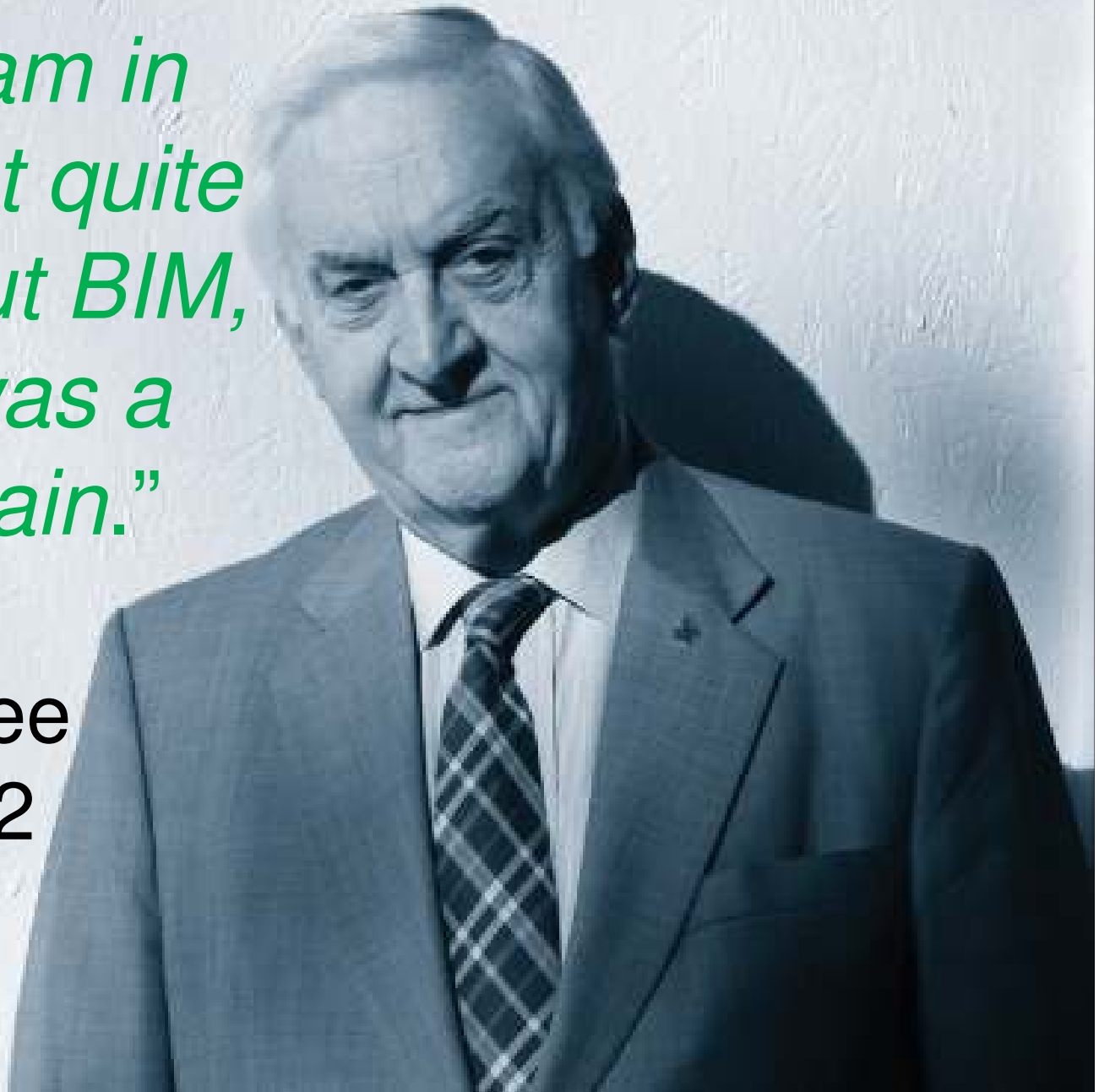


Patrick MacLeamy
CEO of HOK
Global Chairman
BuildingSMART International

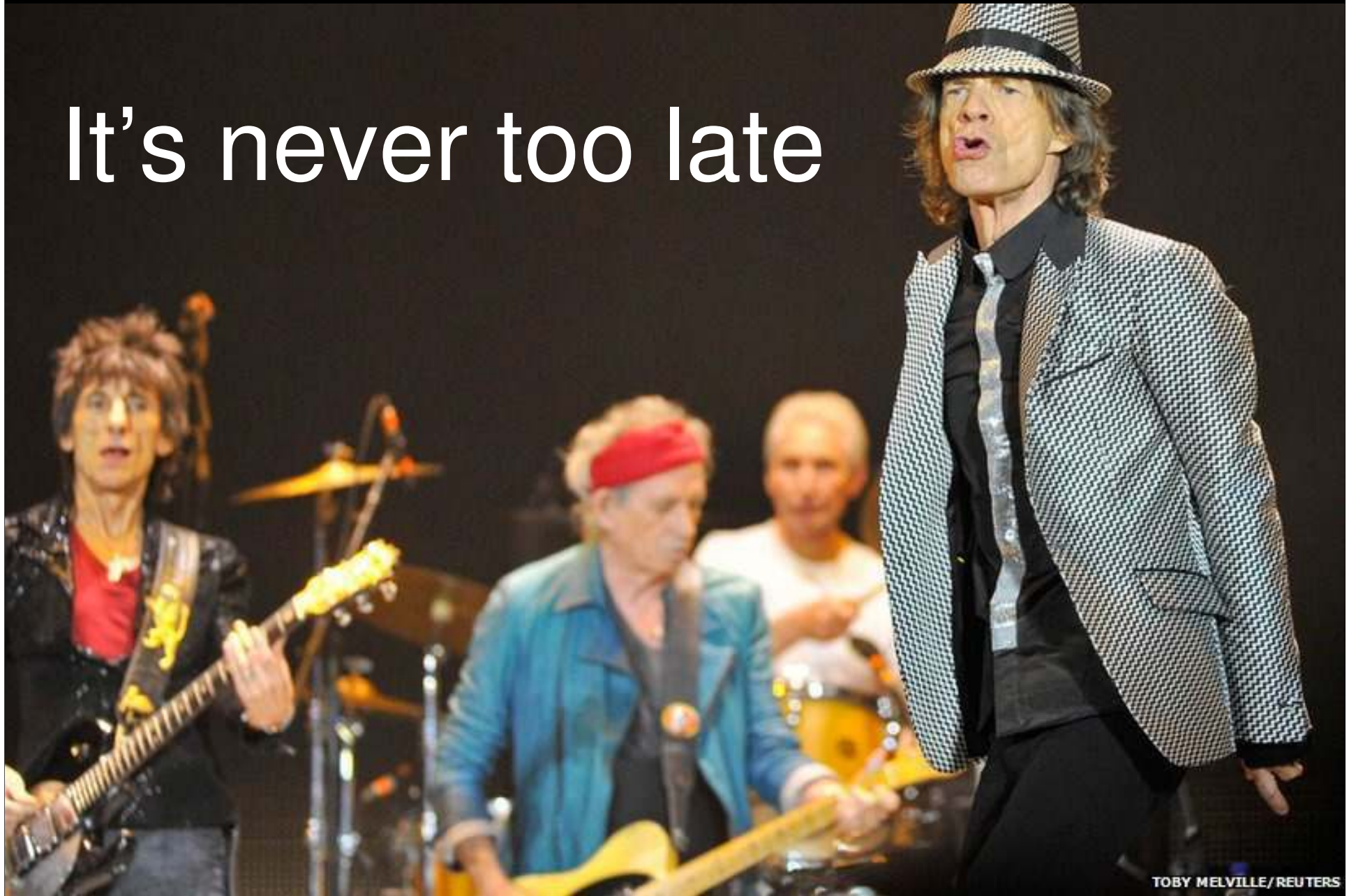
The UK BIM Strategy is the most ambitious and advanced centrally driven programme in the world. The UK has a window of opportunity to capitalise on its domestic programme to take on a global leadership role in BIM exploitation and service provision.

“Although I am in my 70s, I get quite excited about BIM, and wish I was a graduate again.”

Doug Oakervee
Chairman HS2



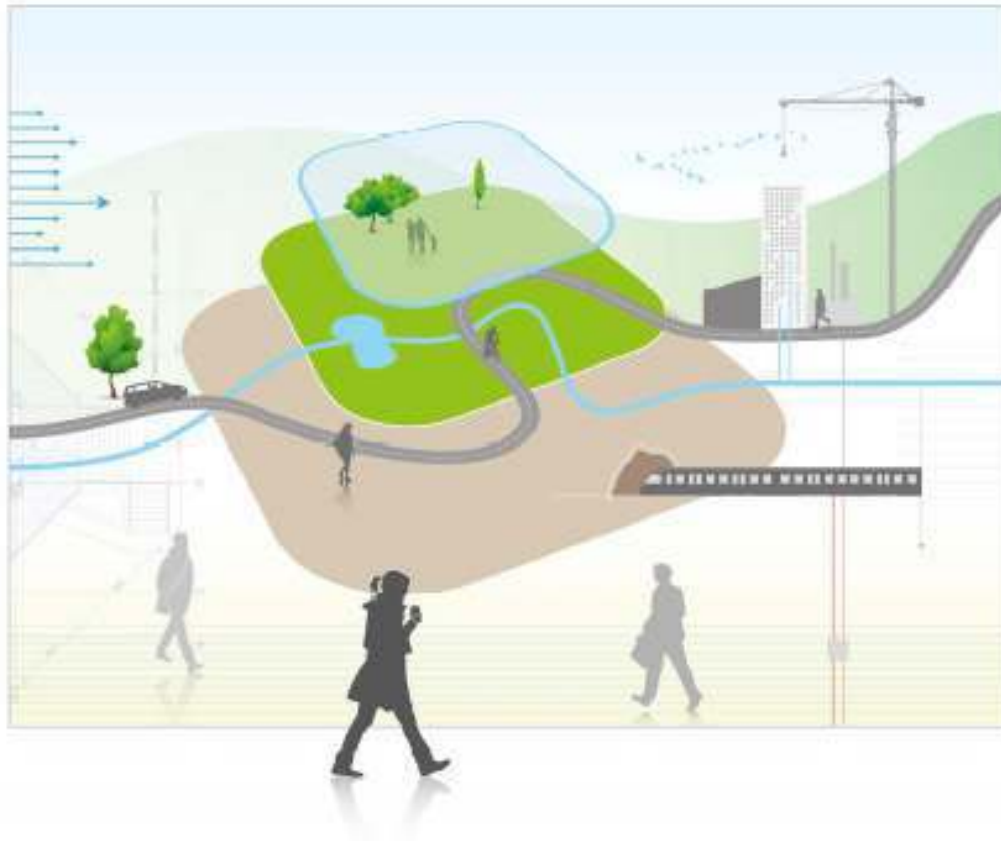
It's never too late





BIM

Management for
value, cost & carbon
improvement



Government Construction Client Group Building Information Modelling (BIM) Working Party Strategy Paper

Leave complexity in the supply chain



A push/pull strategy

“Push”

Packaging BIM Products

- Training
- Technology
- Standards
- Contracts
- Understanding



“Pull”

Data Collection & Use

- Gateway Reviews
- Planning
- Handover
- O & M
- Whole life
- Carbon



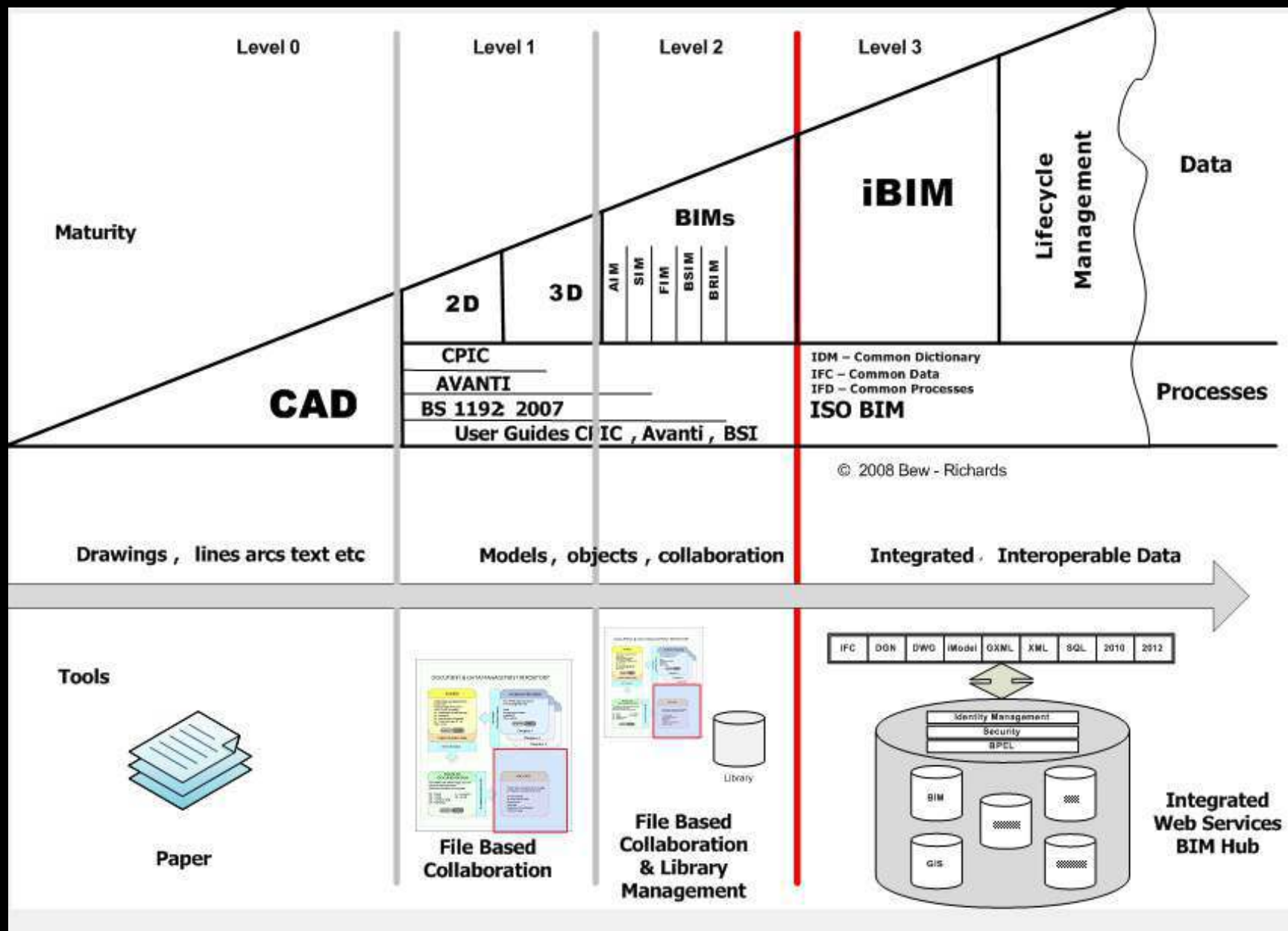






Small(ish) steps









Beware complexity







Just because you can ... it doesn't mean you have to

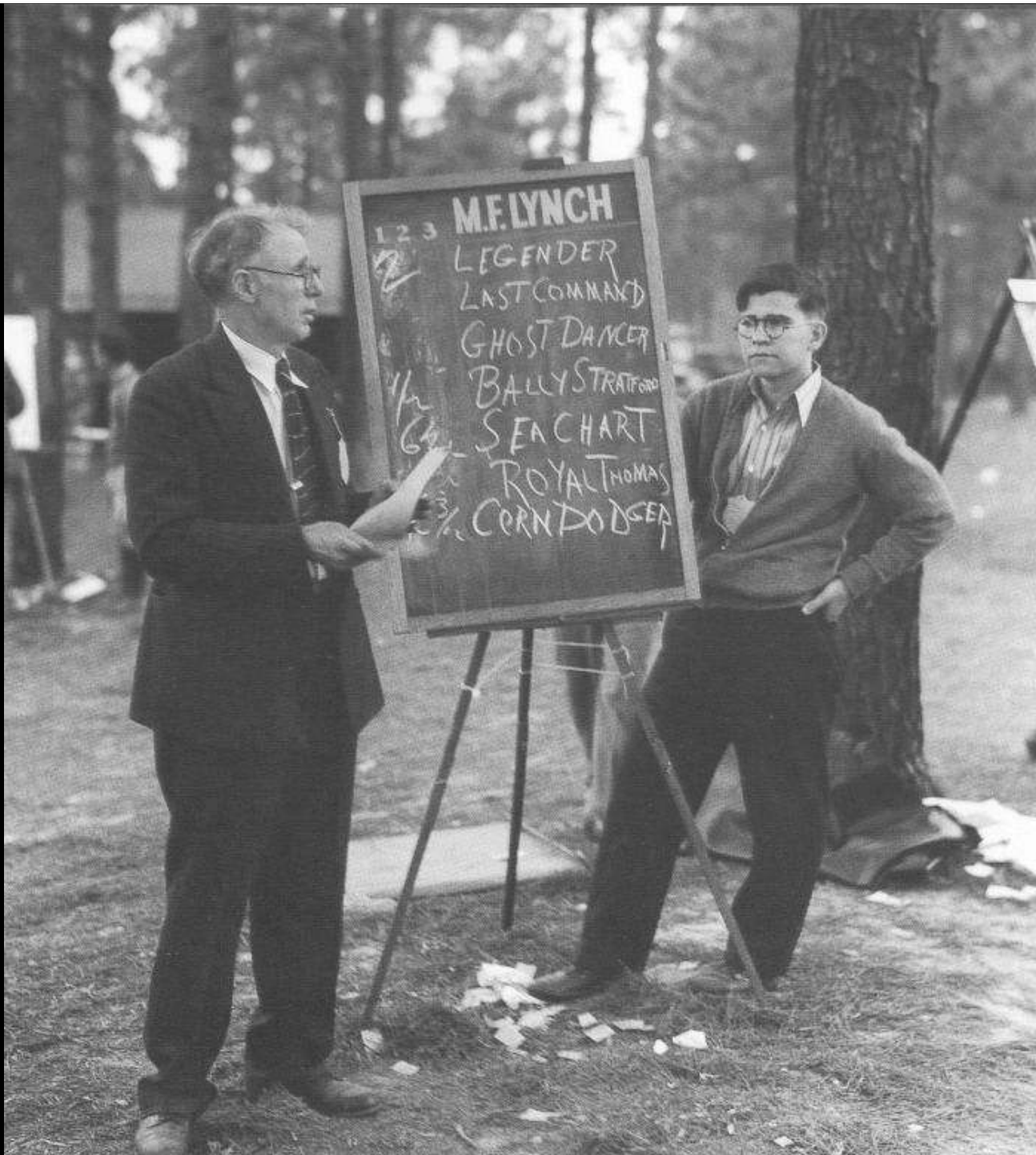




***Only ask for what
you will use***







1 2 3 M.F. LYNCH

LEGENDER

LAST COMMAND

GHOST DANCER

BALLYSTRATFORD

SEA CHART

ROYAL THOMAS

CORNDODGER

A shared platform

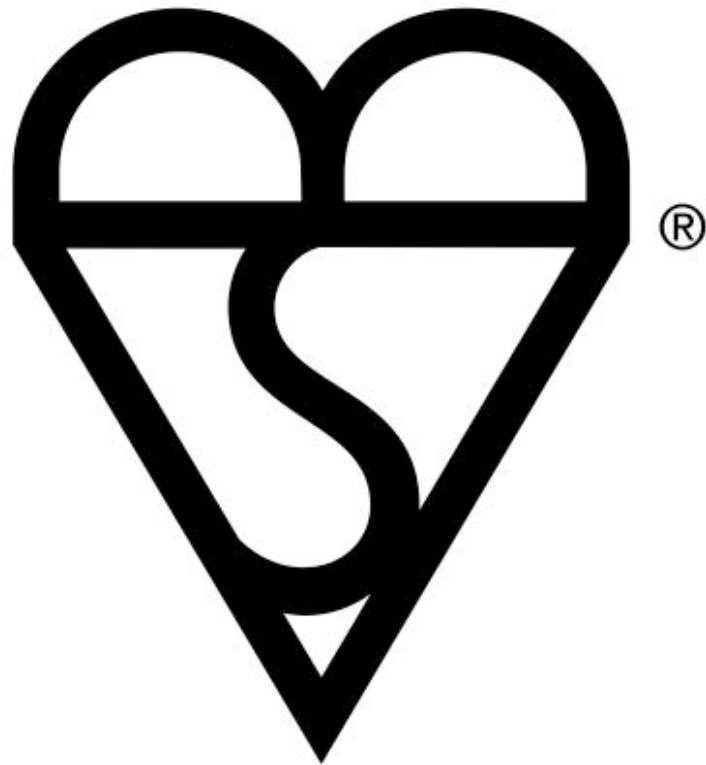




**There's an App
For That**

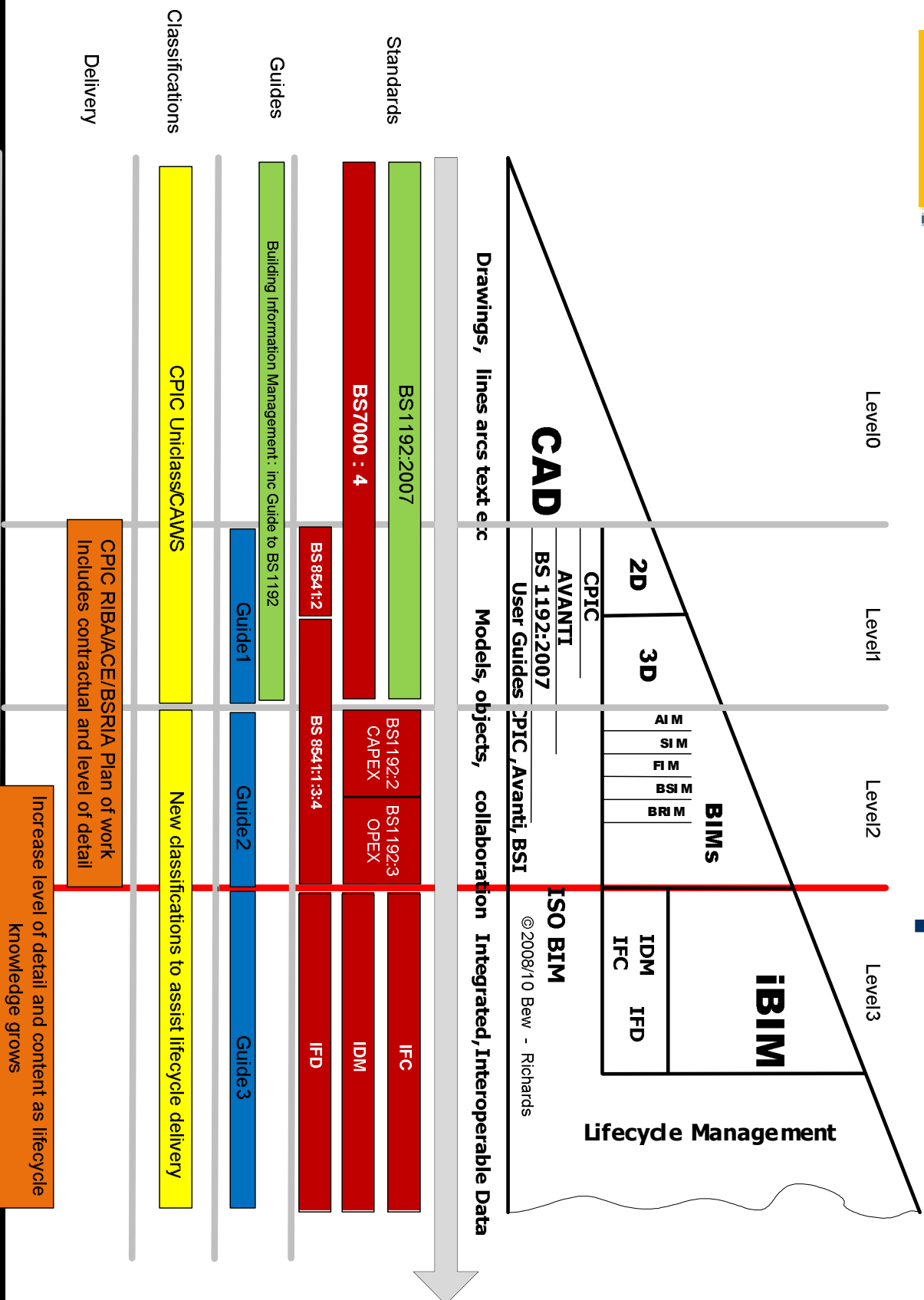


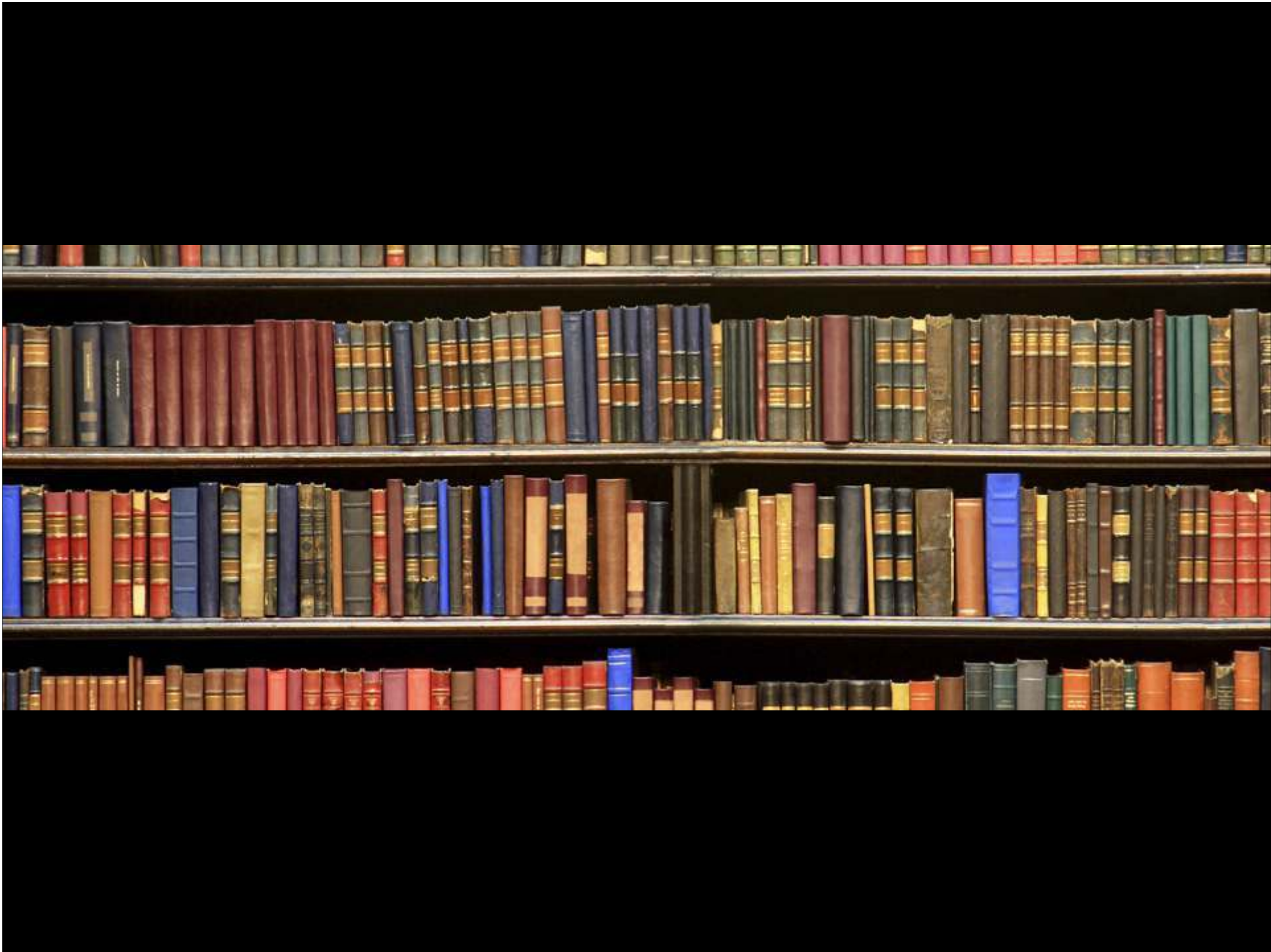
Standards and methodologies



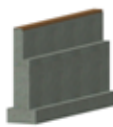


BS5555 Roadmap





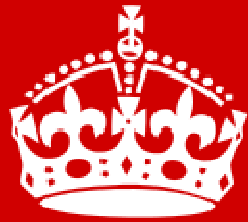
Assembly Management – Level of Detail

Foundations		General Information Use			
	BIM Object or Element	Basic Tool Features	Derived Data	Selection Agent	Building System
	Item Category - Foundation Description: A 2D and 3D element. Elements that make up the structural support system for the base of the building. There may include: wall, footing, slab, column, grade beam, etc.	Structural System	Material Values, Linear Feet of Material	Primary Circular Structural Element Secondary Circular:	How System Category - Uniform
Level of Development	Information Category for Information Item (See Master Information Tab)	Information Item (Information about the specific object or element)	Model Element Author	Information Classification Origin	IFC Support
LOD 1-Brief/Concept					
Overall Building Massing Indicative of Area, Height, Volume, Location, and Orientation.	Curbing Requirements	Conceptual Cart			IfcFooting>IfcCartValue.CartType="Conceptual"
	Curbing Requirements	Conceptual Unit Cart			IfcFooting>IfcCartValue.CartType="Conceptual" * UnitBar
	Curbing Requirements	Future Cart Assumption			IfcFooting>IfcCartValue.CartType="Whole life"
LOD 2-Developed Design					
Generalized System or Assembly with Approximate Quantities, Size, Shape, Location, and Orientation.	Building Program & Project Meta	ComponentName			IfcFooting>IfcQuantityLength.Name="Length"
	Building Program & Project Meta	ComponentType			
	Building Program & Project Meta	ComponentDescription			
	Building Program & Project Meta	ComponentSpace			
	Building Program & Project Meta	Type			
	Building Program & Project Meta	TypeCategory			
	Building Program & Project Meta	TypeDescription			
	Building Program & Project Meta	TypeAssetType			
	Physical Properties of BIM Objects &	Length			
	Physical Properties of BIM Objects &	Width			IfcFooting>IfcQuantityLength.Name="Width"
	Physical Properties of BIM Objects &	Height			IfcFooting>IfcQuantityLength.Name="Depth"
	Physical Properties of BIM Objects &	Area			IfcFooting>IfcQuantityArea.Name="GrossSurfaceArea"
	Physical Properties of BIM Objects &	Volume			IfcFooting>IfcQuantityVolume.Name="GrossVolume"
	Physical Properties of BIM Objects &	Maximum Size			
	General Spatial and Spatial Location of	Story Number			IfcFooting>IfcBuildingStoryName
	General Spatial and Spatial Location of	SpaceName			IfcFooting>IfcZone.LongName (new in IFC2x4)
	Manufacturer Specific Information	General Type			IfcFootingType.Name + IfcClassificationReference
	Curbing Requirements	Value Based Curbing (i.e. Cart Sam.)			IfcFooting>IfcCartValue.CartType="Estimated" * UnitBar
	Code Compliance/ Occupant Safety	Fire Rating Requirement			IfcFooting>Pset_FootingCommon.IfcProperty.Name="FireRating"
	Code Compliance/ Occupant Safety	Building Type Selection			IfcFooting>IfcBuilding>IfcConstraint
Phase Time Sequencing & Schedule	Time Sequence			IfcProject>IfcTask>IfcRelSequence + assign IfcFooting>IfcRelAssignToProcess	
Phase Time Sequencing & Schedule	Order of Project Milestone			IfcProject>IfcTask.InMilestone>IfcRelSequence + assign IfcFooting>IfcRelAssignToProcess	
LOD 3-Production					
Specific Assembly that are Accurate in Terms of Size, Shape, Location, Quantity, and Orientation.	Physical Properties of BIM Objects &	TypeNominalLength			
	Physical Properties of BIM Objects &	TypeNominalWidth			
	Physical Properties of BIM Objects &	TypeNominalHeight			
	Physical Properties of BIM Objects &	TypeSize			
	Physical Properties of BIM Objects &	Nominal Size			
	Physical Properties of BIM Objects &	Capacity			IfcFooting>Pset_FootingCommon with Property.Name="LoadBearing"
	Physical Properties of BIM Objects &	Perimeter			
	Physical Properties of BIM Objects &	Cross Section			
	Physical Properties of BIM Objects &	Depth			
	Physical Properties of BIM Objects &	Elevation			total height, sum up by IfcFooting.ObjectPlacement.RelativePlacement.Location.[2]
	General Spatial and Spatial Location of	Elevation to Datum			total height, sum up by IfcFooting.ObjectPlacement.RelativePlacement.Location.[2]
	General Spatial and Spatial Location of	Rotation Angle			IfcFooting>IfcBuildingStory.Elevation
	General Spatial and Spatial Location of	Elevation to Storey			IfcFooting.ObjectPlacement.RelativePlacement.RefDirection
	General Spatial and Spatial Location of	Coordinate Category			
	General Spatial and Spatial Location of	Coordinate Axis			IfcFooting.ObjectPlacement.RelativePlacement.Location.[8]

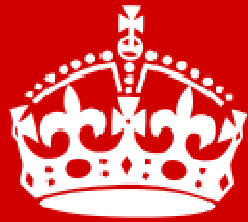


Contracts and Legal

- Ownership and sharing
- Copyright and IPR
- Insurance
- Contracts



**KEEP
CALM
AND
CARRY
ON**



**KEEP
CALM
AND
CARRY
ON**



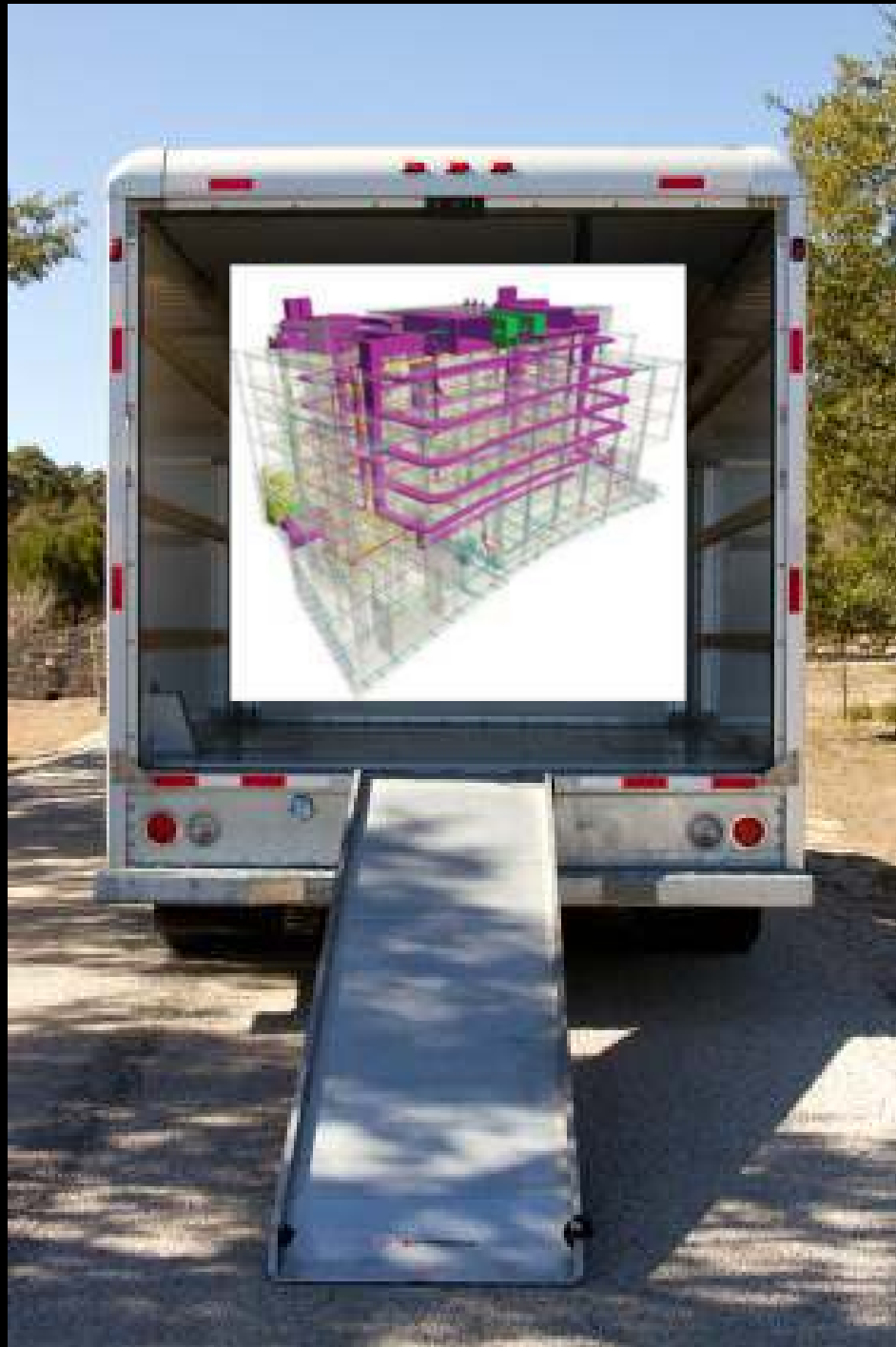
**AFFIX
BLAME
AND
SUE**

Training & Support Systems (packaging the “push”)

- Technology
- Training
- Accreditation
- Support Organisations
- Documentation
- Shrink Wrapping
- Organisation

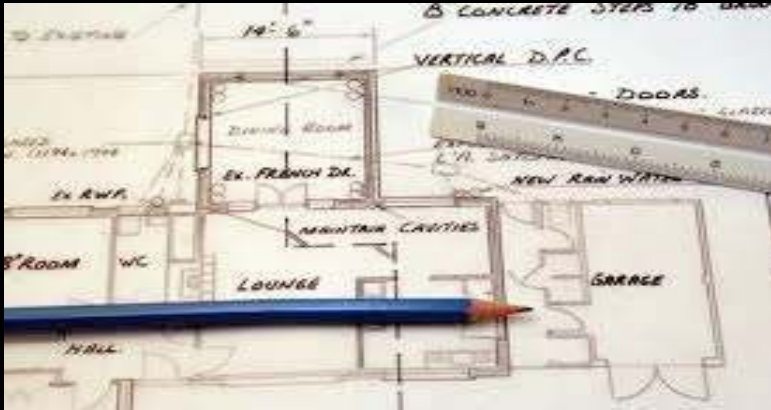




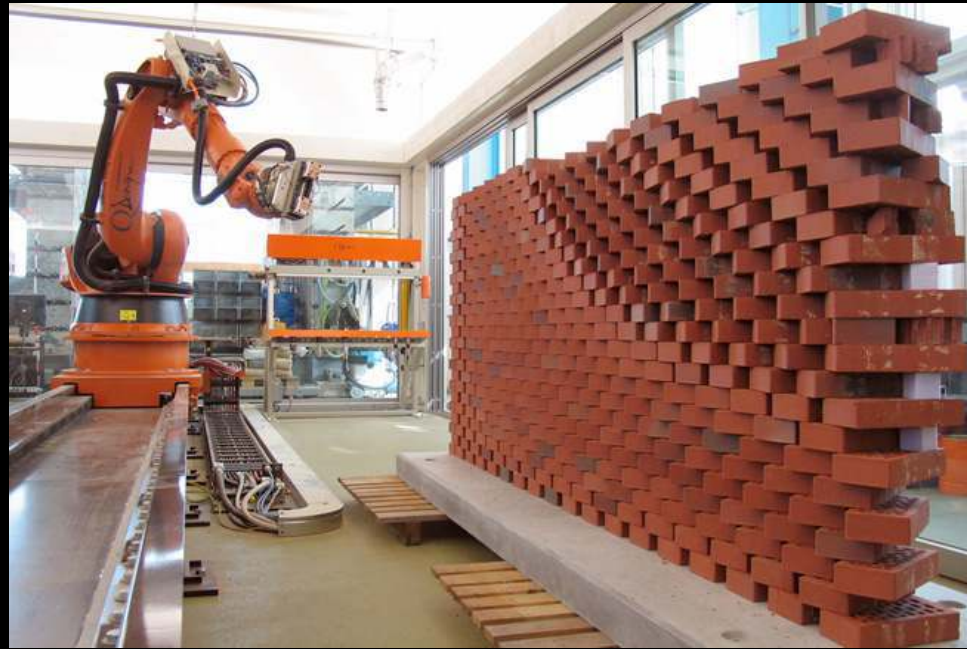




Educating for the past or for the future?



How can we get talented people interested in working in the industry?



Acknowledgement: Professor Arto Kiviniemi, University of Liverpool

BIM networks



Regional BIM Hubs



- To raise awareness across the supply chain
- To develop a programme to assist mobilization
- To create and promote consistent standards



Mike Peasland, Group Chair

BIM4SupplySideDelivery

“I believe it will be a nail in the coffin of small, highly skilled local contractors.”



BIM4SMEs



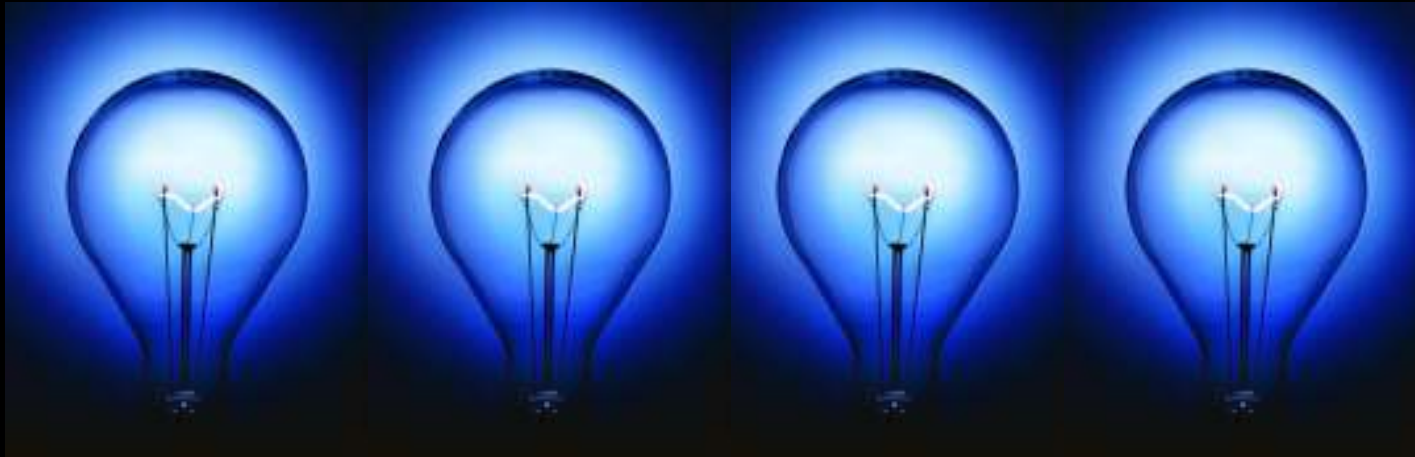
BIM4Retail



BIM4Commercial



BIM4Rail



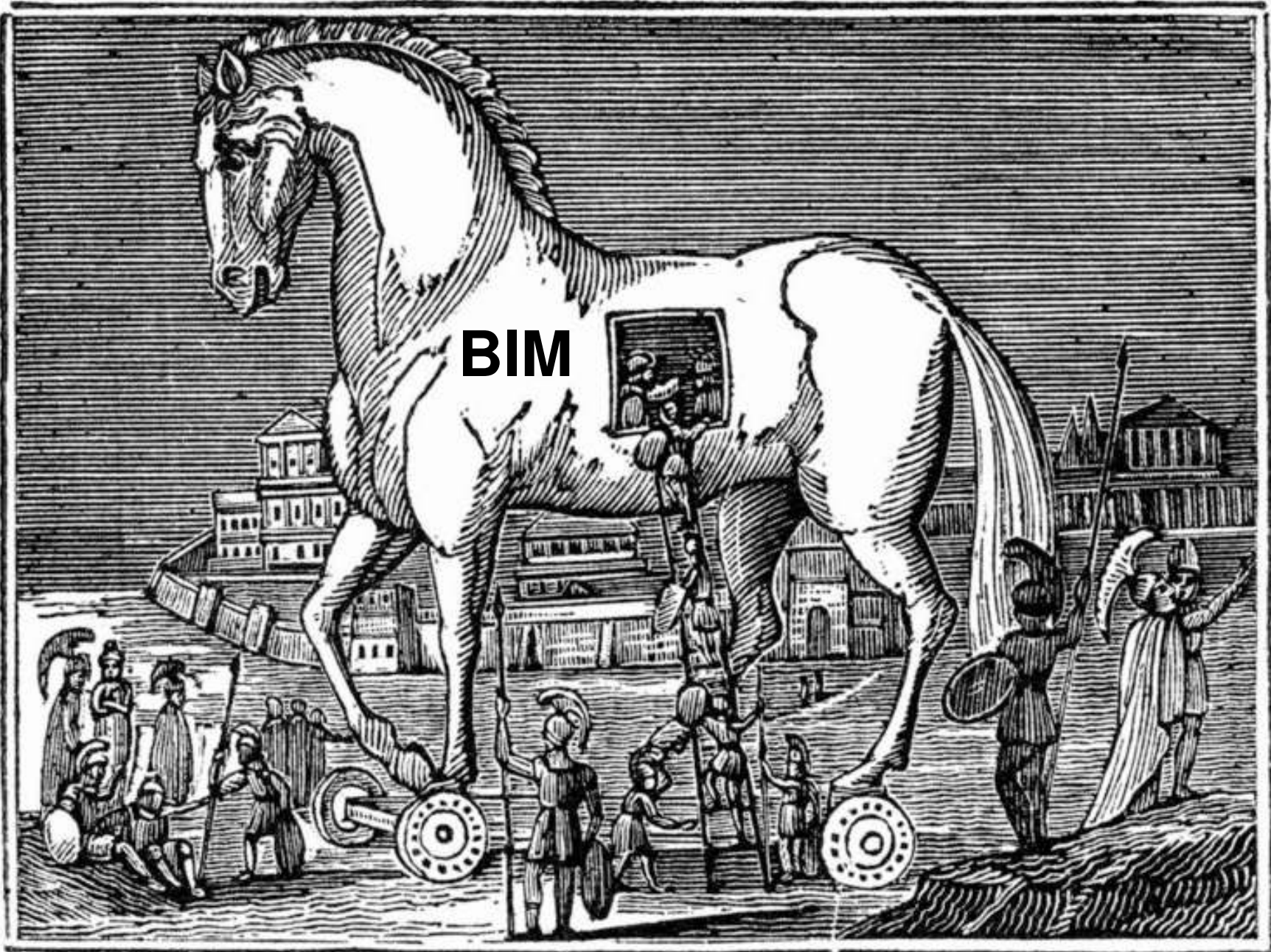
BIM4Lightbulbs

BIM2050 Group

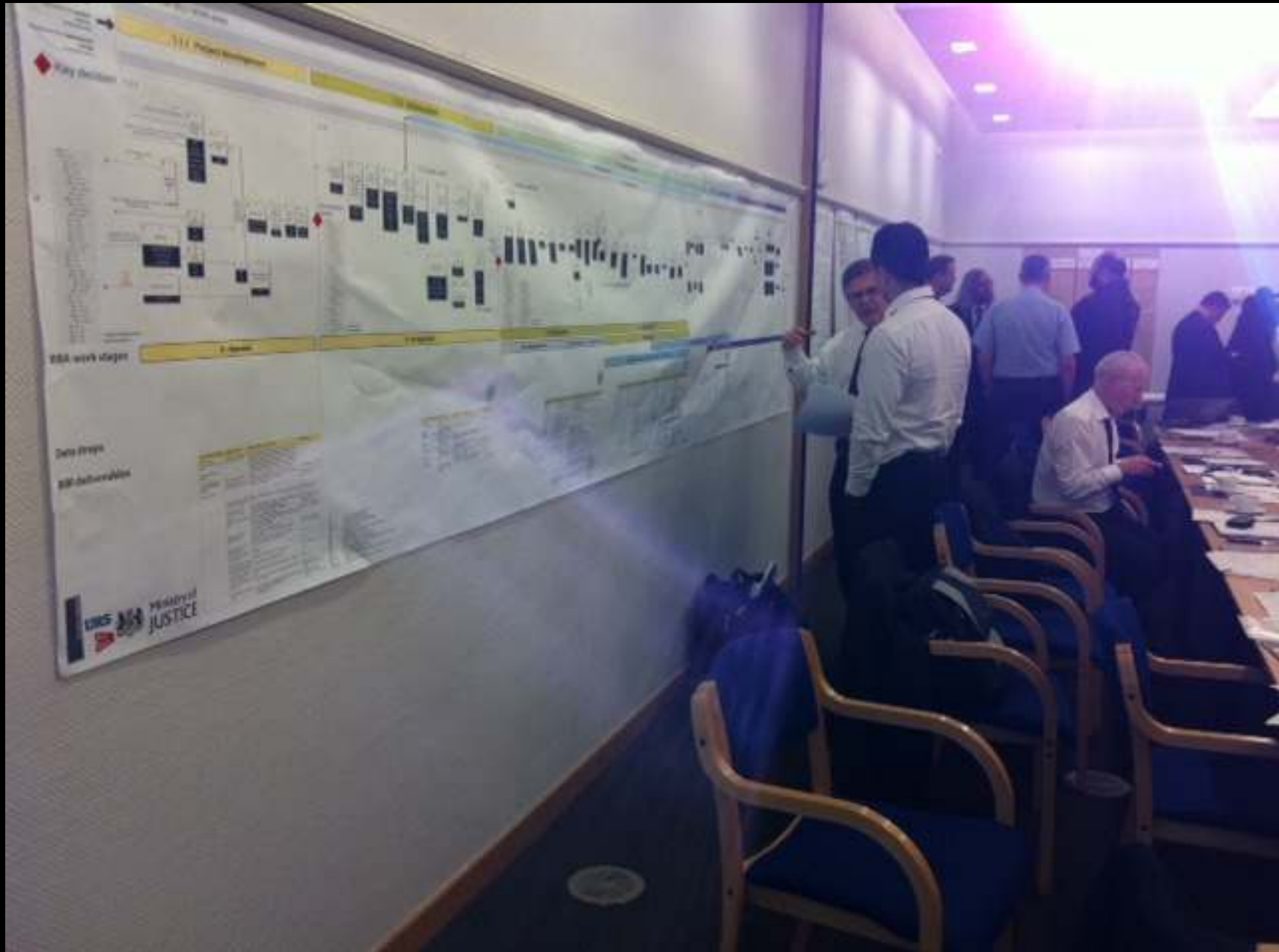




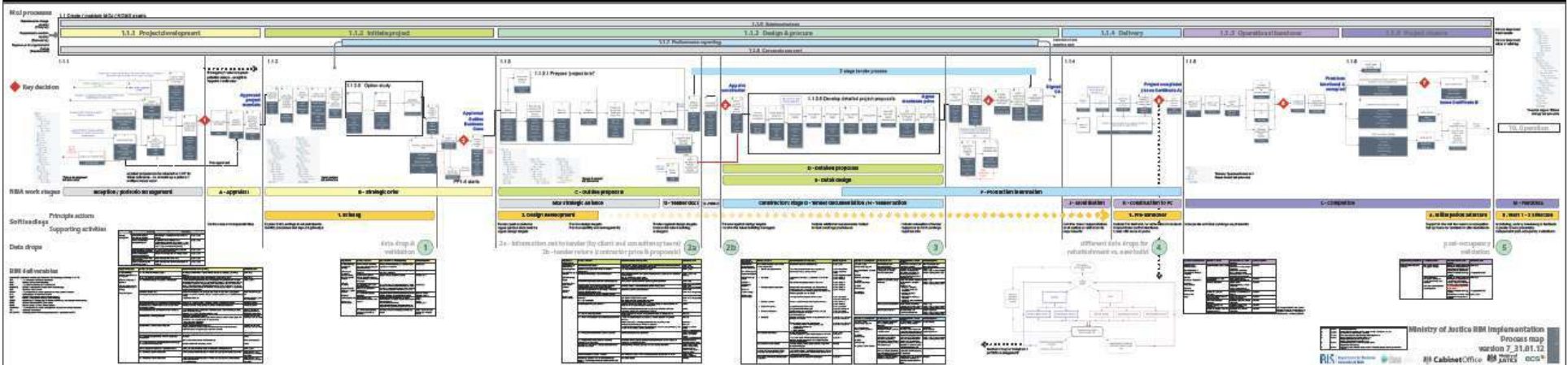
BIM Steering Group



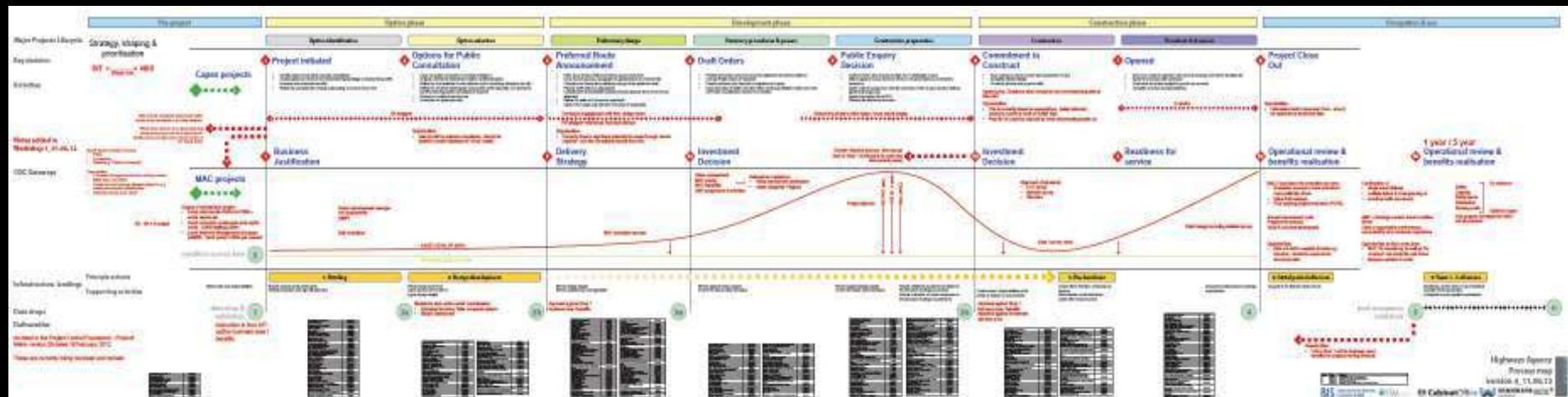




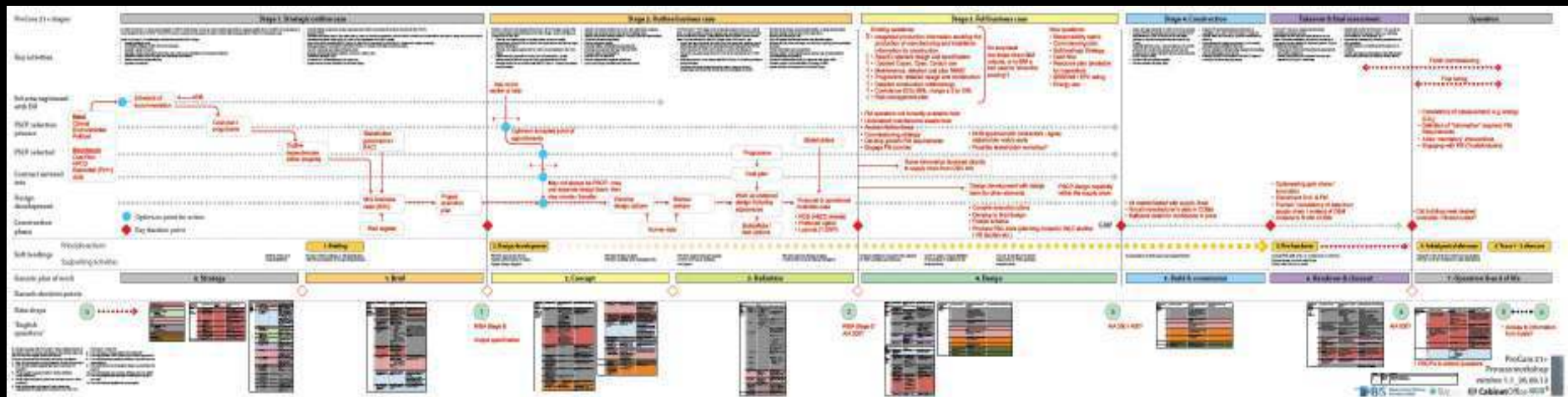
Ministry of Justice



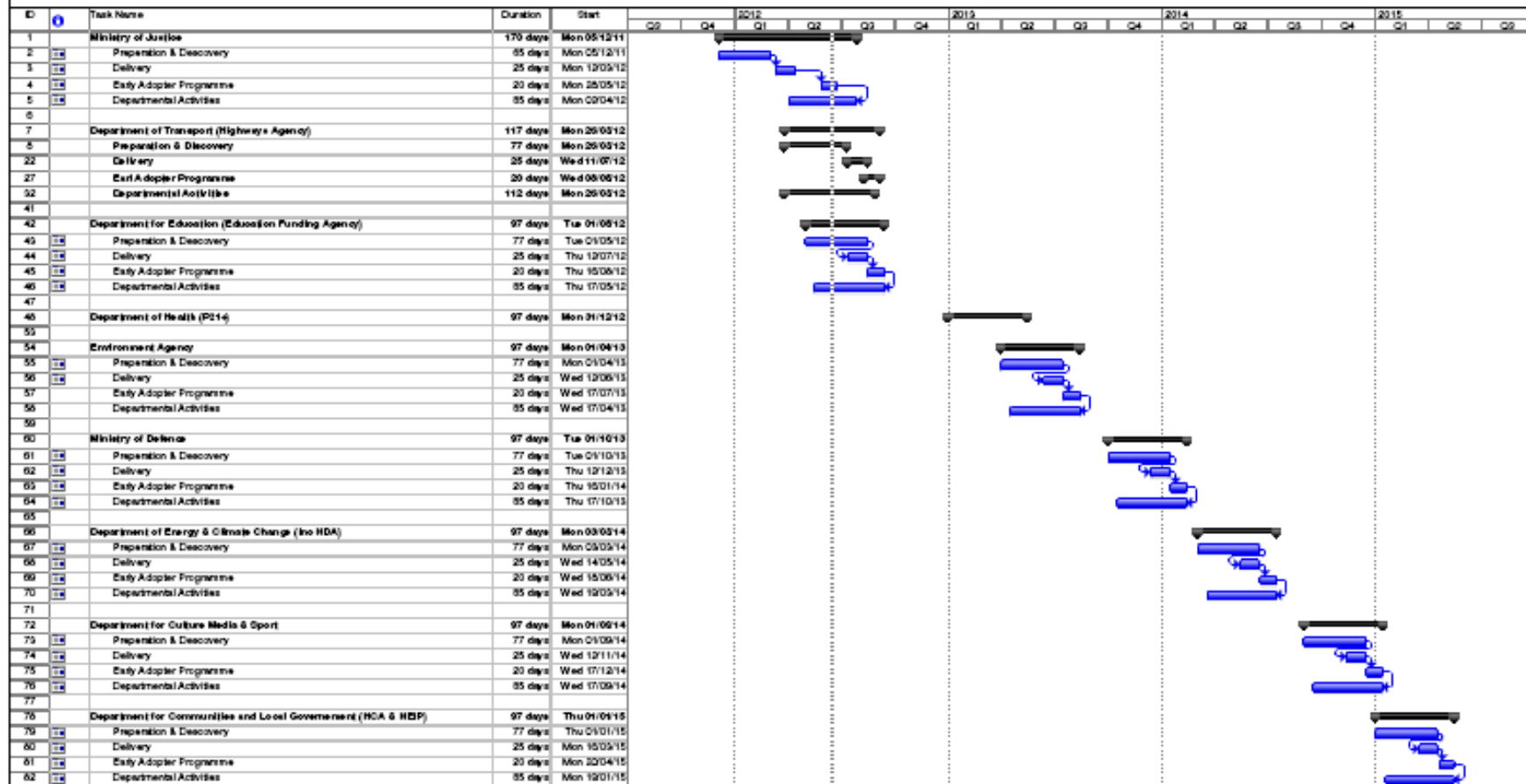
Highways Agency



Procure 21+ (Health)



Typical Departmental Engagement Programme for BIM Implementation



Project: Project 2
Date: Wed 13/02/12

Task Progress Summary External Tasks Deadline

Split Milestone Project Summary External Milestone



Data drops

Visualization

Integration

Co-ordination

Construction

Maintenance



Soft Landings









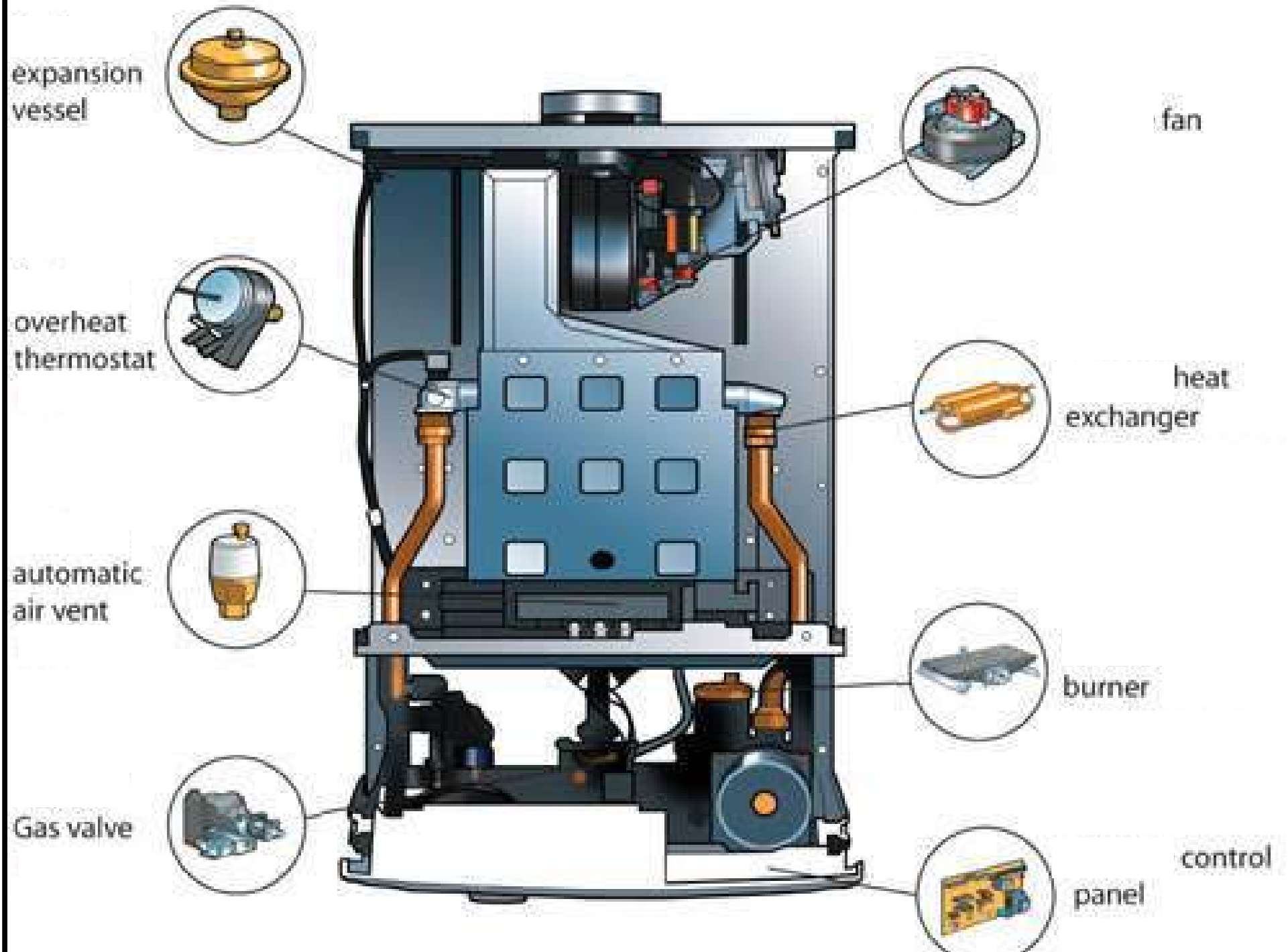


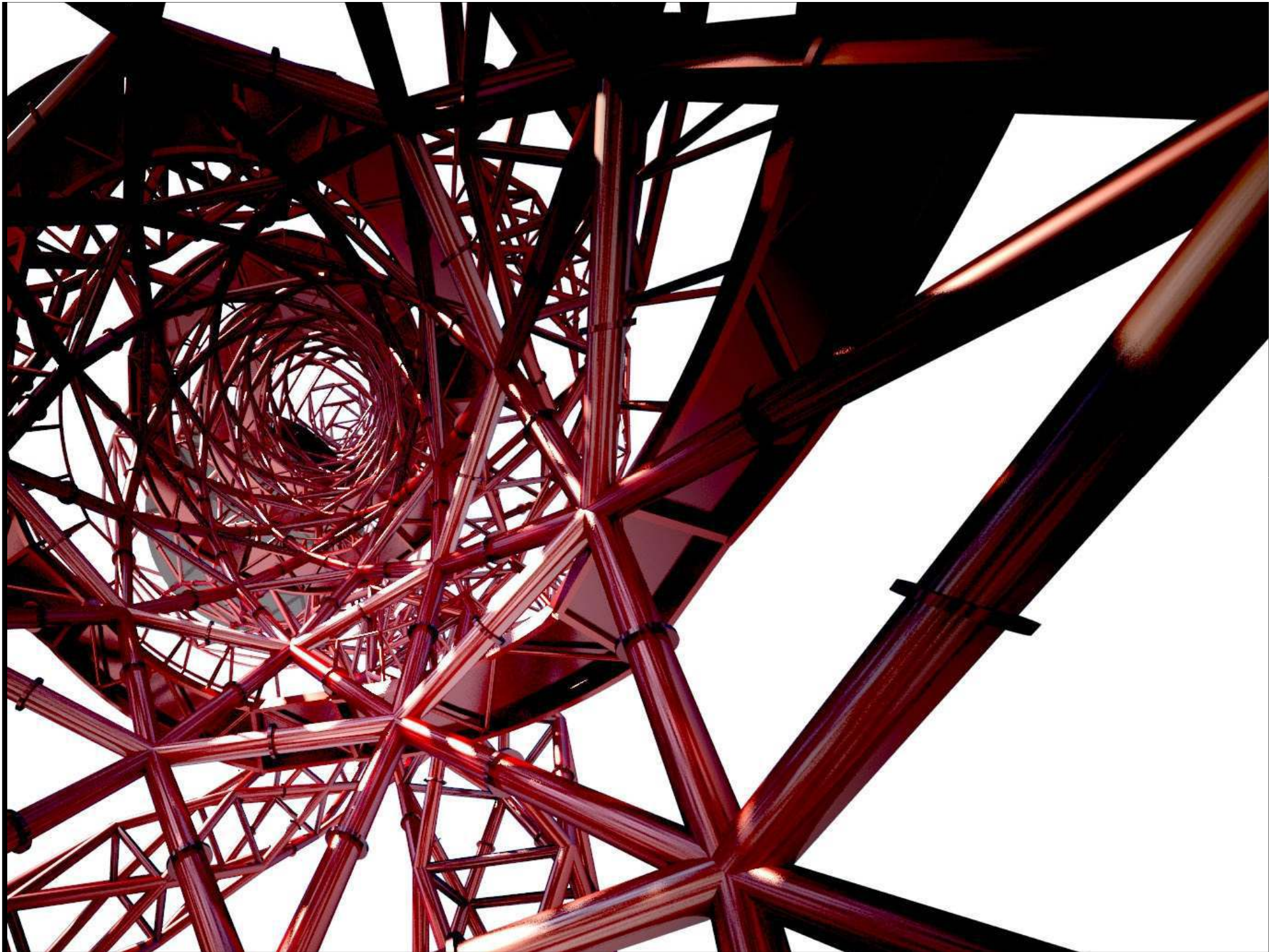


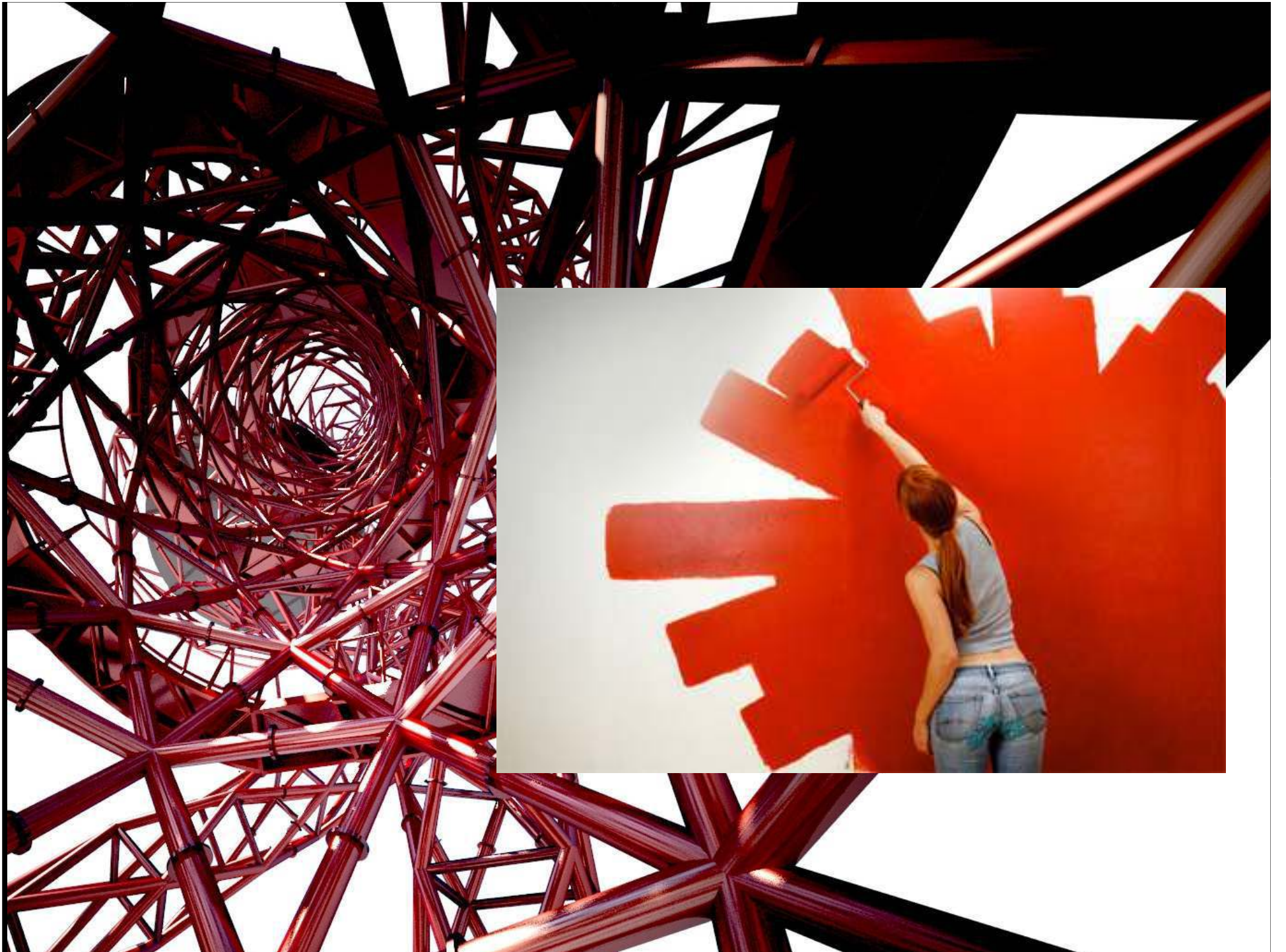














Looking for Data

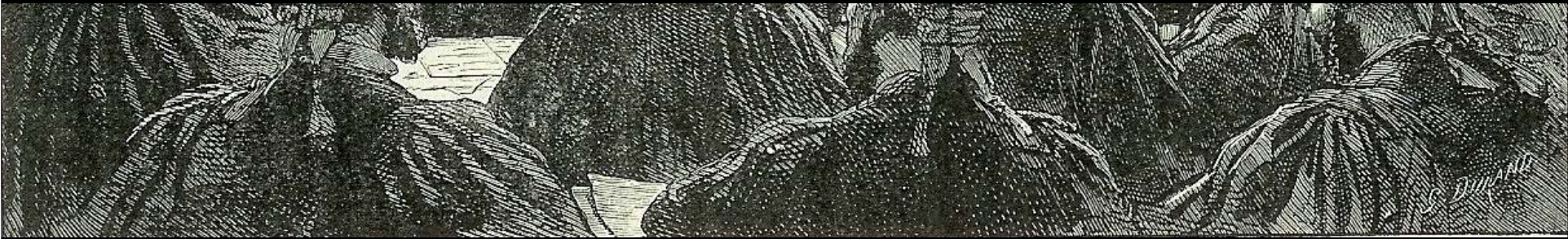
Trial projects





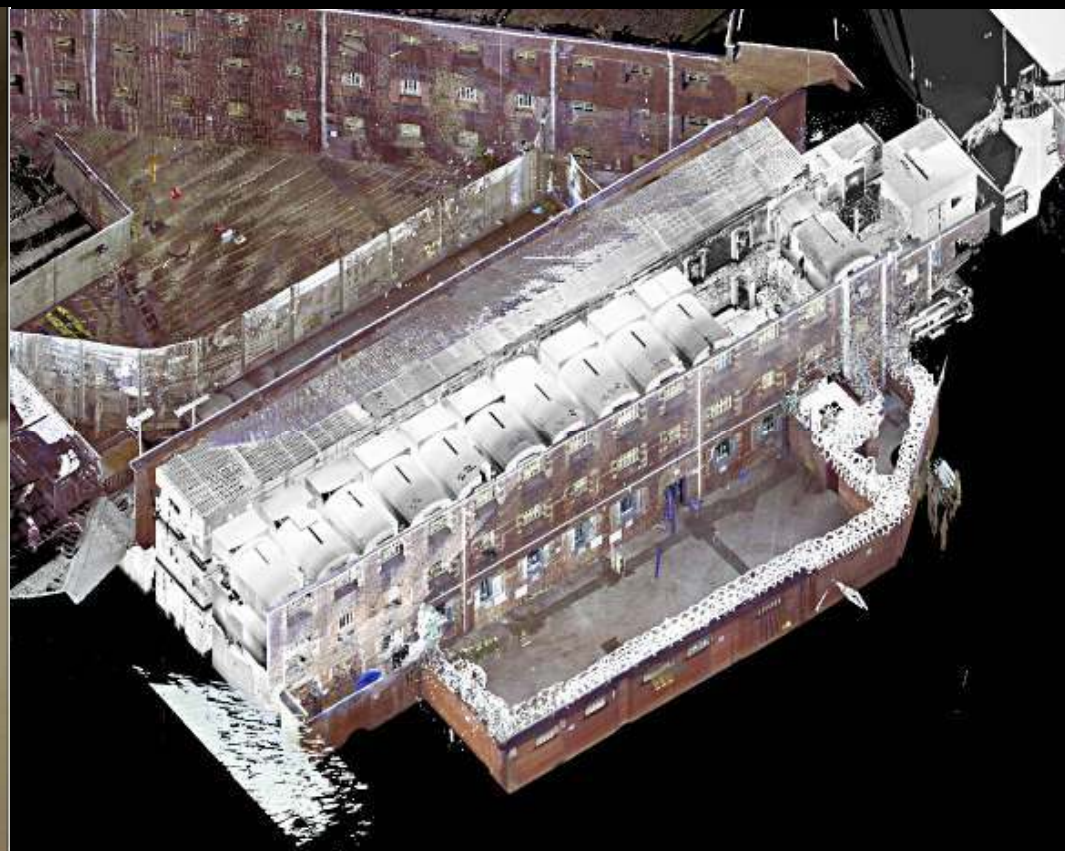
HMP Cookham Wood

New 180 room, accommodation unit for the Youth Justice Board with associated education building.



HMP Chelmsford – Refurbishment

Laser Cloud Survey Information



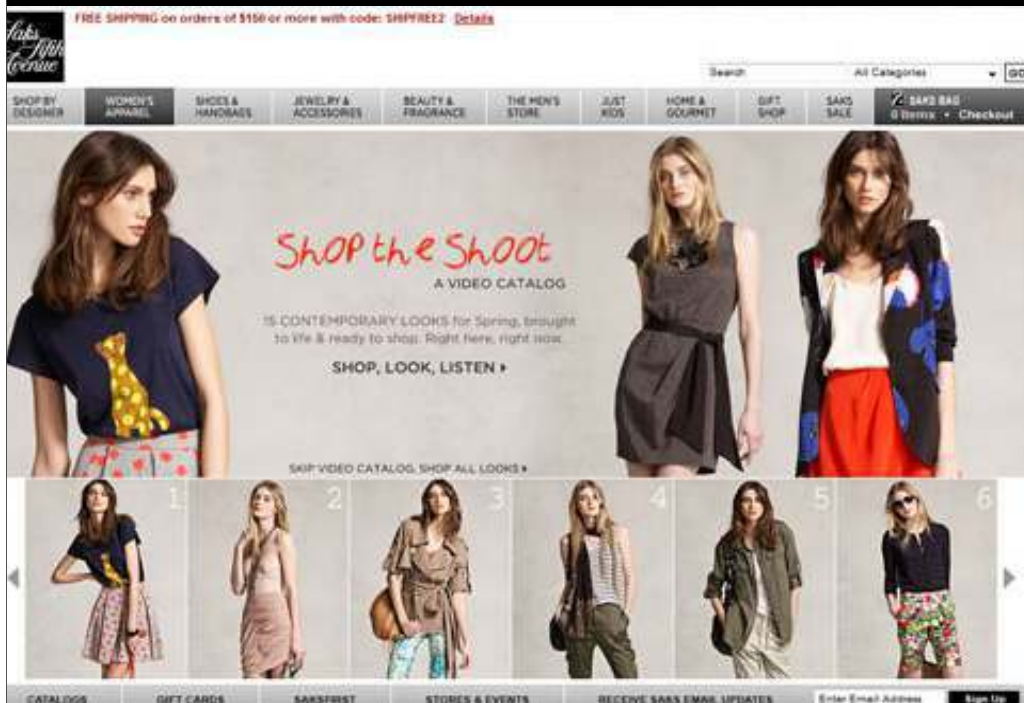
Communications



- Press
- Documents & Collaboration
- Web & Social
- KTN
- Government
- Institutions
- Alliances



**2016
Level 3**













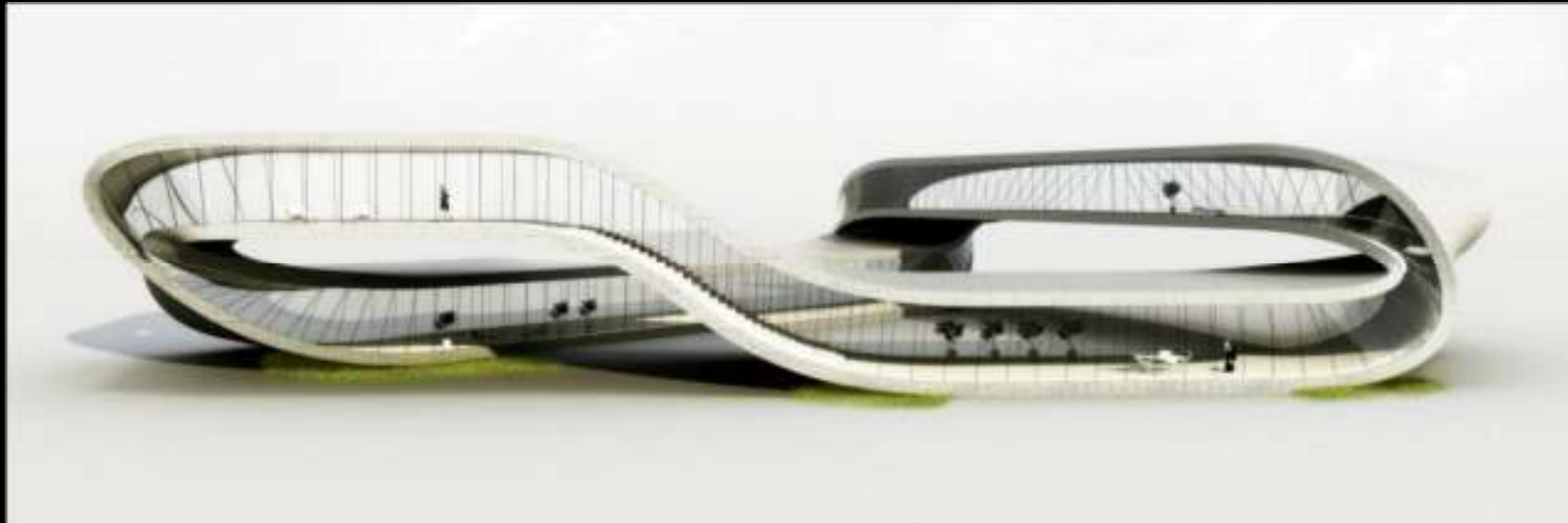




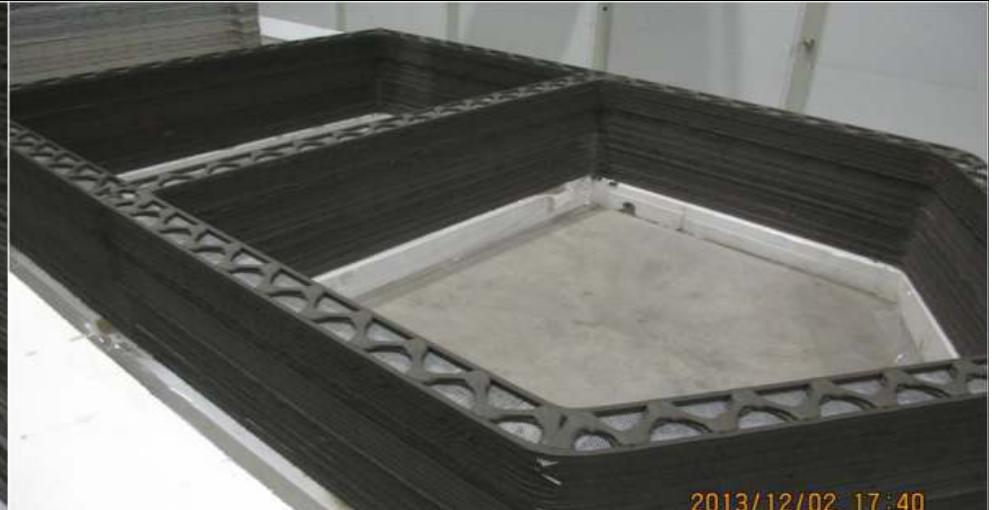


Plans by Dutch architect Janjaap Ruijssenaars for a building to be made with the help of Enrico Dini's Dshape 3D printer.

The project would cost up to 5 million euros and was to be completed in 2014.



Source: <http://www.sciencegymnasium.com/2013/04/architectsare>









46°00'N, 8°57'E Piazza Riforma Lugano

Bar/Ristoranti 500m
Bar/Ristoranti 500m

Caffé Federale
Menu Mostra Navigazione

Bar Vanini
Menu Mostra Navigazione

Bar Argentino
Menu Mostra Navigazione

Mostra:

Bar / Ristoranti

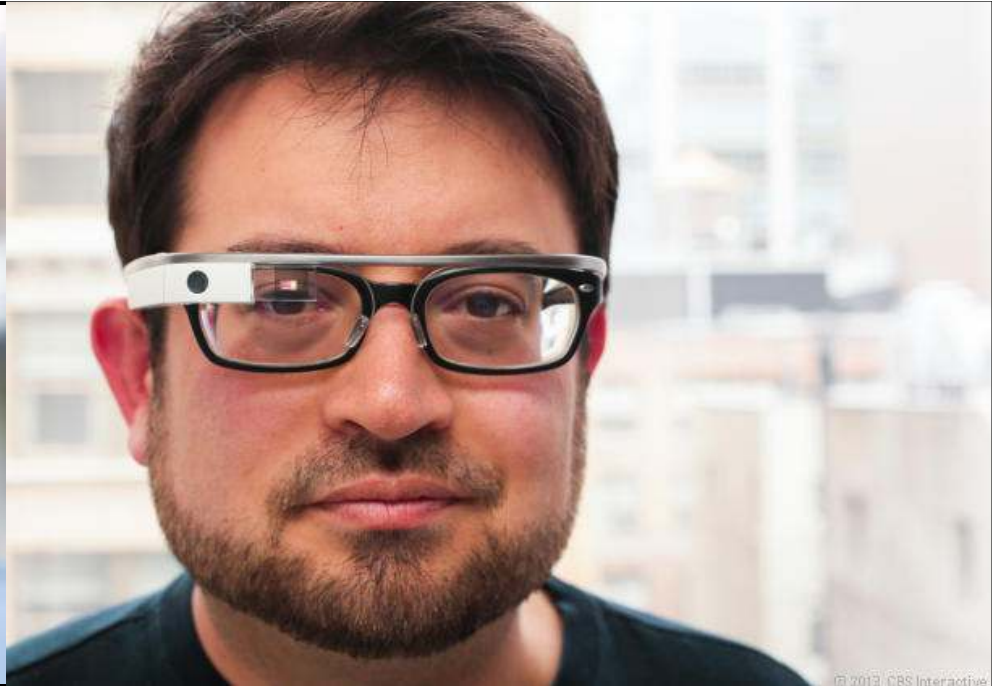
Distanza:

500 m

OK

Cancel

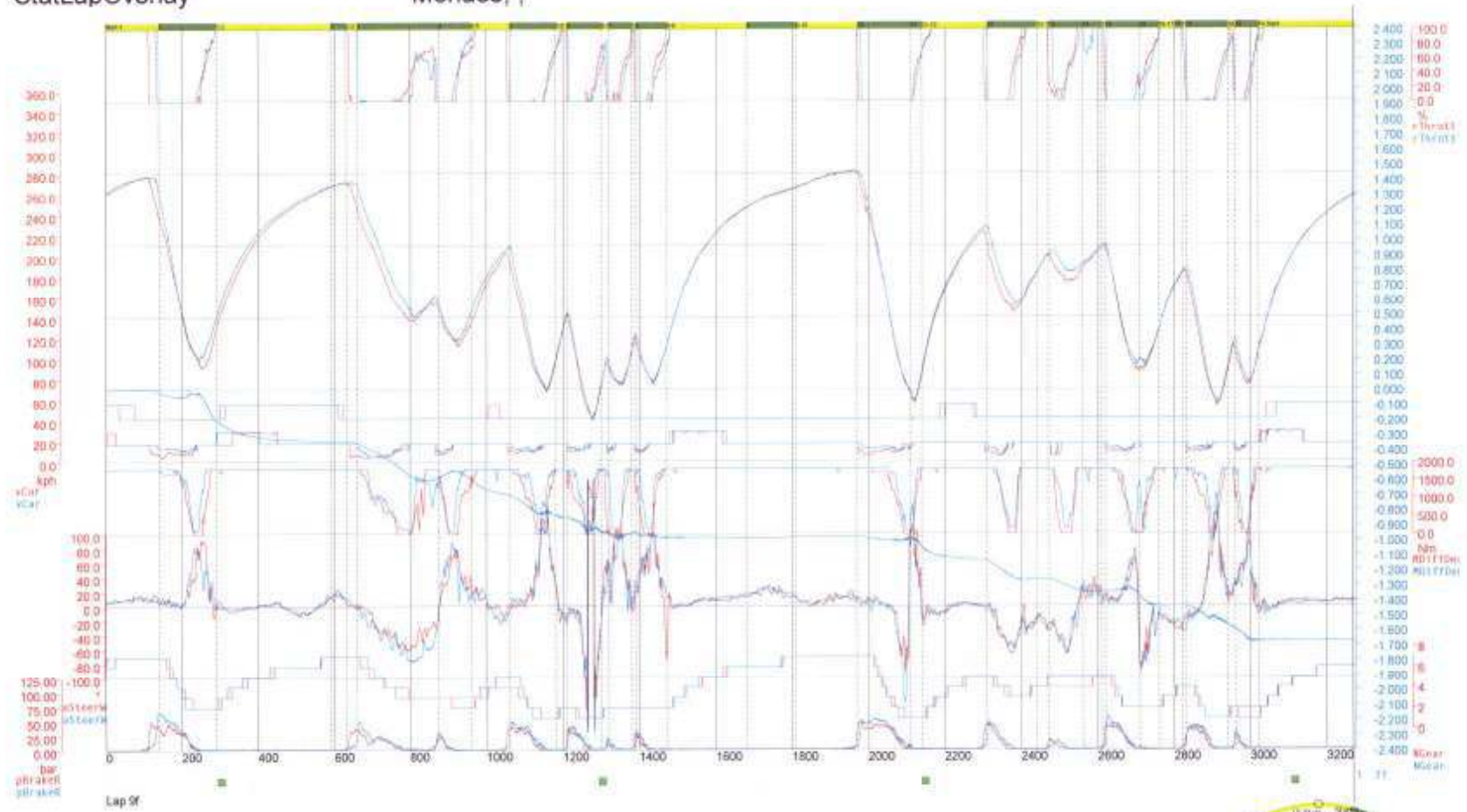






StatLapOverlay

Monaco, ,



vCar	=259.3	=258.5	kph	MDiffDemand	=-1800.0	=1800.0	Nm
NGear	=6	=6		MKERSDemand	=0	=0	Nm
rThrottlePedal	=100.0	=100.0	%	BNRearWingStateControlMode	=Active	=Active	
aSteerWheel	=8.5	=7.4	°	TDiff		=-1.670	
pBrakeR	=1.23	=1.07	bar				

StatLapOverlay

Monaco, ,



vCar	=259.3	=258.5	kph	MDiffDemand	=-1800.0	=-1800.0	Nm
NGear	=6	=6		MKERSDemand	=0	=0	Nm
rThrottlePedal	=100.0	=100.0	%	BNRearWingStateControlMode	=Active	=Active	
aSteerWheel	=8.5	=7.4	°	TDiff		=-1.670	
pBrakeR	=1.23	=1.07	bar				





Barcode Building, Oslo

Smart cities

Internet of Things
(assets, devices, mobile
and static sensors)

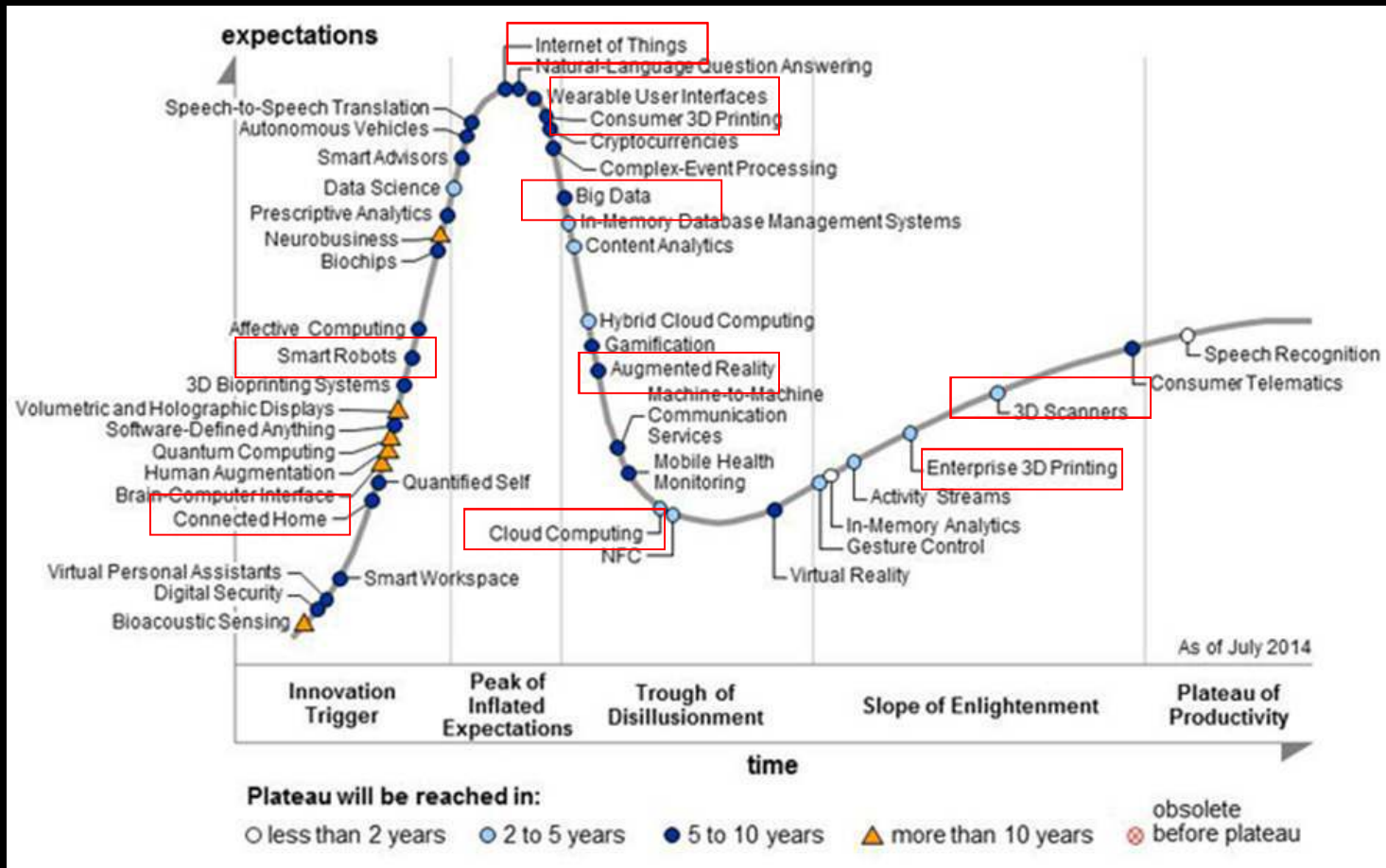
Internet of People
(social networking, crowd-
sourcing, workflow)



Internet of Services
(cloud-based solutions, processes,
tools and operations)

Internet of Data
(Linking of Open Data)





Source: Gartner

Data Growth

- Data centre IP traffic will nearly quadruple over the next 5 years, growing at a compound annual rate of 31%, reaching 554 exabytes per month by 2016 (up from 146 exabytes per month in 2011).
- Global cloud IP traffic will increase six-fold over the next 5 years, growing at a CAGR of 44% and reaching 4.3 zettabytes by the end of 2016 (355 exabytes per month - up from 57 exabytes in 2011).
- Global cloud IP traffic will account for nearly two-thirds of total data center traffic by 2016.

Source – Cisco Systems



- By the end of 2016, there will be 2.3 billion computers, tablets and smartphones running Android, and only 2.28 billion Windows-powered devices (source Gartner)
- The amount of mobile data traffic will grow at a compound annual rate of 78% between 2011 and 2016, by which time the number of mobile devices connected to the Internet will exceed the number of people on Earth (source Cisco Systems)





Images by Kjell Ivar Bakkmoen

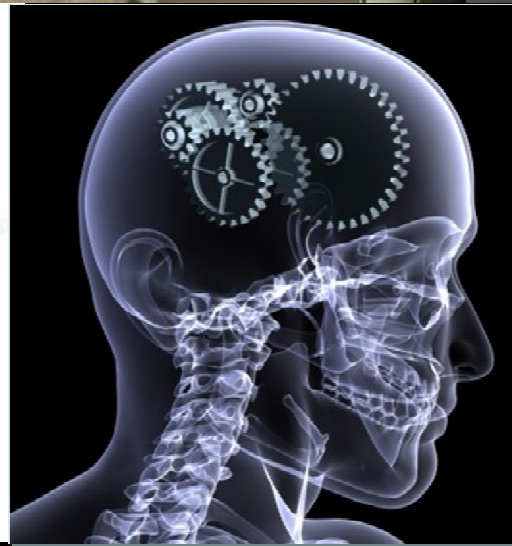
**South-Eastern Norway Regional Health Authority
Chair buildingSMART International User Group**



Online

Transparent

Secure



Knowledge based

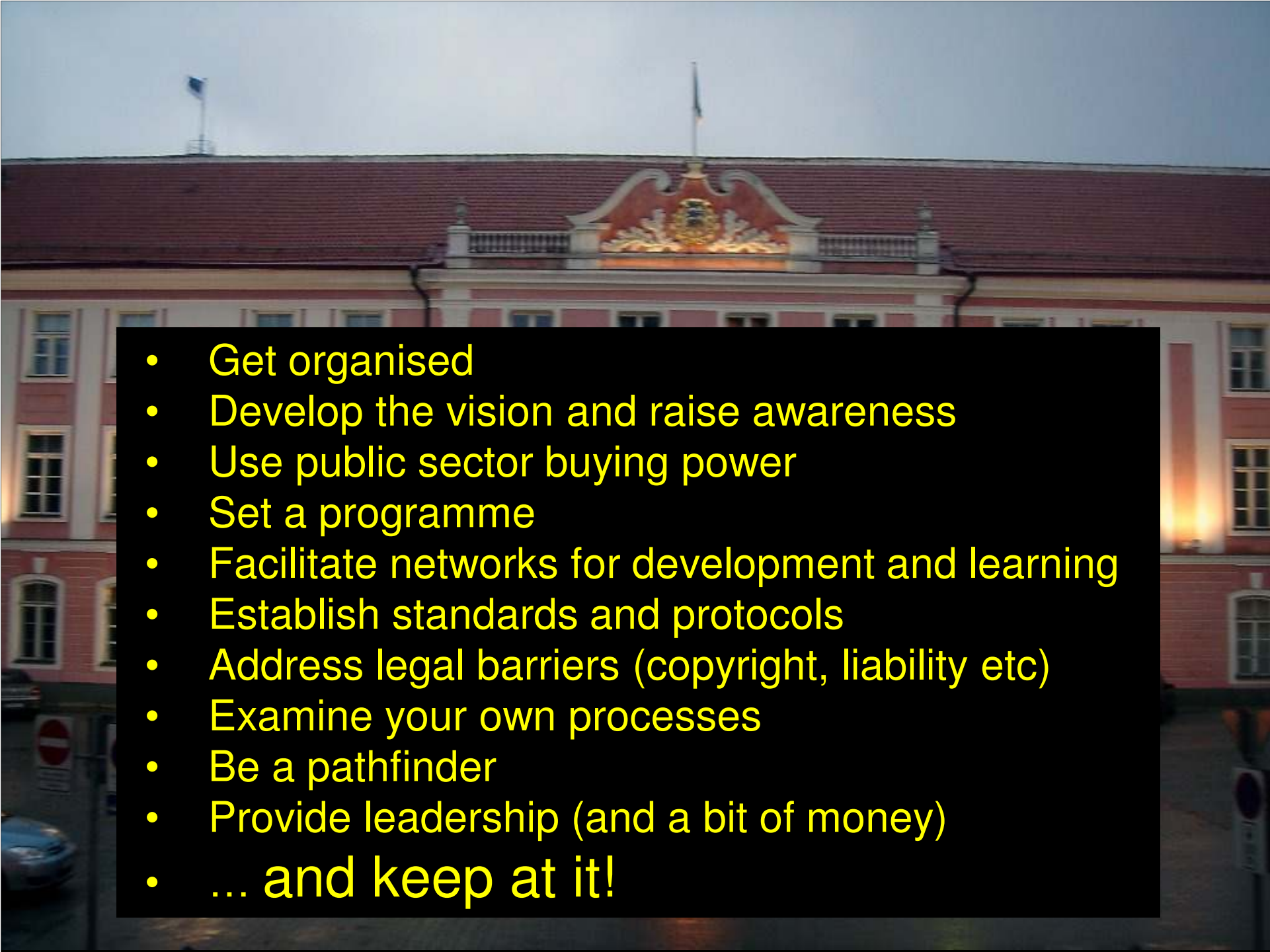
Self checking

Artificial Intelligence

Some automation



An agenda for Government

- 
- Get organised
 - Develop the vision and raise awareness
 - Use public sector buying power
 - Set a programme
 - Facilitate networks for development and learning
 - Establish standards and protocols
 - Address legal barriers (copyright, liability etc)
 - Examine your own processes
 - Be a pathfinder
 - Provide leadership (and a bit of money)
 - ... and keep at it!

New business models







amazon®



amazon®



New forms of co-operation

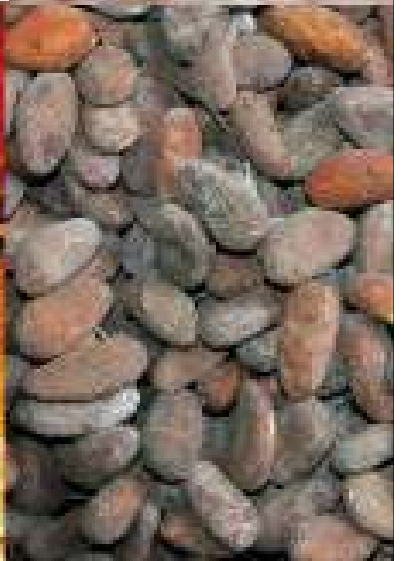






Design for manufacture

Image: Tocci Building Companies





Cannistraro



Cannistraro



Edventure
(Bryanston Square)



Learning Barn
(BAM Design)



EcoCanopy
(Bryden Wood/
Ashe Construction)



Nurture Future
(Cartwright Pickard/
Tarmac Building Products)

Sunesis
(Scape/Willmott Dixon)

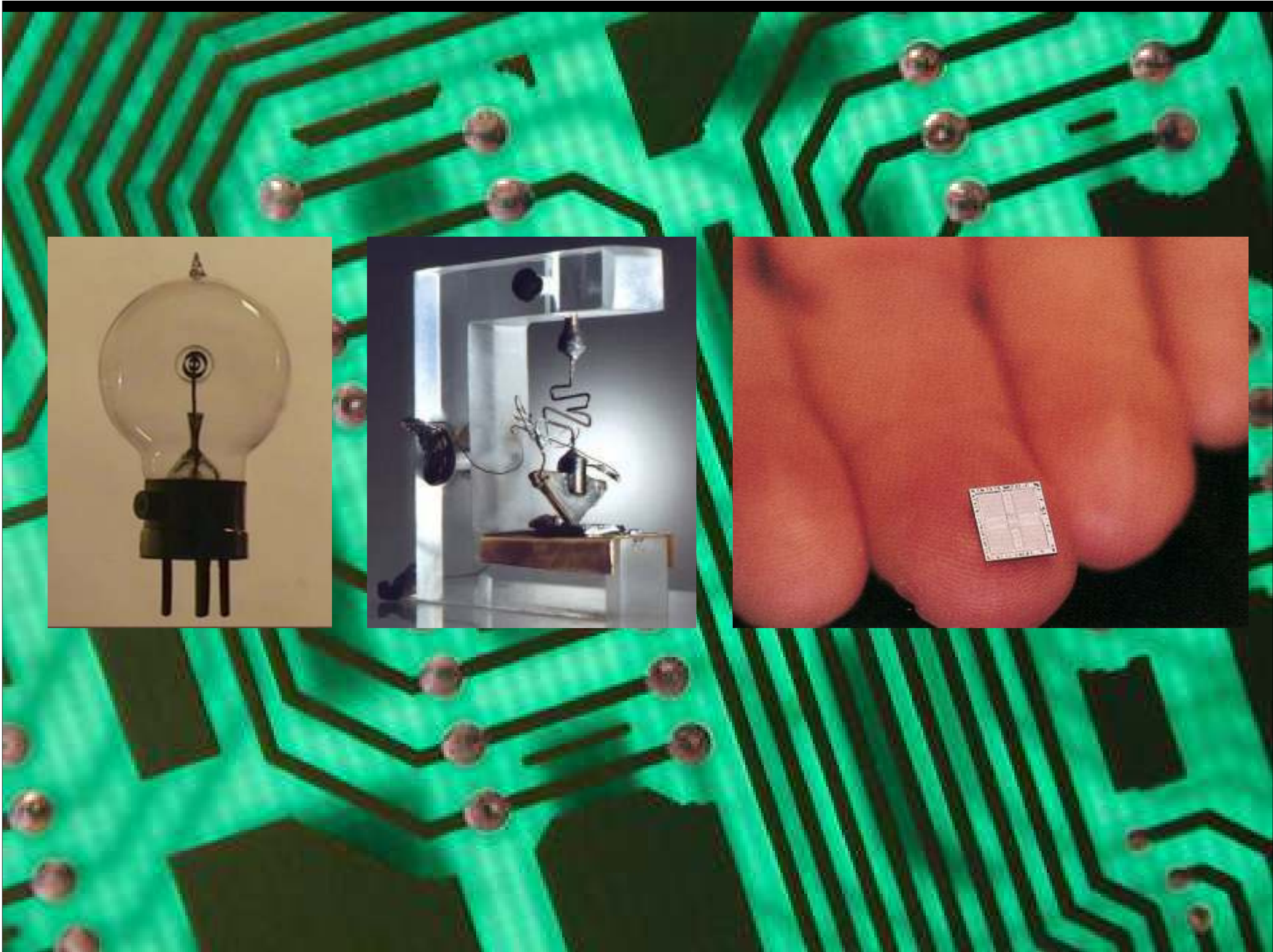


“Flat back!”









Killer Apps

Killer Apps

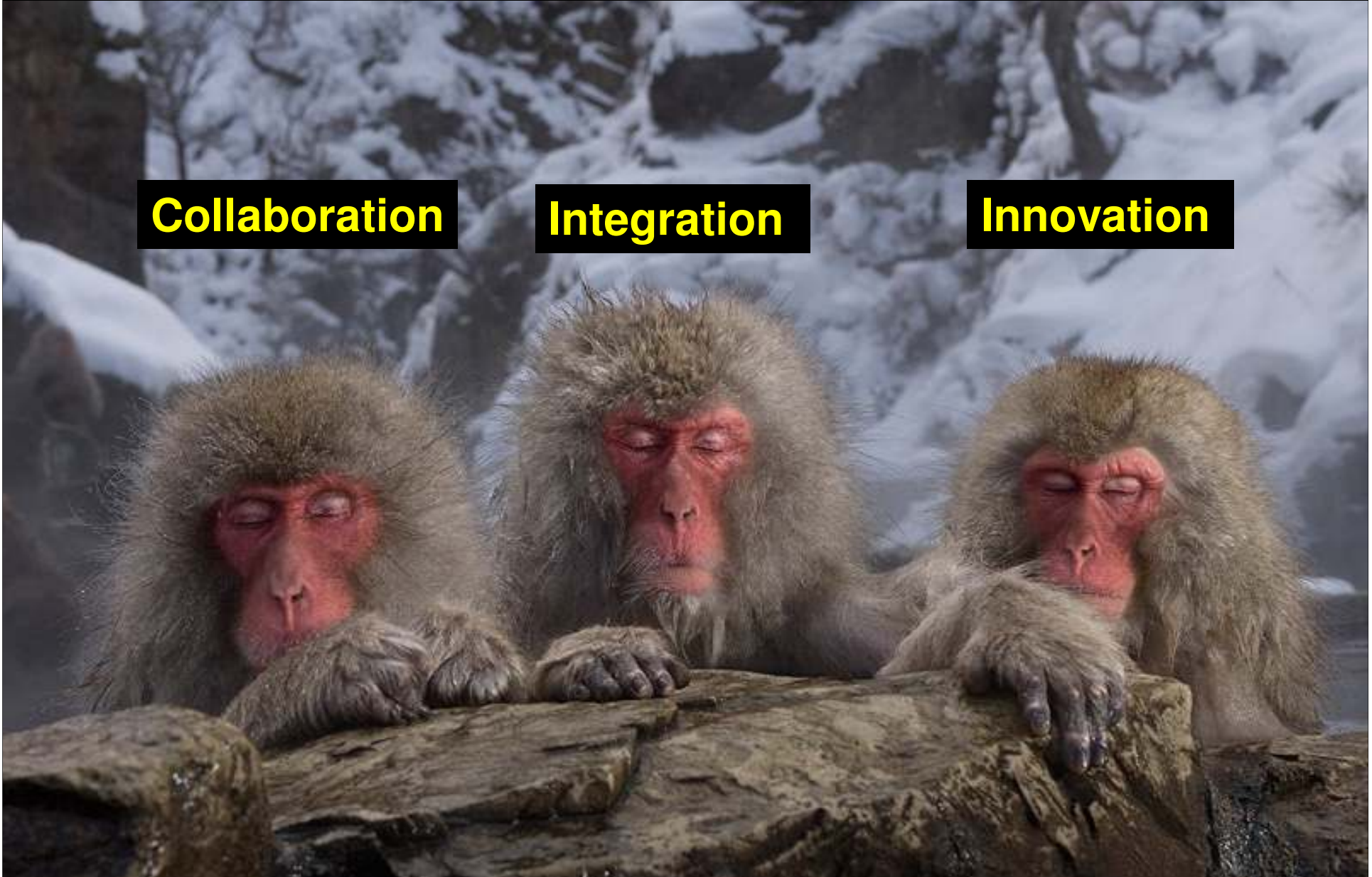


Killer Apps

Collaboration

Integration

Innovation





Thank you