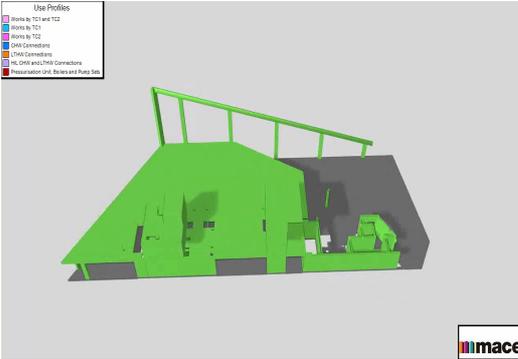




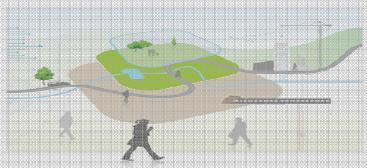
**thinkBIM**  
London  
BIM Level 3 and Cloud  
Computing event



Use Profiles  
 - Works to TC1 and TC2  
 - Works to TC1  
 - Works to TC2  
 - O&M Connections  
 - O&M Connections  
 - O&M and O&M Contractors  
 - Measurement O&M, Bases and Post-It's



**David Philp**  
BIM Task Group  
Head of BIM





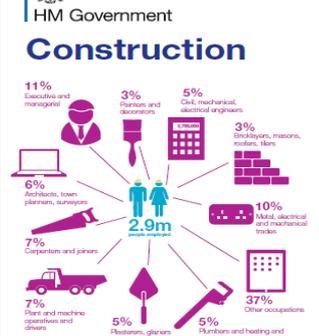




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HM Government

## Construction



There are **2.9 million** jobs filled in the Construction Industry, circa 10% of all jobs (in over 280,000 businesses)

Global construction output is forecast to increase from around \$8.5 trillion today to **\$12 trillion in 2025**  
\*Source: Global Construction 2025

The **UK has the sixth largest green construction sector in the world**. Around 60,000 jobs are expected to be supported by the insulation sector alone by 2015

**90bn**  
Construction contributes nearly £90bn to the UK economy, 6.7% of the total

*Economists have estimated that the UK market for BIM-related services will be an annual £30bn by 2020. In a global context, UK-based firms already export £7bn of architectural and engineering services.*

*Taking a global leadership position in developing BIM capabilities will provide strong potential for further export growth. The UK leads a global race to develop both open standards and supporting tools for adopting BIM.*

#indstrategy







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**HM Government Construction strategy**

The construction industry is vital to this government's long term economic plan. The government has been working with the construction industry to get better value from public spending.

**2011** Government Construction Strategy was published

**2014** It has saved **£1.4bn**

Government saved **£840m** last year on construction projects – exceeding the target by 13%

Department of Health saved **£60m** on construction projects last year – equal to the price of **67** MRI scanners

We now build **7** schools for the old price of **5** ( $5+2=7$ )

#BuildingBritain #GCSummitUK

**BIM** (Government Soft Landings)

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**BIM Learning Outcomes Framework**

- PAS1192-3:2014
- PAS1192-2:2013
- BS1192:2007
- TSB Classification 2015
- TSB dPoW 2015
- BS1192-4:2015
- BS 11000 Collaborative Business Relationships Framework
- BS8536:2015
- BSRIA Soft Landings Framework
- Cabinet Office Government Soft Landings
- CIC BIM Protocol
- CIC Information Manager Guide
- CIC PI Guide

**BIM** (Government Soft Landings)

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## Digital transformation in the Built Environment

[Wikipedia](#) says “Digital transformation refers to the changes associated with the application of digital technology in all aspects of human society.

Digital transformation may be thought as the third stage of embracing digital technologies:

- digital competence →
- digital literacy →
- digital transformation.

The latter stage means that **digital usages inherently enable new types of innovation** and creativity in a particular domain, rather than simply enhance and support the traditional methods.”



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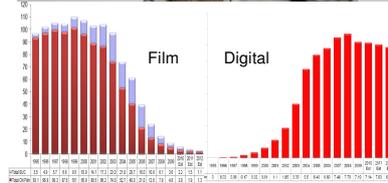
## The Times They Are A-Changin’...and for those that don’t get it a reminder from history!

- In 1975 a Kodak scientist invented the first digital camera. Kodak senior management were unimpressed because:
  - the camera was huge,
  - image quality was poor compared to film,
  - getting a print was complex requiring a PC and PC skills,
  - the film market was growing and so were Kodak sales and profits,
  - If the technology could be improved, it would kill film – the Golden Goose.
- The technology was buried by Kodak



### Business results:

- In 1988 Kodak employed 145,300 people and made a profit of \$1.17bn on \$13.3bn revenue
- In 2009 it employed 19,900 people and made a quarterly loss of \$111m
- In January 2012 Kodak filed for bankruptcy protection



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## There is no going back, we have reached a tipping point

Open source construction set - print your own house. Blog Press Contact @WikiHouse



**WikiHouse** CO

Home **What is it?** Open library Design Community News Support Us

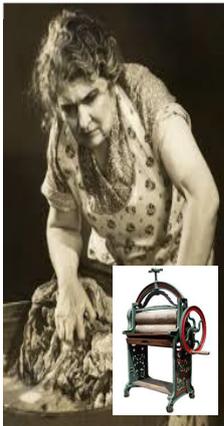
WikiHouse is an open source construction set. The aim is to allow anyone to design, download, and 'print' CNC-milled houses and components, which can be assembled with minimal formal skill or training.



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## If it can be automated it will be?

**Degree of technology integration**



**Level 0: Paper / Unmanaged**



**Level 1: CAD/3D / Common Wash Environment**



**Level 3: Integrated / Internet of things**



**Level 2: Parametric / Domain based washing**









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So what's the future for those that don't have Washing machine?

**Two billion have access to washing machines across the globe**

They are more productive and have time to do other things. A two tier washing society?

**Will BIM be the same? Will those that don't embrace be beta-maxed out? Will it be limited to megaproject environment?**



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## Did we waste a good crisis?

*"Since we published Never Waste a Good Crisis in 2009, the Olympic Development Authority has delivered world class outputs and now Crossrail has taken up the baton to move the industry forward. With the UK Government fully engaged about the key role that infrastructure plays in the economy, there are signs of real momentum in our industry.*

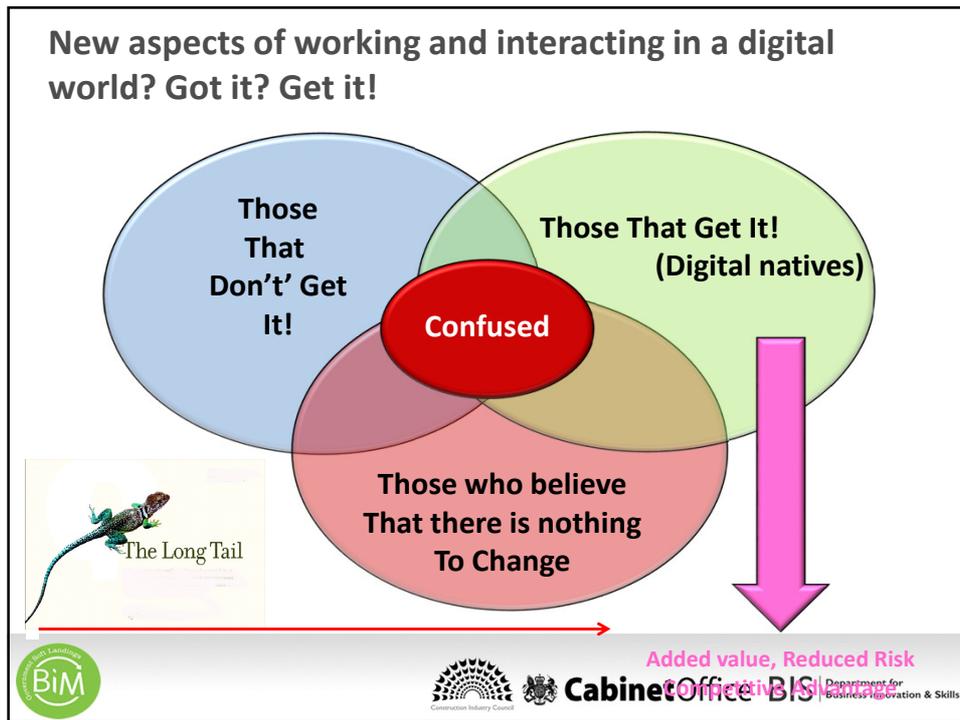
***It is clear to me that the new generation entering our profession understands why we need to look at how value is created over the whole life cycle of an asset.***

***We are also seeing an increasing take up of game-changing technology such as BIM. My concern though is that our industry will become increasingly polarised between those who 'get it' and those who do not."***



**Andrew Wolstenholme OBE**  
20<sup>th</sup> Nov 2013





# Construction 2025...

HM Government

Industrial Strategy: government and industry in partnership

Construction 2025

July 2013

## HM Government 2013

Industrial Strategy: government and industry in partnership

<p><b>Lower costs</b></p> <p><b>33%</b></p> <p>reduction in the initial cost of construction and the whole life cost of built assets</p>	<p><b>Faster delivery</b></p> <p><b>50%</b></p> <p>reduction in the overall time, from inception to completion, for newbuild and refurbished assets</p>
<p><b>Lower emissions</b></p> <p><b>50%</b></p> <p>reduction in greenhouse gas emissions in the built environment</p>	<p><b>Improvement in exports</b></p> <p><b>50%</b></p> <p>reduction in the trade gap between total exports and total imports for construction products and materials</p>

**Towards a Digitally Built Britain With 21<sup>st</sup> Century Assets**

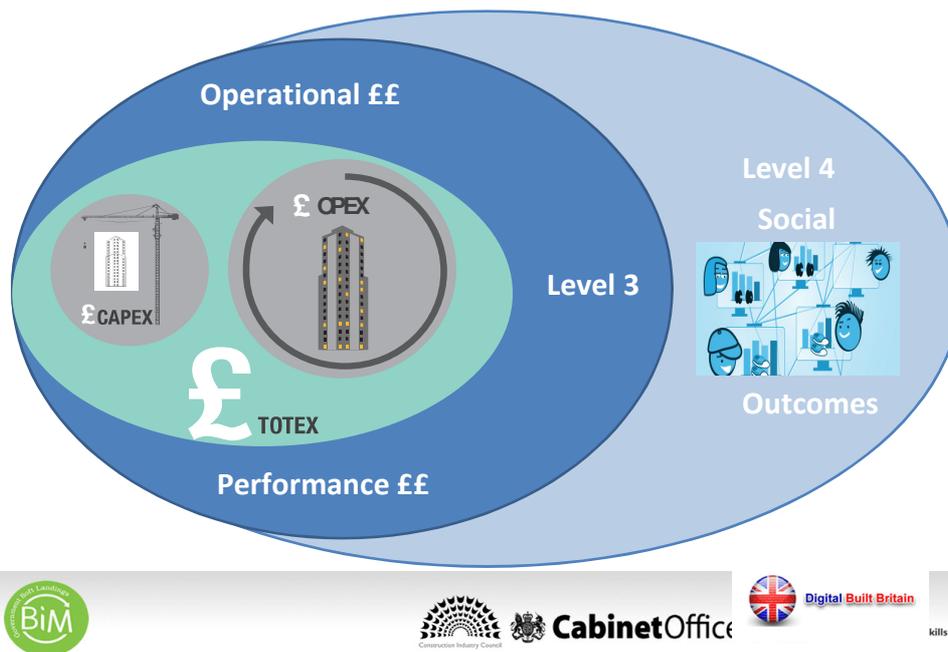
**BiM** Construction Industry Council **CabinetOffice BIS** Department for Business Innovation & Skills

### HS2 aspirations for BIM

- For BIM to be our methodology for electronic storage *and* usage of data
- For BIM to help deliver collaboration; off-site; NEC; ECI
- For HS2 to achieve BIM Level 2 by 2016
- To buy (and make best use of) data
- Maximise off-site manufacture



### Stimulating behavioural **change** within the industry



- **Level 2: Deterministic approach**
- **Level 3: Probabilistic ones (in case of the adoption of Relational and Performance-Based Contracting)**
- **Level 3 will allow the Construction Industry to be reshaped as a Digitised Industry of the Built Environment.**
- **L3 Dawn of a new era**
- **L2 what we should have been doing since the 50s**



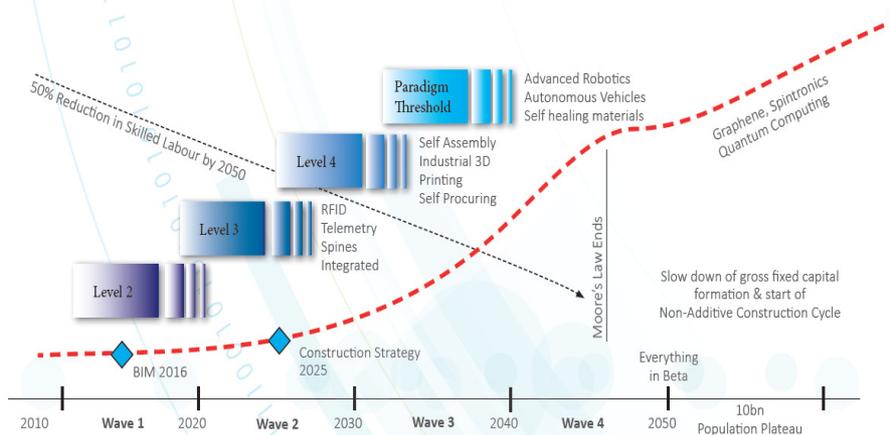
**Tomorrows needs:**

- Decisions at lightning speed
- Nano corporate / procurement
- CFIO / Chief Uncertainty Officer



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Socio-technological Frontier



**Level up:** Key technologies have been placed in the context of the levels of BIM maturity across a timeline. This has been mapped against other factors such as skilled labour and Moore's Law. Everything in Beta refers to the agile management of the future state of transactions, technology implementation and construction.

Feedback Cycle Wave: ©Philp, Thompson 2013



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Copyright: Philp and Thompson 2013

**Waves:** the first wave shows how the current lag of information exchange gives us only one chance to exchange between formal transactions. As we move in to wave 2 the lag is less and we can fit more iterations of simulation in to our transactions. Moving through to wave 4, transactions are almost instantaneous and computing power enables vast simulation options.

Wave 1	Wave 2	Wave 3	Wave 4
Analogue Decisions	Digital Decisions	Predictive Digital	Artificial Intelligence
At key stages Capex/Opex	Converging Information Performance / Operation	Emerging Information Social Outcomes	Adaptive & Agile

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**This is level 3 – a vision that we can innovate towards**

**Speed of travel**  
 New supersonic jet: 2,500 mph  
 Concorde: 1,350 mph

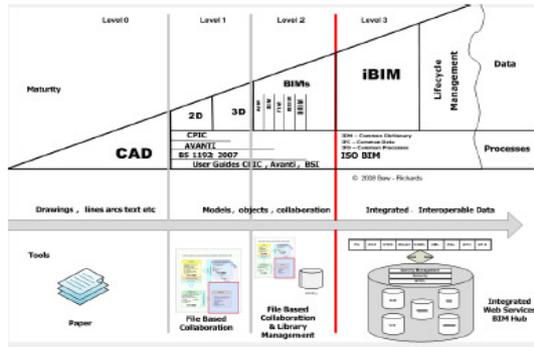
The jets will use lighter composite materials, advanced engines and smaller fuselages to reach top speeds

**London to Sydney**  
 Supersonic jet → 4hrs  
 Commerical jet → 20hrs 10mins

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## What is Level 3 ?

- Future Proof
- Online
- One Transparent Model
- Self Checking
- Secure
- Automated Processes
- Knowledge Based
- Artificial Intelligence
- Self Procured
- Market Futures
- Commercial Transaction Model
- Constraint Management
- Post Occupancy Automation and Productivity



The greatest BIM challenges arise when moving from level 2 BIM to level 3 BIM and the perceived 'holy grail' of the single project model. Level 3 envisages a wholly integrated model accessed by all members of the project team in real time.



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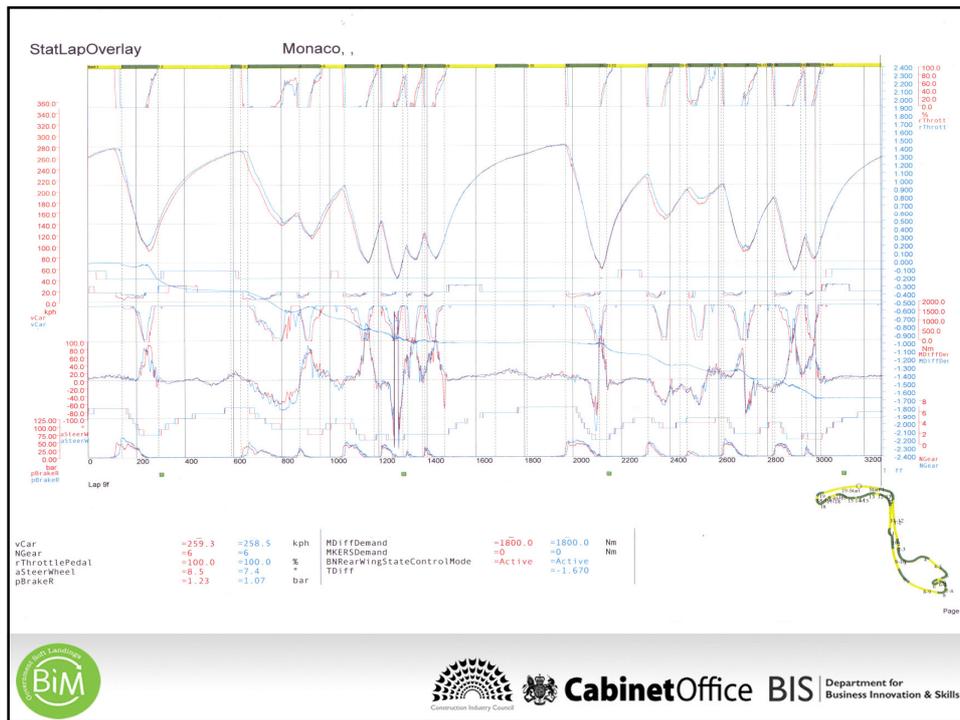


### With level 3 BIM it may be possible for:

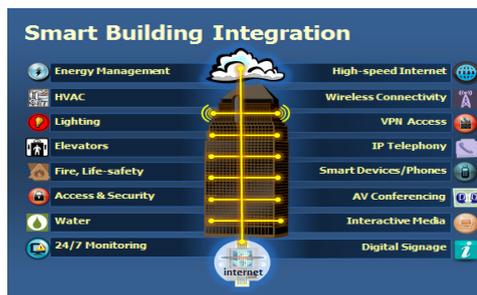
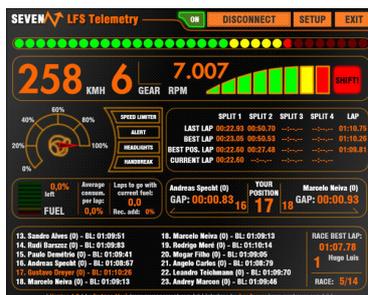
- Early rule based design and analysis on environmental performance minimising iterative design time;
- Cost models to be quickly derived from the model using new costing interfaces;
- Health and safety aspects associated with the construction and maintenance of the building to be analysed in parallel with the design; and asset management, KPI, and other feedback information to be aligned with intelligent briefing,
- Enabling information in the model to develop during design and to be used as part of a Soft Landings approach, and to inform and improve future projects.



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With level 2 there is limited functionality for the delivery of the operational data sets and **integration of telemetry**. Level 3 will address these in sector delivery and operational stages, with a focus on **enabling total cost and carbon outputs**.



## Performance and operation of assets (performance based contracting?)

Figure\* 7.10.1 Network System of Formula 1 / Some of the key devices. (+/-)

Figure\* 7.10.1 Network System of Formula 1 / Some of the key devices. (+/-)

## Internet of things!

**Figure 7.10.1 Network System of Formula 1 / Some of the key devices. (+/-)**

The diagram illustrates the network system of a Formula 1 car. At the top, a Formula 1 car is shown with a lightning bolt indicating a "Radio link for the transmission of ECU". Below the car, a radio tower is connected to an "ATLAS data server (receives and distributes data)" and an "SQL Server 2008 (database server)". These servers are connected to a central network bus. Below the bus, there are "ATLAS client" laptops and an "SQL server (OLEDB / ODBC users)" laptop. To the right, a grid of various sensors and components is shown, including: Display, Interface unit, Alternator, Power source, Air resistance, Tire pressure, Server, Computer, Display data, Software, Create a Message, Electronic control, Ignition coil, Management system, EV, Gyro stabilizer, Humidity, Acceleration, Rainy lights, Triggering device, Lambda probe, Liquid pressure, Torque, Signaling, Telemetry, Speed, Access to pit-stop, and Rainy lights.

## What will infinite computing via the cloud do?

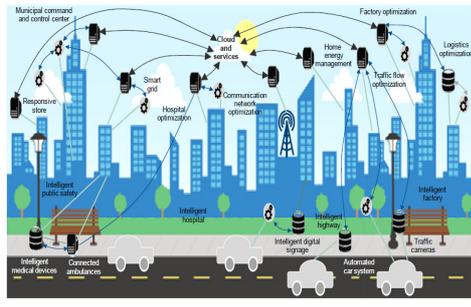


- Unlimited processing power available
- Real world data together, easily and in real time
- Always on analysis of assets 24/7 – predictive analysis
- Optimisation of design solutions and outcomes
- Speed of exploration (ultra rapid cycle times)

**Figure 7.10.1 Network System of Formula 1 / Some of the key devices. (+/-)**

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A City with a Digital Overlay

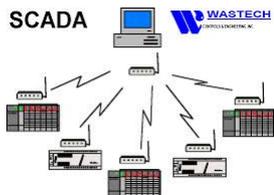


# Cyber Security



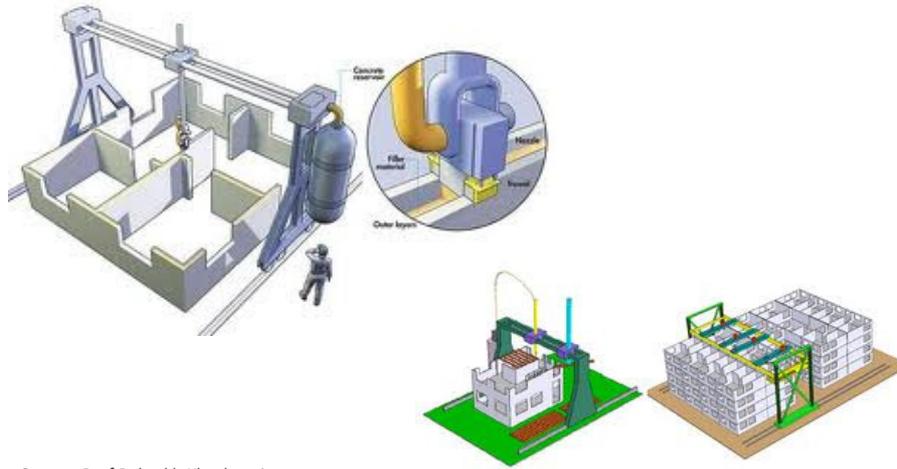
## Big data!

- Buildings
  - Transportation
  - Water
  - Power
- 
- L4 – Social outcomes (people)



**Embedded sensors, Interface systems, Interoperability of Operating systems, Data Storage and Exchange, Ontologies, Integrated Contracts**

## Contour Crafting – 3D printing with concrete



Source: Prof Behrokh Khoshnevis  
University of Southern California



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## Our new colleagues – a robotic future?

An exhibition built entirely by flying robots', assembled a 6m-high tower comprising 1,500 prefabricated polystyrene foam modules.

The installation involved a fleet of quadcopters programmed to interact, lift, transport and assemble the final tower, all the time receiving commands wirelessly from a local control room.

Up to 50 vehicles can be tracked simultaneously, at a rate of 370 frames a second, with millimetre accuracy.



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## Plan for level 3 and do Level 2

L2  NOW

L3  LATER





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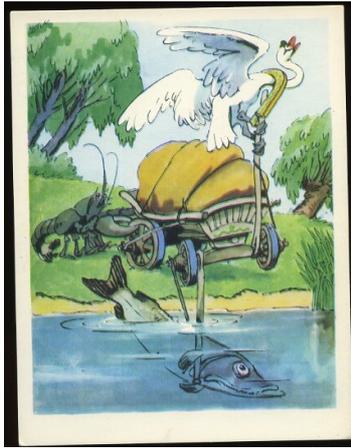
In 1814 Ivan Krylov wrote a fable called  
**“Swan, Pike and Crawfish“:**

**Purpose and integration**

When partners can't agree  
 Their dealings come to naught  
 And trouble is their labor's only fruit.

Once Crawfish, Swan and Pike  
 Set out to pull a loaded cart,  
 And all together settled in the traces;  
 They pulled with all their might, but still the cart  
 refused to budge!

The load it seemed was not too much for them:  
 Yet Crawfish scrambled backwards,  
 Swan strained up skywards, Pike pulled toward the sea.  
 Who's guilty here and who is right is not for us to say -  
 But anyway the cart's still there today







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## Thank You

Have a look at our web-site

[www.bimtaskgroup.org](http://www.bimtaskgroup.org)

Follow us on Twitter [@BIMgcs](https://twitter.com/BIMgcs)

## Questions?



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