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Centre for
Smart Infrastructure and Construction

An Innovation and Knowledge Centre

Industrial Information Engineering in Smart Infrastructure & Construction

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CSIC Cambridge Centre for Smart Infrastructure and Construction

EPSRC Engineering and Physical Sciences Research Council

Technology Strategy Board Driving Innovation

UNIVERSITY OF CAMBRIDGE

Backdrop

From Prof Mair's Introduction:

Modern construction and infrastructure needs to be

- *Optimised in terms of efficiency, cost, low carbon footprint and service quality*
- *Robust, resilient and adaptable to changing patterns*
- *Innovative across all sectors – driven by business in partnership with government*

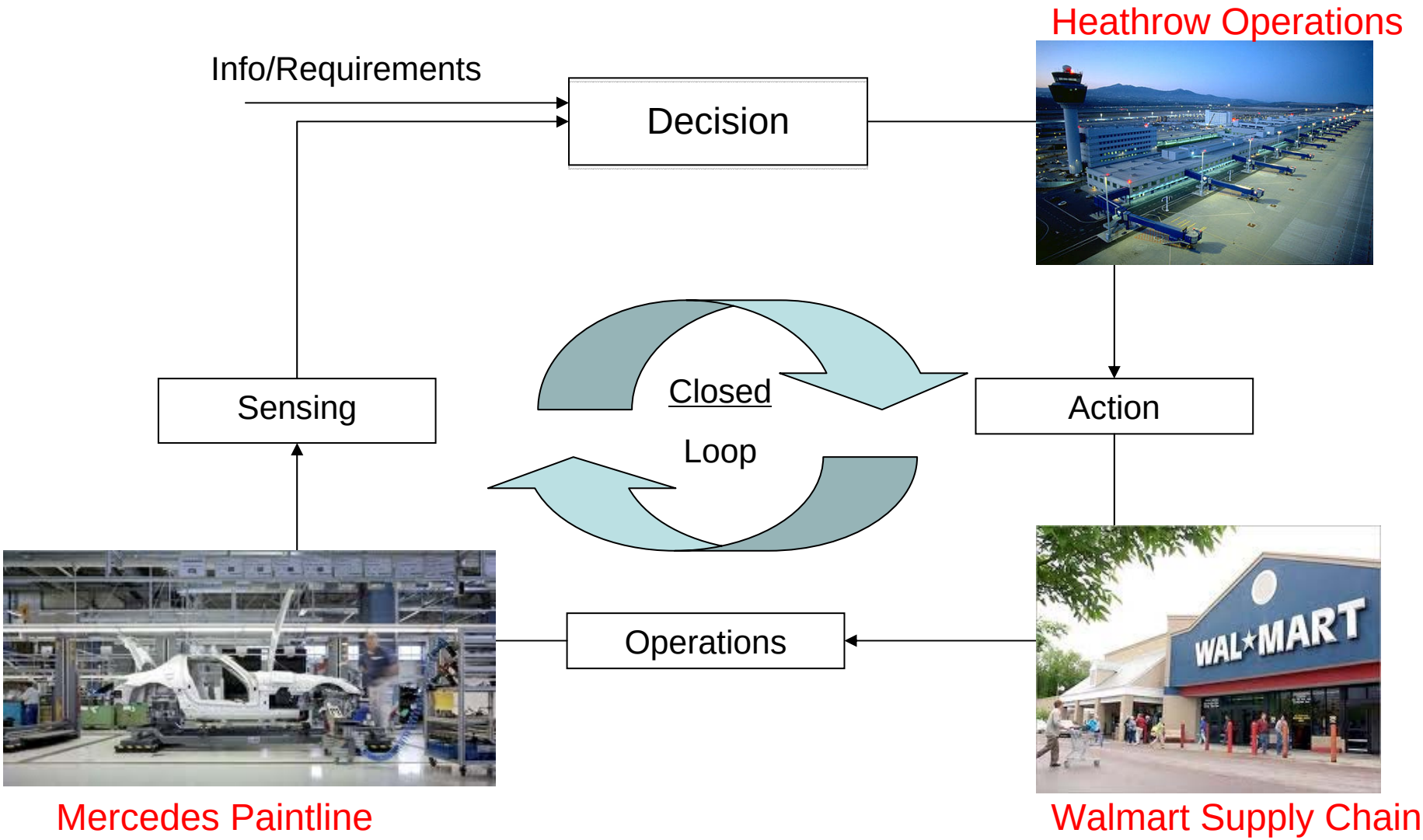
Source: A National Infrastructure for the 21st Century. Council for Science and Technology, 2009

… Modern manufacturing and the industrial supply chains linked to it have faced these challenges continuously over the last 20 years

Some Key Issues in Manufacturing & Supply Chains

- *Industrial Resilience:*
  Preparing systems for disruption/unexpected change
- *"Servitisation":*
  Transformation from a manufacturing to service organisation
- *Throughlife management:*
  Whole life cycle of assets and products

Why an Industrial Information Angle?



Information Questions in Smart Infrastructure and Construction?

1. Information Requirements: What information is needed?

2. Information Management: How is that information best acquired, stored, maintained and accessed?

3. Information Value: What is the value/impact of the information?

4. Asset Optimisation: How can the information ensure "best" use of key Infrastructure assets?

Effective Management of Information

What are the challenges?

- *Appropriate methods for acquisition of data?*
- *Most effective organisation and management of critical information*
- *To what extent are existing information systems capable of supporting the information required?*
- *Reliable means of retrieval of meaningful information*

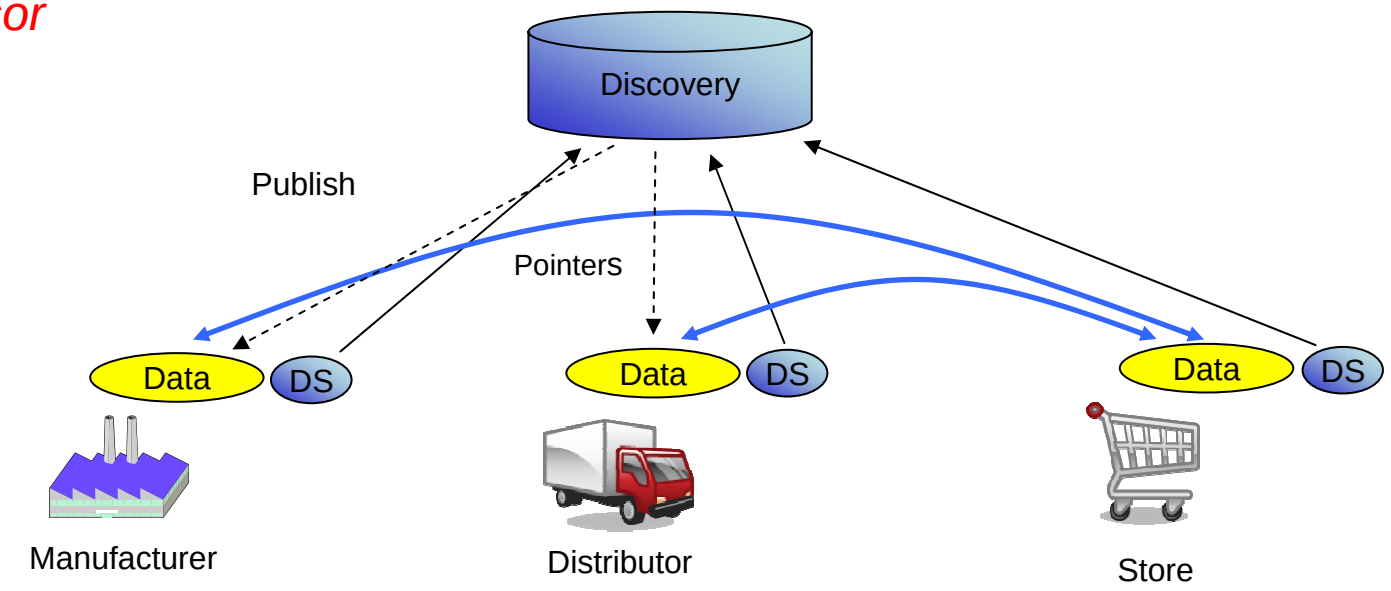
RFID in Concrete: Laing O'Rourke

Fiat Service Centre

Effective Management of Information

How do we tackle the challenges?

- *Analysis of appropriate sensor locations, types, numbers*
- *Software for distributed data retrieval*
- *Embedding Information [intelligence] in objects*



Effective Management of Information

Issues for Smart Infrastructure and Construction?

- *Appropriate acquisition of data* → Life cycle tracking of construction elements & assets [RFID etc]
- *Most effective organisation and management of critical information* → Approaches for managing new and existing information required across the life of complex infrastructure
- *To what extent are existing information systems capable of supporting the information required?* → Are BIM and other information models appropriate/adequate for life cycle support of key infrastructure
- *Reliable means of retrieval of meaningful information* → Mechanisms for accessing appropriate data during construction, refurbish, extension, rebuild

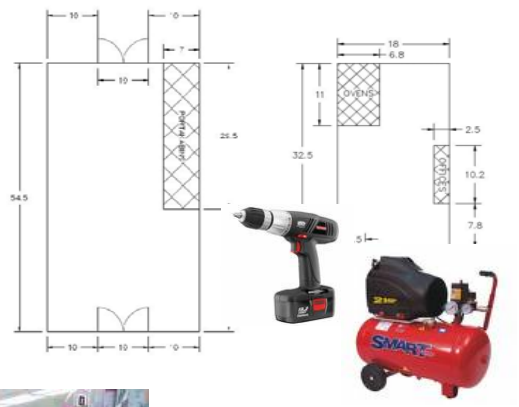
Value of Information

What are the challenges?

- *How do you calculate the "value add" from improved information?*
- *How do mulitple information sources compare in terms of impact on operations, maintenance etc*
- *When is it worth investing in new information solutions*

Exxon Maintenance Strategy

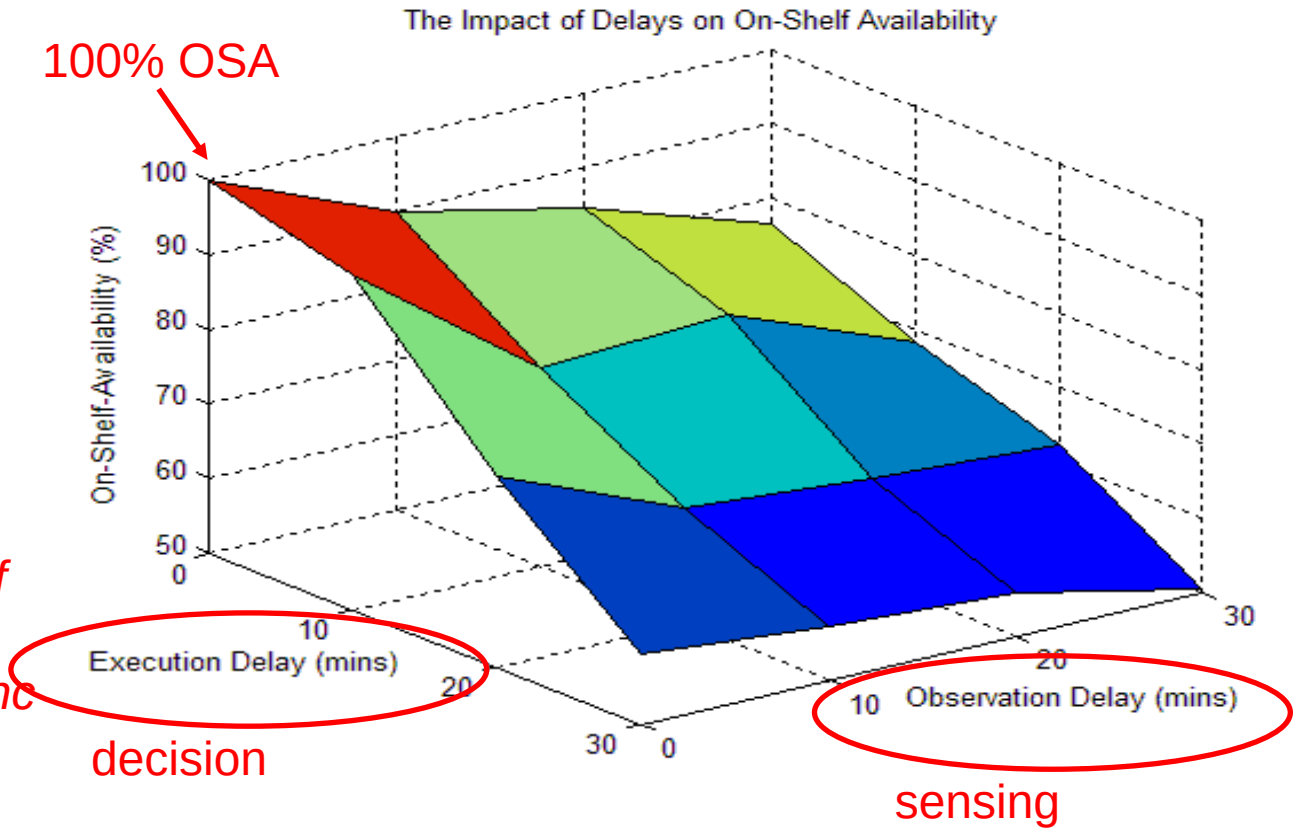
Marshalls: Tool Location



Value of Information

How do we tackle the challenges?

- *Combining sensors and probabalistic prediction models*
- *Modeling of impact*
- *of improved information on decision making*
- *Analysis of impact of better decisions on operations/maintenance*

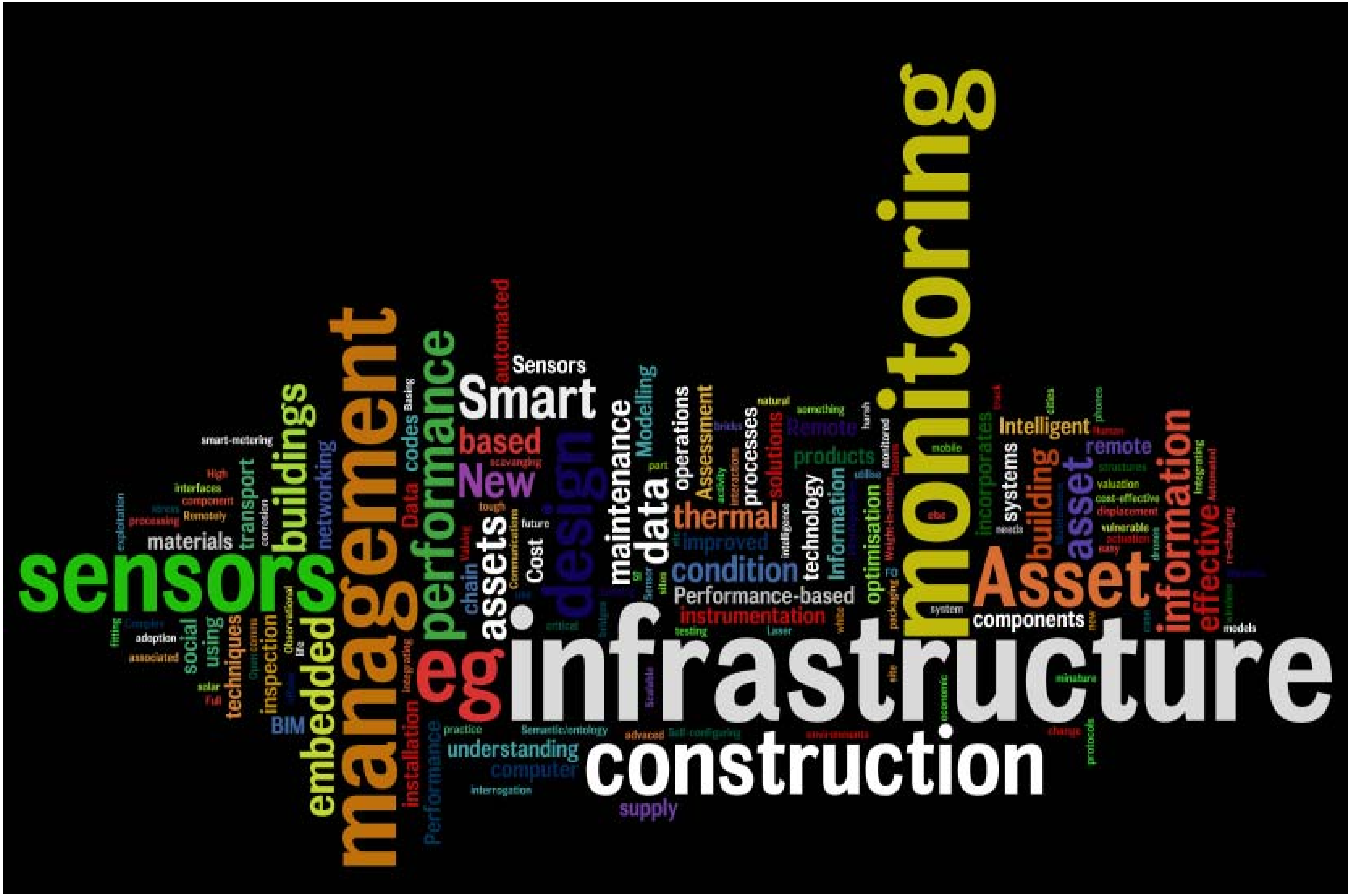


Proposed Research in the CSIC

Information Requirements	Information requirements assessment for whole life asset information
Information Management	Futureproofing of Infrastructure asset information RFID in construction supply chain
Value of Information	Strategies for Infrastructure sensing
Asset Optimisation	Optimisation of Asset Life Cycle Performance

Summary

- Systematic, standardised approach to integrating new information sources
- Sensing is the first step in the closed loop
- manufacturing & industrial supply chains directly relevant to those in construction & major infrastructure



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