
Engineering the future

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LAING O'ROURKE

Laing O'Rourke

Laing O'Rourke is the largest privately owned construction solutions provider in the UK. Formed over 30 years ago, the Group's international operations posted managed revenue of £4bn in 2011.

1	2	3	4	5	6
Investment and Development Services	Programme Management Services	Design and Engineering Consultancy	Manufacturing and Construction Solutions	Infrastructure and Buildings Management	Support Services
					
<ul style="list-style-type: none"> • Pre-construction services consultancy • Investment management • Development management 	<ul style="list-style-type: none"> • Stakeholder management • Global procurement expertise • Construction delivery management • Project controls and risk management • Programme governance 	<ul style="list-style-type: none"> • Design for Manufacture and Assembly (DfMA) • Civil engineering • Structural engineering • Materials engineering • Mechanical and electrical engineering • Chemical and process engineering • Buildability studies 	<ul style="list-style-type: none"> • Design for Manufacture and Assembly (DfMA) • Remediation and enabling works • Logistics management • Global procurement expertise • Integrated construction delivery • Building technologies installation • Testing and commissioning 	<ul style="list-style-type: none"> • Refurbishment • Facilities and network distribution management services • Environmental impact management • Building controls management 	<ul style="list-style-type: none"> • World-class fleet of plant and equipment • Building Information Modelling and digital prototyping capability • 'Insite' cost and programme quantification and modelling tool

Buildings vs Infrastructure



Parallels with PC/Computer Industry

- **Performance has changed dramatically**
 - **286 PC to i7 processor**
- **Price hasn't change**

Innovation for Growth?

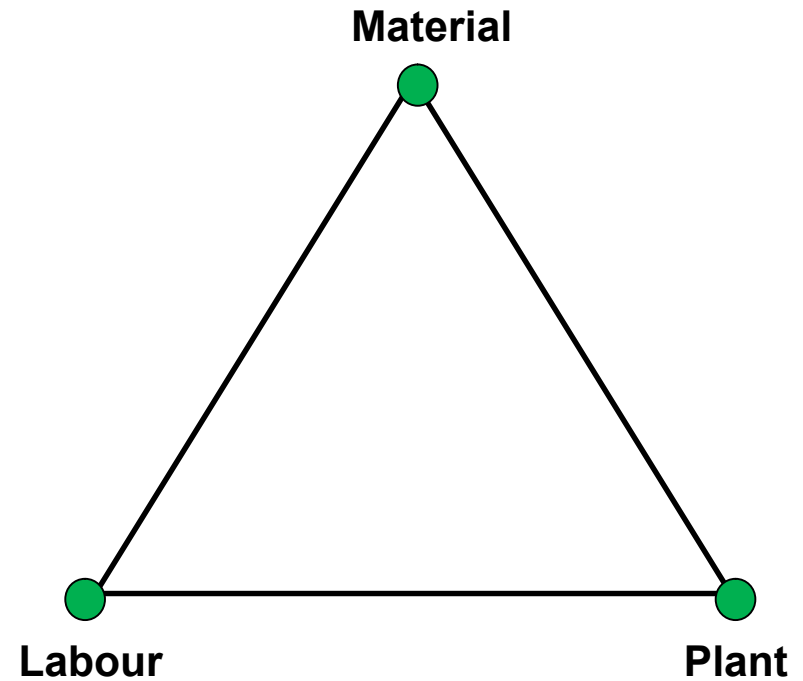
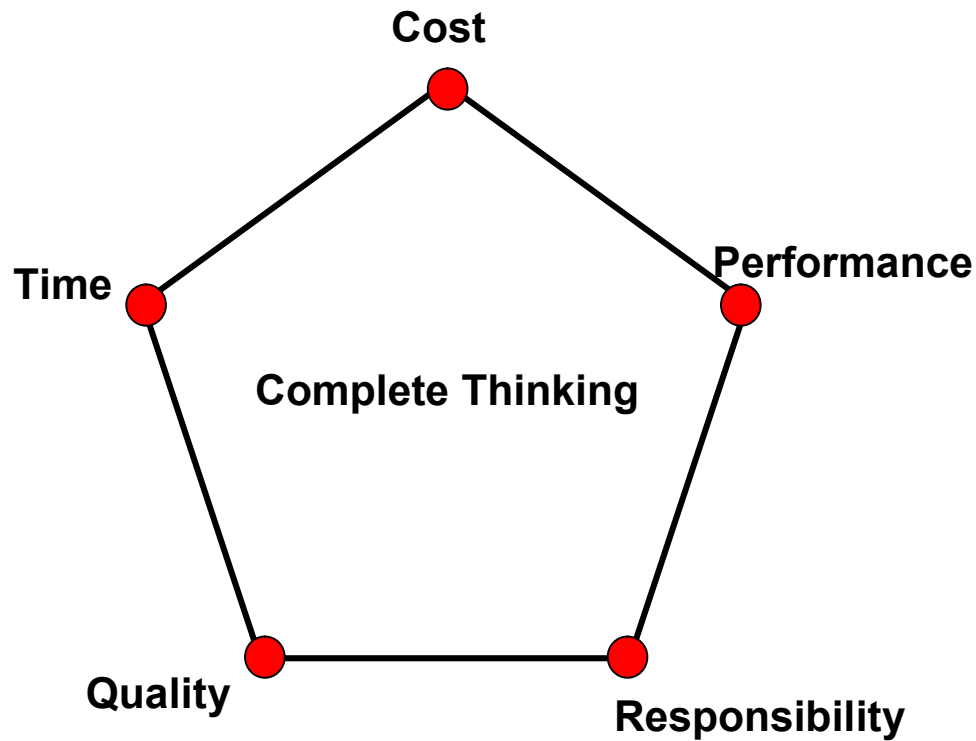
OR

Innovation for Demand Creation

Complete Thinking

Predictability

$$\text{Cost} = \text{Material} + \text{Plant} + \text{Labour}$$



Materials

- Carbon Negative Cement (e.g. Novacem – TSB funded)
- Aggregates from waste (e.g. SILAC-G – TSB funded)
- Concrete
 - Think product not concrete as a material (e.g. Nuclear)
 - is it suitable for manufacturing?
 - Self healing? Self cleaning? Self maintained?
- How about non-concrete structural materials
 - Learn from other industries

Materials

- Lightweight structural components
- How about the use of textiles in infrastructure??
- De-icing of road
- De-icing of airport runways and aircraft parking bays
- Energy harvesting/storage materials?

PLANT AND LABOUR

DfMA strategy: to deliver projects differently

Yesterday:



DfMA strategy: to deliver projects differently

Today:



DfMA strategy: to deliver projects differently

Today:



Explore Industrial Park

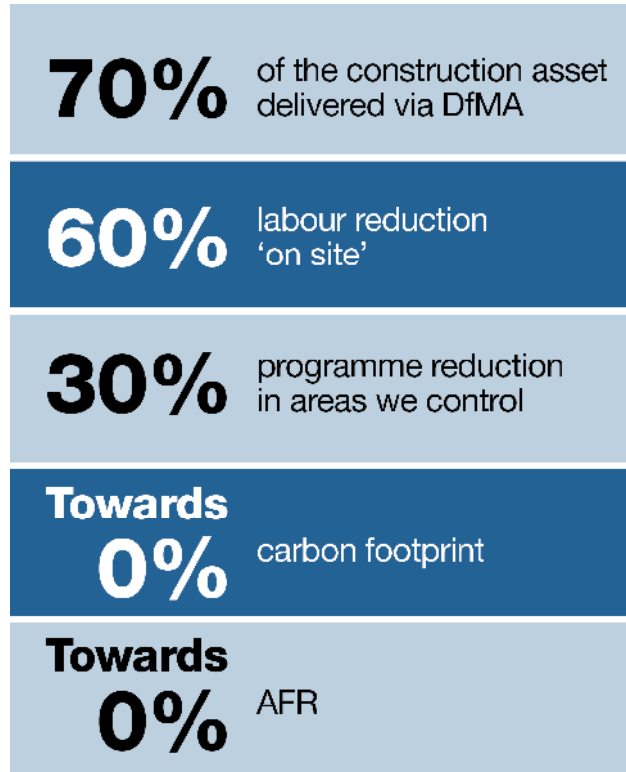
Europe's most advanced manufacturing facility for concrete products



Automation in construction



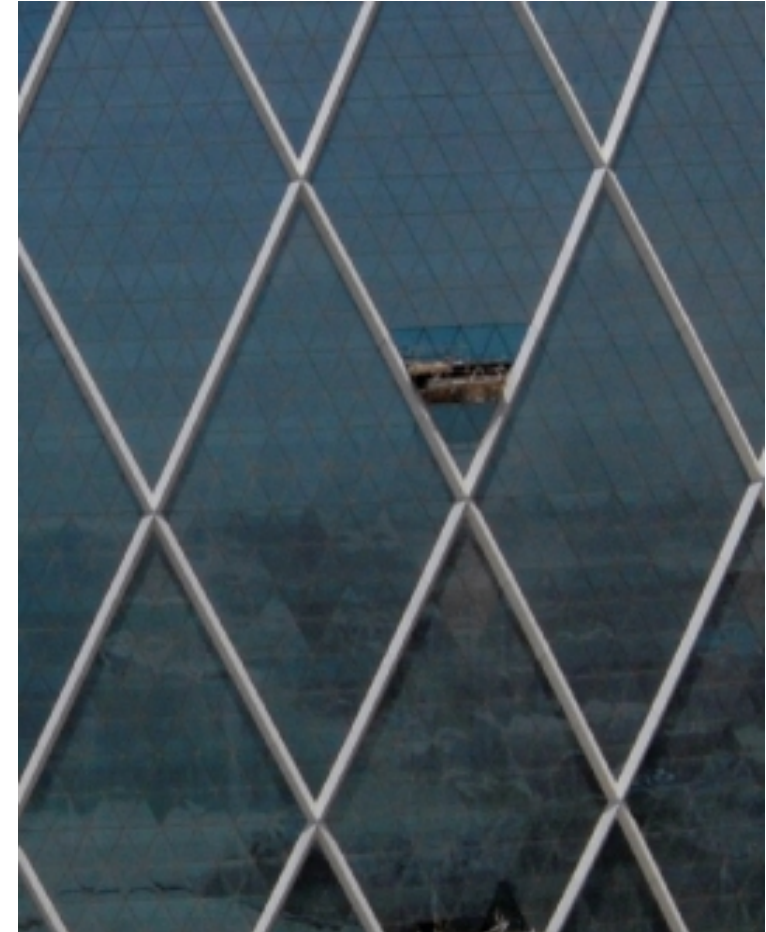
Our Vision



“ Transforming traditional construction methodologies into a modern process of assembly ”

Automation in Construction

- Use of robotics systems



Automation in Construction

- Logistics Challenges
- Monitoring and sensing
- Use of SCADA, GPS, GIS, telemetry etc



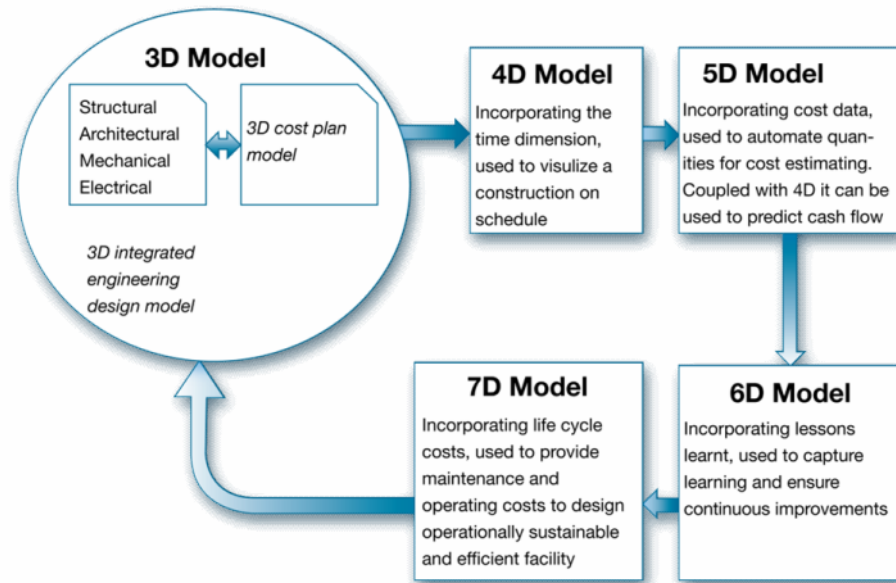
Alice Springs to Darwin Rail



Lawrence Hargrave Drive,

BIM – nD modelling

- We build project twice first digitally then physically



- Vision - nD modelling. Single model environment
- Computer vision and Augmented reality
- Wireless sensors, RFID, Fibre Optics etc.....

Geotechnical Challenges

- Understanding geology better
- Capturing 4D information
- Measuring and monitoring tools and techniques
 - Optical fibre instrumentation in foundation piles
- Optimised design
- Geothermal Energy

Systems Engineering

- Systems of pieces built by different subsystem groups did not perform system functions
 - Often broke at the interfaces




Photo from Dec 1999 Civil Engineering magazine

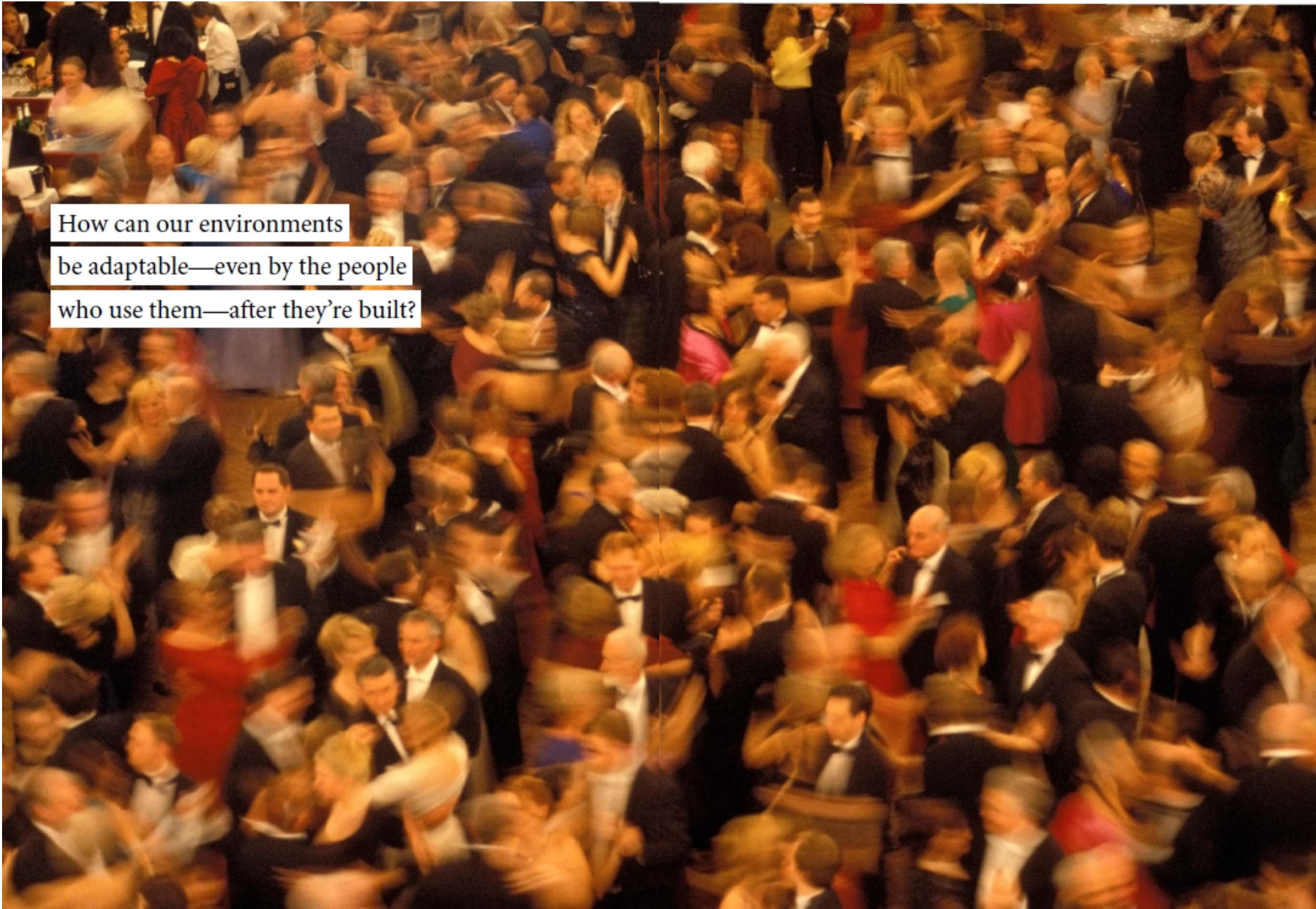
***Systems engineering* is a robust approach to the design, creation, and operation of systems.**

The approach consists of:

- identification and quantification of system goals
- creation of alternative system *design* concepts
- performance of *design* trades
- selection and implementation of the best *design*
- verification that the *design* is properly built and integrated, and
- assessment of how well the system meets the goals

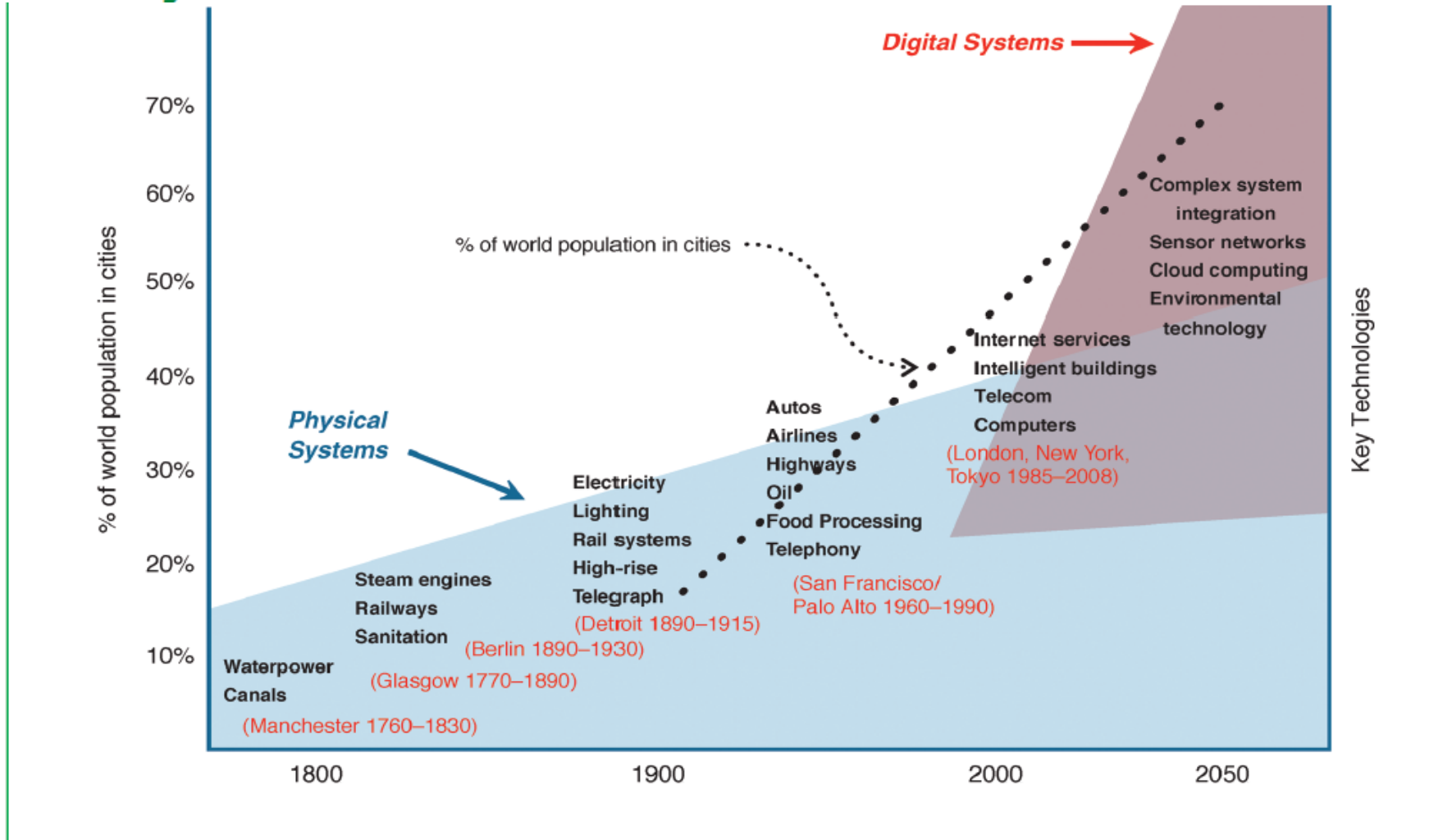


How can the construction process
be made easier and less costly through
embedded technology?



How can our environments
be adaptable—even by the people
who use them—after they're built?

Physical–digital integration in city infrastructure



London 2012 Olympics park



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