

A Systems Approach to the Advanced Engineering and Low Carbon Economy

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Introduction

- Creating Systems that Work – the sequel ...a preview
- Aim:- to promote systems to a broader audience -
 - More business case than technical guidance.. Political ?
- Three books in one
 - Systems
- Contribution that Systems can make to
 - Advanced engineering economy
 - Climate change
- Recommendations
- Looking for comments and feedback



We live in a systems society....

- Transportation, Education, Health, Welfare Security, Criminal Justice, Housing, Banking, Pensions, Insurance, Travel, Work, Trading, Investment, Utilities, Agriculture, Retail, Energy, Finance, Distribution, Manufacturing, Entertainment & Leisureeven Social...
- Regulators, Local Government, Central Government, European Union, World Trade, Global economy
- Birth to death...we're part of the "system"
- Like it or not they're all connected ...all interdependent
- **But have they been properly engineered ??**

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.....NO !!

T5 Baggage Handling

**Foot and Mouth
CHAOS at HEATHROW**

**Immigration Out
of Control**

**Soham enquiry highlights
"Systemic" Problems at
Humberside**

Lehman Brothers

**Northern Rock
Collapse**

**Financial Services
Authority Fails**

**Prison
Down
Soham results fiasco**

London Probation System Fails

**Criminal Justice in the Dark
ages - Tony Blair**

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People just aren't “systems” aware....

Systems just isn't part of:-

- Politics, economics and philosophy
- Staff Colleges Hendon, Sandhurst, Cranfield, Dartmouth
- Institute of Directors.....
- Training for Doctors, Lawyers, Accountants or other professions.....
- Not universally part of Engineering courses.....
- Leadership and Professions lack awareness and understanding

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Review of Government Guidance

- OGC Best Practice Guidelines:-
 - Focus is on Project Management
 - Dig deep to find “systems” and then it’s not as we know it
 - A few ad hoc pages amongst a library of other material
 - Conclusion:- On the periphery - not centre stage
- HM Treasury ... Lots of specific projects
 - As with OGC no guidance on how to specify, design, build, operate, optimise
- Cabinet Office - Prime Minister’s Strategy Unit - Strategy Survival guide - July 2004
 - has a reference to Soft Systems methodology !!

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Government in control ??

Under Freedom of Information asked for
Estimated wastage on Major Projects

- Treasury >>>>OGC
- OGC
- Public accounts committee

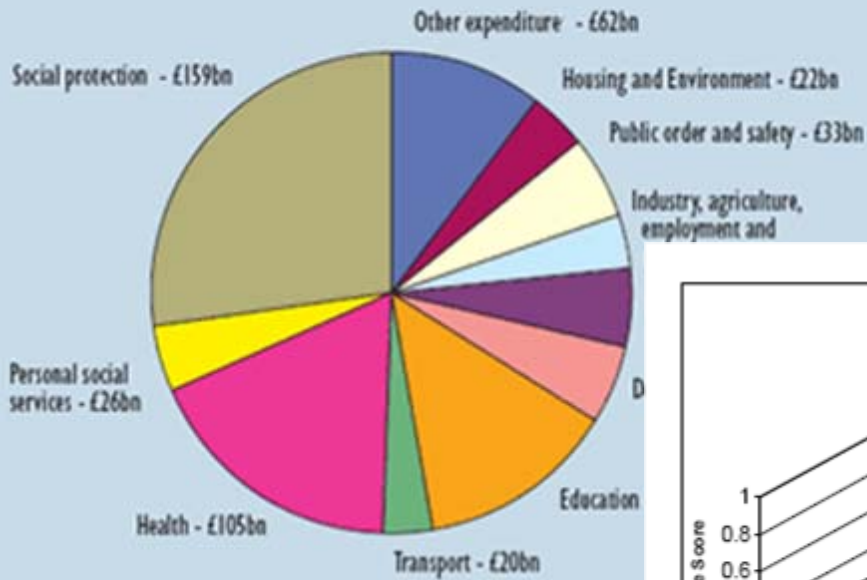
- From Responses:- UK Government doesn't know how much its wastes on "Failed" or underperforming systems

- Not being monitored across all departments
 - Direct costs
 - Indirect cost OR social and economic impact

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Systems CAN add value

Where taxpayers' money is spent



£ 175 Bn per annum on procurement
£175Bn Spending Deficit

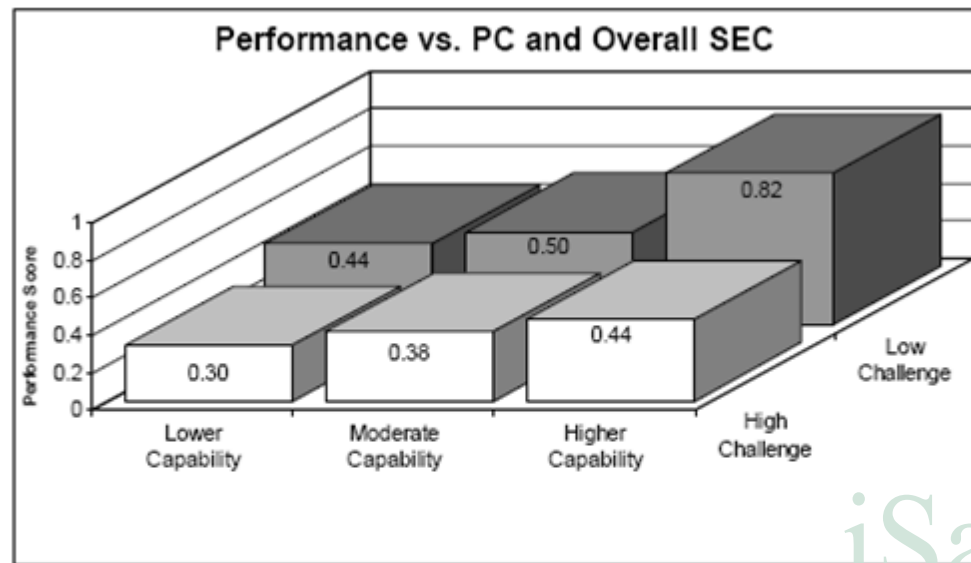


Figure 63: Performance vs. Project Challenge and Overall SE Capability

Both figures clearly show the combined impacts of Project Challenge and SE Capability.

Where “Systems” can make a difference.... economy as whole :-

A Unique tool to help:-

- Streamline structure and process – enterprise architecture
- Tests for system effectiveness
- Value for money
- System Maturity

- Higher productivity.... policyto front line

- Improve Project Performance –
Government and Industry Primes

- Help reduce government spending and reduce deficit
 - Positive impact on Front line
 - More cash for wealth creation

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Two themes to illustrate the point

- Advanced Engineering Economy
- Climate Change

Two themes to illustrate the point

- **Advanced Engineering Economy**
- Climate Change

Engineering's Economic Contribution

- **The Engineering and Technology Board (2004) *The Frontiers of Innovation: Wealth Creation from Science, Engineering and Technology in the UK.***
- Looking at the broader picture, researchers at the Science Policy Research Unit of Sussex University have estimated that **30% of UK GDP is in sectors related to engineering and the physical sciences** (they omit the bio/pharma sector), **accounting for 22% of total employment and around 40% of investment.**
- The Royal Academy of Engineering has estimated that half of the companies listed in the FTSE (excluding purely investment companies) depended extensively on engineering.
- The 2002 balance of payments figures show that **engineering consultancies earned a net surplus on the services account of £2.1 billion.**
This compares quite favourably with net surpluses in services for insurance (**£6.2 billion**), financial services (**£10.5 billion**) and computer and information services (**£1.9 billion**).

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The competition

- **Demos (2007) The Atlas of Ideas: Mapping the new geography of science - Conference & report launch Brochure 17–18 January 2007, London**
- Since 1999, China's spending on research and development (R&D) has increased by more than 20 per cent each year. In 2005, it reached 1.3 per cent of gross domestic product (GDP), up from 0.7 per cent in 1998. In December 2006, the Organisation for Economic Co-operation and Development (OECD) surprised policy-makers by announcing that China had moved ahead of Japan for the first time, to become **the world's second highest R&D investor after the US**. Spending by central government in 2006 reached 71.6 billion RMB, or **£4.7 billion**, compared with **£3.2 billion** by the UK government.

The Strategy

- **Lord Sainsbury of Turville (2007) Sainsbury Review: The Race to the Top - A Review of Government's Science and Innovation Policies. Retrieved on 17 June 2009**
- The best way for the UK to compete, in an era of globalisation, is to move into high-value goods, services and industries. An effective science and innovation system is vital to achieve this objective.]...
- .[The best way for the UK to make the most of globalisation opportunities is to support the restructuring of British companies into high-value goods, services and industries. We should seek to compete with emerging economies in a “race to the top” rather than in a “race to the bottom”.]...

The “Top of the Food Chain” Model...

Dominance in product development and exports =

- maintaining overall control at the top of the food chain
- understanding the market as entrepreneurs and investors,
- developing the IPR, the product and the services,
- organising the manufacturing (or the construction),
- the distribution, the after sales...
- managing the whole value life cycle

so that maximum export revenue flows back to the UK.

Can't do this without systems...
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Where “Systems” makes a difference:-

- Leadership
- Strategy
- Life Cycle
- Design
- Tier 1 Tier 2 Procurement
- Project outcomes - Quality – Schedule - Risk

- Enterprise design
- Processes
- Systems assurance
- Governance
- Process improvement CMMI



The political environment to enable an advanced engineering economy

- A united political will
- A regime where all stakeholders work together
- A National Forward load
- A shared strategy for growth two to three decades out
- A policy which encourages innovation and entrepreneurialism
- A welcome environment for inward investment
- Strategic “must keep” capability and critical knowledge bases
- Support infrastructure

Sound Familiar ??

- Ironically, we believe many of the components required for an Advanced Engineering Economy exist already, but because the overall organisation has been allowed to evolve in an unstructured, unsystematic manner over the last few decades or more, it has lost focus and has become fragmented.
- Turnover at the top – unreceptive – not a champion

Recommend a full time joint Government and Industry Executive

- Based on the model of an independent Bank of England

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Two themes to illustrate the point

- Advanced Engineering Economy
- **Climate Change**

Climate Change

- **Melting Polar Ices caps & Glaciers**
- **Weather patterns and ocean currents**

Impact

- Coastlines retreat - Low lying land mass disappears)
- Desert regions expand
- Water shortages
- Habitat, Vegetation and Agriculture become “stressed”
- Availability of Fossil Fuels
- Health and demographic movement
- Security and Political dimensions

Additional challenges

- Growth of population
- Spread of Industrialisation increases Greenhouse gas emissions by another 50%

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The response.....

- Engineering mass migration and demographic change
- Coastal defences & Flood defences
- Re-siting road and rail links to make them less vulnerable
- Re-siting critical infrastructure such as power, water and waste systems
- Re engineering the national grid to make it more resilient and secure
- Creating whole new energy efficient towns and cities –

- Re engineering existing cities and buildings to make them more carbon efficient and more suited to future climates
- Rainwater harvesting
- Re thinking agricultural production
- Re optimising food distribution and logistics
- Health policies and infrastructure
- Re-siting of Hospitals

- Meeting new patterns of disease
- International trading relationships
- Systems of regulation, control and governance

- Other implications create major challenges to foreign policy, national security and defence

Systems Can make a difference

- **Each of these are essentially highly complex, multi-disciplined and multifunctional affairs** which require detailed analyses and tradeoffs to establish the “best fit” solutions.
- **This is a core competence within systems - providing a unique structure and discipline to the design process as well as unique solutions.**
- **There will not be enough trained resources** and where we now rely on expert offshore companies to solve these problems - these may be in shorter supply as each country deals with its own restructuring.
- **“Owning” critical resources will be a key to economic survival**
- Most of these projects are long term and the work should be starting now

Are we prepared ??

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Conclusions

- Systems have a major role to play in the UK economy and social progression
- Systems as a discipline, as a key contributor, is undervalued by Government and Industry

Recommendations

- A dedicated national campaign
- The Prime Minister should appoint a Secretary of State to take full responsibility across all government departments

- **Forward Load – critical capability development**
- **Systems awareness and training**
 - Politicians, Civil servants, Accountants, Lawyers, Journalists, teachers, doctors, Local government officers.....”leadership” as a priority
- **Staff Colleges**
- **Management Colleges**
- **Professional institutions and Learned Societies**
- **Systems and the Board**
- **Benchmarking**
- **Supporting Infrastructure**
- **Systems Research** to reinforce the business case

Systems CAN add value.....

- A more advanced class of enterprise solutions for Government and Industry - delivering both performance and value for money as well as real operational advantages for the community.
- Better outcomes on Major Projects and Infrastructure development
- A major contribution to Exports and the balance of payments
- A reduction in the UK's dependency on critical off shore resources / know how, products and technology
- A dominant position as an intelligent customer - providing the critical skills to buy and operate national systems professionally in a tough global market place
- A major contribution to the **Advanced Engineering Economy**
- The ability to meet the complex challenges of
a **Low Carbon Economy and Climate Change**



Questions ?

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