Systems Thinking for Project Management: 
The Trialogue and The Homeostat

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PMI Seminar
Hewlett Packard, Bristol
29th March 2012
• ‘Grain Dryers in Northumbria reduce performance of ECML’

• ‘Snow on slip road prevents food deliveries’

• ‘Buses not running due to snow’

• ‘£50k fine for pollution that devastated river’
‘An Infrastructure for the 21\textsuperscript{st} Century’

The effects of serious NI failures on business and public confidence are likely to be far reaching and long-lasting, with inevitable economic and political consequences if that failure is localised in the UK.................

.....the last 50 years has been the gradual, but ultimately seismic, shift from a series of unconnected structures to an interconnected NI where failure in one part has a direct and damaging knock-on effect in others...........

......The UK national infrastructure is now a network of networks
Systemic Interaction

The Elements

Transport  Energy  ICT  Waste  Water

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Systemic Interaction

The Elements

Energy
ICT
Transport
Waste
Water

The Interactions
Systemic Interaction

The Elements

- Transport
- Energy
- ICT
- Waste
- Water

The Interactions

The System
Systemic Interaction

- Understanding Systemic Thinking
  - Interaction
    - The existence of ‘system’ is rooted in the connectivity of one element with others – this constitutes a network which must be dealt with in its totality – it is a ‘system’
    - Key ideas:
      » Von Bertalanffy, Wiener, Checkland, Beer, Ackoff, Forrester
• Understanding Systemic Thinking
  • Interaction
    – The existence of ‘system’ is rooted in the connectivity of one element with others – this constitutes a network which must be dealt with in its totality – it is a ‘system’
    – Key ideas:
      » Von Bertalanffy, Wiener, Checkland, Beer, Ackoff, Forrester
  • Interdependency
    – The functioning of one element of the infrastructure depends on one (or more) other elements
    – Issues cannot be resolved in isolation
  • Emergent properties
    – Systems exhibit properties that belong only to the system – not to any of its elements
      » Flight
Systemic Interaction - flight

Airframe
Systemic Interaction - flight

Airframe <-> Propulsion
Systemic Interaction - flight

Airframe

Control System

Propulsion
Systemic Interaction - flight
Systemic Interaction - flight

- Airframe
- Propulsion
- Control System
- Management System
- Maintenance System
- Energy Supply System
Systemic Interaction – safe flights

- ATC System
- Energy Supply System
- Airframe
- Propulsion
- Control System
- Management System

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Systemic Interaction – regulated airspace

- ATC System
- Airframe
- Propulsion
- Control System
- Management System
- Maintenance System
- Energy Supply System
- Regulatory System
Systemic Interaction - society

enables

depends on

Society

Health -> Education

Commerce -> Defence

Civil Admin

Energy

Transport

ICT

Water

Waste
Systemic Interaction

• Why is this a challenge?
  • Current paradigm
    – (Relatively) linear, reductionist thinking
    – Solutions to THIS issue are developed in isolation from THOSE issues
    – But THOSE issues are interdependent with THIS one
• Why is this a challenge?
  • Sometimes, rather than solve issues they are moved or displaced:
    – The NHS displaces patients from one budget holder to another
      » changes in GP contracts re out of hours surgery has displaced local practice volumes to A&E departments
      » the number of people treated is, roughly, the same
  • Sometimes, issues in one area impose a cost burden in another – which is beyond our capacity to control
    – Healthcare for those involved in road accidents imposes costs on the NHS not the DSA
    – A project that ‘solves’ one problem while creating others?
• Why is this a challenge?
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      NHS not the DSA
    – A project that ‘solves’ one problem while creating others?
      » HS2?
      » Boris Island or 3rd Runway at Heathrow?
• The Good, the Bad and the Disinterested
  – Ideas around for about 90 years
  – Offers models which are both ends and means oriented – organisational, social and political perspectives
    • VSM, SSM, Systems Dynamics, SAST, CSH
  – ‘Systems’ or ‘holistic’ thinking beginning to be adopted
  – But not core in Academic or Professional Education
    • It is easier to work within the established paradigm than change the thinking (Machiavelli)
    • There is a dearth of truly systemic thinking in our approaches to problem solving
    • This may well exacerbate our challenges as systemic interactions become more complex
  – More widely – the language of systems is being used – but without meaning!
    • Projects are often narrowly bounded and tightly focused
    • ‘The operation was a great success, but the patient died’
    • The system works but the benefits are not realised!
• Organisations, activities, systems ARE complex
• Let us recognise that and work with it
Systemic Interaction – The Journey
Systemic Interaction – The Journey

Propulsion System

Rail Vehicle
Systemic Interaction – The Journey
Systemic Interaction – The Journey

- Propulsion System
- Control System
- Rail Vehicle
- Operator
Systemic Interaction – The Journey
Systemic Interaction – The Journey
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Systemic Interaction – The Journey

- Energy Supply
- Maintenance System
- Propulsion System
- Control System
- Rail Vehicle
- Operator
- Station
- Permanent Way
- Maintenance System
- Land Management System
- Track Use System
- Maintenance System
- Ownership System
- Regulatory System
- Ticketing System

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Systemic Interaction – The Journey
Organisations are Massively interconnected

Infrastructure
  – Ageing
  – Congested
  – Beyond Design Capacity
  – Questionable Resilience
  – Embedded Potential for Systemic or Cascade Failure
    • Complexity
    • Rooted in increasing and often unrecognised interdependencies
    • Increasing reliance on ICT (new vehicles, signals, services)

“The Infrastructure” is a system
  – Either it all works or none of it works!
“Something must be done!”

- Einstein on madness?
  - “Doing the same thing and expecting a different result”

- If we want to change the way things work (and it rather looks like we need to) then we need to adopt different methods
A Project: A ‘whole’ system?

- People
  - Values, Skills, Behaviours
    - ‘Soft’
  - Information Systems
    - ‘Hard’
  - Process, Structure, Decisions

- Organisation
  - Closure

- Effectiveness (Viability)
• Solving ‘soft’ problems
Soft Systems Methodology

1. Unstructured Problem
2. Problem Expressed
3. Root Definitions
4. Conceptual Models
5. Comparison
6. Feasible Changes
7. Taking Action

Real World
Systems Thinking
The Viable Systems Model

• Solving ‘hard’ problems
The Viable Systems Model
The Trialogue

Emerging Opportunities

Strategy
Creating the Future

Tension

Operations
Managing the Present

Current Activities
The Trialogue

Emerging Opportunities

Strategy

Purpose, Vision, Values

Operations

Current Activities

- Resolves tension
- Defines ‘rightness’
- Drives ‘morality’
The Homeostat
The Homeostat

Inputs → Process or Operation → Outputs
The Homeostat

Inputs
- Materials
- Energy
- Cash
- People
- Behaviour
- Data

Process or Operation

Outputs
- Materials
- Energy
- Cash
- People
- Behaviour
- Data
Information for Decisions

Modification of Input → Inputs → Process or Operation → Outputs → Measurement of Output

The Homeostat
The Homeostat

Did we do things right? How could we do better?

Information for Decisions

Modification of Input  
Measurement of Output

Inputs  
Process or Operation  
Outputs

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Did we do things right?
How could we do better?

Information for Decisions

Modification of Input

Inputs

Process or Operation

Measurement of Output

Outputs

Materials
Energy
Cash
People
Behaviour
Data

The Homeostat
Did we do things right?
How could we do better?
The Homeostat

Did we do right things?
What else could we do?
What should we stop doing?

Measure Managerial Performance

Measure Operational Performance

Inputs → Work → Outcomes

Current

Desired

Potential

Senior Manager
Modify

Manager
Modify

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The process ensures that we do the right thing right!

Measure Managerial Performance

Modify

Inputs

Work

Outcomes

Manager

Measure Operational Performance

Modify

Senior Manager

Modify

The Homeostat

Process
The Potentiometer

A device for measuring effectiveness
The Potentiometer

Capability
The Potentiometer

- Potential
- Capability
- Latency
- Productivity
- Actual
The Potentiometer

Potential → Latency
Capability → Productivity
Actual → Effectiveness
The Potentiometer

Potential → Latency
Capability
Driving operational improvement → Actual
Productivity
Effectiveness
Driving strategic improvement
Driving operational improvement

Potential -> Capability -> Actual

Latency
Productivity
Effectiveness
Project Management?

Effectiveness (Viability)

Values, Skills, Behaviours

‘Soft’

Information Systems

‘Hard’

Process, Structure, Decisions

Closure

People

Organisation

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Understand the information needed to manage the business

Business Effectiveness
Understand the information needed to manage the business

Business Effectiveness

Understand the value to the business of having that information

Business Financial Performance
Understand the information needed to manage the business

Business Effectiveness

Understand the value to the business of having that information

Business Financial Performance

Develop an Information Strategy
Understand the information needed to manage the business

Business Effectiveness

Develop an Information Strategy

Understand the value to the business of having that information

Business Financial Performance

Determine what hardware and systems are needed
Information Projects

Understand the information needed to manage the business
Business Effectiveness

Understand the value to the business of having that information
Business Financial Performance

Develop an **Information** Strategy

Determine what hardware and systems are needed

Commission **Information** Projects
Information Projects

Understand the information needed to manage the business

Business Effectiveness

Understand the value to the business of having that information

Business Financial Performance

Develop an Information Strategy

Determine what hardware and systems are needed

Commission Information Projects

Measure the Information Payback
Understand the information needed to manage the business

Business Effectiveness

Understand the value to the business of having that information

Business Financial Performance

Develop an **Information** Strategy

Determine what hardware and systems are needed

Commission **Information** Projects

Measure the **Information** Payback

Measure the **Value** Added
Conclusion

• Systemic Interaction
• Systems Thinking
• Soft Systems Methodology
• Viable Systems Methodology
• The Trialogue
• The Homeostat
• Information Projects
• The Potentiometer
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