How Can Organisations Deal with Complexity?

The Bath Royal Literary and Scientific Institution

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How Can Organisations Deal With Complexity?

- When faced with a complex organisational, societal or global problem we find it very difficult to cut through all the issues and to see how to address it effectively

- We instinctively search for a simple, straight forward and understandable solution – unfortunately such solutions do not work!

Why?

- Because they are often linear and address only one or two key aspects of the problem
  - e.g. we may be convinced that the key issue within an organisation may be the culture, or the IS system or the organisational structure and we focus on that particular aspect

How Can Organisations Deal With Complexity?

- Complex problems cannot be 'solved' with single solutions, however optimal they may appear at the outset

- The talk will offer examples where that approach did not work, but where a complexity science based approach did address the problem far more effectively

Background

- The LSE Complexity Group has been working for over 22 years with research partners in the private, public and voluntary sector
- To develop, test and refine a methodology underpinned by complexity science
- Based on close collaboration with research partners
- The core of the methodology is qualitative, but includes modelling (ABM), art and a psychology tool

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Research Partners & Awards

Awards: 5 EPSRC; 3 ESRC; 2 AHRC; 3 EU; 1 ECOWAS = 12 & 21 industry/public sector projects: 4 NHS projects (2004 – 2007 & 2014); 1 Environment Agency (Defra) on leadership (2005);4 GSK projects (2005-2008); 1 DWP on leadership (2007); 1 HSE on the relationship between policy and outcomes (2010); 2 RBL projects on governance of a new project awarding loans and grants to ex-service personnel (2010-11); 1 LARCI (Local Government), 3 FCO (Foreign & Commonwealth Office); 3 Dartington Trust, 1 UNEP on gender asymmetries and decision making

The above 33 projects have raised over £10m.

Research Partners include AstraZeneca, AXA, BT, BAe Systems, Cabinet Office, Citibank (New York & London), City of London Police, Dartington Trust, DWP, Defra, FCO (Indonesia), GlaxoSmithKline, Home Office, Humberside TEC, Legal & General, London Emergency Services (Fire, Ambulance, Police), MoD, Mondragon Cooperative Corporation (Basque Country), the NHS, Norwich Union Life, PBA, Rolls-Royce (Aerospace & Marine), Royal British Legion, Shell (International, Finance & Shell Internet Works), TOTAL (Paris), Transport for London, UNEP, the World Bank (Washington DC)

The projects addressed the following topics

- Alignment between IT and the rest of the business;
- Post M&A integration;
- Leadership in the NHS, Defra, and many other organisations in the private and public sectors;
- Regeneration & sustainable development in communities;
- Organizational learning;
- Innovation in the private and public sectors;
- Disaster risk reduction in West African States;
- A new framework of governance for government using complexity theory with 5 Governments;
- Corporate governance – co-authored a book
- Evacuation dynamics after a major disaster – large 4-year EU project;
- Organisational transformation of a government agency in Jakarta to help them address deforestation in Indonesia;
- Land Trust in Ireland to scale up successful activity in Galway;
- Employee engagement and training to facilitate engagement;
- Pandemics & conflict – 5 workshops working with world experts;
- Gender & decision making in ocean and inland water communities;
- Strategy development to 2020 for an EC Agency; a multi-business trust;
- Security challenges facing a global insurance co. with Security Executive Cttee;
- The Hospital of the Future, Tel Aviv, with physicians and nurses in the Intensive Care Unit, 2018

+ Seminar series since 1992 & training courses

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Advisory Positions

- Advisor to Rabin Medical Centre, Tel Aviv, Israel (2018)
- Advisor to ECHA (European Chemicals Agency), Helsinki (2015-16)
- Advisor to UNEP (UN Environment Programme) GRID-Arendal, Norway (2015)
- Advisor to UN OCHA (Office for the Coordination of Humanitarian Affairs) (2014)
- Member of the World Economic Forum Global Agenda Council on Complex Systems (2012-2014)
- Advisor to government agency in Jakarta, Indonesia (2012-2013)
- Scientific Advisor to the Governments of Australia, Brazil, Canada, Netherlands, Singapore and UK (2010-11)
- Advisor and Evaluator of the relationship between policy and outcomes to HSE (2010)
- Advisor to Royal British Legion on the governance of a new national project delivered locally by multiple partners (2010-11)
- Advisor to ECOWAS (Economic Community of West African States) Commission, on Disaster Risk Reduction, in association with King's College, Humanitarian Futures Programme (2008-9)
- Advisor to Board of GlaxoSmithKline, Pharma, UK (2006-7)
- Advisor to Board of Rolls-Royce Marine (2004)
- Advisory Board Member on Complexity, Citibank, New York (1997-8)
- Advisor to the Czechoslovakian Ministry of Education (1988)

Complexity Theory

- Complexity theory offers a different way of
  - thinking
  - seeing the world
- Many scientific and business approaches look at the finer and finer detail
- Which is *reductionist* thinking
- Complexity looks in the other direction

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Complexity Theory

- Complexity looks at *interacting* elements and asks:
  - How do patterns emerge from these interactions?
  - How do these patterns unfold or evolve over time?
- Complex behaviour arises from *interaction*
- Complexity theory focuses on *relationships* within the whole
- Considers any system *as a whole* within its broader context
- The distinguishing feature of complex systems is that they can *create new order*

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Theories

Natural sciences

Dissipative structures
chemistry-physics (Prigogine)

Autocatalytic sets
evolutionary biology (Kauffman)

Autopoiesis (self-generation)
biology/cognition (Maturana)

Chaos theory

Social sciences

Increasing returns
economics (B. Arthur)

Generic characteristics of complex co-evolving systems

emergence
connectivity
interdependence
feedback

path-dependence

self-organisation

space of possibilities

co-evolution

historicity & time

far from equilibrium

creation of new order

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Emergence

- Emergent processes, qualities, patterns
  - arise from *interaction*
- Cannot always be predicted
- Not additive or cumulative
- More than the sum of the parts

Examples of emergent processes:

- learning, culture, innovation
- new ways of organising/new organisational forms

- Emergence needs to be taken into consideration in any change process

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Emergence

Two-way process

- *Bottom-up* (micro to macro): through interaction of individual interacting agents

+

- *Top down* (macro to micro): the emergent constrains the interacting agents in two ways:

  a) constraints some of their actions

  b) at the same time it opens up new possibilities, not available to individuals on their own

  (Alicia Juarrero 2002)

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Birds flocking, an example of self-organisation in biology

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Self-organisation in human groups

- Forming unexpected and unplanned groups - often as a response to a specific problem or issue
- *Spontaneous* 'coming together'
- *Not directed* or designed by someone outside the group
- The group decides *what* needs to be done, *how, when* …
- Can be a source of ***innovation***

(Kauffman, 1993, Mitleton-Kelly 2003)

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Self-Managed or Empowered Teams

- Part of *formal structure*
- Formal, temporary or permanent
- *Not spontaneously* formed
- Indirectly controlled or *steered by senior management*
- Managers decide 'who' and 'what'
- Replace the hierarchy
- Empowered by senior management
- Strongly shared culture
- Some sense of shared purpose
- *Order achieved via recognized processes*
- Behaviours influenced by procedures and roles
- Strong sense of team commitment
- Variable amounts of energy and enthusiasm
- Possibility of some learning

(Stacey 1996, McMillan 2000)

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Self-organising teams

- *Not part of formal structure*
- Informal and temporary
- *Spontaneously* formed
- Boundaries influenced, but not determined, by senior management
- *Team members decide* 'who' and 'what'
- Often in conflict with or constrained by the hierarchy
- Empowered by team's members
- Strong sense of shared purpose
- Inherent *order emerges*
- Strong sense of personal & team commitment
- High levels of energy and enthusiasm
- Co-learning community

(McMillan 2000, 2004)

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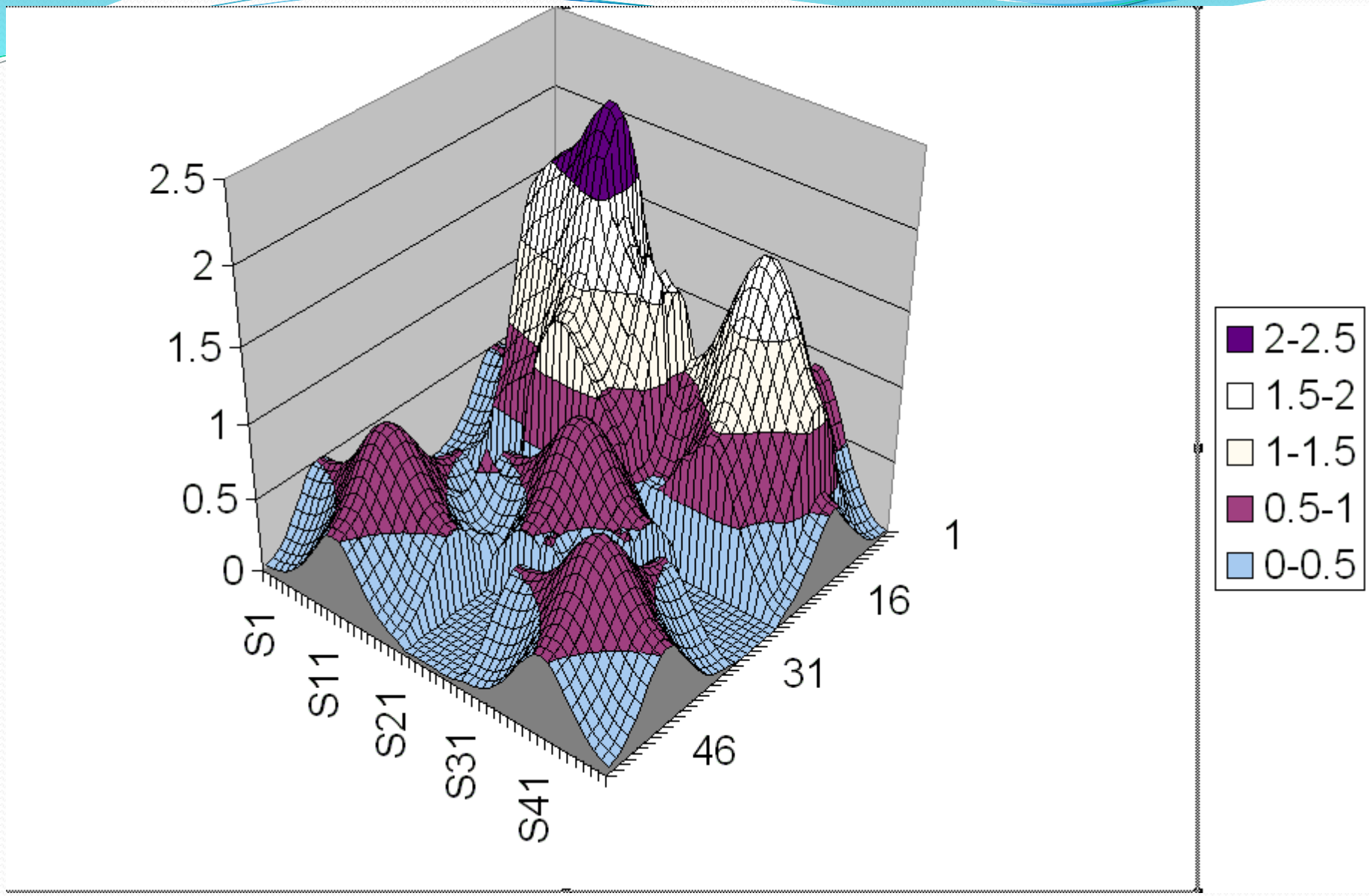
Exploration of the Space of Possibilities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1-1.5
0.5-1
0-0.5

Exploration of the Space of Possibilities

- Exploration of new options, different ways of working and relating
- Essential for innovation
- The search for a single *'optimum'* strategy is neither possible nor desirable, in a changing or turbulent environment
- Multiple micro-strategies + distributed strategies, power, intellectual cap

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Exaptation

- e.g. viagra, post-its, non-stick pans
- Often not expensive R&D which produces major innovations, but *'seeing'* a novel function, in a new light.
  - *"**Exaptation** is the emergence of a novel function of a part in a new context. … Major innovations in evolution are all exaptations. Exaptations are not predictable."* [Kauffman, Complexity and Technology Conference, London, 11 March 1997 + Gould 1982, 1991]

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Next Adjacent

- When searching the space of possibilities, whether for a new product or a different way of doing things
- It is not possible to explore all possibilities
- But it is possible to consider change one step away from what already exists

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Nature of Change

- Step change – fundamental, radical change
  - e.g. revolutions/uprisings
  - Often apparent not actual
  - Change takes place all the time at a micro level
- Incremental change
  - Next adjacent
- Both necessary and both may be happening at the same time

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Co-evolution in biology

- Bumblebees and the flowers they pollinate have co-evolved so that both have become dependent on each other for survival

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Co-evolution in a Social Ecosystem

- ***Reciprocal influence, which changes the behaviour of the interacting entities*** (individuals, organisations, industries, economies, etc.)
- Co-evolution takes place within a social ecosystem
- If influence and change are entirely in one direction: *'adaptation to'* a changing environment
- Short-term adaptation may result in long-term co-evolution

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Far from Equilibrium

Ref: Wired, Brandon Keim, 18 Nov 2010

Far-from-equilibrium

- The original work on dissipative structures was done by Ilya Prigogine and his co-authors Nicolis and Stengers

- Nobel Prize for reinterpreting the Second Law of Thermodynamics
  - increase in entropy & irreversibility

- Dissolution into entropy is not a necessary condition but *"under certain conditions, entropy itself becomes the progenitor of order"*

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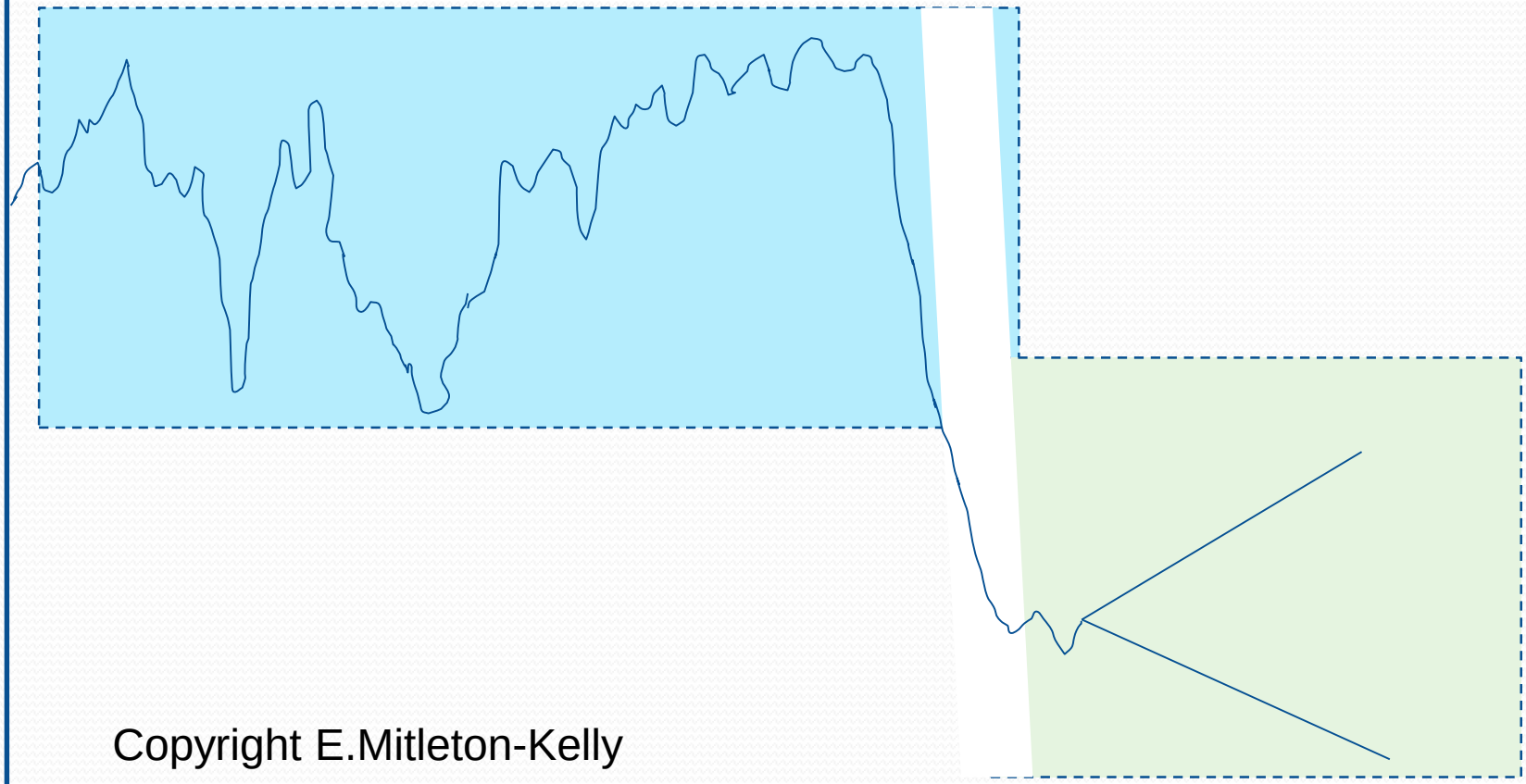
Point of bifurcation when system is pushed far-from-equilibrium



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Far-from-equilibrium

- When an external event disturbs the behaviour of an open system significantly, so that it can no longer operate within existing limits, then it is pushed *'far-from-equilibrium'*

- In a social context: moving away from established norms, procedures, ways of working and relating

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Summary of characteristics

When a system is pushed far-from-equilibrium the following characteristics come into play to create new order:

- *Self-organisation*
- *Exploration of possible solutions at the critical point*
- *Co-evolution*
- *Emergence of new structure*

- *Precise* behaviour can neither be predicted nor controlled

- **Creation of new order**

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A Practical Example

Rolls Royce Marine

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Rolls Royce Marine

- RRM: working with 14 members of the ALD (Accelerated Leadership Development) team
  - One of five cases in
  - Mitleton-Kelly, E. *'Identifying the Multi-Dimensional Problem-space & Co-creating an Enabling Environment'* in E:CO (Emergence: Complexity & Organisation), 2011 & as Chapter 2 in Moving Forward with Complexity, Ed. Andrew Tait & Kurt A. Richardson 2011, ISBN 9780984216598, Emergent Publications

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RRM

- Two years after a major acquisition RRM was suffering from significant lack of social and organisational integration and all problems were attributed to ***a single cause***

- The research team, working with 14 volunteers from the organisation, identified ***a set of inter-related causes*** that would have seriously threatened the wellbeing of the company if not addressed

- The outcome was a set of 12 work-streams implemented by the company, to address each critical issue identified and to co-create an ***enabling environment*** to improve integration

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How Can Organisations Deal with Complexity?

1. See and understand their organisation as a *complex social system*
   - learn about complexity principles

2. Analyse complex problems *holistically*, with
   - many interrelated and interacting *causalities*
   - *multiple dimensions*: social, cultural, political, economic, physical, technical, etc.

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How Can Organisations Deal with Complexity?

- Complex problems/challenges do not have a single optimal solution

3. They can be addressed much more effectively by co-creating an ***Enabling Environment***

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LSE-ALD Project

- **A**ccelerated **L**eadership **D**evelopment team
- 14 volunteers joined the LSE team
- Total of 4 teams
- Conducted 44 interviews with RRM executives on top 3 levels in parent & acquired company
- LoM (Landscape of the Mind – Kate Hopkinson) with all 70 RRM executives
  - psychology tool which identifies preferences
- 2-day facilitated workshop with ALD & LSE teams, and sponsors

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Landscape of the Mind (Kate Hopkinson)

- LoM results with 70 top execs showed that there were no significant differences in preference profiles between the different national groups

- Supported the interview findings and provided evidence that different national cultures were not the single cause for lack of integration

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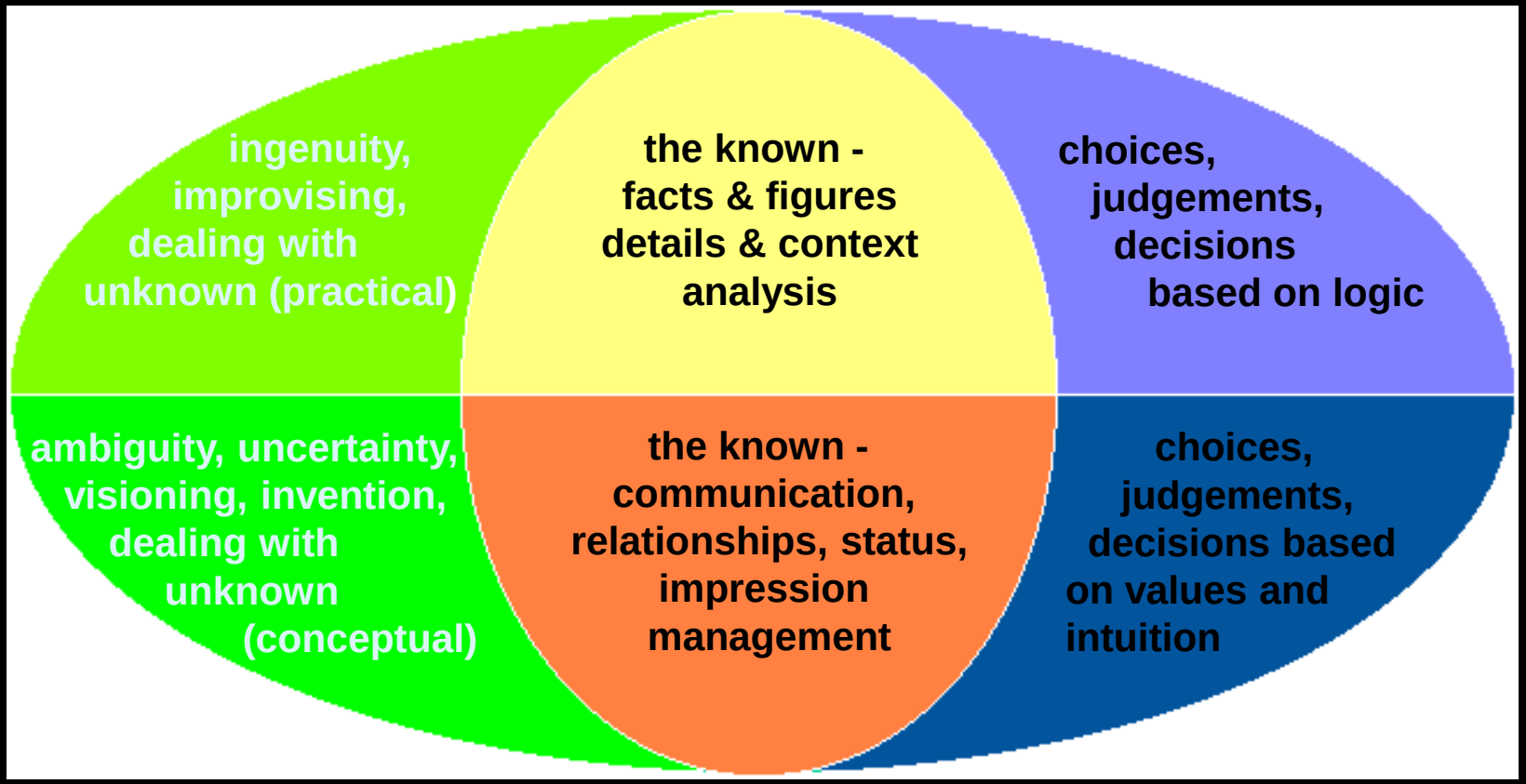
Landscape of the Mind (Kate Hopkinson)

The universe of all "inner skill" (competencies)



divergence future | convergence present | evaluation past

Landscape of the Mind (LoM)

(Kate Hopkinson, Inner Skills, UK)

- Email questionnaire
- Shows diagrammatically individual and group profiles of preferences
- Preferences can act as potential enablers or inhibitors in effective decision-making, strategic thinking, knowledge generation, etc.

- e.g. RRM & GSK

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Acknowledgements

Kate Hopkinson
Inner Skills Consultancy Limited
Website: www.innerskills.co.uk
hopkinson@innerskills.co.uk
Tel: 020 8989 4387

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2-day Facilitated Workshop

- 72 themes grouped into 8 clusters:
  - OBU/CFBU Interface
  - Complexity of structure (matrix)
  - Human behaviours
  - Cultures*
  - Communication
  - Leadership/role of central team/management
  - Identity
- 12 Underlying Assumptions

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Erroneous Approach

- Acquisition demanded a different structure and a different way of working and relating or the *'creation of new order'*

- Not understood and therefore the approach was inappropriate
  - imposed the wrong structure
  - did not facilitate interaction

- Consequences
  - lack of integration
  - lack of communication between Nordic and UK managers
  - lack of learning – why?

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- Mistaken attribution of cause
  - assumed to be different national cultures

- *A complex problem space has many inter-acting underlying causalities*

- Jumped to obvious conclusion without in-depth analysis of the *problem space*

- No concept of the *'enabling environment'*

Quotation from Project Sponsor

- *"Often in industry there is pressure and a temptation to jump directly from the problem to an intuition-based solution with little analysis*
- *The LSE ensured that we resisted this pressure and temptation*

- *Also, the issues that we were faced with, did not obviously lend themselves to analysis*
- *The LSE showed us how analysis could be used."*

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Conclusion

- By understanding the complex *problem space*
  - with several underlying interacting causalities
  - and multiple dimensions

- RRM was able to build on the findings and to co-create an *enabling environment* to facilitate integration

- That was sustainable

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RRM

- Project completed Aug 2004 (duration 2001-4)

- **Profits in £m**

2005	2006	2008	2009	2010	2011
89	101	183	263	309	376

- **Revenues in £m**

2005	2006	2008	2009	2010	2011
1,097	1,299	2,204	2,589	2,123	2,235

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Conclusion

- Addressing difficult complex problems needs a methodical approach and an explanatory framework based on sound theory

- It need not be prolonged and time consuming, but it does need to be thorough and to identify the different dimensions and their co-evolutionary dynamics (how they influenced and changed each other) – and ***why?***

- A complexity approach can help provide such a framework

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Suggested Reading

- **Mitleton-Kelly E. (2003)** *'Ten Principles of Complexity & Enabling Infrastructures'* in Complex Systems & Evolutionary Perspectives of Organisations: The Application of Complexity Theory to Organisations, Ed. Mitleton-Kelly, Elsevier, ISBN 0-08-043957-8

- **Mitleton-Kelly E. 2011** *'A Complexity Theory Approach to Sustainability: A Longitudinal Study in Two London NHS Hospitals'* in The Learning Organization (TLO) Special Issue, Elements of Organizational Sustainability, Vol. 18 Iss: 1, pp.45 – 53, January 2011

- **Mitleton-Kelly E. (2011)** *'Identifying the Multi-Dimensional Problem-space & Co-creating an Enabling Environment'* in E:CO (Emergence Complexity & Organisation) in 2011 & as Chapter 2 in *'Moving Forward with Complexity'*, 2011, Ed. Andrew Tait & Kurt A. Richardson, 2011, ISBN 9780984216598, Emergent Publications

- **Mitleton-Kelly, E. (2015)** *'Effective policy making: addressing apparently intractable problems'*, Ch. 8 in Handbook on Complexity and Public Policy, Ed R. Geyer & P. Cairney, Edward Elgar Publishing Ltd. [doi = {10.4337/9781782549529.00014}]

- **Mitleton-Kelly, E. (2018)** *'Addressing Global Challenges: the EMK Complexity Methodology'*, in Handbook of Research Methods in Complexity Science: Theory & Application, Edward Elgar, Eds. Mitleton-Kelly E, Paraskevas A, Day C.

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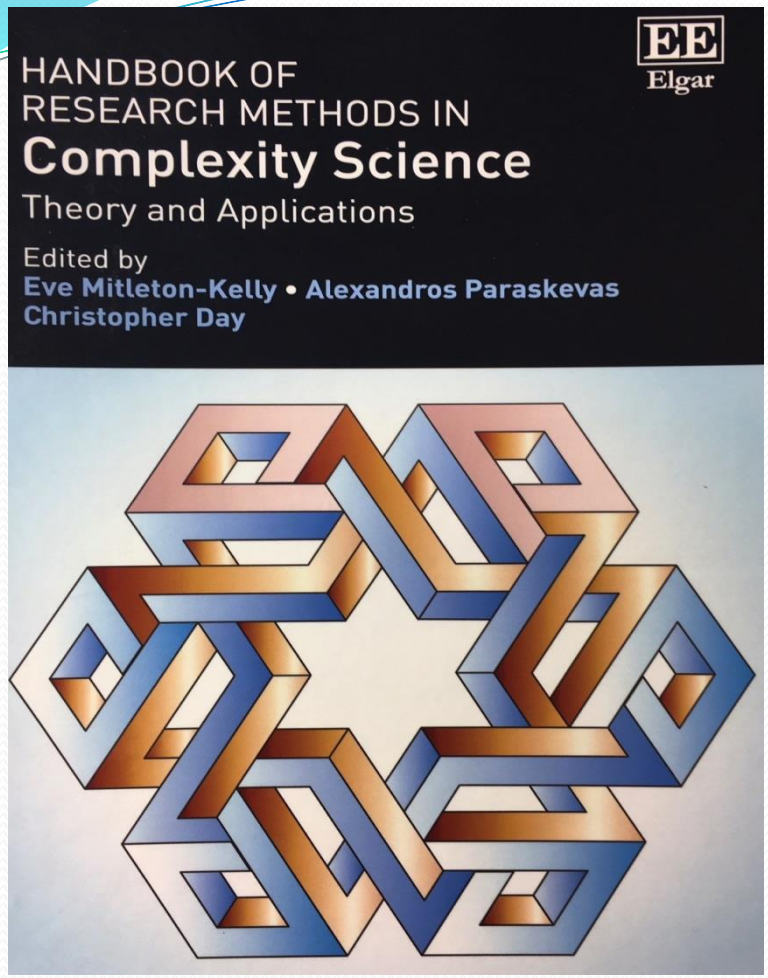

Handbook of Research Methods in Complexity Science
Theory and Applications, 2018
Edited by Eve Mitleton-Kelly, Alexandros Paraskevas, Christopher Day

This comprehensive Handbook is aimed at both academic researchers and practitioners in the field of complexity science. The book's 26 chapters, specially written by leading experts, provide in-depth coverage of research methods based on the sciences of complexity. The research methods presented are illustratively applied to practical cases and are readily accessible to researchers and decision makers alike.

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Special Discount

- Code CMPX35

- Can be used when ordering the book direct from Edward Elgar website: https://www.e-elgar.com/shop/handbook-of-research-methods-in-complexity-science
- can email: sales@e-elgar.co.uk quoting the discount code CMPX35 with payment details

- Applicable until end **of December 2019**

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Courses at Schumacher College, Dartington Trust, Devon

- ***Effectively Addressing Apparently Intractable Problems in Organisations***
  - ***28 October – 8 November 2019***
  - ***https://www.schumachercollege.org.uk/courses/short-courses/EMK-addressing-problems***

- ***Effectively Addressing Apparently Intractable Problems – Advanced Course on the Multi-Dimensional Analysis***
- ***27 April – 3 May 2020***

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Thank you

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