An Integrated Methodology to Facilitate The Emergence of New Ways of Organising

Prof. Eve Mitleton-Kelly
Director
Complexity Research Programme
London School of Economics
Houghton Street
London WC2A 2AE
&
Visiting Professor
Open University, UK
E.Mitleton-Kelly@lse.ac.uk
020 7635 5553

Leszek R Puszczynski
Vice President, Customer Business
Rolls-Royce
Leszek.Puszczynski@rolls-royce.com

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Abstract: The paper will describe the different qualitative and quantitative tools and methods of the LSE Complexity Group's integrated methodology using a specific case. The tools provide rigor by triangulating the data and the findings and by testing against interpretation bias. They also provide different but complementary information about the organisation and offer a very rich and deep understanding. The findings can then be used as an informed basis for *co-creating an enabling infrastructure*, based on social, cultural and technical conditions that facilitate the emergence of new ways of organising.

Key words: complexity, collaborative action research, connectivity, enabling infrastructure, new ways of organising.

Introduction

If organisations are seen as complex evolving systems (CES), then the approaches, methods and tools that we use to study them and to help them evolve need to be appropriate - for example, they need to take the characteristics of organisations as CES into account; they need to track changes over time; and they need to address both the qualitative and the quantitative aspects of the organisation under study as well as its broader environment.

The Complexity Group at the London School of Economics has been working collaboratively with organisations since 1995 to develop such a methodology. At the same time the Group has been developing a theory of complex social systems, which underpins the methodology. Both the methodology and the theory have been developed and tested in practice in a series of projects looking at real problems faced by our business partners. They

include BT, BAe Systems, Citibank (New York), GlaxoSmithKline, the Humberside TEC, Legal & General, MoD, Mondragon Cooperative Corporation (Basque Country), the Modernisation Agency of the NHS, Norwich Union, Rolls-Royce (Aerospace and Marine), Shell (International, Finance and Shell Internet Works), the World Bank (Washington DC), AstraZeneca and several companies in the Aerospace industry.

We work with *natural experiments* using a *collaborative, action research* approach. A *natural experiment* is part of an organisation that wants to change, it cannot be controlled and there is no closure, as it is ongoing. It is *collaborative* in the sense that we work closely with our business partners and the whole approach emphasises co-creation, facilitation and relationship development. It is *action research* in the sense that we are part of the process and the research directly influences our partner and vice versa. In one of the cases that will be described, 16 members of the company became 'researchers' for a period and conducted 34 out of the 44 interviews and were then guided into analysing the data. Rolls-Royce Marine (RRM) and the researchers learned from and influenced each other during that process - they co-evolved - and produced a set of recommendations that were developed into 12 work streams by RRM.

The integrated methodology uses both qualitative and quantitative tools and methods, which provide rigor by triangulating the data and the findings and by testing against interpretation bias. They also provide different but complementary information about the organisation and offer a very rich and deep understanding. The findings can then be used as an informed basis for *co-creating an enabling infrastructure* and an environment conducive to change and the emergence of new ways of organising. *The methodology however is not just a set of tools and methods - it is about facilitating connectivity, emergence, self-organisation etc. and about helping to co-create an environment, which acknowledges organisations as complex social systems that co-evolve over time, both internally and with their broader social ecosystem.*

The paper is in four parts. The first outlines the problem and introduces the case study, the second describes the methodology, the third provides the complexity context and a summary and the fourth describes the benefits from the academic and the business perspectives (the latter written by L. Puszczynski, RRM).

I. RRM'S PROBLEM

We start with a specific issue or practical problem, or at least with the *perception* of such a problem. In the process of research, analysis, triangulation, validation, etc the problem may appear in many different lights, but initially we have to start with what our business partners *see* as the problem.

In the case of RRM the problem was a lack of integration following the acquisition of a New Business, which was a set of small product-centric manufacturing companies, predominantly based in the Nordic Countries (Sweden, Norway, Finland) but also with operations in the UK and US. In the recent years preceding acquisition by RRM, the New Business had itself undergone several mergers, acquisitions and restructuring, which resulted in the head office of the New Business being established in Norway. A year after the acquisition by RRM the company held a conference to bring together the senior management of both the New Business and RRM, to focus on integration. The conference was facilitated by external consultants and followed an elaborate process of directed activities and exercises,

involving long hours and little time for reflection. The process followed a typical Anglo-American structure, rather than working with all parts of the business to address the issues the participants wanted to explore. Consequently the conference was not as successful as had been hoped and instead of ameliorating the problems, the conference made it worse. Three years after the acquisition (2002), there were still problems of communication between all parts of the business, the *apparent* cause was different national and business cultures. With the appointment of a new HR Director, a second conference was organised which emphasised connectivity and informality and allowed time for networking.

The outcome was a successful conference in the sense that it identified certain sensitive issues that needed to be addressed as well as improving the 'atmosphere' thus making it possible to develop better relationships. Two priority issues emerged from the conference:

1. Clarifying roles and responsibilities.
2. Increasing cultural awareness.

The HR Director, charged with implementing a programme to address these two issues, was uncertain how to proceed, when the LSE Complexity Group presented its initial findings on a limited set of interviews. One of the findings was that the matrix structure that had been introduced after the acquisition was creating some significant problems, including lack of clarity of roles and responsibilities. A key question raised was "why is diversity seen as a problem?" Can it not be seen as a strength, an advantage, to be built upon? The two issues identified at the conference were reflected in the findings. The presentation triggered an insight and the HR Director appointed a Project Manager (PM), tasked with delivering a set of recommendations on how to address the two issues, using the LSE Complexity Group. The project team was resourced by members of the company's High Flyers (HF) programme (those individuals identified with the potential to become future leaders of the business) and the LSE Complexity research team, and was organised into four groups – three HF teams and one LSE team.

The Project Manager brought together the rigor of academic research through the LSE team, with the practicality of the business environment, to ensure that both the LSE and RRM benefited from the project. This approach was a new and exciting challenge for the LSE team. It changed their way of working, it influenced how some of the tools were used and it introduced new ideas into the methodology.

II THE METHODOLOGY

Natural Experiments

A natural experiment is part of an organisation that wants to change. It is not an experiment in the scientific sense where the researcher is testing something and is able to control the experimental situation; a natural experiment cannot be controlled and there is no closure, as it is ongoing. A natural experiment is one where the organisation itself wants to experiment and to explore different *ways of working and relating.* That is, the way that people interact, communicate and work together - the 'way of relating' reflects the informal structure of the organisation and if this changes it could have significant implications on ways of working or how work is done, how procedures and processes are undertaken. To use the language of complexity, when individual agents change their patterns of interaction new structures or new properties *emerge*. This process may also affect the culture of that part of the organisation.

These insights resonate with the logic of complexity, which proposes that organisational change cannot effectively be designed top down and cannot be determined in advance in full detail. The constant failure of major restructuring initiatives and of merger and acquisition activity, where a highly specified organisational design is involved, indicates that the approach may be flawed. We are working on the hypothesis that a robust organisation evolves its social and organisational relationships and is capable of guiding and supporting its co-evolution with a changing environment. This kind of organisation has a relatively high degree of self-organisation and is comfortable that some procedures, processes and relationships will emerge and cannot be predetermined. It can live with this type of uncertainty and does not find it threatening. It also encourages the exploration of the space of possibilities by acknowledging that exploration means that some attempts will 'fail'. But without experimenting and running the risk of failure, a new order cannot emerge.

This is not easy to put into practice, as it requires a different style of leadership and management, as well as a high degree of personal responsibility from all employees. But it has been achieved with remarkable outcomes and is the longer-term objective of our approach - i.e. to help organisations become fitter and more sustainable by learning to co-evolve effectively with their changing environment, or to become aware of *co-evolutionary sustainability*. Co-evolution is an ongoing process, but it may become reactive and change its emphasis from co-evolution with to adaptation to a changing environment. [Mitleton-Kelly E. Chapter 2 '*Ten Principles of Complexity & Enabling Infrastructures'* in 'Complex Systems and Evolutionary Perspectives on Organisations: The Application of Complexity Theory to Organisations' Elsevier 2003, ISBN: 0-08-043957-8] The distinction is between strong and weak reciprocal influence and in the way the organisation thinks about and responds to changes in its environment.

In the RRM case the natural experiment has to be seen in the broader context of the business as a whole and in the identification of the two issues - *the clarification of roles and responsibilities and greater cultural awareness.* The whole of RRM wanted to address these issues and to find new ways of working and relating. They introduced an innovative way of helping the organisation to explore, identify and develop these new possibilities, by inviting members of the High Flyers team to become researchers for a while; to listen and to learn about the New Business, to understand the underlying issues and to offer some recommendations. Those directly affected by the recommendations in RRM , became directly involved through the research process.

Necessary Conditions

But how can this 'holy grail' of organisational fitness be achieved? First of all the organisation should *want* to experiment; secondly it needs to spend some time and effort in trying to *understand in depth* the deep underlying issues, as the symptoms may not reveal the real problem; thirdly it needs to know *how to set up* the natural experiment, to facilitate its success; and fourthly it needs to create an *enabling environment* that will help it achieve its goal, while understanding that the goal may itself change. The following qualitative and quantitative tools and methods provide the material and the processes on which that understanding may be built. They each provide different but complementary information about the organisation, so when all the tools and methods are used the organisation ends up with a very rich and deep understanding of itself. The findings can then be used as an informed basis to identify the conditions for co-creating the enabling infrastructure, which

must continue to evolve - it cannot remain static if the organisation is to successfully co-evolve with a changing social ecosystem.

To begin with, the researchers meet some of the key people involved and discuss the background to that particular 'natural experiment'. This gives us some context and identifies the key questions, concerns or problems. We explain the research process and our business partner is then in a better position to identify potential interviewees, who will take part in Phase One of the project. This phase includes (a) a set of **semi-structured interviews**, taking the key questions and concerns into account; (b) an introduction to **complexity thinking** by using the principles of complex evolving systems; (c) use of the **other tools and methods**; (d) analysis and presentation of the initial findings from the interviews at a facilitated **Reflect-Back workshop**; (e) findings from other tools and methods, may also be incorporated in the workshop presentation; (f) working with a core group to identify the **enabling conditions**, and to co-create the enabling framework that will be implemented in Phase Two. This will facilitate the emergence of a new way of organising or even a new organisational form. In addition, there are regular **inter-organisational workshops** for all business partners in a project so that they can learn from each other, as well as meetings with both **business and academic advisors**, who bring in different perspectives to the research process.

In RRM the business itself had identified the two issues and wished to do something about them, thus meeting the first criterion. Secondly, the LSE researchers spent time with the sponsors, conducted an initial set of interviews and together with the HF teams refined the interview topics. Once the project was underway, all four teams spent a great deal of time conducting the interviews, debriefing after the interviews and then analysing the findings. All this work meant that together we had achieved some deep understanding of the underlying issues, which were not confined to roles and responsibilities and cultural awareness. This met the second criterion of trying to *understand in depth* the deep underlying issues.

Another criterion was setting up the experiment correctly. The key success criteria were a committed sponsor who supported the project throughout, access to the interviewees, other key personnel and to relevant meetings and workshops, and the appointment of an involved Project Manager (PM). The RRM Project Manager was able to oversee the organisation of the interviews, their transcription and the organisation of the Joint Analysis Workshop. The PM was also the main contact with the LSE research team. He made sure that all the three top levels of the organisation were contacted and briefed about the project. He ensured that each team had all the information it needed to make the interview appointments. He arranged for the transcriptions and even bought the tape recorders! He spent a good deal of time with the research team and with the other three teams throughout the process and kept the two sponsors of the project (the HR and one other Director) informed about progress. Finally he funded a professional facilitator (provided by the research team) to facilitate the Joint Analysis Workshop.

Semi-Structured Interviews

Semi-structured interviews are based on only eight topics that stimulate reflection on the central problem and on related issues. They take 1.5 hours; they are recorded with the express permission of the interviewee and are conducted by two interviewers. The lead interviewer describes the topics (not seen by the interviewee) and invites comments and reflections, while the second interviewer explores any broader issues. The analysis uses direct and full transcripts, as the language used by the interviewee is an important element in the analysis. Some researchers use the software Atlas for the analysis while others prefer to work

directly with the scripts. The first analysis identifies *common themes, dilemmas* and *key questions.*

The interviews are analysed by at least three researchers and each researcher will analyse interviews done by him/her as well as interviews done by the other researchers to gain as broad experience of the interview data as possible. All the researchers will then meet for one or more whole days to share their initial findings. The themes and dilemmas are clustered in related groups with their associated questions. All papers are then put aside and after a break the team reconvenes to identify some *underlying assumptions*. This is the hardest part of the analysis. Assumptions are not voiced by interviewees. They are tacit. They are based on impression and interpretation and are the most 'subjective' element in the analysis. But they are extremely valuable as they are a good indicator of how the organisation thinks about itself. Articulating underlying assumptions, surfaces the organisation's beliefs and values, which are then validated at the Reflect-Back Workshop.

During this process several things happen: (a) interpretation bias is reduced by checking each other's reading; (b) by offering several perspectives, the understanding of each individual researcher and of the team is deepened; (c) patterns emerge and connections are made leading to some significant insights. The process is so powerful that we can identify key themes and dilemmas with only 6 interviews. In practice however we usually conduct 12-20 interviews. Interviewees are not seen as an average sample in a population, but as fractal representatives of the whole, offering different and overlapping perspectives.

Experience of the organisation is not confined to interviews. We join our partners in conferences, workshops and other meetings. We spend time over lunch with them and we keep in touch by telephone and email. Building and nurturing of these relationships is essential. We also scan the press for articles involving our partners; we visit their websites and generally keep ourselves informed through the literature and the media.

In the RRM project, the four research teams conducted 44 interviews. The LSE team provided the three HF teams, with guidelines as to how to conduct semi-structured interviews and then on how to analyse the interviews from transcripts. All the researchers then met at a 2-day Joint Analysis Workshop, which was quite different and on a much larger scale than before. Instead of 3-4 academic and associate researchers, we had a group of 21, mostly business partners, which included all the researchers from the High Flyers' team, the LSE team, the sponsors and invited Directors, the Project Manager and a facilitator. Together we identified 72 themes, which were grouped into 8 clusters and 12 underlying assumptions. On the basis of this understanding the group made recommendations, which became a set of 12 work-streams presented to the RRM Board. The LSE Complexity Group Director and 2 of the HF team were invited to sit in the Board meeting. The project sponsor made the presentation and the guests were asked for comments. The initial atmosphere in the boardroom was ambivalent , but as the meeting progressed the Board realised that we were not suggesting a re-organisation or restructure of the business, thereafter the atmosphere became more relaxed and receptive. The outcome was that the 12 work-streams were agreed for implementation in the business .

The Reflect-Back Workshop

The initial, *non-attributable* findings (individual respondents are not identified) are presented to the interviewees and sponsors at a Reflect-Back Workshop for validation. They offer a 'mirror' to the organisation and provide an informed starting point for the

identification of the social, cultural and technical conditions (within a political and economic context) that will help co-create an *enabling environment* to facilitate the emergence of new ways of organising or a new organisational form.

This procedure was modified in RRM. The PM conducted a series of Reflect-Back Workshops with the interviewees and opened the discussion on the recommendations. Finally the recommendations and their implementation were discussed at a 3rd Conference in 2003, involving all the senior management of RRM.

Facilitation

The Reflect-Back workshops and in the RRM case, the Joint Analysis Workshop, were facilitated by a professional facilitator. Setting the correct, receptive atmosphere is essential to the success of these workshops. They are pivotal in moving from traditional research mode to the co-creation stage. Some issues may be very sensitive, but must not be seen as a criticism of the organisation. The findings provide the rich data set with which to build the enabling framework, but if handled with lack of sensitivity, the whole process can (and does) stall. Hence the need for professional, informed facilitation.

In parallel with the interviews and before the Reflect-Back Workshop one or more of the following may also take place:

Complexity Thinking Workshops

Introduce complexity thinking to all those interested in exploring the theory and how to apply it in practice. Participants are introduced to ten generic principles of complex evolving systems, which are then positioned within an organisational context [Mitleton-Kelly E. 2003, Ch 2 as above]. The ten principles are: emergence, connectivity, interdependence, feedback, self-organisation, far-from-equilibrium conditions, exploration of the space of possibilities, co-evolution, historicity and time, path dependence and the creation of new order. The first four (emergence, connectivity, interdependence, feedback) are familiar from systems theory. Complexity builds on and enriches systems theory by articulating additional characteristics of complex systems and by emphasising their inter-relationship and interdependence. It is not enough to isolate one principle or characteristic such as self-organisation or emergence and concentrate on it in exclusion of the others. The approach taken by this chapter argues for a deeper understanding of complex systems by looking at several characteristics and by building a rich inter-related picture of a complex social system. It is this deeper insight that will allow strategists to develop better strategies and organisational designers to facilitate the creation of organisational forms that will be sustainable in a constantly changing environment.

If we understand the characteristics of organisations as CES, we can work with those characteristics rather than against them. This kind of understanding can help change mind-sets and bring about quite fundamental changes in ways of organising and relating. Workshop participants are encouraged to use the principles of complexity within their own organisational context and this may provide insights as well as practical benefits, when applied in day-to-day operations. In RRM the principles were presented at the Joint Analysis Workshop and helped to position the findings within a complexity perspective.

Landscape of the Mind (LoM)

We can also look at the cognitive preferences of individuals and teams, in the way that they make decisions, exchange information, create new ideas and how they implement them, etc. This is done through a tool called Landscape of the Mind (LoM) developed by Kate

Hopkinson, which is based on an email questionnaire completed by the participants themselves. The findings help to triangulate the interview data, but individual details are not disclosed to anyone other than the person concerned. Presentations only show findings for whole groups.

Individuals and teams use different **'conceptual architectures'** to think when taking decisions, generating knowledge, etc. These architectures can act as potential constraints or enablers in the decision taking process, in strategic thinking, in knowledge generation, etc. The tool identifies and shows in diagrammatic form, both individual and group profiles of the 'Landscape of the Mind'**.** There are several levels of analysis providing ever-greater detail on specific preferences. It is not only the architecture itself which is important, it is also a question of how individuals, teams and organisations move around within an architecture – the "inner skills strategies" they use to progress, for instance, from a new idea to implementing it.

LoM represents a new way of approaching human diversity. Instead of beginning from old paradigm notions of personality and traits, which have been treated as both monolithic and context-free, the LoM model starts from the concept of inner skills, and preferences for using different types of inner skills strategies in different circumstances. In effect, it offers a different way of thinking about – and developing - human and social capital.

"Inner skills" refers to everything that is "upstream" of behaviour – including past experience, knowledge, imagination, logic, values, intuition and so on – which influences what we do. Individuals and teams have stable patterns of preference for using different inner skills strategies. However, in any *specific* situation, whether and how inner skills are used also depends on the context and the organisational micro-culture in which people find themselves. Of course, this micro-culture is itself generated by the overvaluing of certain inner skills at the expense of others – a good example of epistatic interactions.

Another distinctive facet of LoM is that the model can be used to describe work, as well as people. This provides a language and framework for people to discuss how they can bring their respective talents etc to bear in a particular context, or in a particular project – very useful with remote or virtual teams.

The evidential base, which makes this possible, is generated via an e-based questionnaire. The results can be used at individual, team or group, or corporate level, since the model is scale-invariant. Initially, they are used diagnostically, to highlight important facets of organisational functioning. Subsequently, the model can be used developmentally, for instance to strengthen the range of inner skills strategies available to an individual, team, or organisation.

In the context of ICoSS, LoM provides a human metric, which is relevant to the strategic issues that organisations are facing today. It complements the other tools, especially the semi-structured interviews, offering a way of triangulating the data, so that a richer and deeper picture emerges. It can also identify issues, which the interviews cannot.

All 70 senior managers in RRM completed the email questionnaire and the LoM findings were compared between the UK and the Nordic managers. What they revealed was quite surprising. There was no significant difference in the preference profiles of the UK and Nordic senior managers! This changed the initial perception that national cultural differences

were the main problem. This revelation enabled the company and the researchers to focus on the deeper issues that could potentially threaten the success of the business.

Visual Representation

During the analysis our resident artist, Julian Burton, would sit with the research team would sit with the research team and capture some of the themes, dilemmas and underlying assumptions in a picture. This has several advantages: many related aspects that are difficult to think about at the same time, can be captured in one picture; and very sensitive issues that are difficult to talk about, can be presented diagrammatically to workshop participants, before the presentation begins. Once they recognise what is being shown they may laugh and thus break the tension and open the issue(s) to discussion.

The interviews, analysis, reflect-back workshops, LoM and visual representation are all qualitative tools and methods. The quantitative tools are agent-based-models (ABM) and simulations and a tool called NetMap, which maps exchanges based on email or any other interactive medium. Each tool also expands the scale of application - e.g. we may do 20 interviews, apply LoM to 70 individuals, ABM to 100-200 respondents and NetMap to several thousand email exchanges.

Agent-Based-Models (ABM) and Simulations

The agent-based-models and simulations, built by Dr Ugur Bilge, show connectivity patterns using all media (email, face-to-face meetings, virtual conferencing, etc). The simulations help with 'what if' exploration. When repeated, they also show the evolution or development of connectivity. The data is collected through an email questionnaire, which is refined and tailored to each individual business partner, after the initial interviews. The tool enriches the insights and data set derived through the interviews and shows the different and inter-related informal and formal, social and work-related networks within the organisation. They can also show how ideas spread, how new ideas may lead to innovation or be blocked from being developed.

The modelling approach used, followed 6 steps:

1 – Identification of connectivity vectors, dimensions
2 – Visualisation of connections
3 – Quantification and measurement of connectivity
4 – Qualification of what may be a "good" organisation in a particular context
5 – Understanding organisational properties by linking quantitative with qualitative properties
6 – Experimenting with 'good' virtual organisations by automatically testing out many possible combinations with given resources and constraints.

A small business unit of 10 to 100 people is selected as a pilot, after identifying a number of appropriate parameters as dimensions of connectivity vectors. We start with Team, Business, Technical, Social parameters as personal competences of each dimension. A questionnaire is then designed to elicit individual preferences and opinions on these parameters to populate the connectivity vectors.

Statistical analysis is then carried out on the collected data and, having developed a simple Graphics User Interface, the data is visualised in a simulator and presented back to the

organisation to stimulate discussion. We point out connectivity distributions and bottlenecks in communications.

Using the simulator we can modify the virtual organisation by trying out a number of possible configurations. At each step we focus on quantifying measures of connectivity. Connectivity refers to the measures of total distance between nodes, degree of separation between two nodes, distribution of technical/social skills in clusters (teams) and communications overloads (bottlenecks).

The simulator can be used to experiment with alternative structures and configurations, in a safe space (without the costs of actual restructuring). For example, we can set up a number of project teams with a good level of connectivity, minimum communications overloads, good distribution of social/business/technical-oriented individuals in project teams, and using the simulator we can also look into dynamic properties of the organisational networks.

NetMap

The models and simulations are complemented by another tool called NetMap, developed by Prof. John Galloway, which maps patterns of connectivity across an organisation based on any communications medium (e.g. email, phone, instant messaging, documents, or data sourced from interviews). This tool is extremely powerful and shows connectivity based on the sending and receiving of emails, but the tool allows zooming-in at many levels to look at the connectivity patterns. Exploring these patterns with our partners helps them to understand the formal and informal networks within the organisation as well as connections with suppliers, customers, etc. It will again show the evolution of connectivity when repeated during the life of the project. The input to NetMap only requires a file containing the log of e-mail traffic and only looks at the exchange of emails not at content.

The simulations and NetMap both show connectivity patterns and identify 'lynchpins' or highly connected individuals or groups. If an organisation is contemplating any kind of restructuring it needs to know about these individuals or groups. In addition they show lack of connectivity where it should be taking place. ABM and NetMap could provide a useful metric of social capital, by showing changes in connectivity as a means of tracking the exchange of information over time.

III. THE COMPLEXITY CONTEXT & SUMMARY

Where Does Complexity Come In?

Complex behaviour of systems arises from the *inter-relationship, interaction*, and *inter-connectivity* of elements within a system and between a system and its environment. These relationships also create intricate *interdependencies* throughout a system. In a human system, connectivity and interdependence mean that a decision or action by any individual (group, organisation, institution, or human system) may affect related individuals and systems. When this influence is in one direction we may see *adaptation* of one entity as a response to the influence of other entities (or collectively, the influence of the environment or ecosystem). When the influence and response are reciprocal we may see *co-evolution* or change in all interacting entities. Both Netmap and Agent Based Modelling show the interaction of individuals and the *emergent* properties (e.g. patterns of connectivity, informal groups, etc) that arise as a result of that interaction. The connections are also good indicators of feedback; Netmap in particular acts as an indicator of feedback as it depends on an exchange of emails

(or other media) and information (we are aware however that no such tool can provide an exhaustive picture on all feedback processes). Both tools also show *self-organisation* and when repeated they can show the *evolution of relationships* over time. Landscape of the Mind also looks at individuals and the way they relate within a group, in other words LoM can show *epistatic interations* — i.e. the extent to which the fitness contribution made by one individual depends on related individuals. Complexity principles are scale invariant and apply to all scales from the individual, to the group and the whole organisation. All three tools can show characteristics at different scales. Working with these tools an organisation is also able to look at alternatives and thus *explore its spaces of possibilities*.

Connectivity and interdependence is one aspect of how complex behaviour arises. Another important and closely related aspect is that complex systems are *multidimensional*, and all the dimensions interact and influence each other. In a human context the social, cultural, technical, economic, political and global dimensions may impinge upon and influence each other. The narrative analysis based on the interviews can identify these multiple dimensions as well as the connectivities, interdependencies, self-organisation, co-evolution, far-from-equilibrium conditions, historicity and time, feedback, emergence, path-dependence and the creation of new order. In the later stages of the methodology, when the research team works closely with a core group from the organisation to identify the conditions for the enabling framework and finally when the organisation co-creates an enabling environment, all the principles come into play. This process is supported by the Complexity Thinking Workshops when members of the organisation are introduced to complexity thinking and its language. It continues throughout a project as the theory is constantly exemplified through practical examples from the organisation, thus making the theory tangible and accessible.

The visual representation also captures the multiplicity of dimensions and helps us to see the picture as a whole.

Complexity, however, is not a methodology or a set of tools. Complexity theory provides a conceptual framework, **a way of thinking**, and **a way of seeing the world**. The way it has been articulated and used by the LSE Complexity Group is that any complex evolving system has a set of characteristics or principles. When all of these characteristics are evident and the system is able to create new order, then it may be called 'complex' otherwise it is 'complicated'. Any methodology that purports to be based on complexity must therefore be based on those principles.

Why So Many Tools?

We use so many tools because they triangulate the data and provide robust and rigorous findings. But that is not the only reason. They each provide different but complementary information about the organisation. So when several tools and methods are used the organisation ends up with a very rich and deep understanding of itself. The findings can then be used as an informed basis for building the enabling infrastructure. This last part is a **co-creation** activity. We work with a core team of 'volunteers who can make a difference' to identify the social, cultural and technical conditions (within a political and economic context) that together will help the organisation co-create the kind of environment conducive to change and the emergence of new ways of organising (ways of working and relating). But this is not a one-off process, the new ways of thinking based on complexity, the new relationships, procedures, processes, structures, etc need to become embedded in the business culture if they

are to be sustainable. Ideally, the organisation will build the capacity to continue the process of *co-evolutionary sustainability*.

When the tools are used a second or third time in a longitudinal study, they show organisational evolution over time. However, the emphasis on co-creation and collaboration keeps the research team in close touch with the business partner and helps to monitor these changes. To facilitate reflection on organisational evolution, we also hold regular reflecting meetings within the team as well as with our business partners. The researcher on the project for example, Melissa Nolas, conducted a second set of interviews with the HF team, i.e. the interviewers, to evaluate the process and to assess their learning. We are also exploring the possibility of video stories that will capture the dialogue process in a deeply felt issue and the emergent outcomes.

It is not necessary to use all the tools and we may choose the most appropriate 2-3 to use in each case. In addition, there are regular **inter-organisational workshops** and meetings with the **business and academic Advisors**. These help learning between partners.

We use these specific tools and methods because at present we find them relevant and appropriate to a methodology using the logic of complexity. Individual tools and methods may be familiar to our business partners (some are well established) and their familiarity is an advantage as it provides a useful transition from the known and familiar towards the new and unfamiliar concepts of complexity. There could also be other tools that could be used and we are constantly exploring new ideas. The methodology is not, and cannot be, static. It has to evolve and to co-evolve with the needs of our business partners and the requirements of sound research. **In addition the methodology is NOT just a set of tools - it is about connectivity, collaboration and co-creation - but also about enabling individuals and teams to self-organise, and about being open to a significant degree of emergence and innovation.**

The Three Phases

To summarise, the end of phase one is the identification of the conditions for co-creating the enabling infrastructure. The second phase involves experimenting with that infrastructure and implementation. There is a lot of learning in this phase and this is where working with the research team and other business partners, is advantageous and beneficial, because the business partners will learn from each other's experiments and will support each other during implementation, as well as getting support from the research team.

The final and third phase runs in parallel with the other two phases and continues to the end of the project. It is the documentation and dissemination of the research process and the findings. This is interesting at two levels. First of all we will be looking at the research process at a meta-level. The researchers, business partners and advisors make a good natural experiment – we are exploring new ways of working and different ways of relating; and we want to capture this. The other level of course is to do with dissemination and this handbook is part of that dissemination process - so that others may benefit from our work. Since the project is funded by a Research Council its ultimate aim is to benefit industry as a whole, not just the few business partners and the research team. Apart from this handbook, we have also written papers, made presentations, etc. to document and disseminate the findings.

IV THE BENEFITS

What are the benefits?

Organisations want to perform efficiently and effectively. But if organisations are complex evolving systems with a specific purpose, we need new ways such as complexity theory to review and understand areas in which organisational performance can be improved. Despite the initial fear that the project would recommend a reorganisation, partners found that application of complexity theory emphasised connectivity between individuals, and worked to develop the informal networks, improving organisational performance and saving the disruption of yet another restructuring. The first benefit of this approach, therefore, is the ability to make significant improvements in organisational performance without the need to re-organise.

The process ensures that the organisation has a well-founded view of the "underlying assumptions" held by members of the organisation. Widely held beliefs form part of the business culture and business partners found that recognition of them was a critical success factor in developing the organisation. The second benefit of this approach, therefore, is that research of underlying assumptions form the basis of recommendations for change.

The project has been successful when there was an enabling environment from the start and when the organisation had identified that there were issues in the business that needed addressing, and the senior management had a desire to want to tackle them. Also when there was a definite recognised opportunity to apply the methodology to real business issues. The third benefit of this approach, therefore, is that given an enabling environment and a strong sponsor, the methodology delivers tangible results to the business.

Organisations, and the environment in which they operate, change over time. If an organisation is to continue to perform in a changing environment, it must learn to co-evolve with its environment and with its stakeholders. The application of complexity theory in organisational development embeds a doctrine/culture of co-evolution with the environment as the driver for organisational development. Embedding environmental co-evolution into the business culture is the fourth benefit of this approach.

Benefits to RRM of working with LSE (by L Puszczynski)

RRM benefited in that the project delivered a recommendation for 12 separate work streams for change to improve the business. But how much of this output was as a result of the collaboration with the LSE? And what process would RRM have used to tackle the issues, instead of using Complexity theory?

RRM could have chosen to address the issues within the business in many different ways. Without the LSE, it would probably have conducted some interviews with a selection of people from within the organisation, it may have looked at other organisations in a quest for 'Best Practice' and it would more than likely have drawn on the experience and intellect of the High Flyers team, asking them to develop a process or methodology for the project to follow. All these approaches would more than likely have resulted in a few minor changes and/or a re-organisation of some or part of the business, based on another organisation's success. In any case whatever the approach, without the LSE team, it is unlikely the RRM project would have considered the organisation as a complex evolving system. Therefore the benefit of working with the LSE Complexity group was the application of Complexity theory into organisational development. The LSE provided the methodology and tools (as described in this paper) to help RRM understand the organisation and its issues in both a quantitative

and qualitative way. RRM were then able to use this as an informed basis to co-create an enabling infrastructure, the result of which was the 12 work streams.

The other benefit of collaborating with the LSE Complexity group, was the enforcement of an academic, research based approach. Turning the High Flyer team into 'internal researchers' worked well as it significantly increased their participation in the project and increased the total number of researchers, making it easier to collect and analyse more data. It also meant there was a high degree of business knowledge amongst the research team. The LSE team also provided the research/analysis rigour that can get overlooked, as the business demands quick results.

The Project Manager involved in the RRM case, believes that collaboration with the LSE Complexity team significantly contributed to the success of the project.

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BIOGRAPHY
Prof. Eve Mitleton-Kelly is founder and Director of the Complexity Research Programme at the London School of Economics, UK; visiting Professor of Complexity & Organisation Studies at the Open University, UK; Coordinator of Links with Business, Industry and Government of the European Complex Systems Network of Excellence, *Exystence*; Executive Co-ordinator of SOL-UK (London) (Society for Organisational Learning); and Advisor to European and USA organisations. EMK's recent work has concentrated on the implications of the theories of complexity for organisations and specifically on strategy, IT legacy systems, organisational learning and the emergence of new organisational forms. Has published several papers including *"Complex Systems & Evolutionary Perspectives of Organisations: The Application of Complexity Theory to Organisations"*, Editor: Mitleton-Kelly E, Elsevier, ISBN 0-08-043957-8, 2003;*"Ten Principles of Complexity & Enabling Infrastructures"* in "Complex Systems & Evolutionary Perspectives of Organisations: The Application of Complexity Theory to Organisations", 2003; *'Complexity Research - Approaches and Methods: The LSE Complexity Group Integrated Methodology'* in Keskinen A, Aaltonen M, Mitleton-Kelly E *"Organisational Complexity"*. Foreword by Stuart Kauffman, Scientific Papers 1/2003, TUTU Publications, Finland Futures Research Centre, Helsinki, 2003; Garcia-Lorenzo L., Mitleton-Kelly E., Galliers R.D. *'Organisational Complexity: Organising Through the Generation and Sharing of Knowledge'* in The International Journal of Knowledge, Culture and Change Management, Vol 3 Article MC03-0023-2003, Ed by Kalantzis M. and Cope B; **"***An Integrated Methodology to Facilitate The Emergence of New Ways of Organising"* Conference Proceedings of the 3rd European Conference on Research Methodology for Business and Management Studies (ECRM) April 2004 and the proceedings of the International Conference on Complex Systems (ICCS) held in Boston, USA on 16-21

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Leszek Puszczynski is currently Vice President - Customer Business at Rolls-Royce Defence Aerospace in Bristol, UK. He has worked for Rolls-Royce for 20 years and has a science degree from Nottingham University and a Masters in Business Administration from The Open University. Although Leszek joined Rolls-Royce as an Engineer, he quickly moved into the business environment, and since then has been involved in developing the business at all stages throughout the supply chain. Whilst holding specific Management and Senior Management positions over the years, he has also directed change programmes in supply chain, logistics and organisational development.