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Mika Aaltonen is a Ph.D. (Econ.), Adjunct Professor (Foresight and Complexity), member of the American Council for United Nations University Millennium Project, editorial board member of E:CO (Emergence: Complexity and Organizations) journal, board member of TimeAdventurers´ Club, confirmed speaker of World Future Society, author of ten books and several articles about strategy, complexity, sensemaking, futures studies, knowledge management and methodology. He acts as Development Director in Finland Futures Research Centre.

Theodor Barth

Theodor Barth is a Ph.D. and a social antropologist, and he works as Scientific Researcher in Knowledge and Strategy department in SINTEF, Norway. His field of interest lies in the cross fertilisation of models thinking in (a) social science and (b) technology in the field of *critical anthropology.* His background in social anthropology led him to take an active interest in *complexity theory.* The comparative relevance he saw between 'disordered systems' in generative analysis and complex adaptive systems (CAS) as a cross-disciplinary field of research. To build the comparative edge of generative analysis - as a framework for model building in social anthropology - he started working in SINTEF (the Norwegian Foundation for Research in Science and Technology), having his previous research experience from the Norwegian Institute of International Affairs, and the ARENA programme (Advanced Research on the Europeanisation of the Nation-Sate). His methodological grounding in social anthropology - and participant observation - is the background for his operational involvement in fieldworks

(East-/Central Europe), knowledge management (Computas), architecture projects and art projects. He is currently moving back to social science.

John L. Casti

John L. Casti was born in Portland, Oregon in 1943. Following completion of a doctorate in Mathematics from the University of Southern California in 1970, as well as tours of duty at The RAND Corporation and the University of Arizona, he left the USA in 1974 to take up a post as one of the first research staff members of the International Institute for Applied Systems Analysis (IIASA) in Vienna, Austria. With the exception of a small break in the late-1970s and early-1980s to serve on the faculties of New York University and Princeton, Casti worked at IIASA on problems of system modeling and applied systems analysis until the autumn of 1986. At that time he left to join the faculty of the Technical University of Vienna as a Professor in the Institute for Econometrics, Operations Research, and System Theory. In 1992, Casti joined the Santa Fe Institute in Santa Fe, New Mexico as a resident researcher and was named to the Institute's faculty in 1993. Casti has written several books on science and general readers, among them *Alternate Realities: Mathematical Models of Nature and Man,* two volumes under the title *Reality Rules, Paradigms Lost: Images of Man in the Mirror of Science, Five Golden Rules, Would-Be Worlds, and Godël: A Life of Logic.*

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T. Irene Sanders is Executive Director of the Washington Center for Complexity and Public Policy and author of *"Strategic Thinking and the New Science: Planning in the Midst of Chaos, Complexity and Change"* (Free Press/Simon & Schuster, 1998), pioneered the application of chaos theory and complexity to strategic thinking — the most essential skill in today's fast-paced business environment. She is easily recognised as one of the most innovative thinkers and communicators on the subjects of individual and organisational change, and leadership. She is a powerful and engaging speaker, educator and facilitator, who helps individuals and organisations see, understand and influence the dynamics of the real world context in which their decisions are being made.

Mika Aaltonen

EMERGENCE – AT THE HEART OF SENSEMAKING

In continuously changing markets characterised with rapid pace of change, relative ease of entry and exit by rival companies, emerging technologies, and ambiguous consumer demands (Thomas 1996, Brown & Eisenhardt 1998, Bogner & Barr 2000) *the best practices are quickly turning into old practices.* Instead of ensecuring companies´ future they are threatening it by creating obstacles for innovation and renewal.

Under these conditions sensemaking is becoming more critical to companies´ success than decision-making. People and organisations seek to construct sensible events, and how, why, and with what effects they do that are the questions that interest people interested in sensemaking. (Weick 1995, also Huber & Daft 1987).

Sensemaking assumes:

1. Both humans and reality are sometimes orderly and sometimes chaotic.
2. There is a human need to create meaning, and knowledge is something that is sought in mediation.
3. There are differences in human experience and observation.

The first assumption assumes that situations are always open for multiple interpretations because of changes in time and space, because of differencies in how people make sense of the situations from different perspectives and positions,

and "because of how people construct bridges over gap-filled reality". (Derwin et al. 2002). Sensemaking is tested everytime predictations break down, whenever ongoing activities are interrupted (Louis 1980, Weick 1995). In changing markets, *the linear developments are continuously interrupted by nonlinear developments.*

How to make sense of our lives, is perhaps the biggest challenge any human being or organisation faces. If we are unable to place a piece of information in context, the meaning of that information is lost. Hence, the ways we imagine the future, understand the past and come to grips with the present are extremely valuable in providing continuity and direction for our lives.

The reason for writing the *"Complexity as a Sensemaking Framework"* is to study organisational sensemaking on three relevant themes:

1. To understand the "hows" and "whys" of how we today arrived at what we are.
2. To make sense of, or to anticipate, the future.
3. To make sense of the ways of getting to the future.

We assume, that *the competition in international business takes place inside themes two and three, i.e. anticipating the future, and understanding how future emerges, and how we can influence it.* These two however cannot exist without the first one, in fact continuous updating of personal and organisational memory is necessary to successful anticipation.

There are two strands of thought that underpin sensemaking theory and research: cognitivist and constructionist. The differences between the two approaches are minor and perhaps at least partly semantical. According to cognitivist approach sensemaking draws on upon a shared schemata within a social group. These schematas can be called "cognitive frameworks", "perception filters" or "mental models", and through them, and the previous experiences of the sensemaker,

the world is construed. (Hopkinson 2001). Constructionist approach instead gives more emphasis upon language, the situations are formed within, not only communicated through, language. Sensemaking is seen as a discursive process, where the discourse defines possible selves and their associated actions. The discourse cannot be changed by will because the participants both influence it and are influenced by it. Constructionist approach regards sensemaking as an ongoing process of negotiation through which the group is formed and structured. (Watson & Chiappini 1998, Joerges & Czarniawska 1998, Hopkinson 2001).

The two sensemaking approaches express important qualities about the subject of sensemaking, and therefore about this study: The way we think influences the way we act. In larger context this means, that changes or interruptions in linear developments represent a major challenge for managers thinking, and in our opinion they represent also a major area where success and failure will be defined, and consequently managers´ responses to the changes represent another area of competition. In other words, regardless of specific market characteristics, companies´ responses "are tied to the cognitive frameworks managers use to organise stimuli and filter cues" (Barr & Huff 1997).

To use our own terminology, the first schemata chosen for this book is sensemaking, and the second is complexity. Let us clarify, what the conscious choice of *"**Complexity** as a Sensemaking Framework"* basically involves, what kind of answers can be expected from this study, and from which direction the answers generally are searched for.

John L. Casti, one of the contributors in this book, presented in *"Would-Be Worlds"* (1997) key components of complex systems. Firstly, in contrast to simple systems which tend to involve a small number of interacting actors, and to large which are large enough that statistical means can be used to study them, complex systems involve a medium-sized number of actors. Secondly, the actors are intelligent and adaptive, they are rational and logical when they adapt to new information and situations. Thirdly, no single actor has access to all information,

to what all the other actors are doing. Each actor gets information from a limited number of sources, including other actors, and comes to a decision how to act based on this local information.

Term complex adaptive systems (CAS) derives from Santa Fe Institute, from the work of scientists like Murray Gell-Mann, John Holland and Stuart Kauffman. Eve Mitleton-Kelly, also a contributor in this book, prefers to use a term complex evolving systems (CES) because, she states, the systems – social, cultural, technological, organisational – are not only adapting to the emerging conditions, they are co-evolving within them.

The generic characteristic of complex evolving systems described in *"Complex Systems and Evolutionary Perspectives on Organisations"* (2003) are:

- Connectivity and interdependence
- Emergence
- Feedback
- Self-organisation
- Co-evolution
- Far-from-equilibrium
- Exploration of the space of possibilities
- Path dependence
- Historicity
- Creation of new order

To explain this, let us consider people at their work, people and organisations that all have their histories. They often influence each others, and are connected through direct and indirect feedback loops. They are also able to undertake activities that are not directed by any external agency. These activities are taken under conditions far from equilibrium, where facing constraints they will explore the space of possibilities and are able to create new ways of organising, working and thinking; something emergent. (C.f. Cilliers 1998, Mitleton-Kelly 2003).

For us, these generic elements of complex systems present an alternative and complementing framework for present business, change and strategic practices, that rely much on visions and master plans, and believe that future can be designed and re-engineered.

For this study the generic elements of complex systems are not the final, but the starting point. They provide the ontological and epistemological basis for our work, that is used for understanding the history, anticipating the future and figuring out the ways emergence occurs. This framework is realised in four knowledge and learning related chapters.

In chapter two Mika Aaltonen and T. Irene Sanders take a cognitive sensemaking approach to methods, especially to futures research methodology and for the first time, present *Complex Systems Concept-Tools Map.* The writers study the boundaries of these methods; what kind of insights the methods and the combinations of methods can provide us to recognise systems´ new initial conditions and to create new leverage points for strategy.

Then Eve Mitleton-Kelly views mergers and acquisitions (M&A) through complexity lenses and identifies key contributing factors to successful co-evolutionary integration and proposes that the co-evolutionary integration can be facilitated through an enabling infrastructure based on social, cultural and technical conditions.

In the fourth chapter Theodor Barth seeks to create an agenda for disordered systems, i.e. non-ordered systems in relation to each other where the systemic features do not derive from top-down governance. Within complexity theory he develops a framework to make structural heterogeneities readable - in relation to external events - at an appropriate level of depth.

The final chapter is written by John L. Casti. It was initially published in *Complexity,* Vol. 4, No. 4, 2002 in a column *"The Simply Complex".* There are couple of good reasons to publish it also in this context. First reason is very human – John is a well-known and respected fellow of the other writers. Secondly, *"BizSim – World of Business in a Box"* uses an example from the world of finance and a digital computer as a laboratory to apply shared assumptions of complexity theory.

If the creation of complexity science is a subtask for a more general programme, as John claims, of creating a theory of models, then *"Complexity as a Sensemaking Framework"* partakes to this task with a coherent set of articles: Mika Aaltonen and T. Irene Sanders make sense of a large amount of anticipation methods and figure out which ones have emergent properties; Eve Mitleton-Kelly and Theodor Barth deal with co-evolution with slightly different perspectives; and John L. Casti studies informational structure of complex systems using simulation.

References

Barr, P. & Huff, A. S. (1997) "Seeing is not believing: Understanding diversity in the timing of strategic response". Journal of Management Studies, 34, 337-370.

Bogner, W. C. & Barr, P. S. (2000) "Making Sense in Hypercompetitive Environments: A Cognitive Explanation for Persistence of High Velocity Competition". Organization Science, Vol. 11, No 2, March-April, 337-370.

Brown, S. & Eisenhardt, K. (1998) Competing on the Edge: Strategy as Structured Chaos. Harvard Business School Press. Boston.

Casti, J. L. (1997) Would-be Worlds. How Simulation Is Changing the Frontiers of Science. John Wiley & Sons Inc. New York.

Cilliers, P. (1998) Complexity and Post-Modernism.

Dervin, B. & Foreman-Wernet, L. & Layterbach, E. (2002) Sense-Making Methodology. Reader. Hampton Press Inc. New Jersey.

Hopkinson, G. C. (2001) "Influence in Marketing Channels: A Sense-Making Investigation". Psychology & Marketing, Vol. 18(5): 423-444.

Huber, G. (1991) Organizational learning: The contributing processes and the literatures. Organizational Science, 2, 88-115.

Joerges, B: & Czarniawska, B. (1998) "The question of technology, or how organizations inscribe the world". Organization Studies, 19, 363-386.

Mitleton-Kelly, E. (2003) Complex Systems and Evolutionary Perspectives on Organisations. The Application of Complexity Theory to Organisations. Pergamon. Amsterdam.

Thomas, L. G. (1996) "The two faces of competition: Dynamic resourcefulness and the hypercompetitive shift". Organizational Science, 7, 221-242.

Watson, T. J. & Chiappini, F. B. (1998) "Managerial sensemaking and occupational identities in Britain and Italy: The role of management magazines in the process of discursive construction". Journal of Management Studies, 35, 285-302.

Weick, K. E. (1995) Sensemaking in Organizations. Sage. Thousand Oaks.

Mika Aaltonen & T. Irene Sanders

COMPLEXITY AS A SENSEMAKING FRAMEWORK FOR METHODOLOGY

Abstract

If one of the characteristics of a complex adaptive system is sensitivity to new and initial conditions, and if this sensitivity to new and initial conditions provides opportunities for influencing the future of the system, then foresight methodologies should have the ability to identify these points of influence. This serves as a point of departure for the re-analysis and re-classification of the American Council for the United Nation's University Millennium Project's *"Futures Research Methodology – V2.0"*. To find out which futures research methods are able to identify a system's new and initial conditions, and which present the future as a continuation of the present *"Futures Research Methodology – V2.0"* has been re-analysed. This analysis has been made according to the nature of the possible understanding of the system the methods can deliver, and the means of influencing the system the methods offer to the user. In the conclusion a new set of methods – *"Complex Systems Concept-Tools Map"* – is introduced, aiming at identifying the new and initial conditions to which the system may be sensitive.

Key words: *strategy, sensemaking, futures studies, complexity, emergence, methodology.*

The Complex Adaptive Systems View of the World

Methods provide boundaries and restrict our understanding of our world; they work as a common point of reference, and guide common points of view. They also create contexts that affect an organisation's ability to learn, adapt and innovate because they constrain people's interaction (Juarrero 1998, Thomas & Sussman & Henderson 2001, Dervin et al. 2002, Mitleton-Kelly 2003). These are some of the reasons, why methodological issues need to be reviewed constantly. Methods have embedded qualities, which a *priori* set the limits to our ability to imagine possible futures. Thus, a thorough understanding of these qualities, and the continuous development of more insightful methods would improve our capabilities to anticipate future.

Two questions are essential in our study:

1. Do the methods present the future as an extension of the past or do they recognise new and initial conditions that could dramatically influence the future?
2. What is the nature of understanding of the system the methods can provide, and what are the means offered by the method to influence the system?

John Holland claims (1995, c.f. Waldrop 1992) that all complex adaptive systems (CAS) – i.e. economies, minds, organisms – build models to allow them to anticipate the world. If this is true, models and predictions are everywhere, and every agent in a CAS uses them explicitly or implicitly, and as long they survive, they can adjust their models to work better in their environment. In this paper an explicit data method for predicting and modeling the future – *"Futures Research Methodology – V2.0"* – is presented.

However, there is one major element that needs to be discussed. The assumptions, on which the major part of the data presented below, have been built differ significantly from the new set of assumptions, although the newer set of methods has been built on them. Due to this difference it is argued that the new

set of methods and models should also be different. According to the new assumptions the whole is always more than the sum of its parts, and the future's development cannot be predicted from the nature of its constituent parts. In fact, because of the systems nonlinear dynamics and feedback loops the future of the system cannot be predicted at all. It is, however, possible to influence the future development of the system by using the new and emerging initial conditions as points of influence. (Letiche 2000).

The classic sand pile simulation (Bak & Chen 1991, 28) serves as an illustration of how the concept of CAS creates a different basis of understanding on which the new set of methods might be built. "An observer who studies a specific area of a pile can easily identify the mechanisms that cause sand to fall, and he or she can even predict whether avalanches will occur in the near future. To a local observer, large avalanches would remain unpredictable, however, because they are a consequence of the total history of the entire pile. No matter what the local dynamics are, the avalanches would mercilessly persist a relative frequency that cannot be altered. The criticality is a global property of the sand pile." This quotation brings to our awareness the temporal and relational boundaries relevant for effective anticipation. And furthermore, it makes us aware that change introduces plurality, and when emergence occurs the results are new, and nonlinear. Therefore linear presentations of the future, extrapolations and business – as – usual scenarios, can be helpful, but in limited, stable circumstances.

A lot of things evolve because of carefully laid out plans and visions; the change is designed; it is managed; it is reengineered. This article claims that there is another way to understand change based on a different understanding about how things emerge, and this understanding calls for the use of different methods. "Planned change" is a popular approach to change, but a much larger amount of things emerge as a consequence of local interaction between the agents involved without any master plan. In these local settings, the agents act logically but according to their principles, their own logic, not one "big" logic imposed by a CEO or a president or a director. (Sanders 1998, Aaltonen 2003, Aaltonen & Barth 2005).

Besides that, CAS consists of many agents that act in parallel, it also typically has many niches, which can be exploited by an agent able to anticipate a possibility and adapt to fill it. And filling the niches creates new niches - new opportunities are always being created in CAS as long as the system does not reach equilibrium. (Waldrop 1992, Kauffman 2000, Mitleton-Kelly 2003).

Hence, CAS is formed by individual agents, and its structure, its social fabric, is not designed by anyone, but it develops, and takes direction "as a result of the way it responds to contingent information in a dynamic fashion" (Cilliers 1998, also Bak & Chen 1991).

In other words, clusters of information from the external world will flow into the system, and the quality of that information will influence the interaction of some of the agents in the system. And consequently the anticipation practices, applied methods and their qualities, as well as questions concerning power, politics, and culture influence the flow of information, and therefore are focal points in the evolutionary or emergent process of any organization.

Another argument is vital to our discussion; the CAS's sensitiveness to its initial conditions. Different initial conditions will place the system in different groups of attraction, changing into different evolutions, different histories. For instance, if a new activity is launched at a certain time, it will become a success, if it is launched in another time it may not succeed. (Nicolis & Prigogine 1989). In these types of systems events never materialize the same way twice, because they are variables that interact and change in response to each other. (Sanders, 1998).

In nonlinear dynamic systems variables cannot be taken apart and then reformed as they were before. This means two things: new opportunities for change are constantly emerging, and the global features of the system cannot be understood by analysing the parts separately. (Bak & Chen 1991, Lorenz 1993).

"Perking" information is used in this paper as a term for those new and initial conditions to which the system may be sensitive. Perking information refers to emerging conditions, changes and developments that are already taking shape just below the surface, but are not yet visible. (Sanders, 1998).

The Point of Departure – Futures Research Methodology – V2.0

The *Futures Research Methodology – V2.0* presents a short history of futures research methods since the 1940s. Over half of the methods are written by the inventor of the method or by a significant contributor to its evolution. (Glenn & Gordon 2003).

Every method, however, is a child of its time; every method has been built on assumptions of its time. A notion important to this article is that the evolution (or learning) that has taken place in relation to the basic assumptions, regarding how the anticipation and modeling of the future should be conducted, has meant that the methods have also evolved accordingly.

The above argument becomes clear when we look at the origin of methods, i.e. when they were invented and used for the first time. In the *Futures Research Methodology – V2.0* there are two relatively new methods; the SOFI Index and Causal Layered Analysis. SOFI was used for the first time in 2001, Causal Layered Analysis in 1999. When we look at the rest of the methods, we find that over four fifths of them were invented in the 1970s or before, namely; Environmental Scanning, Delphi, Futures Wheel, Trend Impact Analysis, Cross-Impact Analysis, Systems Perspectives, Decision Modeling, Statistical Modeling, Relevance Trees, Scenarios, Participatory Methods, Simulation and Games, Genius Forecasting, Field Anomaly Relaxation, Text Mining, and Agent Modeling.

The methods are classified into four categories: quantitative, qualitative, normative and exploratory. The terms quantitative and qualitative need no explanation, but normative means work based on norms or values, while exploratory work explores what is possible regardless of what is desirable and norms and values do not have the same significance as they do in normative methods.

Table 1. AC/UNU Millennium project taxonomy of Futures Research Methodology – V2.0 (Glenn & Gordon 2003).

Method	Qualitative	Quantitative	Normative	Exploratory
Environmental Scanning		X		X
Delphi		X	X	X
Futures Wheel		X	X	X
Trend Impact Analysis	X			X
Cross-Impact Analysis	X			X
Structural Analysis	X	X		X
Systems Perspectives	X			X
Decision Modeling	X			X
Statistical Modeling	X			X
Technology Sequence Analysis		X	X	
Relevance Trees and Morphological Analysis		X	X	
Scenarios	X	X	X	X
Interactive Scenarios		X	X	X
Participatory Methods		X	X	
Simulation and Games		X		X
Genius Forecasting, Vision, Intuition		X	X	X
S&T Roadmapping		X	X	X
Field Anomaly Relaxation		X		X
Text Mining		X	X	X
Agent Modeling		X		X
SOFI Index	X	X	X	X
Multiple Perspective Concept		X	X	X
Causal Layered Analysis		X		X

Evidently, Table 1 provides clear information about the methods and their properties. It shows that all the methods have at least two of the four properties used as the basis of the taxonomy, and two methods, scenarios and the SOFI Index, all possess qualitative, quantitative, normative, and exploratory features. (Aaltonen 2005). But it does not provide the kind of information; we need in order to be able to answer our two basic questions:

1. Which methods recognise new and initial conditions that could dramatically influence the future?
2. And what are the means for influencing the system offered by the method?

The Sensemaking Model of the Re-Analysis

This paper claims that much of the sensitivity of an organization is derived from its people and their ability to apply different theories and methods flexibly. Executives need to pay more attention to management theory, and understand how the theory, even when implicit, and the methods they use in their strategic work, significantly influences the way they the members of an organization see their environment, as well as the outcomes from the strategic process. That should be done rather than paying attention to simple recipes derived from a superficial understanding of past practices in other organisations "in the naïve belief that if a particular course of action helped other companies to succeed, it ought to help theirs too." (Christensen, C & Raynor 2003).

The matrix in Figure 1 seeks to describe the landscape where futures research methods are used, and the variety and distribution of methods relating to described qualities. The picture identifies four distinct types of landscapes, two of which – engineering approaches and systems thinking – have a long history, are widely used and currently dominate thinking and practice in strategic management. The other two – mathematical complexity and social complexity – are not yet widely used and they represent both a contrasting and a complementary view

of how the future emerges[1]. (Senge 1990, Hammer & Champy 1993, Axelrod & Cohen 1999, Stacey & Griffin & Shaw 2000, Watts 2003).

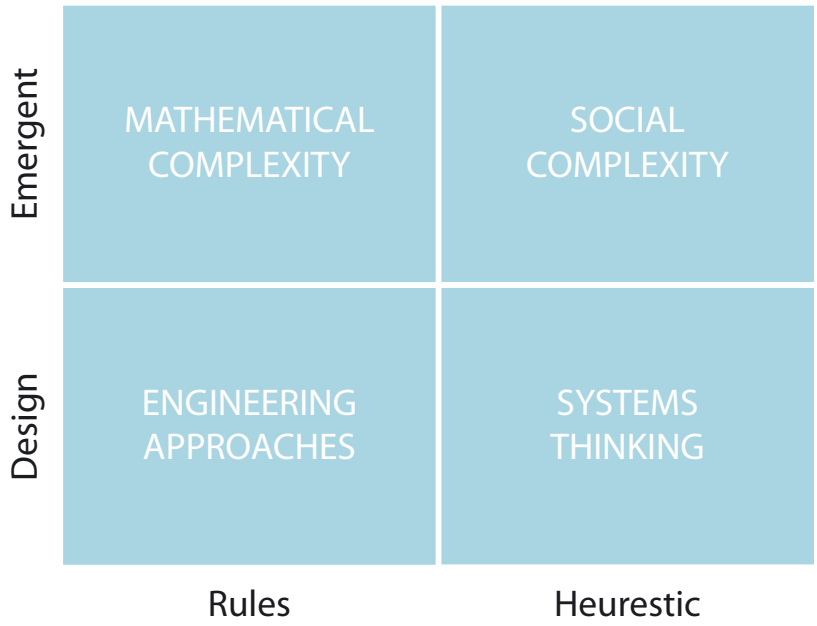

Figure 1. The sensemaking model of the re-analysis of Futures Research Methodology – V2.0.

The differences in the basic assumptions between these four approaches can be clarified in the following way: The vertical dimension looks at the nature of our possible understanding of the system, and the horizontal at our means of controlling or directing that system. The vertical dimension design is contrasted with emergence, engineering approaches and systems thinking represent design, and mathematical complexity and social complexity represent more emergent processes.

[1] We are indebted to the comments and work of Dave Snowden of the Cynefin Centre, c.f. also "Innovation as an objective of knowledge management. Part I the landscape of management." (2004).

How sensemaking is accomplished, and what kind of solutions are provided by movement across time and space is dependent on the model of analysis. By design, we mean the ability of a manager, leadership group, expert or researcher to stand outside the system and design the system as a whole. With emergent systems, the system cannot be understood or managed as a whole by a manager, leadership group, expert, researcher or by anyone at all, because the system emerges through the interaction of the agents (people, processes, technology, government etc.) that act on local knowledge and their own principles. In the horizontal dimension we contrast rules (which could be restated as "process") which remove ambiguity; with heuristics (which could be restated as "values") that provide direction with a degree of ambiguity that can adapt to different and changing contexts. There is a design element to emergent systems, but not in the same way as earlier, because there are possibilities to influence the evolution of such systems, although they can not be led by any agent.

A Re-Analysis of Futures Research Methodology

The methods presented earlier are placed in the sensemaking model presented in the latter chapter (Weick 1995, Bogner & Barr 2000, Weick 2001, Hopkinson 2001, Woodside 2001). The model works as an effective communication tool that aims at delivering a large amount of information about the whole methodology of the *"Futures Research Methodology – V2.0",* the properties of the methods in the *"Futures Research Methodology – V2.0",* and the relationships between the methods.

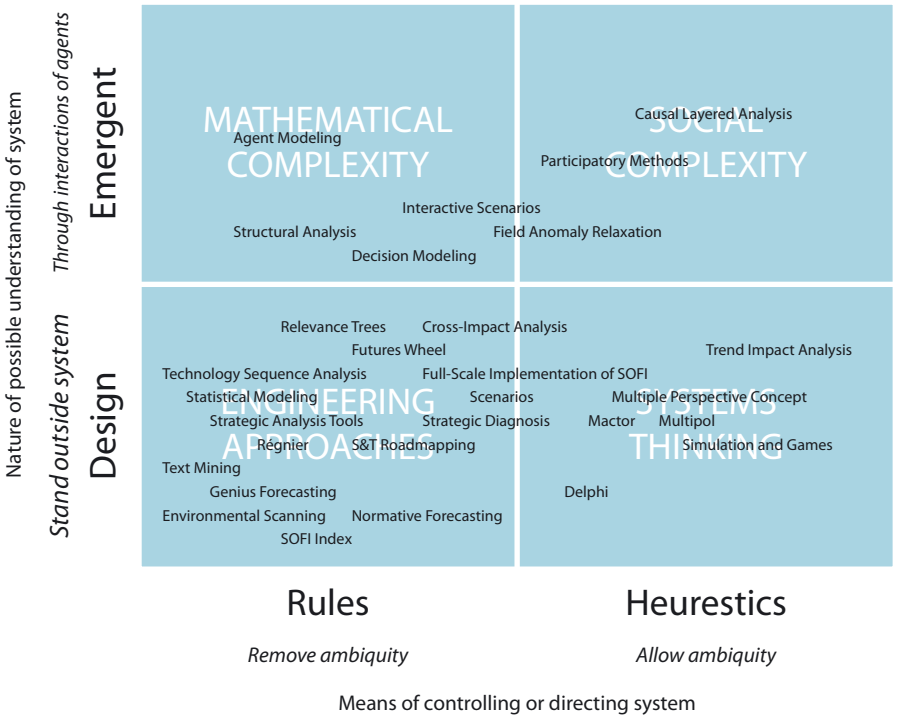

Figure 2. The re-analysis of "Futures Research Methodology – V2.0".[2]

The analysis reveals that most of the methods presented in *"Futures Research Methodology – V2.0"* are designed to remove ambiguity and they concentrate on knowing, or to be more precise, on delivering more knowledge into the decision-making process. Most of the methods are also used outside the system in order to bring new information inside the system. These are also the methods that bring new information and awareness to the present situation, but they are not able to change it. Only if skilfully used as the renewal point of a discussion

[2] We especially thank the people of the Finland Futures Research Centre, Finland Futures Society, and AC/UNU Millennium Project Helsinki Node for their contributions to the analysis.

can they be helpful in identifying new and initial conditions of systems. They are found in the low left and right hand corners of the matrix.

The difference between the sides is that the right side allows more ambiguity than the left one. The embedded conception of causality for both low sides, of how things happen, is that there is an actor, that is capable of finding the causalities and this actor is able to design interventions that lead to a desirable future.

There are methods that are reliant, even if implicitly, on different causal assumption about how things happen. They are placed in the upper half of the model and share the belief that things happen through the (local) interaction of agents. The movement towards a future is seen as depending on the other actors as the adaptive moves of a single actor can influence other actors' strategies by creating new possibilities and constraints. These methods are more sensitive to the new and initial conditions of systems and more capable of benefiting from the niches and space that continuously emerge from such conditions (Waldrop 1992, Holland 1995, Mitleton-Kelly 2003).

Based on the number of methods that habituate the upper part of the model, it would be accurate to say that this approach is not as popular among futurists as the ones in the lower part of the Figure 2. However, some methods are made in order to remove ambiguity and simulate emergent possibilities. The smallest number of methods lies in the social complexity corner. The methods that try to provide a future direction with a degree of ambiguity and aim to do so in a not always orderly environment are few, but they are the ones in which the initial phases are different from the final phases. In other words they begin an exercise with a method that will finish in a place different from its point of origin (C.f. Cilliers 1998, Juarrero 1999, Stacey & Griffin & Shaw 2000, Shaw 2002, Barabasi 2003).

Ideas for Methodology Development

In this paper the analysis and classification of the AC/UNU Millennium project's *"Futures Research Methodology - V2.0"* report was challenged and further elaborated upon. Qualitative, quantitative, normative and exploratory perspectives were replaced with engineering, systems thinking, mathematical complexity, and social complexity perspectives.

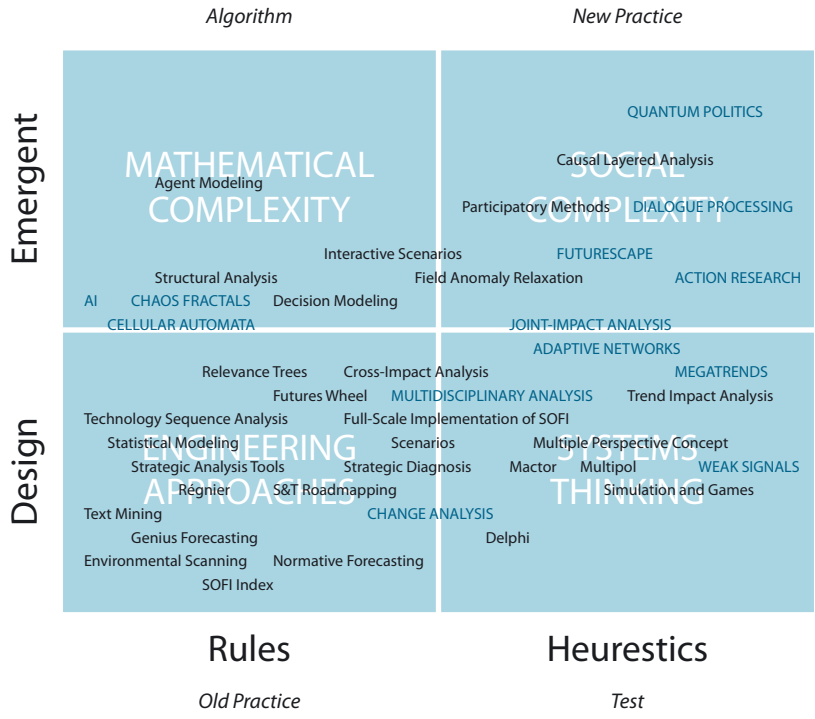

Figure 3. Futures Research Methodology - V2.0 with Complex Systems Concept-Tools Map.[3]

[3] The comments of Ph.D. Auli Keskinen were warmly welcomed.

According to the arguments laid out in this paper, it is natural to explain the location of the major parts of *Futures Research Methodology – V2.0;* as being built on the assumptions of their time. However, it must be noted that there are also futures research methods that allow ambiguity, and those that are sensitive to new and initial conditions, i.e. not all futures research methods are classified as engineering approaches. Even those methods, classified in the low left hand corner, aimed at removing ambiguity and directing the system from outside, are not totally inappropriate or not to be used at all. They are useful if used under stable conditions to provide more information on an existing situation, and when used in combination with other methods.

In Figure 3 the *Futures Research Methodology – V2.0* is complemented by a new set of methods the *Complex Systems Concept-Tools Map* – which is based on complex adaptive systems view of the world. This new set of methods aims at understanding the complexities – inter-relationships, connections, and patterns – in the larger environment where the decisions are made. From these relationships, between order and disorder, self-organising change occurs as a result of the interaction that takes place.

Every method has its own embedded qualities, and they need to be understood properly as has been done in Figures 2 and 3. Glenn and Gordon (2003) state a few words of warning: Simply taking and extending futures research methods into the future assumes that the only forces shaping the history are those that exist in history. However, forecasts based on discoveries not yet made are exceedingly difficult to include and accurate forecasts of some complex and nonlinear systems may be impossible.

Despite these difficulties, or maybe because of them, the need to anticipate and to model the future, and the development of these skills is a must. In this work nonlinear thinking is critical because a small event in one place can cause tremendous turbulence in another. In addition systems thinking is vital due to the necessity of looking at whole systems and scanning across industries and dis-

ciplines in order to discover emerging conditions and finding opportunities for innovation. (C.f. Sanders 1998).

The main conclusions of this study are condensed in the following three points:

1. A deep and broad understanding of methods; and their qualities is the starting point for successful anticipation.
2. No single method should be trusted; an insightful combination of various, even contradictory methods can create foresight; *Futures Research Methodology* can be successfully used with *Complex Systems Concept-Tools Map.*
3. More important than the qualities of presenting the future as an extrapolation of the present, are the qualities that allow us to influence the future by responding to and influencing what is emerging.

References

Aaltonen, M. (2003) "Allowing Complexity in the Puzzle of Strategic Sensemaking". In: Organisational Complexity. Keskinen, A. & Aaltonen, M. & Mitleton-Kelly, E. Foreword by Stuart Kauffman. FFRC Publications 6/2006, 14-38.

Aaltonen, M. (2005) "Methods as Boundary Objects". Futura. In press.

Aaltonen, M. & Barth, T. (2005) "Making Sense of Future. Analysis of Futures Research Methodology V2.0". Journal of Futures Studies. In press.

Arbnor, I. & Bjerke, B. (1997) Methodology for Creating Business Knowledge. Sage. London.

Axelrod, R & Cohen, M. (1999) Harnessing Complexity: Organizational Implications of a Scientific Frontier. New York. The Free Press.

Bak, P. & Chen, K. (1991) "Self-Organized Criticality". Scientific American, January 1991, 26-33.

Barth, T. (2004) "Civility and Dialogue: a Rejoinder to Busekist", in Security Dialogue, Vol. 35; No 1, March, pp. 99-103.

Bogner, W. C. & Barr, P. S. (2000) "Making Sense in Hypercompetitive Environments: A Cognitive Explanation for Persistence of High Velocity Competition". Organization Science, Vol. 11, No 2, March-April, 337-370.

Boisot, M. (2003) "Is There a Complexity Beyond the Reach of Strategy?" In: Complex Systems and Evolutionary Perspectives on Organisations. The Application of Complexity Theory to Organisations. Pergamon. Amsterdam, 85-202.

Bowker, C. G. & Star, S. L. (1999) Sorting Things Out. MIT Press. Cambridge, MA.

Christensen, C. & Raynor, M. (2003) "Why Hard-Nosed Executives Should Care Abut Management Theory", Harvard Business Review, September 2003, 67-74.

Dervin, B. & Foreman-Wernet, L. & Layterbach, E. (2002) Sense-Making Methodology. Reader. Hampton Press Inc. New Jersey.

Dourish, P. (2002) Towards a Foundational Framework for Embodied Interaction. MIT MediaLab, March 2003 (presentation).

Fairhurst, G. T. & Sarr, R. A. (1996) The Art of Framing. Managing the Language of Leadership. Jossey-Bass. San Fransisco.

Gell-Mann, M. (1995) "What Is Complexity?" Complexity, Vol. 1, No. 1.

Glenn, J.C. & Gordon, T.J. (2003) Futures Research Methodology – V2.0. AC/UNU Millennium Project.

Hammer, M. & Champy, J. (1993) Reengineering the Corporation. Nicholas Brealey Publishing.

Holland, J. H. (1995) Hidden Order. How Adaptation Builds Complexity. Perseus Books. Cambridge, MA.

Hopkinson, G. C. (2001) "Influence in Marketing Channels: A Sense-Making Investigation", Psychology & Marketing, Vol. 18 (5): 423-444.

Juarrero, A. (1999) Dynamics in Action. Intentional Behavior as a Complex System. MIT Press. Cambridge, MA.

Letiche, H. (2000) "Phenomenal complexity theory as informed by Bergson", Journal of Organizational Change Management, Vol. 12, No. 6, 545-557.

Lorenz, E. N. (1993) The Essence of Chaos. Seattle. University of Washington Press.

Mitleton-Kelly, E. (2003) Complex Systems and Evolutionary Perspectives on Organisations. The Application of Complexity Theory to Organisations. Pergamon. Amsterdam.

Nicolis, G. & Prigogine, I. (1989) Exploring Complexity. Freeman.

Sanders, T. I. (1998) Strategic Thinking and the New Science. Planning in the Midst of Chaos, Complexity, and Change. New York. The Free Press.

Sanders, E. B. (2001) "N. Virtuosos of Experience Domain". In: Proceedings of 2001 IDSA Education Conference.

Senge, P. (1990) The Fifth Discipline: The Art & Practice of the Learning Organization. New York Doubleday Currency.

Shaw, P. (1997) "Intervening in the Shadow Systems of Organizations: Consulting from a Complexity Perspective." Journal of Organizational Change Management 10 (3): 235-250.

Snowden, D. (2004) "Innovation as an objective of knowledge management. Part I the landscape of management." In press.

Stacey, R (2001) Complex Responsive Processes in Organizations. Routledge. London.

Stacey, R. D. & Griffin, D. & Shaw, P. (2000) Complexity Management. Fad or Radical Challenge to Systems Thinking? Routledge. London & New York.

Star, S. L. & Griesemer, J. R. (1989) "Insitutional Ecology, "Transitions" and Boundary Objects: Amateurs and Professionals in Berkeley´s Museum of Vertebrate Zoology 1907-39." In: Social Studies of Science, Vol. 19.

Streatfield, P. J. (2001) The Paradox of Control in Organizations. Routledge. London & New York.

Thomas, J. B. & Sussman, S. W. & Henderson, J. C. (2001) "Understanding "Strategic Learning": Linking Organizational Learning, Knowledge Management, and Sensemaking". Organization Science, Vol. 12, No. 3, May-June 2001, 331-345.

Waldrop, M. M. (1992) Complexity. The Emerging Science at the Edge of Order and Chaos. Touchstone. New York.

Watts, D. J. (2003) Six Degrees. The Science of a Connected Age. W. W. Norton & Company. New York.

Weick, K. E. (1982) "Management of organizational change among loosely coupled elements." In: Change in Organizations. Jossey-Bass. San Fransisco.

Weick, K. E. (1995) Sensemaking in Organizations. Sage. Thousand Oaks.

Weick, K. E. (2001) Making Sense of the Organization. Sage. Thousand Oaks.

Woodside, A. G. (2001) "Editorial: Sense Making in Marketing Organizations and Consumer Psychology: Theory and Practice", Psychology & Marketing, Vol. 18 (5): 415-421.

Eve Mitleton-Kelly

CO-EVOLUTIONARY INTEGRATION – THE CO-CREATION OF A NEW ORGANISATIONAL FORM FOLLOWING A MERGER OR ACQUISITION

Despite an apparently thorough 'due diligence' process, many mergers and acquisitions (M&A) still fail to meet pre-merger objectives. One of the main contributing factors is insufficient emphasis on post-merger relationships, and the development of an emergent culture to support the new organisational form.

The paper will use two examples of M&A to illustrate a successful and a dysfunctional application of post-merger integration, seen from a complexity theory perspective. An ideal post-merger integration, according to complexity, would resemble the creation of a child. It has some characteristics inherited from both parents but it has its own unique personality and identity. Yet in most cases the more dominant partner tries to impose its own culture, ways of working and procedures. It expects the dependent partner to adapt to these conditions, instead of facilitating reciprocal learning and co-evolution between the partners.

The paper will explore the differences in attitude of the two companies and identify some of the key contributing factors to successful *co-evolutionary integration* from a complexity theory perspective. It will do so by outlining the relevant characteristics to M&A, of organisations as complex evolving systems. In one case it will illustrate how the innovation process regarding new product devel-

opment was constrained and how this affected relationships with customers. It will also show how restrained communication and the restriction of knowledge contributed towards dysfunctional behaviour. It will finally propose that co-evolutionary integration may be facilitated through the *co-creation of an enabling infrastructure* based on social, cultural and technical conditions.

Key words: *complexity, co-evolution, mergers & acquisitions, enabling infrastructure, leadership, organisational culture.*

Critical Path of M&A (History)

In the last decade M&A activity throughout the world, accounted for approximately 70% of the total value of inward investment in developed countries, making mergers & acquisitions a more important component than greenfield investments in foreign direct investment (UN, 1995, Zadmach et al 2003). In 1999, according to J P Morgan, companies worldwide spent 3.3 trillion dollars on M&A, 32% more than was spent in 1998 (Francis et al 2000). Also in 1999 over £300 billion was exchanged via M&A in the UK. Mergerstat (2003) reports that the value of transactions between US companies and those outside the US peaked at almost $436bn in 2000, up 19fold from $23.3bn in 1992. Yet the growing literature underlying practices and systems for successful mergers and acquisitions shows a relatively low rate of success. For example, McKinsey consultants suggest that approximately 60% of acquisitions fail to deliver returns exceeding the cost of annual capital (Nguyen & Kleiner, 2003). In response, the market has recently seen a slowdown in M&A activity since 2000 due mainly to the high percentage failure rate.

In the early 1980s, M&A deals were primarily financial transactions aimed at gaining control of assets, sometimes undervalued, which were often broken down into smaller parts and sold individually to increase financial gain. Today according to Coffey et al (2003) M&A have become strategic and operational in

nature. It would also appear that the market perceives certain types of transaction as more lucrative than others. Acquisitions, for example, create the most market value overall while if a deal is structured as a merger or a sale it has little clear effect on stock prices.

Some Key M&A Statistics

- On the announcement of an M&A deal, company stocks rose in only 30% of cases (Coffey et al 2003)
- Synergies projected for M&A are not achieved in 70-80 % of cases (Coffey et al 2003)
- Routinely cited as problems are people and cultural issues in failing or failed integration (Coffey et al 2003)
- Almost 95% of all new products fail as a result of poor M&A management.
- 65% of strategic acquisitions and mergers result in negative shareholder value (Marcum 2003)
- Serial acquisitions are made in some instances to hide previous failed mergers and underlying financial problems (HRM Manager 2003, Vol 12)
- A Board making serial acquisitions will usually be more intent on focusing on the next deal than on integrating the business in hand. The Board enters into a vicious circle in order to keep shareholders sweet. (Deloitte & Touche 2001)
- New initiatives are launched with decisions stacking up but no one to make them (Webb 2002)
- Customers and staff are forgotten (Deloitte & Touche 2001)

Many of the above studies have identified lack of integration as the common theme, while other studies (Krishnan et al 2004; Hutchings et al 2003; Faulkner 2002; Demers et al 2001; Bijlsma-Franema 2001) suggest that M&As fail primarily because they have underestimated the people factor and organizational fit (Faulkner 2002).

A Deloitte & Touche study (2001) found that only 1/3 of their total sample of 540 companies surveyed about mergers and acquisitions, could say that they thought that their merger was successful. Some of the reasons highlighted for failure of M&As:

1. People and cultures being ignored
2. Slow integration
3. Lack of communication
4. Failure to address retention issues across all platforms: employees, customers and suppliers
5. Failure to clearly define roles, responsibilities and incentives and a clear structure

Almost all the above issues are related to people and cultural issues. Slow integration does encompass technical integration but it is the integration of the different cultures and ways of working that are often the critical factor. This cultural integration takes time and the effort involved is often seriously underestimated. Critchlow (2003) states three converging trends, which can help explain why cultural issues have become so important:

- First, service companies increasingly dominate the largest global economies. That means the chief assets are not factories and equipment, but people - executives who develop client relationships and leverage a certain expertise. Consequently, mergers involve assets that can leave when things become uncomfortable. This was supported by Coffey et al (2003) who found that 47% of executives leave the company within the first year, and 75% leave within the first three years.
- Second, the sharp increase in cross border deals between global firms with operations in many different countries means that different national cultures become an additional challenge.
- Finally, deal rationales have become more complex. Many companies engage in mergers and acquisitions not just to squeeze out value or in-

> crease their size, but also to transform their business or industry. Whereas only one of the top ten global deals (by purchase price) in 1988 aimed to change the basis of competition, eight of the top ten deals announced in 2000 did so.

Mergers and acquisitions often fail to meet pre-merger objectives, despite an efficient due diligence process at the outset, because not enough time and energy is devoted to post-merger relationships and the development of an emergent culture to support the new organisational form. The erroneous assumption is that once the financial issues are dealt with everything else will fall into place. The two case studies will show that this is not the case.

The Two Case Studies

The two cases are an international engineering company (EnFirm - EnF) and a company in the Service Sector (SSFirm - SSF). The latter went through a very thorough due diligence process and the market considered the merger process a great success. Two years after the merger, however, SSF was suffering from severe dysfunctional relationships. Part of the problem was that individuals were uncertain of the boundaries of their authority and autonomy, which had been clear in the pre-merger firms. SSF knew they were good at the pre-merger process and expected that a successful post-merger process would follow automatically. The analysis in this paper is based on semi-structured interviews conducted with a wide cross-section of interviewees in SSF, on many meetings with individuals and groups and on a Reflect-Back Workshop, which validated the findings. (A description of the LSE Complexity Group's Integrated Methodology can be found in Mitleton-Kelly 2003c and 2004a)

Company EnF acquired an organisation made up of small firms that had already gone through a series of M&As, in a different but related market to its main operations. The parent company was primarily a UK organisation while the

acquired company (AcqC) was distributed throughout Scandinavia. There were therefore apparently significant cultural differences and in the first two years after the merger these tended to overshadow other differences in business processes and procedures. At this point EnF joined the research project. The research findings showed that national cultural differences were not a significant issue, but other areas that impacted on the relationship with the AcqC did need more urgent attention.

Eighteen months into the project, the relationship between the parent and the AcqC had improved and the new company had increased its market share. The integration process in EnF was much more successful than in SSF, partly due to the recognition of an integration problem early on and an attempt to correctly identify and remedy the situation.

'Designing' A New Integrated Organisation

SSF company was good at mergers, had gone through several and the current one was considered *"a good fit - a good mix of business and financial strength"*. They were acknowledged by the market to be excellent at pre-merger planning, however they made two serious errors. They assumed that integration was merely a matter of good planning and that once they had appointed the integrated Board and the heads of the support functions, all else would automatically follow. They also assumed that the integration process to create the new organisation could be designed in detail in advance.

> *"They actually announced the new Board of each of the business units. ... So effectively you've done the integration because you've made all the difficult decisions."*

> *"So work starts on integration the second the announcement happens, and you come together as teams almost as soon as that's happened. These are the sup-*

port functions of HR, Finance, etc. We let the rest of the business run on. So the support functions actually work together to design the processes."

Organisations often assume that it is possible to 'design' an organisation in the same way that engineers can design a new product, but this is an erroneous assumption and the repeated failure of organisational restructuring and of M&As to create a successful new integrated organisation, provide significant evidence that a different approach is required.

Human systems are complex and are fundamentally different from machine-type systems. Human behaviour is not predictable and people are capable of changing their rules of interaction, thus changing expected outcomes. They are able to *self-organise,* to influence each other and be influenced in turn, and this reciprocal influence can change ideas, behaviour, ways of thinking, working and relating - that is, humans are able to *co-evolve,* to self-organise and to *create something new that is emergent* in the sense that it could not have been predicted at the outset. They create intricate *networks of relationships* sustained through communication and other forms of *feedback,* with varying degrees of *inter-dependence.* Although heavily influenced by their history and culture they can transcend both when necessary. When they meet a constraint they are able to explore the *space of possibilities* and find a different way of doing things, i.e. they are creative and innovative. (The principles of complex evolving systems shown in italics are discussed in Mitleton-Kelly 2003b).

To create a new organisation successfully the thinking needs to move away from the machine paradigm - organisations cannot be designed in detail, in advance, they cannot be controlled in every detail and their behaviour cannot be predicted. What they do need, however, is a *clear vision and direction.* In addition they need **an enabling infrastructure**, that is, **a framework of social**, **cultural**, **technical**, **economic and political conditions that will help them achieve that vision**. An enabling framework provides a new approach to 'designing' organisations, based on the theory of complexity.

The logic is that organisations need to grow organically; they need to explore alternatives and find the most appropriate ways of working suitable to the task; this is not an argument for total lack of structure or accountability or leadership. All those are necessary, but structure has to start as an outline that is then allowed to evolve into that which is required and necessary. Organisations, both in the private and public sectors that have adopted this approach find that individual responsibility increases to a significant degree and accountability becomes clearer and stronger. They also find that they develop true distributed leadership, as everyone is a responsible agent working towards a shared vision, exploring possibilities and taking initiatives that nevertheless fit well into the overall strategic direction. They achieve this through a strong network of relationships and peer support (rather than pressure).

The official 'leader' then becomes a person who holds that space for them, negotiates with other stakeholders and is free to scan the horizon for new patterns and to influence the overall direction.

Two years after the merger, however, SSF had no clear vision to give direction and to create a sense of identity and coherence, just a sense of fragmentation *"Our culture is very fragmented, both within business units and across the group."* Part of the reason was that the original business had not integrated - they had not become one new business *"What we've got is two bolted together businesses".*

This lack of integration into a coherent whole is not unusual after a merger or acquisition. The original firms try to maintain their old identity and there is a constant struggle to impose ways of working, procedures, etc onto the other. Instead of conflict and imposition, complexity would argue for the notion of *'co-evolutionary integration'.* That is, the coming together of two or more separate companies to create a new organisation. An apt simile here is that the new organisation is like a child. It inherits certain characteristics from each parent but has its own distinct identity. If the merged organisations had that objective in view, then the way they approached post-merger integration would be more positive and creative.

Despite the lack of integration in SSF, there was a sense of pride in the company's position in the market place *"It is great to be part of the largest company in our industry."* There was also an awareness that they needed to create some kind of enabling infrastructure to support the change and to facilitate communication and the sharing of values. But these ideas were voiced by middle managers who did not have the power to influence Board decisions but who did nevertheless influence their local area of operations.

> *"We're trying to generate a framework, an infrastructure that can disseminate this information and support people in defining what the values mean in their areas."*

They were aware that they needed a coherent culture but they were not clear what kind of culture they wanted. They again talked about creating a culture in the same naive and mechanistic way that they thought about the design of the organisation.

> *"What behaviours do we want?"*

> *"We need clarity on end goal or we could be wasting a lot of time and resource."*

In a more insightful way they were also aware that this did not mean *"necessarily a uniform culture"* and someone actually raised the profound question *"What do we want to be? To do?"*

Another mistaken assumption is that a coherent culture is the same as a uniform or homogeneous culture. But this is not necessarily the case. A resilient organisation needs to be able to accommodate several heterogeneous cultures, provided that there is overall coherence that provides unity of purpose and/or values. As will be illustrated by EnF diversity does not need to be a problem, but can be built upon to strengthen the new organisation.

Communication

This was an area in SSF that attracted conflicting comments. Some were very critical, which if addressed, could become powerful enablers. While others illustrated how communication was already acting as an enabler.

Some of the critical comments referred to 'the strategy cascade' and SSF was said to be *"not good"* at communicating the strategy, of discussing it and clarifying it. *"I think the communication ... is not particularly good. I don't think the leaders play an active role."* The leaders did not play an active role, but this reflected an overall weakness in sharing knowledge: *"As a group, my view is we are spectacularly bad at knowledge management."*

One of the themes that emerged was that there was a lot of unnecessary formality, with much emphasis on formal structures rather than on reflection about the business. In an uncertain organisational environment formality and the following of well-established procedures, is seen as the safe way to proceed. Another theme was that the new business was fire-fighting all the time and not enough time was spent on looking at context. Overall there was little time for reflection and this was an indicator of the manic activity that permeated the organisation.

Communication upwards was constrained, possibly due to fear or lack of trust. The CEO did try a suggestions channel and an open door policy, but this wasn't entirely successful because the fear was too embedded *"that doesn't work necessarily very well because staff here, still think that to speak your mind might be held against you and I don't really know how you break down that barrier, because we've got a blaming organisation."* The sense of blame, of fear, of lack of trust had permeated the organisation and made it extremely difficult to communicate openly.

The CEO also led lunchtime communication sessions, which were viewed as positive and an enabler to greater clarity and team building. Furthermore an HR team was experimenting with facilitating conditions such as room format,

music, etc. for the sessions to make them more appealing. There were two sessions once a month of 1.5 hours each open to all, and attendance was voluntary. These were successful in so far as they attracted a good number of participants, but the effect on the culture was still very limited. Partly because the willingness to be open and to communicate was not shared by the rest of the management team *"Haven't got any feedback loops breaking through the levels ... they've not got a shared agreement about what they are delivering. The CEO is very, very clear about what he wants delivering and then as soon as you get below him, I hear conflicting messages which worries me."*

Furthermore there was a strong perception that two years after the merger, the Executive team was not working together effectively *"We're from excellent to poor and I think that, again, that's one of the consequences … there hasn't been a pulling in together".* The initial idea therefore, that appointing an integrated executive team early, would solve the problem of integration, had not materialised. To overcome the problem they appointed a new CEO, and as indicated above he was trying very hard to open the channels of communication. But the attempt was only partially successful because it was too top-down and because his Executive team did not share his aspirations and did not work well together - that is, they reflected the fragmented culture of the rest of the organisation.

In addition there was not enough attention paid to the 'people issues', defined by one interviewee as *"people and direction and leadership",* after the merger. Initially, during the merger and for those leaving, conditions were good, but it was felt that now efforts needed to be concentrated on those staying, with more emphasis on personal development, as training and development budgets were often cut – *"Will we invest in the capability of our people?"* The perception was that there were good development programmes for senior staff but not so good for junior staff.

Making Change Happen

Organisations that have gone through a merger have to spend a great deal of time and effort on the integration process. Both organisations have to change, to create the new integrated organisation. The mistake is to assume that this degree of change can be determined by careful planning. Not that planning is unnecessary; simply that it is not sufficient. What is required, in addition to thoughtful planning, is an environment that encourages and facilitates exploration of the space of possibilities, i.e. exploring alternative ways of working that are appropriate to the needs of the new organisation. To do this there has to be a significant degree of self-organisation, to allow individuals to come together without external direction to experiment with new ideas, and new ways of working.

Facilitating self-organisation, exploration of the space of possibilities and emergence, is the key to creativity and innovation. It is also a prerequisite for co-evolution. A successful merger is in essence a successful attempt at *co-evolutionary integration* – when the partners influence each other in a reciprocal way (not one-way imposition), experiment and find the best way of working together. In SSF there was little evidence of self-organisation and exploration – there were two possible reasons for this: (a) fear of failure and its effect on one's career and (b) a control mentality that saw experimentation as dangerous. In part there was a risk if advice given to the public was inaccurate or a new product was not sound; but these risks could be contained. The error was in assuming that this risk applied equally to the development of different ways of working and to the building of relationships. The perception of risk was also associated with the lack of standards. It was true that there were duplicate systems and sets of procedures - but these were a result of tight control rather than experimentation.

Self-organisation was not totally absent in SSF, but there was a noticeable division between those who felt able to self-organise and those who felt serious constraints. Senior managers were seen as being good at self-organisation, because

they had the space, the authority and the power to act independently, but this did not appear to be the case for the rest.

Junior staff tended to use a formal approach to present new ideas. They feared that they would be turned down and therefore needed to seek approval. The size of the merged organisation did not help.

> *"The bigger we've got, the more formal it's had to become, because there are more people bidding for that very same resource. The smaller you are, the less formal it is."*

Although some enlightened senior managers wished to encourage self-organisation, it did not happen. *"We've nearly got ourselves into a spoon feeding type approach, if it doesn't come from senior management, we're not going to do it, rather than well why don't you just do it anyway?"*

The reluctance of staff to self-organise was possibly due to the following reasons:

a. Lack of clarity on roles, responsibilities and objectives.
b. Decisions were pushed upwards because they did not feel comfortable in making them, as their boundaries of authority were unclear.
c. All changes were perceived as needing approval.
d. The organisation seemed to prefer a structured disciplined approach.

Focus and Leadership

One of the main themes was that too many projects were claiming equal high-level priority and all were competing for limited resources, time, funding and energy. Many interviewees appeared exhausted with the constant battle to meet so many high priority deadlines. *"We try to do too much all the time, constantly failing." "We have so many projects clambering for resources at the moment.* ***All the***

projects are classed as priority one *and so it's difficult to know what to work on first."* Overall there had been just too much change and they were suffering from change-fatigue *"they are punch drunk from all the change";* with the corollary that it was difficult to believe that the transformation would take place.

This was indicative of the lack of direction and focus. They needed clarity to help them concentrate their efforts on the important issues: *"We potentially set out to try and do too much too soon in our merger, possibly not the right things first."* They also felt the lack of leadership: *"They desperately need vision, but they need leadership to go with it to lead them out of where they are."* The workforce was in effect rendered unable to help itself, so they needed *"to be shown the way out".* But leadership was not readily available as the Executive team was not *"knitted together"* and did not have a *"consensus view".*

Weak leadership coupled with a controlling attitude, lack of a clear vision and direction, all contributed to becoming a dysfunctional organisation. Yet when the merger took place the companies involved did not suffer from these shortcomings. Size did make a difference in the sense that systems, processes, structures, procedures, etc did not easily scale up; there was also much duplication and no clear idea of how to integrate the duplicated systems quickly and effectively. These issues were not unique to SSF, but are common in M&A failures. The overwhelming need to grow, to become a global player, to become the industry leader, or simply to increase the organisation's or the individual's power base, become drivers for their own sake and push all other considerations aside.

A complexity perspective on the other hand would take a more holistic view and look at all the conditions necessary for a successful merger or acquisition. Apart from the financial and legal dimensions there are also the social, the cultural, the technical and the political dimensions that need to be taken into account. Each plays an important role in the social ecosystem of the organisation and influences all the others, while the ecosystem influences individual parts. The whole co-evolves and creates new order.

Integration Across National Cultures

Company EnF acquired an organisation made up of small firms that had already gone through a series of mergers and acquisitions, in a different but related market to its main operations. The parent company was primarily a UK organisation while the acquired company (AcqC) was distributed throughout Scandinavia.

The parent company was in a market that demanded extremely high quality and safety, while the products of the dependent company were not in the same category. Applying the same procedures was inappropriate and in due course started affecting the innovative response of AcqC. Had this continued it could have had serious implications for the entire organisation. AcqC at the time of the acquisition was a leader in its field and that position was due to its relationship with its customers and its quick response to their changing requirements. The new procedures made that response very much slower and were beginning to affect AcqC's relationship with its customers. In addition, the parent company had imposed a matrix structure that was confusing and difficult to work.

EnF was very much aware that there was an integration problem, seen in terms of the different national cultures. At a Conference in 2002 they identified *'awareness of cultural differences'* as one of two main issues to focus upon. The other was clarification of roles and responsibilities. The HR Director in EnF was tasked with addressing the two issues, but did not know how to go about it. The LSE research project had just started and some initial findings were presented to EnF. At that meeting the HR Director asked the LSE research team to work on the integration issues. As this was a *collaborative action research project,* 14 members of the parent company and the AcqC, joined the LSE research team. Together they formed four teams and interviewed the top three management layers in the Nordic countries, the UK and the USA. The EnF teams were guided by the LSE research team in conducting semi-structured interviews and in analysing the findings from the transcripts.

At a 2-day facilitated workshop the four teams identified a set of common themes, dilemmas, key questions and underlying assumptions. A set of recommendations, based on the findings, was presented to the Executive Board and adopted. The interview findings were supported by a tool called 'Landscape of the Mind' (LoM), which identifies preferences in decision-making, knowledge acquisition and sharing, etc. The majority of the top team had answered the LoM email questionnaire and the results were quite surprising. They showed that there was no significant difference in the preference profiles of the Nordic and the UK management teams, hence many of the problems associated with the national cultural differences were more apparent than real.

Apart from the interviews, LoM findings, workshop and Board meeting, the LSE Group also attended meetings, conferences and joint presentations. In addition a second set of interviews was conducted with the high flyer team that had acted as interviewers and an agent-based model was built based on an email questionnaire.

The findings showed that the national cultures issue had become a smoke screen that was used to hide all the other difficult issues that were impacting the relationship between the parent company and AcqC. Eight overarching themes were identified at the 2-day workshop, and cultures was only one of them:

1. Complicated structure
2. Human behaviours
3. Relationships
4. Cultures
5. Communication
6. Matrix interfaces
7. Leadership/role of central team/management
8. Identity

Matrix Structure and New Product Development

The complicated structure was associated with the matrix organisation. This was something that the parent had imposed on the AcqC - the latter had been a set of small firms with simple business models and a shallow hierarchy. Everyone knew everyone else, as they were often part of the same small societal community with one or two main employers. The AcqC firms built relationships both within the firm and outside with their customers. They had a large global customer base while the parent had very few, but large customers. The matrix was relatively new for both parent and AcqC and no one knew precisely how to operate within it. The parent, however, was already used to a fairly complicated structure as part of a large organisation, they also introduced the matrix rather than having it imposed upon them, hence the psychology and the dynamics were quite different. For the AcqC on the other hand the changes were significant. They had gone through 2-3 mergers and acquisitions in a relatively short time, they had as a parent a very well known organisation, but one which operated in a totally different market sector and was not familiar with AcqC's market. The parent brand in fact was seen as a constraint for the AcqC not an advantage.

The matrix was so complicated that it can only be described as a cube. It was not surprising therefore that the second issue identified by the 2002 Conference was *'clarification of roles and responsibilities'.* The fuzzy boundaries of responsibility and accountability, the multiple reporting lines, etc were uncomfortable and confusing for an engineering culture that prefers clear, unambiguous structures. For the AcqC it was even more difficult as their previous business model and structure was relatively simple, clear and unambiguous. However, in due course some of the AcqC's senior managers learnt that the best way to *'work the matrix'* was through good informal networking. One interesting and uncharacteristic insight into the matrix was that it would *"produce leaders who are comfortable with change and complexity".* Another point was that there were *"no cross functional activities"* and that they needed *"real not virtual teams, with a physical focal point e.g. war room".*

EnF acknowledged that working the matrix was a problem and that it affected its relationship with AcqC and one of the recommendations accepted by the Board and implemented was the need to define the desirable characteristics and behaviours for a matrix, and to provide training and support for working in a matrix. Furthermore it developed programmes and events to facilitate informal networks, develop trust and foster loyalty to different groups.

Another issue associated with the complicated structure was new product development. Prior to the introduction of the matrix the location of product development was quite clear for both parent and AcqC. Those who interfaced with the customer brought back ideas and requests about the development of the product and these were directly implemented. But when the customer facing business units were separated from the operating business units, the responsibility *(factory or marketing?)* and location of product development became confused *"team responsibilities have been split to detriment of the ability to meet market demands"*. In addition customers were confused, as they no longer knew who their main contact person was. This was a serious issue for the AcqC as they had built their reputation with their worldwide customers on their quick response rate and innovative approach. But post acquisition ideas for product development had to be submitted to head office in the UK, signed off, counter-signed, etc and the process became cumbersome and slow and innovation was in danger of being seriously compromised. When this point was brought to the attention of the Board, they were surprised, but quickly realised the potential damage of this procedure and implemented the following actions, giving them a high priority.

The product development process was clarified for the businesses; and a 'Customer Focus' programme was developed with a consistent account management process to facilitate the relationship between the customer and the business.

Relationships, Culture and Communication

The 'human behaviours' and 'relationships' themes produced the most voluminous comments at the 2-day Workshop. The main points relating to the relationship between parent and AcqC were the following. Both sides were seen as having hidden agendas. The parent suspected the AcqC of sticking to the old structures and trying to preserve their old relationship with their customers; that they gave too much emphasis to their small entity interests over those of the group; that knowledge was power and people did not want to share their knowledge. On the other hand, the AcqC suspected the parent of having a hidden agenda because of lack of transparency and open communication; they also feared that they planned to close them down, hence creating mass unemployment in their small communities, as they were seen not to share the same culture of community. Both were inaccurate on the whole and once they were voiced, it was much easier to address them.

One of the main insights on the national cultures theme was that *"awareness of national cultural differences may not be enough"* and that this was *"not a national culture problem but a business culture problem"*. The national cultures issue was seen both as a *"stumbling block"* and as a *"smoke screen"* hiding other issues such as lack of empowerment and *"lack of confidence to put the right person in the right job for fear of cultural faux pas"*. It was recognised that there were business sub cultures even within the parent with *"cultural differences in doing business"* and *"cultural differences in communications"*. Regarding the parent and the AcqC *"customer relationships were affected by different styles of doing business"*. The imposition of ways of working was recognised, in particular that the parent culture of corporate governance plus self protection did lead to a detailed and lengthy decision making process.

Culture and communication were seen as going *"hand in hand"* and that national styles did affect customer relationships. The inadequate and multiple in-

formation systems of the group were not fully integrated and that was another constraint to communication.

Leadership, Role of Central Team, Management

One of the main findings from the workshop was that middle management lacked drive and created an impermeable layer between middle and senior management *"senior management understands the strategy but the message is lost in the levels below"*. People were evading the matrix not operating it and they exploited grey areas for personal benefit. They also used the *"confusion of the matrix"* to excuse non-delivery. The Central team was criticised for not explaining why they requested information, while themselves not providing information in the best way. This created the perception that *"people feel that they lack full information"*. It was also acknowledged that the centralised reporting regime was overdone and was based on the parent requirements that were inappropriate for the AcqC.

EnF took these findings very seriously and implemented a whole series of action streams. They put in place a Leadership programme to develop business leaders and managers. They simplified and reduced management reporting requirements. Finally they now aim to clarify the strategy process, and to communicate it by making it relevant locally. Organisational changes in structure, roles and interfaces are being communicated in a variety of ways including several articles in the in-house journal. They are also trying to develop more effective ways of sharing knowledge.

EnF Success

Fifteen months after the 2-day facilitated workshop, which identified the real underlying issues, most of the recommendations have been implemented. The Board listened and took action and the parent company co-created an enabling

framework with the AcqC to facilitate integration. The framework consisted of 12 action streams and these were outlined above. But prior to that the HR Director had the vision to work collaboratively with a research team and to try out a different way of thinking based on complexity. In addition he appointed a Project Manager whose dedicated efforts and management style made the project a success and EnF is on the way of actually creating a culture of co-evolutionary integration.

By opening up again the product development process they enabled self-organisation by the local teams and the exploration of the space of possibilities and facilitated creativity and innovation. They have relaxed their rigid structure and have enabled emergence without risk. They have acknowledged the importance of connectivity and have worked hard to improve the relationships between the parent and the AcqC. They have improved their feedback and communication processes and opened up new channels. They have acknowledged that local autonomy is essential and are on the way of improving the central-local control balance. They have understood the subtle balance of interdependence and have learned to co-evolve through reciprocal influence between the parent and the AcqC. They have done this by honouring the differences between them and by seeing diversity as a strength to build upon, not as a weakness.

Summary: Enablers of Integration Post M&A

The two case studies moved in the opposite direction, each beginning at a different starting point. SSF's merger started well but deteriorated when not enough attention was given to social and cultural integration. The two sets of employees were not given the space to explore the new relationships and to experiment with new local micro-structures. SSF made the mistake of assuming that integration would happen in the absence of an enabling environment. The senior management team was so taken up with its own power struggles and agendas, that they engendered an environment of fear and blame, which constrained the explora-

tion of new ideas, of different ways of working and relating and the spontaneous coming together of new groups to explore the new; i.e. they inhibited self-organisation, the exploration of the space of possibilities and consequently the emergence of new order or in this case of a new integrated post-merger organisation.

EnF on the other hand started with the belief that national cultural diversity was a serious problem. But they were prepared to experiment and to try out a new approach. When the evidence was presented that the perception of the problem was inaccurate, they re-focused on the other deeper issues uncovered by the collaborative research process and addressed them fully. This however did not mean that they ignored their cultural differences. But by addressing them in the first instance they reduced the problem considerably and they continued to work to improve relationships. This reflected their belief that relationships mattered. The Conference had articulated that belief by identifying cultural awareness and roles and responsibilities as the key issues. The main difference was that they were no longer hiding behind a single simplistic explanation, but acknowledged the complex nature of the underlying issues.

Following is a summary of the key findings both from the merger and the acquisition, as both addressed the challenge of post-M&A integration:

- Clear and well communicated vision and direction
- Strong sense of identity (not uniformity but an overall sense of coherence that accommodates diversity)
- A leader who 'holds the space', articulates the vision and direction, identifies emergent new patterns quickly and develops partnerships/networks/alliances
- Distributed leadership and distributed power
- Local autonomy
- Effective and timely communication of the process; the reasoning behind it and the benefits and successes to be gained
- Regular updates on progress

- Key successes: *"recognising what we are doing that's good"*
- Gain involvement: open to everybody, so they feel part of the change process
- Time for reflection not just constantly fire-fighting
- Creating an enabling environment that facilitates co-evolutionary integration
- An evolving business model – there is no single 'right' model

The last point in one sense captures the process and the thinking behind co-evolutionary integration following a merger or acquisition. The business model as well as the culture of the new organisation should be allowed to emerge, not through a detailed design but through the creation of an enabling environment that facilitates the co-creation of a new organisation through co-evolution not imposition. There is also no one correct or optimal model. What may appear as optimal in one set of circumstances will no longer be optimal when those circumstances change, but if the organisation is able to co-evolve with a changing environment then the business model stands a better chance of being appropriate in any current conditions.

If an organisation adopts a complexity perspective then it would (a) actively facilitate, rather than inadvertently inhibit, the emergence of new ways of working, new relationships and power structures, (b) through enabling infrastructures that facilitate emergence, self-organisation and the exploration of the space of possibilities. It would therefore (c) encourage the self-organisation of local teams and (d) the exploration of alternative ways of working or ideas for new products, or simply a different way of doing things. This of course carries a great deal of responsibility, as the well being of the organisation cannot be jeopardised. (e) The structure of such an organisation would be neither too organised nor too random (e.g. a kind of fuzzy matrix); and (f) the power structure would favour distributed power and local autonomy (g) acknowledging the value of distributed intelligence and knowledge throughout the organisation. In addition such an organisation would (h) value variability and the consequent large repertoire

of responses through diversity in people, cultures, products, markets, etc.; (i) it would understand connectivity and interdependence and that generative relationships foster a collaborative culture that (j) is likely to co-evolve and co-create a new responsive organisation that would enable it to cope in unpredictable environments and to achieve co-evolutionary integration.

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Bibliography

Appelbaum, S. H. and Gandell 2002 "A Cross Method Analysis of the Impact of Culture and Communications upon a Health Care Merger" Journal of Management Development Vol 22,5 pp 370-409

Axelrod, R., and Cohen M. D. 2000 Harnessing Complexity: Organizational Implications of a Scientific Frontier, Free Press

Bijlsma-Frankema K. 2001 "On Managing Cultural Integration and Cultural Change Processes in Merger and Acquisition" Journal of European Studies, MCB University Press, Vol. 25, pp 192-207

Bijlsma-Frankema K. 2001 "Managerial Perspectives on Success and Failure of Post-acquisition Processes" Current Topics in Management, Greenwich Vol 4, pp 155-78

Bragg, T. 2001 "Lessons from Mismanaged Merger" Industrial management, Norcross, March/April Vol

Coffey, J., Garrow, V. and Holbeche L. 2003 "Reaping the Benefits of Mergers and Acquisitions" Butterworth & Heinmann, Oxford

Critchlow J. 2003 "Post Merger Integration: Seize the Day" Acquisition Monthly, Vol 9, Thompson Press

Demers, C., Giroux, N. and Chreim, S. 2003 "Merger and Acquisition Announcements as Corporate Wedding narratives" Journal of Organisational Change, Vol 16 No 2

Deloitte & Touche 2001 "Solving the Merger Mystery", Financial Times, Feb 12, 2002

Francis M. "Learning to love: The People Problem in Mergers" The McKinsey Quarterly, 2000 Number 4

Faulker D., Pitkehly, R. and Child, J. 2002 "International mergers & Acquisitions in The UK 1985-94: A Comparison of National HRM Practices" International Journal of Human Resource Management 13:1 Feb pp 106-122

Garcia-Lorenzo L., Mitleton-Kelly E., Galliers R.D. 2003 '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.

Hutchings et al 2003 "The Process and Impact of trust Mergers in the National Health Service; A Financial Perspective" Public Money and Management, CIPFA, April, pp 103-112

Hall, P. and Norburn, D. 1987 "The Management Factor in Acquisition Performance" Leadership and Organisational Development Journal Vol 8.

Krishnan R. A. Joshi, S. and Krishnan, H 2004 "The Influence of Mergers on Firms' Product Mix strategies" Strategic Management Journal Vol 25 pp 587-611

Lawson, J.D. & Leslie, K. 2004 "When Reorganisation Works" The McKinsey quarterly, No 2

Levy, N. 2003 "EU Merger Control: From Birth to Adolescence" World Competition Vol 26, pp195-218

International Labour Organisation 2001 "The Employment Impact of Mergers and Acquisitions in the Banking and Finance Service Sector" International Labour Office, Geneva

Hofstede, G. 1991 "Culture and Organisations" London McGraw-Hill

Mergestat 2003 "Lessons from Mismanaged Merger" Industrial Management; Norcross; Mar/Apr; www.mergermanagers.com

Mitleton-Kelly E. 2003a Ed. "Complex Systems & Evolutionary Perspectives of Organisations: The Application of Complexity Theory to Organisations", selected papers on complexity by 14 international authors, Elsevier, ISBN 0-08-043957-8

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

Mitleton-Kelly E. 2003c'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

Mitleton-Kelly E. 2004a "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 International Conference on Complex Systems (ICCS) May 2004

Mitleton-Kelly E., Speh Birkenkrahe M. 2004b 'Treasury Operations in A Multi-National Oil Company: Dialogue on the Methodology of Using Natural Experiments in Complex Evolving Systems' in Complexity Theory and Management of Networks, Ed. Andriani, P & Passiante G, Imperial College Press, ISBN 1-86094-460-4.

Mitleton-Kelly E. 2004c (forthcoming) 'The Organisational Culture Gap: An Inevitable Consequence of Plural Rationalities, Information Rejection and Complexity' in Innovation: The European Journal of Social Science Research

Mitleton-Kelly E. 2004d 'IT Legacy Systems: Enabling Environments that Reduce the Legacy Problem: A Complexity Perspective' in Software Evolution, edited by N. H. Madhavji, M.M. Lehman, J.F. Ramil and D. Perry, Wiley, 2004

Milligan, J. 2003 "The Perfect Blend: Mastering the Art of Merger", Bank director Quarterly, 1st and 2nd Ed

Milligan, J. 2003 "Merger Integration: Ensuring a Smooth Transition", Bank director Quarterly, 3rd Ed

Murphy, P. 2002 "Beating the Post merger Odds" Bank director Quarterly, 1stEd

National Statistics Office "Mergers & Acquisitions 0204" 4th Quarter 2003/4

Nguyen H.; Kleiner B.H. "The Effective Management of Mergers" Leadership and Organization Development Journal, 12 November 2003, vol. 24, iss. 8, pp. 447-454(8) Emerald Group Publishing Limited

Ralls. J.G and Webb, K.A. 1999 "Mergers & Acquisitions: How to Plan, Negotiate, and Implement Alliances and Partnerships in a Complex World" Cashman Dudley, Texas

Ralls. J.G and Webb, K.A. 1999 "The Nature of Chaos in Business" Cashman Dudley, Texas

Thiersch et al (2002) "European Banks; Verging on Merging" McKinsey Quarterly No3

Vestring, T. King, B. Rouse T. and Critchlow J. 2003 'Merger Integration: Why The "Soft Issues" Matter Most', Spring, European Business Forum.

Wallis, S. 2000 "When Deals Work: In Managing Mergers & Acquisitions" IBM Global Services

Webb K. A. 2002 'The Success of Global Alliance' Library of Congress Data, Gulf Publishing

Zadmach et al 2003 "Rising Metropoli: The Geography of Mergers and Acquistions in Germany" Urban Studies, Vol 40, No 10, September

Theodor Barth

INTRODUCING DISORDERED SYSTEMS – TOWARDS AN AGENDA FOR A MESO-LEVEL ANALYSIS OF REFLECTIVE ACTORS IN COMPLEX DYNAMICS

"Love, which according to Plato is an intermediate stage between possessing and not-possessing, is in the inner subjective life what means are in the objective external world. For man, who is always striving, never satisfied, always becoming, love is the true condition. Means, on the other hand, and their enhanced form, the tool, symbolize the human genus."
(Georg Simmel, 1978 [1900][4], p. 211)

[4] Simmel, Georg: 1978 [1990]: The Philosophy of Money, London: Routledge & Kegan Paul.

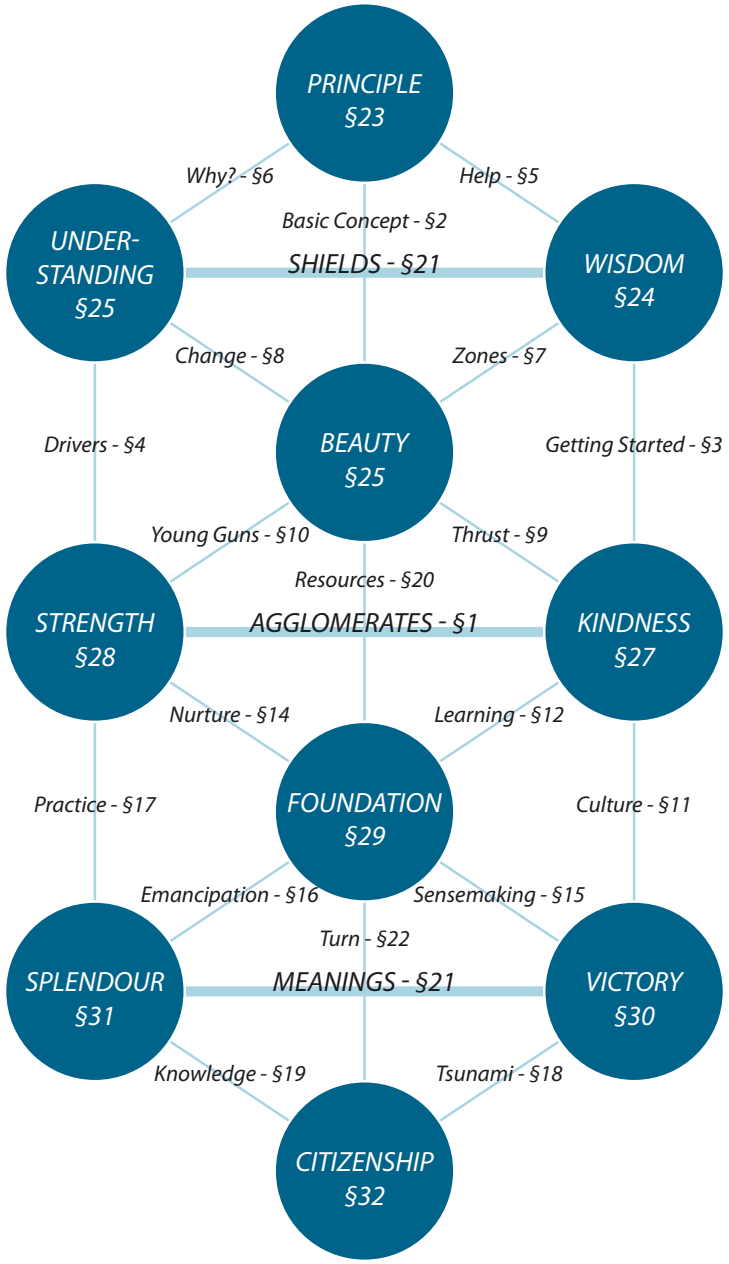

Figure 4. *An Agenda for a Meso-level Analysis of Reflective Actor in Complex Dynamics.*

Agglomerates

§1 – The concept of 'disordered systems[5]' (F. Barth, 1992) was developed for the generative analysis of how people connect and knowledge sticks, in agglomerates where people live in different realities – or, worlds – that are characterised by heavily coded social scripts[6]. Any such agglomerates is complex, in the sense that it is composite and that its systemic features do not derive from the structural properties of its constituent worlds, but from certain dynamics at the systems' "messy" *meso*-level that involve actors directly (i.e., at the operational level).

Basic Concept

§2 – The worlds of a disordered system are by definition *non-ordered* in relation to each other: accordingly, the systemic features of disordered systems do not derive from top-down governance. In fact, top-down governance can be one of several sources of trouble, or disorder, in such systems. The systemic features of the 'disordered system' are linked to structural heterogeneities – contingencies – that are manifested in the agglomerate: contingencies that are structurally heterogeneous, in the *specific* sense that an inventory of the agglomerate's contrasting worlds – even when structurally coded (Lévi-Strauss, 1964-71) – does not allow to infer, predict, nor even analyse, the contingencies.

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5 The concept of 'disordered system' comes from structural geology: in studying crystal migration the analysis of structural heterogeneities is critical to describe how the larger system behaves when submitted to the impact of events from the outside. Fredrik Barth, *personal communication* (Fredrik Barth is not a family relation of the author).

6 C.f. Sohar – *Culture and Society in an Omani Town* (F. Barth 1983), and later *Balinese Worlds* (1993). The 'worlds' are in fact *partially overlapping,* but we'll get back to what this means later on in this paper. For the time being, the reader is invited to consider them as Wittgenstein's *language games.*

Getting started

§3 – Structural heterogeneities are the cultural stuff of agglomerates in their material reality: structural heterogeneities are contingencies that appear in a *co-active space* – i.e., a space in which a multitude of activities are taking place at the same time[7]. Hence, the co-active space is not defined by the a *priori* presence/absence of interaction, or exchange, between actors: rather, the concept of 'co-active space' is focussed on the systemic effects of actors *simply being* together – materially, or in a virtually enhanced reality – while engaged in different, contiguous or partially overlapping activities. The idea is that these activities affect each other *marginally* – directly or through an interface – in the sense that they are mediately noticed by actors who are engaged in the co-active space. The disordered systems approach allows us to take into consideration the affordances created in humans by their *being together:* as we live, love and work in the agglomerate, this *way of being* is imminent. Hence, the interest we take in what people make out of this possibility.

Drivers

§4 – *Being together,* as a human condition, is related to the existence of the collective as a material fact, and its perception by individuals – even when they do not directly interact or engage in exchange with each other. Urban environments, and other concentrated artificial environments as cyberspace, allow individuals to *assume* togetherness and act upon this assumption. The activity of picking up *pattern* and *detail* in contingencies (F. Barth, 1987), originating from this condition – regularly, or from time to time – involves individuals in an exchange with the larger environment, beyond their current worlds. Our point is that this activity is discontinuous and the sense of reality associated with it can be submerged. The distinctive challenge of disordered systems, therefore, is to

[7] Warren Brodey; *personal communication.*

understand the signatures of the system that rather reveal themselves through *immergence* – patterns of disappearance – than through emergence *(per se)*. The disordered system shifts between (a) an *open* and superficial state [receptive but disconnected] and (b) a bounded and *deep* state [absorbed but connected]. This is the signature of complexity: *complex systems are composite and deep.* Concomitantly, the point of these paragraphs is to create *an agenda* for disordered systems, within the broader field of theory of complex systems, by developing a framework to make structural heterogeneities *readable* – in relation to external events – at an *appropriate* or *required* level of *depth*[8].

Help

§5 – The irregular (a) dwindling of realities into the flat land of contingencies; and (b) people's subsequent attention to new realities, insight and depth goad us to ask what goes on in peoples' minds, and how the dynamic *shifts* between the *surface* of contingencies and the contextual *depth* occur in co-active spaces. In agglomerates of worlds, the way individual actors are engaged in backstage 'tactics' (Certeau, 1984) is a key to the issue. Such backstage drill – e.g., the internal newsreel picking up information with no immediate purpose – is characteristic of tactical operations in open fields[9], or the *no-man's lands* between social worlds: i.e., field where human minds are like nodes connected by transient, or passing,

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[8] Deuleuze (1969, p.7): "In Plato, an obscure debate was raging at the depth of things, in the depth of the earth, between that which undergoes the action of the Idea and that which eludes this action (copies and simulacra). An echo of this debate resonates when Socrates asks: is there an Idea of everything, even of hair, dirt, and mud – or rather is there something which always and obstinately escapes the idea?"

[9] De Certeau (ibid.) contrasts the open field of tactical drill – which in the present case could be anything from newspaper reading, passing through internet surfing and games to local gossip – with strategic action: i.e., premeditated action from the bastion of a fortified position, with resources, manpower, a universe of shared meanings and an horizon of action which is unknown to the enemy.

links to the critical events that may determine the course of their lives. *In this collusive* state, the disordered system is similar to systems of multiple agents in general complexity theory. However, the dynamics of disordered systems is different from what might be coined interaction between *simple agents* (Axelrod & Cohen, 1999; Holland, 1998).

Why?

§6 – The *culture of contingencies* – its existence, form and substantial concerns – moves us away from simple agents and towards *reflective agents.* Concomitantly, we are highlighting a key aspect of *civic culture:* i.e., a way of being that makes a point of contingencies (Rorty, 1989). Baudelaire's *flâneur* and Simmel's *stranger* are the modern avatars of the much older archetype. We are talking about people who – though they keep and reproduce their "tribal" affiliations – have evolved *within* and *beyond* the tribe. The experience that something new, different and connective can come out of mixes is simply urban culture. In complexity theory, this domain has been included into the realm of scientific inquiry (c.f., Waldrop, 1992): we believe that it is fundamentally motivated by the wish of bringing science into the "kitchen of life". Currently – in these kitchens of flows – people are busy mixing media (Gulio Jacucci, 2005) and creating new *life spaces,* or *design space:* when the spaces of places – pace Castells (1996) – have become spaces of flows, people respond by creating 'places in time' – *chronotopes*[10] (Bakhtin, 1981) – or, what Appadurai has captured in the richer and far reaching notion of *ethnoscapes* (Appadurai, 1996).

[10] *Chronotope* (lit. place in time): the place where the knots of narrative are tied and untied.

Zones

§7 – Concomitantly, the ethnography of civic culture – the culture of citizens, university people or project organised business services – may today concern itself with the variety of new ways of *being together,* and with how transactions in knowledge are canalised in disordered systems: systems traversing multiple worlds, or agglomerates. Indeed, the way individual actors, in such systems, pick up on contingencies and make sense of them in pattern and detail is striking both in its lack of immediate -utility and -intersubjective coherence. And what really seems to be a prime characteristic of systems with multiple worlds is the lack of a *pre-established* consensus on pay-offs. Values are continuously created that either disappear from peoples' minds during the exchange, or are reaped in ways we wish to understand. In other words, we are concerned with the relation between the *reflective practitioner* (Donald A. Schön [Newman, 1999]) and value creation, under the constraints of everyday life. By gleaning the agglomerate for pattern and detail actors in disordered systems – during the regular activities in the co-active space – build a *readiness potential:* this wayward activity is evidently central to the contemporary emphasis on the knowledge -enterprise, -work, -society.

Change

§8 – Therefore, we are here focused on a certain *class* of pay-offs, with certain distinctive characteristics: benefits which are difficult to *predict,* and value creation that is difficult to *remember* and represent[11]. This is the key issue of *immer-*

[11] Kenneth Arrow (in Introduction to Brian Arthur, 1994): "Alfred Marshall expanded broadly, if vaguely, on the implications of increasing returns, including those of economic growth, irreversible supply curves, and the like, as well as the novel and far-reaching concept of externalities, where some, at least, of the increasing returns are captured, not by the producer but by others."

gence in the dynamics of disordered systems. In other words, actors perceive what the benefits are *as they occur* and often have problems securing these, whenever the initiative to do so is delayed (for a variety of reasons), or whenever the deliveries of *reflective work* is not adequately represented and designed. If we wish understand how value creation *drifts* we also have to face the problem that such value creation also *dissipates,* as a part of the same characteristic dynamic.

Definition: The disordered system defines through a dynamics of value dissipation ***into*** *the process that generates the system – or, immergence. This immergence of 'self' in disorder – that grants it systemic features – is generated by the following steps: (a) the actors' engagement in relations of effective exchange with an environment beyond their current world [engagement]; (b) imprinting the interface – that allowed this exchange – with the procedures that will make it operable to others [operability]; (c) tracing the subsequent disappearance of the original use* ***into*** *general use [traceability]; and finally (d) establishing the depth of this cycle (a-c), and thereby make its contingencies readable as context [readability].*

In other words, the disordered system is self-reliant rather than self-organising: the disordered system aggregates a relative autonomy in relation to the social worlds that it traverses. The disordered system defies social scripts, but yet unfolds in the midst of social worlds [owing to a certain "motivated blindness" to meso-level dynamics that paradoxically (1) empower social worlds institutionally while simultaneously (2) making them permeable to disordered systems dynamics]. Social worlds may be perceived to evolve within themselves, but actually ***co-evolve***[12] *with the business that traverses them.*

The disordered system may define at any level of the social worlds it traverses and the critical feature that concerns us here is how it can be maintained in *presence* for the purposes of theoretical inquiry: i.e., in people's memories (even as they periodically forget), current experiences (even as it periodically fails them) or

12 C.f., Mitleton-Kelly, 2004.

anticipations (even as they are periodically wrong). In this agenda, we argue that this is a problem of *representation, conceptualisation* and *design*[13] – as a distinct level of activity – and responds to the question, which concerns theorising – as a non-academic activity – in disordered systems: what are the operational characteristics of the maintenance in presence of the future, past and present (Aaltonen & T. Barth, 2005; Crites, 1971)? How should we understand responsibility in disordered systems? What is the difference between (a) self-*transgressive* and (b) self-transcending dynamics in disordered systems? Or, in more plain terms: what is the difference between (a) collecting rents to establish boundaries and (b) make profits to go beyond them? Concomitantly: how do we manage the phenomena of *drift* and *dissipation* in value creation that disordered systems bring to evidence? What could be the design elements of a unifying model?

Thrust

§9 – Disordered systems appear to be chaotic when seen in isolation – patterns come and go without any pattern[14] – whenever the actors' cultural involvement in contingencies runs on *historical precedence* rather than on the impact from an external reality (Rorty, supra): when chaos is the "illness", *path dependency* becomes the "cure". And it drives the disordered system into an institutional syndrome. This syndrome is full of paradoxes since their ritual engagement with the chaos of unpredictability, takes place in the wake of a surprisingly deft handling of historical contingency (March & Olsen, 1989; Lunnan & T. Barth, 2003).

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13 If seen with the eyes of games theory (c.f., F. Barth, 1966), transactions in knowledge are not only characterised by the unequal distribution of information, but also the lack of pre-established consensus on pay-offs (c.f., Gibbons, 1992). In fact, even if information was evenly distributed throughout a system with multiple worlds, the dissensus on pay-offs still makes for nonzero sum games (Nash). But the number of possible alternative equilibria are in a disordered system are legion. And for all practical purposes the internal dynamics of a disordered system can therefore be described but are difficult to predict.

14 Personal communication on the Cynefin model, David Snowden.

The institutional ritual behaviour is not just any type of ritual: it constitutes a secular ritualism – linked to the emergence of Weberian bureaucracy in modern times – shrouding the idiosyncratic ways of power. In the language of Wilfred Bion (1961) the past, present and future are maintained in presence in institutional isolates by a set of *basic assumptions* – in the institutionalist language 'rules of appropriateness' – while *the isolate* in which these assumptions and rules are made to operate (by definition) fosters a dynamics of self-transgression, observed by Bion in 'basic assumption groups': the rents collected – in tokens of allegiance – generate a self-transgressive dynamic, because the tracery of prestations becomes the main issue (ignoring, or at the detriment of, the environment).

Young guns

§10 – The dynamics of *opening* and *closing,* however, are tricky and complex: a group process may open and close and appear to adapt dynamically to the subject of its quest and query, while simultaneously the group's assumptions on rules are fixed, and are made to operate in a very rigid way. The Late-Modern institutional framework is more likely to operate in this "mixed" fashion. Seeing institutions as disordered systems approach allows us to approach this particular form of *immergence:* the blurring of events, signatures and depth in institutional dynamics. The way institutions are fixed in ritual forestalls the *reflective practitioner's* activity of learning from organisational dynamics: that is, to learn when the connective dynamics with critical events – in the external environment – occur or fail. However, institutions do not stumble on their *secular ritualism* – in fact, this feature makes them quite interesting in a broader scope – but rather on their failure to operate *reflexively:* the 'garbage can' management of unpredictability – solutions looking for problems – forecloses reflexive practice. In actual reality, trouble comes looking for people. And the discussion we are proposing here is not whether institutions have *good systems,* or not: rather, we are concerned with the full cycle of how problems are solved at a people-to-people level, *where value is created* and managed. In other words, we are asking: what is the

full job – not only how institutional actors are working with the support of a system (requiring pattern), but how matters are closed at a people-to-people level (requiring detail)? What are the *exit procedures?*

Culture

§11 – Typically, institutions – from time and time again – *time out.* They become "frivolous" and celebrate the unpredictable as a "fruitful chaos" – or, even, as "culture". These cultural *time-outs* cohabit quite well with directive regimes of the matter-of-fact empowerment of institutions: they can operate as the *handymen*[15] of political shortcuts – or, elliptic behaviour – and retrospectively reflect an historical understanding of their proceedings into the system. How is this possible? We learn much more about this if we agree to look at agglomerates in relation to *external realities* – rather than as isolates – and study the full dynamic of disordered systems: i.e., how it shifts between open and closed states. We then see that there is a *no-man's land* between social worlds where institutions represent but *one* possible regime – or, doctrine – of governance. Bringing the enormous pool of activities in this co-active space into the bargain, hinges on a proper take on representation, conceptualisation and design. In other words, we may create a link between *institutional actors* and *reflective practitioners* – into our understanding of how value is created and secured – by focusing on the procedural aspects of how opportunities can be explored and tested[16]. The virtue of 'institutions' – from the disordered systems point view – is that it constitutes a concept for *meso*-level dynamics: to capture these dynamics, however, we propose the alternative concept of *learning theatres*[17] at the same *meso*-level of

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15 C.f., Handyman = Fr. *Bricoleur.*

16 C.f., Fredrik Barth's return to the methodological challenge of describing 'discovery procedures' and 'procedures of falsification' throughout his (early and late) works.

17 We are indebted to seminar discussions with Mika Aaltonen, Gianni Jacucci, Ina Wagner, Yasmin Merali, Liam Bannon and Ritva Rautkylä-Willey for the shaping of this concept.

description, analysis and theory. The learning theatre is a conglomerate of rooms and props used by reflective practitioners to make good uses of disorder: learning theatres manage disordered systems by a tactics of *pace-and-lead.*

Learning

§12 – To proceed in this direction, we need to focus further on some of the prime characteristics of disordered systems. The call to study disordered systems (F. Barth, 1992) enjoins us to acquire a proper understanding of structural heterogeneities – in agglomerates of social worlds – since it preconditions our ability to grasp how the agglomerate system behaves in response to the impact of external realities (this response reflects the *ability to respond,* and is *not* necessarily *adaptive*). According to this view, the activity of picking up pattern and detail from contingency – by individual actors – is far from gratuitous: even when the benefits cannot be calculated, they can yet be premeditated. And in the sense that the external event that creates a relevance for contingencies – nor the impact of this relevance – can be predicted, the goalseeking behaviour we have in mind is *sensitive to final conditions*[18]: i.e., (a) small variations in the *occurrence* and *type* of response from the larger environment can dramatically affect (b) *how* and *which* contingencies are reframed as the context of this response in the agglomerate. Sensitivity to final conditions is eminently characteristic of political processes. However, responsivity a *priori* does not have to be the same as responsibility: *responsivity* is an activity in which being responsive is – or is considered to be – key to the outcome of the activity. As an ongoing activity, the prerogative of responsivity is simply to find a workable relation between *contents* and *constraints.* It becomes (a) functional and (b) liable only as the workable relationship between contents and constraints becomes a subject of *design,* and concretely resolved as *architecture.*

[18] The notion of sensitivity to final conditions responds to (a) the focus on the sensitivity to initial conditions in complexity theory; (b) to the four orders of causation in Aristotelian philosophy, discussed by Juarrero (1999).

Meanings

§13 – The distinctive take of 'disordered systems' approach allows to remove ourselves from the debate on whether/not culture is functionally *adaptive* to an environment (Geertz 1963, 1973) – as a binary 0/1 issue – and accept that from time and time again culture is vested in being *responsive* to an environment: in the agglomerate conditions of *being together* individuals also engage a responsive exchange with an environment beyond their social worlds: either networking with the natural environment (Latour, 1993), the technological environment (Barabasi, 2002) or the weak ties of the social environment (Granovetter, 1983) – i.e., civic networks: networks in which actors relate to an environment beyond their current world through *transitional objects* (Winnicott, 1967; 1995; Rudnytsky, 1993) which in turn negotiate relationships in their world[19]. This activity has an interactive component – of course – but also an *intra-active* component, directed towards the environment, involving tools and engaging consciousness and emotions. This intra-active component is defined as follows: the quest and query of actors in seeking to establish dynamic links between (a) how they manage their knowledge and (b) how they manage their networks.

[19] Transitional objects = objects used as proxy substitutes – or, placeholders – of an environment needed for relating to someone – or, something – inside one's world. In Winnicott's psychoanalytic theory: mother's body is an environment needed for relating to Mother. When mother's body is not there – and yet the relationship to mother is summoned – a teddy may act as a proxy substitute (or transitional object) to the child. In this way Mother (as an objective subject) may be summoned in mother's absence (as a subjective object). The pattern and detail of how elements interact is deemed crucial to the child's development from a me to an I, and the transitional object is a boundary marker negotiating the relationship between the I and the me. In adult life, human beings evolve to become the reflective practitioners of negotiating this relationship – i.e., the self – through the use of objects.

Nurture

§14 – Accordingly, in disordered systems, individuals are not only social beings but also civic creatures, to whom *being together* is way of being and a basic assumption – derived from the *agglomerate* as a given condition – and therefore also turn their attention *inwards:* actors can withdraw from interaction to engage in an other type of activity. That is, a backstage activity, seeking to connect with realities *within* – through the *interface* of artefacts – and *beyond* the economic requirements and social scripts of their social worlds. The point being that, in agglomerates, such activities are not economically insignificant. Consider the paradoxical behaviour epitomised by the famous "the murderous driver" in games theory (or, as one says in French – *reculer pour mieux sauter*): in agglomerates, human actors can go inwards – within their current world – with the intention of reaching *beyond*[20]. These operations are sensitive to final conditions: small changes in external events that create relevance for contingencies make a big difference for contextual understandings, values created and – at some point – shared. However, it is evident that individual actors cannot engage in such activities if effectively isolated: even when there are watersheds between worlds they are connected by a trickle – i.e., they marginally affect each other – in agglomerates. This is even true in tightly guarded pockets such as jails and psychiatric institutions. Humans appear to engage in this type of gleaning activity – or, *boundary spanning* – no matter how tightly guarded the boundaries in and out of their world: the critical issue is density – agglomeration. And under these conditions boundaries appear to *foster* such activities rather than discourage them. This is why (a) the agglomerate and (b) the boundaries of the worlds it brings together are *both* constitutive of disordered systems. Under such circumstances

[20] Evidently, the meaning of this stereotyped paradox on human behaviour can coin anything from the life of a mystic, via the businessperson who reads its daily newspaper, to systems developers working with technology to serve users in processes of participatory design. Thus, the phase shifts of relevance (and the present attempt to define knowledge and knowledge activities operationally).

the back-stage withdrawal of actors, is not motivated by the need for abstract intellectual exercises of finding good names and concepts for things: actors are concerned with finding how their knowledge can be *instantiated* by the realities in which they become involved. There is no ready use for knowledge: this is a main characteristic of disordered systems.

Sensemaking

§15 – With this inclusive agenda it is then critical to situate properly the level of analysis, in order to delimit what the 'disordered systems' concept *does:* we are specifically *not* talking about a psychological mechanism in individuals, but about a *meso*-level dynamic of activity under the agglomerate conditions of *being together.* Hence, the importance of giving heed to *boundary markers:* the (a) internal contingencies that occasionally *shift* to become (b) contexts for external events – and thereby as an "interface" between actors and their environment – seek beyond *social worlds.* The toolbox of the tactical drills used to call on reality, harbour claims and secure belonging, includes boundary markers as first order tools. They allow realities to be transformed into *cultural contents,* and this transformation at all stages takes place the *collective sphere.* Accordingly, we are not – pace Wittgenstein – falling into the trap of assuming the *existence of private languages.* Rather, we are attempting to highlight the dynamic interplay of practices and artefacts that constrain and extend human understandings, beyond the precincts of *language games:* and it all occurs in the co-active space of the agglomerate, in which *being together* is a material condition. Thus, gleaning – or, boundary spanning – is an activity taking place at the *margins* of what can be expressed in dialogue, and transactions in knowledge take over: that is, meanings that are not shared but made *interoperable.*

Emancipation

§16 – Individuals reap benefits from transactions in knowledge, whenever knowledge eventually checks out with an external environment (or is indexed by a reality to which it may thereby respond). Ideas are often seated in realities that at once (a) isolate and (b) escape them: but when realities are made to interoperate the same ideas connect. Thus, *reality checks* are brought into the realm of *sensemaking* and the coupling of ideas – by making realities interoperable – define what we understand as the mean-time of knowledge transactions. The *mean-time*[21] of knowledge transactions feeds – or, *immerges* into – knowledge identities. In fact, knowledge identities are marked by being effectively *linked* in much the same way as ethnicity is marked by being effectively *distinct:* and if the boundary markers of ethnicity are tied up in the social organisation of cultural *difference* (F. Barth, 1969), the boundary markers of knowledge identities are tied up in the cultural policies of *links* (Barabasi, 2002; Granovetter, 1983). Money – in Georg Simmel's sense (1990 [1900]) – provides an excellent example: individual holdings of money are evidently recognised, but the money *as such* is beyond private ownership – it is "owned" by a Central Bank. *This* money – general money (Godelier, 1986) – is "shareware" and a *placeholder* for personal recognition that extends beyond boundaries and transcends the life span of an individual. *That* money belongs somewhere, or to someone. In the language of

[21] The notion of 'mean-time' is a neologism pegged to an expression with a common horizon of meanings (as GMT and standing expressions such as "in the mean time"): the intention that motivates the mean-time concept it to capture the time running between the initiation of the project – and the contractual agreements preceding it – and the closing of a project (and its subsequent inclusion into the project portfolio of an enterprise). The mean-time of knowledge work is therefore the time of the running, or ongoing, activity – whether it is limited by the time span of a project or not – and it is coined to emphasise and capture the process of creation and securing value. In Paul Ricoeur's terms (Ricoeur, 1966), it is between the *courte durée* (short time span – or, short term) and the *longue durée* (long time span – or, long term). The *mean-time* of knowledge work is qualitatively different from the time of short- and long term mindsets in management.

modelling: there is a difference between money as an *object,* and money as an *instance.* Making this difference makes a lot of difference (Bateson, 1972). Self-transcending systems dynamics foster the readability of ideas, but make their origins difficult to trace.

Practice

§17 – Therefore the concept of 'boundary object' (Star & Griesemer, 1989) pertinently relates to our business with disordered systems, and its relevance for understanding the complex dynamics in agglomerates: in fact, the items exhibited in a co-active space – such as a museum, a city or any other agglomerate concentration – are better conceived as *boundary objects* than as markers (c.f., §16), because the *link* they convey with the external environment – beyond social worlds – creates *affordances* for co-construction: hence, they bring us beyond a narrow sense of *value creation,* to a sense of transations in knowledge that broaden the "civic bandwidth". The co-construction of reality by actors with differently situated types of knowledge (Haraway, 1991; Preziosi & Farago, 2004): Star & Griesemer's choice of a *zoological* museum as their case is a case in point, since the natural environment of course is the archetype of the external reality beyond social worlds. However, the point would evidently be identical with an ethnographic museum where the boundary objects are constituted by cultural artefacts. In fact, museum exhibits are candidate laboratories for how contextual value is created for contingencies[22] in disordered systems. In the language of modelling: the *objects* at a museum exhibition belong to everyone [as messages or examples of something], while the *instance* belongs exclusively to the museum

[22] A point underscored by many of Marcel Duchamp's well-known conceptual artworks, such as the infamous upside-down urinal, which for the event of the exhibition was called "Fountain". This perspective is, of course, even more relevant for social and environmentalist projects – devoid of artworks and even of reference to artworks – which today are exhibited in art-spaces.

[i.e., *that* particular item and the collection of other listed items it belongs to]. However, if we go beyond exhibits – and exhibit spaces – to the *practice* of exhibiting, we are approaching the type of focus advocated for the *learning theatre* (c.f., Yates, 1966).

Tsunami

§18 – We are then not primarily concerned with the inter-subjective interaction in the co-construction of boundary objects: we are rather concerned with how the reflective practitioners' construction of boundary objects – in a co-active space – generates forms of co-operation *(synergy)* and joint rule *(synarchy)* in agglomerates. That is, *civic networks* understood as the *voluntary association* of practices and artefacts in a group of people. This priority does not reflect a dismissal of co-construction: in *systems development* – in the sense, of information systems – the co-construction of boundary objects is important in the management of organisational change. However, there are some aspects of collaboration – relating to *reality checks* – that enter the space of sensemaking by an itinerary that differs from co-construction in significant ways. When in use, people need their boundary objects to warrant that their ideas are seated in realities, and *then* help them make sense of human relations. This is due to the fact that while (a) while new forms of co-operation *emerge;* (b) *synarchies* – or, civic networks – *immerge.* New forms of co-operation are proposed to everyone, while synarchies in practice can exist in exclusive ways. Vouching for a stereoscopic view of collaborative technologies and networks – as we do – therefore is an open invitation for information system (IS) and knowledge management (KM) to integrate their efforts and views (c.f., Sage, Stanbridge & Husmann, 2005). The great challenge in this connection – if seen from a European point of view – is (a) how virtual resources can be conjugated to appear as *instances* of objects (b) to realise these objects as *physical prototypes* and thereby include virtual resources into the backstage of our theatre. The possibilities of connecting *knowledge architectures* with the *dynamics of practices and artefacts,* then set the stage for mobilising the man-

agement of – knowledge and – networks in a convergent dynamics. Let us wrap up this proposal with a regulative idea. Thus, our anti-Türing question: *how can we know that a computer is different from any other trivial object?* In the learning theatre we can: physical prototypes – or, objects – can be concepts. This has been well known and much explored in the *art-world* for quite some time. However, the corollary is non-trivial: in the learning theatre, models can be instances of objects[23]. Here the point that concepts are defined through use is driven further: indeed, interaction is defined by performance (Giulio Jacucci, 2005).

Knowledge

§19 – This order of priority may be solved through design, but we still need to know what *kind* of design concept is needed (Gianni Jacucci, T. Barth, Tinella, 2003). The design we need to bring the reality check into the space of sensemaking may fruitfully be conceived as *design for end users' design in use* (DEUDU): that is, a design allowing the reflective practitioner to (a) engage with realities beyond his/her current world [*first practice learning* reflecting critical events and their dynamics], and *then* (b) co-construct the experiences from this exchange with peers (reflective their values and economic interests). This design-concept conveys a particular take on *boundary objects:* as a tool, it feeds back representations while in use; as a representation, it calibrates different uses. In other words,

[23] To highlight this point: prototypes used as theoretical objects would have various theories – and relations between theories – is instances. For instance, actor network theory (ANT, Latour, Callon, Knorr-Cetina, etc.) and activity theory (AT, Vygotsky, Leont'ev, Engeström, etc.)) can be treated as instances of objects, or even instances of the same object (depending on the model). The point of treating theories in this way can compared to mathematical topology (c.f., Leach, 1961): for clearly defined purposes it can be relevant to compare geometrical objects (a) without broken lines to geometrical objects (b) with broken lines. Thus, circles, squares, triangles, polyhedra belong to group (a), while crosses, David stars and swastikas belong to (b). This can only be done with a clearly formulated purpose and to an extent not greater than required.

the boundary object (1) divides and (2) connects *practices* and *artefacts* in non-random ways (Schmidt & Wagner, 2005) – i.e., with detail and pattern. In our learning theatre, the DEUDU approach reflects the concern that human actors need a space in which they can get prepared – both for first practices learning and group work – which in the language of theatre may be called a *green room*[24]. We will return with a sufficient detail to address the *architectural issues* of how this functionality of the boundary object is solved (i.e., the concrete issues of divisions and connections). In the following, however, we will provide a firmer framework to set this issue in a political setting.

Resources

§20 – Let us recapitulate. Stickiness between social worlds is an affordance generated whenever boundary objects serve to organise a response to the outside world. One of Hannah Arendt's chief statements in *Vita Activa* (2003) has a direct bearing on the political setting: artefacts – the existence of human world of *things* – precondition the possibility of *political dialogue.* With this political view of co-active spaces, boundary objects may be seen as *connective hubs* that warrant the stickiness – synergy – between social worlds, as well as the synarchy – joint rule – reflected in various arrangements (such as the community arrangements in different worlds, but also civic networks that at some point may mutate into new worlds that may co-exist of replace older ones). These connective hubs decay and wear out and new ones are created all the time: actors are *nodes* that use boundary objects as *hubs* to create transient links with an external environment, whenever reflective actors organise and solicit a response from realities beyond their current worlds. In disordered systems, we may move from the study of human activity, to a critical understanding of *activism* (c.f., Hardt & Negri, 2000). In

[24] Green Room: space where actors hang out before entering the stage – or, between the scenes of the play – taking on and off their role, and assuming the character changes that defines it in the play.

the learning theatres perspectives *activism* reflects a condition – which is by no means the monopoly of small subaltern political groups – in which learning and reflective practitioners invade the space held by institutions in modern times.

Shields

§21 – We are therefore summoned to create a better understanding of the practices that delegate such capacities to the class of artefacts called 'boundary objects', since the co-evolution of *practices* and *artefacts* – in Arendt's framework (2003) – can be grasped as the organisation and solicitation of response, to external events the external environment, through a dialogue that is political inasmuch as it relates to collective action beyond social scripts (Arendt, 2004). Of course, these ideas are shared cultural meanings that are almost trivial in the mindset of modern critical theory. However, when transported into the setting of the late-modern knowledge society these discussions reveal a surprising and unexploited potential: whereas the mode of production in the modern industrial economic formation was a terrain for political conquests, the political potential of the knowledge society would appear to be imminent in the reflective practice that defines knowledge work. When this assumption fails, we are led to ask: why? Why isn't the knowledge society ubiquitously and pervasively political? Are people working too much and therefore react to the topic of political engagement – as busy modern Germans, pace Nietzsche (1991), reacted to religion – with *surprise*? And if so: what is the *genealogy* of this surprise? We must return to the beginning and the end – the origin – of complexity.

Turn

§22 – As a determination of the agglomerate as a form of life and a way of being, *disordered systems* denote complex dynamics that frequently appear *messy* from the point of view of the agglomerate worlds. The disordered system shifts

between (a) *transgressing* and (b) *transcending* its worlds. Under which conditions do such shifts disappear and become invisible to the worlds? And when – to the contrary – are they perceived? Our hypothesis is that the messy *gestalt* of political action to the inhabitants of social worlds is because they alternate between getting lost in (a) *details* of action plans, and in (b) *generalities* of patterns in political action. As they move back-and-forth between *populist* (bottom-up) and *elitist* (top-down) perspectives on political developments, they become caught by a "bi-polar syndrome" of sorts, and – at a critical juncture – cease to separate between transcending and transgressive politics (alongside the possibility of major shifts in the political climate). Mass-media, naturally, play a central role fostering and nurturing these developments[25]. In counterpoint, let us envisage a third dynamic – different from merely muddling through with bottom-up and top-down perspectives: let us envisage *metamorphosis* as a third dynamics in disordered systems, different from self-transcendence and self- transgression. The concept of metamorphosis epitomises an *interstitial dynamic* – a state *between* an initial and final state – during which the system is immergent, or deep. The learning theatre is *deep* – in this sense: an interstitial dynamic, with an *entrance* and an *exit*[26]. Concomitantly, the learning theatre may be understood as the design-to-management of *phase transitions.*

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[25] Merali, Yasmin (2003): contribution to the panel on complexity and systems at ECIS2003 in Naples, on the complex dynamics of the internet and the development of news-communities, with Al Qaeda and the Middle Eastern conflict theatre as cases [Chair: Theodor Barth].

[26] The computer simulation experiments conducted by researchers in the Santa Fe milieu's early days are also deep in this sense: that is, if the conceptual and practical work needed to set them up is included. In other words: experiments that display collective behaviours emerging from the interaction of multiple simple agents, is itself immergent if seen as a phase in the total HCI (Human Computer Interaction). In this larger framework, Per Bak's uncouth question (Waldrop, 1992) of whether his scientific peers knew what they were talking about, in fact summons the context of what in mainstream emergence theory appears as contingencies.

The schema represents a series of key-words grouped under the cells of 'object' and 'instance': these two terms should be understood as the terms of a mutually constitutive relationship (and likewise the terms listed under these).

Object	**Instance**
Pattern	Detail
General	Specific
Background/Purpose	Enter/Exit
Transition	Immergence
Collage/Montage	Depth/Connection
Practice/Artefact	Action/Event
Tipping Events	Lock-in

Principle

§23 – Our proposed alternative to the top-down and bottom-up approaches is *middle-out.* It is based on the assumption of *civil rights* for all, placed into an operational setting: i.e., that defining and holding a place for individual self-recognition – and making such placeholders available as "shareware" – is distinct from the biography of how well different people fare: *placeholders* and *stakeholders* are distinct. This is not a liberalist assumption, but rather a methodological one: the construction of (a) *artefacts* that mediate knowledge and the development of (b) *practices* that create value, represent two different areas of management which – from a methodological point of view – cannot be reduced to one another. The middle-out perspective, accordingly, proposes a unified model of empowerment, in which the *push-and-pull* of (a) mediation [shared] and (b) value creation [divided] may converge in a common *design space.* Therefore, the *middle-out* perspective proposed here highlights a level of management, rather than the importance of a special class of personnel in business enterprises (i.e., 'middle managers). It focuses on:

a. the importance of *meso*-level of professional activities in the construction of mediating artefacts;
b. the importance of the *mean-time* of knowledge work [f.n. 15] and deliveries in the securing of value creation [i.e., reaping benefits];
c. the importance of making these converge in a single design space, by the use of *resonance* in phase transitions;

Our corollary: there are features of dynamic effectiveness (Juarrero, 1999) – or, causation – that do not appear unless the dynamics are studied at the *meso*-level of systems evolution. For instance, the *meso*-level focus affects the way we take the *individual actor*-level into consideration: we are not concerned with individual actors as isolates, but are interested how individuals act, when the material reality of *being together* can be assumed. We are interested in how they pull it off, in a setting where boundary objects are the *placeholders* of co-construction, and the success at identifying boundary objects with this function is one of the *stakeholders'* the main bargaining points during transactions in knowledge. This is a scheme to build our capacity of including what has been interesting coined 'externalities' in economics (Arthur, 1994). Frequently this means that the actors effectively engaged in harbouring success are not the same as the ones that worked out and produced the solution. We propose to gather these two activities and discuss what might make them converge in a single design-to-management space, by inquiring into the marginal exchange that sometimes takes place between (a) the enter- and (b) exit- phases of transitions (c.f., Wallerstein, 1991).

Wisdom

§24 – The *meso*-level focus brings attention to some particularities of *lock-in* that seem to *not* appear at the macro-level. Though instances of macro-level economy have become textbook examples of lock-in (Arthur, 1994) – ranging from QWERTY keyboards, Freon refrigerators, fax machines and Microsoft – *lock-in* at the *meso*-level of complex dynamics is a (1) high frequency but (2) irregular phenom-

enon. At the *meso*-level of analysis, *lock-in* is problematic therefore interesting. Lock-in at the *meso*-level is a composite phenomenon involving the *coupling of:*

a. artefacts and practices, with
b. actions and events[27]

This means that the two following dimensions of lock-in are clearly distinct at the *meso*-level of complex dynamics:

a. bringing together the parts of a previously non-existing whole, and
b. achieving the threshold that mobilises a *critical mass* of users

These two thresholds are similar in pattern, but they are situated at the opposite ends of a phase transition: the one at the *entrance,* the other at the *exit.* But though they are dissociated, these dimensions may converge in the mean-time of knowledge work, if provided the design space that affords complexity management[28]. To provide this space we define the afore-mentioned marginal exchange between activities (a) and (b).

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27 In Husserl's phenomenology (1970), phenomena have nothing to do with future, historical or actual events: his 'phenomenological reduction' withdraws the phenomenon from human emotion, involvement and valuation, in order to submit it to a philosophical inquiry. This means that the call to understand a phenomenon by coupling 'practices and artefacts' with 'actions and events' is non-trivial.

28 Dave Snowden's early ideas on the Cynefin model is an example of such a design space (Snowden, David http://www.knowledgeboard.com/library/cynefin.pdf), Dave's professional activities – as a reflective practitioner – also point in this direction. There are of course other models, and ways of making them tangible in the space of mixed media that is typical of co-active spaces in agglomerates.

Understanding

§25 – We do not situate this research problem at the *strategic* level of business reporting – focusing on the place of "intangibles" or the value creating in the enterprise related to knowledge (c.f., Roberts & Breunig, 2004) – nor the complementary accounts on how the value of trust impacts on the societal economy (c.f., Putnam, 2000; T. Barth, 2002). These are longer term dimensions of value creation. Here we are thinking more specifically on the *operational* problems of invoicing and acknowledging knowledge work, or using design to make knowledge work deliveries *tangible* in the mean-time of value creation (i.e., between short term and long term):

1. internal systems for invoicing by the hour – in private and public enterprises – do not reflect the fact that value creation in knowledge work tends to proceed by *fits & starts* delivers in *spurts,*
2. external invoicing for past deliveries frequently suffer from the problem that the *memory* of knowledge deliveries is not socially very robust[29].

Representing knowledge work deliveries *outside* of the collaborative dynamics that engage practices and artefacts therefore represents a major source of trouble (Schmidt & Wagner, 2005). The disordered systems agenda addresses this particular slice of *knowledge accountability:* establishing an ongoing design-to-management activity that fosters convergence between two clusters of *people-and-problems:* (1) the *creative cluster* coming up with the boundary object which is key in making the parts "tip" into a whole, (2) the *business cluster* making the solution locks into mean-time value creation. The people can be the same, yet the clusters are different and can never be fused: they can only co-evolve convergently in time. The distinctiveness of the *meso*-level dynamics lies precisely here: at the macro-level the two threshold dynamics appear as though they constituted a structurally unified phenomenon. The disjuncture identified at the meso-level,

[29] C.f., the concept of social robustness in Nowotny & Gibbons, 2001.

is what makes it a management issue rather than one of the surprising affects of Adam Smith's invisible hand (c.f., Cohen & Axelrod, 1999). The point of the exercise is therefore to point out the design-to-management in which convergence may take place, and discuss why – frequently – it does not happen. Knowledge intensive service providers – as IT consultants developing custom made systems – constitute a prime example of the point we are making here: a particularity of a knowledge intensive development project is that knowledge deliveries have to be supported by sustaining sales throughout the project: that is, by repeatedly re-designing and multiplying inter-enterprise relationships, conjointly – and in parallel – with the development of the system.

Beauty

§26 – However, we will not profess advanced design principles to reach this end here, but rather discuss the timing of design – and type of design – that may contribute to make knowledge deliveries more *tangible* and more *socially robust.* Boundary objects can require *minor knowledge* in comparison to the carefully engineered parts they bring together. Their virtue is first and foremost lies in responding to *something,* or *someone.* Hence, our challenge does not lie in displaying the sophistication of the knowledge "stored in" boundary objects, but rather to bring clarity to how this class objects – under certain conditions – come to *canalise* a special class of actions: i.e., those that *couple:*

a. general knowledge with specific events *[engagement],*
b. objects with instances *[operability],*
c. placeholders with stakeholders *[traceability],* and
d. physical prototypes with virtual models *[readability].*

Since we have now reached back to the foursquare definition of the steps generating immergence in a disordered system (c.f., §8), we may now use our enriched box of tools and representations to show how drift can be generated by

the dissipation of value creation *into* the system, and determine how deep we need to be to benefit from the value creation of knowledge work.

Kindness

§ 27 – An example from a airport bestseller by Malcolm Gladwell (2001) – *The Tipping Point – How Little Things Can make a Big Difference* – will serve illustrate the point of how much depth is needed. In an experimental information campaign on *tetanus,* psychologist Howard Levanthal spread carefully engineered *high-* and *low-* fear information materials on the disease among different groups of students: the difference on contents were measurable on attitudes concerning *tetanus* in the two groups, but had little effect on behaviour. About 3% went to get inoculated. In a later version of the experiment the rate rose to 28%, with an equal share of students from the *high-* and *low-* fear groups (Gladwell, op.cit. p. 97): and what was the secret?

> *"It was simply including a map of the campus, with the university health building circled and the times that shots were available clearly listed."*

Another story – from one of our projects – relates a similar message. The company Simplicitas Ltd. had acquired and developed a tool called Theodorakis which it was using and selling in a number of projects. From an engineering point of view it is a technological sensation: a very powerful tool for visual modelling that can be loaded with a range of equally sophisticated templates for specialised modelling in customer firms. However, the tool proved to be extremely difficult to represent – and talk about – outside the context of use, and therefore required a work-consuming sales effort. Then a gathering in Washington D.C. was organised to discuss use cases and future requirements among modellers. An informal *travelogue* relating the journey from Norway to the US and the encounter with other users was received as a first generation success of representing the generic

tool to novice – or, general – users[30]. The travelogue was later used to support the sales process with new customers.

Both examples show how boundary objects – the map and the travelogue – come about by a non-directive search for pattern and detail in contingencies that succeeds in transforming contingencies into *context.* The two stories also serve to exemplify how experiments in *trying and failing* – different from both *bricolage* and engineering – serve to probe the depth needed to make intelligent parts in a way that responds to a reality check, as a way of making sense. Let us call this attitude, or orientation, *connective holism.* It is impossible to predict on beforehand *which* little "trinket" – or, artefact – is going to canalise job. But it is possible to understand the characteristics of the practices serving to organise the response: the trial and failure used to determine the depth needed to make sense, is a *comparative* exercise used by artists and architects, and known as *collage/montage*[31]. To go further we must then address the issue of how these dynamics – involving practices and artefacts – are linked up with actions and events.

Strength

§28 – To link up collage/montage with actions & events – which is the gist of the design-to-management idea – we must address how knowledge becomes *tacit* (Polanyi, 1966). And, in this regard, we are proceeding from the opposite end of those who ask how *tacit knowledge* can be unravelled and coded. In its relevance to ICT, our question is not linked to how knowledge may be stored, shared and patterned as a work process – which will always be lacking in detail – but rather to the selection of objects that serve to prototype bundles of virtual resources in physical space: i.e., *tangible computing* (Dourish, 2000). Furthermore, the coupling of such objects in the purpose of action – i.e., prototyping objects in view of their

30 Th. Barth in 2003 (in Norwegian).

31 Personal exchange with Ina Wagner at the ALP-IS seminar 2005.

practical relevance to users – not only promises a renaissance for *objects* in human lifeworlds (as theorised by Arendt [2003] and eulogised by Baudrillard [1968]), but also provides a laboratory to explore the design aspects of *canalisation:* how virtual technologies, in general, may be mobilised to *enhance reality* (Giulio Jacucci, 2005). Such laboratories are deep. But we do not want them to be *unfathomly deep:* we need to find a way of determining how deep they need to be.

Foundation

§29 – To fathom the depth in disordered systems, we need an equivalent of *collage/montage* applicable to space. For this we need not one single laboratory, but a collage/montage – or, a conglomerate – of laboratories: this is our concept of *theatre.* The spaces of the theatre are created for different experimental purposes, but allow reflective practitioners to work simultaneously at two levels: (a) with the *tipping events* of mediation *inside* each experimental space; (b) with the *lock in* of value creation *between* the spaces [i.e., locking in the values created in the bulk of activities]. As pointed out earlier, the pattern of these activities is similar. However, this similarity is formal: the substance of mediation and value creation is dissimilar. Inside the experimental spaces of the theatre, the realities brought into sensemaking are different, because the sensemaking spaces are different: as a consequence the experimental spaces are eventually *vectored* to different realities. At the agglomerate level, where the spaces are brought together, the relation between the experimental spaces – as an effect – eventually becomes so squeezed and brittle that the activity at level (b) is canalised towards *a vectorial sum* of the realities (c.f., Wallerstein, 1991 [Prigogine & Stengers, 1979]). Level (b) activity is a decision making process close to Jones' and Humphrey's notion of authoring (Jones & Humphrey, 2004). While the organisation of response is driven by contents in mediation (a), the organisation of response is driven by constraints in value creation (b). Accordingly, the exchange we have in mind between (a) and (b) is realised in *architectures* that resolve contents and constraints conjointly. Even though we are addressing issues relating to ICT, the concept of architecture here

refers to the older term: i.e. the realisation of contents and constraints in physical space through design. In architecture depth can be considerable or negligible: in either case, it has to be *resolved* and made acceptable to contractors, users, juries and peers. Architecture is therefore a key methodological concept for the middle-out approach: using design to negotiate the relation between contents and constraints, with a clearly formulated purpose, and to an extent not greater than required to organise an effective response to critical events in the environment.

Victory

§30 – On this background *design for end users' design in use* (DEUDU) should be considered as the generic design-to-management principle of the present agenda proposal[32]. It is based on the idea that (a) mediation – especially in settings of *first practice* – can be learned: *designing the job* in a modelling space builds a competence in comparison, by multiplying the experiences in design and execution. The user *learns to learn:* not abstractly but by developing a repertoire of *learning patterns.* Furthermore, DEUDU is based on the idea that (b) value creation – especially in the delivery of innovation – is *accountable:* the experience in collage/montage – as the core concept for user design in use – provides the user with the experience that a cogent representation of the whole is possible even as the parts are unfinished and ongoing. The marginal exchange between (a) and (b) *enhanced* by an architectural solution, yields the modelling space of the *learning portfolio*[33]. This solution is architectural in the sense of resolving the push-and-pull of *contents* and *constraints* in ongoing learning processes: (a) at the level of mediation [i.e., folder-, or container-, architecture]; (b) at the level of value creation [i.e., portfolio architecture]. Both levels are engaged in organising a response, under conditions of pressure of external events. But DEUDU brings us beyond the theatre (§29), the middle-out exchange is now supported by a tool: the learning portfolio. The learning portfolio

32 As such it constitutes the first level of dynamic efficiency design.

33 Laurence Habib, personal communication.

is a tool for a generation of knowledge management (KM): sharing ongoing learning processes with multiple dimensions, rather than inventories or representations of knowledge[34]. DEUDU therefore represents the definitive step beyond the dichotomy of the *bricoleur* (handyman) and the *ingénieur* (engineer).

Splendour

§31 – The *learning theatre* transforms the elements, features, functionalities and interactions of the learning portfolio into *instances* of physical object prototypes. It should be considered as the principle for specific design, in the present agenda proposal[35]. While the learning portfolio is content driven and managed through constraints, the learning theatre is driven by constraints and managed through contents: this is why the learning theatre is an *expressive* space (Giulio Jacucci, 2005). Like the simple theatre in §29 it is an agglomerate of several spaces, but it goes beyond the *engagement* and *authoring* fostered by the simple theatre in making the *traceries* of the learning portfolio *readable* in space. While the activities in the learning portfolio have backgrounds and purposes, the activities in the learning theatre bring to the fore the *boundaries* of these activities: since the specific design principle uses the constraint of *practical pertinence* (Prieto, 1975) to select the *prototypes* – used to express the portfolio in a space of *performance* (Giulio Jacucci, ibid.) – that relate to the thematic bundles in the portfolio (at the folder, or container, level). As the physical analogues of objects, the prototypes therefore are made to operate as the *boundary objects* of virtual resources in physical space. This is non-trivial, since: (1) the learning theatre can be used as a method to determine the patterns of *immergence* in the learning portfolio, and make them

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34 The learning portfolio harnesses immergence in a relational space with multiple and ongoing learning processes, which in themselves are manageable only through work design: in other words, the learning portfolio is a modelling environment for design-to-management of learning processes that in themselves – or, in isolation – are unrepresented, and even non-representable.

35 As such it constitutes the second level of dynamic efficiency design.

readable[36]; (2) the compound learning -portfolio & -theatre is the unified design space we have announced earlier. Since it models a dynamic interaction between practices and artefacts, it can also be used to manage – as announced earlier – the relation between artefacts & practices and actions & events. In other words, we are suggesting that the complex dynamics – in the sense of dynamic effectiveness (Juarrero, 1999) – that presuppose the mediation and value creation of humans in order to occur can be harnessed with the design-to-management approach. Since, the learning theatre and the learning portfolio is like the left and right legs, we may ask what comes about by walking. Is the long walk towards the knowledge society in Europe become shorter if we apply the wisdom of human networks to the design space discussed here? May we assume that the closer the practices and artefacts of the design space are to the actions and events of human networks, the more likely we are to manage lock-in as a regular aspect of *meso*-level dynamics? Will the expressive space of learning theatres ease task of making deliveries representable in *mean-time* of knowledge work? Will the adaptation of portfolio architecture to the limits of human short term memory make them stick better? Well, yes…probably.

Citizenship

§32 – *The whole is less than the sum of its parts,* is the canon of how wholes are generated by immergence. The "implosions" that connect and make networks grow tighter, are dynamics that may be understood as germane to disordered systems. The prerogative of disordered system – as a conceptual framework for the analysis of complex dynamics – is therefore not limited to economic behaviours, but to the co-evolution of human life-worlds and technologies in *mixed economies.* Human beings are not simple agents: they *forget* (Bannon, *forthcoming*[37]),

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[36] It is assumed that such readability does not emerge in portfolios if left to themselves.

[37] Personal communication: "Forgetting as "a Feature, not a Bug": the Duality of Memory and Implications for Ubiquitous Computing."

reflect (D.A. Schön, in Newman, 1999) and *remember* (Lowenthal, 1985). Immergence is key to understand human mentation, as well as how human beings grow closer to each other – or farther apart – in the sense of being potentially available to each other. The "bandwidth" of *being together* – as the material condition of living in agglomerates – evidently is variable: it can be narrow and it can be broad, it can become narrower and it can become broader. This issue is core to the small and large decisions on how relation between mediation and value creation should be solved in mixed economies. Concomitantly, the convergence between KM and IS – as evoked in this paper – can bring about a new level of reflection on *citizenship* in Europe: beyond a collection of constitutional rights and juridical procedures for legal subjects, the convergence and co-evolution between KM and IS can bring about a new agenda for citizens as *political subjects:* the co-active space of agglomerates has been presented here as a scenario of response to critical events (Das, 1995). It is the space of *chorè* – of movement[38] – at once separated from and connected to the environment by the world of things – artefacts – which has been used to situate the role of *architecture* in agglomerates (Møystad, 1994). This is why – in this particular paper – we have been concerned with individuals as actors on stage, in dialogue with a public (Boal, 1979). By adopting this focus, we do not pretend to exhaust the policy issues of the knowledge society: we have used this particular focus to make a point, and propose an agenda related to that point: bringing IS and KM to pitch with Post-Modern social theory (Cilliers, 1998).

[38] Also in the virtual sense (Massumi, 2002).

Bibliography

Aaltonen, Mika & Barth, Theodor: 2005, "How do we Make Sense of the Future" – Analysis of Futures Research Methodology" Forthcoming in Journal of Futures Studies.

Appardurai , Arjun: 1996, Modernity at Large. Cultural dimensions of globalization. Minneapolis: U of Minnesota P, 31.

Arendt, Hannah: 2003, Vita Activa or vom tätigen Leben. München: Piper.

Arendt, Hannah: 2004, Then Origins of Totalitarianism, New York: Schocken.

Arthur, Brian: 1994, Increasing Returns and Path Dependence in the Economy, Economics, Cognition, and Society; Ann Arbor: The University of Michigan Press.

Bakhtin, Mikhail: 1981, The Dialogic Imagination: Four Essays, ed. Michael Holquist, trans. Caryl Emerson & Michael Holmquist, Austin: University of Texas Press.

Barabasi, Albert-László: 2002, Linked – The New Science of Networks, Cambr. Mas.: Perseus Publ.

Barth, Fredrik: 1966, Models of Social Organisation, Occasional Paper 23, The Royal Anthropological Institute of Great Britain and Ireland.

Barth, Fredrik: 1983, Sohar: Culture and Society in an Omani Town, Baltimore: Johns Hopkins University Press.

Barth, Fredrik: 1987, Cosmologies in the Making: a Generative Approach to Cultural Variation in inner New Guinea, Cambridge Studies in Social Anthropology: Cambridge University Press.

Barth, Fredrik: 1993, Balinese Worlds, Chicago: University of Chicago Press.

Barth, Fredrik: 1992, "Towards a Greater Naturalism in Conceptualising Societies" repr. From Kupar, Adam (ed.) Conceptualising Society, London: Routledge.

Barth, Theodor: 2002, "The Role of Human and Social Capital – Complex Issues raised by the OECD" KUNNE Nedtegnelser N01/02, SINTEF Industrial Management.

Bateson, Gregory: 1972, Steps to an Ecology of Mind: Essays in Anthropology, Psychiatry, Evolution and Epistemology, London: Intertext Books.

Baudrillard, Jean: 1968, Le système des objets, Paris: Gallimard.

Bion, W. R.: 1961, Experiences in Groups, London: Tavistock

Boal, Agusto: 1979, Theatre of the Oppressed, London: Pluto Press.

Castells, Manuel: 1996, The Rise of the Network Society, in series The Information Age: Economy, Society and Culture, Oxford: Blackwell.

Cilliers, Paul: 1998, Complexity and Postmodernism: Understanding Complex Systems, London & New York: Routledge.

Certeau, Michel de: 1984, The Practice of Everyday Life, Berkeley Calif.: University of California Press.

Cohen, Don & Axelrod, R.: 1999, Harnessing Complexity: Organizational Implications for a Scientific Frontier, New York: Free Press.

Crites, S.: 1971, The Narrative Quality of Experience, in Journal of the American Academy of Religion. 39, 291-311.

Das, Veena: 1995, Critical Events: an Anthropological Perspective on Contemporary India, Oxford India Paperbacks, Dehli: Oxford University Press.

Deleuze, Gilles: 1969, The Logic of Sense, Continuum, London & New York: The Athlone Press.

Dourish, Paul: 2000, "A Foundational Framework for Situated Computing", Computer Science Laboratory, Rank Xerox PARC.

Gibbons, Robert: 1992, A Primer in Games Theory, Financial Times, London: Prentice Hall.

Geertz, Clifford: 1963, "The Ecological Approach in Anthropology", in Geertz (ed.) Agricultural Involution: the Process of Ecological Change in Indonesia, Berkeley and Los Angeles: University of California Press, pp. 1-11.

Geertz, Clifford: 1973, The Interpretation of Cultures: Selected Essays, London: Hutchinson.

Gladwell, Malcolm: 2001, The Tipping Point: How Little Things can make a Big Difference, London: Abacus.

Godelier, Maurice: 1986, The Mental and the Material: Thought, Economy and Society, London: Verso.

Granovetter, Mark: 1983, The Strenth of Weak Ties: a Network Theory Revisited, State University of New York: Stony Brooks, Sociological Theory.

Haraway, Donna: 1991, Simians, Cyborgs and Women: the Reinvention of Nature, London: Free Associations Books.

Hardt, Michael & Negri, Antonio: 2000, Empire, Cambr. Mas.: Harvard University Press.

Holland, John: 1998, Emergence: from Chaos to Order, Oxford: Oxford University Press.

Husserl, Edmund: 1970, The Crisis in European Science and Transcendental Phenomenology: an Introduction to Phenomenological Philosophy, Evanston: Northwestern University Press.

Jacucci, Giulio: 2005, Interaction as Performance – Cases of Configuring Physical Interfaces in Mixed Media, PhD Thesis: University of Oulu.

Jones, Garrick & Humphrey, Patrick: 2004, The Evolution of Group Decision Support Systems to Enable Collaborative Authored Outcomes, Research Report LML-LUDIC-RR-01, London: LSE.

Juarrero, Alicia: 1999, Dynamics in Action: Intentional Behavior as a Complex System. Cambridge, MA: MIT Press.

Jacucci, Gianni; Barth, Theodor & Tinella, Stefano: 2003, "Culture epistemiche e campi di ricerca: come i Sistemi Informativi sono diversi dalla Simulazione in Fisica dei Solidi", Workshop Roma, Reprint KUNNE: Oslo.

Latour, Bruno: 1993, We have Never been Modern, New York: Harvester & Wheatsheaf.

Leach, Edmund: 1961, Rethinking Anthropology, Monographs on social anthropology / London School of Economics and Political Science, Department of Anthropology - 22.

Lévi-Strauss, Claude: 1964-71, Mythologiques, Paris: Plon.

Lowenthal, David: 1985, The Past is a Foreign Country, Cambridge: Cambridge University Press.

Lunnan, Randi & Barth, Theodor: 2003, "Managing the Exploration vs. Exploitation Dilemma in Transnational "Bridging Teams"," in Journal of World Business, (38) pp. 110-126.

March, James G., & Olsen, Johan P.: 1989, Rediscovering Institutions: The Organizational basis of Politics, New York: Free Press.

Massumi, Brian: 2002, Parables for the Virtual – Movement, Affect, Sensation, Durham & London: Duke University Press.

Mittleton-Kelly, Eve: 2004, "Co-Evolutionary Integration: the Co-Creation of New Organisational Form, Nexus Conference: University of Manchester (9-10 September).

Møystad , Ole: 1994, Architecture - the Body of Cognition, PhD Thesis, Oslo School of Architecture

Newman, Stephen: 1999, Philosophy and the Teacher Education: A Reinterpretation of Donald A. Schön's Epistemology of Reflective Practice, Aldershot: Ashgate.

Nowotny, H; Scott, P & Gibbons, M: 2001, Re-thinking Science: Knowledge and the Public in an Age of Uncertainty, Cambridge: Polity Press.

Polanyi, Michael: 1966, The Tacit Dimension, New York: Doubleday.

Preziosi, Donald & Farago, Claire (eds.): 2004, Grasping the World: the Idea of the Museum, Aldershot: Ashgate.

Prieto, Luis: 1975, Pertinence et pratique: essai de sémiologie, Paris : Minuit.

Prigogine, Ilya & Stengers, Isabelle : 1979, La nouvelle alliance : métamorphose de la science, Paris : Gallimard.

Putnam, Robert: 2000, Bowling alone: the Collapse and Revival of American Community, New York: Simon & Schuster.

Ricœur, Paul: 1986, Du texte à l'action: essays d'herméneutique II, Paris : Seuil.

Roberts, Hanno & Breunig, Karl Joachim: 2004, "Communicating Intellectual Capital: Putting your Mouth where your Resources are", BI Norwegian School of Management, SINTEF – KUNNE: Oslo.

Rorty, Richard:1989, Contingency, irony, and solidarity, Cambridge: Cambridge University Press.

Rudnytsky, Peter L. (ed.): 1993, Transitional Objects and Potential Spaces: Literary Uses of D.W. Winnicott, New York: Columbia University Press.

Sage, Jonathan; Stanbridge, Peter & Husmann, Elmer: 2005, "Knowledge Management in 2010 – Business Needs and Market Prospects", IBM: Report (presentation) – co-authored by David Snowden.

Schimdt, Kjeld & Wagner, Ina: 2005, Ordering Systems: Coordinative Practices and Artifacts in Architectural Design and Planning, in Computer Supported Cooperative Work, pp. 349-402.

Simmel, Georg: 1978 [1900], The Philosophy of Money, London: Routledge & Kegan Paul.

Star, S. L. and J. R. Griesemer: 1989. "Institutional Ecology, 'Translations,' and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907 - 1939." Social Studies of Science 19: 387-420.

Waldrop, M. Mitchell: 1992, Complexity : the Emerging Science at the Edge of Order and Chaos, New York: Simon & Schuster.

Wallerstein, Immanuel: 1991, Unthinking Social Science: the Limits of Nineteenth-Century Paradigms, Cambridge: Polity Press.

Winnicott, D.W.: 1995, The Family and Individual Development, London: Routledge.

Yates, Frances: 1994 [1966], The Art of Memory, London: Pimlico.

John L. Casti

BIZSIM – THE WORLD OF BUSINESS IN A BOX

The Computer as a Laboratory

The central process distinguishing science from its competitors – religion, music, literature, mysticism – in the reality-generation business is the so-called *scientific method.* An integral part of this method by which we arrive at scientific "truth", is the ability to do controlled, repeatable laboratory experiments by which hypotheses about the phenomenon under investigation can be tested. It is just such experiments that on a good day lead to the theories and paradigms constituting today's "scientific" world view. And, more than anything else, it is the inability to perform experiments of this type that separate the natural sciences from the worlds of social and behavioral phenomena. In the latter, we have no way of doing the experiments necessary to create a bona fide scientific theory of processes like stock market dynamics, road-traffic flow, and organizational restructuring.

In an earlier, less discerning era, it was often claimed that the realm of human social behavior was beyond the bounds of scientific analysis, simply because human beings are "complex", "unpredictable", "display free will", "act randomly", and so on and so forth. It's hard to believe that any modern system theorist would do anything but laugh at such childish and naïve attitudes to the creation of workable and worthwhile *scientific* theories of social and behavioral phenomena. The major barrier to bringing the social beneath the umbrella of science is not the non-explanations just given in quotes, but the fact that until now we have had no way to test hypotheses and, therefore, make use of the scientific method in the creation of theories of social behavior. Now we do. And that laboratory in which we do our experiments is the digital computer. Let me illustrate with an example from the world of finance.

Booms and Busts, Bubbles and Crashes

In the fall of 1987, W. Brian Arthur, an economist from Stanford, and John Holland, a computer scientist from the University of Michigan, were sharing a house in Santa Fe while both were visiting the Santa Fe Institute. During endless hours of evening conversations over numerous beers, Arthur and Holland hit upon the idea of creating an artificial stock market inside a computer, one that could be used to answer a number of questions that people in finance had wondered and worried about for decades. Among those questions were:

- Does the average price of a stock settle down to its so-called *fundamental value* – the value determined by the discounted stream of dividends that one can expect to receive by holding the stock indefinitely?
- Is it possible to concoct technical trading schemes that systematically turn a profit greater than a simple buy-and-hold strategy?
- Does the market eventually settle into a fixed pattern of buying and selling? In other words, does it reach "stationarity"?
- Alternately, does a rich "ecology" of trading rules and price movements emerge in the market?

Arthur and Holland knew that the conventional wisdom of finance argued that today's price of a stock is simply the discounted *expectation* of tomorrow's price plus the dividend, given the information available about the stock today. This theoretical price-setting procedure is based on the assumption that there is an objective way to use today's information to form this expectation. But the information available typically consists of past prices, trading volumes, economic indicators, and the like. So there may be many perfectly defensible ways based on many different assumptions to statistically process this information in order to forecast tomorrow's price. For example, we could say that tomorrow's price will equal today's price. Or we might predict that the new price will be today's price divided by the dividend rate. And so on and so forth.

The simple observation that there is no single, best way to process information led Arthur and Holland to the not-very-surprising conclusion that deductive methods for forecasting prices are, at best, an academic fiction. As soon as you admit the possibility that not all traders in the market arrive at their forecasts in the same way, the deductive approach of classical finance theory, which relies upon following a *fixed* set of rules to determine tomorrow's price, begins to break down. So a trader must make assumptions about how other investors form expectations and how they behave. He or she must try to psyche out the market. But this leads to a world of *subjective* beliefs and to beliefs about those beliefs. In short, it leads to a world of induction in which we generalize rules from specific observations rather than one of deduction.

In order to address these kinds of questions, Arthur, Holland and their colleagues constructed an electronic stock market, in which they could manipulating trader's strategies, market parameters, and all the other things that cannot be done with real exchanges. The traders in this market are assumed to each summarize recent market activity by a collection of descriptors, which involve verbal characterization like "the price has gone up every day for the past week", or "the price is higher than the fundamental value", or "the trading volume is high". Let us label these descriptors *A, B, C,* and so on. In terms of the descriptors, the traders decide whether to buy or sell by rules of the form: "If the market fulfills conditions *A, B,* and *C,* then buy, but if conditions *D, G, S,* and *K* are fulfilled, then hold". Each trader has a collection of such rules, and acts in accordance with only one rule at any given time period. This rule is the one that the trader views as his or her currently most accurate rule.

As buying and selling goes on in the market, the traders can reevaluate their different rules by assigning higher probability of triggering a given rule that has proved profitable in the past, and/or by recombining successful rules to form new ones that can then be tested in the market. This latter process is carried out by use of what is called a genetic algorithm, which mimics the way nature combines the genetic pattern of males and females of a species to form a new genome that is a combination of those from the two parents.

A run of such a simulation involves initially assigning sets of predictors to the traders at random, and then beginning the simulation with a particular history of stock prices, interest rates, and dividends. The traders then randomly choose one of their rules and use it to start the buying-and-selling process. As a result of what happens on the first round of trading, the traders modify their estimate of the goodness of their collection of rules, generate new rules (possibly), and then choose the best rule for the next round of trading. And so the process goes, period after period, buying, selling, placing money in bonds, modifying and generating rules, estimating how good the rules are, and, in general, acting in the same way that traders act in real financial markets.

A typical frozen moment in this artificial market is displayed in Figure 5. Moving clockwise from the upper left, the first window shows the time history of the stock price and dividend, where the current price of the stock is the black line and the top of the grey region is the current fundamental value. The region where the black line is much greater than the height of the grey region represents a price bubble, whereas the market has crashed in the region where the black line sinks far below the grey. The upper right window is the current relative wealth of the various traders, and the lower right window displays their current level of stock holdings. The lower left window shows the trading volume, where grey is the number of shares offered for sale and black is the number of shares that traders have offered to buy. The total number of trades possible is then the smaller of these two quantities, because for every share purchased there must be one share available for sale.

After many time periods of trading and modification of the traders' decision rules, what emerges is a kind of ecology of predictors, with different traders employing different rules to make their decisions. Furthermore, it is observed that the stock price always settles down to a random uctuation about its fundamental value. However, within these uctuations a very rich behavior is seen: price bubbles and crashes, market moods, overreactions to price movements, and all the other things associated with speculative markets in the real world.

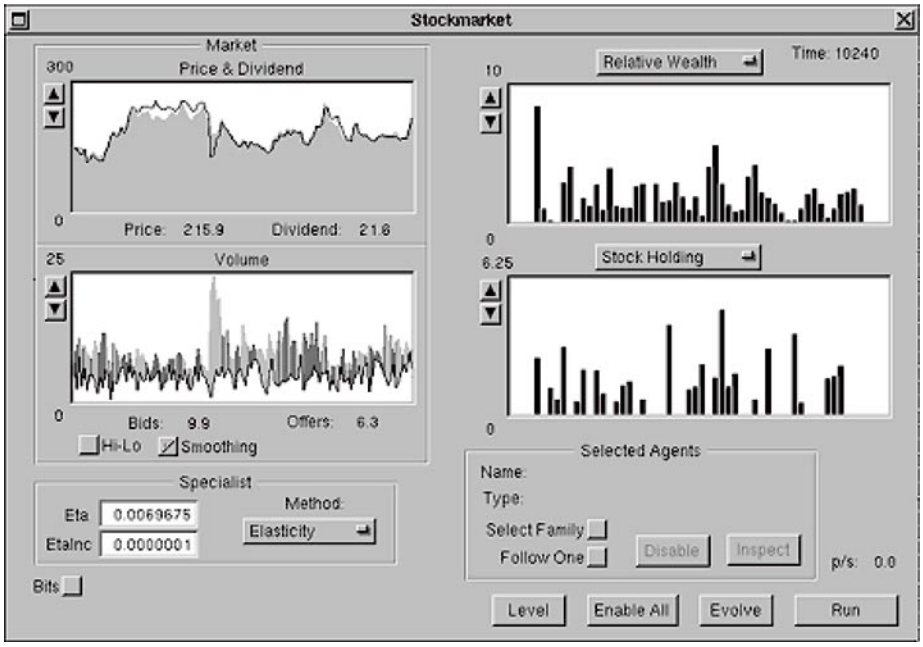

Figure 5. A Frozen moment in the surrogate stock market.

The agents in the stockmarket simulation are individual traders. A quite different type of business simulation emerges when we want to look at an entire industry, in which case the agents become the individual firms constituting that industry. The world's catastrophe insurance industry served as the focus for just such a simulation exercise called *Insurance World,* carried out by the author and colleagues at the Santa Fe Institute and Intelligize, Inc. over the past couple of years.

Insurance World

As a crude, first-cut, the insurance industry can be regarded as an interplay among three components: *firms,* which offer insurance, *clients,* who buy it, and *events,* which determine the outcomes of the "bets" that have been placed between the insurers and their clients. In Insurance World, the agents consist of primary casu-

alty insurers and the reinsurers, the firms that insure the insurers, so to speak. The events are natural hazards, such as hurricanes and earthquakes, as well as various external factors like government regulators and the global capital markets.

Insurance World is a laboratory for studying questions of the following sort:

- *Optimal Uncertainty:* While insurers and reinsurers talk about getting a better handle on uncertainty so as to more accurately assess their risk and more profitably price their product, it's self-evident that perfect foreknowledge of natural hazards would spell the end of the insurance industry. On the other hand, complete ignorance of hazards is also pretty bad news, since it means there is no way to weight the bets the firms make and price their product. This simple observation suggests that there is some optimal level of uncertainty at which the insurance – but perhaps not their clients – can operate in the most profitable and effcient fashion. What is that level? Does it vary across firms? Does it vary between reinsurers, primary insurers, and/or end consumers?
- *Industry Structure:* In terms of the standard metaphors used to characterize organizations – a machine, a brain, an organism, a culture, a political system, a psychic prison – which type(s) most accurately represents the insurance industry? And how is this picture of the organization shaped by the specific "routines" used by the decisionmakers in the various components making up the organization?

The simulator calls for the management of each firm to set a variety of parameters having to do with their desired market share in certain regions for different types of hazards and level of risk they want to take on, as well as to provide a picture of the external economic climate (interest rates, likelihood of hurricanes/earthquakes, ination rates and so forth). The simulation then runs for 10 years in steps of one quarter, at which time a variety of outputs can be examined. For instance, Figure 6 shows the market share for Gulf Coast hurricane insurance of the five primary insurers in this toy world, under the assumption that the initial

market shares were *almost* identical – but not quite. In this experiment, firm 2 has a little larger initial market share than any of the other firms, a differential advantange that it then uses to squeeze out *all* the other firms at the end of the ten-year period. This is due to the "brand effect", in which buyers tend to purchase insurance from companies that they know about.

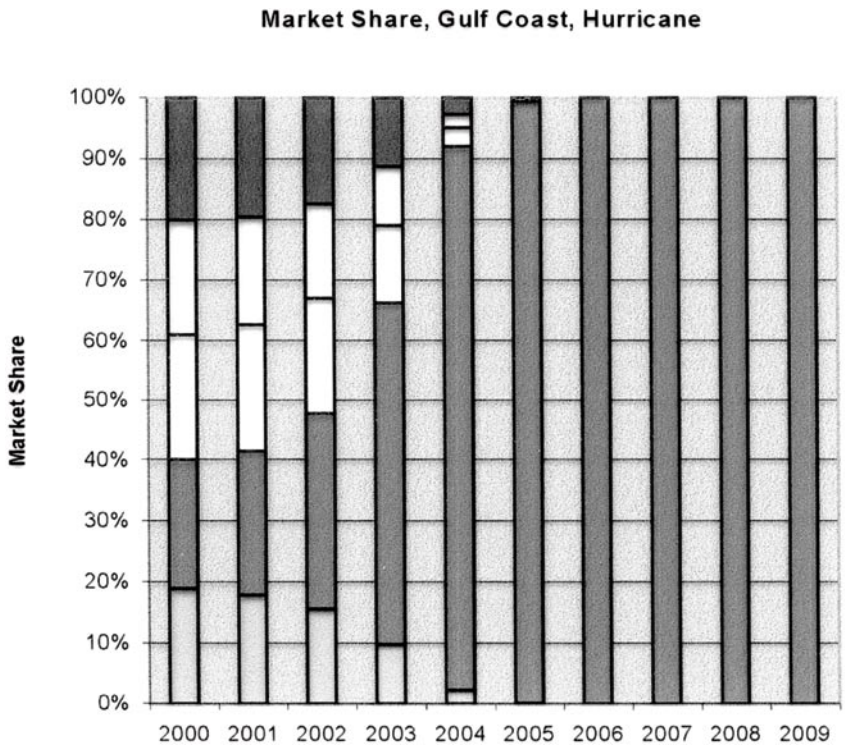

Figure 6. Market share distriburion for five primary insurers.

As a final example of what simulation and business have to say to each other, consider the movement of shoppers in a typical supermarket. This world is dubbed *SimStore* by Ugur Bilge of SimWorld, Ltd. and Mark Venables at J. Sainsbury in London, who collaborated with the author on its creation.

SimStore

The starting point for SimStore is a real supermarket in the Sainsbury chain, one located in the London region of South Ruislip. The agents are individual shoppers who frequent this store. These electronic shoppers are dropped into the store, and then make their way to the various locations in the store by rules such as "wherever you are now, go to the location of the nearest item on your shopping list", so as to gather all the items they want to purchase.

As an example of one of the types of outputs generated by SimStore, customer checkout data are used to calculate customer densities at each location. Color codes are with descending order: blue, red, purple, orange, pink, green, cyan, grey and nothing. Using the Manhattan metric pattern of movement, in which a customer can only move along the aisles of the store, all locations above 30 percent of customer densities have been linked to form a most popular customer path. Once this path is formed a genetic algorithm will minimize (or maximize!) the length of the overall shopping path.

In the same store, this time each individual customer path has been internally calculated using the simple "nearest neighbor" rule noted above. All customer paths have been summed for each aisle, in order to calculate the customer path densities. These densities are displayed in Figure 7 as a relative density map using the same color code just mentioned.

Simulation is Good for Business

Large-scale, agent-based simulations of the type discussed here are in their infancy. But even the preliminary exercises outlined here show the promise of using modern computing technology to provide the basis for doing experiments that have never been possible before. Even better, these experiments are exactly the sort called for by the scientific method – controlled and repeatable – so that

for the first time in history we have the opportunity to actually create a *science* of human affairs. If I were placing bets on the matter, I'd guess that the world of business and commerce will lead the charge into this new science that will form during the 21st century.

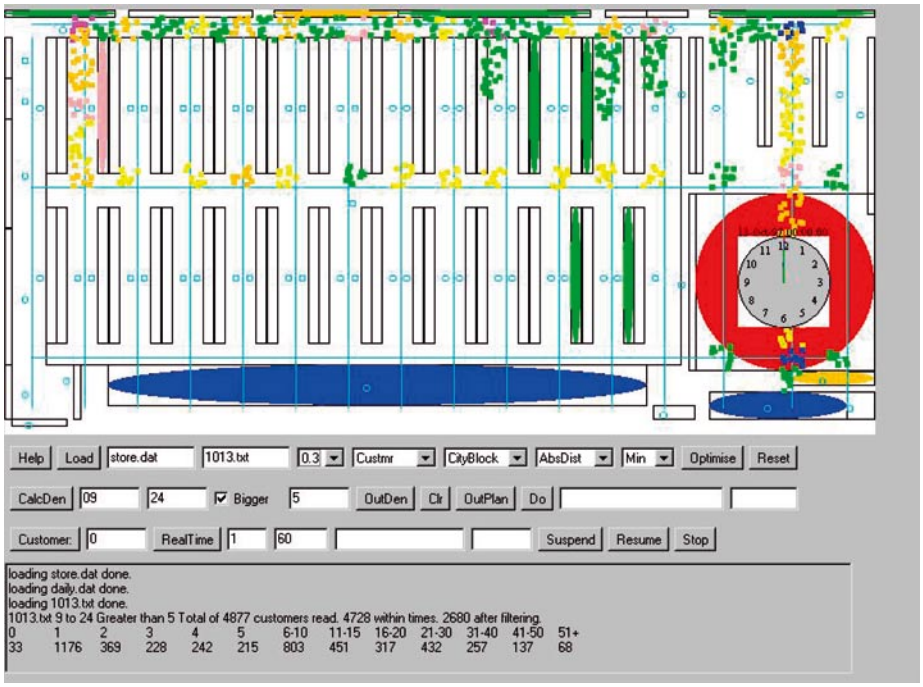

Figure 7. Customer densities along each aisle in the simulated store.

Mika Aaltonen

VIEWS ON EVOLUTION IN ORGANISATIONS

In many organisational strategy and development processes, it is hard to recognise when something starts and something finishes. Viewing organisations´ life and economy as a co-evolutionary world comprises the understanding that in the changing markets new competitors as well as possible partners constantly emerge, but also that temporary competitive advantages have a limited life-cycle. New ideas are replacing old ones, new products old products, and everyone´s have to evolve as fast as they can just to stay in the game.

Stagnation, stability and happiness with the existing state endanger the future. To survive organisations can not look back at their glorious past nor rely on their brave visions of the future, *organisations can survive only as a process*.

For us, this continuous process of doing is *a process of continuous anticipation and sensemaking that includes searching and discovering of better ideas for anticipation, and a more fuller understanding of how emergence happens in organisational settings*.

Applying a neo-Darwinian view of evolutionary processes consists of three elements:

- Mutation: The characteristics determining an organism´s fitness are determined by the genetic makeup bequethed to the individualby its parents. The genetic endowment can be modified by chance and by genetic grossover, i.e. combination of different genes.

- Variation: The members of the population are able to produce good copies of themselves.
- Selection: Members of the population having good genetic make-ups are able to produce more offspring than those having bad genes. (Casti 1997).

From this point of view adaptation is a sum of mutation, variation and selection. However, *"Complexity as a Sensemaking Framework"* places complexity in organisational settings, and therefore, even if ideas deriving from analogies with evolutionary processes are certainly fruitfull in many respects, two notions must be added: Firstly, as Stuart Kauffman put it "Darwin did not know about self-organisation". This means that the Darwinian view of adaptation lacks some of the crucial elements of emergence, at least according to the principles presented in the first chapter of this book. Secondly, also the SFI tradition of complexity theory has received critics about placing only little emphasis on experiencing subject. Self-organisation, complex systems and emergence are described too heavily in terms of rules, the critics continues.

Evolutionary or genetic algorithms, cellular automata and other methods created by computer scientists have been developed to catch the evolutionary process to solve difficult problems. Many of these methods are extremely sophisticated, and their use requires great mathematical skills. In chapter two, we have discussed the use of these methods alone, and in combination with other methods to create more insight. Moving from mathematical complexity towards organisational complexity must take into consideration the coherence of the self(selves), the experiencing subject(s).

Organisational complexity does not accept universality of reason and the predictability and sees that linear, "engineering" approaches are able to respond only partly to issues of emergence in organisations and their environments. *Organisational complexity perceives the world less certain and more open to nonlinear developments than engineering approaches, and seeks ways to survive and succeed*

under these conditions. This book was written to take part in and to enrich this discussion.

References

Aaltonen, M. & Heikkilä, T. (2003) Tarinoiden voima. Miten yritykset hyödyntävät tarinoita? Talentum. Helsinki.

Casti, J. L. (1997) Would-be Worlds. How Simulation Is Changing the Frontiers of Science. John Wiley & Sons Inc. New York.

Cilliers, P. (1998) Complexity & Postmodernism. Understanding Complex Systems. Routledge. London.

Kaivo-oja, J. Y. & Katko, T. S. & Seppälä, O. T. (2004) "Seeking convergence between history and futures research". Futures, Vol. 36, 527-547.

Keskinen, A. & Aaltonen, M. & Mitleton-Kelly, E. (2003) Organisational Comlexity. FFRC Publications, 6/2003.

Letiche, H. (2000) "Phenomenal complexity theory as informed by Bergson". Journal of Organizational Change Management, Vol. 13, No. 6, 545-557.

Sage, J. & Stanbridge, P. & Husmann, E. (2004) Study on Market Prospects, Business Needs and Technological Trends for Business Knowledge Management. European Commission DG Information Society Publications.

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COMPLEXITY AS A SENSEMAKING FRAMEWORK

The theory of complex adaptive systems is used in this book as a theory-constitutive metaphor to reconceptualise and rethink some of the vital issues in organisations´ everyday practices.

In *Complexity as a Sensemaking Framework* Mika Aaltonen, Theodor Barth, John L. Casti, Eve Mitleton-Kelly and T. Irene Sanders set new light on methodology, co-evolutionary integration, disordered systems, and business simulation.

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