

Autopoiesis and organizations: a biological view of social system change and methods for their study.

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Abstract

For many years we have been concerned with the role that autopoietic theory can play in resolving what is often termed the micro-macro problem in social science. The ‘micro-to-macro problem’ concerns our capacity to explain the relationship between the constitutive elements of social systems (people) and emergent phenomena resulting from their interaction (i.e. organizations, societies, economies). To this end we have argued (Goldspink and Kay 2003, 2004), for a synthesis of autopoietic and complexity theory, where autopoietic theory provides a basis for understanding the characteristics of the micro-level agents that make up social systems (human individuals), whilst complexity theory provides a basis for understanding how these characteristics influence the range and type of macro-level behaviours that arise from their interaction. Implicit to this view is the assumption that it is biology which specifies the characteristics and qualities of human agents. Therefore it is also biology which constrains the range and type of interactions these agents can generate, and hence the form of structure which emerges from that interaction. This approach differs considerably from the disembodied sociological path taken in Luhmann’s (1990) application of autopoietic systems.

The main contribution of Maturana and Varela’s (1980) autopoietic theory has been to provide a concise specification of the defining characteristics of biological agents including humans. It serves therefore to advance our understanding of the micro facet of the micro-macro problem. Before his death, Varela began to explore further the implications of autopoiesis for understanding social macro phenomena drawing increasingly on a complex systems view (Thompson and Varela 2001; Rudrauf et al. 2003). We seek to extend this offshoot of the original contribution.

In this chapter we attend in particular, to some of the practical implications that result from a social extension of autopoiesis. Principle amongst these is our understanding of the basis for and nature of organizational change. We begin by giving a brief overview of the micro-macro problem and an outline of our approach to its resolution. We then draw on this approach to develop a perspective on stability and change in organizations. We illustrate this using two cases and in so doing also provide examples of methods which can be used to map the interplay of micro and macro behaviour in particular organizational contexts.

Introduction

Many approaches to understanding organization change approach ‘the organization’ as a relatively static entity. Punctuated equilibrium models have also become popular but here too the notion of unfreeze-change-refreeze suggests change as an exception – a break with the more normal stability upon which organizational control is predicated

(Taplikis 2005). By contrast Tsoukas and Chia (2002: 570) have argued that ‘*Change must not be thought of as a property of organization. Rather, organization must be understood as an emergent property of change. Change is ontologically prior to organization- it is the condition of possibility for organization.*’. Intuitively we agree with their position. However it raises some significant questions for practitioners, principle among them: if change is *constitutive* of the organization rather than something which managers can control, then how subject to strategic influence can change be?

The problem implied by this question can be resolved to some extent by appreciating that it is change at one level which influences stability at another. We typically refer to this phenomenon using the concept of ‘emergence’. The concept has however been criticised as a cover all – used to appear to explain what we cannot currently explain in scientific terms (Clayton and Davies 2006). It is here then that the micro-macro problem takes hold. Emergence remains particularly controversial when applied to social science (Sawyer 2001, 2005). The reason is that the mechanisms of emergence within social systems can be expected to be different from those present in other natural systems, due to the presence of cognitive agents (Castelfranchi 1998; Ellis 2006; Goldspink and Kay 2007, 2008). How they are distinct is made clear from the application of autopoietic theory.

We use autopoiesis to better understand the reciprocal interplay between the micro behaviour of agents on the one hand and the resulting pattern of behaviours at the macro level on the other. These emergent macro structures are somewhat robust patterns associated with particular groups of agents. They have traditionally been referred to using terms like ‘institutions’, ‘norms’ and, the focus of our interest here ‘organizations’. These patterns do not result from upward causation only, as is the case with particle interaction for example, but rather they include a downward causal path: constraining the scope of action of the very agents which give rise to them. In other words macro-level patterns have micro-level effects. This has been referred to as ‘immergence’ (Castelfranchi 1998).

Fuchs et al (2005: 33) takes an emergentist perspective in his classification of alternative approaches to the micro-macro relationship within social theory as follows.

	Relationship between	
	Individuals...	and Society
INDIVIDUALISM, AGENCY THEORY, CONSTRUCTIVISM (BOTTOM-UP DETERMINISM)	sufficient conditions	resultant
SOCIOLOGISM, "SYSTEM THEORY," STRUCTURALISM (TOP-DOWN DETERMINISM)	resultant	sufficient conditions
INDIVIDUAL-SOCIETY DUALISM (INDETERMINISM)	independent	
INDIVIDUAL-SOCIETY DIALECTICS (BOTTOM-UP AS WELL AS TOP-DOWN EMERGENTISM)	necessary, but not sufficient conditions	emergent
	emergent	necessary, but not sufficient conditions

Tab. 1: Ways of Relating Individuals and Society

Most social theory falls into one or other of the first two categories. These theories work with a dichotomous view of macro and micro: focusing attention on just one level or the other and failing to address their relationship. This is consistent with Weik's (2006) view. She has argued that social theory can be divided into three categories, dualist, duality and theories which avoid or deny the separability of micro and macro. In social science the micro-macro problem is also referred to as the problem of structure and agency. Structure emerges from the agency of social agents and at the same time constrains it but neither determines the other. Weik argues that in most social theory this micro level capacity for partial independence is commonly attributed to *intention* or *purpose* – the debate being about how 'free' agents are to exercise these with respect to structure. Structure implies a repetitive relation between two or more individuals with different theorists positing different dimensions to that relation – viz shared knowledge, functions, routines, constraints reciprocal expectations, power or force, rational choice, identity need, habit or rule following. *'Some of these definitions overlap, some have been taken together to form several levels of structure embedded in one another...and some are, of course, contradictory.'* (Weik 2006: 3). Another area of confusion relates to where these structures are considered to reside – *'The most prominent candidate is, of course the individual mind'* however alternatives include: the brain, body, human essence, the act (*habitus*), and language. Finally, the mode of influence between levels is often unspecified: Is it causal or something else?

In short social theory has attempted to resolve the problem using a wide range of conflicting theoretical stances none of which have proven satisfactory. Those that come closest are in Fuchs dialectical category. These too are diverse, including but not restricted to Marxist dialectical materialism, the critical theory of Habermas, the critical realism of Bhaskar and the structuration theory of Giddens. A few incorporate the theory of autopoiesis with some drawing directly on Maturana and Varela's original work, whilst others have adopted a more Luhmannian perspective. What then does it offer?

Autopoiesis

Before illustrating what an autopoietic view can bring to addressing micro-macro interplay to understand real organizational dynamics, it is worth providing a brief overview of the key elements of the theory and its implications.

The theory was developed to provide explanations of the nature and characteristics of living systems (biological cells and meta-cellular organisms). The central idea is that living systems are characterized by their self-production: the components of the system producing the components of the system. A key implication of this is that the requirements for the maintenance of self-production constrain the way in which individuals can interact with and 'know' their environments.

Within autopoietic theory, an individual's behaviour is determined by particular states of nervous system activity (Maturana and Varela 1980), this activity is defined by the concept of *operational closure*, which presupposes that in all cases nervous system activity results from and leads to further nervous system activity in a closed cycle (Maturana & Varela 1980). Possible and actual changes in state of the nervous system are therefore defined by the nervous system's structure and not external forces. External or environmental forces may act as triggers for change but it is the nervous system's structure that dictates which forces can be a trigger (Mingers 1991).

Therefore changes to the structure of one person's nervous system, and consequently their behaviour, will be unique to that person. The environmental perturbations that act as a change trigger in one person will not necessarily trigger a change in another, or if they do, the change that is triggered may take a different form and/or have different implications for the viability of that person in his/her environment, given his/her history. Individuals may contribute to the emergence of a stable pattern, but they do so by acting on the basis of their unique history.

Although the nervous system is operationally closed it is plastic, its structure changes over time and it is this quality that allows for changes in behaviour and subsequently what we describe as learning (Mingers 1991). Therefore as the state of the nervous system changes, so too will the potential range of behaviours that its structural-determinacy makes possible. The term used for this history of structural change is *ontogeny* (Maturana and Varela 1992).

Barandiaran (2005) has argued that the advent of the central nervous system in organisms allows them to exploit the rapid response times of the neural system supporting a significantly increased set of responses to environmental perturbation. The responsiveness of the central nervous system may be further enhanced to the extent that it operates as a far-from-equilibrium system, at the edge of chaos, as has been argued within the emerging field of neuro-dynamics (Kelso 1995; Rocha 1996; van Gelder 1998; Thompson and Varela 2001; Cosmelli et al. 2007). It is the resulting asymmetry between the state space of possible configurations and the range of response needed to maintain immediate regulation in a given environment that gives rise to the 'agency' that is of concern to social emergentists. According to Barandiaran '*The higher the agent's capacity for adaptively guided self-restructuring (plasticity) the higher its behavioural adaptive autonomy and hence its agency*', (2005). Autopoietic theory therefore casts a light on the nature and origins of agency fundamental to understanding social emergence, specifying the biological processes that support and constrain it.

Hejl pre-empted this more recent perspective, (1993) referring to it as "cerebral overcapacity". He noted that it conveyed both advantages and disadvantages to the agent. The advantage is that a capacity to generate a wide range of responses (requisite variety) improves the agents' survivability in a wide range of environments. The disadvantage is that this plasticity contributes to the contingent nature of agent-agent and agent-environment interactions. It dramatically increases the non-linearity of the system and hence reduces its stability: it is a double edged sword. The resulting variability can therefore only be harnessed by the agent to the extent that it can be channelled or constrained at least over short time frames. Hejl notes, "*The only 'solution' to this problem seems to be society*" (1993:229). In other words social structures represent dynamic attractors which imply a temporary reduction in complexity. This supports agent viability in the short term while at the same time giving up none of their intrinsic and open ended flexibility to adjust to changing circumstances in the medium term.

These *social attractors* which provide a temporary reduction in complexity are a product of the recurrent interaction – *structural coupling* in Maturana and Varela's terminology – between agents, in the context of a feedback path between structure and agent. We have argued (Goldspink & Kay 2003; 2004) that structural coupling is the mechanism by which all social structures emerge and are maintained, including those we refer to as organizations. Thus structural coupling constitutes the generative

mechanism which gives rise to social organization. Structural coupling implies the coordination of *behaviour* between agents – the behaviour of one agent triggers a reciprocal behaviour in those with which it is coupled as part of a closed network or *domain* of reciprocal interaction. Maturana and Varela refer to a domain of coupling as a phenomenal domain.

In other words, when considering social systems, we are looking at self-organizing phenomena. It commonly results in the formation of nested hierarchies and heterarchies of phenomenal domains. When organised hierarchically each domain constrains the range and scope of behaviour of that above it. Intersecting domains (ie domains which include some common agents) within a heterarchy perturb one another and may themselves become structurally coupled. In human social systems the hierarchy will include behavioural and linguistic domains and the heterarchy will comprise the many social domains any individual may participate in simultaneously (family, club, work group).

Bridging the Micro-Macro Divide

Our approach brings together the autonomous agent ontology of autopoietic systems described above with complexity theory. Autopoiesis provides a model of how macro (social) phenomena emerge from the complex (and non-linear) interplay between the heterogeneous agents (people) which make up a social system. Complexity theory allows us to explain the resulting dynamics by describing the generative processes that result when these agents enter into recurrent interaction and become structurally coupled. From this perspective social systems can be seen as a specific class of complex system and it is autopoiesis which clarifies the distinguishing characteristics of the constitutive agents and hence the range and class of behaviour which can emerge. In particular it provides an account of the cognitive range and resulting linguistic/reflexive character of social agents (Goldspink and Kay 2007).

This, of course, represents an emergentist view, but one very different from that involving physical systems (Davies 2006). In human social systems, including organizations, there is an additional feedback loop made possible by the fact that human agents can observe at a distance, distinguish pattern at the social level, recognise themselves as contributors to that pattern, and change their behaviour accordingly (Goldspink and Kay 2008). From this perspective an organization's apparent coherence is a product of self-referential cycles (1981; Hejl 1984, 1993) generated as emergent structure results from agent interaction and then feeds-back to constrain agent behaviour.

In order to understand the change which is producing the patterns which characterize an organization at a given time there is a need to pay attention to this dialectic between macro and micro behaviours. In human social systems most of the action happens in and through the linguistic coordination of the coordination of action (Maturana and Varela 1980; Maturana 1988; Maturana 1988). This is to say that human social structures arise and are maintained in linguistic phenomenal domains. The way in which people place themselves in the context of organizing, as well as the way in which they make sense about others, and place themselves in relation to physical (e.g. building layout, geography) and social artefacts (such as norms, rules and structures and information technology) will largely be revealed in the way they use language. Language use will therefore reveal a great deal about the constitutive mechanism of the organization as a distinct social phenomena. The emerging

linguistic nexus will contain nested patterns of stability and points of potential instability which provide targets for study and intervention.

It is our proposition that for an organizational change intervention to be effective it needs to be designed with an appreciation of the patterns and drivers that, in the words of Tsoukas and Chia, describe the change dynamics from which the organization emerges. These will be specific to an organization at a given point of time. In complex systems terms, the patterns are *attractors* of the system and the *drivers* are the states of variables that maintain the operation of the system on any particular attractor. But what are the variables? The state space of a social system comprises a dimension (degree of freedom) for all of the behaviours which can be generated by the agents which constitute it. In human systems such as organizations, this includes linguistic behaviour. Language is highly flexible and recursive (distinctions on distinctions) and as a result the state space it supports effectively has infinite dimensionality. It is this vast space of possibility which, as we have already discussed, is the basis for *agency* and which explains the inherent flexibility of social systems. However, as with many complex systems, at any particular time a much more limited set of behaviours may explain the dynamics at the level of interest. It is this limited subset of behaviours which we refer to as the *drivers* of the change dynamics of the organization. These are the relatively small number of behaviours (including linguistic utterances) which generate and maintain a particular attractor. These attractors are of course the cultural norms and institutions which combine to support the higher order attractor which we refer to as 'the organization'.

For many managers detecting these drivers is an intuitive process or one based on experience, however, more systematic research methods may also be used to surface them. Once the key drivers influencing such patterns have been identified the manager can take action to disrupt those that appear to support undesired stability and/or stimulate those that might support desired change.

While developments in complex systems and social simulation have advanced our ability to map complex dynamics, this has generally been in systems where agents have limited cognitive capacity (Sawyer 2003, 2005). While developments in these techniques hold promise for the future, at the current time there are few techniques that support our understanding of dynamics that result from the reflexive emergence associated with human agents (Goldspink and Kay 2007; 2008; 2008). It is therefore necessary to use more conventional research methods to gain insights into the operations of organizations. A range of methods have been developed for the study of linguistic interaction. Some focus on mapping the denotative content of utterances while others are concerned with the illocutionary or pragmatic force of language as a basis for direct influence (Searle 1969; Habermas 1976)¹. In the following two cases we illustrate techniques which can be employed to surface the change dynamics from which the organization emerges, focusing primarily on alternative methods for linguistic analysis.

The Case studies

Normal qualitative or quantitative techniques will often provide a static snapshot of pattern at one or more levels but leave much of the generative process unclear. In particular, many conventional methods, founded as they are on functionalist

¹ We are examining this in another case study on normative self-organization in the Wikipedia - see Goldspink, C. (2007). Normative self-regulation in the emergence of global network institutions: The Case of Wikipedia. . [ANZSYS07](#). Auckland, New Zealand.

reductionism, fail to support any analysis of the interplay between micro and macro levels. However creative recombination of existing techniques sometimes makes them more useful. In the first case study we combine two well established methods; narrative analysis (Bruner 1991, 1991; Snowden 2001; Browning and Boudes 2005) and repertory grid technique (Fransella et al. 2004; Jankowics 2004) and illustrate how these can be used in combination to generate deep insights into factors which influence the dynamics of an organization. In the second case we use analysis of the illocutionary force of language to identify influence patterns associated with governance of an institution.

Case Study One: Financial Services trust and innovation potential

The research context was a small business unit within a large financial services institution. The business unit in which the case study was conducted was lead by a General Manager and a six Heads of Department each with multiple direct reports in a strongly hierarchical structure. Each department in the business unit was responsible for the management of different outsourcing arrangements and contracts with suppliers. The leadership team were concerned at the low level of collaboration between the different Departments and the effect this had on innovation and the quality of decisions making. In response they designed a small intervention to facilitate collaboration across the Business Unit. The task involved bringing together Senior Managers from the different Departments to solve a set problem.

The managers were asked to establish a taxonomy against which the top 100 suppliers could be categorized, according to whether they were strategic (bringing new capability), aligned (providing improved capability to an existing strategy) or standard (providing supply to a non-strategic function). It was intended that the taxonomy would form the basis for new relationship management models. Participation in the project was voluntary and undirected: those who volunteered to participate were expected to self-organize in order to clarify and generate strategies to address the problem. The voluntary nature of participation resulted in only about half of the potential participants taking part.

The outcome of the project was seen by most people associated with it, including the General Manager, to be unsatisfactory, both in terms of the proposed solution and the collaboration achieved. The group, working on the project fragmented into two sub-groups with each advocating incompatible solutions. The fact that such a relatively simple task could not be completed came as a shock to the GM, who suspected there were deeper issues at play. We were asked, as people independent of the institution, to explore the reasons why the exercise failed. Our brief was to understand the factors affecting the group's ability to collaborate: why couldn't a group of intelligent, experienced managers, organize themselves to complete a relatively simply problem solving activity?

Methodology

Eleven Senior Managers took part in our study drawn from a group of eighteen possible participants. Participants were selected at random from a list of all the senior managers. Six out of the eleven interviewees had taken part in the exercise, whilst the others, although aware of it, had either specifically chosen not to be involved, or had sent a representative from their team.

We sought to gain an understanding of the recent history of interactions, the environment and how both individual (micro) sense-making and (macro) institutional structures combined to limit collaboration. To achieve this, a methodology which combined narrative and Repertory Grid methods was employed. Both narratives and the repertory grids were collected in a single interview which lasted on average about one and half hours.

Narrative

Narrative is seen from a number of perspectives within the social and organizational sciences. Most commonly it is encountered as a method – one particularly appropriate to:

...examine the interconnectedness of human agency and social structure and the temporality of historical events in processual ways. (Gotham and Staples 1996: 481).

It has, however, been argued to be at the core of the functioning of human meaning making – the narrative mode of thought (Bruner 1991; Dautenhahn 2002). Bruner observes that there is a sense in which:

...narrative, rather than referring to 'reality' may in fact create or constitute it...' (1991: 13).

From this perspective, narrative data provides an account both of how people interpret past events and how those interpretations play a role in embedding particular ways of thinking and knowing in the culture of the organization – how they come to be constitutive of the organizational reality. When we construct narratives we place ourselves as a character, even if it is one of innocent bystander. Narrative can reveal a lot about the part and future role an actor may play. We can and do of course revise our narratives. We will, however, be very reluctant to change the central character – ourselves: the grand narrative that is our sense of identity. Narrative data then provides insight into the relationship between events – i.e. how the observer/participant sees how events are linked in time. More than this, and significantly for this study, it captures individual and collective accounts of the interplay between individual behavior and collective consequences. These accounts play a part in the maintenance of existing order and/or to reflect the basis for change in established routines by revealing compartmentalisation in the linguistic domains.

In this case study a very simple narrative collection was undertaken. This involved asking participants to recall two recent collaboration experiences with which they had been involved within the institution: one a positive experience and the other a negative experience. Not all participants were able to think of two stories that they felt were worth telling and as a result 14 stories were collected out of a possible 22. The stories were analyzed with the participant at the time of the interview. Six key events were selected that 'stuck in their mind'. These events were equivalent to what David Snowden (2000) would describe as an *anecdote*. Breaking the stories down into anecdotes supported analysis of the stories as a whole but also identified discrete events for subsequent thematic analysis across narratives. Eighty four separate anecdotes were collected and clustered according to commonalities in their content, i.e. common words, depiction of similar events etc

Grid Interviews

Personal Construct Theory was developed by George Kelly (1963) in the 1950s. Central to the theory is the idea of constructive alternativism (Bannister and Fransella 1989). This simply states that any event or situation is subject to alternative construal by different individuals. An event can carry many different meanings and the meaning it carries for any individual will depend on how he/she construes it at that time and how it fits (its implication) within his/her existing construct system. His/her existing construct system is a product of prior acts of construal and forms a hierarchical system of more or less tightly held conceptual distinctions which orientate behaviour. Kelly saw this construct system as dynamic – being constantly modified as the agent acts in the world and attempts to be effective within it.

While a construct system is specific to the individual and forms the basis of that individual's agency, it is a product of his/her history of interaction in the current and other social domains. Constructs low in the hierarchy have fewer dependent connections with other constructs and can be surrendered or modified more readily than those at the top of the hierarchy. Super-ordinate constructs form primary orientating distinctions: they are associated with world-views and individuals will generally be reluctant to change them as they have profound implications for the way he/she sees and orientates him/herself in the world. Kelly (1963) argues that all social processes necessarily involve the mutual construal of others construction and that this gives rise to some commonality of construction (consensuality) in that domain of interaction.

Repertory grid (Fransella et al. 2004; Jankowics 2004) is one of a family of related methods developed by Kelly and others to make Personal Construct Theory operational. In the context of this case study Repertory Grid offered a means for mapping both individual (micro) and collective (macro) patterns of construal within a particular social domain. Furthermore, Grid analysis supports the development of metrics which allow some prediction of how willing or likely individuals would be to change their construal and thus how responsive they may be to alternative change interventions.

Repertory grids collect fine grained data about individuals sense-making about some target. While the data is fine grained it is also sharply focused so the challenge in using grid as a means for data collection is to ensure that the data converges well onto the topic of inquiry. Critical here are the choice of items of experience ('elements') that will be used to 'elicit' 'constructs' and the focus question used during elicitation (Jankowics 2004). Elements need to be tangible items of experience (i.e. time bound events, things or people). For this exercise we chose to use relational descriptors as prompts and to have the respondents supply specific people who matched the descriptor². These people then became the elements in that respondent's grid. Each respondent would have different individuals, but individuals which were selected against criteria common to all respondents. Respondents were asked to identify eight colleagues from within the senior manager team who matched the following descriptions:

- A colleague with whom I share information.
- A colleague with whom I don't or seldom share information.
- A person who is senior to me whom I learnt a lot
- A person who senior to me from whom I learnt a little

² In a more recent related study which focused on innovation rather than collaboration and trust as with the case study reported here, in this latter case 'innovation events' were taken from the narratives and used as elements.

- A direct report with whom I share info
- A direct report with whom I don't share
- A colleague who I trust implicitly
- A colleague that I don't trust.
- A colleague I feel comfortable asking for advice
- A colleague I don't feel comfortable asking for advice

These descriptions were considered to capture qualities of relationships associated with collaboration and also to assemble into an approximate continuum of relational strength. The minimum quality of relationship upon which any level of collaboration could be built was taken as a 'willingness to share information'. Above that would be a relationship in which the respondent would be 'comfortable asking advice'; 'learn from'; and 'trust implicitly'.

Constructs were then elicited using the triadic method (Fransella 1977) using the comparison question 'Which two of these people is similar to one another and different from the third in terms of how they helped or hindered collaboration?'. The answers were captured directly on a grid and scored by the respondent in the normal way.

Analysis

All the people involved selected and described the same negative experience – the exercise in generating collaboration discussed earlier. As might be expected the narratives captured quite distinct and different accounts and interpretations of events: unique personal histories of the shared experience. These narratives provided anchoring events against which the individual sense-making of the participants (as revealed by the repertory grids) could be interpreted. They also revealed the wider environmental factors and historical sequence, as well as the individuals reading of cultural rules, norms and institutional practices, which they believed influenced the outcome.

Grids were analyzed using the software package Idiogrid (Grice 2002). Patterns in the relationship between elements and constructs were examined using Principal Component Analysis. This enabled us to identify, for each respondent, the type of person he/she was likely to share information with compared to those with whom he/she would be unlikely to share; what type of person he/she would trust compared to not trust etc. It also revealed the degree of association between the element classes; if likelihood to 'share information' was closely associated with 'trust' or based on different factors in a relationship for example.

According to Kelly, a person's construct system provides them with a basis for hypothesizing about consequences of their and others actions. Tight construal (as indicated by a high mean correlation between constructs in the grid), would suggest that a respondent would have relatively unvarying predictions based on his/her construal of a situation. In other words, the characteristics the respondent attributes to individuals would, from his/her perspective, be expected to provide good prediction of the collaborative behaviour of others. Loose construal, by contrast, would suggest a person with more flexible views, someone open to surprise. Inferences can therefore be drawn about a respondent's openness to change. In addition an ordination score can be used to reveal the location of a construct within the respondents construct hierarchy, with higher scores suggesting higher ordination or more meaningful (and

abstract) constructs (Landfield and Cannell 1988). Individuals are less likely to be willing to change higher order constructs as they have significant implications for how he/she makes sense of the world (Kelly 1963; Bannister and Fransella 1989).

Combining the results

A comparative analysis of the results of the two data sets was undertaken on two levels. Firstly, individual stories were mapped to individual repertory grids. These two data sets revealed insight into which constructs in each individuals meaning system primarily orientate their construal of events and guide their action. Secondly, the narrative clusters emerging from the thematic analysis of the stories were mapped to the output from the group grid analysis.

Usually repertory grid analysis is undertaken at the individual level, however, in this instance we conducted a thematic analysis across the constructs of the entire group (see Jankowics 2004 for a systematic process for doing this). This analysis provided insight into how each agent made sense of their situation and the degree to which there were commonalities to this sense-making. Mapping these two together revealed the areas of common construal around a distinct series of events. It also means we could see the depth with which that construal is held and therefore also which dimensions of the social system's patterns can easily change, and those that will not.

From the combined analysis it was possible to discern three primary distinctions that orientated respondents toward one another and influenced their willingness to collaborate.

Observations

Approximately two thirds of the respondents had one or more of these as key characteristics in the way they distinguished collaboration between members of the group. These three distinctions appeared to form the basis for the creation of sub-groups within the broader team, where people of like characteristics have a much higher propensity to trust and collaborate with each other rather than those they perceived as being different. The combination of depth with which these constructs were held and the degree to which they were shared across the group strongly drove the eventual outcome of the particular activity we studied, i.e. the group that was supposed to be collaborating split to create sub-groups closely aligned to the constructs described above.

What is interesting here, is that overtly all the participants, wanted to collaborate, and indeed initially did collaborate around the problem they had been set, thus creating a new pattern of interaction that had not existed before. However, over a relatively short period, this new pattern broke down with a slightly modified version of the pre-existing pattern of interaction re-emerging. In the evidence collected there is a clear explanation for this. Individuals were construed through established constructs and these influenced subsequent behaviour. As there was nothing in the design of the intervention which was directed at challenging or disrupting the existing ways of making sense of the situation, and in particular, nothing powerful enough to compel the need to reconsider deeply held constructs, no change was achieved. On the contrary, the existing patterns reappeared in a slightly modified form.

Conclusion on case study one

This case selected for this research centered on an intervention designed to address a limited capacity for innovation in a senior management team – i.e. a perceived inability for managers to bring new ideas, understandings and capabilities to challenging situations. We have examined the reasons for the failure of this intervention by seeking better to understand the way in which individuals contribute to maintaining current patterns in the organization and how the intervention failed to address these. This represented a move away from approaches which treat ‘organizations’ in a reified way to a complex systems view focusing in particular on understanding the interplay between macro and micro levels.

The intervention initially used to try to build collaboration in this work unit, assumed that collaboration was not occurring due to formal structural inhibitors (institutional silos and or physical distance) and/or lack of opportunity. It was anticipated that providing different people from different backgrounds with the opportunity to work on a common project would be all that was required to overcome the problem of lack of collaboration. This proved too simplistic as it failed to identify the way in which individual and collective sense-making around who and when to share information or trust had developed within the organization and had come to constrain the range and type of relationships members were prepared to participate in.

The data gathered using both narrative and repertory grid methods revealed a more complex picture. The senior management group was shown to have formed a set of ways of interpreting their environment which limited their willingness to engage on the basis of three dimensions of relationship. These were not related to the formal structure or to physical proximity directly (although these would have influenced the formation and maintenance of the dimensions found) but were culturally stable dimensions which had become self-maintaining attractors. This combined with a pattern of tight construal contributed to a very stable system whereby individuals sense-making reinforced cultural patterns which shaped interaction so as to reinforce individuals sense-making in a manner which restricted the possibility of change.

This analysis supported the argument that organizational behaviour is a complex product of the interplay between individual agency and institutional structure and that these come together to form phenomenal domains. We have argued that unless insights can be gained into the drivers which support attractors in these domains intervention is likely to be ineffective. We have shown how conventional methods, in this case narrative and repertory grid technique may be combined to help locate these drivers in the linguistic domain pertaining to the particular context.

Case Two – Wikipedia

This case concerns a less conventional form of institution – an online ‘community’ albeit one which has self-organized to produce a product more commonly produced by a command organization. The interest here was to understand how widely dispersed and heterogeneous (in terms of having different skills, knowledge, goals and resources) agents can come together to produce a credible encyclopaedia.

This case is being undertaken as a part of the EU funded research project titled Emergence in the Loop (EMIL). EMIL is explicitly concerned with the micro-macro problem and is using both empirical and computer simulation methods to advance our understanding of it. The insight behind the EMIL project is that this two-way

interpenetration of micro and macro levels is fundamental to ‘normative action’ in social systems. Agents perceive higher order social structures (norms) and (perhaps) change their (micro) behaviour in response, thus at the same time acting on the norm (perhaps reinforcing it or diminishing it). The case studies chosen therefore involve the study of the emergence of social norms. First among these is that of Wikipedia.

Wikipedia is of interest as the individuals that that have participated in creating it appear, through their collective action, to have emerged a set of permissions, obligations, rules and norms which bring it into being and maintain it as a social system: it has bootstrapped itself into being. Significantly, this was not intended or foreseen by those who initiated it (Sanger 2005). From a governance perspective there are very few means within Wikipedia by which formal control can be exercised and it therefore relies on emergent self-regulation to function despite significant perturbation from ‘vandals’ (task saboteurs), ‘trolls’ (social saboteurs), and turnover of contributors in the context of a task which may require the resolution of emotionally and value based conflict.

That said the theoretical lens of norms adopted by the EMIL project is problematic. Normative theory has functionalist origins and reflects the confusion surrounding the macro-micro problem. There remains considerable confusion, for example, as to whether ‘norms’ are best ascribed as ‘in’ the environment or ‘in’ the agent. There is debate also as to whether normative order is the result of agents applying rules or reflects pattern which appears ‘as though’ it is rule based. We approach it here through our own theoretical lens as outlined earlier in the paper.

Wikipedia can help us to understand:

- How people influence one another and converge on common expected patterns of behaviour;
- The emergence and role of social constructs which have become somewhat ‘reified’ within a particular consensual domain (rules and explicit norms) in an open volunteer community where there is little to no hierarchy and limited capacity for formal sanction and which must continue to attract and retain agents if it is to survive (is in a sense self-maintaining and producing);
- How these norms and rules are generated and maintained within behavioural and linguistic domains;
- The relationship between goal, technical artefacts and social structures and the exercise of individual agency within the resulting domains.

Methodology

In Wikipedia there are two classes of activity:

- editing activity; and
- conversation about editing activity.

As this study was not concerned with the editing activity but with the self-organizing and self-regulating phenomena which make it possible, the Discussion pages of a sample of Controversial and Featured articles were analysed. Controversial articles were chosen as they were more likely to involve the need to resolve conflict and hence place greater demand on effective normative regulation; Featured articles by

contrast may be so rated due to the attainment of a higher level of consensus among participants.

The activity on the Discussion pages comprises a series of ‘utterances’ or speech acts between contributors about editing activity and the quality of product. The only means for editors to influence one another’s behaviour (to structurally couple) is through these utterances. On the face of it then, these pages should provide a fertile source to support analysis of how self-organization was occurring and to identify the agent characteristics and mechanisms involved.

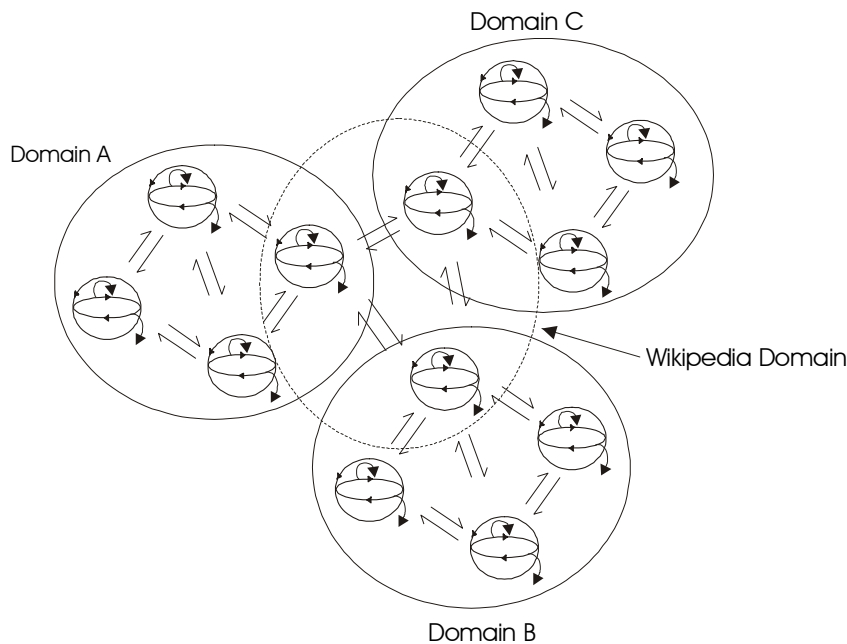
It was anticipated that the process may involve quite subtle use of linguistic cues. Accordingly sampled pages were coded to a high level of resolution using the Verbal Response Mode (VRM) taxonomy (Stiles 1992). VRM is very attractive where there is a need (as in this case) to capture many of the subtleties of natural language use that derive from and rely on the intrinsic flexibility and ambiguity of natural language yet map them to a more formal or axiomatic system needed for computer simulation. A range of additional codes were applied, including; whether a listener accepted or ‘validated’ an utterance; the explicit invocation of norms or rules; the associated deontic command; and the style and focus (subject) of the utterance.

For the study we randomly selected a sample of Discussion pages associated with both Controversial and Featured articles. At the time of the study (May/June 2007) there were 583 articles identified by the Wikipedia community as controversial and approximately 1900 as featured. The analysis reported here is based on a sample of nineteen Controversial and eleven Featured articles. The most recent three pages of discussion were selected for analysis from each Discussion page associated with the article included in the sample.

These were subjected to detailed coding using the Open Source qualitative analysis software WeftQDA. Both qualitative and quantitative analysis was performed. The latter was undertaken by re-processing the coded utterances such that each utterance constituted a case and each applied code a variable associated with that case. This data set was then analysed using SPSS and MLWin.

Analysis

How might we usefully think about the Wikipedia as an organization? The volunteers who participate in Wikipedia simultaneously participate in a number of other social domains. For the sake of simplicity we depict just one. Figure two shows the situation diagrammatically. Each domain (A-C) is comprised of a number of autopoietic agents in structural coupling. The Wikipedia domain represents a fourth domain. The agents which comprise it represent nodes of intersection between the other domains. To remain viable in all domains, agents at these nodes will need to satisfice the requirements for ongoing viability in the other domain to which they belong. In the case of Wikipedia, the fourth domain is happening virtually – agents interact by observing each others editing behaviour and by interacting linguistically (asynchronously and by written exchange). Our analysis was designed to identify pattern within this domain.



We found a distinctive emergent pattern in the utterances. They typically involved an exchange of assertions delivered with a neutral – i.e. non-emotive style. There are very few explicit praises, or put downs, and few niceties like explicit acknowledgements of one another. Seldom do contributors refer to one another by nick name – the exchanges are rather impersonal. This does not tally with what one would expect if the Wikipedia etiquette (<http://en.wikipedia.org/wiki/Wikipedia:Etiquette>) had been institutionalised. The Featured articles conform a little more closely but if we assume that the etiquette captures the community's explicit ideal and the form of conduct which it collectively endorses and strives to achieve (the collective goal), then the actual behaviour is significantly different from the intended.

What kind of phenomenal domain emerges within Wikipedia?

To think about what is happening in the domain of Wikipedia we can usefully draw on Habermas theory of Pragmatics. For Habermas, a successful speech act would be one in which the listener both comprehends and accepts the validity claims made by the sender and thus enters into the intended relationship. The tests of validity include comprehensibility, truth, sincerity and rightness. Thus for Habermas, a speech act only serves to support the maintenance of effective communicative exchange to the extent that it is held as valid by listeners. At the level of the individual agent what is held to be valid will largely be a product of their past participation in one or more phenomenal domains with the norms or rules typical of that domain. Habermas distinguishes between communicative acts and strategic action. The former is action based on consensus while the latter implies action resulting from the exercise of power or compulsion. The latter is not possible in Wikipedia as there are very few means for compulsion or exercise of formal or authoritative power. The intrinsic openness of Wikipedia means that the majority of exchanges can be expected to conform to the qualities of communicative acts – i.e. bounded and influenced by normative behaviour rather than through the exercise of formal authority, power or coercion. The existence of community is central to establishing such an environment as the heterogeneity of social backgrounds and experiences of participants coming together incidentally around the task would likely fail to have sufficient power to

provide coherence to the relationships unless it had the opportunity to converge locally around an accepted set of behavioural regulators. Do we see any evidence of this type of regulator?

The absence of any expression of acknowledgement of emotions and/or similarity of attitude (homophily) among many contributors suggests that Wikipedia lacks many of the qualities of verbal exchange that would identify it as strong community. Possibly it therefore fails to constitute a distinct consensual domain. It is more consistent with being a place to share coordination of a task. This could suggest that the goal is the primary orientating point. However, the lack of quality of discourse needed to achieve consensus is more indicative of a brief encounter between different and established milieux which struggle to find common understanding rather than of a community committed to a common goal (Becker and Mark 1997). This might suggest that the primary influence of the utterance strategies employed by agents is the consensual domain/s to which they belong in their wider life – not the immediate environment of the Wikipedia. If this were the case then we would expect to see speech acts which are a minimal accommodation: are minimally concerned with establishing understanding and aimed at a pragmatic accommodation or satisficing of presenting demands from different editors. Certainly this is one way of interpreting the patterns observed in the data. Similarly we would expect to find that local norms and rules had little effect and that social behaviour was primarily influenced by the socialised ‘norms’ consistent with the editors primary domains – that is to say – brought in from outside the Wikipedia.

Conclusions on case two

In this case we are particularly confronted with the epistemic implications of the theory base we are following. Where do consensual domains begin and end? Does the communicative activity in Wikipedia give rise to a distinct phenomenal domain or can it only be understood by appreciating the domains with which its participants are involved outside of the Wikipedia? As Hejl long ago noted, the attributions of closure to social domains (as compared to physical ones at the level of biological entities) is an epistemic act not an ontological one and it reinforces the view that social systems are not autopoietic in and of themselves.

Hejl (1984) distinguished between self-maintaining systems and self-referential systems. He argued that functionally autonomous entities (such as organizations) are abstract, they are self-referential but as they do not ‘self-produce’ in a physical domain: they should therefore be considered as self-maintaining but not autopoietic. Thus both Varela and Hejl identify social systems as belonging to the broader class of autonomous, operationally closed and self-organising/self-referential systems but not as autopoietic. Further, the concept of autopoiesis only offers new insight into systems that do self-produce in a physical domain: biological systems as per the genesis of the concept. In relation to other classes of system the concept of operational closure and self-organization are sufficient and equivalent

To revisit some fundamentals, the criteria Maturana and Varela (1980) used to distinguish autopoietic systems are:

1. their principle output is themselves, i.e. they are first and foremost self-producing;
2. they bring forth their own boundary as a result of their ongoing process of self production;

3. they are operationally closed and are therefore autonomous—their response to perturbation being entirely determined by their structure;
4. in the case of composite unities there is mutual dependence between the levels of autopoiesis—the continued autopoiesis of the components of a composite unity is dependent on the maintenance of the autopoiesis of the composite unity and vice versa.

Criterion 2 refers to the necessary existence of a ‘boundary’. This is inextricably linked to self-production as it is the boundary, amongst other things, which is to be self-produced. The key issue concerns the required *tangibility* or materiality of such a boundary. The existence of a physical boundary was an important attribute of autopoietic systems identified in the earlier work of Maturana and Varela although there was ambiguity about whether the physicality was a necessary condition for a system to be classed as autopoietic. Gaines (1981) identifies, for example, that in Maturana and Varela’s 1975 work, *Autopoiesis and Cognition: the organization of the living*, from which the above criteria were drawn, the authors permit that an autopoietic unity may be distinguished from its environment by a “*concrete or conceptual operation of distinction*.” This implies that an autopoietic unity may arise both as an ontological fact and/or as a result of an epistemological act of an observer. If the requirement for tangibility is to be so relaxed, it is still necessary to identify the boundedness of autopoietic systems and to identify how this boundedness is self-maintained.

Mingers (1995) notes that the boundary of a social system is not physical in the way that a cell boundary is physical. There has been some attempt to equate boundary with belonging to some class or set. Zeleny and Hufford, for example, adopt this approach. They argue that social or categorical boundaries are readily distinguished and that restricting the definition to tangible boundaries “*serves no useful purpose*” (1991: 322). Mingers, in addressing this point states:

A physical boundary has a spatial dimension forming a barrier between inside and outside. This is not the case for a membership-type boundary; some members are not nearer the outside than others (Mingers 1995: 128).

Thus in Mingers’ view, this substitution is unsatisfactory. Replacement of a physical boundary with a categorical distinction is substitution of a different equivalence class. A categorical distinction has no necessary operational basis or topological characteristics. Members are identified as related through a shared characteristic, there is no implied relation either spatially or through identification of functional interdependence.

Mingers reference to topology is interesting and important. It points to unexpected areas of ambiguity in the concept of boundedness, even for physical systems. Hejl (1984) notes, for example, that problems of boundary identification are not confined to social systems but are already present with biology. His point can be appreciated by considering the following questions: are the inside membranes of the lungs, oesophagus and intestines ‘inside’ or ‘outside’ of the human body?; is the boundary of a pond ecology the waters edge?. When considering the boundaries of social systems he concludes that; as a systems boundary is ‘*constituted through the interactions of the components*’ (1984: 72) and; as individuals are nodes in many intersecting social systems, and further, as the observer needs to be included in this ‘network’ of intersecting social systems, then:

it is not enough to define [the boundary] as an external observer. If we want to know where the boundaries of what we take hypothetically as a social system are, we have to observe as well as ask the individuals who constitute it (Hejl 1984: 72).

This is highly suggestive of naturalistic enquiry. The cases we have presented here involved a degree of this in that the methods stayed close to the language usage of the contributors and they were involved in the choice of anecdotes. In the second case the natural language was again used in order to find evidence of points of relative closure.

In social systems then, boundaries are defined by observers and it matters where we draw them. This is not to say that we cannot gain some empirical clues as to where we may usefully draw them and the Wikipedia case provides an example of the type of data that may be used for this purpose and the implications of drawing it in different places.

Overall Conclusions

The first case suggests that it may be possible to map the key distinctions which characterise and contribute to the coherence of particular linguistic domains. The challenge is in gaining sufficient initial lead to know where to look closely. We have identified several conventional tools which can be used. Elsewhere we have also outlined a model to assist with the interpretation of the resulting findings (Goldspink et al. 2008). These are relatively easy to use and have modest data needs – a great deal can be gleaned from a well targeted and small scale collection of information from a few key players as was illustrated in the case. Doing so could prove highly valuable in a wide range of high value organizational change exercises. These include Mergers and acquisitions, structural change programs and cultural realignment exercises. It demonstrates that the abstract theory being derived from autopoiesis can be used to significant pragmatic effect and in real time in organizational transformation exercises. The analysis provides insights into the drivers of particular patterns and provides some clues to a) the feasibility of attempting to change them and the likely scale of intervention needed b) where best to target any intervention so as to increase the likelihood of an outcome which has some similarity to that which was intended.

The second case is interesting for an altogether different reason. It too provides practical understanding, in this case of the governance processes associated with a new form of organization and how they are influenced by technical and social artefacts. It also demonstrates how conventional methods may be employed, although in this case the analysis was time consuming and not feasible for dynamic interpretation of events. The main contribution of this case therefore remains theoretical. It helps answer a long standing controversial question among users of autopoietic theory: are social systems (including organizations) autopoietic?

Despite protestations to the contrary autopoiesis and complexity theory can provide practical tools and guidance to real world organizational and social problems. In combination they offer an opportunity to move past many of the long standing problems of alternative social and organizational theory which are largely based on the assumption of change as the exception rather than the norm (Burrell and Morgan 1980). They provide a means for directly theorising about and, perhaps more importantly, researching and responding managerially to the interplay or dialectic between micro and macro level phenomena which are constitutive of organizational phenomena. While the theory we have been developing is not yet complete or fully

articulated and while techniques which could see it applied most directly (such as multi-agent modelling) are still under-developed we have demonstrated here that it can still be put to use.

We have also argued that the greatest potential lies in working with the original conception developed by Maturana and Varela not on the grounds that it was complete and inviolate, but on the grounds that it offers a critical foundation otherwise lacking in social theory: an answer to the question ‘in what way is human social behaviour derived from and constrained by our biology?’. Excellent work is underway to advance and consolidate this foundation without needing to violate the essential premises upon which the original theory was based. We refer here to the work being undertaken in neuro-phenomenology (Thompson and Varela 2001; Rudrauf et al. 2003; Thompson 2004), Artificial Life (Moreno and Etxeberria 1995; Moreno et al. 1997; Barandiaran 2005; Barandiaran and Moreno 2006; Duijn et al. 2006) and Robotics (De Jaegher and Di Paolo 2007; Di Paolo and Lizuka 2007; Di Paolo et al. 2007). To attempt to redefine autopoiesis to make it fit with the constitutively different nature of social systems is not necessary and moves to decouple it from its grounding in biology serve to weaken its application. In Luhmann for example, the issue of domain intersection is highly problematic. It represents a retreat from coming to terms with the fundamental origins of social behaviour in the cognitive capability of living breathing human agents.

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