

# Giving Requisite Variety to Strategic and Implementation Processes: Theory and Practice<sup>1</sup>

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## ABSTRACT

Fundamental disagreements are inherent in the variety of viewpoints, and often coercive nature of relationships, contained within an organisation. In this paper I explain how differences in purpose can be handled successfully using approaches to complexity which take forward ideas developed since the 1950s in organisational cybernetics [1][2][3][4]. These methods complement the powerful complexity ideas derived from work focused on more unitary biological systems [5][6].

In Part 1, I work the requirements for individual and organisational survival and for participation leading to effective performance. I explain why managing differences in purposes in an increasingly interdependent world depends on finding organisational structures which balance the interests of autonomous individuals with those of the global social systems in which they participate. Design criteria are identified for optimising strategic and implementation processes and forging cohesive and effective organisational operations.

Part 2 introduces through examples a methodology for undertaking related organisational transformations. This methodology has resulted in new strategic and implementation processes through the design of organisational structures which establish novel forms of co-operative relationships based on trust and self-organising autonomy.

## 1. VIABILITY AND COMPLEXITY

The key ideas for managing organisational complexity that I use here have a rich history. Their main roots lie in the

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<sup>1</sup> This paper is based on a talk given by the author at the London School of Economics in November, 1997. The transcription of this talk was edited by Malcolm Peltu and further elaborated by the author for the purpose of the JAIST Conference in Ishikawa, Japan, September, 2000.

concepts of organisational cybernetics articulated initially by Ross Ashby [1] and further developed by Stafford Beer [2][7][8]. I will highlight their potential power for meeting the needs of modern organisations faced with the growing complexity of the competitive global marketplace.

## Variety, distinctions and effective performance

Ashby's notion of 'variety', which he defined in terms of the number of *possible* states in a situation, is often used to measure complexity. Variety proliferates at an extraordinary rate. For a group of just seven people, there are in the order of 4.5 million possible states for their interactions in time [2]. Such numbers are so huge that they become literally meaningless, as people cannot make any useful sense of them. Because of this, I have found that a more practical basis for understanding and managing organisational complexity is to consider the number of 'distinctions' a person is able to make in a given situation, rather than its variety [9].

Distinctions are related directly to the operational performance we expect to achieve in practice. We hear that an Eskimo can make tens of distinctions between variations of the colour white, each of which makes a difference to physical survival in a very cold environment. Most other people identify only a handful. But, in general, there is a mismatch between the distinctions we make as we experience disturbances in our relevant world and the related practices or embodied actions we use to cope with them.

This contrast between distinctions and practices indicates that a definition of the degree of complexity in a situation depends on recognising the differences between two types of context:

1. the 'operational domain', including all the moment-to-moment *tacit* distinctions we make as we are thrown into interactions and communications in all our action domains, for which we already have practices; and
2. the 'informational domain' containing the explicit distinctions we make even though some of them are not yet grounded in action.

Understanding the centrality of the operational domain and the largely supportive role of the informational domain is a crucial insight into managing organisational complexity.

Each of us operates in multiple action domains. However, in any action domain, particularly if we are discharging managerial roles, the chances are that our distinctions, for which we have incorporated practices, will depend on the distinctions made and the practices incorporated by many others.

In many contexts, a decision at the point of action typically depends on a handful of distinct scenarios and often only on making a decision between two options: *Yes* or *No*. This means that the same level of distinction-making complexity may be involved when, for instance, a national leader has to decide whether to go to war, or a sales person has to decide whether to accept or reject an order. The decision about going to war may depend on the distinctions and actions of many

more than the decision of accepting the order, possibly involving Think Tanks, simulations and other assessments before a decision is finally made. However, these aspects do not affect the much lower operational complexity of both decision makers vis-à-vis the much larger complexity of the 'war' and 'supplier' action domains for which they are accountable. Additionally, of course, the operational complexity implied by these decisions is likely to be vastly different. In the war case, it may imply the operational participation of millions of people over years; for the sales example, it may just imply a couple hours work by a few operators.

**Why the 'Fifth Discipline' fails to manage complexity**

In his widely-read book *'The Fifth Discipline'*, Peter Senge [10] identified two kinds of complexity, which he called 'detail' and 'dynamic'. He argued that methods and tools based on the dynamic perspective were the most valuable and useful approaches likely to achieve improved performance. Detail complexity, he claimed, fudged the situation and made it unclear by taking only variety into account. I disagree fundamentally. For me the essence of what complexity is about lies in the details of the operational domain and not in the complications of an informational domain.

The informational domain has a valuable role in the management of complexity because it may increase the capability of people to make distinctions as the basis of taking decisions that lead to actions. For example, it is in the informational domain that managers and others can explore different potential impacts of a decision by using modelling and dynamic simulations, such as the 'microworlds' advocated by Senge. Microworlds are a means of creating distinctions in business settings, where managers can learn together by conducting experiments that would be vastly more costly in real business situations.

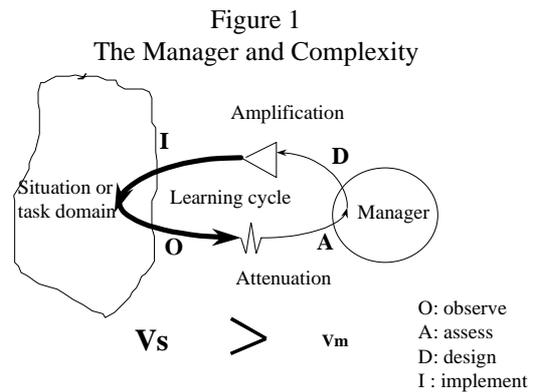
However, in the end we are all restricted in the distinctions we can make. But once a course of action is taken, the outcome in the operational domain depends on how others make aligned distinctions for action, in a complex chain of relations. Senge's emphasis on dynamic complexity in the manager's informational domain means that he fails to deal with these latter distinctions, which are the most significant complexity in order to make things happen. This complexity is in the world of details in which we as social participants operate, that is, in our operational domains.

**The learning loop and requisite variety**

Decisions by the CEO of a company with 10,000 employees may be of more strategic significance and depend on more complicated informational support than those made by the other 9,999. However, the 9,999 can make far more distinctions in the operational domain than can be made by the CEO in their shared action domains. Equally, the number of distinctions made and incorporated practices by people in any particular domain with an agreed purpose, such as a marketing department or an assembly-line team, are also greater than the number of distinctions and practices that their managers can

make in those domains. Executives therefore have to manage operational situations far more complex than their own complexity.

This can be considered as a simple cybernetic model involving a 'learning loop' between two basic entities within an organisation, the manager and the situation being managed (see Figure 1). After 'observing' the situation, the manager 'assesses' it (i.e. makes distinctions), then 'designs' what needs to be done, based on his/her incorporated practices. This, in turn, triggers the 'implementation' of those decisions. Those actions change the situation, which provides feedback into the Observe-Assess-Design-Implement learning loop.



It is interesting to relate this model with Ashby's powerful and important 'Law of Requisite Variety'. This states essentially that to control a situation, that is, to perform up to requirements, the variety of response actions must at least match the relevant variety of the situation. However, my earlier analysis shows that this balance cannot exist in an organisation because the variety in the situation to be controlled is always far greater than the manager's variety. This would suggest that the manager will never have the capacity to respond adequately to the variety in a situation by himself or herself. Therefore, in order to achieve the balance implied by Ashby's law at a desirable level of performance, management must develop strategies, supported by others, for 'attenuating' (reducing) the variety observed from the situation being managed, while 'amplifying' its variety when transforming a decision into action.

The very large number of distinctions created within a situation are attenuated by the smaller number of distinctions made by its manager. The most important attenuator of variety is the ignorance which comes from not being able to know everything happening in a situation. Managing this ignorance well is critical. Bad models of the situation will generate irrelevant distinctions that later produce inadequate actions which reduce performance, while good models will focus attention in relevant aspects that may lead to better performance.

**How we can all participate in managing complexity**

The learning loop indicates how everyone managing a task in

an organisation participates in the management of complexity through a continuous process of communication and action which attenuates and amplifies variety in the process of producing the task. Performance will depend on the quality of the attenuation and amplification, which produce the balance identified by the Law of Requisite Variety. However, this process is often misunderstood because the concept of 'matching variety with variety' is usually treated like a boxing metaphor, which assumes that a heavyweight always has to be matched with a heavyweight. A more appropriate analogy would be jujitsu.

Jujitsu promotes the idea that strength is derived from understanding what happens in a situation, which is where most complexity is seen to reside. This understanding can enable the actions of a smaller entity to stand up successfully to something much larger. Understanding a situation itself, through good models of the mechanisms for its self-regulation, is a useful way of dealing with its complexity. This is particularly the case of managers faced with having to control situations with more complexity than their own. Most successful modern companies around the world are doing this by creating conditions in which most complexity is handled locally, in the situation itself, except for the 'residual variety' that must be handled directly by them. This is a very powerful strategy for managing complexity.

The effectiveness of this strategy depends on the transformation of relationships which sought 'win-lose' or 'zero-sum' outcomes to new 'win-win' objectives. Many companies are seeking to achieve this in relations with their markets. For example, customers are increasingly being asked to do work previously done within a firm, such as carrying out banking transactions from home. The customers win because they get a better service and the companies win because their costs are cut. They achieve more with less.

Many enterprises are similarly transforming their supply-chain relationships, say by giving access to production programmes which enable a supplier to decide when to send certain components to a manufacturer. Franchising the running of individual shops, as carried out by retail chains like the Body Shop, is another way of establishing new relationships to achieve much higher performance than could have been reached by adopting the boxing metaphor of having to create a heavyweight organisation to take on a heavyweight market.

The jujitsu metaphor is also based on seeking outcomes that are humane as well as efficient. This means the views of all participants must be taken into account in the conversations and negotiations required to establish genuine partnerships, without attempts being made to impose a situation favouring particular stakeholders. It also indicates a need to consider broader societal dimensions. For example, the use of customers to take over some work previously done by bank staff will not have any losers only if the overall economic cake grows sufficiently to ensure staff cut by the bank find other suitable employment.

### **Overcoming the limitations of hierarchical systems**

The kinds of transformation in relations I am advocating,

based on the jujitsu metaphor, are at the core of new ways of successfully handling complexity within organisations, not just in interactions between an organisation and its market. These new relationships create the capacity for solutions to emerge from the people who participate in the processes by establishing conditions within which autonomous self-organisation and self-regulation are encouraged to flourish. Such autonomy often emerges as a natural strategy for coping with complex real needs, even in organisations and systems based on rigid controls enforced through centrally-imposed norms and penalties.

For instance, when the Soviet Union still existed I studied its GOSPLAN planning system for about a year [11]. We found attempts to operate by central diktat broke down because people at the centre couldn't know about everything going on everywhere. Groups which failed to get adequate responses, such as those in a remote area like Siberia, developed autonomy through self-organisation, despite threats of punishment if they were caught. That was the only way they could achieve anything at all. In practice, the attenuating ignorance that helps to balance unbalanced varieties (cf. the Law of Requisite Variety) meant they were rarely found out by the centre as they acted autonomously at the local level. Of course, this was also the source of corrupt practices.

Nevertheless, many organisations are still driven by the hierarchical paradigm that assumes the distinctions made at the top are the only relevant ones, which implies that people at lower levels are there only to implement them, but not to make distinctions of their own. Therefore the assumption is that the complexity of a senior manager is much greater than that of a professional in the production line. Somehow it is assumed that people at the top have much bigger brains than those working at 'lower' levels. Since they don't, the space of creative action at 'lower levels has had to be reduced. The assumption becomes a self-fulfilling prophesy. This becomes manifest when power is exercised by enforcing distinctions made at corporate levels to construct a limited context of action for the majority in the organisation.

The most potent examples of this paradigm are accounting systems, which embody the view that the only important distinctions are those related to the bottom-line profit or loss figures. Organisations and society at large pay in many ways for problems caused by the narrow focus imposed by accounting systems that are blind to the broader complexities of the world in which an organisation operates. This world functions through a chain of human activities involving many people in constant action and interaction, with the potentials for creating plans, making distinctions and implementing them. It is therefore important to try to develop accounting systems based on broader concepts of complexity which nurture and account for the complexity of all participants in an organisation [12]. However, this depends on the opportunities for creating non hierarchical organisations.

One reason why hierarchies grew as the main paradigm for organisational structures is that they offer a useful model for attenuating situational complexity, thereby helping to make the managerial job more manageable. Their cost is lower

performance, since those potentially sensitive to local needs are not supposed to make their own distinctions, let alone to enact them in the organisation's products and services; they just have to follow the overall view of the top. For instance, a demand to meet shareholders' economic goals can be cascaded down the hierarchy to become part of the objectives of all units in the organisation. This power structure transcends the ability of people lower down in the hierarchy to articulate an alternative perspective, which could create different forms of organisation to produce different types of enactment.

### **Agreeing and enacting an organisation's primary purpose**

The narrowly-focused funnel enforced by hierarchical structures, where the few create the organisational context for the many, undermines an organisation's capacity for handling complexity because it wastes resources, kills variety and limits flexibility. The main challenge in moving to an alternative paradigm is to identify structures which better balance the need for a degree of corporate discipline with the capability for exercising local autonomy, which is essential to the successful management of complexity. Understanding the processes by which the organisation's purposes are agreed or enacted by its own stakeholders is a key stage towards achieving this.

Aligning tacit or explicitly agreed purposes for the organisation is vital to ensuring all participants work together as an effective system. This is necessary in order to take into account the varied constructions held by individuals and groups in the enterprise of their own purposes and their perceptions of organisational goals. I'm not talking about one single organisational purpose, but more significantly about the alignment of multiple local purposes under common self-created purposes. These global purposes are more like the ingredients of a vision or global transformation, which people are prepared to work for without losing their personal or local interests. This vision, or shared global purpose, enables a significant distinction to be made between:

1. the organisation's 'primary activities', which are those local activities producing through their actions and interactions the global purpose as desired; and
2. the organisation's 'regulatory functions', which are enablers of primary activities, for instance by defining strategy or co-ordinating their activities in a market segment.

Primary activities are potentially autonomous tasks. As I discuss below, they can be analysed in a non-hierarchical way because their embedding in another larger primary activity does not define a relationship of seniority, but simply one of containment.

For example, if we take the primary purpose of a university to be the creation and distribution of knowledge, then each academic member of staff may be seen to be carrying out an autonomous primary activity, as they develop knowledge in their own topics. They may be embedded in academic departments, developing knowledge in particular academic disciplines. This embedding should not be seen as a social

hierarchical relation, since the autonomous professor may see the academic department only as a shared disciplinary framework to co-ordinate his or her work. Similarly. Equally, a surgeon in an operating theatre is delivering a local primary activity of a hospital (itself, in this context, a 'global' primary activity), with most other members of the theatre team in an enabling role. All of them may be embedded in a particular speciality Department (an 'intermediate' primary activity) of the hospital (embedding several similar teams). Nevertheless, it is unlikely that the surgeon will be seen as a junior in the hospital simply because he/she is the most 'local' primary activity.

The person performing a primary activity, like the surgeon, is said to be 'at the edge' of an organisation. The terms 'primary' and 'regulatory' are non-judgemental categorisations to help analyse a situation. They do not implicitly boost or denigrate the status or importance of participants carrying out either set of activities.

### **Dysfunctional autonomy and effective innovation**

Understanding the agreed purpose of an organisation also helps to identify any autonomous unit whose purpose has grown so far out of line with the organisation's purpose that it should be moved somewhere else. This is a common occurrence. For instance, it happened many years ago within the UK National Coal Board, where the Operational Research Executive (ORE) grew so large and active in the consultancy market that its purpose of being a regulatory function was at odds with the Board's primary purpose of digging and distributing coal. Eventually, the ORE was divested and became part of a larger independent consultancy.

Such dysfunctional autonomous units might emerge for the best reasons, before creating all kinds of awkward situations when they start to serve their own interests at the expense of the organisation they are supposed to serve. This can also lead to a great mismatch between the purpose espoused by an organisation and its purpose in use. In one company I have studied, the espoused purpose was to mine and sell copper, yet in practice it ran a large hospital, schools and a power generation station for a whole region. It either had to completely change its identity, accepting it was, for instance, a regional development agency, or divest out of its non-copper mining activities, thus keeping its mining identity. Otherwise, it was in danger of losing a real sense of unified purpose.

The emergence of dysfunctional autonomy is very different to the concept of 'emergence from co-evolution', which is a most powerful idea derived from complexity theory. Emergence from co-evolution creates novel qualities or other outcomes, which could not have been predicted by studying the individual elements involved in the process. This can be a powerful force for successful adaptation and innovation. Co-evolution is a powerful engine for innovation.

In an organisation designed to promote self-organisation, care must be taken in mediating between units at different structural levels (i.e. units embedded in others). For example, in the UK, during the conservative governments of the 80's

and 90's, the policy was to promote a large number of autonomous local health units, based on different professional, patients and governmental interests. However, the development of intermediate levels (based for instance on geography criteria) embedding local concerns was overlooked. Promoting autonomy was useful to improve local performance but the cost was global unfairness in the distribution of resources.

-Such levels need to be considered as an aspect for organisational design, as discussed in Part 2 below.

All organisations need a degree of commonality in actions, based on their agreed purposes, which should not be confused with creating hierarchical relations. This commonality can help to handle complexity, provided corporate standards act as a framework for promoting much effective local autonomy. Approaches such as this have underpinned apparently rigid hierarchical institutions like the Army or Catholic Church, as well as many retail chains, automobile manufacturers and other businesses. An organisation that appears to be standardised and unchanging from the outside might actually be applying a standard framework in areas that aren't the essence of its business (i.e. its purposes). In the activities which really matter to achieving the purposes of the organisation, that framework could encourage great flexibility. As Pliny the Younger said: "You need to obey the law to become truly free".

### **Creating cohesion from diverse purposes**

I have explained basic ideas for managing complexity. These ideas point to the need for structures which enable members of an organisation to create and run their own spaces of action in ways that cohere to perform the larger organisational purpose as agreed. The idea of autonomous units within autonomous units is a powerful strategy to manage an organisation's task complexity. This requires a 'recursive' organisation, in which structures replicate themselves at multiple levels to create autonomous units containing autonomous units, which themselves contain autonomous units, and so on [2]. Companies are increasingly adopting this kind of approach to succeed in the knowledge society, say by allowing greater autonomy on the production line.

The recursive organisation reflects the vital insights into managing complexity gained from the study of the natural world. From a biological viewpoint [13], natural systems have evolved from very simple units to highly differentiated entities. When simple systems become functionally differentiated, an umbrella organism emerges which subsumes them into ever more complex systems. Organisations can similarly handle complexity by creating an environment within which autonomous systems can thrive within autonomous systems, recursively. This recursive organisation can then fulfil the purposes of all autonomous parts (i.e. primary activities) as well as of the total system.

Indeed, organisational complexity cannot be managed by assuming there is a unitary purpose. It is therefore necessary to establish a language and methodology which enables people to

understand how cohesion can be produced around the very different purposes existing among individuals and groups within an organisation. These need to offer a means of creating structures within which organisational actors can self-construct an operational domain allowing their own space for action, while at the same time creating cohesion between autonomous units producing agreed purposes for the larger organisations.

Such a vibrant structure offers an exciting opportunity for developing an engine for creativity and the production of spectacular performance improvements based on co-operation between truly autonomous groups and individuals who respect each other. This offers an attractive future for organisations and the people within them, compared to more boring and less efficient structures where people are treated like automatons obeying the instructions of a few managers.

## **2. DESIGNING ORGANISATIONS**

### **Creating organisations to manage complexity effectively**

I have developed and applied a method for designing recursive structures of autonomous systems within autonomous systems to produce an organisation's products or services as defined by its self-created strategic intent. The method is called VIPLAN [14] and is based on Stafford Beer's Viable System Model [2][8]. It assists in the discussion and study of different structural scenarios by showing how organisational complexity unfolds, either by design or happenstance, and whether this unfolding is consistent with the organisation's agreed mission and vision. It has been used to design organisational structures in a variety of real business contexts [4][15][16].

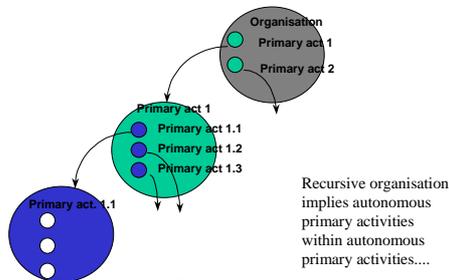
Figure 2 shows the initial stages of the 'unfolding of complexity' process, which starts by identifying primary activities. Each primary activity is unfolded at the next level in terms of its own embedded primary activities. These are similarly unfolded in a recursive chain than eventually maps the total organisation. As task complexity grows, small autonomous groups evolve within the original group, thus further unfolding complexity.

The unfolding process explains the chain of autonomous units that have 'structural recursion' at each level of unfolding [2][15]. Structural recursion means that the structure of each primary activity is the same as that of the total system. This is the structure for viability. To be seen as viable, a system must have the capacity to create, regulate and implement its own policies. It will not be viable if any one of the creation, regulation and implementation structural capabilities is not available within the system.

This means all viable units, not only the total corporation, are capable of performing functions like policy making and regulation, as well as implementation. In this context, the ability to 'create' is a wider concept than 'planning' and is

distributed throughout the organisation.

Figure 2  
Unfolding of complexity



Although the unfolding in Figure 2 is represented in a top-down framework with the total organisation at the top, it is vital to remember that this is a non-hierarchical, embedded, structure. As discussed earlier, some people carrying out key primary activities at the edge of an organisation, such as a surgeon, may appear at the lowest level of unfolding although they are of high status in the traditional organisational hierarchy. The traditional paradigm has become so ingrained in modern industrial society that people naturally tend to assume that the unfolding of complexity follows social hierarchical flows.

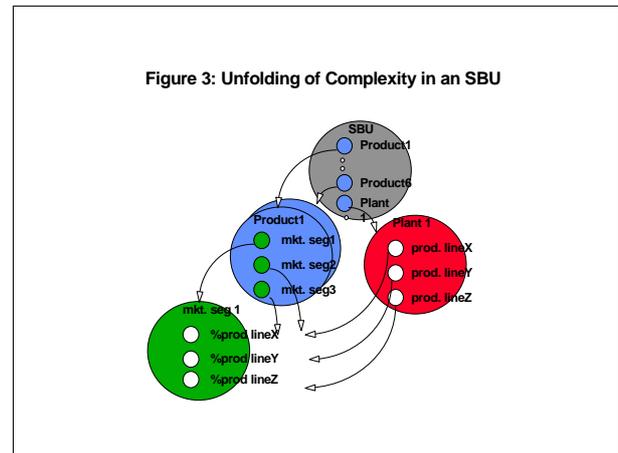
One of the problems of hierarchical organisations highlighted by unfolding complexity is the large degree of fragmentation created. In the functional structures encouraged by the hierarchical paradigm, the space for flexible primary activities is very limited indeed, since it fragments creation and regulation from implementation. This leads to embedded primary activities with very limited capacity for task creation and regulation and to corporate managers and resources becoming overloaded because they are gatekeepers of information flows between functions. The next sections offer two examples of successful organisational design in two large enterprises.

### The unfolding of complexity in a global corporation

The unfolding of complexity for a large company can be illustrated by work I did with others over a period of several years with a globally-operating European chemical corporation [4]. This was a highly centralised, functional organisation, which eventually realised it had to unfold its complexity. Initially, its management recognised the need to create autonomous divisions; one of them was the Plastics Division. However, this change only shifted the centralisation burden to the divisions. Divisional management became responsible for co-ordinating its R&D, manufacturing plants and market segments. When divisional management was recognised as the bottle neck, the corporation eventually agreed to unfold the divisions into Strategic Business Units (SBUs). In the Plastics Division one such SBU was for PVC. As a typical SBU, it was highly complex in itself. It had more than a 1,000 people and included a number of markets and two plants.

A new focus was needed to bring all parts of the organisation into a co-ordinated system. The key question to be answered was to find out what kind of autonomous units should be the basis for constituting the next level of unfolding from the SBU. The most attractive choice seemed to be market segments, as they focus on customer requirements. However, marketing groups did not have easy connections to the plants, either geographically or through structural communications. The market segment was therefore not a viable system because it did not have the implementation capacity to make things happen, although it could create and regulate its policy. The market segment was not a total system.

Eventually we found a way for this unfolding. The SBU wanted to make viable its products and plants. For instance, PVC recognised six product lines based on different processes and two plants. An effective new structure was created by unfolding the SBU's complexity through both products and plants as primary activities (see Figure 3). Then, each product was unfolded into a number of market segments, while plants were unfolded into distinct production lines.



In order to make them autonomous viable systems, market segments were given an implementation capability by allowing a percentage of the production lines to be steered directly by marketing managers. This ensured products could be sold on the basis of a defined manufacturing commitment to an agreed timescale. It also helped to overcome the traditional tension between production staff, who complained that marketing people meddle far too much in their scheduling, and the marketing view that production people did not offer the flexibility needed to meet the needs of a dynamic marketplace. Within the new relationship between the groups shown in Figure 3, people accountable to a particular market segment were appointed within each plant. They participated in teams committed to that market, which closed the loop of the recursive structure of viable autonomous systems.

### Managing complexity in a bank's lending operations

The VIPLAN method, in particular its unfolding of complexity activity, was also used to understand and articulate the evolving structure of National Westminster Bank during a

period of major restructuring and change. This was carried out as part of the SYCOMT research project in the Computer Supported Co-operative Work (CSCW) research programme sponsored by the UK Department of Trade and Industry and the Engineering and Physical Sciences Research Council. It developed a framework of methods for designing systems which support the co-operative nature of work more effectively [16].

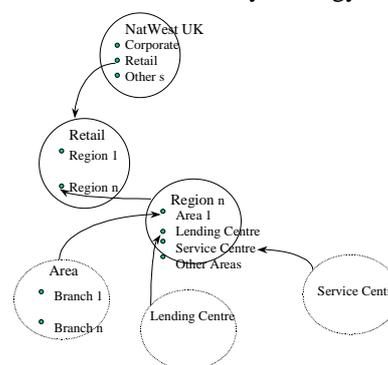
Figure 4 shows the unfolding of complexity at the bank when we first did an analysis. The main focus of our collaboration was with the retail operations of NatWest UK, encompassing over 2,000 branches structured into seventeen regions. Shortly before we started our analyses, a new service delivery strategy had been implemented which aimed to improve services to customers by centralising specialised resources for some common operations, thereby enabling higher qualified staff to be employed for these activities. The new strategy created Lending and Service Centres to carry out work that was previously undertaken in the back offices of branches.

Branches were sub-ordinated to Area Management. These often contained both new branches, which operated in collaboration with the new centres, and old branches still responsible for the total operations. Lending Centres could operate as autonomous units in managing and delivering loan products. The branches with which they were collaborating could also perform these functions, below certain discretionary powers. Service centres also acted autonomously, essentially as magnified computer centres processing the bank's transactions, including those of branches and Lending Centres. Lending and Service centres were sub-ordinated to Regional Management.

This arrangement was creating fragmentation because branches, Lending Centres and Service Centres were operationally interdependent, but were part of different, independent reporting structures and were generally in different physical locations. Branches and Lending Centres also competed to a degree for a particular customer's business. Incentives were based on the loans secured within a branch or Lending Centre, so branch staff might be reluctant to pass on a customer contact to a Lending Centre and vice-versa.

The bank agreed SYCOMT could establish a prototype to experiment with ways of overcoming this fragmentation. We proposed three options. One was to make the branch the lending primary activity within the Region, with Lending Centres offering expert advice to support these activities (i.e. operating as regulatory functions rather than as businesses in their own right). Another would have made the Lending Centres the primary activity and owner of the customer, with branches acting strictly as functional support to facilitate channels of communication with customers. The bank decided to proceed with a third 'hybrid' option, which was a mixed perspective combining roles. This was implemented initially for loans to small businesses within the Chester and Wirral Area of NatWest's Merseyside Region and, later on, for all the branches' operations.

Figure 4  
NatWest UK: Delivery Strategy



### Improving team work and communications

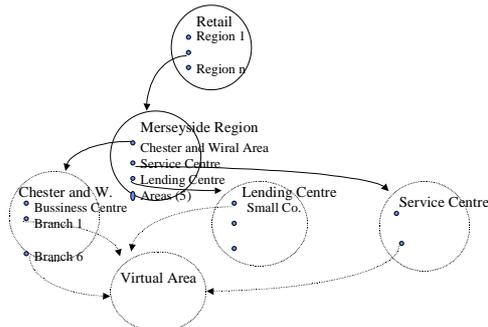
The SYCOMT prototype established 'lending teams'. These were 'virtual' teams composed of people in branches and Lending Centres who could work together interactively using IT-based communication services, like email and bulletin boards accessed through intelligent desktop PCs. Figure 5 shows the unfolding of complexity for this strategy. The circle at the bottom including an arrowed line represents the virtual lending teams handling loans. The reporting system was changed to ensure that everyone worked together in the same direction. Assistance was also provided to help staff from different locations to understand different roles and to get to know each other. Extensive job swaps, including ones at managerial levels, proved to be the most successful and popular way of achieving this. Effective team working from different locations depended on all staff having access to an appropriate PC-based network. Only dumb terminals were available previously, so a new network supporting co-operative team working had to be developed first. The implementation of the virtual teams was facilitated by the use of process flowcharting techniques, such as 'deployment flowcharting' [17]. This enabled the braiding of business and organisational processes by modelling the details of business process in relation to the unfolding of complexity model, as well as linking all processes with their sub-processes.

We established a Meta-management Area Team (MAT), consisting of the managers of the Area, Lending Centre and Service Centre, to address the need to provide co-ordination and a common framework across existing functional divides. The MAT was the mechanism used to create a virtual Area, integrating lending and service activities with branch activities. It was responsible for aspects like generating a shared vision and agreeing joint aims, performance measures and targets. The MAT together with the lending teams constituted the virtual Area Primary Activity, which embedded the individual lending teams.

After a six months trial, this Area outperformed all others in the Region by so much (at least by over 25%) that it became clear the experimental hybrid approach could boost performance substantially by forging a virtual organisation

that operated effectively as an integrated autonomous unit. In addition to the performance outcomes, the success of the approach was indicated by the degree to which the technological drive was soon pulled by team members once they could see the tangible benefits, such as real-time access to operational information for which they previously had to wait one or more days as it was distributed through couriers.

Figure 5  
Option 3: Mixed Perspective



Some ingredients of this success related to the specific environment, such as the bank's project manager who gained deep knowledge of the principles and practice of the unfolding of complexity method, as well as being an influential motivator and resolver of potential resistance to change. Job swaps also proved to be important. The full interplay of human, organisational and technological changes was mapped in detail by SYCOMT researchers at Lancaster University.

However, the enduring broader significance of this project is its demonstration of how structural changes can help to improve performance and replace fragmentation by cohesion. Once the structure was right, including the new communication links, all people in the virtual teams began to flow together rather than compete. The prototype also showed that introducing technology is much easier if attention is paid first to designing an appropriate structure.

### 3. CONCLUSION: WHY COMMUNICATION IS MORE IMPORTANT THAN INFORMATION

The creation of recursive organisations is not a matter of improving information flows alone. Changes in information systems do not recognise the much more complex reality of interpersonal communications. Therefore to transform a hierarchical organisation into a recursive one requires transforming relationships. I want to illustrate this with reference to a couple of examples.

In the SBU of the global European chemical corporation, an important source of its inefficiency was a mismatch between its computerised information system and the way the social system worked. At one time, orders in the SBU were processed centrally using a sophisticated linear programming

model that planned detailed machine scheduling for the two plants. By the time it came to produce the goods, the plan was already out of date because many customers had changed their minds. The problem was so great that each order was changed 1.5 times on average, generating 15,000 modifications for every 10,000 orders received initially. The natural game played between customers and manufacturers was a key reason for so many changes. For instance, customers often placed an order before finalising their detailed requirements as they wanted to get an early place in the production queue to ensure they would meet the demands of their own customers. In this situation, acceptable deliveries were achieved only when market-sector managers succeeded in cajoling production staff to give priority to their goods.

Such mismatches between information systems and real human work processes are common, indicating why it is wrong to suggest that organisations can be created by creating their information systems. Instead, organisations should be seen as being produced by people's communications. The dynamics of an organisation's internal relationships are based crucially on communication acts between participants. The capacity to handle complexity by responding effectively in the vital operational domain depends on how these communication structures transform the vast amount of external disturbances into business meanings that trigger more effective performance. From this viewpoint, there can be no objectively 'right' or 'wrong' way of reading the 'true' meaning of the environment in which an organisation operates, but only structural capacity to accommodate these disturbances. If this capacity is not there, disturbances will not be heard. This blindness is responsible for making irrelevant declarations for participative organisations. Their hierarchical nature will remain as long as their systems produce hierarchical relations.

The informational domain plays a useful but supportive role, for instance in helping firms to avoid costly trial and error processes by anticipating the future. The danger of giving too much weight to the informational domain was illustrated in the BBC -TV *Troubleshooter* series with Sir John Harvey-Jones. In one episode, he expressed deep concern when he could not find formal strategic development plans for the Morgan car manufacturer. Yet the company had a bulging long-term order book. This demonstrated how a firm can gain a close empathy ('structural coupling') with its market in the operational domain, where complexity is actually managed, without necessarily relying on sophisticated formal planning processes in the informational domain.

The unfolding of complexity method focuses on critical processes in the operational domain because it unfolds the actual requirements of organisational complexity. It also helps to establish an effective self-organising capacity for solving problems as they arise, as part of a coherent drive to satisfy agreed organisational purposes.

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