Applying Complexity Theory to the Strategic Development of an Organisation

Volume One

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by

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Abstract

How useful is complexity theory for describing the strategic development of an organisation? I begin by using Whittington's framework to give an overview of mainstream strategy literature. I highlight some of the shortcomings in current approaches to strategy and suggest that a new approach is needed. Complexity theory is offered as a new approach. I examine the complexity theory literature. I discuss rules based and connectionist approaches to complexity theory and the use of complexity theory concepts as metaphors. The complexity theory concepts of sensitivity to initial conditions, disequilibrium, positive and negative feedback and emergence of order are identified. Shortcomings in using the theory to describe a social system are then given. I examine the research paradigms open to researchers and conclude that to apply complexity theory to a social system, research within a phenomenological paradigm is required. I present an three and a half year ethnographic study of AYTAG, a public sector regulatory organisation. I use narrative to describe its development in terms of complexity theory concepts. The organisation set out to become flexible and flat structured, with multiskilled professionals and a strong centre to drive it forward. What emerged was an hierarchical organisation with powerful operational departments, a weak centre and a traditionally skilled workforce. AYTAG retained its primary role of regulator but failed to promote its influencing role. I found that order emerged at the boundary between the organisation's legitimate and shadow systems. The underlying dynamic which led to the order that emerged was the need to reduce anxiety. I examine the usefulness of each complexity theory concept to our understanding of the development of AYTAG. I describe the difficulties involved in determining the exact nature of initial conditions in social systems

and the need to consider disequilibrium as a social state rather than a particular action or event. In particular I highlight the use of the concept of feedback as an interesting avenue for studying organisations. I examine the nature of feedback processes at the level of the organisation and at individual system level. I describe the interplay between them and its effect on the order emerging in AYTAG. I draw attention to some of the difficulties I found in applying complexity theory concepts to a social system, such establishing precise definitions of the different concepts. I question the assertion that organisations are naturally complex adaptive systems producing novel forms of order and suggest that in social systems equilibrium seeking behaviour is the norm. They self organise into hierarchy. I conclude by saying that complexity theory has to be informed by the behavioural sciences if it is to help our understanding of human systems.

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The Application of Complexity Theory to the Strategic Development of an Organisation

Abbreviations used in the text

APT	AYTAG Planning Team
AYTAG	Pseudonym for the organisation studied
CMT	Corporate Management Team
EPO	Environment Protection Officer
HMIPI	Her Majesty's Industrial Pollution Inspectorate
LA	Local Authority
ODT	Organisation Development Team
PPC	Pollution Prevention and Control
PRP	Performance Related Pay
Quango	Quasi-autonomous non-government organisation
VAT	Value Added Tax
WQA	Water Quality Board

The Application of Complexity Theory to the Strategic Development of an Organisation

Table of Contents

Volume One

Chapters	Page
Introduction The Organisation Studied and the Purpose of the Research	1
Chapter One The Theoretical Approaches to Strategy	6
Chapter Two The Need for a New Approach to Strategy	25
Chapter Three Complexity Theory and its Application to Strategy Development	40
Chapter 4 The Methodological Approach to the Research	75
Chapter 5 The Research Process – Data Collection and Analysis	107
Chapter 6 The Formation and Development of AYTAG	126

The Application of Complexity Theory to the Strategic Development of an Organisation

Table of Contents

Volume Two

Chapters	Page
Introduction to Chapters Seven to Ten	140
Chapter 7 Initial Conditions in AYTAG	143
Chapter 8 Disequilibrium Conditions in AYTAG	161
Chapter 9 Negative and Positive Feedback Processes	178
Chapter 10 Strategic Development - Order Emerging in AYTAG	215
Chapter 11 Anxiety Reduction Activity in AYTAG	249
Chapter 12 Emergent Order at the System Boundary	256
Chapter 13 Feedback; its Links to Connectivity, Initial Conditions and Disequilibrium	263
Chapter 14 Complexity Theory and Social Systems – Problems, Limitations and a Possible Way Forward	271

The Application of Complexity Theory to the Strategic Development of an Organisation

Table of Contents

Volume Two continued

Chapters	Page
Appendix One Interview Plan for Interview with Director for Special Projects	290
Appendix Two Using Action Research to Multiskill Professionals and Develop the Management Process in AYTAG	292
Appendix Three Mind Map – AYTAG Initial Conditions	295
Appendix Four Whittington's Framework and the Research Results	296
References	300

The Application of Complexity Theory to the Strategic Development of an Organisation

List of Figures and Tables

Volume One

		Page
Figure 1.1	Generic perspectives on strategy	8
Table 3.1	Data collection areas	72
Figure 4.1	Research paradigms	76
Table 4.2	Strengths and limitations of case studies	97
Table 4.3	Action research and ethnography as research methodologies	102
Table 4.4	Research limitations, advantages and implications for the research process	104
Figure 5.1	Data collection and analysis in AYTAG	108
Table 5.2	My participant observation roles in different work situations	110
Figure 5.3	Overview of the data collection and analysis process	111
Table 5.4	Linking the data obtained to the key concepts of complexity theory	112
Table 5.5	Writing narrative	122
Figure 6.1	The size of AYTAG's business in 1996	127

The Application of Complexity Theory to the Strategic Development of an Organisation

List of Figures and Tables

Volume Two

		Page
Figure 7.1	The emergence of order	142
Figure 7.2	Initial conditions in AYTAG	145
Figure 7.3	Structure of AYTAG April 1996	155
Figure 8.1	Planned and unplanned actions and events in AYTAG bringing about disequilibrium	163
Figure 9.1	Feedback processes acting against achieving the desired new state	180
Figure 9.2	Feedback processes working towards achieving the desired new state	181
Figure 10.1	Strategy milestones	220
Figure 10.2	Statement of management style December 1996	221
Figure 10.3	Corporate Management Team Actions	222
Figure 10.4	AYTAG culture	223
Figure 10.5	The AYTAG Manager	224
Figure 10.6	Levels and types of feedback required to create desired new order	227
Table 10.7	Emergent order in AYTAG	228

The Application of Complexity Theory to the Strategic Development of an Organisation

List of Figures and Tables

Volume Two continued

		Page
Figure 10.8	Key concepts in relation to the continuation of wide spans of control	229
Figure 10.9	Key concepts in relation to the development of employee flexibility	233
Figure 10.10	Key concepts in relation to the empowerment of managers	237
Figure 10.11	Key concepts in relation to value for money	240
Figure 10.12	Key concepts in relation to a strong corporate centre	242
Figure 10.13	Key concepts in relation to wanting to regulate and influence	245
Figure 12.1	The emergence of undesired order	258
Figure 12.2	The emergence of desired order	258
Figure 13.1	levels of feedback and their effects on organisational change	265
Figure 13.2	The individual as the system. The relationship between individual level human interaction and negative feedback	268

"For this world also which seems to us a thing of stone and flower and blood is not a thing at all but is a tale. And all in it is a tale and each tale is the sum of lesser tales and yet these also are the selfsame tales and contain as well all else within them. So everything is necessary. Every least thing. This is a hard lesson. Nothing can be dispensed with. Nothing despised. Because the seams are hid from us you see. The joinery. The way in which the world is made. We have no way to know what could be taken away. What omitted. We have no way to tell what might stand and what might fall. And those seams that are hid from us are of course in the tale itself and the tale has no abode or place of being except in the telling only and there it lives and makes its home and therefore we can never be done with the telling."

From Cormac McCarthy, "*The Crossing*"

Introduction

The Organisation Studied and the Purpose of the Research

During the 1980's and 1990's there was widespread change in the public sector. These changes related to the way the sector was structured and to the services it provided. One of the results of the changes was the spread of the "quango" in the British system of governance. The growth of quangos does not necessarily increase or decrease the level and extent of state activity. It shifts the allocation of functions and resources between the different domains of the state from the elected to the appointed or self appointing domain.

The term quango is described by Wilson (in Payne and Skelcher, 1997) as an umbrella beneath which a variety of organisations shelter. Weir and Hall (in Payne and Skelcher, 1997) suggest that the term is so indiscriminately used that it has lost its meaning.

The essential features of quangos are that

1. they are created as a result of government action, although not necessarily directly by government

2. they have no direct electoral accountability

3. they are responsible either for commissioning, purchasing or delivering certain public services or adjudicating over individual decisions made by public bodies or advising public policy makers

"Opening up Quangos" (1997) comments that the establishment of Executive Agencies in the UK has allowed a clear delineation between the functions of

policy formulation and policy implementation. In this way areas of relative freedom from bureaucratic constraint have been created in which a more businesslike climate can be maintained. Establishing an operational unit around clearly demarcated and coherent set of functions allows the development of operational goals, uniting staff with a clarified sense of mission.

AYTAG, the organisation which is the subject of this research, is a quango. It was established in 1996 as part of local government reorganisation in Scotland to take over the functions of various bodies that had a role in environment protection and regulation. Environmental protection had previously been mainly undertaken by local organisations governed largely by locally elected representatives. In April 1996 all existing environmental protection functions were brought under the control of one agency, AYTAG. This quango brought together Water Quality Boards, (WQBs) previously responsible for regulation of inland and costal waters, civil servants previously responsible for the regulation of large scale industrial processes and the air pollution control and waste regulatory duties of local authority environmental health departments. The formation of AYTAG also meant that a strategic national approach to environment protection could be developed alongside the provision of a coherent service at operational level.

AYTAG was unusual because of the number of different organisations that gave up their work to it. Over 500 employees came from 63 different predecessor bodies. Around 150 were directly recruited. The Water Quality Board staff had worked in small organisations with relatively undifferentiated structures. Local authority staff came from organisations larger than AYTAG with clearly defined central support departments. People from different professional backgrounds with experiences of working in different organisational cultures suddenly found themselves working together. There had been considerable work undertaken prior to April 1996 to determine a structure for the organisation to integrate the regulation of the different

environmental media. There were clearly expressed strategic objectives and the Corporate Management Team had articulated the type of organisation they wanted to manage. This was very different from what many of AYTAG's employees had previously experienced.

Reports produced during the period when AYTAG was being set up and in the first four months after it became operational give a clear indication of the direction the organisation wanted to take. These reports included the Options Team Second Report, Minutes of Board and Corporate Management Team Meetings and the first Corporate Plan. Interviews with directors and members of the Options Team during the course of the research reaffirmed what was said in these documents. They all tell us that AYTAG set out to be an organisation with

1. a flat structure with wide spans of control

2. an emphasis on employee flexibility

3. empowered managers and delegation of authority to its lowest point

4. an emphasis on value for money

5. a strong centre to knit the business together out of the organisation's predecessors

6. a reputation as an influencer in environmental matters as well as a regulator.

On transferring into AYTAG many managers found themselves in operational divisions managing interdisciplinary teams where much more was demanded of them. Multiskilled teams of professional environmental protection officers were seen as critical to the development of a "one door approach" to which

AYTAG aspired. They were also seen as an efficient and effective use of staff resources. The development of strategies and policies for environment protection, staffing and financial resources was the realm of head office divisions. In their previous organisations, operational managers had significant input in to strategy and policy development. In AYTAG they were in roles that downgraded their involvement in these areas.

I joined AYTAG one month after its formation in May 1996 as training and development manager. AYTAG was in a very fluid state. My job was to develop the skills of managers and front line professionals to enable the organisation to move towards its vision. Early in 1995 I had been introduced to the work of Ralph Stacey, and in particular, his work on complexity theory and how it could be a used to conceptualise strategic development in organisations. I recognised that I was in a good position through my work to use AYTAG as a research case study to contribute to our understanding of how complexity theory can be applied to organisations and their development.

The strategy literature is full of tools, techniques and advice for managers to help them work towards their stated goals. Many of these do not question managers' unity of intention when they make plans to reach their goals. Strategic plans frequently have to be changed to take account of circumstances that analytical tools have failed to highlight. I wanted to investigate whether complexity theory could improve our understanding of organisation development and explain why to a lesser or greater extent organisations do not to achieve their stated aims? When we think of organisations as complex adaptive systems is this The purpose of this research is two fold. Firstly it will add to the number of empirical examples of the application of complexity theory to the study of organisations. There are relatively few academically robust empirical organisational studies reported in the literature. They are insufficient to describe the development of a human system from a complexity theory perspective. The second and main purpose of the research is to explore how far complexity theory is a useful conceptual

device for understanding the strategic development of organisations. To contain the research within manageable proportions I limited it to four key complexity theory concepts; sensitivity to initial conditions, negative and positive feedback processes, disequilibrium and emergent order. We have seen the development of different approaches to complexity theory however these concepts are common to them all. I use these four concepts as devices for examining what happened in AYTAG and to gain insight into why AYTAG failed to achieve its vision.

In this thesis I identify four areas where there is a contribution to knowledge. The research makes a methodological contribution through the adoption of an ethnographical approach to a longitudinal study of change and development in an organisation. What is presented is a real empirically rich example. The research furthers our understanding of the application of complexity theory in three ways. Firstly, by commenting that complexity theory can offer an explanation of the prevention of change. Secondly, by introducing the human dimension, it furthers our understanding of the application of complexity theory to social systems. And finally it sheds light on the multi-level nature of change processes particularly in relation to positive and negative feedback processes. Dynamics which drive change in the system that is the organisation drive resistance at individual system level.

Chapter One

The Theoretical Approaches to Strategy

In this chapter I briefly describe the different approaches that have been taken to studying the strategic development of organisations. The study of strategy is multifaceted. In order to compare and contrast the many different perspectives it is useful to use a structured framework. Mintzberg et al (1998) and De Wit and Meyer (1998) both offer structured ways of looking at strategy formulation and implementation. Mintzberg and his colleagues divide strategy theories into eleven different schools. These include the design school, the learning school and so on. De Wit and Meyer ask us to look at strategy from three different perspectives – content, process and context. In this chapter I have chosen to use the framework developed by Whittington (1993) as it provides a broad and concise basis to discuss divergent views on the formation and implementation of strategies. I briefly introduce complexity theory showing how it does not fit neatly into any one of Whittington's individual categories. This chapter paves the way for chapter two in which I argue that a new approach to the strategic development of organisations is required.

In the mid 1970's discontinuities in the business environment led to major changes in the way organisations viewed strategy and strategic planning. Energy prices exploded, inflation was erratic and growing, economic growth was stagnant, customers were becoming politicised, wages in Western Europe increased to become the highest in the world and there was rapid internationalisation of competition. As these events occurred they replaced the continuities that businesses had become accustomed to since the Second World War. Companies responded in different ways but those that survived detected that their planning systems did not work and they changed their

approach. For some this took years. Shell was one of the first to gain attention through their use of scenario planning. The logic behind this was that by developing worst case and best case situations and developing plans to meet these, managers would be able to cope with the real situation which would most likely be somewhere between the two. Strategic planning went from producing a formal plan identifying the best way forward for increased growth to a shorter more flexible document acknowledging that it was necessary to make assumptions, assessments, guesses and evaluations to cope with frequent change. It also went from being driven by corporate planners to a much increased involvement of all levels of management in its development (van Mesdag, 1987). This opened up opportunities for a variety of theories and models to be developed by academics and management consultants to "aid" organisations in their approach to the strategic development of their businesses.

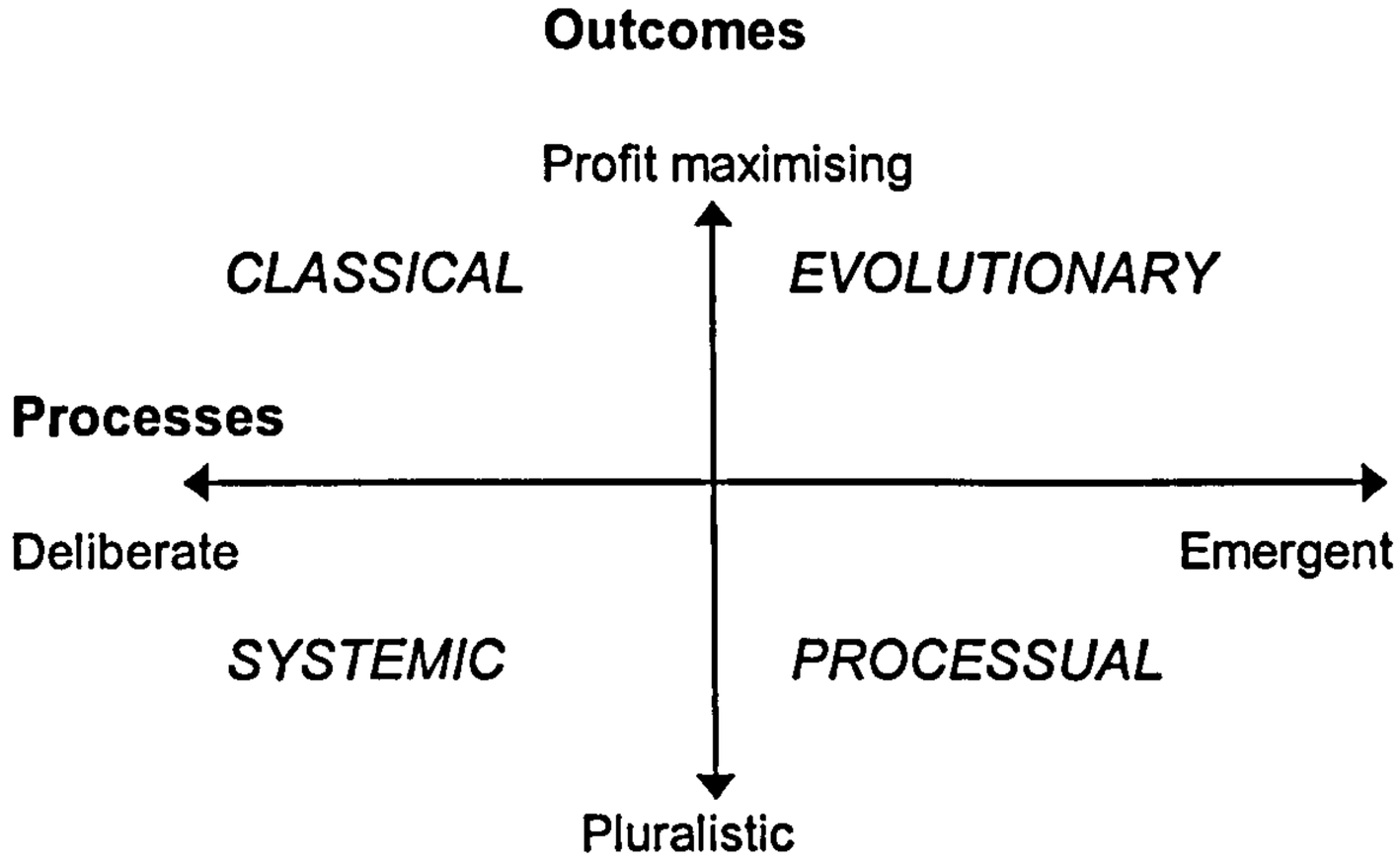
There are strongly differing opinions on most of the key issues within the field of strategy. These run so deep that even a common definition of the term is scarcely possible (De Wit and Meyer, 1998). Mintzberg (1988) suggests that we might be fooling ourselves pretending that concepts such as strategy can be reduced to a single definition. The word is generally used in different ways suggesting that implicitly we accept various definitions even though formally we tend to quote only one. The variety of conflicting views means that strategy cannot be reduced to a number of models or flow diagrams which can simply be followed like an instruction manual.

In order to study strategy a structured process has to be followed so that the various approaches can be viewed separately, compared and contrasted. A common way of looking at the strategy literature is to divide it into two areas "strategy content" and "strategy process" (De Wit and Meyer, 1998; Pettigrew, 1992; Quinn et al, 1988). Strategy content includes the work of Ansoff (1984), Porter (1980) and Chandler (1962), and is concerned with the classical, rational approach to strategy. Strategy process encompasses a

wide range of views on what constitutes strategy and is expressed by writers such as Mintzberg (1988), Hannan and Freeman (1988), Granovetter (1985) and Cyert and March (1963). In last ten years " strategy content", the classical rational approach which was by far the dominant view has been challenged and has lost ground to other approaches. This means that it is now useful to distinguish the different views which lie within "strategy process" so that they can be considered separately.

Whittington (1993) provides a useful model for doing this. His model, figure 1.1, is shown below.

Figure 1.1 Generic perspectives on strategy



adapted from Whittington (1993)

Whittington defines four basic conceptions of strategy - rational, fatalistic, pragmatic and relativist all of which have very different implications for how organisations go about "doing strategy". The rational or classical approach is the oldest, underpinning the planning methods dominant in textbooks. It is still the most influential. The evolutionary approach is fatalist and has strong links with Darwinian evolutionary theory. Processualists are pragmatists who emphasise that organisations and markets are unreliable. They advocate an

incremental approach. The Systemic approach is relativistic regarding the ends and means of strategy. Strategy is inescapably linked to the cultures and powers of the social systems in which it takes place. Wittington's basic conceptions are, in my view, a usefully structured way of understanding and separating out the variety of approaches that exist in the strategy field.

The Classical Approach to Strategy

Classical strategic thought stresses the importance of a top down, planned and rational approach. The emphasis is on the future. its explicit focus is on goals and the logical flow of actions and resources to take the organisation towards these goals. For the classicists rational planning is the way to achieve profitability. Strategy is formal and explicit. Its only goal is profit maximisation. This approach can be traced back to the militaristic ideals of Ancient Greece, through to the eighteenth century and Adam Smith. It became a coherent discipline from the 1960's based around the writings of Alfred Chandler, Igor Ansoff and Alfred Sloan (Whittington, 1993). Its dominance as an approach to strategy has its origins in the 1920's in two American Companies Du Pont and General Motors in which the Du Pont family had a large stake.

Alfred Sloan recognised the need for strategy, which he called policy, when he took over the presidency of General Motors in the mid 1920's. He stressed the importance of keeping it separate from the day to day business of operations - policy creation separated from policy execution was essential to the long term success of the business. In General Motors the operational managers were excluded from the Executive Committee which had responsibility for policy development. This "elevation" of policy became a fundamental part of classical thinking. The management consultant Peter Drucker wrote two books that publicised Sloan's approach, "The Concept of the Corporation" in 1946 and "Big Business" in 1947. Igor Ansoff was much impressed with Sloan and cited him in the first ever strategy textbook which he

wrote in 1965 - "Corporate Strategy". More recent strategy writers such as Andrews (1987) argue that strategy formulation is an activity widely shared in the management hierarchy, rather than being concentrated at the higher levels.

The word “strategy” comes from the Greek word for “general” linking it to the military. Military metaphors are widespread in business today. For classical theorists, the military model is complemented by a strong inheritance from economics. Academics with an economics background have given the business strategy field many basic techniques - for example Michael Porter in his 1980 book "Corporate Strategy - Techniques for Analysing Industries and Firms". Classical approach writers provide managers with a variety of tools, techniques and formulae with which to diagnose their situation and plan with military like precision their way forward. Economics has also contributed another cornerstone of the classical approach, the construct of rational economic man. This can be traced back to Adam Smith and his book “The Wealth of Nations”. This conception of man allowed strategy formation and implementation to be conceived of as a controlled, conscious process.

Organisations had to have structures that allow the top managers to focus on their strategic responsibilities. This led to the development of multidivisional companies. Divisions are headed by operational managers responsible for strategy implementation. Success or failure is determined internally through the quality of managerial planning, analysis and calculation. This approach was pioneered by Alfred Sloan in General Motors. He, in turn, was influenced by the writing of Alfred Chandler. Chandler was the first writer to promote the idea that the structure of the organisations should follow strategy. He defined strategy as “ the determination of the basic long term goals and objectives of an enterprise and the adoption of courses of action and the allocation of resources necessary for carrying out these goals”. Structure he defined as “the design of the organisation through which the enterprise is administered” (Chandler, 1962). This led to the multidivisional or “M” form of organisation

which has become the dominant organisational structure of American based and American influenced multinational companies (Williamson, 1975).

As organisations are organised into units a distinction is drawn between corporate plans and business unit plans (Hofer and Schendel, 1978). The corporate plan is concerned with what activities or business the company should be in and how the corporate level should manage that business. The value of the corporate plan is that in addition to co-ordinating and making consistent the business unit plans it creates "synergy" so that the whole adds up to more than the sum of the parts. The business unit plan sets out how that business unit is going to secure competitive advantage by achieving the performance objectives set by the corporate level. As business units are generally organised functionally into divisions such as finance, personnel, sales and production, the business unit strategy is translated into functional or operational strategy.

For the Classicists strategy is a linear process. First comes the analysis with its typical emphasis on tools such as SWOT analysis, then strategy formulation with the generation and evaluation of strategic options and finally the implementation stage when the option chosen is converted to a number of concrete activities to be carried out. Strategy is also rational as strategists identify, determine, evaluate, choose, translate etc based on rigorous logic and extensive knowledge of a wide range of factors. Michael Porter (1980) put classical economic theories of market form into a framework for analysing the nature of competitive advantage in a market and the power of a company in that market (Porter's Five Market Forces). Another major contribution by Porter to strategic thought is the more controversial notion of generic competitive strategies such as overall cost leadership, differentiation and focus. These are the ways of coping with the five competitive market forces and outperforming industrial rivals (Porter, 1980). Other techniques include gap analysis (Argenti, 1980; in Stacey, 1993), value chain analyses (Porter, 1985) and cost benefit analysis (Mirsham, 1980).

Ansoff contributed the notion of decision classes (Ansoff, 1965) which categorised decisions into strategy, policy, programme and standard operating procedures. Ansoff's precise definitions have been largely ignored but his broad distinctions have been accepted. They are familiar as strategy, structure and process. In his later work Ansoff (1990, 1984) acknowledged that change is occurring more rapidly and is less easy to predict. He is more sensitive to the increasing complexity of organisations and the people who work in them recognising that human and organisational inertia have to be overcome when strategic change is necessary. In his comparison of Western and Japanese decision making processes he acknowledges that they are based on different intellectual traditions. These later works provide a bridge into both the Processual and Systemic approaches to strategy. However Ansoff maintains that whatever the level of unpredictability it can be identified in advance of acting by strategic diagnosis (Ansoff, 1990).

Complexity Theory and the Classical Approach

The classical approach focuses on "formal systems" giving little consideration to what is tacit in an organisation. Complexity theory helps us look at formal and informal organisational systems and take into account the influence of an organisation's history. Classicists maintain that organisations should work towards reducing instability and offer a rational linear approach to planning. Complexity theory approaches contradict such assumptions arguing that organisations should not to think that equilibrium is the norm. Complexity theory accepts that routine predicable activities should be subject to planning and that organisations can plan in the short term. What complexity theory also recognises is that for the longer term a different approach is required which allows appropriate responses to emerge. Organisations face contradictions when they try to plan; first, let chaos develop because it is the only way to find new forms of order and second, look for order but not too much because it may be a source of chaos. Order is necessary to achieve organisational

mission, for actors to position themselves in the power structure and hierarchy and to facilitate decision making.

The Evolutionary Approach to Strategy

The evolutionary approach to strategy has its roots in Darwinism and the survival of the fittest. Rather than have a firm belief that top management can plan and act rationally they expect markets to secure profit maximisation. The competitive processes of natural selection are stressed. Evolutionists are fatalists who argue that whatever methods managers adopt it will only be the best performers that survive. The Boston Consulting Group, proponents of the evolutionary school, have produced models for managers to use when trying to determine their way forward. Alchian (1950, in Wittington, 1993) appealed directly to the biological principal of natural selection proposing an evolutionary theory of the firm that downgraded managerial strategy and emphasised environmental fit. Markets not managers choose the prevailing strategies within a particular environment. Strategic fit or coalignment between a firm and its external environment is the key to competitive advantage (Carini et al, 1998).

Evolutionary strategists initially emphasised competition in product markets as a means of eliminating inefficient competition. Critics of this view including Penrose (1952, in Whittington, 1993) were quick to point out that many large companies dominate markets rather than being disciplined by them and have sufficient power to act as a buffer against competitive markets. Evolutionary strategists have gone on to emphasise other markets such as managerial labour markets, the market for capital as selecting the best performers for survival. With this broader viewpoint incompetent managers are eliminated as they fail to develop their careers, as they find themselves unable to borrow money, fall victim to take-overs etc. So by one market or another the pressure for profit maximisation is maintained.

Using a population ecology perspective, Hannan and Freeman (1988) argue that overall efficiency can best be achieved by ensuring a steady stream of new entrants into organisational populations. They saw populations of organisations surviving, thriving or declining in particular environments. The wider ecological perspective goes beyond the problems an individual organisation has in coping with the environment to seeing an organisation as one of a population which co-exists with or competes with other populations of organisations. The environment of each consists mainly of other organisations so that the existence of each is bound up with that of its own kind and of other kinds. What matters is an abundance of diverse initiatives from which the environment can select the best and the relatively ill adapted can be quickly weeded out. For the evolutionist it is best to let the environment do the selecting rather than the managers.

Organisations have to maintain an effective alignment with their environment while managing internal interdependencies. According to Miles and Snow (1978), to align the organisation and the environment successfully, management has to solve three problems and solve them continuously. The entrepreneurial problem is to choose the general market domain of operation and target it with the right products and services; the engineering problem is to find ways of making the products and offering the services and the administrative problem is to organise and manage the work. The aim should be an effective adaptive cycle.

Colvin (1991) suggests that strategy characterises a firm's competitive orientation and can be conceptualised as a pattern of business related decisions. To understand these patterns, strategy typologies have been developed. In each of them, two core strategy types are associated with a firm's success. The first emphasises the innovative aspects of a firm's activity and is comparable to the Prospector (Miles and Snow, 1978), Differentiation (Porter, 1980) or Entrepreneurial (Colvin, 1991) strategy. This approach is

characterised by differentiation by offering products which are considered unique along dimensions such as design, brand image, service and features. It involves minimising customer sensitivity to price rather than competing on cost, while seeking out new markets and products. The second successful strategy in these different typologies emphasises stability. Firms pursuing the Defender (Miles and Snow, 1978), Cost Leader (Porter, 1980), or Conservative (Colvin, 1991) approach aim to achieve cost leadership through an advantage such as tight cost control in a stable product area.

Contingency theory also promotes the view that the organisation must fit the environment if it is to succeed. The theory asserts that success will be secured when the organisation secures a good match between its situation and its strategies and structures (Burns and Stalker, 1961; Lawrence and Lorsch, 1967). Mechanistic bureaucracies are said to be appropriate for stable environments but flexible, organic structures are required for turbulent environments. The design of an effective organisation has to be adapted to cope with the "contingencies" which derive from the circumstances of the environment, technology, scale, resources and other factors in the situation in which the organisation is operating (Child, 1984).

Adopting the principle of competitive exclusion established by the Russian biologist Gause in 1934 which proposes that two species cannot co-exist if they make their living in the same way Henderson (1989, in Whittington, 1993) concluded that business survival in a competitive environment depends on strategies of differentiation. Many evolutionary theorists doubt if organisations have the capacity to achieve differentiation and adaption in a deliberate and sustainable way. Complex biological organisms usually adapt more slowly than their environment resulting in human organisations having limited capacity to anticipate and respond positively to environmental changes. Environmental fit is more likely to be the result of chance or good fortune than the outcome of a deliberate strategy.

Alchian (1950, in Whittington, 1993) warns against overestimating the power of strategy as organisations are hit by unpredictable and uncontrollable market forces. Success is the result of the chance of being in the right place at the right time and investing in long term strategising is expensive and a waste of time. Strategy can be a dangerous illusion with the exception of a few firms with significant market power the only real competitive advantage is relative efficiency which means managers have to concentrate on costs.

Complexity Theory and the Evolutionary Approach

Like the classicists, evolutionary approaches focus on "formal" organisational systems. Both primarily accept negative feedback models. The "informal organisation" where many positive feedback processes are found tends to get ignored or is seen as unhelpful to strategy development. There are similarities between complexity theory and evolutionary models but the former does not reject the notion that strategy is an emergent property. Complexity theory views organisations as non linear systems driven by positive and negative feedback. When driven by negative feedback an organisation is sustained in its adaptive fit with its current environment. The result is regular patterns of human behaviour brought about by shared mental models that inhibit innovation. Competitive environments change continuously. Organisations stumble not because they fail to adapt but because they do not create and innovate. Viewed as a complex adaptive system an organisation is capable of producing endless variety. Natural selection weeds out all systems that reach states of either complete instability or complete stability. Survivors are those systems that maintain "bounded instability".

Processual Approaches to Strategy

Processualists adopt a pragmatic approach to strategy. They share the Evolutionists doubt about rational strategy development but are less confident

about markets ensuring profit maximising outcomes. They regard organisations and markets as messy phenomena from which strategies emerge with much confusion and in small incremental steps. By not striving for the unattainable ideal of rational action and accepting and working with the world as it is, managers can obtain competitive advantage. Cyert and March (1963) laid the foundations for this approach by producing a behavioural theory of the firm. "Rational economic man" is considered to be a fiction; people are "boundedly rational" (Cyert and March, 1963).

By this is meant that human beings are

- unable to consider more than a handful of factors at a time,
- reluctant to carry out unlimited searches for relevant information,
- biased in interpretation of data
- prone to accept the first satisfactory option that presents itself rather than searching for the best.

The Processual approach to strategy is based on two fundamental themes. The theme of cognitive limits on rational action which has been developed further by Henry Mintzberg (1987) and the micro politics of organisations which was taken forward by Andrew Pettigrew (1985). Human nature means that the environmental scanning, the calculations and the data analysis advocated by the Classicists tend always to be flawed and incomplete. The importance of rational analysis is downgraded by the Processualists. It is considered to limit the search for strategic flexibility and it reduces the expectations of success.

The micro-political view of organisations argues that organisations are not united in optimising a single factor such as profit. They are coalitions of individuals bringing their personal objectives and value systems into the organisation. The members bargain with each other. The combination of political bargaining and bounded rationality favours strategic conservatism with the need for change only imperfectly recognised. Strategic behaviour tends to become routinised and systematised. Organisations gradually adapt as

awkward messages from the environment force themselves on managers. Contrary to what the Evolutionists believe Processualists argue that the market is tolerant of less than optimum performance and firms can build in organisational slack to cushion themselves against the need for strategic change. Firms "satisfice" rather than "profit maximise". Organisations do not search for optimum solutions but satisfy themselves with the established routines and heuristics of the organisation. Because organisations live within these they have a narrow band of “choices”.

The regular routine of strategic planning is a comforting ritual. According to Weick and Sandilands (1990) it doesn't matter if the plan is wrong so long as it can give managers a sense of purpose to act. The Classicists' sequence of strategy formulation followed by implementation is reversed. Mintzberg (1987) doubted that top managers had the capacity to prescribe effective strategies in isolation and proposed that strategy should be seen as “crafting”. The strategist needs to retain a closeness and an awareness such as a craftsman would have with their material. For Mintzberg strategy is a continuous and adaptive process with formation and implementation inextricably entangled. It is the “science of muddling through” (Lindblom, 1959), and “logical incrementalism” (Quinn, 1980). Smart strategists appreciate that they cannot always be smart enough to think through everything in advance (Mintzberg, 1987). They are committed to a process of experimentation and learning.

The incremental approach does not rule out “strategic intent” in which an organisation has a broad clear sense of direction allowing flexibility and opportunism to be taken advantage of along the way. However according to Mintzberg (1987) the underlying strategic logic may only be perceived after the event. Strategies are often “emergent” noticeable only when a series of small steps emerge into a pattern.

The resource based theory of the firm which has its roots in the classical approach has evolved into a theory which recognises the importance of social

and "non-rational" factors making it part of the Processual approach. An organisation's competitive advantage lies in what is unique and embedded in its resources which constitute its core distinctive competences. A firm's resources are not all bought and sold in the market they include tacit skills and knowledge, patterns of co-operation and intangible assets that take time and learning to evolve. The ability to compete lies in the internal resources of the firm and not externally through positioning the firm in the right market. Strategy depends on building core competence and not chasing every market opportunity (Hamel, 1991). Core competences are the collective learning in the organisation especially how to co-ordinate diverse production skills and integrate multiple streams of technologies. Unlike physical assets competences grow rather than deteriorate as they are applied and shared. Prahalad and Hamel (1990) argued that the way in which many organisations are structured around strategic business units (M Form) interferes with the organisation's ability to be competitive. It can lead to under investment in core competences and core products.

Senge (1993) forwarded a view that the primary institutions of western society are orientated towards controlling rather than learning; rewarding individuals for their performing for others, rather than for cultivating their desire to learn. By focusing on performing for someone else's approval, organisations create the very conditions that predestine them to mediocre performance. In an increasingly dynamic and unpredictable world it is no longer possible for the person at the top to "figure it all out." This model has to give way to integrating thinking and acting at all levels. Senge used the term "learning organisation" to describe an organisation which can develop successfully in a competitive and complex environment. Learning organisations require a different form of leadership with leaders taking on roles as designers, teachers and stewards. Leadership does require leaders to have a vision of the desired future state and an accurate picture of current reality. The gap between them generates a natural creative tension. Individuals, groups and organisations learn how to work with creative tensions and how to use the energy such tensions

generate. In order to carry out the new leadership roles, leaders require three critical new skills, building shared visions, surfacing and challenging mental models and engaging in systems thinking.

The Processualist critique sees classical strategic thinking as a reduction of the unknowable into a comforting simplicity that merely affords meaning to the manager. It is not about choosing markets and policing performance. It is something that may only emerge retrospectively. Most importantly organisations need to cultivate internal competences so that they can turn the messiness of organisations and markets to their advantage. By doing this, by cultivating the flexibility of incremental adaption, organisations can work towards maximum performance.

Complexity Theory and the Processual Approach

Processual approaches to strategy are more pluralistic than either the evolutionary or classical approaches and they pay more attention to informal organisational processes. Processualists acknowledge that instability is continually present in organisations and accept that organisations have to work with it continuously. In this way they are similar to complexity theory. The focus for processualists is on strategy process rather than strategy content. Complexity theory offers the promise of reuniting the two (MacIntosh and MacLean, 1999). Like strategy content, strategy processes often turn out to be different from what had been envisaged. These differences are down played or "explained away". Complexity theory can help us understand these differences, as it allows different strands of organisational behaviour theory to be brought into the equation. The theory helps us see that organisations can only move forward in times of rapid change if they capture and act on relevant and vital information which is present but traditionally has not necessarily been acknowledged. Managers who can handle a dynamic unwritten list of issues, aspirations and challenges which exist in all organisations and translate these

into meaningful data will enable that organisation to develop strategically (Stacey, 1991).

Systemic Perspectives on Strategy

The Systemic approach is relativist. Central to it is the belief that decision makers are not detached rational individuals interacting in purely economic transactions, they are people who are deeply rooted in densely interwoven social systems. Economic activity cannot just be considered in the context of financial calculations. Economic behaviour is embedded in a network of social relations which can include family, state, professions, educational and ethnic background and religion. These networks define what is appropriate and reasonable behaviour and therefore influence both the strategy outcome and process. The Systemic theorist will argue that organisations differ according to the social and economic systems in which they are embedded. They are not all profit maximisers which classical theory says they choose to be and evolutionary theory says they have to be. Nor are they the product of internal limits and compromises as put forward by Processualists. The norms which guide strategy are derived from the cultural rules of local society and not by the cognitive boundaries of individuals.

The differences between the social systems of countries and changes in those systems are important to Systemic theory. Different kinds of enterprise structures become possible and successful in particular social contexts. Writers on strategy frequently ignore the purpose of an organisation or make assumptions that all organisations exist for the same basic reasons. Business organisations play an important role. The purposes they attempt to fulfil will have a significant effect on the functioning of society (de Wit and Mayer, 1998).

The idea of strategy may itself be culturally peculiar. The Classical approach to strategy gained popularity in North America after the second world war and has strong connotations of free will and self control. These ideas are alien to some cultures such as Muslim and Chinese. Fundamentalist Moslems see life as a path preordained by God. The Chinese often explain events in terms of a combination of luck and fate. Some cultures such as the French see the enlisting of state resources as a natural part of strategic management. To operate successfully firms have to subject themselves to the conforming role of the social pressures of their own countries. The work related values of any individual national culture are distinctive and different. This results in differences in organisational processes and behaviour. Hofstede (1980) argues that we should not expect the same conceptions and prescriptions to be appropriate in all cultural areas. Cultural differences have an important impact on how organisations function. American business works in a culture that respects profit, values technical procedures and has strong faith in the free market. Regardless of whether the formal planning processes of the Classical approach are economically effective they have to be carried out to conform to the cultural norms of that particular business environment.

Firms using copycat strategies can be said to be adopting a systemic approach. They can look at what others do and then copy it. This strategy is more often referred to as benchmarking or adopting best practice. Firms adopting such strategies can run into problems if they are operating in one cultural environment and try to copy the successful practices of a different culture. The Western admiration for Japanese practices such as “quality” is such an example. There are many features both cosmetic and fundamental that distinguish American, European and Japanese industry and attempts to imitate successful strategies based in other cultures often overlook important cultural issues. In addition successful strategies are individual to the particular firms which adopt them (Kay, 1995).

Shivastava (1986) points out that the Classicists put the emphasis on a top down management approach and profit maximisation which serves to reproduce the conditions of a hierarchically organised capitalist society. The tendency for organisations to have different levels of strategy; corporate level, business level and functional level also supports this view. Shivastava goes on to argue that Classical strategic management is not a neutral scientific discipline but an ideology which serves to perpetuate that society. Challenging the narrow range of options which are open to strategists operating with the Classical framework is to challenge the established social order. Morgan (1986) comments on the rise of the professional managerial class. Since the 1920's control of businesses has shifted from owners to managers. His view is that the discipline of "strategy" reflects the ideological needs of the professional managerial class rather than that of maximising capital growth. The formally structured rational Classical strategy making approach gives managers culturally acceptable power because it is cloaked in science and objectivity.

The systemic approach encourages managers to consider the key elements of the social systems in which they work. It challenges the idea that there is a single applicable model. The objectives of strategy and the manner of strategy making depend on the strategist's social characteristics and the social context in which they operate. Therefore the Classical approach may be appropriate to some societies but not all.

Complexity Theory and the Systemic Approach

The systemic approach has similarities with complexity theory in that it acknowledges that internal organisational characteristics can generate "norms of behaviour" or in complexity theory terms emergent outcomes. Complexity theory concepts such as sensitivity to initial conditions, disequilibrium and positive feedback can enrich this approach by paying attention to

organisational history and encouraging the exploration of situations that are not in equilibrium and how these can be used to help survival.

In Conclusion

The purpose of this brief review of the approaches to strategy through Whittington's (1993) framework has been to show in a concise way that strategy is multifaceted. The word strategy itself has different meanings. There are strongly differing views running through the literature and different strategy theorists start from different basic assumptions about the world. I have briefly shown that complexity theory does not fit neatly into any of Whittington's categories and that it may offer an useful alternative perspective to give us insight into organisations that cannot be gained from using the individual approaches described by Whittington. I will now move on to argue in my next chapter why a new approach to the study of strategy is required, one which can bring together the divergent strands that exist in the strategy literature.

Chapter Two

The Need for a New Approach to Strategy

Having described the major approaches to strategy I want now to examine why these are insufficient. In this chapter I look at some of the theoretical assumptions that underpin our understanding of strategy. I consider some of the limitations of current theory and why a new approach is needed. This new approach is based on complexity theory which I will discuss in my next chapter.

Strategic management is about managing change at its most fundamental level not merely change within an organisation but change that affects the organisation's very existence. Change has continued throughout history serving to illustrate the importance of strategy and managing change. Human adaption to change whether singly or in groups has been sufficiently rapid in terms of generation turnover to keep pace with the rate of change required. Adaption occurring within the span of a generation now requires individuals and the groupings of them in organisations to change more often than is comfortable, or for some possible (Schendel, 1994).

In the 1990's the study of strategy fell on hard times with well known consulting firms such as McKinsey and the Boston Consulting Group who built their reputations on strategy consulting playing down their strategy focus. Academic doubt was voiced as to the value of strategy literature and schools of thought. Deregulation, excess capacity, mergers, acquisitions, environmental concerns and technological discontinuities are some of the catalysts which are driving the need for a changed approach to strategic thinking, strategy development and a re-examination of the appropriateness of traditional strategy paradigms. Traditional industrial boundaries are breaking down and there is a lack of clarity as to the boundaries of new and emerging industries.

Theoretical assumptions underpinning strategy theories

In order to understand current strategy theories it is necessary to look at the roots of the western scientific approach. This is an extension of Greek thinking beginning with Democritus and continuing through the Enlightenment until today. The optimistic positivism that grew out of the Enlightenment was so successful in shaping our understanding and control over the physical word that as a result it has been incorporated into the social sciences and the understanding of the management and organisation of business. This leads us to try to identify the cause of success before we act. We set long term objectives and try to control the movement of a business along a future path to achieve it. The result of this is when organisations do not achieve their objectives or reach their goals our reactions are those of rapprochement.

The opposing view championed by Heraclitus can be summed up as "you can't step into the same river twice". Everything is changing all the time in a process of becoming. This view brings with it the idea of "emergence", ideas about living systems and Eastern approaches to philosophy. In Taoism for example there is no inherent order. The universe in Taoism is perceived as vast, amorphous and ever changing. The elements stay the same, they continue to rearrange themselves. The world is a medium of patterns that change, that partly but never quite repeat (Waldrop, 1992). Both Eastern and Western approaches are weak at dealing with unexpected change, they seek to dampen down or exclude the unexpected and neither on its own is creative (Zohar, 1997).

Most theoretical models dealing with strategy primarily put forward rational explanations within the positivist paradigm. They stress the same internal organisational equilibrium, harmony among people, continuing adaptation to the changing environment, matching resources to capabilities and securing fit

which they say will lead to success, excellence, profit, achieving objectives etc. Most management theory has strong parallels with traditional physics and/or Darwinian evolutionary theory. Rational models of management do not achieve the accuracy of classical physics, but they have had an enormous impact on organisations enabling them to handle increasing complexities of scale. Just as classical physics cannot deal with all natural phenomena neither can rational models deal with all management phenomena. How do you operate when you are in an open-ended situation of change and when you don't know what you are doing? Such questions may not be admissible for a rational model. Unpredictability is a characteristic of complex systems such as organisations and because western scientific definitions focus on predictability it is difficult to accommodate that complexity in traditional scientific terms.

The future will be different from the past and different from what we expect it to be. Many organisations and the managers within them however behave as though the future will be a linear extrapolation of the present. This view is governed by our acceptance of a Newtonian perception of reality. Newtonian organisations are rule bound. Twentieth century philosophers such as Whitehead (Emmet, 1932), Russell, Wittgenstein (in Waldrop, 1992) set out to demonstrate that all mathematics could be founded on simple logic. They were partly right but the mathematician Godel showed that even some very simple systems are inherently incomplete. They always contain statements which cannot be proved true or false within the system, even in principle. Turing has shown that even very simple computer programmes can be un-decidable (Hilton, 1963). The development of chaos theory has taken models of non-linearity and shown their application to a wide range of physical and social phenomena.

The application of linear explanatory models is seen as increasingly limited. Life is not a series of interconnected events like beads in a necklace. Life is a series of encounters in which one event may change those that follow in an unpredictable and even devastating way. As the world becomes more complex

and interdependent change becomes increasingly non-linear, discontinuous and unpredictable, the future becomes less like the past and less like we expect it to be. Senge (1990) in his work in systems theory develops complex non-linear systems to portray the dynamics of an organisation. This whole system view requires very different management expectations and analytical processes. Rather than creating a model to forecast the future of the system, non linear models encourage the modeller to play with them and observe what happens. Different variables are tried out in order to learn about the systems critical points and its homeostasis (Senge, 1990). Controlling the model is not the goal; more important is to understand how the system works so that analysts "can interact with it more harmoniously" (Wheatley, 1992).

Scientists commonly hold the view that they can stand outside experiments as neutral observer. Autopoiesis tells us that we draw reality from the inside. We do not perceive the world directly. Incoming data is filtered by our mental model of the world. Scientists have an effect on their experiments. Not acknowledging this detracts from science and from management in turn as many on the ideas of management are derived from science. Organisations can be considered autopoietic systems. They produce and reproduce the elements they consist of with the help of the elements of which they consist (Brans and Rossbach, 1997).

The limitations of current theory

Strategy theories, and particularly classical strategy theory which is dominant in the literature, have been subject to criticism. Some writers criticise the emphasis on rationality. Others say that the true nature of strategic thinking is intuitive and creative rather than rational. Peters and Waterman (1982) argued that managers were being misled by a belief that they ought to be rational and were consequently spending too much time on research and analysis that diminished the urge to act, the results were "paralysis by analysis". They

condemn the excessive use of rationality in its technical and reasoned senses in strategic management and focus instead on "reality testing" forms of rationality. Raimond (1996) outlines two strategic mindsets the "intelligent machine approach" and strategy as "creative imagination". The idea that strategy is comprehensive and involves large scale action across whole organisations has also been challenged. Trying to get the entire organisation lined up to change at the same time is unrealistic if not impossible. Different parts of an organisation are under different pressures, have different timetables and practices resulting in strategic change which is more fragmented and gradual rather than radical and coordinated (De Wit and Mayer, 1998).

Critics of strategy theory have argued that it has proved difficult to demonstrate a direct relationship between the presence of formal strategic planning and enhanced organisational performance (Mintzberg, 1987). This is because planning and implementation are thought of as two distinct activities by classicists. The result of this is that planners have difficulty understanding the business they are planning for and managers feel little ownership of, or responsibility for, implementing the plans. Planning is often overly concerned with quantitative analysis of financial variables and therefore misses the rest of the substance of the business being planned for. The more human aspects particularly the emotions that stem from all high performing human systems are also missed. The formulation of strategy is relatively easy, the real issues and problems are those of implementation. The conventionally prescriptive approach ignores the degree to which strategy in a real business is emergent rather than directed. Senge (1990) accepts that organisational work is complex with numerous and ill recognised feedback effects, however he still seeks a world with a clear sense of direction.

Strategists today are concerned with the speed of change and ask questions about the relevance of existing strategy theory (Hamel, 1998 (2)). Existing strategy theories all have their limitations particularly when applied to turbulent environments. They are based on recurrent patterns that are recognisable, but there are usually too many exceptions for the models to have much predictive

value (Levy 1994). Porter's input/output framework (1980) is useful if the competitive forces represented by competitors, supplier, buyers etc. are relatively stable and independent. A firm can find an appropriate strategy for each industry configuration and erect the necessary barriers for protection. Prahalad and Hamel (1993) argue that the role of strategy should not be to accommodate an existing industry structure but to change it. They used the term "strategic intent" quoting Cannon's war cry "Beat Xerox" as the example to show how an apparently unreasonable aspiration can be achieved. Their model does assume that Xerox would stay the course. Prahalad and Hamel focus on the organisation's competencies. Kay (1993) focuses on capabilities as key drivers of strategy. However strategic victories won as a result of competitive innovation and competence leverage can be short lived in turbulent environments. D'Aveni (1994) proposes a "New 7S Framework" to continually seek to change the rules of the game and so deal with the fleeting nature of competitive advantage. In his framework he proposes that strategy, structure, systems, style, staff and skills should give way to superior stakeholder satisfaction, strategic soothsaying, positioning for speed, positioning for surprise, shifting the rules of competition, signalling strategic intent and simultaneous and sequential strategic thrusts. He extends Prahalad and Hamel's idea of competitive innovation to a continual process rather than a one time breakthrough. D'Aveni's framework put its emphasis on competitive dynamics stating that only temporary advantages exist. These are created by the company's speed and aggressiveness. The framework is still based on the assumption that strategic prophesying is possible and that competitive battles are won and lost by a firm's own actions.

Courtney et al (1997) maintain that the analytical approach to strategy should be tailored to the level of uncertainty in the environment. Should organisations try to shape the future, adapt to it or reserve the right not to participate until the direction being taken by others is clear. Trends that include globalisation of firms and markets, shifts in the fields of knowledge production and distribution, more highly educated workers and major technical innovations illustrate a fundamental transformation in society. These trends have significant

implications for organisations in terms of their structures and their strategies. Powerful and knowledgeable employees challenge traditional control structures and customers demand that their individual needs are met. There is a shift from visible assets such as machinery to invisible ones such as competence and creativity. There is a shift from invisible customers seen as mass markets or segments to individual visible ones with particular demands (Lowendal and Revang, 1998).

Traditionally business strategy in the western world has been the business of top management. This group represented the link to external stakeholders. Prahalad and Conner (1996) recognised that the management of competent and autonomous employees is a topic for strategic management. Employees need to continue learning to enable the organisation to continue to compete. This results in organisational members at all levels taking responsibility in a broader sense than the traditional authority and responsibility allocated to each position in a traditional bureaucratic, divisionalised organisation. Employees take on multiple roles and their authority and responsibilities shift depending on the particular role they are playing at any one time. When this occurs employees use their own judgements to guide their actions rather than seek permission from further up the hierarchy. They deal with internal and external relationships with the result that the strategic apex of the organisation begins to crumble away. It diminishes as a centre of information and as a centre of power and authority. The classical models assume that the parts of the system which bring about change in other parts need to be "stronger", "higher" or more "persistant" than the changing parts. Luhmann (in Brans and Rossbach, 1997) argues that unstable parts may command stable parts because of the reflexive orderings of systems.

Lowendal and Revang (1998) say that in today's climate organisational differences are about how organisations organise their customers and assets and the way they try to improve these relationships. At the core of strategy is an ability to create maximum value by building and maintaining relationships both internally with employees etc and externally with customers etc. As a

result both the internal and the external environments become more complex. The internal because of technology and the increasing knowledge and skills requirements of employees and the external because of uncertainty partly caused by the rapid development of technology.

Mair (1999) looked at the number of times the Honda Company had been used by strategy theorists to argue for the relevance of their particular approach to strategy making as the reason for Honda's success. Over the decades from the 1950's Honda has been a case study for; the Boston Consulting Group and Pascale advocates of the Evolutionary approach, Quinn (logical incrementalism), Mintzberg (crafted strategy), Hamel and Prahalad (core competence), Stalk, Evans and Shulman (core capabilities) all with Processualist view points. Different authors have used Honda to exemplify their own approach to strategy. The Honda strategy literature does not mention failures, they are ignored by strategy writers. The dichotomies that Honda faced such as the individual versus the group on the factory floor stressing individual in "group" society Japan and team work in "individualist" USA are not pursued by the strategy writers. Such a "sound bite" approach leaves one to question the appropriateness of any of these approaches in enabling a complete picture of strategy to be seen.

Kanter et al (1997) argue that popular models of planned change like the strategic models from which they derive are assumed to start when leaders make an explicit decision to seek a well constructed new course of action. Such models reflect a bias towards official history and suggest that only top management and formal actions count. Retrospective accounts of strategy and change processes often distort the real story. Conflict fades into consensus, plausible alternatives disappear, early events and the people involved in them lessen in importance, fuzziness with hindsight becomes a clear-sighted strategy.

Van De Ven (1983, in Cameron and Quinn, 1988) asserted that strategy theories are based largely on linearity and consistency and the simultaneous presence of incongruent and contradictory patterns is seldom explained or acknowledged. The need for consistency drives out contradictory thinking. Unpredictability is a characteristic of complex systems such as organisations and because western scientific definitions focus on predictability it is difficult to define that complexity in traditional scientific terms. When unpredictability and contradiction are taken into account then organisations can be viewed as non equilibrium systems with dynamics that are essentially disorderly, developing through political processes in a dialectic manner and displaying one crisis after another. The contrary nature of organisations makes it impossible for managers to establish a shared intention about comprehensive long-term outcomes. These are partly emergent and partly the result of intentional choice (Stacey, 1995).

Organisations consist of formal and informal systems (Schein, 1992). Much of the strategy literature focuses on formal systems and tends to downplay the informal or "shadow" side that organisations have (Egan, 1994). The shadow system is considered a negative influence and firms have traditionally introduced rules to contain and dispel it. This hinders the ability of managers and employees to identify problems, analyse information and make and implement decisions (Baum, 1987). Also often ignored are the many paradoxes that exist in organisations such as control versus autonomy, differentiation versus integration, collective action versus individual interest, boundary opening and boundary closing activities and innovation versus conservation.

The explanations of managing and organising to which we pay most attention do not capture enough about continuing interactions between individuals and groups within and between businesses and with people outside a business (Stacey, 1991). In successful companies Stacey believes that managers do not actually use frameworks of missions and values in the real strategic

development of their business. They do not use explicit models because these do not work in turbulent times. These observations suggest that managers use implicit rather than explicit models. Stacey suggests that interactions between managers lead to outcomes which are not captured by the explicit explanations and that we do not understand at all well the implicit models managers use. Managers arrive at a strategy by unconsciously eliminating possibilities that don't fit their mental models. The production of long term plans can be considered artefacts to create the illusion of managing to reduce the cognitive dissonance between what managers are supposed to do and what they can achieve (Thiétart and Forgues, 1995).

Despite the techniques, prescriptions, strategic analysis etc managers continue to experience difficulty in identifying strategic issues and making choices when there are conflicting views. This can encourage a focus on the matching of existing resources to customer requirements and meeting existing competition. It leads to strategies of imitation rather than of creative innovation (Stacey, 1991). Many firms mainly follow a classical approach whilst at the same time disparaging it. Few address the strategy process in a different way despite senior managers sensing that rationalism undervalues people and underestimates implementation. Many managers feel that new more behaviourally orientated approaches are required, but there is little consensus of what they might be (Kay, 1995).

One of the enduring problems facing the field of strategic management is the lack of the possibility of theoretical tools becoming available to help predict the behaviour of firms and industries. This is particularly the case when organisations are undergoing rapid change and through turbulent periods. Even if we know that industries are likely to experience periods of stability alternating with periods of intense competition we do not know when they will occur and what will be the outcome. It is almost impossible to predict the impact of a new competitor or technology on an industry. Industries evolve in a dynamic way over time as result of complex interactions among firms,

governments, employees, consumers, financial institutions and other elements. Industry structure influences firm behaviour and firm behaviour in turn can alter industry structure (Levy, 1994).

Each of the four approaches to strategy described by Whittington (1993) can be questioned. None on its own can adequately describe how organisations develop successfully. Strategy can no longer be just externally focused as promoted by the Environmental and Systemic approaches nor simply internally focused as advocated by the Processualists and the Classicists. Tensions exist in current theory between strategy content and process, strategies deliberate (Ansoff, 1984; Andrews, 1987 and Porter, 1980) or emergent (Mintzberg, 1988), internally "driven (eg the resourced based view of the firm, core competencies) and externally "driven" (eg Porter's five forces). These different approaches result in opposing recommendations for managerial action.

The requirements of a new approach

In the past strategy researchers have limited the attention they have given to open ended change and turbulent environments. Many of the existing frameworks in strategic management are based on negative feedback models. The dynamics of success are assumed to be a tendency towards equilibrium and thus stability, regularity and predictability (Stacey, 1995). Advances in technology coupled with a global political climate that is favourable to free markets have made parts of many industries such as financial services, health care and transportation more turbulent. In industries related to information and communication the traditional boundaries have disappeared. The number of competitive forces that these firms face has expanded and coping with the resulting turbulence calls for a new approach to competitive strategy (Chakravarthy, 1997).

Behaviour in organisations is relatively autonomous, multidirectional and dialectical. Organisations cannot be adequately understood with simple models borrowed from other scientific disciplines. Using models offers only the illusion of understanding organisations. It delays the development of theories that address organisations for what they are. The mainstream attitude ignores the complexity of human systems and addresses a single dimension of organisational life such as rational choice, adaption etc to the exclusion of others. For practical purposes it is easier to study organisations in this way and they can be studied according to established professional norms. It is difficult to acknowledge the complexity of organisations at the same time as building a clear cut theory. Focusing on a single dimension and ignoring the complexity gives the appearance of a scientific discipline. Partial theories multiply and increasingly fragment the field of study.

Some scholars are pluralists acknowledging rather than denying the complexity but denying the possibility of a complex theory. Morgan (1986) and Bolman and Deal (1991) for example argue that these diverse theories can be treated as complementary lenses for studying organisations. Pluralists do not propose new theories but play down the conflict between existing theories. They offer strategy students ways of enhancing their awareness of organisational complexity. They advocate the use of metaphors and analogies to describe organisations. Weick (1998) advocates the use of jazz improvisation as a metaphor for the processes of creating innovation in organisations. Mintzberg (1998) continues this theme by suggesting that leaders should think of themselves as orchestral conductors and lead their organisations in the same way a conductor leads an orchestra. Approaching organisations in this way can give only an illusion of understanding without having to actually address what organisations are.

Bouchikhi (1998) views organisations as social spaces continually torn by their members in multiple and contradictory directions which raises theoretical challenges avoided by traditional theories of organisations. Any theory needs

to answer such questions as what keeps organisations from collapsing at any time, how the externally observable attributes of an organisation such as its products do not display random behaviour. If human behaviour is autonomous, multidirectional and dialectic, is management a purely symbolic role or does it have a substantial but different role from that traditionally presumed.

Stacey (1991) usefully distinguishes three types of change which organisations can experience; closed, contained and open ended.

1. Closed changed - the consequences of actions and events is predictable. For example a customer increases the size of an order the factory increases its output. In such situations insignificant events have insignificant consequences and can be ignored.

2. Contained change - events and actions are not exact repetitions of the past for example a customer places an order for a variation of the product. The organisation can adapt using relatively fixed rules and procedures.

3. Open ended change is different. Preferences and objectives are not initially clear cut or agreed because the level of uncertainty so high. Choices can only be made by means of complex forms of learning and political activity in which preferences and objectives are discovered. The cause and effect links are difficult to identify. Situations can escalate into major consequences and totally change the behaviour of the system. Open-ended change is difficult to understand in its past form and unpredictable in its future form. The organisation has to develop new approaches to control and development because the change is unique and has not been confronted before.

Research has shown that organisations are naturally change resistant with a strong tendency to inertia and will only change when forced, kicked or disturbed into doing something (Menzies, 1960). However once disturbed the track

which the disturbance takes through the organisation and the degree of transformation it will generate in the pathway it follows, will differ over time and across different organisations with no single end result for any disturbance (Laughlin, 1991). The pathways themselves may be so complex that it is difficult to plot any possible direction a disturbance might take (Morgan, 1986).

Hamel (1998 (2)) has lamented the lack of a true theory of strategy. Prahalad and Hamel (1994) recognise that the strategy field needs a new paradigm to break from the limitations of existing mindsets. The need for strategic thinking and behaviour among managers is now more important than ever before. This reality should force a re-examination of the traditional strategy paradigms. Handy (1995) writes about unlearning the way we have done things in the past. Senge (1993) expresses it as stop trying to figure out what we have to do by looking at what we have done. Hammer (1996) argues that the formulae for yesterday's success are almost guaranteed to be the formulae for failure tomorrow. MacIntosh and MacLean (1999) argue that the calls for a more dynamic view of strategy are essentially the same as one which reintegrates strategy content and strategy process; both strategic decision taking and strategy processes are emergent phenomena. A new conceptual framework is required to enable the development of organisations to be studied more holistically.

This framework needs to address

- appropriate rational planning advocated by the Classicists to deal with the more stable routine activities in organisations;
- the political and cognitive tenets of the Processual and Systemic approaches which will help explain how personality, group behavioural dynamics and societal norms affect the political learning which leads to strategic choice and action and how strategy can be developed as a series of small steps over time

- ♦ the biological, evolutionary arguments for profit maximising put forward by the Evolutionists.
- ♦ operating effectively with open ended unpredictable change

Any new approach has to bridge gaps in current theory, for example those that exist between strategy content and strategy process so that apparently contradictory views of strategy can be held at the same time rather than one appearing to be "right" and the other "wrong".

Stacey (1991) argues that we need a new dynamic model. I will now move on to my next chapter to look at complexity theory which appears to offer a dynamic systems approach to the study of strategy and the capability of incorporating the issues outlined above. It points away from viewing success as a movement towards stable equilibrium and helps us understand the dynamics of organising and managing. The science of complexity may provide a framework that pulls together into a coherent whole literature covering a number of views which do not currently command all that much attention from those researching the strategy process (Stacey, 1995).

The main purpose of this research is to determine if complexity theory is a useful conceptual device for understanding the strategic development of organisations. Organisation development theorists interested in complexity theory express the view that we can use it to deepen our understanding of strategic change. The literature relating to the application of the theory to social systems has developed quite rapidly since the early nineteen nineties. Within that literature views range from those who advocate its use as an overarching theory of strategy to those who see its usefulness as metaphor for what happens in organisations. I will now move on to review the complexity theory literature, examine how we can use the theory to help us understand strategic development and discuss the issues that are raised when applying the theory to social systems.

Chapter Three

Complexity Theory and its Application to Strategy Development

This chapter is concerned with complexity theory. The theory has come to prominence over the last ten or so years. The literature is rapidly increasing but it is still fragmented, with confusion over definitions and terms as individual authors stake their claim to it. I begin by exploring the various definitions, different theoretical perspectives and their key concepts. I continue with a discussion of how the theory may be useful to the study of organisations and what constraints and limitations there are when applying it. The final section of the chapter describes the focus of the research and where data can be gathered.

Introduction to Complexity Theory

Complexity theory belongs with the so called "New Sciences" which have grown out of contemporary physical scientific thought. As well as complexity theory the new sciences include the study of non-equilibrium thermodynamics, dissipative systems and chaos theory. Dissipative systems are entities regulated by transfers of energy from their immediate environment and as a result continually change in order to survive. Chaos theory is the study of the dynamics of change moving towards an understanding of the ways in which all systems undergo natural and social change. Complexity theory is a cousin of chaos theory (Johnson, 1999). Complexity theory is concerned with the emergence of order through elements in the system interacting dynamically by exchanging energy or information with their environment (Cilliers, 2000).

Systems are of central importance in complexity theory. Levy (1994) amongst others claims that systems theory is the foundation of complexity theory. A

system can be defined as a group of interacting parts functioning as a whole and distinguishable from its environment by recognisable boundaries. Systems are made up of elements which vary according to the type and function of the system. Elements interact to form patterns of system behaviour.

Chaos theory is based on the iteration of mathematical algorithms or the application of simple rules of interaction. In chaos theory the iterative formulae remain constant. Complexity theory differs as the systems concerned are capable of evolving and changing the "rules" of interaction. These systems are dissipative systems. The primary difference between natural dissipative systems and social dissipative systems is the element of human free will and innovation. Social dissipative systems are often referred to as complex adaptive systems (Johnson, 1999).

Complexity theory causes us to take the view that systems are best regarded as wholes and studied as such, rejecting the traditional emphasis on simplification and reduction. The emphasis is on the interacting whole and the non-reduction of its properties to individual parts (Mitleton-Kelly, 1998). Wholeness has implications about the way we go about studying and developing organisations. Single dimension results cannot predict behaviour (Lucas, 2000 (2)). An holistic approach has to be adopted to try to understand the patterns of behaviour the system as a whole produces (Parker and Stacey, 1994). It is necessary to look at the whole system even it that means taking a crude look, and then allowing possible simplifications to emerge from the work (Murray Gell-Mann in Battram, 1998).

The development of complexity theory comes from the work of Prigogine (Prigogine and Stengers, 1984) on dissipative structures. Subsequently it has been applied to social systems (Tsoukas, 1998; Parker and Stacey, 1994; Stacey, 1991) offering a dynamic systems approach to the study of strategy. Complexity theory has developed along a very interdisciplinary path taking insights and inputs from mathematics, biology, computing, and economics

(McKergow, 1998). It can offer valuable insights into management and strategic issues (See Stacey, 2000; MacIntosh and MacLean, 1999; Cilliers, 1998; Brown and Eisenhardt, 1997).

Definitions of Complexity Theory

The terms chaos, complexity, complex adaptive systems and complexity sciences are increasingly found in the strategy, organisation development and change literature. Although Griffin, Shaw and Stacey (1998) say that a broad spectrum of writers may be using similar words when talking about complexity they often mean something different, there is frequently considerable overlap in meaning by authors using the different terms. Some (eg Mitleton-Kelly, 1998) attempt to distinguish between the terms, others use them interchangeably. This is noticeable in the work of Stacey during the 1990's, however, in the third edition of "Strategic Management and Organisational Dynamics" he is much more specific, acknowledging his reasons for the changes he has made over the years (Stacey, 2000).

A survey of the literature reveals the following terminology.

- Complex adaptive systems (Shaw, 1997; Juarrero, 2000),
- Complexity theory (Parker and Stacey, 1994; Brown and Eisenhardt, 1997; Sanchez, 1997; MacIntosh and MacLean, 1999; Cilliers, 2000),
- Chaos theory (Levy, 1994; Smithson, 1997; Thiertart and Forgues, 1995, 1997),
- Complexity sciences (Medd and Haynes, 1998; Lissack, 2000),
- Science of complexity/ complexity science (Stacey, 1994, 1995; McKerrow, 1996; Lissack, 1997; Shaw, 1997),
- Complexity (Bouchikhi, 1998; Colado, 1995; Griffin, Shaw and Stacey, 1998; Tasaka ,1999),
- Organised complexity (Kallinikos, 1998)

- Complexity as a Metaphor (Levy, 1994; Morgan, 1997; Medd and Haynes, 1998; Lissack, 1997, 2000)

Some authors use these terms with little or no introductory explanation of what they mean (eg Brown and Eisenhardt, 1997); others use a variety of definitions.

Definitions found in the literature vary. Some examples are

(Santa Fe Group 1996 in Battram, 1998). "Complexity refers to a condition of the Universe which is integrated and yet too rich and varied for us to understand in simple common mechanistic or linear ways. We can understand many parts of the universe in these ways but the larger and more intricately related phenomena can only be understood by principles and patterns - not in detail. Complexity deals with the nature of emergence, innovation, learning and adaption".

Stacey (1998) states that the science of complexity studies the fundamental properties of nonlinear feedback networks, or complex adaptive systems.

Chia (1998) writes that the basic premise of a science of complexity is the systematic and deliberate descriptive reduction of the complexes of human experiences into a transmittable and understandable form.

Mitleton-Kelly (1998) "There is no single theory of complexity, but several theories arising from the various sciences of complexity, such as biology, chemistry, computer simulation, evolution, mathematics and physics." She describes complexity from three different perspectives; interconnectivity, dissipative structures and edge of chaos commenting that all three are valid ways of thinking about it. She notes that chaos and complexity are at times used interchangeably and states, "they are not identical and need to be distinguished as their application to social systems may differ." She proposes a working definition for organisational complexity. It "is associated within the intricate inter-relationships of individuals, of individuals with artefacts (such as IT) and with

ideas, and with the effects of interactions within the organisation, as well as between institutions within a social ecosystem. Complexity arises through connectivity and the processes of feedback and emergence."

Lissack (1999) writes "the study of complex systems, or as some call it complexity theory is a rigorous and formal attempt to deal with the issue of emergent wholes." He continues with "it is less an organised rigorous theory than a collection of ideas which have in common the notion that within dynamic patterns there may be underlying simplicity.... it is also the discipline that has self organised to examine the question of how coherent and purposive wholes emerge from the interactions of simple and sometimes non-purposive components."

Kurtyka J (1999) "Complexity theory... views the world in terms of the behaviour of Complex Adaptive Systems (CAS). A CAS consists of interacting agents, following rules (or models), exchanging influence with each other and with their environment. The interaction of the agents can alter the environment and the agents themselves, resulting in the emergence of additional properties within the CAS."

Lucas C (2000) "Complexity theory states that critically interacting components self organise to form potentially evolving structures exhibiting a hierarchy of emergent system properties".

The LSE Website (2001) "We take complexity to mean the intricate inter-relationships that arise from the interaction of agents, which are able to adapt *in* and evolve *with* a changing environment. The theoretical framework being developed is based on work in the natural sciences (in physics, chemistry, biology, mathematics, and computer simulation) studying complex adaptive systems (CAS). The work at the LSE is focusing on complex *social* systems using the generic characteristics of CAS as a starting point, but without direct mapping between the disciplines. In other words, organisations are studied as

complex social systems in their own right, not as metaphors or analogies of physical, chemical or biological CASs".

Murray Gell-Mann's (1994) comment that "No definition of complexity is intrinsic; it is always context specific." helps us to some extent understand why definitions vary.

Having looked at the various attempts to define complexity theory I feel I come closest to Mittleton Kelly's (1998) description. For the purposes of this PhD I have formed the following working definition.

Complexity theory is concerned with the emergence of order in a complex adaptive system. Complex adaptive systems are sensitive to their initial conditions and exist far from equilibrium. Order manifests itself through emergent self-organisation occurring as a result of unpredictable changes in the balance between positive and negative feedback processes.

Theoretical approaches to complexity theory

Researchers offer different interpretations of the theory (see Anderson, 1999; Brown and Eisenhardt, 1997; Stacey, 1995; Smith and Gemmell, 1991) suggesting that it is not a coherent body of work underpinned by a coherent and robust theoretical framework (MacIntosh and MacLean, 1999). Two interpretations are emerging, sharing common themes but differing in their basic assumptions about how order emerges. They can be described as the rules based and connectionist approaches.

The rules based approach has its roots in artificial intelligence, abstract mathematical models and in linguistic concepts such as deep structure. Self organisation is the emergence of order through the repeated application of simple rules. Basic order generating rules govern behaviour, by continuously repeating

them complex things can be built. To enable new forms of order to emerge the order generating rules or organisational deep structure has to change. This approach is closely linked to dissipative structures and has underlying similarities with punctuated equilibrium (Prigogine and Stengers, 1984; Gersick, 1991).

Parker and Stacey (1994) suggest that business organisations and economies are essentially dissipative structures exhibiting both stability and instability at the same time. Smith and Comer (1994) suggest that the dissipative structures approach can be useful for understanding group effectiveness in a turbulent situation and that it may help groups and organisations break away from familiar past patterns of behaviour that have become dysfunctional. Thiétart and Forgues (1995) proposed that in dissipative systems "the chaotic evolution may get organised around structures that we find at different scales -namely the strange attractors." The attractor creates an implicit order. Inside the attractor space the system behaviour is highly complex and unstable. When looking at this complexity we can see that it is also organised and that it reproduces at a smaller level what is observed at a more global level. Such "self similarity" can be used to explain phenomena such as stock market fluctuations.

Connectionist approaches to complexity have as their basis neural networks of interconnecting nodes and are supported by more interdisciplinary groups such as neuroscientists, psychologists and engineers. The networks have no central control in the classical sense. Processing is distributed over the network and the roles of the various components change dynamically (Cilliers, 1998). Change and transformation are dependant on the capacity of the network to learn by changing the nature and number of the nodes in the network, the pattern of connections between them and the strength of these connections (Wood, 1999). In complex adaptive systems such as organisations the nodes or agents only act on information available in their immediate environments, from those few agents connected to them in a feedback loop (Anderson, 1999). The connectionist approach is closely linked to the work of the Santa Fe Institute and to the "edge of chaos" perspective. Edge of chaos is the predominant approach in

academically reviewed journals, the more popular journals and management books that are appearing about the relevance of complexity theory to the strategic development of organisations.

The edge of chaos approach regards the organisation as a complex adaptive system. It is driven away from equilibrium but does not descend into chaos. It stays out of the bifurcation zone, being nimble enough to never reach it. The focus of this approach is operating at the edge and not on the creation of order. Operating at the edge keeps the organisation alive. The organisational memory defines the choices the organisation takes. The organisation is poised at the edge of order and chaos with creative change happening at the edge when the system is at the boundary between stability and instability. (Brown and Eisenhardt, 1997; Shaw, 1997; Zohar, 1997; Waldrop, 1994; Stacey, 1993).

To remain at the edge of chaos organisations have to be effective in the way they handle change and develop new strategic directions (Stacey, 1991; Nonaka, 1988). Declarations of mission and vision become attempts to define boundaries rather than literal statements to be followed exactly and in doing so aid rather than stifle the organisation (Cilliers, 2000). According to Brown and Eisenhardt (1997) continuously changing organisations are likely to be complex adaptive systems with semi-structures that poise the organisation on the edge of order and chaos. These organisations are dynamic and the edge of chaos perspective is a more realistic description of how they actually compete.

The edge of chaos perspective is more frequently associated with work in living systems and is based on the premise that such systems typically exist in far from equilibrium states; transformation is viewed as a continuous process. The work relating to dissipative structures tends to focus on transition between relatively stable states with order emerging out of an intervening chaotic period with transformation viewed as episodic (MacIntosh and MacLean, 1999).

Although there are these different interpretations a number of common concepts are observable. These include non-linearity, sensitivity to initial conditions, the presence of disequilibrium and positive feedback processes all of which interact to produce novel forms of order. The emergence of order is common to both the dissipative structures and edge of chaos approaches to complexity theory what is disputed is the "mechanism" that gives rise to the emergent order. In the research I have undertaken I have chosen to transcend the discussion between rules based and connectionist approaches by focussing on the concepts that are common to both. The key concepts common to each of these approaches are described in the next section.

The Vocabulary or Common Key Concepts of Complexity Theory

Complexity theory is not a single discipline. It is a process that represents the sharing of ideas, method and experience across a number of fields (Wood, 2000). If we are to share, we have to have an understanding of the key concepts. In this section I describe the common key concepts I am using in my research. In trying to separate them out I have found that there is a degree of circularity as all are closely related. The key themes are

Sensitivity to initial conditions

When we look in the literature for what is meant by the term initial conditions we find a vagueness around the definition. What I have distilled from this vagueness is that initial conditions are those conditions that exist in the aftermath of the creation of a system, that is the factors in the system in the very early stages of its existence. The initial conditions are all the factors that exist at that point in time. Initial conditions operate as a set, they are enabling and/or constraining mechanisms that configure what a system can work towards. Complex adaptive systems are highly sensitive to initial conditions partly because of non linearity and partly to do with the instability in the system. In non linear relationships a given cause can have many different effects or outcomes. A small change in a

system variable can have a disproportionate effect on another variable. As a result the initial conditions can have a disproportionate effect on an emergent outcome of the system as a whole. Cilliers (2000) tells us that a complex system has memory, therefore it has a history and that history is of cardinal importance to the behaviour of the system. Time and context are central to the identity and behaviour of the system.

Negative and positive feedback processes

Complex adaptive systems are driven by positive and negative feedback. Feedback is negative when it acts on the system to offset or cancel out deviations. Negative feedback is dampening and stabilising. A negative feedback system is attracted to a point from which it will only move if there is an external "shock". Positive feedback is the opposite of negative feedback. Instead of feeding back the discrepancy between outcome and intention in a manner which closes the gap between the two, positive feedback progressively widens the gap. It does not cancel out deviations it reinforces them. Positive feedback is amplifying and destabilising. In mechanical systems negative feedback is emphasised, in complex adaptive systems positive feedback processes are highlighted.

Dis- equilibrium/far from equilibrium

Prigogine established that non linear systems are changeable only if pushed far from an initial equilibrium (Prigogine and Stengers, 1984). Equilibrium behaviour is an either/or choice. Systems can be closed or open. Where there is no exchange of energy between the system and the environment or where any interaction is stabilised the system is said to be closed. Where there is continual interaction with the broader environment of which the system is a part, it is open. Closed systems are attracted to a state of equilibrium and are driven by negative feedback. They do not change or they change in repetitive and predictable ways. Complex adaptive systems are open systems and are driven by positive and negative feedback. When such systems are far from equilibrium they automatically apply internal constraints to keep instability within boundaries.

Self organisation and the emergence of order

Self organisation in a system is the natural result of non linear interaction not any tendency of individual agents to prefer or seek out order. The system evolves into an organised form in the absence of external constraints. The importance of the emergence of order in a system comes from Prigogine's work on dissipative structures (Prigogine and Stengers, 1984). Non linear systems can import energy or information from the environment which is then dissipated through the system. The system still has a structure in the form of irregular patterns capable of renewal through self organisation. According to Coveney and Highfield (1996) emergent properties appear as macroscopic patterns in collections of elements. Order arises because these elements are partially but not fully connected (Anderson, 1999).

The theoretical framework of complexity includes other concepts which management and strategy researchers are finding useful such as fractal structures, attractors, connectivity, fitness landscapes, bounded stability etc. Complexity theory provides a framework for thinking about, and seeing the world, that is different from the Newtonian paradigm. Stacey (1991) considers that it can offer an explanation of why most phenomena observed in nature and in human behaviour have characteristics of order and stability on the one hand accompanied by disorder and regularity on the other.

How can complexity theory be useful to the study of strategic organisation development?

Complexity offers the prospect of an explanatory framework of how organisations behave. It offers an alternative way of studying strategy. It is not a metatheory encompassing all other theories. There are many authors who promote the usefulness of complexity theory to the study of organisations. Allen et al suggest that "*the complexity framework is complementary to other*

approaches because this kind of analysis helps us to comprehend the fundamental nature of adaptation, knowledge, innovation and learning that characterise the co-evolutionary behaviour of complex social systems". They continue by saying that "*by taking as a starting point the organisation as a complex system of interaction, we are forced to reconsider the nature of the processes that we observe, the strengths of interaction and how these shape eventual outcomes. .. We are forced to step back from the position of viewing the future as a rational predictable process*" (Allen et al, 2002. pp 316). Thiétart and Forgues (1995) suggest that complexity theory offers the opportunity to reconcile two apparently divergent visions of management, the rational and quasi mechanistic on the one hand and the unexpected and disorderly on the other. Levy (1994) proposes that complexity theory offers a promising framework that accounts for the dynamic evolution of industries and the complex interactions among industry actors. According to Stacey (1991) by conceptualising industries and organisations as complex adaptive systems a number of managerial implications can be developed. Different authors present different "takes" on the subject emphasising different aspects and so generating different managerial implications and priorities (Rosenhead, 1998).

In the remaining part of this section I focus on the individual concepts described in the previous section. Each can be used descriptively to give different perspectives on organisational phenomena to further our understanding of how organisations develop and together offer a broad based insight into the behaviour of individuals as well as organisations as a whole.

Sensitivity to initial conditions and non-linearity

Complex adaptive systems are essentially historical and as a result highly sensitive to initial conditions (Juarrero, 2000). The system history is important and cannot be ignored as the initial conditions come from it. The activities, events, routines, procedures, behaviours and human interactions in an organisation constitute the initial conditions for the emergence of future order.

Some of these will be amplified through feedback and others dissipated through the system. As a result apparently insignificant transactions within organisations can lead to large organisational changes and almost undetectable differences in initial conditions can gradually lead to diverging system reactions until eventually there is the evolution of dissimilar behaviours (Rosenhead, 1998). The track initial conditions take through the organisation and the degree of transformation generated in the pathway followed will differ over time and across different organisations with no single end result (Laughlin, 1991). Organisations contain multiple actors with diverse agendas who try to co-ordinate their actions in order to exchange information and to interact in other ways. They do all this in a dynamic manner. Actions taken by some actors influence actions initiated later on by others, often with different frames of reference and value systems (Thiétart and Forgues, 1997). As a result the pathways that an initial condition can follow may be so complex that the link between cause and effect is effectively lost.

There are examples in the literature that urge paying attention to initial conditions. In banking for example the effect of changing credit policy can set off a chain of events and interactions which reverberate back to the bank in the form of multiple consequences such as competitor responses, deposit levels, loan demands etc (Kurtyka, 1999). Initial conditions have a significant effect on how organisations successfully complete mergers and acquisitions particularly from the human perspective (Cartwright and Cooper, 1992). Morgan (1993) argues that organisations can learn how to use small changes to create large effects. Hamel (1998 (2)) writes that strategists rather than working on the "strategy" need to concentrate on the preconditions that could give rise to strategy innovation.

Negative and positive feedback processes

The "general systems theory" strand of thinking sees an organisation as a feedback system. Rational decision making models (Porter, 1980; Williamson,

1975) and proponents of incrementalism (Quinn, 1992; Mintzberg, 1988) are operating in a negative feedback manner resulting in the continuation of regularity and stability which is equated with success. Planning and similar forms of control are essentially driven by negative feedback, their intention is to produce predictable patterns of behaviour. The equilibrium of classical economics is also of this type (Parker and Stacey, 1994). Organisations can continue to build on their current strengths, however there is evidence that this attraction to the stable point leads to failure (Miller, 1993). In practice positive feedback is widespread in organisations and leads to self reinforcing change. In economic life positive feedback can be observed in bandwagon effects, self fulfilling prophesies, self reinforcing growth and virtuous and vicious circles.

Complexity theory acknowledges that both positive and negative feedback are essential to the survival of an organisation. Feedback processes can help us understand how and why people behave in the way they do in organisations. When managers are carrying out their day to day repetitive business they are operating close to certainty and are highly likely to be operating with shared mental models which makes them feel secure and not afraid of failure. They are using negative feedback to maintain this situation. When managers are trying to do something innovative and creative, they question and change existing mental models and use positive feedback processes. As creative behaviour is inherently destructive, there is inevitably an increase in anxiety, ambiguity confusion etc.

Increase in anxiety, uncertainty and ambiguity, conflict and contradiction can result in possible fear of failure and embarrassment. This in turn leads to unconscious group fantasies and basic assumption behaviour which directly affect how people discover what is going on, how they choose what to do and ultimately determines how they behave (de Board, 1993; Baum, 1987). In such situations organisational defence routines can cause negative feedback to sustain the status quo. When negative feedback processes dominate organisations are unable to change and adapt. Basic assumption behaviour

may take the form of "fight" (Bion, 1961). Then positive feedback processes operate which can lead to amplifying and destabilising effects. When organisations are dominated by positive feedback systems which take the form of overt and covert political activity and game playing they are attracted to disintegration and ultimate failure (Kets de Vries and Miller, 1994).

Negative and positive feedback in organisations can be seen as counteracting forces at play. The dampening negative feedback of written rules, planning routines and formal systems which guide managers can serve the purpose of creating islands of rationality and certainty pushing the system towards stability. Their power of closure assists managers in making decisions and implementing them. However such rules and systems are also a source of disorder. They tend to stiffen the organisation around artificial codes of working practice which prevent a natural adjustment taking place between the internal and external dynamic forces the organisation is subjected to. Other forces of innovation, initiation and experimentation push the system towards instability and disorder. Divergence between the forces of stability and instability create the conditions necessary for the development of innovation and future survival of the organisation (Stacey, 1993). Successful innovative organisations are ones in which both the positive and negative feedback systems are utilised effectively, allowing the strategy process to be dynamic and evolving, not a strategic intent that can be held constant for a long period.

Negative and positive feedback processes are found in the different organisational systems. The formal organisational systems governing day to day organisational behaviour use negative feedback processes allowing the organisation to carry out these activities in a rational and stable manner. People also operate within a richly connected and informal or decentralised system which embraces individuals and groups across organisational boundaries (Schein, 1992). This is where the positive feedback operates, amplifying the activities of double loop learning, of covert games and unconscious processes that provoke people to learn in a constructive manner. (Egan, 1994) refers to

this system as the "organisational shadow side." Traditionally the shadow side has been seen as a source of inertia. In the behaviour produced by the combination of negative feedback and positive feedback processes there are recognisable if irregular patterns in which unpredictable specific developments occur over time. These can lead to creativity and innovation required by organisations if they are to survive (Stacey, 2000).

Disequilibrium

One of the major insights complexity theory brings to strategy theory is that an organisation can be viewed as a non-equilibrium system. The concept of the organisation moving from one stable state to another as a result of change is flawed. Complexity theory points away from viewing success as a movement towards stable equilibrium and helps our understanding of the dynamics of organising and managing. The idea that people can manage change presumes a specific predictable end point, the point of equilibrium.

Prigogine (Prigogine and Stengers, 1984) has shown that when physical and chemical systems are pushed away from equilibrium they survive and thrive, if they remain in equilibrium they die. Complexity theorists apply the characteristics of these systems to social systems and individuals. When an individual or a social system is pushed by circumstances or deliberate intervention away from an established pattern of behaviour or when constraints are encountered in reaching a goal then humans are forced to experiment, to explore alternate ways of reaching goals or change the goals altogether (Mitleton- Kelly, 1998). Although we can see that we have to work away from equilibrium to find new structures, relationships and different ways of operating, classical physics and economics have made it hard to accept that this is beneficial. Traditionally organisations have tried to maintain equilibrium through rules and regulations. Bureaucracies are an example. Striving to maintain

equilibrium results in rigidity and an inability to adapt resulting in failure. Organisations are now urged to operate "at the edge of chaos" and maintain "bounded stability" in order to survive (Pascale, 1999; Hamel, 1998 (2); Stacey, 1993).

Complex organisational systems are characterised by highly interrelated parts where opposite forces are at play in a dynamic manner and behaviour is difficult to understand and predict (Thiétart and Forgues, 1997). Unplanned action is inevitable and not necessarily due to ignorance or incompetence. In a world that is complex and unpredictable the outcomes of actions within an organisation cannot be known in advance. Complexity theory can help us understand that the failure of management to realise their intended long term plans lies in the properties of organisational systems rather than in some form of managerial incompetence. The links between actions and long term outcomes are so unpredictable that it is inherently impossible for managers to design and realise intended long term outcomes. This is a major departure from the more traditional approaches to strategy, which downplay the unpredictability of the long-term evolution of organisations.

Self Organisation and the Emergence of Order

Organisations are "whole" living systems, once they are broken apart they cease to exist. Self organisation and emergent order in organisations cannot be predicted from studying the fine detail. What emerges is more than the sum of the parts. Emergent properties exist at the level of the system not at the level of the elements and express a unity at the systems level which transcends differences among the elements, displaying them as features of an integrated whole (Coveney and Highfield, 1996). Checkland's work on soft systems methodology has provided us with a means of examining social systems holistically and as well as way of describing the emergence of changes or "new order" in these systems (Checkland and Scholes, 1999).

As groups and organisations find themselves in situations of increasingly paradoxical demands, the concepts related to self organisation take on greater and greater potential significance (Smith and Gemmill, 1991). A self organising organisation is one which can discover through experimentation answers to its problems improving its capacity of response to changing conditions. Self organisation occurs through the formation of interest groups and coalitions around specific issues. According to Weick (1979) self organisation in organisations originates from experimentation and activities not directly connected with the organisation's mission. There are interactions in organisational shadow systems where no one is "in control" but patterns of controlled behaviour appear, leading to emergent order that profoundly influences the actual evolution of the organisation. Managers and policy makers find themselves having to rely on a self organising process of organisational learning from which the future emerges. The organisation develops a catalogue of responses and stimulates learning opportunities though multiple experiments. It creates information, captures tacit knowledge and in turn creates meaning (Nonaka, 1988). As a consequence it prepares itself for new forms of operation when these are required.

Complexity theory regards organisations as complex adaptive systems made up of sub-systems. A subsystem is part of the whole as well as being a whole in its own right. A complex adaptive system (CAS) on one level is made up of lower level complex adaptive systems interacting and creating the higher level order. The structure of complex systems can be summarised as an overall heterarchical view where successively higher levels show a many-to-many structure rather than a top down tree structure common to conventional thought. Non-linear social organisations have fractal like qualities. We can observe several layers of similar patterns and configurations at the organisational, at the sub organisational, group and individual level (Thiétart and Forgues, 1995). Menzies (1960) in her study of hospital nurses found that supervisory nurses criticised their managers for their apparent lack of support and their own staff for

their lack of ability to apply themselves in their jobs. These attitudes were repeated at more senior levels and in other parts of the organisation. Baum (1987) found a similar situation in his study of planners in the USA.

Complex adaptive systems co-evolve. For organisations this means that two types of strategic thinking are required, the horizontal and the vertical. Traditionally organisations have practised vertical strategic thinking; vision, strategy and action plans with upper and lower levels interacting as a result. Horizontal strategic thinking or horizontal integration strategy is to act simultaneously on the complex parts that make up co-evolution (Tasaka, 1999). An organisation wanting to develop knowledge management has to work in a least three different parts - the information system, the management style and the corporate culture.

Understanding the way emergence occurs helps us recognise why change management initiatives do not always succeed. Many of these attempt to design and control outcomes and as a result they block or constrain emergent patterns of behaviour. This implies that such initiatives should concentrate on providing enabling infrastructures to allow emergent new patterns of relationships and ways of working to arise which would be more in tune with the culture of the organisation. We become aware of change only when a different pattern becomes discernible. But before change at a macro level can be seen, it is taking place at many micro-levels simultaneously (Mitleton-Kelly, 1998). Complexity theory can help managers feel more comfortable living "*with continuous transformation and emergent order as a natural state of affairs*" (Morgan, 1993; pp. 266). Instead of planning an action in advance, constraints can be specified and the local conditions at the time can determine how a task will be done.

Organisations can create an enabling infrastructure by presenting strategic concepts which give broad direction and allow freedom of interpretation. The strategic ambiguity they represent nurtures fluctuations of viewpoint and

creativity as do the presence of co-existing counter cultures. Fluctuations can also be created from built-in organisational structures and processes. There is recognition that middle managers occupy a key position, as they are able to eliminate fluctuations and "noise" within the organisation. They are the starting point for action to be taken at upper and lower levels and also serve as an agent for change in the organisation's self renewing process.

Order arises through interactions in the different organisational systems. Interaction alone however does not lead to emergence. For it to be a useful construct it must be neither rare nor everywhere. If unusual it will have little to do with everyday organisational dynamics. If it is everywhere it loses its explanatory power (Goldstein, 2000). There is some evidence in the literature of what can help or hinder emergent order in organisations. Seel (2003) through his work as consultant and film editor has found that good boundaries seem to be necessary for emergence to occur. These may be deadlines, clear goals and intentions, prescriptions about length or size, and so on. The common factor seems to be that there is a well-bounded 'space' within which emergence can occur. Emergent order cannot be directed but may be influenced. According to Seel (2003) one example would be the placebo effect. If we assume that the immune system is a self-organising system which can be assisted by medicinal drugs, then it would seem that a placebo can help it self-organise in the same way as a drug, provided the human host believes that the drug has been administered. Another example that Seel gives is labelling theory. It is well-known for example that children who are labelled as 'slow' or 'stupid' at school tend to conform to that label. They underachieve compared to those with similar innate ability who are positively labelled.

Stacey (1996) argues that in human systems two variables are significant; the amount of anxiety and the extent of power differentials in the system. Too little or too much contained anxiety inhibits emergence. If the anxiety in an organisation is too contained there will be no possibility of change or creativity. Too much anxiety can lead to 'headless chicken' behaviour or else the building

of bogus and obstructive defences. If power differentials in the system are too high or too low, emergence can also be inhibited. Too much control, in the form of high power differentials between different parts of the organisation can result in creativity and readiness for change being subdued or obstructed. However if the control mechanisms are too weak the system can dissolve into chaotic or random behaviour.

Self organisation and the emergence of order has consequent implications for researchers, managers, consultants and others who study organisational systems for research purposes or who work in them to bring about organisation change. Traditional methods of analysis and synthesis have proved to be of limited use in the search for "knowing the whole." Methods have to be found to comprehend "the whole". These may well turn out to be methods such as using intuition, gut reaction and tacit understanding that experienced managers have traditionally used and that have been frequently been condemned by management researchers as “unscientific”.

MacIntosh and MacLean (1999) have argued that complexity theory and in particular emergence offers a dynamic view of strategy which could be useful for re-integrating strategy content theories with strategy process theories such as those described by Whittington (1993). Both strategic decision taking and strategy processes are emergent phenomena. Looking at organisations through the individual concepts of complexity theory enables us to bring to the study of their development different strands of organisational theory. Many of these strands have not previously commanded much attention. Complexity theory allows us to say something about the way organisations learn, about the nature and role of politics in choosing and acting, what part spontaneity and difference play in control and what part creative tension and chance play in outcomes. It can help establish the conditions necessary for the effective practice of totally different forms of managerial control. The qualitative properties of complexity theory such as sensitivity to initial conditions, non linearity and disequilibrium all offer perspectives from which the way organisations work can be viewed.

Complexity as a Metaphor – Changing Linguistic Mental Models

The key concepts of complexity theory such as non-linearity have come directly from other sciences such as mathematics where they have specifically defined meanings. Their use by complexity theorists to describe social systems often results in a change of meaning to something less specific and as a result they can be regarded as acting as metaphors.

The Shorter Oxford English Dictionary defines a metaphor as "*a figure of speech in which a name or descriptive term is transferred to some object to which it is it is not properly applicable*". A metaphor is a means of expressing certain phenomena in a novel way, so that day to day understandings of these phenomena may be enriched or replaced by other interpretations. The metaphor works by transferring a whole set of ideas and associations from one domain to the other (Rosenhead, 1998). The use of metaphors to describe activities in organisations is a familiar one. Morgan (1993,1986) for example has written extensively on their use. He uses the term metaphor to distinguish different paradigms in the way we view organisations. Organisations consist of individuals and groups whose knowledge, understanding and interests differ considerably. In order to work effectively they require a common language and a way of sharing the interpretation of events and actions. Metaphors assist in creating and sharing understanding. They establish images of how things fit together. Metaphors and the images they create express what is important and unimportant in the organisation.

Weick uses the term "sensemaking" to describe an organisation's need to interpret and make sense of the environment around it if it is to survive (Weick, 1995). The ability to make such sense is, in great measure, a by-product of the language of interpretation available to the organisation and its members. Nonaka (1988) maintains that knowledge creation is closely tied to language

use. It requires both the creative use of metaphors, analogies and models and a resolution to the conflicts which such creative uses may provoke.

The broad usage of "traditional" metaphors and other linguistic devices such as proverbs suggest that managers find value in them, however organisations struggle with change and individuals struggle with uncertainty which suggests that such metaphors may not be the most appropriate for handling these sort of situations. Complexity theory based metaphors may be more appropriate. The traditional metaphors used to describe organisational life do not fit the key concepts of complexity theory. Many of the metaphors used in organisations are within the machine or military paradigms. Examples include "chain of command," "running like clockwork," "re-engineer". They fit well with the classical approach to strategy which has dominated management thinking. Such metaphors often create meaning that inhibits understanding organisations from a complexity theory perspective.

Many metaphors, proverbs and popular sayings deny the importance of an organisation's history to its future development. Comments such as "that's history", "all that's in the past", "don't re-invent the wheel", demonstrate this. Others that try to acknowledge it such as "don't throw the baby out with the bath water" often imply a sense of resignation. The expectation is that what the person is saying will be ignored. Many of the expressions used such as "get all your ducks in line," "keep on track" and "in the pipeline" are linear in nature. Others such as "we have a mountain to climb" do imply that things may not be done in a "straight line" but there is still a very clear end in view.

As previously stated complexity theory acknowledges the usefulness of both negative and positive feedback to successful organisation development. Expressions used in organisations tend towards stressing the importance of negative feedback - "dampen this down", "put the breaks on", "a stitch in time saves nine" etc. Positive feedback has traditionally been regarded as unhelpful and the metaphors reflect this - "viscous circles", "bandwagon effects",

"spiralling out of control". More constructive positive feedback metaphors such as "virtuous circles" are now being used. Many of the metaphors are about maintaining equilibrium. "Don't rock the boat" for example and Lewin's much quoted change metaphor, unfreeze - change - refreeze are typical.

Complexity theory research is developing its own language and as a result new metaphors can be found. New metaphors create new meaning and therefore have the power to create new reality. Complexity metaphors draw our attention to certain features in organisations about which organisation theorists were on the whole only subliminally aware. Words and phrases such as non linearity, feedback loops, unpredictability and emergence make up a new vocabulary we use to attempt to re-describe organisations (Tsoukas, 1998). The metaphors shift from competing in a game or a war to trying to find the way on an ever changing landscape. Such a conception of an organisation's basic purpose can change the day-to-day decisions made by managers (Lissack, 1999). Morgan (1997) says that the research on complexity is "*full of resonant images ..they provide a valuable resource for carrying organisation and management theory into a new domain*" (pp. 273). Complexity theory offers new metaphors however the influence they will have over managerial actions will depend on their vividness and on how plausible they appear to managers.

Theory Constraints and Limitations

The literature which discusses the application of complexity theory to social systems and, in particular organisations is fragmented. Smithson (1997) refered to it as a "small literature". Since then considerably more has been written and complexity theory is appearing regularly in popular management books as well as more academic publications. However the theory is still in its infancy in its application to social systems (Mitleton-Kelly, 1997; Thiétart and Forgues, 1995). The variety of definitions, the doubts expressed as to whether it is a theory, theories or a framework and the different usage of the terminology associated

with complexity highlighted at the beginning of this chapter are all indicators of its infancy. Although chaos theory and complexity theory are different social scientists sometimes conflate the two. The result is that analogies from chaos theory are frequently misapplied (Mitleton-Kelly, 1997).

Complexity theory (or framework) has been developed out of physical systems without necessarily taking into account fundamental differences between physical and social sciences. Management complexity authors lean heavily on 'science' in their texts using phrases like "scientific discoveries have shown that..." or "the science of complexity shows that...". The illustrative examples provided are commonly of natural rather than social or managerial phenomena such the behaviour of molecules when the temperature of liquid rises or the weather (Rosenhead, 1998). Gersick (1991) however has shown us that understanding similar theories from different research domains can suggest thoughtful insight for others.

Mittleton-Kelly (1997) and Goldstein (2000) recognise the need for circumspection when attempts are made to transfer complexity theory formulations from the natural to the social domain. Johnson and Burton (1994, in Tsoukas, 1998) and Baumol and Benhabib (1989, in Levy, 1994) question if it is realistic to apply it to social systems. Qualitative differences between the inert material world and the living social world are often downplayed (Chia, 1998). The temptation is to take findings from these systems and apply them directly to human systems such as organisations. Gemmill and Smith (1985) for example use the human immune system as an example of a dissipative structure and then offer dissipative structures as a model for organisation transformation. Beinhocker (1999) states that as both biological evolution and business evolution are complex adaptive systems we can employ tools that help us understand biological evolution to help us understand the evolution of business strategy.

Behaviour in physical systems may be assumed to be governed by laws. The rules that determine the interactions in human systems are socially constructed and are not fixed by laws of nature. In the social world outcomes often reflect very complex underlying relationships, for example humans have membership of multiple systems which results in the blurring of boundaries between systems. Human agency can alter the parameters and structures of social systems (Levy, 1994). Social and physical systems also differ in sources of unpredictability. In the social world far less accuracy is possible in defining precise initial conditions and the specification of the system structure is less precise.

A major problem for complexity theory and organisations is the lack of empirical studies currently available. Many of the 'results' cited in the complexity literature are not firmly grounded in empirical observations. They are the outputs of computer simulations (Goldstein, 2000; Rosenhead, 1998). In such simulations the variables can be determined by the modeller and are limited in number. McKelvey (1999, 1997) argues that we need a systematic agenda linking theory development with computational model development and the testing of model structures with real-world structures. It is difficult to see how such models can account for the intricacies of human behaviour which include; the role played by emotion, the options humans have to interpret, adjust or break rules and the fact that humans belong to many systems which may or may not have easily defined boundaries. In social systems the precise identification and measurement of the multiple of variables is considered an impossible endeavour so such systems cannot be observed in their entirety.

The relatively few academically robust empirical organisational studies reported in the literature is cause for concern. They are insufficient to describe the development of a human system from a complexity theory perspective. Case studies undertaken by Brown and Eisenhardt (1997), MacIntosh and Maclean (1999) and MacLean and MacIntosh (2002) are examples of trying to move complexity theory onto a practical footing, but all are relatively short term studies. None explores in sufficient detail such issues as the effects of the

different social settings for the firms they were studying. Seel (2001), Griffin et al, (1998), Shaw (1997) and Stacey (1996), give examples of consultancy assignments where they have applied complexity theory concepts to organisational change initiatives they have been called in to facilitate. They describe what they did in organisations to create situations to increase connectivity and positive feedback so that novel forms of order could emerge, but they do not say how effective their interventions were over the longer term. Relatively new and insufficiently tested theory is advocated as a sound way to work on strategic organisational change. According to McKelvey (1999) "*without a programme of experimental testing, complexity applications ... will remain metaphorical and if made the basis of consulting agendas .... are difficult to distinguish from witchcraft*". (pp. 21)

Rosenhead (1998) argues that formally validated evidence is not available to demonstrate complexity theory-based prescriptions for long term survival. Evidence of longer term success is almost exclusively anecdotal in character. Stories range from tales of successful corporate improvisation, to longer accounts of organisational death wishes, to innovation which bypasses the obstruction of the formal hierarchy. There are also approving quotations from business leaders (Rosenhead, 1998). Anecdotal evidence is most persuasive to those who are already persuaded. For others it can be hard to judge the validity of the examples. Different standards of proof or disproof may be used for different sides of the argument. For managers in organisations there has to be a balance between acting on plausible insights and firmly rooted theory. In the literature managers are given the "advice" that complexity is a useful tool. This is sometimes accompanied by catchy phrases such as "Don't analyse, intuit the whole", "Don't plan or manage, stimulate self-organisation" (Tasaka, 1999). Academics largely write about the "promise" of complexity theory. Its interdisciplinary nature may work against its acceptance and comprehension particularly because the academic world is strongly focused on specialist fields and slow to involve outsiders in research (Lucas, 2000).

There is criticism concerning the role of subjectivity in discerning emergence. A look at some aspects of emergence (level, pattern, predictability) leads to the conclusion that any description of emergent phenomena must contain some element of subjectivity. According to Seel (2003) we are faced with the issue of pattern recognition and the ontological status of perceived patterns. Cilliers (2000) states that we may be able to construct good models of complex systems but they will always require interpretation. Studying organisations from a complexity perspective involves qualitative descriptions of the phenomena under investigation. This implies the presence of the observer to understand the dynamics taking place (Medd and Haynes, 1998). Is the emergence of a new pattern simply a gestalt switch on the part of the observer or is it 'really' there? To determine patterns both observation and participation are required with the two kept in tension and dialogue (Seel, 2003). However subjective bias relating to complexity theory is not substantially different from that in any other scientifically informed discipline. Starting with subjectivity does not necessarily mean ending up there (Goldstein, 2000).

Much of the literature urges applying complexity theory to help organisations innovate and change (Pascale, 1999; Brown and Eisenhardt, 1997; Stacey, 1995). Encouraging self organisation and emergence does not necessarily mean that the outcome will be better than what existed before. Such examples can be seen in the break-up of political structures such as Yugoslavia and the Soviet Union and in organisational mergers that fail. Self organisation and emergence are powerful forces that need to be channelled appropriately with conditions created to work towards a "better" state. According to Goldstein (2000) this can possibly be done through working with psychological, physical and social "boundaries".

Some writers such as Stacey (1993) have gone as far as stating that the links between cause and effect are completely lost. This is often followed by descriptions of the futility of long-term planning. Goldstein (2000) argues that complexity and emergence does not violate causality per se, what has

happened is that our ability to trace all the micro determinates responsible for it has been challenged. There is predictability in chaotic systems due to the presence of attractors; this also challenges the notion that emergence is completely unpredictable. There is a need to enhance our understanding of how coherent patterns emerge and reconfigure as a result of interaction, how knowledge is effectively used and how stability, change, routine and novelty are interwoven and feed on each other (Tsoukas, 2001). What is required are advances in classification schemes for helping to discover pattern of sequences and thereby gaining greater predictability Goldstein (2000). Seel's (2003) comments mentioned earlier in the chapter on the placebo effect and labelling theory and David Cooperrider's appreciative inquiry work (1990) on the way positive intentions can lead to positive outcomes suggest that it is possible to influence the broad general direction of emergence in human systems although not to control or specify it.

Stacey (2000) has highlighted the importance of the organisation's shadow system to the emergence of order. In my last chapter I noted that the strategy literature tends to ignore or downplay the presence of the shadow system. Stacey is right to highlight its importance. However much of what he subscribes to can be explained succinctly through work of earlier authors such as Menzies (1960) and Argyris (1992) on social defences mechanisms and Hirschorn (1990) and Kets de Vries and Miller (1994) on the psychodynamics of organisations. It remains to be seen what additional value complexity theory can add to our study of organisational shadow systems, their interaction with formal or legitimate systems and their contribution to understanding of how organisations develop.

There is a debate in the literature about the element of the system. Stacey (1995) writes about decision rules and scripted relationships between people who can change the rules, schemas or scripts which govern their behaviour. He argues that informal feedback networks form around issues which individuals join. Weick (1979) and Schein (1985) express it as regularities in human behaviour coming about because each successive piece of behaviour is

conditioned by the institution in which it occurs. For Talcot Parsons the ultimate element of a system is the action. For Luhmann an action only becomes such if the system interprets an event as an action. Elements of systems are not pre-given entities but are generated by the system itself. In Luhmann's philosophy everything that exists does so only in relation to a system (Brans and Rossbach, 1997). This debate is taken up by Maclean and MacIntosh (2002) who suggest that those arguing for an edge of chaos perspective have the human being as the element of the system. Those electing for a dissipative structures approach consider that there are other options, the element of a system may be organisational routines, tasks, competences etc.

Complexity theory provides general guidelines and constraints; it does not offer specific models to predict exact outcomes (Cilliers, 2000). The prediction of complex behaviour is only possible as a form of generalisation. It can for example tell us in broad terms when to expect bifurcation points which alter the ratio of order and disorder but it cannot tell us if we should hurry or retard such bifurcation. It cannot help managers make accurate predictions. There is the danger that because of their generality complexity theory statements can appear as motherhood and apple pie. According to Rosenhead (1998) this gives them a sense of being unchallengeable. Many authors do make very general statements which in themselves are not helpful. Morgan (1997) is typical, suggesting that insights into complexity have enormous implications for modern management, rethinking what we mean by organisation and especially the nature of hierarchy and control. He continues by urging managers to

"*learn the art of managing and changing contexts. Learn how to use small changes to create large effects. Live with continuous transformation and emergent order as a natural state of affairs. Be open to new metaphors that can facilitate process of self organisation*"

However he does not conclude by offering managers help to implement his suggestions.

Social sciences have long been influenced by the metaphors and methods of science. While science has undergone dramatic changes in the twentieth century, the type of science that remains influential in the social sciences is that of enlightenment science. Complexity theory is being helpful in challenging the Newtonian view in the social sciences however many of the claims for it as a complete paradigm shift or revolution may be over enthusiastic. It may be that complexity theory will be most profitably used in the social sciences if it is seen not so much as a set of mathematical formulations but as an alternative imagery, a source of inspiration and a repository of insights. It may be most useful as a metaphor. However one of the problems of using complexity theory in this way is that metaphors can be linguistic fashion statements. Once another fashion comes along the complexity metaphors will be forgotten.

I summarise this brief review of constraints and limitations by agreeing with Letiche (2000) who says that complexity theory desperately needs to "explain itself". Much of it is theoretically messy and its insights are somewhat unclear. This I am sure is no different from any other theory in the early stages of its maturation process where theory and practical application are being developed at the same time. Complexity theory is acquiring a much firmer foundation and usefulness as a scientific explanation of organisation development. It does offer an alternative way of thinking and if organisations are seen as complex adaptive systems evolving within social ecosystems then strategy and management will be seen from a different perspective. As with any theory the “value added” is dependent on personal perspectives.

The Research Focus

As this review of the literature demonstrates the application of complexity theory to the study of the development of organisations is still very much in its early stages with theoretical propositions far outweighing examples of its practical

application. Inherent in key concepts of complexity theory is the implication that the theory can be useful in two ways; firstly for explaining how individual organisations have reached their present state, and secondly as a guide to their future development. It remains to be seen if its main contribution will be as a theory of explanation rather than as a theory of broad prediction. The purpose of my research is provide an empirical study showing the value of complexity theory as a theory of explanation, rather than a theory to guide my actions as I worked in ATYAG. As a theory of explanation we need to be able to describe an organisation in terms of the key concepts of complexity theory. I aim to show that the strategic development of an organisation can be explained through four key complexity theory concepts.

- its *initial conditions*,
- events and actions both planned and unplanned which create *disequilibrium*
- and the *feedback* processes operating in the organisation.
- leading to the *emergence of order*

By doing this I will add to the body of empirical evidence of the usefulness complexity theory to our understanding of how things happen in organisations in the way they do. The research will contribute to Goldstein's (2000) call for advances in classification schemes for helping to discover pattern of sequences and Tsoukas' (2001) desire to see an enhanced understanding of how patterns emerge and reconfigure as a result of interaction.

Suggested Data Collection Areas

AYTAG began operation in April 1996. I joined in May 1996. My position enabled me to study the organisation closely over a relatively long period of time - three and a half years. The time period was sufficient for me to look for order emerging in AYTAG and I could do this by gathering data to demonstrate that

the key concepts of complexity theory; sensitivity to initial conditions, disequilibrium occurrences and negative and positive feedback processes come together to produce the order emerging in the organisation.

In order to show the relevance of concepts of complexity theory given in the previous paragraph data had to be gathered. According to Stacey gathering data for researching complexity theory involves playing a role in the legitimate system and the shadow system simultaneously inferring that data has to be gathered from both systems. Based on Stacey's (2001) views and those of Seel, (2003); Thietart and Forgues, (1997) and Shaw, (1997) I considered areas where it would be useful to gather data. These are indicated in table 3.1 below.

Table 3.1 Data Collection Areas

Complexity theory – Key Concepts	**Thoughts on where to collect data and what data to collect**
Initial conditions	The nature of the previous organisations, their size, structure, etc Reports and studies recommending setting up of AYTAG and the organisation of its work. The structure of AYTAG The transfer of staff into the new organisation Recruitment policy for senior managers and additional staff Policies and procedures in place to guide the regulatory activities Early human resource initiatives to integrate staff and functions Public perception of the need to protect the environment Management styles and cultures in the previous organisations Feelings and opinions of employees about the new organisation
Disequilibrium	Changes to senior staff Unexpected crises for example an environmental disaster Large swings in funding commitments for example for new offices and laboratories, research, training, etc Sudden intakes/ redundancies of large numbers of employees New work as the result of the requirement to implement new legislation Covert resistance to change initiatives for example through criticism and lack of time to carry out tasks
Feedback	Continuous shifts in resources in a particular direction Decisions supporting change initiatives Regular communication to staff through newsletters, e-mail etc on progress Unshifting opinions on the organisation and change initiatives Continuation of traditional ways of working

Emergent Order	Patterns appearing in the way decisions are taken Patterns of behaviour appearing in staff Development of the management process Changes to staff workloads/skill bases Achievement / non achievement of publicly stated strategic objectives Shifts in the balance of power between members of the corporate management team Organisational structure changes such as increases / decreases in hierarchy

Conclusion

According to Tsoukas (1998) we badly need complex theories to take into account context, time, history, meaning, politics and emergence. In chapter one I outlined the different approaches to strategy and in chapter two argued that strategy theory needed a new approach. Complexity theory can provide that new approach by throwing fresh light on social phenomena and why organisations develop in the way they do. As an open complex system an organisation is subject to fluctuations in information, resources, people, technologies and legislation and it has to adapt to a shifting landscape.

Complexity theory helps us realise that we cannot control or predetermine outcomes of interest. It allows different strands of organisational behaviour theory such as the psychodynamic of organisations, group and individual behaviour etc to be brought into the equation rather than sticking to linear mechanistic tools to guide the organisation forward. It demands communication between the different parts of the organisation and listening to a wide range of people. Complexity theory allows us to include stability and instability, uniformity and variety, and explain how choices are made and enacted in a continuing loop through time (Colado, 1995). Its qualitative properties such as sensitivity to initial conditions, strange attractors, time irreversibility and bifurcation processes all offer perspectives from which organisations can be viewed. With bigger organisations, changes in societal norms, faster communications and greater access to information, complexity theory has become a useful explanatory blueprint.

This chapter has been a brief critique of complexity theory. I have highlighted two critical points. Firstly there are relatively few robust academic studies and secondly there are concerns about how easily the theory can transfer to human social systems. My research described in the following chapters aims to address both these points. By contributing a detailed ethnographic study it will add to the relatively few academically robust empirical organisational studies. Secondly it examines the currently under explored issues in relating complexity theory to social systems and in doing so considers how far complexity theory is a useful conceptual device for understanding the strategic development of organisations.

Chapter Four

The Methodological Approach to the Research

The framework in which the researcher operates affects all aspects of the research; the initial literature review, the research questions, the methods chosen, how the research results are written up and distributed. According to Zohar (1997) our questions, assumptions, prejudices and beliefs that make up our paradigm determine how we will act and therefore what changes we will bring about. Prior to deciding how research should be undertaken a researcher needs to explore the paradigmatic options to him/her and their appropriateness to the chosen field of study. The methodology has to fit the research aim.

In this chapter I will argue that reductionist approaches to the study of organisations are inappropriate when a researcher aims to demonstrate that complexity theory is a helpful way of explaining the development of organisations. The nature of the theory itself requires a qualitative approach with implications for the researcher's skills and the research methods. I argue that case studies are useful to the development of new theory regardless of research paradigms. I describe my reasons for taking an ethnographic approach with participant observation as my main data collection method. I conclude the chapter reviewing the strengths and limitations of my chosen approach.

Research Frameworks and the Social Sciences

The research frameworks in the social sciences are split into two broad paradigms; positivist or reductionist and phenomenological. The requirements these paradigms are summarised in figure 4.1 below.

Figure 4.1 Research Paradigms

Research Methods	Increasing concern for external objectivity, hypothesis testing and increasing world knowledge	Generalisation by the researcher through large data sets
Reductionist methodology • Positivist/ • Post positivist Phenomenological/ Qualitative methodology • Ethnography • Participant inquiry • Grounded theory • Soft systems methodology • Action research /action science • Clinical method		
	Increasing concern for context and involving /helping the "researched"	Generalisation by the reader through recognition of patterns applicable to their own situation

The Positivist or Reductionist Paradigm

"The predominant research tradition in the social and behavioural sciences has been of a quantitative, empirical nature. It is based upon the statistical analysis of data collected by means of descriptive and comparative studies and experiments. This approach is usually termed positivistic. It assumes that only knowledge obtained by means of measurement and objective identification can be considered to possess truth."

Rubenowitz pp. 152, in Gummerson, 1991

This frame of reference requires establishing the real causes of real events and the effects of real intervening variables (Gummerson, 1991). Positivism has been the primary epistemology since Descartes in the 17th century. John Stuart Mill (1843 - 1906) was one the first to encourage social scientists to emulate the so-called hard sciences in order to achieve a more rapid maturation of their fields of study. This approach has been invaluable in furthering our understanding of the development of organisations from the work of Taylor and scientific management in the early 1990's to more recently Porter (1980). The dominance of the quantitative approach in the social sciences stems from a concern for acceptability and an appearance of being "scientific."

In a reductionist approach to research the roles of the researcher and the subject are mutually exclusive. The researcher contributes all the thinking and makes the decisions, the subjects contribute the action to be studied (Reason and Heron, 1995). There is strong emphasis on the researcher as objective observer, standing outside the research looking for objective knowledge and "one truth". According to Daft (1983) the research challenge is to plan the work so that it comes out as predicted. Research follows a predetermined path, "scientific method", in order to verify (positivism) or falsify (post positivism) an hypothesis or a model. The distinction between verification and falsification was made by Karl Popper as a way of dealing with the problem of induction (Easterby Smith et al, 1991). Quantitative research is undertaken using specific methods which require large sample sizes and rely heavily on statistical analysis. Generalisation and replicability are emphasised. Reductionism regards the whole as no more than the sum of its parts and through reductive separation and study of the parts the whole will be determined. The quantities approach is authoritarian in so far as researchers take all the decisions about content, methodology and findings. It ensures that the institutions to which the researchers belong remain the

gatekeepers of the knowledge gained. Such research is necessarily ahistorical, acontextual, and frequently aprocessual. When used in the social sciences it isolates individual events and activities as units of analysis in order to study them. As a result these studies are divorced from the immediate and more distant context in which they are embedded. Consequently inadequate descriptive theories and guides for action are likely to be developed (Pettigrew, 1985).

Practical Limitations of the Reductionist Paradigm

The practical difficulties of the reductionist approach are well documented. Common sense beliefs about the world are taken on trust in order to experiment. To test a particular hypothesis the plausibility of all other hypotheses entering the experiment have to be assumed (Clegg et al, 1985). The replicability of the researcher's observation does eliminate the risk of a single observer's eccentricity but it does not enforce the difference between fact and opinion (Sherrard, 1997). People holding similar but invalid opinions will cite identical observations to support their view. Repeatability does not guarantee their objectivity. Rather there is a shared consensus arising out of the features themselves. Daft states that when researching organisations "*the myth that successful research comes out as predicted, probably more than anything else, restricts the discovery of knowledge in our discipline*" (Daft 1983, pp. 540). As Marshall and Rossmann point out "*quite unlike its pristine logical presentation in journal articles, real research is often confusing, messy, intensely frustrating and fundamentally non-linear*" (Marshall and Rossman, 1989:21; in Parkhe, 1993).

As the limitations of the positivist or reductionist approach have become more apparent other systematic ways of studying complex systems have been developing. From the second half of the 19th century there have been "anti-positivists" including Weber, later Wittgenstein and Sartre who have moved away

from the science of the enlightenment and suggested that individuals do not exist in isolation and therefore need to be understood as part of the cultural and social environment. According to Reason (1994) there is a view emerging in the study of human social systems which is more holistic, pluralistic and egalitarian that is essentially participative. This has given rise to a number of new knowledge building paradigms such as constructivism and critical theory. Critical theory is a grouping of several alternate paradigms which include participatory inquiry and post-modernism (Guba and Lincoln, 1994). These paradigms share assumptions such as a belief in a plurality of methods and that each method has its validity determined by the specific situation in which it is applied and by the type of knowledge sort (Kock et al, 1997).

Phenomenological Paradigms

This approach moves us towards more localised, pragmatic and constructivist practical knowledge based on the experience and actions of all those involved and away from the search for a singular truth (Reason, 2001). It does not try to explain causal relationships by means of "objective" facts and statistical analyses. Instead it uses a more personal interpretative process in order to understand "reality". Such an approach allows flexibility and opportunity to pursue emerging insights. Language takes on a central role. Qualitative assessments partially replace quantitative data and general characteristics are of lesser interest than specific features. What can be taken as "data" for the research is much more varied and can encompass orthodox forms such as statistics and interview transcripts to less orthodox expressive forms such as story telling and dance. Data can be gathered through free floating discussions and informal interpretation, avoiding the temptation to force material into models which would result in barriers to the consideration of the material. Theory is derived from data and then illustrated by characteristic examples of data (Glaser and Strauss 1967).

Such research is concerned with what is tacit and unconscious and as a result researchers have to confront defences and overcome anxieties if these issues are to be brought to the surface. Intuitive faculties are systematically cultivated in order to make sense of diverse data and bring it into a coherent pattern of meaning (Reason and Goodwin, 1999). This not only makes for a rich enquiry, it also provides a means through which ordinary people may experience and validate the data being used. The researcher's intervention can change in response to the changing nature of the context. The phenomena to hand are not reduced to their constituent parts searching for law like rules which govern them; the researcher seeks to understand social phenomena in terms of patterns of interactions and feedback loops (Weick, 1979).

The research process is much more two way with input at various stages by the "researched" such as the research focus, design and conclusions so that the research becomes an emergent process. The research frequently has a dual aim, to produce knowledge that is useful to a group of people and to empower people through the process of constructing and using their own knowledge (Reason, 2001). The researcher can use a variety of methodologies such as grounded theory (Glaser and Strauss, 1967), soft systems methodology (Checkland and Scholes, 1999), action science/action research, ethnography and clinical method to seek to generalise insights about the pattern of one situation that may have relevance for understanding a similar pattern elsewhere. In recording the outcomes of the research narrative is used to describe actions of interacting agents, the occurrence of events unfolding over time and how they intertwine to produce current phenomena.

If the researcher wishes to follow an interpretative approach it is not possible to do so at a distance. It requires their personal commitment through investing their personality and experience into the field of research. The researcher is

encouraged to acknowledge their biases and assumptions about the world and not hide behind a mask of objectivity. Carrying out research is recognised as a powerful and political act. Personal experience of the area of study is considered to be a scientific merit. The researcher is concerned with metaphors and the images that people use as well as what is factual (Stacey, 1995).

The Limitations of Phenomenological Approaches

This alternate view is not without its critics who identify a number of weaknesses. Firstly what is often referred to as qualitative research is primarily an approach to the collection and analysis of data which can be used in a number of distinctive research approaches. For example when a researcher conducts a semi-structured interview he or she will collect comments made by the interviewee that can later be presented as an analysis of trends. This can lead to confusion about what is meant by qualitative research (Kock et al, 1997). Validity and reliability are also areas of controversy. The problem of validity in phenomenological research concerns the difficult of gaining an accurate or true impression of the phenomenon under study. To what extent are the researcher's biases affecting what is being observed. Reliability centres on the replicability of the research; for example data is collected in a non standard way and is often generally not useful for statistical treatment. Without a statistical analysis to confirm patterns and trends researchers cannot ensure that their findings are real. Reliability comes in qualitative research when the study is repeated and it generates the same range and diversity and the same explanatory associations. Proponents of qualitative approaches argue that most fieldwork is exploratory and is concerned with producing descriptions and explanations of particular phenomena or with developing theories and not with testing existing hypotheses. The methods used are less structured and as a result more flexible so that the researcher can alter the problems and questions they are pursuing as they gain greater knowledge of

their subjects. This enables insight into new realities or new ways of looking at old realities (Tyrrell, 2001).

To a large extent problems of validity and reliability can be overcome by seeking confirmations, refutations and reformulation throughout the course of the research (Morgan, 1993). Yin (1994) recommends safeguards against unconstrained subjectivity which include using a variety of data collection methods and triangulation of the resulting data. He also recommends reporting all the steps of the data collection, analysis and the grounds of interpretation. Moreover the use of intuition which is encouraged in qualitative research is a universally recognised subjective component of scientific discovery (Reason and Goodwin, 1999). Glaser and Strauss (1967) go as far as to say that although verifying theory is the researcher's principle task for existing theories, when developing new theories the researcher's main goal should be their systematic generation from the data of social research.

Generalisability of findings is another key issue. Studies often have small numbers of client organisations and can be in-depth, longitudinal studies making it difficult to generalise across a number of organisations or industries. The researcher has little control over the environment in which they operate. This can prevent the production or testing of strong theories and the building up of research models based on "solid" evidence. The development of general theories from findings of individual studies needs to be done transparently if it is to have validity. The reader has to be able to work through from findings to theories and see how the researcher has arrived at his or her interpretations. According to Lester (1999) this may well involve the researcher appearing in the research. The personal involvement of the researcher may introduce biases in the research methods, the interpretation of data and the reporting of the findings. Research methods employed such as action research often produce little in the way of

documentation. They are seen as lacking scientific discipline. As a result they do not always command high academic interest.

Practitioners of qualitative research argue that it is inappropriate to judge its worth using the tools of the positive approach. In reply to positivist accusations of subjectivity qualitative researchers will argue that objectivity is deceptive rhetoric as it is impossible for researchers to be completely objective. No method of data collection can be free from presuppositions. Criticisms can easily be made when research conducted within a particular paradigm is assessed from the vantage point of another. Both paradigms require the ability to see reality in a new light. Moon et al (1991, in Stevenson and Cooper, 1997) suggest that inquiry positions lie along a continuum with positivism at one end and constructivism at the other. Any inquiry stance will entail certain suppositions concerning epistemology (how we know) and ontology (what can be known). Implicit in the idea of a continuum is the possibility of adopting some middle ground.

The debate about the relative merits of the different approaches to research will continue. We should bear in mind Lewin's comments that *"to proceed beyond the limitations of a given level of knowledge, the researcher as a rule, has to breakdown the methodological taboos which condemn as "unscientific" or 'illogical" the very methods or concepts which later on prove to be the basis for the next major progress"* (Lewin, 1949; in Morgan 1993, pp. 295).

The Skills Required by Researchers

Different paradigms assume researchers with different skills. Positivist and post positivist researchers require being skilled in quantitative methods including statistical techniques in order to measure the phenomena in question. A fundamental assumption is that researchers are able to eliminate the influence

that their biases, prior experience and knowledge may have on a research project. The researcher here is the "objective observer". The relationship with those they research is one of "scientific neutrality".

On the other hand researchers undertaking projects using a qualitative inductive process argue that a position of objective observer is impossible and possibly unhelpful when seeking to gain new knowledge. All observations are acknowledged to be theory laden. Researchers have to be much more self aware so they are able to reflect on how their prior experience and belief systems impinge on their research and take steps to reveal them and their possible effects. As the research is much more of a two way process with input from the "researched", researchers need to be more highly skilled in group process skills such as facilitation to enable them to effectively engage with the people with whom they are working and support their personal growth and development. The researcher has to develop enquiry skills and validity procedures to help improve the quality of the research process. These include; the management of emotional states, being open, reframing and reflecting ideas and conclusions, challenging consensus collusion, refraining from investing personally in an action but remaining committed and managing conflict and distress (Reason, 2001).

Strategy and Organisation Development Research

Theories and models derived from the positivist paradigm dominate the strategy literature. Hypothesised connections between a specific cause, usually in the environment, and a specific effect, usually in part of the organisation being studied, are tested using cross-sectional data on organisations obtained from statistics, public documents, questionnaires and interviews (Stacey, 1995). Studies in scientific management, operations research, systems analysis, cybernetics, total quality management and business process re-engineering all

embrace this logical, analytical, deductive approach to development (Wood, 2000).

Management practice as well as strategy research is steeped in ways of conceptualising organisations as systems in equilibrium with their environments. Leading on from the work of Frederick Taylor in the early 1900's organisations have sought to operate as closed systems through efficiency measures and rules and regulations to assert managerial control (Pugh and Hickson, 1989). From the 1960's organisations have been seen as open systems in a more dynamic equilibrium with their environment (Boisot and Cohen, 2000). This informs the goals and methodologies of management and organisation development practitioners and strategists. Researchers have provided many models for understanding organisations in these terms. The design perspective of the research focuses on the organisation's legitimate system, its prescribed network of relationships and hierarchies, its bureaucracies, its approved ideology and explicitly shared culture. This rational picture of business problem solving and development has had as its major concern the content or "what" of strategy - the outcome which is sought - and has had less to say at an explicit level of how to achieve the outcome. Lagging behind are process theories of how to achieve the strategic outcomes so logically derived from analysis of the organisation's environment and competitors (Pettigrew, 1985).

The comparative lack of research based on process theory and the dominance of reductionist methodologies have meant that organisations have been studied as timeless fixed items. Weick (1979) argued that organisations can only be understood in terms of their organising activities. Viewing an organisation for longer periods of time will create the impression that organising is underway. Viewing it for shorter periods will suggest an organisation exists. Therefore we observe either an ongoing process that appears frozen or steady because it is glimpsed only briefly or we observe that the process is continuously changing if

we watch for a longer time span. According to Weick (1979) crucial events are explained in processes, their structuring, modification and disappearance.

Research into strategy development in organisations falls either into strategy content or to a lesser extent strategy process. As discussed in chapter two, calls for a more dynamic view of strategy are a move towards the reintegration of strategy content and strategy process (MacIntosh and MacLean, 1999). Such a move requires a pluralistic research agenda, to take researchers beyond current mindsets and will incorporate quantitative and qualitative research approaches.

Cameron and Quinn (1988) argue that the traditional ways in which organisational scientists think are inappropriate for analysing complex organisations. For example, there is an underlying assumption that organisations engage in rational decision making (Weick, 1979). Such thinking according to Cameron and Quinn is unidirectional, uniformistic, hierarchical, classificational and quantitative. They observe that organisations are becoming more sensitive to the presence of simultaneous opposites or contradictions in effective management and organisation behaviour. Cameron and Quinn then state that the requirement for understanding complex phenomena is thinking that is mutualistic, heterogenic, interactionist, qualitative, relational and contextual. Van de Ven (in Cameron and Quinn, 1988) similarly asserts that organisational and management theories match analytical thinking in narrowness and unidirectionality. Daft (1983) raises an important point when he says that one of the difficulties many authors have in developing interesting and insightful theories about organisational development can be explained by their lack of experience of organisations.

To overcome such criticisms there is a growing body of organisation development researchers who take a more subjective, inductive or co-operative approach (See Stacey, 1996, 2000; Shaw, 1997; Schein, 1995; Reason, 1994; Kets de Vries, 1991 and Cooperrider, 1990). These researchers place greater emphasis on

looking at what is odd, contradictory and paradoxical in what people say in organisations. Argyris and Schon (1978) have shown that behaviour in organisations is driven by theories in use which can often differ from espoused theories - that is people often say one thing and do another. This has raised awareness of the problems of traditional methods of gathering data to test hypotheses, as the data collected is based on what people in organisations say they do. The growing emphasis on the importance of tacit knowledge, below the surface and contradictory, is making it sometimes less likely that the straightforward application of questionnaires, documents and interview data to the testing of hypotheses is reliable (Liedtka et al, l997; Nonaka, 1991). Cassell and Symon (1994) argue that only qualitative methods are sensitive enough for detailed analysis, critical when organisation dynamics are being studied. Data collection and analysis are integral parts of the research process, but they are intermediate points between an initial hunch and the final story about the organisational world (Daft, 1983).

The Nature of Complexity Theory and the Implications for Researchers

In the previous chapter I gave my working definition of complexity theory and discussed the key concepts I am using for this research - sensitivity to initial conditions, feedback processes, disequilibrium and the emergence of order. MacIntosh and MacLean (1999) argue that complexity theory itself should determine an appropriate research methodology. I strongly support this argument. Complexity theory argues that order emerges in organisations through the self-organisation of systems and is undeterminable in advance. Organisations are complex adaptive systems in which the whole greater than the sum of the parts. The approach to the research has to align with these concepts.

Many of the problems in the study of organisations stem from attempts to treat them as if they were objects (Boisot and Cohen, 2000). In general systems theory a system is ahistorical in character, reversible and has no memory (Cillers, 1998). Complexity theory highlights the sensitivity of a system to its initial conditions. The system history shapes its future development. The time dimension is essential to the understanding of complex adaptive systems, they are, to all intents and purposes irreversible. The reductionist approach to research is essentially an ahistorical approach thus making it inappropriate for the study of organisations from a complexity theory perspective if we are seeking insight into an organisation's sensitivity to its initial conditions.

The reductionist approach of testing hypotheses about causality independently of each other assumes that the systems being studied are linear or approximately so or are non linear but are required to operate in states of stable equilibrium. Linear organisation is generally predictable in its consequences. From a complexity perspective however organisations are essentially non linear systems and therefore it is difficult to find the specific causes of specific effects. Even where it is possible to do so, with hindsight it provides little useful information about the future. Non linear modes of organisation can generate obvious or surprising consequences, properties "emerge" from the interaction of local level processes. This emergence or "structure" or "pattern" cannot be understood or predicted from the behaviour or properties of the component units alone (Eve et al, 1997). The emergent properties at different levels cannot be completely reduced to or wholly explained in terms of another level (Hodgson, 2000). Analytical reductionism is a valid mode of explanation when both the whole and its parts can be observed. In much of organisation theory the whole is unobserved and as a result is then identified as the sum of its parts. If organisations are non linear feedback systems with emergent properties then reductionist approaches to researching them are likely to produce misleading conclusions. The theory of emergence, in which the whole is greater than the sum of its parts, offers a non-reductionist account of

complex phenomena as such cannot be researched using a reductionist methodology (Hodgson, 2000).

According to Boisot and Cohen (2000) complex adaptive systems do not directly react to events but to their internal representation of them, organising information to generate plausible representations of their environment as a basis for action. Such systems act recursively producing changes that are progressive and different each time around. Representations of the environment shape the organisation's capacity and hence its conception of what it should or could be. The organisational context is critical. It develops a dynamic of its own which escapes the control of organisational actors. The organisation is what observers see and because of this it is not possible to separate the organisation as an object from the perceiving subject. The implications for the researcher are that he or she has to be able to; understand the intentions of organisational actors and the interplay between them, observe patterns of overt and covert behaviour and get as close as possible to the phenomena being investigated (Thietart and Forgues, 1997). None of this is possible if the research takes an external objective stance. Theory that is developed from the deep insights gained will both be more accurate and more appropriately tentative because the researcher must take into account the intricacies and qualifications of a particular context. Such an approach to research will only be valid within a qualitative framework.

In order to deal with the emergent nature of complex adaptive systems Reason and Goodwin (1999) advocate a science of qualities. This is an iterative process which cycles through phases of action and reflection with periods of divergent and convergent activity. Complexity theory tells us that convergence with its implications of negative feedback and divergence implying positive feedback contribute to the building of emergent properties. There are a number of research methods such as action research, ethnography (Gummerson, 1991), grounded theory (Glaser and Strauss, 1967), co-operative inquiry (Reason, 1994), clinical

inquiry (Ket de Vries and Miller, 1987) in which cycles of action and reflection occur. These have been described as Mode Two research (MacLean and MacIntosh, 2002; Tranfield and Starkey, 1998). Implicit in these methods is the lack of prediction of the actual outcome of the research process. They only facilitate its emergence. As such they may be appropriate methods for examining organisations through a complexity lens. They are however the methods that are less frequently applied to strategy research (Stacey, 1995).

Complexity theorists argue that it is impossible to offer prescriptions for long term organisation success. Traditionally the research questions posed are conditioned by the notion that strategic management should reduce the level of uncertainty, so diminishing the element of surprise in the development of the organisation. The complexity theory framework poses a different question, how do or should managers conduct themselves in the presence of irremovable uncertainty, surprise, the unknowable and open endedness (Stacey, 1995). Research therefore has to focus on; explanation or hypotheses about whole systems, their dynamics, the conditions under which they display different kinds of dynamic and the relationship between the dynamic and innovative success. As Weick (1979) has pointed out it is not the tangible fixtures of the organisation that are crucial, these merely provide the media through which processes are expressed. Their tangibility and visibility has little to do with their degree of importance for understanding what occurs. Their importance lies solely in the shape they will give to the processes that occur over and over in any organisation. Qualitative descriptions seem best suited for capturing the circular texture of organisational phenomena, the emergence of order and to express the importance of the historicity of the phenomena being explained.

In my view if research into the application of complexity theory to the strategic development of an organisation is to be convincing it has to meet two main criteria.

1. It has to be accessible so that it can be of use to the management community both researchers and practitioners.
2. The research methodology used has to be congruent with complexity theory itself.

Reason and Goodwin (1999) have said that the principles of complexity theory should lead us to towards a form of research and practice in organisations which is intimate, systematic and emergent. Much research into organisations never reaches managers; it does not become useable knowledge. It is presented in unfamiliar language and without helpful linkages to enable managers to see its practical application. Reason and Goodwin (1999) also suggest that the principles of complexity theory should be used as design principles to create the conditions for high quality creative inquiry and as criteria to assess the emergent understanding and practice. These two prerequisites point us firmly in the direction of a qualitative, participative approach.

The Case Study Approach

Parkhe (1993) argues that the development of theory should follow a research route which begins with exploratory research, followed by descriptive research and finally by explanatory research. To advance the application of complexity theory to the understanding of social systems exploratory research needs to be carried out. Yin (1984) noted that exploratory research allows an investigator to examine a phenomenon and develop suggestive ideas in a flexible way. A suitable starting point is a single case study (Glaser and Strauss, 1967; Eisenhardt, 1989; Parkhe, 1993; Brown and Eisenhardt, 1997). According to Lowe (2001) as ideas about the nature of knowledge change case studies look increasingly relevant. The contribution of case study analysis is in adding depth to more conventional

approaches. A case study permits the researcher to get close to the action and provide rich, thick data for analysis (Easterby-Smith et al, 1991; Glaser and Strauss, 1967). Descriptive case analysis provides the intellectual raw material for useful theory (Daft, 1983).

Traditional case study researchers have tended to let their analyses emerge over time choosing to focus on contexts and on describing the phenomena and contexts richly. The ultimate goal of such research is to provide a vivid description of the social scene, to describe the context in which events occur and to reveal the deep structure of organisation behaviour (Light, 1979). A good case study can be holistic and convey a feeling of what it is like to experience an organisation or a problem from the inside. It can explain attitudes and behaviours in context and from their participants' own frames of reference (Clegg, 1985). Laughlin (1991) says that change "pathways" in organisations can only be understood in the context of actual organisational examples. He quotes from Greenwood and Hinings (1988) when he states that it is from attempts to map tracks in different institutional settings that a richer understanding of organisational evolution and transformation will occur.

As a form of research a case study is defined by interest in individual cases and not by the methods of inquiry used (Stake, 1994). Case studies are undertaken by researchers using interpretative paradigms as well as those who have a more positivist orientation. It is important to consider case studies as a method not implying a particular form of data collection. This may be quantitative or qualitative.

Case Studies within a Phenomenological Research Paradigm

Case studies carried out within a qualitative framework give detailed descriptions of specific phenomena with deeper understanding of particular contexts. Such case studies create exemplars from which other researchers can compare their experiences and gain theoretical insights. When a phenomenological approach is

taken to case study research it may be inappropriate for the researcher to attempt to generalise his or her findings. However it is appropriate and possible for them to be generalised by their readers who can share the meanings they embody and identify with them as a result of their own experiences and settings (Clegg, 1985). The classic case study approach has been so powerful because the authors have described phenomena so well that others have little difficulty seeing the same in their own experience and research (Dyer and Wilkins, 1991). Knights (1995) suggests that case research ought not to concern itself with generalisability but should seek instead to emphasise its strengths which include telling convincing stories and the ability to express the uncertainty and undecidability of organisational life. It is these strengths which give case researchers a distinct position in contributing to the appreciation of the intricacies of organisational action.

Two common qualitative approaches to case studies are ethnography (Cooke, 1997; Gummesson, 1991) and action research (Argyris, 1992; Gummesson, 1991).

Ethnography

The ethnographic approach is concerned with the descriptions of social patterns. The ethnographer learns from others about their culture. The primary method of access is participant observation, a highly empirical and inductive method of data gathering (Gummerson, 1991).

An ethnographic approach can be described as one in which the investigation seeks to

- gain a close up detailed rendition of the real world
- challenge the logical positivist position by claiming that all evidence is relative and therefore cannot be independent of the investigator - thereby favouring participant observation as the dominant mode of data collection

- permit and even encourage fieldwork to continue for long periods of time so that the regularities and rituals of everyday life can surface (Yin. 1993)

The ethnographer's primary goal is to obtain valid data for "science" and is not usually to change or help a system being studied. The ethnographer's clients are seen primarily as academics (Cooke, 1997). Unlike the action researcher the ethnographer is not there to "help" the client or organisation. Even where there is an intention to help it is subservient to academic rigour. Ethnography is used extensively to further our understanding of social systems and there is a very extensive literature particularly in sociology and anthropology. Since organisations can be viewed as "tribes" with their own cultures, researchers have used ethnographic methods to study them. There are many examples of ethnographic studies carried out to gain a greater understanding of organisations. The researcher can take on the role of an employee. Thorpe (1980, in Easterby Smith et al, 1991) used this approach to gain an understanding of how lack of attention to motivational needs led to disillusionment and apathy in the workforce. Roy (1952) used it when working as an employee in a machine shop of a large company to show how the piecework scheme was manipulated. Researchers can explicitly agree with an organisation to be present over a specific period of time with the researcher moving around observing, interviewing and participating as appropriate. Fairhurst (1983, in Easterby Smith et al, 1991) used this approach to study employee attitudes to organisational rules.

Action research

Lewin was the first to use the term action research to refer to a specific research approach in which the researcher generates new social knowledge about a social system while at the same time trying to change it (Kock et al, 1997). Gummesson (1991) states that action research always involves two goals, firstly to solve a

problem for the client and secondly to contribute to science. It is an approach to knowledge production which is theory sensitive and practice led.

Argyris (1992, pp 414) says of action research that it

> "*takes its cues – its questions, puzzles and problems - from the perceptions of practitioners within particular, local practice contexts. It bounds episodes of research according to the boundaries in the local context. It builds descriptions and theories within the practice context itself and tests them through* intervention experiments, *that is through experiments that bear the double burden of testing hypotheses and effecting some (putatively) desirable change in the situation.*"

Action researchers may make claims about the generalisability of their research across local contexts, however they do not describe relationships in which the values of a group of dependant variables are uniquely determined by the values of a group of independent ones. Generalisations produced from an action research project tend to describe thematic patterns derived from enquiry in one setting whose valid transfer to other settings depends on confirmation there by further experiment. Action research is used in organisations to bring about change and involves those whose roles in the organisation will be changed. Examples include Moller's (2001) work with educational leaders in Norway and Waterson's (2000) work in a local authority's social services department.

Limitations of Case Studies

Weick (1979) in his critique of the case study as a method agrees that they have a richness of detail but he gives four drawbacks; they are situation specific, ahistorical, tacitly prescriptive and one sided. These four are drawbacks because

of their effect on theory construction. He argues that case studies give a static view of organisations and do not highlight mechanisms associated with processes, change, development and fluidity. Weick's criticism is primarily relevant to case studies carried out within a positivist paradigm. In such instances case studies tend to focus on problems; this is unhelpful to theory development. Theories he argues are built on regularities among events, people and relationships not on sporadic infrequent, explosive episodes. Most case studies do not describe any circumstances in which the author's prescriptions did not work. Some case studies that have been described as action research have not properly fulfilled the requirements of scientific research but have been closer to consultation or journalism.

There is disagreement regarding the number of case studies required to generate theory. Eisenhardt (1989) argues that the more cases a researcher studies the better. She considers that between four and ten case studies are suitable as less than four often makes it difficult to generate theory with much complexity. The empirical grounding is likely to be unconvincing when there is a small number unless each case has several mini case studies within it. Dyer and Wilkins (1991) disagree with Eisenhardt. They argue that classical case studies tend to focus on comparisons within the same organisational context. The critical trade off for researchers is between the deep understanding of a particular social setting and the benefits of comparative insights. The more contexts a researcher investigates the less contextual insight he or she can communicate and the less understanding of the underlying dynamics of the case. Dyer and Wilkins (1991) continue their argument by stating that if researchers apply the paradigm of hypotheses testing to case study work without the goal of telling good stories, they are likely to miss both the calibre and the quantity of theory seen as a result of classical story telling in the case studies of the past. Most of the single organisation case studies are in fact multiple cases in a single setting such as an organisation. They rely on the

comparative multiple case logic of replication and extension for their theoretical insights (Eisenhardt, 1991).

The strengths and limitations of case studies are summarised in table 4.2 below

Table 4.2 Strengths and Limitations of Case Studies

Strengths	Limitations
• allows researchers to get close to the action	• Perceived as risky and are the target of scepticism in the scientific community.
• Can act as a catalyst at the early (exploratory) stage of theory development	• Situation specific and not generalisable
• Can be carried out within positivist or qualitative paradigms	• May need several case studies before theory can be convincingly generated
• Can focus on context and gain a deeper insight into an organisation	• Can be prescriptive and one sided

Organisational Case Studies and Complexity Theory Research

There are many examples of case studies looking at the strategic development of organisations for example Pettigrew's (1985) study of the development of ICI, Mair's (1999) review of the development of Honda and Dair's (1993) description of the formation and development of English Nature. As previously indicated in Chapter 3 empirical studies applying complexity theory to organisation development are few in number. Much of complexity research is still computer simulation and includes simulation models (Levy 1994, Smithson 1997) and rating

scales (Smith and Comer, 1994). Empirical examples of complexity theory based research reported in management journals are case studies.

These include

1. Brown, S. L. and Eisenhardt, K. (1997) The Art of Continuous Change: Linking complexity Theory and Time-paced Evolution in Relentlessly Shifting Organisations, *Administrative Science Quarterly*, 42, pp. 1 - 34.
This well written article is based on a study of six firms in the computer industry and makes interesting comparisons between them. The authors offer complexity theory as a theory of prediction rather than a theory of explanation. It provides insufficient information of the context of these firms and how this influences their performance. To some extent the article justifies Stacey's comment that there are problems in the literature as much complexity theory research starts from a position of objective external observer which makes it hard to hold onto the radical perspectives of the theory (Stacey, 2000).

2. Patricia Shaw (1997) describes how complexity theory was used in a consulting assignment to bring about change in a public sector organisation. Shaw describes the process the consultants went through with the senior management in order to work with them using the theory and reflects the emergent nature of complexity theory. The article clearly demonstrates how complexity theory was applied. The period of the research is relatively short resulting in no long term assessment of the success of the consultancy assignment. (Intervening in the shadow systems in organisations in the *Journal of Organisational Change Management*, (10) 3)

3. In an article "Chaos to Chaords" published in Training and Development in April 1997, Durrance describes how Dee Hock the founder of Visa used the principles of chaos theory to run his company. Unsuccessful activities are avoided and complexity theory is not used to explain these. The article raised awareness of the theory but gave little of substance to those who might seek to understand why Visa became the organisation it is today. It is an example of an article that tries to "sell the benefits" of complexity theory without giving an academic justification for doing so.

The examples quoted have informed the development of my own approach which I will now go on to describe. The research I am undertaking aims to extend our understanding of how complexity theory can be useful in helping us understand organisation development. To paraphrase Goldstein (1999) I aim to make the process of emergence in organisations less opaque. Without more examples of actually applying the theory to real organisations it will remain a topic for discussion and not a means for helping managers understand the environment in which they work.

My Approach to the Research

I have briefly described the research paradigms, the requirement for the research methodology to be congruent with complexity theory, the usefulness of case studies to the development of new theory regardless of the paradigm and listed some of the relevant research cases. It is now appropriate to define my own approach.

Daft (1983) states that significant studies often begin with direct contact with organisations through such things as training sessions and consulting work. I was employed by the organisation that is the subject of my research. I took advantage

of my work situation and the access it gave me to pursue this PhD. It gave me an ideal opportunity to undertake a case study. As already highlighted case studies are suitable for exploratory research required for increasing our understanding of the application of complexity theory. Case studies are popular with researchers looking at the relevance of complexity theory to organisation development.

I was responsible for corporate training and development in AYTAG. I made recommendations to the Corporate Management Team and implemented strategies to develop staff. I operated as an internal consultant. The approach I took to my work had a significant effect on the direction of human resource development in the organisation and on the outcome of this piece of research. As a member of the organisation I was not in a position to stand outside it as an objective observer. This made it almost impossible to use a positivist or post positivist methodology. It was not possible to separate the content from the context and myself as the researcher from what was being researched.

I am not the first person to see the appropriateness of a qualitative approach in order to gain an understanding of organisation development from the perspective of complexity theory. Stacey (2000) deals with the research approach issue by arguing for a reflexive methodological position to seek out the patterns of behaviour which lead to emergent self organising processes. Easterby–Smith et al (1991) state that the role of the researcher as an employee is appropriate when the researcher needs to become totally immersed and experience the work or situation first hand as sometimes it is the only way to gain the kinds of insights sought. MacLean and MacIntosh (2002) also highlight the importance of the research process being consistent with complexity theory with insights regarding the research coming from the broad principles of the theory itself. The concept of emergent properties made it not only impossible to predict in detail the research outcomes but also the exact method of the research itself. There had to be a lesser degree of control over the research process than with a reductionist

approach which does predict outcomes. My role within AYTAG meant that I was involved in the creation and shape of what was being researched. The perceptions of myself and others in the organisation played a role in the creation of the emerging properties. I agree with Morgan (1986) when he says that we cannot obtain knowledge independent of our own judgement and social construction and with Tsoukas (1998) who said that we can never escape the maze of language which causes us (according to the community in which we belong) to describe the world in a particular way. However I remained very aware of issues relating to the subjectivity of the research and the need to ensure that I collected data from a wide variety of sources.

In this thesis I am using four key concepts of complexity theory to explain the development of an organisation. Ethnography and action research were both initially attractive from a complexity theory and an organisation perspective. There would have been the advantage of convenience of using action research as I could have used the same work for my thesis and for my paid employment. However action research entails bringing about change to the system being studied. My research for this thesis did not involve using complexity theory to inform the actions I undertook which made action research unsuitable. It was not my intention to show that by applying key concepts of complexity theory the development of AYTAG could be influenced. I chose ethnography, as this would enable me to observe the system of which I was a member without the express purpose of bringing about a change to the system. From the perspective of this thesis I was observing AYTAG, not trying to change it.

Table 4.3 below summarises the suitability of action research and ethnography for researching complexity theory as a theory of explanation.

Table 4.3 Action Research and Ethnography as Research Methodologies

Method	Key Features	Suitability
Action Research	Requirement to be close to the "action" over a long period of time Primary purpose to bring about a change in client system	Suitable Unsuitable
Ethnography	Requirement to be close to the "action" over a long period of time Research is not directed a bring about a change in the system studied Primary client is academia	Suitable Suitable Suitable

Ethnographical research is well established method for furthering our understanding of human behaviour in organisations and how this helps and hinders the achievements of organisational aims. Hodson (2001) in his study of disorganised workplaces identified over a hundred of organisational ethnographies which were relevant to his work giving an indication of the extent to which ethnography is used as a means to study them.

Participant observation is the main ethnographic data collection method. Participant observation allows the researcher to observe what people actually do rather than reporting what people say they do. The researcher can examine first hand social situations from participants' points of view and gain access to concepts used in everyday life, thereby obtaining insights about core meanings and experience. Webb and Palmer (1998) successfully used this method to investigate how the circumvention of workplace rules and procedures contributed to maintaining production targets in a British based Japanese manufacturing company.

Working ethnographically using participant observation I was able to observe and gather information in AYTAG as I went about my day-to-day business. As indicated earlier in this chapter I was carrying out action research projects to progress multiskilling professional employees and to develop managers as these were two main areas of my job. I was careful to make the distinction between my researcher role to progress the work I did in AYTAG and my researcher role for this thesis. From the perspective of this thesis I gathered data from the action research projects in my role as a participant observer.

The results of ethnographic research lend themselves to being written up in narrative format. Juarrero (2000) states that interpretive narrative models of explanation are suited to the dynamics of self organisation. Narrative descriptions can give historical interpretation and describe how meaningful intentions emerge.

I have already highlighted that the skills of the researcher are fundamental to the quality of the research results. I felt confident undertaking a qualitative approach, my career history having given me the skills and knowledge required. For example I have considerable group facilitation experience. I was aware of the pitfalls that could occur for organisation development practitioners. It was important for me to understand such processes as projective identification, consultant over-functioning and avoid joining collusively with images that people had of the situations existing in AYTAG in order to take on the role of participant observer effectively (Gilmore and Krantz, 1985).

Limitations of the Chosen Research Process

I recognise that no single approach to theory development is self sufficient and that even the best research provides an imperfect model of organisational reality (Parkhe, 1993). I worked in the organisation which was the subject of my

research and as such the research could be viewed as overly subjective. The demands of the organisation could be seen as detractors for producing well grounded theory.

Complexity theory is a new field and can be perceived as "high risk" particularly for a PhD student. Management research generally is fragmented and operates to no single agreed ontological or epistemological paradigm. Paradigmatic agreement in disciplines serves an important co-coordinating role aiding in the definition of key research questions and the specification of appropriate epistemological orientations (Tranfield and Starkey, 1998). This research could be seen as contributing to this fragmentation as it is not trying to clarify what already exists. The limitations and strengths of my chosen approach are summarised in table 4,4 below. Also highlighted are the implications of the research process.

Table 4.4 Research limitations, advantages and implications for the research process

Limitations	Advantages	Implications for the Research Process
New theory - complexity theory	High involvement case study useful at the outset of a new theory	Multiple source of data High involvement may result in data "overload"
Less well defined research path for strategy research – ethnography with participant observation as a data collection method	Fits with research requirements of complexity theory – research as an emergent process Research can be told as a story which best describes the dynamics of emergent order.	As the researcher I could be seen as too "close to the action" Careful use of language to convey meaning

Table 4.4 continued

Limitations	Advantages	Implications for the Research Process
High risk	Possibility of making an early contribution to the development of the application of a new theory	Awareness of the possibility of the theory being inappropriate
Could be seen as overly subjective lacking in academic rigour	As an employee able to gain entry easily and overcome gatekeeper issues Results are accessible to the management community	Need to guard against over functioning Requirement for the academic perspective remain in view
Knowledge produced is not necessarily generalisable	Detailed description will allow the knowledge gained to be generalised by others	Requires clarity regarding added value when writing up conclusions

Conclusion

Complexity theory research describing how key concepts of the theory can be useful to understanding the strategic development of organisations is a new field. The practical application of complexity theory is only in its early stages, much of our current understanding comes from simulations. This empirical study will add to the relatively few robust studies which apply complexity theory to the study of organisations. Its main purpose however is to explore how far complexity theory is a useful conceptual device for understanding the strategic development of organisations. High involvement case studies into the development of new organisations particularly those in the public sector are not numerous so this research has the added benefit of increasing our understanding of such development.

In this chapter I have argued that the ontological and epistemological framework within which the researcher operates and the nature of research topic have implications for the way research is carried out. This together with the level of existing research in complexity theory, the key concepts of the theory, my knowledge, experience and my relationship to AYTAG and its employees all influenced the way I undertook this research. It has resulted in me using an ethnographic approach with participant observation as the main method for gathering data. I now move on to describe what data was collected and how I collected and analysed it.

Chapter Five

The Research Process - Data Collection and Analysis

The purpose of my research is to provide an empirical study showing the value of complexity theory as a theory of explanation. As I have stated earlier I aim to describe the development of AYTAG through four complexity theory concepts namely

- its initial conditions,
- events and actions planned and unplanned which created disequilibrium
- the feedback processes operating in the organisation leading to the
- emergence of order

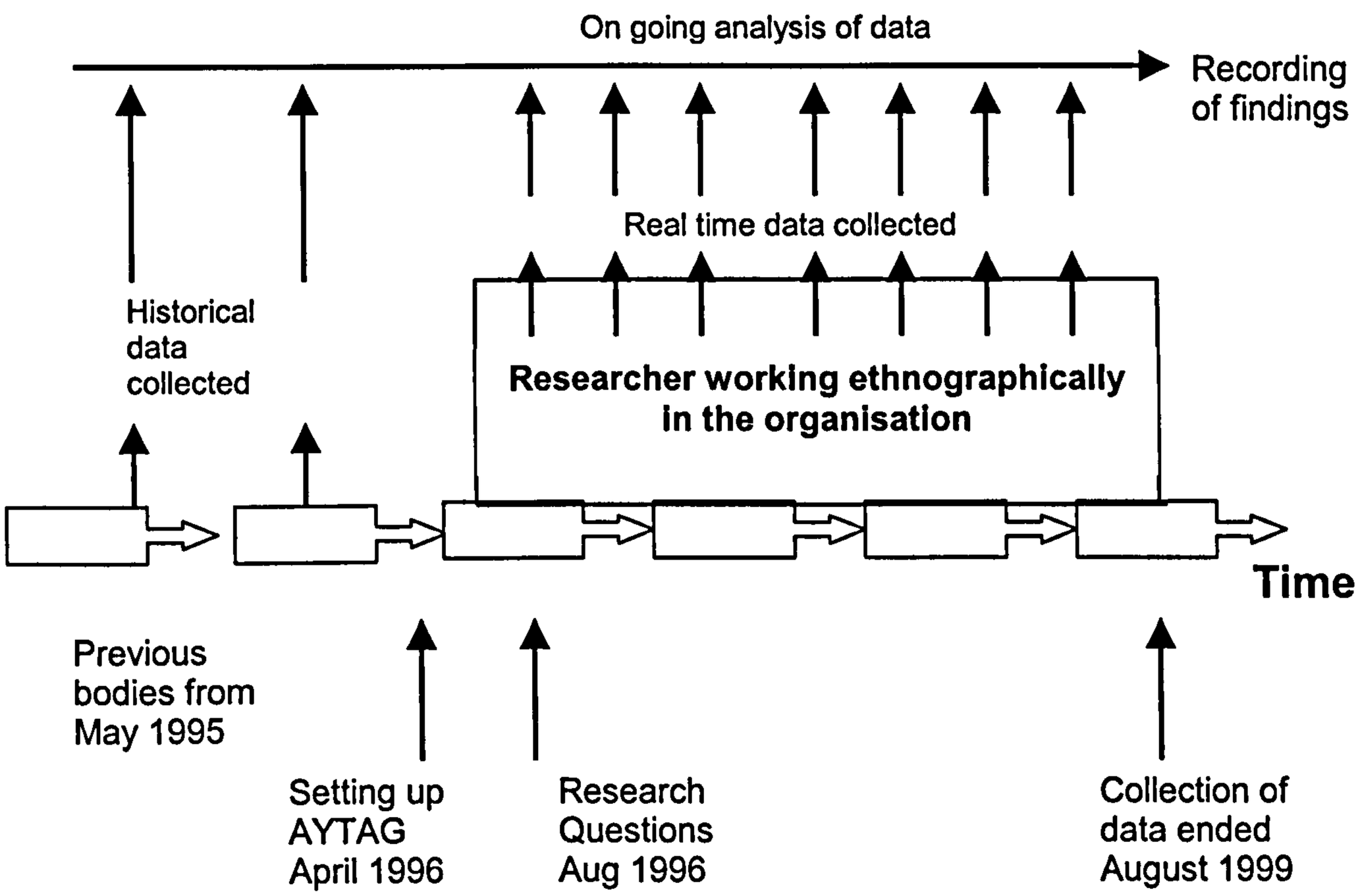
In my last chapter I described why I decided to take an ethnographic approach to this research with participant observation as the main method of collecting data. Also important to this study is the written data I gathered such as official documents, memos, e-mails and workshop outputs. In this chapter I describe the large variety of data I collected and how I collected it in order to gain insight into the way AYTAG developed. I show how the data collected links to my original ideas in my complexity theory chapter. Also detailed is how I reviewed and sorted the data through chronological ordering, mind mapping and process flow charts to determine my findings. The chapter notes my awareness of possible biases and validity issues during the data collection and analysis process and describes the steps I took to address these.

Introduction to data collection

In my chapter on complexity theory I outlined my thoughts on what useful data I could collect. With these thoughts in mind I began to gather data to help identify

emergent themes. I realised that I would need to collect data over a significant period of time to allow for these themes to emerge. The data gathering covered a four year period from May 1995 to August 1999. I joined AYTAG in May 1996. For information about the setting up of AYTAG in the year prior to it becoming operational in April 1996 I collected historical data. The remaining data was collected at the time it was produced. Data collection was an ongoing activity from May 1996 to August 1999. Figure 5.1 depicts the data collection activity.

Figure 5.1 Data Collection and analysis in AYTAG



An issue for a researcher is how much data to collect. I was responsible for training and development in AYTAG giving me access to large numbers of people and multiple sources of data. Employees from over sixty parent organisations came into AYTAG. My job was to facilitate the merger through the development of a multiskilled workforce and a programme of management development. The nature of this job meant I had easy access large quantities of data with the possibility of getting myself into a position of data overload. To help

me focus my data collection activities I drew on Reason and Heron's (1995) comments that a fundamental skill of the researcher is attentional competence, that is the ability to "know what is going on".

I had to keep to the forefront several factors in order to "know what was going on" and these influenced my data collection. These factors were the skills required to be "attentionally competent", the opportunities to gather data, my interest in complexity theory and my role as a participant observer. In order to be "attentionally competent", Reason and Heron suggest that a researcher needs skills such as being open to meaning and being able to reframe constructs. These are skills which an experienced facilitator requires and skills I used frequently in training events and meetings during the period of this research.

AYTAG is an organisation that sponsors and undertakes research. The majority of staff are professionals who use research information on a regular basis. This meant that there was a great deal of easily available explicit information. My interest in complexity theory ensured that I collected both tacit and explicit data (Stacey, 2000; Seel, 2001). I collected as much data as I had access to as it was only with hindsight that I knew which proved to be most useful and relevant. In my participant observer role I noted my observations in a personal diary. My observations were made in situations where I had an organisational reason for being there. I had regular access to operational, policy and administrative staff at all levels of the organisation and I attended meeting of various teams and working groups. I did not ask to observe events I would not normally have attended purely for purpose of this PhD. This was because I could not have acted as a complete observer. The nature of my day to day work would have made it difficult for others to accept me as a such. They would have wanted to involve me or restrict the conversation if the topic was sensitive, thus altering the course of the event I was trying to observe. By collecting data in a "natural setting," that is as I went about my day to day business in AYTAG I lessened biases that can be caused through having to develop trust and establish relationships which ethnographic researchers frequently have to confront.

The Data Collection Process

As I described in my chapter on complexity theory to determine patterns both observation and participation are required (Medd and Haynes, 1998). My main method of data collection was participant observation. Participant observation is an umbrella term covering several combinations of participation and observation. To map out my role as a participant observer I modified a topology devised by Gold (1958, in Tyrrell, 2001) in which he distinguished four ideal typical field roles; complete participant, participant as observer, observer as participant and complete observer. I have distinguished where I acted as a complete participant and a complete observer. I have reduced his remaining two categories to one, that of participant observer. The circumstances in which I collected data made the distinction between the two seem contrived. Table 5.2 below gives examples of work situations and the roles I undertook.

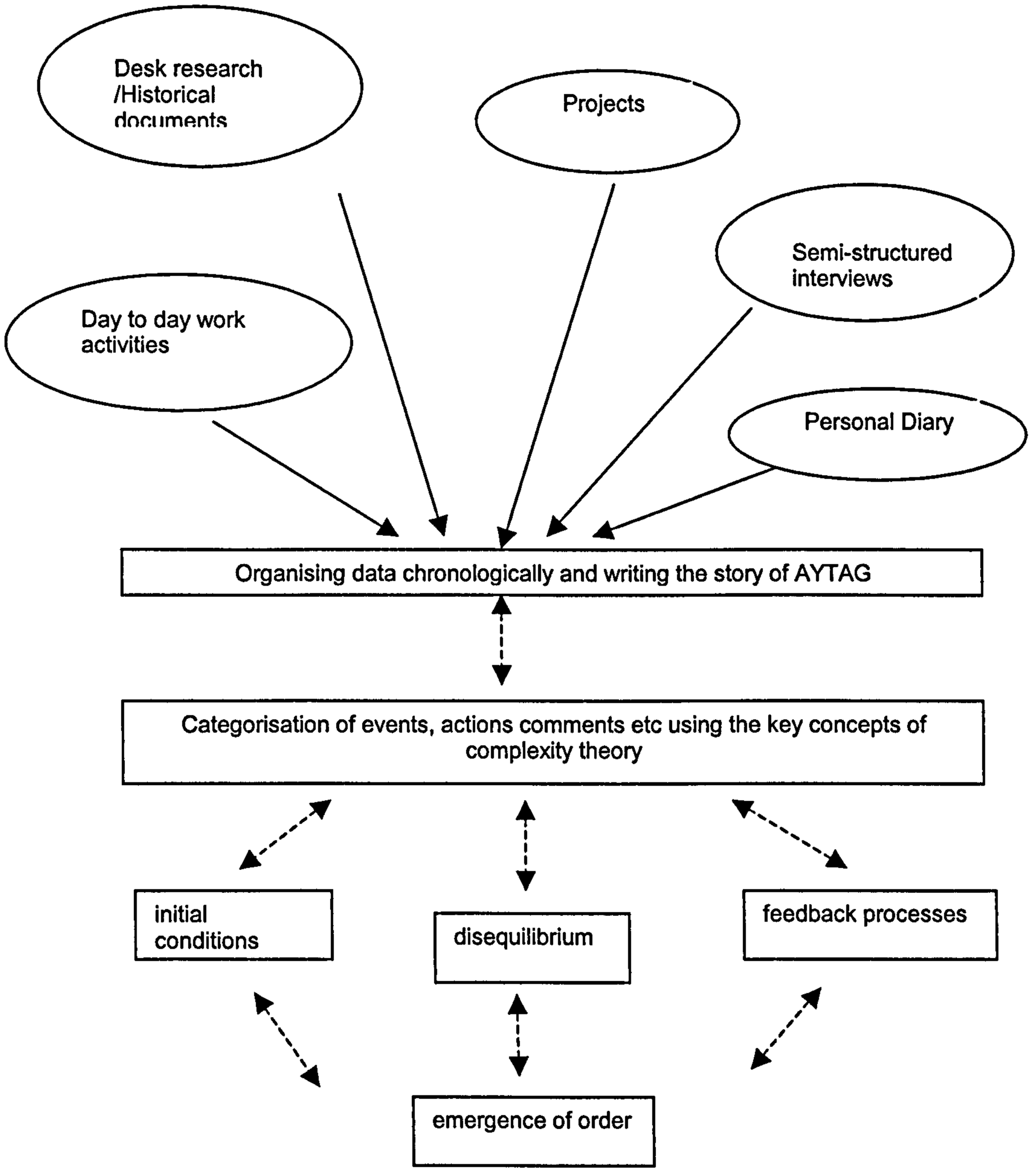
Table 5.2 My Participant Observation Roles in different Work Situations

Complete Participant	Participant Observer	Complete Observer
Member of working groups to implement new environmental legislation Responding to correspondence Personnel Team Meetings Membership of project teams eg management development Informal conversations	Workshop facilitator Delivering training courses and presentations Invited attendant at meetings Attending presentations Action researcher implementing projects to multiskill professional staff and develop managers Conducting semi-structured interviews eg for training needs analysis	Visits to other offices and other parts of Head Office Recipient of circulated documents / general e-mails Working in an open plan office

In addition to participant observation I examined historical documents and interviewed three senior managers. Any data collection activity gives selective exposure to certain types of data and can be perceived as a biased with the

result that it affects the outcome of the research project. I took steps to minimise this by collecting data from a variety of the sources. Figure 5.3 gives an overview of the data collection and analysis process.

Figure 5.3 Overview of the data collection and analysis process



As the figure 5.3 shows my data collection came from four separate areas, historical documents, projects I managed, day to day work activities and my diary. In chapter 3 (complexity theory) I stated where I thought I would find

data relevant to the different complexity theory concepts I was researching. Table 5.4 below shows the actual data I collected and how it relates to these concepts. This table extends Table 3.1 in my chapter in complexity theory.

Table 5.4 Linking the data obtained to the key concepts of complexity theory

Key Concepts of Complexity theory	Thoughts on where to collect data and what data to collect (from complexity theory chapter)	Sources of Data obtained during the period of the research
Initial conditions	The nature of the previous organisations, their size, structure, etc Reports and studies recommending setting up of AYTAG and the organisation of its work. The structure of AYTAG The transfer of staff into the new organisation Recruitment policy for senior managers and additional staff Policies and procedures in place to guide the regulatory activities Early human resource initiatives to integrate staff and functions Public perception of the need to protect the environment Management styles and cultures in the previous organisations Feelings and opinions of employees about the new organisation	Documents produced by the Personnel Department Options Team second report Semi structured interviews with senior managers Reports from the Introduction Programme facilitator Dairy comments AYTAG's first Corporate Plan Environment Act 1995 Staff Survey Publicity Material produced by Public Relations AYTAG files containing meetings of the Corporate Management Team and Board Semi structured interviews with directors/senior managers
Disequilibrium	Changes to senior staff Unexpected crises for example an environmental disaster Large swings in funding commitments for example for new offices and laboratories, research, training, etc Sudden intakes/ redundancies of large numbers of employees New work as the result of the requirement to implement new legislation Covert resistance to change initiatives for example through criticism and lack of time to carry out tasks	Memos to staff from senior managers and the Board Chairman AYTAG's second and third Corporate Plans AYTAG Annual reports Diary comments Staff and management development reports to the Corporate Management Team Minutes of CMT meetings Semi structured interviews with directors/senior managers Flipchart comments etc produced during workshops

Table 5.4 continued

Feedback	Continuous shifts in resources in a particular direction Decisions supporting change initiatives Regular communication to staff through newsletters, e-mail etc on progress Unshifting opinions on the organisation and change initiatives Continuation of traditional ways of working	Memos to staff from senior managers and the Board Chairman AYTAG's second and third Corporate Plans AYTAG Annual reports Diary comments Tender documents Management competency statements Minutes of meetings eg project teams, working groups, CMT, Flipchart comments etc produced during workshops Personnel policies Consultant/facilitator reports from staff and management development initiatives. Training needs analysis meeting reports Training evaluation questionnaires
Emergence of Order	Patterns appearing in the way decisions are taken Patterns of behaviour appearing in staff Development of the management process Changes to staff workloads/skill bases Achievement / non achievement of publicly stated strategic objectives Shifts in the balance of power between members of the corporate management team Organisational structure changes such as increases / decreases in hierarchy	AYTAG's Corporate Plans and Annual reports Diary comments Flipchart comments etc produced during workshops Consultant/facilitator reports from staff and management development initiatives Memos to staff from senior managers and the Board Chairman Minutes of meetings eg project teams, working groups, CMT,

I will now move on to describe my data collection in more detail.

Desk Research/ Historical Documents

Much of the data I gathered on the formation of AYTAG came from historical documents. I had free access to the library in AYTAG which contained official reports on how and why the organisation was set up. I also had access to AYTAG files containing other historical data such as reports by the Options Team set up to advise on the structure of AYTAG and minutes of Board and Corporate Management Team meetings prior to the organisation becoming operational in April 1996. All of this data was particularly useful for

determining AYTAG's initial conditions. The library kept all publicly available documents produced by AYTAG such as corporate plans, environmental strategies, environmental legislation and implementation guidance, press cuttings and information booklets produced by AYTAG's public relations department.

Semi Structured Interviews

I carried out semi-structured, one to one interviews with three senior managers. I specifically asked to interview them because of this PhD. These interviews were

1. Interview (6.4.97) with the East Region Director, a former head of a water quality board (WQB) who had been closely involved with the setting up of AYTAG. I wanted to gather detailed first hand information on the structure and operation of the WQBs and what work had been undertaken to set up AYTAG

2. Interview (3.7.97) with the Management Services Manager a civil servant who had been seconded to the project team (The Options Team) setting up AYTAG and who stayed on in the organisation until July 1997. I wanted detailed information on how AYTAG had been set up and his views on the organisation after it had been in operation for one year. I interviewed him shortly before he returned to his civil service post

3. Interview (25.9.97) with the Director for Special Projects who had been recruited to AYTAG as Director of Corporate Services in Autumn 1995. He was leaving AYTAG after two years and I wanted his views on the development of AYTAG

At the beginning of each interview I explained the purpose to each interviewee and took detailed notes which I later transcribed. As an example of how these

interviews were structured I have included a copy of the questions I prepared for the interview with the director of special projects in Appendix 1 The interviews were particularly useful in helping me understand the way in which Water Quality Boards had operated and their functions and what work had gone into setting up AYTAG. The interviewees also gave me their views on the development of the organisation which helped further my understanding of AYTAG's initial conditions, feedback processes and disequilibrium activities.

Data Gathered during the Management of Projects

During the period of this research I managed three organisation development initiatives. The first of these the Introduction Programme was a series of two day workshops run from August to December 1996. All employees attended. The purpose of these workshops was to act as unifying influence so that staff could get to know each other and learn more about the work of the new organisation. I determined the programme content, ran the first two workshops and then trained an external consultant to facilitate them. Each workshop was run by the consultant and a senior manager who produced a workshop report for the chief executive. The consultant produced two reports one half way through the workshops and a second at the end of them. Each workshop was also evaluated by means of an end of course questionnaire.

The Introduction Programme produced data that was helpful to describe AYTAG's initial conditions. For the purposes of this research my role was a mixture of participant observer and complete observer. There was information on the management styles existing in the predecessor organisations and the concerns that staff had about the unstructured environment they were working in.

AYTAG wanted to provide a customer focused service which required a more effective use of front line, professional environmental protection staff. Multiskilling these employees was seen as the way to do this and many in the

organisation were opposed to it. The second project I managed was to progress multiskilling. I used action research methodology (see appendix 2) which was highly suited to AYTAG. AYTAG managers and professional staff felt more comfortable when they understood that initiatives taken were rooted in theory. They also felt it appropriate to be involved, as their knowledge and experience would give valuable input. This was needed to ensure that what was developed was right for their work circumstances.

With respect to this thesis, during the multiskilling project I acted in all three participant observer roles. Data gathered during the multiskilling project was particularly useful for indication of disequilibrium activities, feedback processes and emergence of order as drivers and blockages to multiskilling were identified and acted upon.

The third initiative I project managed was AYTAG's Management Development Programme. The corporate management team recognised that traditional management practices would be unsuitable if AYTAG was to run effectively. In 1996 all AYTAG's managers were from predecessor organisations. With few exceptions middle and first line managers had managed staff whose technical expertise was the same as their own. In the smaller organisations they had undertaken a traditional supervisory role with very limited authority. Some had come from organisations where there had been no management training, others from organisations that had been close to gaining Investors in People. The expertise of the managers was very varied. In 1996 they had all joined an organisation that required managers to manage multifunctional teams, actively contribute to the business planning process and take on corporate work as members of inter-regional and organisation wide working groups and project teams.

My job was to introduce a programme of management development for all managers to increase their skills and confidence and enable them to take on a different management role. I took the same approach to management

development as I took to multiskilling and used action research as the way to progress it (see appendix 2). During this project I acted in complete participant and participant observer roles. Of the three projects this one provided me with the largest amount of data. The data was gathered from a variety of sources; meeting minutes, consultant reports, questionnaires, outputs from facilitated workshops, reports I produced for the corporate management team and the project board and many diary entries. The data was particularly helpful for the key complexity theory concepts of feedback and emergent order as the changes in the views of the Corporate Management Team were recognised and acknowledged during the implementation of the programme.

Data Gathered during my Day to Day Work

I worked in a large open plan office as a senior member of a busy personnel department. I contributed to the work of the section on a day to day basis, attended departmental team meetings and received requests from managers and working groups to provide specific input into other projects. The work was wide ranging, from dealing with requests from members of the public wanting to work in AYTAG to providing training to implement new environmental legislation. I frequently visited other offices throughout Scotland. This general work activity allowed me to take on the three roles of participant observation. Working in the open plan office and visiting other parts of AYTAG gave me the greatest opportunity to act as a complete observer. I recorded my observations in my diary, such as observations on the general mood staff in different places as I perceived it. The rest of my day to day work gave me opportunity to act as a participant observer such as when I ran trainings sessions and as a complete participant as when I attended personnel team meetings.

The data gathered was helpful for all four key concepts of complexity theory. I had easy access to information about recruitment and terms and conditions of service which was useful for understanding AYTAG's initial conditions and

disequilibrium factors. My observations of others, my participant observer and complete participant roles gave me data for disequilibrium factors, feedback processes and emergent order and significantly added to and supported data I had obtained through the projects I managed.

My Diary

According to Easterby-Smith et al (1991) there is quite a long history of using diaries as a basis for social research. They consider that a diary can provide a rich qualitative picture, allowing the researcher to gain considerable insight into the situations being examined. I began to keep a diary from November 1996 at the suggestion of my research supervisor. I needed a method to record data that would be useful for uncovering AYTAG's organisational shadow system; "*the covert, the undiscussed, the undiscussable and the unmentionable*" (Egan, 1994 pp. 4). I regarded a personal diary as the main source of data in which to do this. The intention of the diary was to capture data that would not be available from other sources such as e-mails, records of workshops, minutes of meetings etc. The regularity of the entries in the diary ranged from a daily, to a weekly basis. These variations occurred as a result of the irregular nature of my work, for example I sometimes had periods when I spent a large amount of my time visiting other offices and the unpredictable nature of unfolding events such as the budget crisis that occurred in AYTAG in 1997. The dairy provided me with data to input into the four concepts of complexity theory I was concerned with. The data recorded was generally "soft" data. Detailed below are the areas I focussed my recording.

I recorded informal conversations and my own thoughts on them. For example on 5.5.98 I wrote

"At the professional development workshop the group said that no one had applied for W's support team because they disagreed with having such a team. One member said to me how would an individual feel if they were dipping in and

out of teams picking up things others didn't want. I was interested to hear that he put that interpretation on it. I thought it could be a career development opportunity"

I noted the feelings of others and myself. For example 28.1.99

"Had a waste minimisation meeting with C yesterday. C seemed fine until I told her what I was planning for the second day. I could see she wanted to criticise it but was worried about saying so. She said one or two minor things – maybe I should e-mail her."

For example November 1998

"Today I felt lazy – Friday 13th ?"

I noted incidents that I found intriguing. For example 12.9.97

"We were discussing the Scottish Parliament vote. W comes in and remains silent waiting to be given attention despite me saying hello. He then ¾ turns his back on R so we are forced to stop and focus on him. R asks him is he OK, have you got a headache. W replies yes, but you aren't the cause of it."

I observed people in other offices I visited and noted my comments. For example 25.4.99

"I ran an appraisal course in East Kilbride on Thursday. The whole place seemed very subdued and the desks where the admin staff sit were empty."

I continued the diary until the research ended in August 1999. I then typed up the extracts in "Word" and used the "find" facility to search for key words and phrases. The diary was useful for helping identify behavioural themes. For example I identified that individuals who had to give "bad news" took leave for at

least one day when the news was given. The first person to do this was the chief executive in April 1997 on announcing the extent of AYTAG's debt, others included the project manager for job evaluation in May 1998 when the results were made public and the Director for West Region when he restructured in the spring of 1999.

The data gathered covered a period of just over four years in total. I needed an end point for my research and I chose to limit it to the period of office of the first chairman. His four year term was extended slightly and finished in August 1999. This became the cut off date for my data gathering activities.

Making Sense of the Data

During the course of this research I gathered a great deal of data and I had to decide the best way to make sense of it. Prior to beginning writing any remaining hand collected data such as interview notes and my personal diary which had not been previously typed were transcribed using Microsoft Word. Some data such as comments on flipcharts from workshops had already been transcribed as it was the practice to feedback information generated in workshops to the participants. Word searches etc when analysing the data could now be easily undertaken. I put all the data I had collected - corporate plans, memos, e-mails, management team reports and transcribed hand written data etc in date order. Sorting the data in this way was my method of organising it and integrating data obtained from different sources.

In chapter three on complexity theory I identified that traditional methods of analysis and synthesis have proved to be of limited use in the search for "knowing the whole" and that methods need to be found to comprehend "the whole". I chose two data analysis techniques which I thought would help me to "know the whole". These were mind mapping (Buzan, 1991) and visual process mapping (Langley, 1999). Mind mapping or concept mapping involves

writing down a central idea and adding new and related information to it in such a way that this additional information radiates out from the original idea. Visual process mapping involves the graphical representation of large quantities of information in a chronological form revealing the occurrence of precedence and parallel processes. Both techniques can give an overview of a large subject area and the non linear nature of a mind map makes it easy to visualise a whole, link and cross reference the different elements of the map. Through the use of lines, colours and branches, connections can be made between the data recorded on the mind map. This is helpful when we study organisations from a complexity theory perspective. Mind mapping and to some extent visual process mapping preserve ambiguities in data useful for understanding shadow side norms. Process mapping is useful for identifying precedent, a possible indicator of disequilibrium in a system. I used both techniques to develop and verify the theoretical ideas I had. Both acted as a check on each other to lessen possible bias towards certain types of information.

Once I had my data in data order I used these two techniques to group it around individual themes, before beginning to write the story of AYTAG. As I looked through the chronological data, ideas for themes occurred to me and I tried to see if I could build a mind or visual process map around each of them. The themes that I eventually identified were those ideas that had produced the most extensive maps from the most varied data sources. They are listed below.

The Business of AYTAG

The initial structure and employee profile

The end of first year budget crisis and subsequent restructuring

Corporate and Business Planning in AYTAG

Personnel initiatives

The Science Reviews

Development of Information Systems

Development of Environmental Strategies

I wrote up each of these themes as a narrative account in preparation for subsequent analysis. I explained in my previous chapter on research methodology the appropriateness of narrative accounts for describing emergent phenomena. A narrative description can move backwards and forwards between parts and wholes reproducing the way dynamic systems self organise (Juarrero, 2000). I used Pentland's (1999) five features to guide the way I wrote my text to give a comprehensive narrative description. Pentland's features and how they influenced the way I wrote my narratives are illustrated in the table 5.5 below.

Table 5.5 Writing narrative

Narrative Feature	Influence
1. time sequence	Used to provide the structure for the narrative
2. focal actor / actors	The focal actor is the organisation AYTAG itself. I have brought in other actors, directors, managers, consultants to help support the structure of the narrative
3. Identifiable voice	The text was written in my own personal style
4. Moral context	I am aware that I was writing from the perspective of an ex member of AYTAG staff and the effect this could have on how I perceived things.
5. Other indicators (these do not advance the plot they serve to help interpretation)	I used quotations from what individuals said in meetings and interviews and notes I made in my personal diary. I have quoted from documents available to me. This was to add detail to the narrative and help interpret events

Each theme told a chronological story describing what happened in AYTAG. Each narrative involved me in "distilling the essence" of what occurred from the multitude of data. In order to limit personal distortions that could result from using mind and visual process mapping to develop key themes I tried to ensure that I expressed myself in a way that brought out the issues from the

perspective of the participants. I illustrated my text with the language and expressions of the participants to convey their meaning. I gave each narrative to others from AYTAG to feedback their views on the way each had been written so that any perceived biases could be noted and dealt with. For example the consultants who ran the management development programme reviewed the narrative on management development and an environmental protection officer read the narrative relating to multiskilling. A summary of these narrative accounts is presented in my next chapter - Chapter 6, The formation and development of AYTAG.

Once I had written the narratives describing the development of AYTAG I moved on to a more detailed analysis. This allowed me to map events and actions against the key concepts of complexity theory - sensitivity to initial conditions, disequilibrium, feedback and emergent order. I systematically read through each narrative and again used mind mapping (Buzan, 1991) and visual process mapping (Langley, 1999) to identify and aggregate themes and issues relevant to the complexity theory concept I was investigating. Once I thought I had identified a theme from studying the narratives I checked back to the original data to confirm what I had identified was justifiable and to seek additional confirmation – information I had not fully included or overlooked when I wrote my narratives. I added this information to the mind or process map.

An example of one of the mind maps I produced is in Appendix Three. This one is for the key concept of initial conditions. In chapter 8 on page 162 I have included the process map I produced for disequilibrium. The information for these mapping exercises came from the narrative accounts with some additions when I checked back to the original data. For example I had originally discarded some of the job adverts when writing my narrative on human resource management initiatives. On returning to this material during my mind and process mapping phase I found it supported my thoughts that there was very high ongoing recruitment activity in AYTAG and I included it in

my process map for disequilibrium. Mind and visual process maps for the other concepts of complexity theory I was investigating (feedback and emergent order) were developed in the same way.

Once the mind and process maps had been constructed I then wrote them up as chapters – one for each complexity theory concept. Once again it was necessary to limit the amount of information I could include and I took on the potentially distorting role of editor of the material. In order to deal with this issue and my further reliance on mind mapping I sought feedback from a range of colleagues. My research findings benefited from the cycling of action and reflection through comments made by my research supervisor and colleagues in the Management Studies Department at Glasgow University, PhD review meetings, from presenting the findings at a British Academy of Management conference in Edinburgh in November 2000, the International Non-linear Sciences Conference in Vienna in February 2003 and for review by the editorial board for the British Journal of Management who made recommendations for resubmitting the paper which I have since done. In review meetings university colleagues took on the role of devil's advocate one of the procedures that Reason and Heron (1995) suggest for enhancing the validity of the research findings.

One of the major criticisms of research conducted in the hermeneutic paradigm is that it is subjective. The use of mind mapping in particular to surface themes in the data could be seen as "unscientific" and "subjective" particularly as this is a technique associated with ideas generation rather than critical analysis. I have explained how I have dealt with the issues of potential subjectivity and distortion during the data collection and analysis phases. I have done this by cross checking mind and visual process mapping findings, continuous self awareness of my own role in the process, undertaking cycles of action and reflection and seeking feedback from others who could comment on AYTAG or on the research process.

My findings are described in the next five chapters; chapter 6 briefly describes the formation and development of AYTAG, chapter 7 deals with sensitivity to initial conditions, chapter 8 with disequilibrium, chapter 9 with feedback processes and chapter 10 with emergent order.

In Conclusion

In my research I am showing that complexity theory can be used as a theory of explanation for organisation development. Explanation theories use organisational events and the comments and actions of organisational actors to tell a story about how organisational outcomes come about. Time is a crucial element in constructing a theory. As well as covering the organisation's history my case study of AYTAG's development covers the first three and a half years of that organisation's existence giving time for organisational processes to unfold. I am mindful however of Calas and Smircich's (1999) comments that the kind of theory developed can vary widely depending on the time interval is used. Throughout my data collection and analysis I have used validity procedures to minimise bias such as using a variety of data sources and exposing my findings to others for comment. I am not stating that my research is valid in any absolute meaning of the term. By using these procedures I am suggesting that some of the distortions which can occur in qualitative research are diminished and the perspective from which the research conclusions are derived can be communicated more clearly.

Chapter Six

The Formation and Development of AYTAG

Introduction

In my introduction to this thesis I briefly described the quango which is the subject of my research. In this chapter I give more detail about the organisation I studied between April 1996 and August 1999 during the period of the first chairman. In my last chapter on data collection I outlined how I had used mind mapping to develop individual themes to structure a description of AYTAG which I then wrote up as narrative accounts, one for each of these themes. These narrative accounts provide the basis for this chapter. It contains a summary of each. I describe how AYTAG came into being, the size of its business, its initial organisational structure and recruitment of staff. I briefly outline the budget crisis that occurred in 1997 and the subsequent organisational restructuring. The chapter continues with short accounts of the personnel initiatives, the reviews of the science function, the development of information systems, the business planning process and the development of environmental strategies. I end the chapter with the training and development programmes undertaken. This chapter sets the scene for the following four chapters where I describe the development of AYTAG from the perspective of key complexity theory concepts.

The legislation which set up AYTAG is the Environment Act 1995. It received the Royal Assent on 19 July 1995. AYTAG became operational on 1 April 1996. Its role was to provide an efficient and integrated environmental protection system for Scotland, to improve the environment and to contribute to the Government's goal of sustainable development. AYTAG's powers and duties extend beyond the sum of those of its predecessors. Its range of new powers gave Scotland a national, integrated approach to environmental

protection. Its employees were a mixture, the majority who transferred from predecessor organisations and some externally recruited. It was a melting pot of organisational cultures and expectations with varying levels of morale. There were twenty three offices scattered throughout Scotland from Wigtownshire in the South to Shetland in the North.

The Business of AYTAG

AYTAG inherited the duties of Scotland's seven Water Quality Boards and the functions undertaken by the three island authorities, HM Industrial Pollution Inspectorate and the waste regulation and local air pollution functions of the District Councils. The state of the initial inheritance varied greatly. Consistency of approach quickly became an important issue. Figure 6.1 below indicates the extent of AYTAG's work when it became operational in April 1996.

Figure 6.1 The size of AYTAG's business in 1996

An indication of the size of AYTAG's business is that

- there are approximately 50,000 km of rivers and lakes, 800 sq km of estuaries and over 7,000 km of coastal waters to protect,
- some 40,000 consents to discharge substances into these waters are operating
- around 1,200 more complex industrial processes are regulated (including oil refineries, power generators, waste incinerators and industries producing a wide range of products
- the disposal and treatment of 16 million tonnes of controlled waste per annum is regulated
- approximately 800 waste disposal sites are licensed and 6,500 waste carriers registered
- disposals from 10 licensed nuclear sites are regulated and
- around 550 "sealed" and 170 users of "open" radioactive sources is regulated.

Taken from publicity material produced by AYTAG's Public Relations Department

AYTAG had eight strategic objectives, seven of which were developed for the Agency by Central Government prior to the organisation becoming operational. They formed part of central government's Management Statement for the

development of AYTAG. The Management Team developed the eighth objective. This focused on AYTAG acting as a good employer.

Additional work came to AYTAG after it was set up as new European Community and European Union environmental directives were implemented. These included The Producer Responsibility Regulations 1997, Integrated Pollution Prevention and Control Regulations (IPPC), the Control of Major Accident Hazards (COMAH), The Water Framework Directive, the Ground Water Directive, the Solvents Directive, Sewage Sludge in Agriculture and implementation of the Contaminated Land Provisions introduced in section 57 of the Environment Act 1995.

AYTAG is funded through grant-in aid from central government, from cost recovery charging schemes and from income from sources such as contract work. In 1999 grant in aid of around £20 million made up about 75% of AYTAG's income. Income from charging was approximately 23% and other income sources 2%. Any new duties AYTAG took on were carried out on a cost recovery basis.

The Structure of AYTAG and Employee Profile

The Main Board of AYTAG is the Agency. It consists of a chairman and ten board members including the chief executive. They were appointed during 1995 by the Secretary of State from amongst those who applied when the positions were publicly advertised. The first Chairman was appointed in April 1995, one year before the start date for the organisation and before the enactment of the Environment Bill. He served until August 1999. There was a balance of expertise on the Board with the Board Members coming from different sector backgrounds. AYTAG also had three Regional Boards, each chaired by a member of the main board. The Main Board met every two months and the Regional Boards met on a quarterly basis.

In order to determine the workload of the new organisation and how it should be structured an Options Team was set up early in 1995. The second report by the Options Team in September 1995 proposed a flat organisational structure with central administrative and policy making units. It was accepted in principle by the newly formed Board.

The chief executive was appointed in August 1995 and five directorates were formed. Two, Corporate Services and Environmental Strategy, were to be based at Head Office. The other three were regional directorates; East, West and North. The day to day operational business of AYTAG was carried out in the Regions with most staff working either in science laboratories or in multidisciplinary pollution prevention and control teams. Corporate Services contained the support functions; finance, personnel, management services, information technology and public relations. The Environmental Strategy Directorate consisted of policy advisers whose role was to lead the development of AYTAG's strategy and policy in relation to environment protection, sponsor research and promote the non legislative aspects of environment protection.

By the end of its first year AYTAG had approximately 650 employees. Over 500 came from 63 different predecessor bodies and around 150 were directly recruited. With the exception of staff working in the Head Office and the West Region Headquarters most employees worked in former Water Quality Board offices. AYTAG's employees were highly educated. About 80% had at least a first degree. Managers considered a science based first degree essential for operational and policy staff. Over half the employees had postgraduate qualifications and membership of a professional body. These were seen as crucial to career development. By August 1999 AYTAG had nearly 700 full time staff with 35% in pollution prevention and control, 35% in science, 5% in policy development and the remainder in support services. Staffing costs accounted for 60% of its expenditure.

The Crisis at the End of Year One and Resultant Restructuring

In March 1997 a major financial crisis occurred. It was realised that AYTAG was unable to meet its VAT bill. During the course of 1996 AYTAG was in discussion with central government about its liability to pay VAT. Its predecessor organisations had been exempt. In mid March 1997 the Secretary of State finally confirmed that, as it was funded differently from these organisations AYTAG would not be exempt. AYTAG did not have an accurate picture of its expenditure during its first year of operation and by the end of March there was concern that there could be insufficient reserves to pay its VAT bill. The financial system common to two of the previous Water Quality Boards was being used initially and it quickly proved to be inadequate. Adding to the problem was the fact that the majority of finance staff were on temporary contracts. There had been frequent changes. Budget holders had no information coming to them. The finance department had an inadequate picture of how much was being spent. The overall impression was that there was sufficient money to do what was required to set up the new organisation.

A new integrated finance and personnel system began to come on stream in April 1997. By mid April the size of the debt was put at £3.5 million. Staff were informed of the situation through a letter sent to each of them by the Chief Executive. He left for a holiday immediately afterwards. In the spring and summer of 1997 employees at all levels first felt shock and disbelief, then anger then cynicism. Gestures to save money appeared all over the organisation. The crisis led to restructuring the corporate management team. The Corporate Services Director became Director of Special Projects and left shortly afterwards. The East Region Director became acting director of Corporate Services. The organisation had to grapple with budget cuts. Some were very severe. The training and research budgets were cut to a few thousand pounds. In August 1997 additional funding of £2.5m was secured from central government. Part of the agreement for this funding was the recruitment of a Director of Finance. He took up his post in January 1998.

In July 1997 the break up of Corporate Services was announced. The responsibilities of the directorate with the exception of finance were distributed between Regional Directors and the Director of Environmental Strategy. Finance became a separate directorate. Two groups were set up to assist the Corporate Management Team, the AYTAG Planning Team (APT) and the Organisation Development Team (ODT). Planning became the responsibility of the APT and a corporate planner was recruited internally. The formation of the APT formalised the corporate and business planning process. The ODT did not find a clear role. In December 1998 the Director of Finance became its chair, its membership changed and he attempted to make it more influential.

Corporate and Business Planning in AYTAG

The production of the annual corporate plans was initially the responsibility of the Management Services Unit in the Corporate Services Department. The first plan was produced in August 1996. It focused on the additional tasks that AYTAG had to carry out in its launch year rather than AYTAG's day to day business. By the end of the first year much of the transitional work had been accomplished. There was a clearer understanding of AYTAG's inherited business and the organisation's strengths and shortcomings. The second Corporate Plan produced in the Spring of 1997 described the size of the organisation's day to day business and began the process of giving targets for the future. It was issued to all senior staff and made available to others who requested it. There was very little involvement of managers in the production of the second corporate plan. It was not well received. This was summed up in a comment made by a Head of Policy who when asked if a particular document was the Corporate Plan said *"it appears to be, it was lying on my chair when I came in this morning. It says things in there which I have no ownership of".*

In August 1997 the production corporate plans, annual reports and directorate business plans became the responsibility of the AYTAG Planning Team (APT). During its first year of operating the APT did a large amount of data gathering about workload, particularly in pollution prevention and control. The detailed review of the work of the environment protection teams resulted in additional funding for an extra 26 full time employees. For the first two years the production of departmental business plans was haphazard. It was very much dependant on the individual line manager. Not all departments within directorates produced one and those that did used their own criteria. By the start of the 1998/99 financial year each Region, the Environmental Strategy Directorate and the central administration sections they managed had business plans with clear achievement targets. Consultation with managers in setting business targets increased but managers still felt they had little ownership of them. Managers complained regularly that targets had been imposed on them. They used business targets as an excuse for not doing other things such as refusing to release staff for training. Many officers worked overtime in order to cope with the workload

Development of Human Resource Systems, Policies and Procedures

The majority of staff transferred to AYTAG from previous organisations retained their terms and conditions and pay scales. Recruitment of additional staff was continuous in 1996. Those recruited were placed on temporary terms and conditions devised by AYTAG. It was envisaged that these would be replaced with permanent terms and conditions which would apply to all staff. There was a shortage of suitable applicants particularly where specific environmental expertise was required. Staff were given permanent posts in the Environmental Strategy Directorate but in Corporate Services most jobs were short term contracts as it was assumed that after an initial high workload work, the demand would decrease requiring fewer staff. Recruitment of environmental protection staff continued for longer than expected as transferred employees moved to fill vacancies as a way of improving their salaries. They switched to

the temporarily implemented AYTAG pay scales as in many cases these were considerably higher than those offered by predecessor Water Quality Boards and local authorities.

During the period of this research the Personnel Department was continuously involved in developing policies and procedures. These ranged from a flexitime system to a maternity leave policy, to a car leasing scheme. To goal was for all employees to have the same terms and conditions. In order to reduce the variety of job descriptions and pay scales, job evaluation and pay and grading exercises were undertaken. These were done with union involvement. All employees were issued with new AYTAG contracts of employment in October 1998. This considerably reduced the work of the department. Until then they had had to accommodate 30 different sets of terms and conditions, fourteen different pay dates and adherence to different local holidays.

An appraisal scheme was introduced in March 1997. Managers were encouraged to set work objectives for staff and identify their training needs. In the first year of the scheme nearly all staff were appraised by their managers. In 1998 fewer managers appraised their staff and it was in danger of collapsing. The chief executive with support from central government wanted to implement a performance related pay scheme (PRP). This was generally unpopular with employees. A PRP scheme was eventually introduced in March 1999.

The personnel staff found it difficult to keep up with their workload. This was particularly problematic in the first year when there were no computerised systems. Computerisation happened gradually between 1997 an 1999 as successive modules of the Personnel and Finance Information System were installed. First came access to basic employee information such as address and salary details followed by absence statistics, training records and course administration and finally recruitment administration in the summer of 1999.

The Science Reviews

AYTAG inherited its science base from the former Water Quality Boards. The scientists, chemists, biologists and hydrologists had all worked in water pollution control and had no experience in the other environmental media that AYTAG regulated. In each region a regional scientist reporting to the director was in charge of all the science functions. During 1996 each of the regional science functions was reviewed. This resulted in some 8% efficiency gains achieved through closing the four smaller laboratories and concentrating the service in the six larger ones. These reviews also looked at the communication that science staff had with other members of the organisation. This was very low. Between 1% and 5% of chemists communicated directly with environment protection staff. The comparable figure for biologists and hydrologists was 30% to 50%. This concerned the senior scientists. One of them commented "*We can't have 200 brains tucked away in the organisation.*" The functional reviews did not change the way in which science staff worked but the increase in efficiency did allow for additional work to be undertaken in air monitoring and the analysis of waste samples.

Following the regional reviews, the first national review was attempted and rejected by the Corporate Management Team (CMT) in May 1997. The strategic review of science was delayed until after the publication of AYTAG's Environmental Strategy. In July 1998 the Chief Executive formed the Science Review Project Board. The Project Board proposed that Science should become a National rather than a regionally based service with a National Director and functional heads. This proposal was rejected by the CMT who chose to keep the Regional Scientists. The Project Board proposed a matrix structure in which Regional Scientists still reported to Directors but had "national" responsibility for one scientific function. This proposal was accepted and implemented. The most controversial decision as far as staff were concerned was the agreement to close two more of the smaller laboratories and concentrate the service in the larger ones based in the regional headquarters.

The reviews did not propose decreasing the number of levels of managers in science. They remained with their original hierarchical structures mostly intact.

The Development of AYTAG Information Systems

When AYTAG was set up in April 1996 the responsibility for information systems (IS) lay with the Head of the Management Services Unit. He recognised that critical to AYTAG's success was its ability to handle all its information requirements. By September 1996 he had set up a project team consisting of regional information systems managers and senior environment protection and science managers to look at the information needs of AYTAG. The organisation had inherited incompatible environmental databases from its predecessor bodies. Most were not year 2000 compliant. Between September and December 1996 the project team held a number of regional workshops to define priorities for business applications. The first priority was to have a management information system for environmental licences, a central information point for all applications, to record and monitor progress and highlight deviations and delays. The second priority was a system to manage work plans for sampling, monitoring and inspection to improve the efficiency. The third priority was a charging management system to set common charges and to monitor recovery.

The project team put their proposals to the Corporate Management Team (CMT). They were initially sceptical of the benefits of such systems. In December 1996 the CMT agreed to implement the project team's proposals. They committed £200,000 to the project in its first year rather than the £600,000 asked for. Once the extent of AYTAG's funding crisis was known in May 1997 funding was withdrawn. The Head of the Management Services Unit left before implementation started.

The Head of the Management Services Unit returned to his civil service post in August 1997 and the IS managers began to operate as a self directed team.

The development of organisation-wide information systems for gathering environmental and customer information was slow, hampered by high turnover of IS staff on temporary contracts. In the summer of 1999, when this research ended, databases outlined as priorities in 1996 were still to be rolled out to SEPA staff although much work had gone into their development. In other areas the implementation of information systems was much quicker. New individual databases were set up to implement new regulations such as the Producer Responsibility Regulations. All AYTAG staff were linked by e-mail by December 1996 and had access to AYTAG's Intranet by December 1998. The Intranet was developed by team headed by the Environmental Services Manager and not by IS staff.

The Development of Environmental Strategies

I explained in my introduction to this chapter that along with its inherited duties AYTAG had new powers to enable it to provide a national, integrated approach to environmental protection. The first step that AYTAG took to develop a national overview was to produce a "State of the Environment" report which it launched in November 1996. This enabled the organisation to identify the gaps in its knowledge of how human activity impacted on the environment. The report underpinned AYTAG's activities. It identified areas where more information was needed and committed AYTAG to closing material knowledge gaps. The report emphasised AYTAG's role in supporting the achievement of the UK government's objective of making future development sustainable. The Director of Environmental Strategy produced a statement of AYTAG's approach to sustainable development in February 1997. Sustainable development was defined and guidance issued to staff.

The production of the Environmental Strategy was a major landmark for AYTAG. The first draft was issued in January 1998. Consultation followed and the strategy itself was launched in June 1998. It identified and prioritised the most important environmental issues, analysed their potential environmental

impacts and assessed the extent to which AYTAG could address them. It was recognised that the implementation of this strategy would require a considerable shift in resources within the organisation and place a greater emphasis on working in partnership and on influencing others. This in turn would lead to a shift in SEPA skills. It implied a considerable training effort. Another landmark was the production of a National Waste Strategy. First drafted in December 1997 and discussed in detail with representatives from organisations in different economic sectors, it was finally published in December 1999.

Employee and Management Development

Between August and December 1996 AYTAG ran its Introduction Programme. Each employee attended as part of the process of bringing about a unified organisation. Participants discussed the human aspects of mergers, AYTAG's objectives, environmental issues and human resource topics such as job evaluation, harmonisation of terms and conditions and management training. Large scale training and development programmes for manager and environment protection staff were planned for 1997 but were severely curtailed as a result of the budget crisis.

Multiskilled teams of environmental protection officers (EPO's) were seen as critical to the development of a "one door" approach to environment protection. As it was seen to be the most efficient and effective use of staff resources AYTAG was expected to move to this approach. It would enable AYTAG to send one officer to a regulated site rather than two or three as had happened previously. Prior to April 1996 EPO's had only worked in one environmental medium; water, air or waste. Multiskilling was one of the most talked about issues in AYTAG. Some were for it. Many were not. There was great dislike of the term. To make the concept more acceptable it was referred to as "professional" diversification from the beginning of 1998. The budget crisis which cut the training budget in 1997 meant that no training could be delivered

that financial year. However some progress was made through job shadowing and site visits. In September 1998 a senior environmental protection officer was seconded to corporate training and development to help develop professional diversification training. Waste, water and air pollution regulation training was piloted on a AYTAG wide basis in March 1999. Further training courses were delivered in summer 1999. After this professional diversification training was incorporated into technical training and delivered on a regional basis. No agreement was reached on the definition of professional diversification or how far the CMT saw it progressing in the organisation.

A two day management development course was offered to managers between December 1996 and April 1997. Managers attended on a voluntary basis. Attendance was very variable. It ranged from almost all East Region managers to almost none from head office directorates. Plans for a Corporate Management Development Programme were postponed in 1997 and in 1998 AYTAG embarked on a large management development programme attended by all managers. During 1997 management competency statements were developed based on the management style and culture the Corporate Management team said they wanted to see in AYTAG. A project team was set up in February 1998 reporting to the Organisation Development Team to design and implement a programme based around the competency statements. The purpose of the programme was to develop both individual manager skills and the management process in AYTAG. The programme was launched by the chief executive in September 1998 and continued until July 1999 when review days were held with the 150 managers who attended the programme. Following this, managers were offered a selection of short training courses. They attended them on an individual basis.

Conclusion

In the first three and a half years of operation AYTAG achieved much. All staff had the same terms and conditions of service and all jobs had been evaluated. Large training programmes had been run and a performance management process put in place. The implementation of environmental strategies was proceeding as planned, new legislation had been implemented and there were performance targets in place for environmental protection staff. These achievements masked a workforce which was becoming increasingly dissatisfied with the way in which policies and procedures were developed and implemented, staff turnover and absence rates were rising and there was increasing criticism of the Corporate Management Team.

Now that I have briefly outlined AYTAG's formation and development during the period of the first chairman I will move on to describe its development using key complexity theory concepts, initial conditions, disequilibrium, feedback process and emergence of order. In chapter 7 I outline AYTAG's initials conditions, chapter 8 covers planned and unplanned events and actions that maintained disequilibrium in AYTAG. Chapter 9 deals with opposing feedback processes that pushed the organisation either towards or away from its desired new state. Finally chapter 10 describes the order that emerged in AYTAG.