Systems Thinking: Creative Holism for Managers

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Dust as we are, the immortal spirit grows
Like harmony in music; there is a dark
Inscrutable workmanship that reconciles
Discordant elements, makes them cling together
In one society.

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Preface

Managers today are expected to cope with increasing complexity, change and diversity.

Complexity stems from the nature of problems. They rarely present themselves individually, but come related to other problems, in richly interconnected problem situations that are appropriately described by Russ Ackoff as ‘messes’. As a result, once you examine them, problems seem to get bigger and to involve more issues and stakeholders.

Change is a product of our era. Organizations, if they are to remain viable, have to respond adroitly to constant shifts in their environments. Customers change their preferences over shorter time spans. Competition can be global and is often fuelled by the onward march of technological innovation. Governments impose new regulations. Transformations in society and in ways of thinking impose fresh responsibilities on managers.

In a world of complexity and change, managers are asked to tackle a much greater diversity of problems. They have to continue to ensure that organizational processes are efficient and that they are served by the latest developments in technology. But this is hardly enough to stay ahead of the game. Staff have to be inspired and the organization’s stock of knowledge captured and distributed, so that the organization learns faster than its competitors. This requires the putting in place of flexible structures as well as the demonstration of transformational leadership qualities. Changes in the law and in social expectations require managers to respond positively to eliminate discrimination and to monitor the impact of their organizations’ activities.

Faced with increasing complexity, change and diversity, managers have inevitably sought the help of advisers, consultants and academics. So desperate have they become for enlightenment that they have elevated a number of these to the status of management gurus. Too often, however, managers
have been peddled panaceas in the form of the latest management fad. We are now awash with quick-fix solutions such as:

- scenario planning;
- benchmarking;
- rightsizing;
- value chain analysis;
- continuous improvement;
- total quality management;
- learning organizations;
- process re-engineering;
- knowledge management;
- balanced scorecard;
- customer relationship management.

Unfortunately, as so many managers have discovered to the cost of themselves and their organizations, these relatively simple solutions rarely work in the face of significant complexity, change and diversity.

Fundamentally, simple solutions fail because they are not holistic or creative enough.

They are not holistic because they concentrate on the parts of the organization rather than on the whole. In doing so they miss the crucial interactions between the parts. They fail to recognize that optimizing the performance of one part may have consequences elsewhere that are damaging for the whole. This fault is known as ‘suboptimization’. In its early days, as is now admitted by the originators of the approach, process re-engineering concentrated far too much on the things that can be engineered at the expense of the people in organizations. People reacted and process re-engineering interventions failed in terms of securing overall improvement. Benchmarking encourages looking at the efficiency of the different parts of the organization separately against external comparators. It fails to see that, even if each part is optimized, the performance of the whole organization can be disastrous if the parts do not interact together well.

Management fads also stifle creativity. They pander to the notion that there is one best solution in all circumstances. Sometimes, if this solution tackles only one of the aspects of an organization relevant to its performance, the effect is to reinforce suboptimization. Total quality management, for example, has done a lot to improve process design, but can be criticized for ignoring wider structural issues and the politics of organizations. At other times, even if more parts are considered, there is the danger that they are all
viewed from the same perspective. The balanced scorecard claims to embrace different viewpoints on organizational performance while actually requiring users to transfer a machine-like view of organizations to a wider range of their activities. It looks at different things, but in the same way. This inhibits creativity.

Because of the frequent failure of the panaceas they have been offered, managers are looking for alternatives. In increasing numbers they are turning toward systems thinking. Systems thinking managers know that simple solutions are bound to fail when pitched against complex problem situations. They are willing to struggle with more complicated ideas that, at first acquaintance, may be more difficult to understand. They hope to emerge from this engagement with systems thinking better equipped to cope with complexity, change and diversity. This hope is based on the fact that systems thinking is holistic rather than reductionist and, at least in the form of critical systems thinking, does everything possible to encourage creativity.

Holism puts the study of wholes before that of the parts. It does not try to break down organizations into parts in order to understand them and intervene in them. It concentrates its attention instead at the organizational level and on ensuring that the parts are functioning and are related properly together so that they serve the purposes of the whole. Being holistic also means approaching problems ready to employ the systems language. For example, looking at organizations, their parts and their environments as systems, subsystems and suprasystems. All the systems approaches described in this book seek to make use of the philosophy of holism and the systems vocabulary associated with it.

Because of the growing popularity of holistic thinking, there is now a rich storehouse of different systems approaches. While these all employ holism they do not all encourage creativity. Some fall prey to the fault found with so many management fads – they encourage us to look at organizations from only one perspective. Increasingly, being systemic is also coming to mean being able to look at problem situations and knowing how to resolve them from a variety of points of view and using different systems approaches in combination. Critical systems thinking specifically encourages this kind of creativity. Creativity is made possible by this book because it presents a full range of systems approaches and discusses how they can be used together.

Managers, although increasingly interested in systems thinking, have reached different stages in their understanding of it. Some know little except that it might help. Others are employing systems ideas almost
It is amazing how often systems concepts are heard in the everyday parlance of managers and decision-makers: concepts such as holism, joined-up thinking, partnership, inclusiveness, stakeholding, governance, interconnectivity, globalization and ecology. A few have engaged in more in-depth study of books like Peter Senge’s *The Fifth Discipline* (Random House, 1990) or of ideas emanating from the sciences of complexity.

If you are a manager or someone aspiring to be a manager, at whatever stage you are in your study of systems thinking, this book is designed to help. If you are new to the ideas, then it should serve as a solid introduction. If you are familiar with a few of the ideas, but know little about how they are related or can be used to manage organizations, then the book will give you a more rigorous understanding of holism and how to use systems ideas in practice. If you understand some systems approaches but not others, then the book will expand your knowledge and enable you to be creative in your choice and use of systems methodologies and methods. You will also be able to use the book as a guide to further reading about systems thinking.

The genesis of this book goes back to the early 1980s when with Paul Keys, at the University of Hull, I established a research programme to inquire into the theoretical coherence and practical value of systems ideas and different systems approaches. This work continued in the late 1980s and in 1991 I published, with Bob Flood, *Creative Problem Solving: Total Systems Intervention* (Wiley). The success of that volume is the inspiration for this book. *Creative Problem Solving* was very popular and, indeed, is still widely used. However, in some important respects it was flawed and it has inevitably got somewhat out of date. Having completed a major theoretical tome of my own in 2000 – *Systems Approaches to Management* (Kluwer/Plenum) – I became confident that I had clarified my own thinking about some of the difficult issues surrounding the use of systems ideas. A productive thing to do, I thought, would be to make available the results of the new research in a more popular format. This book, therefore, draws on the strengths of *Creative Problem Solving*, particularly its introductory nature and accessibility, together with the latest research findings. Its name *Systems Thinking: Creative Holism for Managers* stems from the emphasis placed, as we have already discussed, on the creative use of systems approaches.

I am grateful to the following for their permission to reproduce previously published material: Productivity Press, for Figure 5.4; Abacus, for Figure 7.1; Sage, for Figure 7.2; and Plenum Press, for Figure 10.4.

Bob Flood and I could not agree on what a follow-up to *Creative Problem Solving* would be like or on whether we wanted to do one. This volume has to be, therefore, my own interpretation of what a revised and better *Creative
Problem Solving should be. Nevertheless, there is a debt to the earlier volume, in concept if not in content, and I therefore gratefully acknowledge Bob’s contribution to this book.

For helpful comments on individual chapters I would like to thank Paul Keys (Chapter 4), Ted Geerling (Chapter 5), Peter Fryer (Chapter 7), Amanda Gregory (Chapter 8), Russ Ackoff (Chapter 9), Peter Checkland (Chapter 10), Gerald Midgley (Chapter 11), Norma Romm (Chapter 13) and Keith Ellis (Chapter 14). Thanks to Maria Ortegon, Ellis Chung, Gerald Midgley, Keith Ellis and Alvaro Carrisoza for the case studies in Chapters 7, 8, 11, 14 and 15, respectively. Very special thanks to Angela Espinosa who advised on Chapter 6, coauthored Chapter 12 and provided the case studies for those two chapters. I did not always take the advice offered and all the faults that remain are my responsibility.

At John Wiley & Sons, Diane Taylor deserves special credit for having faith in this project and persevering with it – even if it has taken so long to come to fruition that she has already retired. Thanks also to Sarah Booth.

I still write longhand, not very neatly and with whatever biro I can acquire. My PA Doreen Gibbs copes admirably with this as well as offering loads of other support. I am extremely grateful to her for help over the years.

This has been the most difficult book to complete of all those I have written. It has been done at a time when I have been extremely busy as Director of the University of Hull Business School. Everyone I know, either as a colleague, friend or acquaintance, has got used to asking ‘how is the book coming on?’ Our dog, Kelly, has had even fewer walks than normal. The major sacrifices, however, have been made by my sons Christopher and Richard and my wife Pauline. Thank you so much for having put up with this and I promise it is the last book.

Michael C. Jackson
May, 2003
Introduction

The book is divided into three parts. The first part presents some introductory material on systems ideas and how they came to be applied to management problems. Part II considers and classifies the most significant attempts that have been made to take a holistic approach to improving organizational performance. Many of these holistic approaches employ systems ideas in a manner that enhances creativity. The maximum creative use of holism to assist managers, however, comes from using the different approaches in combination. This is the focus of the final part of the book. Let us now consider how the book is structured based on this overall plan.

In the Preface we noted that systems thinking eschews simple solutions to complex problems. It embraces holism and creativity to handle complexity, change and diversity. These notions are initially a little more difficult to grasp than the fads and panaceas prepared in easily digestible form for managers to consume. We begin therefore, in Chapter 1, by learning the language of systems thinking. Systems concepts have a long history, dating back to early Greek philosophy. They have penetrated and been refined in a variety of different disciplines. We consider the emergence and meaning of the most important systems terms and how they give rise to a language fit for the purpose of dealing with managerial concerns.

It was about the time of the Second World War that the first attempts were made to apply systems ideas to managerial problem-solving. Chapter 2 looks at the birth and development of this applied systems thinking. It is one of the strengths of systems thinking compared with, say, process re-engineering, knowledge management and the balanced scorecard, that it has a reasonably long history of application from which much has been learned. The history of applied systems thinking over the last few decades has seen it continually reframing itself so as to become slicker in dealing with complexity and change in a wider range of problem situations.
The final chapter of Part I relates developments in applied systems thinking to different ways of looking at operations and organizations, and how they should be managed. This is accomplished by considering what assumptions managers make when dealing with problems in organizations. Managers get locked into particular, limited ways of seeing the world and this clearly affects the way they try to change it. The assumptions they make can be revealed if set against the backdrop of the metaphors and paradigms that are used to understand organizations and intervene in them. The various holistic approaches to management themselves build on different metaphors and paradigms. Once this is grasped it becomes possible to understand the strengths and weaknesses of the variety of holistic approaches and to use them in combination to enhance creativity.

Following these introductory chapters on systems concepts, applied systems thinking and creativity enhancement, Part II provides a comprehensive review of the best known and most useful holistic approaches to management. All the approaches considered make use of the systems language presented in Chapter 1 and at least a significant subset of the systems concepts introduced. They are all holistic in character. The use to which they put systems ideas is different however — according to the purposes that they hope to achieve. In particular, the metaphors they employ and the paradigms they embrace make a difference to what is envisaged as the most important aim that systems thinking should pursue. On this basis, holistic approaches can be classified into four types:

- systems approaches for improving goal seeking and viability;
- systems approaches for exploring purposes;
- systems approaches for ensuring fairness;
- systems approaches for promoting diversity.

Part II is divided into four; emphasizing that there are these four ‘types’ of systems approach (Types A–D) each privileging a different aim.

Chapters 4, 5, 6 and 7 detail those systems approaches that can help goal seeking and viability through increasing the efficiency and efficacy of organizational processes and structures (Type A). Their primary orientation is improving organizational performance in terms of how well the organization does its tasks and responds to changes in its environment. Included in this category are ‘hard systems thinking’ (Chapter 4), ‘system dynamics – the fifth discipline’ (Chapter 5), ‘organizational cybernetics’ (Chapter 6) and ‘complexity theory’ (Chapter 7).

Type B systems approaches seek to improve organizational performance
by exploring purposes and ensuring sufficient agreement is obtained among an organization’s stakeholders about purposes. Their primary orientation is to evaluate different aims and objectives, promote mutual understanding, ensure an accommodation is reached and gain commitment to purposes. Discussion around purposes normally involves issues of the effectiveness and elegance of what is being proposed. Chapter 8 considers ‘strategic assumption surfacing and testing’, Chapter 9 ‘interactive planning’ and Chapter 10 ‘soft systems methodology’.

Chapter 11 on ‘critical systems heuristics’ and Chapter 12 on ‘team syntegrity’ consider Type C systems approaches. The main concern shifts to ensuring fairness in organizations. Organizational performance is seen as improved as discrimination of all kinds is eliminated, full and open participation is encouraged so that people have a say over decisions that involve them, and organizations pay attention to all those affected by their actions. This orientation is reflected in a primary concern with emancipating and empowering disadvantaged groups.

Type D is covered in just one chapter, Chapter 13, on postmodern systems thinking. This sees performance as improved if organizations exhibit a diversity appropriate to the challenges they face in new times. Organizations can become moribund, sterile, boring because they are dominated by particular systems of thought and routinized ways of doing things. Postmodern systems thinking challenges normality and the routine, encouraging difference and fun. It emphasizes the importance of looking for exceptions and of engaging people’s emotions when seeking change.

Part II, therefore, presents and considers the most important attempts that have been made to bring holism, and the systems language associated with it, to the attention of managers in ways that they can make use of. Chapters 4–13 set out and critique the main systems approaches to management. As will become apparent the four categories (Types A–D), into which these systems approaches have been divided, can be related back to the different paradigms of thinking about organizations discussed in Chapter 3. Moreover, within each category the differences between the systems approaches selected for consideration can be linked to the variety of metaphors looked at in Chapter 3. This enables us to see clearly the assumptions on which the different systems approaches are based, why they emphasize certain factors as being significant for organizational performance and ignore others, and to understand at a deeper level their strengths and weaknesses.

The role and importance of Part III can now be outlined. Although all the systems approaches considered in Part II embrace holism, and this has
many advantages in dealing with complexity, change and diversity, they do so on the basis of particular perspectives on the nature of organizations and how they should be managed to make them work well. It is surely being even more holistic to believe that improving organizational performance, in its very broadest sense, requires an ability to look at organizations from all these perspectives (based on different paradigms and metaphors). And it requires managers to be able to bring to bear, on the complex, diverse and rapidly changing problem situations they confront, holistic approaches based on the variety of possible perspectives. Overall organizational performance must depend on: improving goal seeking and viability; exploring purposes; ensuring fairness; and promoting diversity. Consideration must be given to efficiency, efficacy, effectiveness, elegance, emancipation, empowerment, exception and emotion. Improvement can involve all of these things although, of course, it is necessary for managers to prioritize and to have a different emphasis to their actions at different times.

Part III of the book is called ‘creative holism’ and is concerned with the use of different systems approaches, reflecting alternative holistic perspectives, in combination. The various systems approaches cannot be used all at once but they can be employed creatively, in an informed and ethical way, to promote together the overall improvement of organizational performance. This is the essence of creative holism.

Part III consists of two chapters. The first looks at ‘total systems intervention’, as the best known approach to combining different systems approaches. The second describes ‘critical systems practice’, as the modern expression of creative holism.

A short conclusion closes the argument.

In this introduction I have sought to make clear the structure of the book and the logic underlying that structure. This is summarized in Table I.1.
Table I.1  The structure of the book.

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The aim of Part I is to provide the reader with the background information needed to understand fully the different systems approaches studied in Part II. Chapter 1 introduces the systems language and some simple systems ideas. It does this by tracing the influence of holism and the emergence of various systems concepts in some important intellectual disciplines, such as philosophy and biology. Chapter 2 considers the development of applied systems thinking since its birth around the time of the Second World War. It tries to put a pattern on events by seeing the different systems approaches that arose as responses, in turn, to the need to improve goal seeking and viability, to explore purposes, to ensure fairness, and to promote diversity. These various requirements themselves originate in the greater complexity, turbulence and variety of problem situations as discussed in the Preface. Chapter 3 steps back a little and sees the development of different systems approaches in terms of a willingness by systems thinkers to explore and enrich various metaphors of organization and alternative sociological paradigms using systems ideas. It is upon an understanding of this process, and of what different metaphors and paradigms have to offer, that the critique of the different systems approaches, exposing their strengths and weaknesses, can be launched in Part II.
The more we study the major problems of our time, the more we come to realise that they cannot be understood in isolation. They are systemic problems, which means that they are interconnected and interdependent.

Capra (1996)

1.1 INTRODUCTION

Simply defined, a system is a complex whole the functioning of which depends on its parts and the interactions between those parts. Stated like this, it is clear that we can identify systems of very different types:

- physical, such as river systems;
- biological, such as living organisms;
- designed, such as automobiles;
- abstract, such as philosophical systems;
- social, such as families;
- human activity, such as systems to ensure the quality of products.

The traditional, scientific method for studying such systems is known as reductionism. Reductionism sees the parts as paramount and seeks to identify the parts, understand the parts and work up from an understanding of the parts to an understanding of the whole. The problem with this is that the whole often seems to take on a form that is not recognizable from the parts. The whole emerges from the interactions between the parts, which affect each other through complex networks of relationships. Once it has emerged, it is the whole that seems to give meaning to the parts and their
interactions. A living organism gives meaning to the heart, liver and lungs; a family to the roles of husband, wife, son, daughter.

It is not surprising therefore that there exists an alternative to reductionism for studying systems. This alternative is known as holism. Holism considers systems to be more than the sum of their parts. It is of course interested in the parts and particularly the networks of relationships between the parts, but primarily in terms of how they give rise to and sustain in existence the new entity that is the whole – whether it be a river system, an automobile, a philosophical system or a quality system. It is the whole that is seen as important and gives purpose to the study.

Holism gained a foothold in many different academic disciplines, benefitting from the failure of reductionism to cope with problems of complexity, diversity and change in complex systems. In what follows we look at the encounter of holism with philosophy, biology, control engineering, organization and management theory, and the physical sciences. We see how the systems language associated with holism was developed and enriched in each case. Particularly fruitful were the encounters with biology and control engineering, which gave birth to systems thinking as a transdiscipline, studying systems in their own right, in the 1940s and 1950s. This produced a language that describes the characteristics that systems have in common, whether they are mechanical, biological or social.

In a conclusion to the chapter I seek to explain why this language is particularly powerful for the purposes of managers.

More detailed accounts of the development of holistic thinking can be found in Checkland (1981) and Jackson (2000).

1.2 PHILOSOPHY

The classical Greek philosophers, Aristotle and Plato, established some important systems ideas. Aristotle reasoned that the parts of the body only make sense in terms of the way they function to support the whole organism and used this biological analogy to consider how individuals need to be related to the State. Plato was interested in how the notion of control, or the art of steersmanship (*kybernetes*), could be applied both to vessels and the State. Ships had to be steered safely toward harbour by a helmsman. A similar role needed to be fulfilled in societies if they were to prosper.

Holism was pushed to the margins of philosophical debate for many centuries, but the golden age of European philosophy, during the 18th and 19th centuries, saw a renewed interest in what it had to offer. Kant and
Hegel were particularly influential in this respect. Kant was an ‘idealist’ who argued that we could never really know reality or whether it was systemic. However, he believed it was helpful for humans to think in terms of wholes emerging from and sustained by the self-organization of their parts. Hegel introduced process into systems thinking. An understanding of the whole, or the truth, could be approached through a systemic unfolding of thesis, antithesis and synthesis. Each movement through this cycle, with the synthesis becoming the new thesis, gradually enriched our grasp of the whole.

It was these philosophical ideas that impacted on the scientific disciplines, where they were given a more rigorous formulation.

1.3 BIOLOGY

The fruitfulness of the relationship between holism and biology can be accounted for by the complexity of the problems encountered by biologists in trying to understand whole organisms. Whole organisms seemed to resist the attempts of scientific reductionists to reduce them to the sum of their parts. In the 1920s and 1930s, as a response to this, more holistically inclined biologists began to argue that organisms were more than the sum of their parts. They conceived that a hierarchy existed in nature – molecules, organelles, cells, organs, organisms – and, at certain points in the hierarchy, stable levels of organized complexity arose that demonstrated emergent properties, which did not exist at levels below. An organism was one such level.

It was argued that an organism (e.g., an animal) had a clear boundary separating it from its environment and was capable, as its main emergent property, of a degree of autonomy. An organism sustained itself in a steady state by carrying out transactions across this boundary with its environment. It had to be capable of making internal transformations to ensure that it was adapted to its environment. The processes that maintained the steady state were referred to as homeostatic, an example being the self-regulating mechanism controlling body temperature. The behaviour of an organism could not, it seemed, be explained by the properties of its parts in isolation. It arose from the particular interdependence of the parts, which gave rise to a new level of organized complexity. Biology was seen exactly as the science appropriate to this level and could not therefore be reduced to physics or chemistry.

Ludwig von Bertalanffy has become the best known of the biologists who argued that organisms should be studied as complex wholes. In 1950
he published an article in which he made the well-known distinction between closed systems and open systems. A closed system engages in no exchanges with its environment. An open system, such as an organism, has to interact with its environment to maintain itself in existence. Open systems take inputs from their environments, transform them and then return them as some sort of product back to the environment. They depend on the environment for their existence and adapt in reaction to changes in the environment.

Von Bertalanfly’s lasting fame and influence has derived from his suggestion that the sorts of behaviour he witnessed in open systems in biology could be seen demonstrated by open systems in other domains. Thus, he initiated and named ‘general system theory’ (see von Bertalanfly, 1968) – a kind of transdiscipline in which systems were studied in their own right and which allowed insights from one discipline to be transferred to others. General system theory was soon embraced by management thinkers who transferred the open system model to their study of organizations.

The biological system model is represented in Figure 1.1. It shows a system separated from its environment by a distinct boundary. The system has a complex structure, being differentiated into subsystems that themselves have parts (systems arranged in a hierarchy of systems). The close interrelationships of mutual influence between the subsystems must ensure homeostasis – the maintenance of a steady state. One subsystem is acting in a kind of ‘management’ capacity, trying to ensure integration and co-ordination. The system takes inputs of material, energy and information.

![Figure 1.1] The biological system model.
from its environment, uses some to sustain itself and transforms the rest into outputs. These outputs may themselves allow the system to secure, through a cycle of events, more of the useful inputs it needs to survive.

The open systems perspective propounded by von Bertalanffy, and so influential in the 1970s and 1980s, has more recently been challenged by the biologists Maturana and Varela (1980). They emphasize instead the closed system of interactions that occurs in living entities. These interactions ensure the self-production of the system and its autonomy. Such self-producing, or autopoietic (from the ancient Greek for self-production), systems respond to environmental disturbances, but not directly or simply; the nature of the response depends on their own internal organizational arrangements. This does not mean that autopoietic systems cannot change their structure, but it does mean that they do this only with a view to keeping their fundamental organizational identity intact. The emphasis on the circular organization of living systems, and their resistance to change, offers a useful corrective to those general system theorists who stress the overriding importance of organization–environment relations.

1.4 CONTROL ENGINEERING

The other figure who stands alongside von Bertalanffy, as a founding father of systems thinking as a transdiscipline, is Norbert Wiener, a mathematician and control engineer. In 1948 Wiener published a book on what he called, borrowing from the Greek, cybernetics – the science of control and communication in the animal and the machine. Cybernetics, Wiener argued, was a new science that had application to many different disciplines because it dealt with general laws that governed control processes whatever the nature of the system under consideration.

The two key concepts introduced by Wiener into the systems lexicon were control and communication. In understanding control, whether in the mechanical, biological or political realm, the idea of negative feedback is crucial. This concept allows a proper, scientific explanation to be given of purposive behaviour – behaviour directed to the attainment of a goal. It was Wiener’s insight that all such behaviour requires negative feedback. In this process, information is transmitted about any divergence of behaviour from a present goal and corrective action taken, on the basis of this information, to bring the behaviour back towards the goal. In a central heating system a thermostat monitors the heat of a room against some preset temperature and uses the information that the temperature is too low or high to switch
the system on or off. Communication is equally significant because if we wish
to control the actions of a machine or another human being we must
communicate information to that machine or individual.

Figure 1.2 shows a simple, negative feedback system. It operates by
sensing the current output of the process that is to be controlled. The
output is compared with the desired goal and, if it diverges from this, an
activator adjusts the input to bring the process back toward achieving the
desired goal. In this way, systems regulate themselves and are controlled, in
the face of environmental disturbances, through the effective communication
of information. It is of course very important that the sensor and comparator
operate continuously and rapidly. This ensures that discrepancies are identi-
fied at the earliest possible opportunity and corrective action can immediately
be initiated. It is also worth noting that it is not necessary to understand the
nature of the process, which might be a complex system, in order to
employ the negative feedback device. The controller can regard it as a
‘black box’ and adjust it simply by manipulating the inputs in order to
achieve the desired outputs.

Figure 1.2  A negative feedback system.
Although it did not impinge much on the consciousness of Wiener, another form of feedback, positive feedback, has become significant for systems thinking. While negative feedback counteracts deviations from a goal, positive feedback amplifies them. For example, one mistimed tackle in a soccer match can lead to a series of deliberate fouls, escalating into uncontrolled aggression from both sides. Identifying situations where the parts of a system are locked into a positive feedback loop, and its behaviour is spinning out of control, is of obvious significance to managers. A good referee can re-establish order with the astute use of a yellow card.

A final systems concept that I need to introduce in this section is ‘variety’. Variety is a term first used by Ashby (1956) to refer to the number of possible states a system can exhibit. According to Ashby’s law of requisite variety, systems can only be controlled if the would-be controller can command the same degree of variety as the system. Today, systems are complex and change rapidly; they exhibit high variety. Managers need to pay attention to reducing the variety of the system they are seeking to control and/or to increasing their own variety. This process of ‘balancing varieties’ is known as variety engineering. We shall see how it is done in Chapter 6.

1.5 ORGANIZATION AND MANAGEMENT THEORY

Early attempts to marry holism with organization and management theory took two main forms. In the first some basic systems concepts were incorporated in the prevailing scientific management tradition to yield optimizing approaches, such as systems engineering. In the second there was a wholesale transfer of the biological analogy, especially as refined by von Bertalanffy, to yield systems models of organization emphasizing the importance of subsystems to overall organizational effectiveness and the significance of the organization–environment fit.

Both these early attempts met with difficulties because they failed to recognize that systems containing human beings are, what we now call, purposeful. The systems of components that engineers are used to dealing with are purposive – designed to reach the goal specified by the engineers. Biological systems are adept at survival, but if this is their purpose it is obviously something ascribed to them from the outside and not something they think about themselves. The parts of social systems however – human beings – can generate their own purposes from inside the system, and these might not correspond at all to any purposes prescribed by managers or
outsiders. Social and organizational systems, therefore, have multiple purposes: they are purposeful.

It was soon clear that a different kind of terminology would be useful for describing and working with purposeful systems.

A number of roles had to be delimited relevant to purposeful systems and reflecting some alternative sources of purposes. The term ‘stakeholder’ is used to refer to any group with an interest in what the system is doing. Decision-makers or owners have the power to make things happen in systems; actors carry out basic tasks; customers or clients benefit or suffer from what a system does. Problem-owners worry about the performance of some aspect of a system. Witnesses are affected by systems but unable to influence their behaviour. Problem-solvers or analysts take on board the task of trying to improve systems.

Since purposes emanate from the human mind, attention also has to be given to the different mental models that people bring to their roles. These mental models are made up, in each case, of a mix of the understanding and values that individuals have gathered through their experiences and education. The facts and values that they use in interpreting the world can perhaps themselves be understood in systems terms. They are said to constitute the world view, Weltanschauung (a German word meaning ‘world image’), or appreciative system employed by an individual or group.

For those who want to manage purposeful systems or intervene to change them the resistance, or otherwise, of Weltanschauungen or appreciative systems to change becomes critical. If the only change that can be contemplated takes place in the context of an existing mental model, then you are limited to bringing about first-order learning. If, however, the mental model itself can be changed, and purposes radically altered, then second-order change is possible. The ways in which world views change became a primary focus of ‘soft systems thinking’ and, within this, Hegel’s notion of a ‘dialectical debate’ between thesis and antithesis was particularly influential.

Finally, in considering purposeful systems, we need to note how significant the concept of boundary becomes. With a machine or organism it is usually very apparent where the boundary of the system lies. For those concerned with purposeful systems, however, this is rarely the case. Where the boundary is seen to be will depend on the world view of the person observing the system. For example, whether the boundary of a business organization should expand to include its natural environment, its local community, unemployed people, etc. are all very much issues open to debate. Values and ethics play a part in such decisions. There is the further matter of who should participate in defining purposes, taking decisions and
drawing boundaries. And because resources and interests will be at stake, as well as different philosophies, power and politics will have a significant impact on purposeful systems.

The encounter of holism with management and organization theory has thrown up complications not found when the focus of attention for systems thinking was the natural realm. Part II reveals, however, that this has not been an unequal challenge; holism has stood up to the task well enough.

1.6 THE PHYSICAL SCIENCES

Systems thinking emerged as a transdiscipline, in the 1940s and 1950s, in large part as a reaction to the reductionism of the traditional scientific method and the failure of that reductionism to cope with the complexity inherent in the biological and social domains. It seemed for some time, therefore, that systems thinking was the antithesis of the scientific method. More recently, however, the physical sciences seem to have undergone their own systems revolution and holism, and the concepts associated with it have been welcomed in physics and chemistry as offering new forms of explanation and new avenues of exploration. Quantum theory in physics and the study of dissipative structures in chemistry are examples of a more holistic orientation in the physical sciences.

Because they have undergone their own systems revolution, the physical sciences are now able to make their own contributions to the language of systems thinking more generally. Quantum physics brought to the fore the notion of indeterminacy and gave new meaning to the concept of relationships. From chemistry comes a reinforcement of the process view of systems and the idea of self-organization. Perhaps most important of all, however, has been the birth of a new kind of general system theory in science under the banner of chaos and complexity theory (see Gleick, 1987).

Complexity theory – the more general term and the one we shall use – complements the normal systems concern for order by being equally concerned with disorder. The fact that so many complex systems appear to exhibit disorder, irregularity and unpredictability had seemed to put them beyond the reach of scientific understanding. Complexity theorists did not actually dispute this. Indeed, their early studies reinforced the notion by demonstrating that a small change in the initial conditions of a system can lead to large-scale consequences later on: famously, a butterfly flapping its wings in the Amazon jungle can conceivably lead to storms in the South
China Sea. However, what they also found was that underlying apparent chaos was a surprising degree of pattern. Complex systems seem to be governed in some way by ‘strange attractors’, which means that although they never repeat exactly the same behaviour, what they do remains within certain limits. The weather in England is notoriously unpredictable in detail, but we never experience extreme cold or extreme heat and, only occasionally, very heavy rainfall and hurricanes. Furthermore, the patterns that govern complex systems seem to be repeated at different levels of the system. The parts of the whole are similar in shape to the whole. Snowflakes and cauliflowers have been used as everyday examples of ‘fractal wholes’ demonstrating such self-similarity.

Pursuing their research into order and disorder in complex systems, complexity theorists discovered what became known as the ‘edge of chaos’. This is a narrow transition zone between order and chaos where systems become capable of taking on new forms of behaviour – of self-organization and particularly innovative activity.

The potential of complexity theory for helping managers is perhaps becoming clear. The organizations they manage seem chaotic and unpredictable. But maybe they too are governed by strange attractors that can, after all, be understood. The environments in which organizations operate are turbulent and ever changing, yet organizations seem slow to adapt. Maybe if they can be driven to the edge of chaos they will be much more creative in the way they behave. A new systems view of organizations has been constructed out of these ideas.

1.7 WHY IS THE SYSTEMS LANGUAGE SO POWERFUL?

In this chapter we have started to become familiar with the systems language. Our understanding will be deepened as we start to see how the language can be used to address management problems in Part II. Obviously, it takes effort to learn a new language and we will have to encounter still more new concepts in what follows. In asking you to make this effort I can perhaps rely on the fact that managers are fed up with being offered simple solutions to complex, diverse problems. They recognize that more sophisticated solutions are necessary and that this may demand a more difficult language. I am keen, however, to close the chapter with just four arguments as to why you should bother with the systems language.

First, as we have seen, the emphasis on holism offers a useful corrective to the reductionism that still governs much management thinking. Organiza-
tions are complex and the relationships between the parts are crucial. There is a need for joined-up thinking in addressing their problems.

Second is the emphasis modern systems thinking puts on process as well as structure. This stems from systems philosophy, from von Bertalanffy’s open systems concept and from complexity theory. It is not always the right approach to design systems according to some predefined blueprint. Allowing a process to take place can lead to innovative behaviour and ways forward that could not have been foreseen before the process was embarked on.

Third is the transdisciplinarity of systems thinking. It draws its ideas and concepts, as we have seen, from a variety of different disciplines and in so doing can draw on their different strengths. Even if analogies derived from physics and biology do not hold strictly when applied to organizations, managers have access to a rich storehouse of insights if they can use other disciplines to provide them with new metaphors for understanding their role.

Finally, the systems language has proven itself more suitable for getting to grips with real-world management problems than that of any other single discipline. It has given rise to a range of powerful systems approaches to management. The next chapter starts to look at the development of this applied systems thinking. In Part II you will get the chance to judge the truth of the claim I am making here for yourself.

REFERENCES


