A COMPOSITE FRAMEWORK FOR THE STRATEGIC ALIGNMENT OF INFORMATION SYSTEMS DEVELOPMENT

SHARON DINGLEY

Doctor of Philosophy

THE UNIVERSITY OF ASTON IN BIRMINGHAM

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SUMMARY

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Information systems are corporate resources, therefore information systems development must be aligned with corporate strategy. This thesis proposes that effective strategic alignment of information systems requires information systems development, information systems planning and strategic management to be united. Literature in these areas is examined, breaching the academic boundaries which separate these areas, to contribute a synthesised approach to the strategic alignment of information systems development.

Previous work in information systems planning has extended information systems development techniques, such as data modelling, into strategic planning activities, neglecting techniques of strategic management. Examination of strategic management in this thesis, identifies parallel trends in strategic management and information systems development; the premises of the learning school of strategic management are similar to those of soft systems approaches to information systems development. It is therefore proposed that strategic management can be supported by a soft systems approach. Strategic management tools and techniques frame individual views of a strategic situation; soft systems approaches can integrate these diverse views to explore the internal and external environments of an organisation.

The information derived from strategic analysis justifies the need for an information system and provides a starting point for information systems development. This is demonstrated by a composite framework which enables each information system to be justified according to its direct contribution to corporate strategy. The proposed framework was developed through action research conducted in a number of organisations of varying types. This suggests that the framework can be widely used to support the strategic alignment of information systems development, thereby contributing to organisational success.

Keywords: Information systems development.
Information systems strategic planning.
Strategic management.
Action research.

DEDICATION

To my parents:
my mother June and
my father Len.

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CHAPTER 1

INTRODUCTION

The purpose of this chapter is to:

1. Introduce the theme and objectives of the research.
2. Present the chosen research methods.
3. Establish the assessment criteria for evaluating the attainment of the research objectives.

The chapter concludes by outlining the progression of the research reported in subsequent chapters.

1.1 BACKGROUND

Commercial experience as a data analyst and an academic project studying the use of data analysis (Dingley, 1992) led to the investigation of conceptual models. The entity-relationship model (Chen, 1976) has survived almost two decades of criticism to be widely accepted by commercial organisations. Chen described the entity-relationship model as an extension of the existing data models of the time. It attempted to overcome the limitations of poor data independence exhibited by the network data model and to retain semantic information lost by the relational model.

Separating data modelling from data store design has permitted the use of data analysis techniques earlier in the information systems development life-cycle (Lewis, 1993). However, the main principles of data analysis remain unchanged, stated by CACI (1985) as to:

1. Develop a thorough understanding and precise description of the business or business area.
2. Provide a communication tool for those involved in addressing a business problem including managers, business users, analysts and systems developers.

A data model as a communication tool facilitates continuity from information systems strategy to detailed information systems analysis and design. Acceptance of these principles has led to data analysis being adopted as the foundation for a number of information systems planning methodologies. This is criticised by Galliers (1987) who suggests that although data analysis is a useful tool for database design:

> "It is much less useful as a means of identifying information requirements (especially where these are fuzzy and unstructured), or in allowing different viewpoints to be taken into consideration".

The initial stages of information systems planning and development, referred to as problem structuring (Shah & Dingley, 1993), identify and investigate the underlying problems which are causing concern. This is an activity which requires many, often conflicting, views and opinions to be considered.

A recent survey (Premkumar & King, 1991) revealed that information systems strategic planning methodologies based on a data-driven approach were not widely accepted in industry, a conclusion which therefore questions the suitability of data analysis beyond database design.

This research critically appraises the use of data analysis for information systems strategic planning, with the objective of enabling and maintaining the strategic alignment of information systems development.

1.2 RESEARCH THEME

The theme of this research is in the area of information systems planning and development. Semantics is a major concern in any research as it affects the application of research results (Preece, 1994), furthermore, the information systems discipline lacks agreed definitions of major components (Avison & Fitzgerald, 1988). This section first aims to establish a clear understanding of the main concepts used in this thesis. The significance of the research theme investigated is then justified before the objectives of the investigation are detailed.

1.2.1 Elements of Research Theme

The subject of this research, the strategic alignment of information systems development, encompasses three main elements which are introduced here and developed in chapter two. These elements are information systems development, information systems strategic planning and strategic management. Before discussing each of these elements, it is necessary to clarify the term 'information system'.

The meaning attributed to the term 'information system' has been extended over time to reflect the evolution of the discipline (Wysocki & Young, 1990). Information systems have emerged from the limited technical focus of electronic data processing to the broader organisational view of strategic resource. The United Kingdom Academy for Information Systems (Avison, 1995, p.4) offers the following definition:

> "The study of information systems is a multi-disciplinary subject and addresses the range of strategic, managerial and operational activities involved in the gathering, processing, storing, distributing and use of information and its associated technologies in society".

This definition embraces the traditional view of the three-tier organisational pyramid in which information systems:

1. Automate operational procedures.
2. Summarise and report operational information to tactical management.
3. Support decision-making at the strategic level.

This research is concerned with the "gathering, processing, storing, distributing and use of information" at all levels in an organisation, to support corporate objectives, independently of technological concerns. The term 'information system', as used in this thesis, is not synonymous with the term 'computer system'; it embodies the people and processes involved in purposeful organisational activities.

The information systems discipline is a combination of computer science and management, together with a number of supporting disciplines such as philosophy, sociology and psychology (Hirschheim & Boland, 1992). A key problem of interdisciplinary study is the interpretation of terminology specific to the native discipline. Terminology in many disciplines is often the subject of extensive debate by specialists in the area. This lack of agreed definitions increases the barriers which exclude other professionals from attaining an appreciation of the discipline. It is however suggested by Ackerman (1965) that an elementary introduction to principles in one discipline can stimulate invention in another. Ackerman proposes that a complete understanding of terms as understood by experts in the native domain is not essential; "it is enough that it should inspire". In Shah & Dingley (1995) it is concluded that researchers should seek inspiration by maintaining a flexible awareness and interest in the potential contributions of 'diverse' disciplines. This thesis adopts the view reflected in Shah & Dingley that advancement of understanding can only be made by breaching the boundaries which constrain its application to specific domains.

Information Systems Development

Information systems development is described as the engineering of informational aspects of organisational activity (Mingers, 1994). The term 'information systems development' has been used to refer to tasks ranging from the design and building of systems to the wider scope of problem statement through to implementation (Cavaye, 1995).

This thesis explores the requirement for an information system to be developed and the definition of information system requirements, through to logical design. This research does not address the physical design, construction, testing and implementation phases of information systems development.

For the purpose of this research, information systems may be equated to tools for performing informational activities in an organisation. A tool is used, when it is judged to be the most appropriate means of meeting a defined need, to address a problem. The development of an information system as a tool, encompasses three issues:

1. *What* need is to be met?
2. *Why* does the need exist?
3. *How* can the need be best satisfied?

Flood (1995) identifies three types of problem-solving methods which relate to these three issues:

1. *Methods for debating* address *'what'* need is to be met.
2. *Methods for disimprisoning* address *'why'* the need exists.
3. *Methods for designing* address *'how'* the need can be satisfied.

Information systems development has been described as addressing *'what'* need is to be met and *'how'* the need is to be satisfied (Wilson, 1990). This *'what'* / *'how'* distinction neglects the wider context of *'why'* a need is present. Information systems development approaches largely assume that *'what'* is needed can be defined and agreed by all parties, therefore methods for debating are not incorporated. This is discussed further in section 2.1. By assuming there is agreement of *'what'* is needed, it is implicitly assumed that *'why'* a need exists is also fully appreciated. When it has been established *'what'* need is to be met and *'why'*, attention is moved to methods of design. It is the neglected issue of *'why'* an information system needs to be developed which forms the focus of this thesis. Methods of disimprisoning (Flood, 1995) examine the current situation and the possible consequences of taking or not taking action, providing the justification to expend scarce resources to satisfy the requirement. The recognition of information systems as corporate resources requires their development to be strategically planned.

Information Systems Strategic Planning

There are two distinct approaches to information systems planning (Lederer & Sethi, 1992); an alignment approach and an impact approach. The alignment approach uses the corporate strategy to guide the development of a portfolio of applications to support the strategy. In contrast, the impact approach identifies a small number of information systems in order to give the organisation a competitive advantage.

Although the term 'strategic information system' is widely used, an agreed definition has not been attained (Wiseman, 1994). Wiseman originally coined the term, defining a strategic information system as:

> "*the use of information technology to support or shape the competitive strategy of the firm, its plan for gaining, maintaining or reducing the edge of a rival*" (original italics).

An essential concept of information systems strategic planning is the application of information technology to establish and maintain competitive advantage (Liang & Tang, 1992). Ives & Learmonth (1984) identify an information system as being strategic if it changes at least one of the following:

1. The product or service provided by the company.
2. The manner in which the company competes in its industry.

A wider view of the strategic alignment of information systems is adopted in this thesis. The premise of this research is that an information system can contribute to attaining corporate objectives, without fulfilling the criteria of a strategic information system. Strategic alignment directs the development of information systems to provide continued support to the attainment of corporate objectives. This is achieved by analysing elements of the corporate strategy, in the context of the potential contribution of information systems.

The essence of strategic planning is survival (Gillenson & Goldberg, 1984; Carter *et al.*, 1990; Houlden, 1990) which requires directing resources to sustain corporate survival. Clemans & Row (1991) define a resource as a "productive capability" which can be tangible, such as equipment, or intangible, such as expertise. Data is recognised as being the foremost corporate resource (Gillenson & Goldberg, 1984) as data concerning other resources is needed for effective management.

A number of approaches to information systems planning which support this view are discussed in section 2.2. An alternative approach adopted by Wilson (1990) recognises information, rather than data, as the corporate resource. Information may be defined as data plus the meaning ascribed to it. Wilson's approach asserts the strategic role of information systems in organisations, acknowledging the aim of information systems as moving beyond improving efficiency to improve business effectiveness (Galliers & Baker, 1994).

Earl (1988) makes the following distinction between information systems strategy and information technology strategy:

1. Information systems strategy is demand-oriented, business-focused, identifying *'what'* is needed.
2. Information technology strategy is supply-oriented, technology-focused, identifying *'how'* the need may be satisfied.

It is the corporate strategy that determines *'why'* an information system is required.

Strategic Management

Despite the insistence of human nature for singular definitions of every concept, the term 'strategy' is used implicitly in different ways (Mintzberg, 1987). Kenyon & Mathur (1993) propose the dispute about strategy being designed or emergent (Ansoff, 1991, 1994; Mintzberg, 1990a, 1991, 1994a, 1994b, 1994c, 1994d), presented in section 2.3, is itself a problem of linguistics.

Many authors refer to the Greek military origin of the word 'strategy' (Mintzberg & Quinn, 1992; Ketelhöhn, 1993; Cunningham, 1994) as the role, and later the art, of a general. Strategy is not only essential to corporate success, but to corporate survival (Gillenson & Goldberg, 1984; Carter *et al.*, 1990; Houlden, 1990) as organisations are portrayed as aggressively competing for survival in a hostile environment.

Ansoff (1965) defined strategy as being:

> "designed to transform the firm from the present position to the new position described by objectives, subject to constraints of the capabilities and the potential".

Mintzberg (1987, 1994d) acknowledges that strategy is a plan in that it can be viewed as an intended course of action, but goes on to define four further dimensions of strategy as a:

1. *Ploy* intended to outwit the competition.
2. *Pattern* of consistent behaviour.

3. *Position* locating the organisation within the environment.
4. *Perspective* framing the organisation's view of the world.

These dimensions reflect the position that strategy is more than a plan of action, establishing the distinct character, direction and scope of the organisation.

The goals which a company aims to achieve are specified by corporate objectives and the approach to achieving these corporate goals is detailed in the corporate strategy. Corporate strategy addresses key organisational issues such as, in which markets to compete and on what basis to compete, derived from analysis of available resources, environmental conditions and the expectations of stakeholders in the company. These distinct aspects of strategy are summarised in the following definition proposed by Quinn (1980), adopted in this thesis:

> "the *pattern* or *plan* that *integrates* an organization's *major* goals, policies, and action sequences into a *cohesive* whole. A well-formulated strategy helps to *marshal* and *allocate* an organization's resources into a *unique and viable posture* based on its relative *internal competencies* and *shortcomings*, anticipated *changes in the environment*, and contingent moves by *intelligent opponents*" (original italics).

Strategies must be communicated to provide the basis for plans which specify the deployment of the organisation's resources.

This research is concerned with information systems strategic planning, uniting strategic management, strategy and information systems development. It focuses on identifying business information needs which provide the justification for '*why*' an information system needs to be developed.

The three elements, information systems development, information systems strategic planning and strategic management which comprise the theme of this thesis are developed through three streams in chapter two, forming the theoretical framework for the research presented. The following section discusses the significance of this research theme.

1.2.2 Significance of Research Theme

Increasing the effectiveness of an organisation through the use of information is described by Battaglia (1991) as a corporate necessity. This is confirmed as information systems strategic planning is recognised as remaining a key concern of managers during the last decade (Dickson *et al.*, 1984; Hartog & Herbert, 1986; Brancheau & Wetherbe, 1987; Parker & Idunden, 1988;

Raghunathan *et al.*, 1989; Niederman *et al.*, 1991; Watson & Brancheau, 1991; Earl, 1992; Clark Jr., 1992; Galliers, 1993a; Galliers *et al.*, 1994).

In a 1987 survey of British information systems managers (Parker & Idunden, 1988) goal alignment and information systems strategic planning ranked as the most prominent issues of concern. A comparative survey conducted in 1992 (Galliers *et al.*, 1994) identified the most important and most problematic issues for the period 1987-1997 as being the improvement of:

1. Information systems strategic planning.
2. The role of information systems in the organisation.
3. The contribution of information systems to the organisation.

In this later survey, improving information systems strategic planning was rated as being of greater importance by non-information systems managers than by information systems managers. In addition, non-information systems managers suggested that information systems strategic planning presented greater difficulties than information systems managers estimated.

The concern to improve information systems planning and the alignment of information systems with the organisational objectives, is shared by information systems executives in the United States of America, Europe and Australia (Watson & Brancheau, 1991).

A survey of the Corporate 1000 companies in the United States of America, conducted by Premkumar & King (1991), showed that most criteria used in evaluating the information systems function, measured operational aspects of the department. The contribution of information systems to organisational performance measures, which is important to illustrate the strategic potential of information systems to managers, was neglected.

Clark Jr. (1992) criticised such surveys which prevent exploration of the issues raised and undertook thirty structured interviews in the south eastern United States of America to facilitate development of the issues raised in his study. During these interviews, information systems planning was again identified as one of the main issues of greatest concern to interviewees.

Although information systems planning has been identified as vital to organisational success, it is still problematic (Lee & Gough, 1993). As businesses experience increased competition, information systems face greater challenges and opportunities (Atkinson & Montgomery, 1990); as information systems change, information systems planning must also change.

Premkumar & King's survey (1991) revealed that only 22% of respondents use a commercial information systems planning methodology. The result of this survey questions the non-acceptance of commercial methodologies. As information systems strategic planning remains a significant issue of concern, further research to investigate this issue is justified.

1.2.3 Objectives of the Research

This research aims to address the management concerns detailed in the previous section. Dantzig (1990) describes the challenge as being to develop an integrative process which:

1. Matches information systems development to corporate strategy.
2. Facilitates communication between information systems developers and the rest of the organisation.
3. Ensures the information systems resource is optimally allocated.

Specific objectives relating to this theme are:

1. *Identify the factors to facilitate the strategic alignment of information systems development.*

The characteristics, techniques, strengths and weaknesses of current approaches to information systems strategic planning need to be investigated in order to identify potential areas of improvement.

2. *Develop an alternative approach for information systems strategic planning that meets the requirements identified.*

The proposal should develop the strengths and overcome the weaknesses of current approaches, satisfying both current and perceived future requirements for information systems strategic planning.

3. *Establish the requirements and limitations of the proposed approach.*

The practical limitations of an approach proposed need to be established including the conditions for which the approach may be appropriate or inappropriate, and the requirements for using the approach, including the degree of commitment and involvement of personnel required.

The methods used to attain these objectives and the criteria for evaluating their attainment are discussed in the following section.

1.3 RESEARCH METHODS

The selection of methods with which to conduct this research represented a critical point in the research programme. This section first affirms the importance of the selection task, before discussing the main factors influencing the choice of research methods and evaluating methods against these factors. The section concludes by presenting the research design with the methods chosen for conducting and evaluating the research reported.

1.3.1 Importance of Research Method Selection

Jenkins (1984) states that the principal role of a research method is to support the attainment of the research objectives. The appropriateness of the research method to the research objectives is regarded as one measure of the quality of the research undertaken (Clark, 1972).

Research methods are the tools of the researcher described by Sayer (1992) as being both the medium and outcome of the research practice. This has two main implications for the results of the research. Firstly, as with the use of any tool, there is the danger that the research methods applied will, to some degree, dictate the findings of the research (Pettigrew, 1984; Mumford, 1984). Secondly, the quality of the tools applied will be questioned when evaluating the overall quality of the research. It is therefore necessary to justify both the selection of a research method and the rejection of other methods. The main factors influencing the choice of methods in this research will now be discussed.

1.3.2 Factors Influencing Selection of Research Methods

Avison *et al.* (1994) suggest that the selection of research methods to be applied should be led by the area of concern. The theme of this research relates to the improvement of information systems effectiveness in organisations but the information systems discipline lacks a generally accepted dominant research method (Avison & Fitzgerald, 1988; Avison *et al.*, 1994). Rather than considering this a weakness, Gable (1994) advises that it provides researchers with greater freedom to combine the strengths of various methods in a research design.

Information systems have a number of characteristics which influence the selection of the methods appropriate for information systems research. These characteristics include the:

1. Interdisciplinary nature of information systems (Galliers & Land, 1987).
2. Fundamentally social nature of systems (Hirschheim, 1984).
3. Situations of human activity with which information systems are concerned (Avison & Fitzgerald, 1988; Checkland & Scholes, 1990).
4. Use of information systems by people in organisations which are going concerns (Nissen, 1984).
5. Applied discipline of information systems (Galliers & Land, 1987).

Jenkins (1984) identifies twelve further factors to examine in selecting research methods:

1. Cost of applying the research method.
2. Types of variables supported.
3. Control of variables in testing hypotheses.
4. Potential for researcher to affect the outcome.
5. Extent to which the research setting approximates the real world.
6. Internal validity of the method, that is, the extent to which independent variables cause an effect on dependent variables.
7. External validity of the method, that is, the extent to which findings may be generalised.
8. Repeatability of method to confirm results.
9. Number of design options.
10. Effectiveness of the method in terms of efficiency and comprehensiveness.
11. Nature of findings.
12. Time horizon, that is, past, present or future.

The influence of these factors is discussed in the following section. A further factor influencing the selection of research methods is the research design adopted to investigate the research theme. The following initial research design is proposed to achieve the objectives stated in section 1.2.3:

Phase 1: Formulate research theme.

Phase 2: Prepare research design and select research methods.

Phase 3: Develop research theme.

Phase 4: Construct research hypothesis.

Phase 5: Test research hypothesis.

Phase 6: Interpret findings.

Phase 7: Refine research hypothesis (return to phase 5).

Phase 8: Evaluate research.

Possible research methods to support this research design will now be evaluated.

1.3.3 Evaluation of Research Methods

A plethora of research methods exist and as previously stated, the information systems discipline lacks a dominant method. Taxonomies have been proposed to assist information systems researchers in selecting appropriate methods (Galliers & Land, 1987; Galliers, 1984, 1991a, 1993a). The purpose of this section is not to reproduce existing accounts of research methods but to report the methods examined for suitability for this research and the results of this examination. Section 1.3.4 includes a more detailed description of the research methods selected.

Research is defined as systematic investigation to increase knowledge; science is cited as critically analysed and ordered knowledge (Preece, 1994). The principles of scientific methods have historically provided the basis for rigour in research, for example, research methods such as laboratory experiments adopt the epistemological stance of positivist science. Susman & Evered (1978) identify the following characteristics of positivist science:

1. Knowledge can only be obtained by direct experience of an independent observer.
2. Methods are assumed to be objective.
3. People are treated as objects.
4. The role of history in the generation of knowledge is eliminated.
5. A system is assumed to be defined only to the extent that a denotative language exists to describe it.

Scientific research methods embracing the characteristics of positivist science are not suitable for studying social systems (Preece, 1994) which assert that:

1. Knowledge cannot be objectively observed, only subjectively interpreted.
2. The act of observation may change the behaviour of the social system.
3. Humans are more complex and variable than inanimate objects.
4. A person's view of the world is influenced by previous experience.
5. The richness of social complexity cannot be captured in language.

It was previously stated that information systems are fundamentally social systems, the use of scientific research methods is therefore inappropriate for many areas of information systems research. This claim is supported by comparing the characteristics of positivist science with the characteristics of information systems identified in section 1.3.2:

1. Laboratory-based experiments support the direct independent observation of a limited number of factors. However, the rich interdisciplinary nature of information systems is too complex to be adequately studied in a laboratory.
2. Scientific methods are assumed to be objective and a basis for objectivity is that experiments can be repeated for independent verification. However, information systems concern human activities

and situations cannot be repeated (Avison & Fitzgerald, 1988; Checkland & Scholes, 1990).

3. Humans are more variable than objects and their behaviour can be affected by being observed, therefore people cannot and should not be treated as objects. Information systems are used by people whose behaviour cannot be objectively observed or predicted.
4. Information systems are used by people and research should be in the interests of all parties. These interests cannot be expressed as general laws but are the product of historical experience which scientific methods neglect (Nissen, 1984).

Table 1.1 indicates the research methods evaluated for suitability in phases three, four and five of the research design. It tailors previously recommended research methods (Avison & Fitzgerald, 1988; Avison *et al.*, 1994; Galliers & Land, 1987; Galliers, 1984, 1991a, 1993a) to the specific requirements of this research. In addition, *literature survey* has been included in the table as a research method.

Reviewing existing material positions the research within the context of existing material and provides a theoretical foundation for the research. All research forms part of a wider collective process of gathering knowledge (Neuman, 1991) and a literature survey is therefore fundamental to all research. Galliers (1991a) amends an earlier taxonomy of research approaches (Galliers & Land, 1987) to include literature survey under the heading 'descriptive and interpretive research'. This amendment recognises the importance of developing cumulative knowledge, building on previous research. However, literature survey was included in table 1.1 to emphasise the additional role of a literature survey as a source of requirements. An extensive base of published surveys in information systems strategic planning was reported in section 1.2.2 which suggests that the literature survey may contribute a source of requirements for information systems strategic planning to the research. The use of literature survey in this context moves beyond that of a conceptual study, which investigates the language used to classify and communicate experience (Frankfort-Nachmias & Nachmias, 1996), to a source of secondary data for analysis.

As previously stated, *laboratory experiments* do not provide the richness required in social enquiry. However, examining isolated elements out of the social context may be of benefit during the construction of the research hypothesis in phase four. If laboratory experiments were used, the artificial nature of the laboratory conditions would need to be compensated for in phase five. This view is supported by Gable (1994) who considers scientific and interpretative research methods to be complementary.

Field experiments extend laboratory experiments into reality (Galliers, 1991a) and may be used in phases four and five for constructing and testing the hypothesis. However, Gable (1994) suggests that although field experiments may provide valuable insights, they are a poor method for verifying hypotheses.

Surveys conducted using questionnaires or interviews may be used in exploratory studies (Yin, 1994) and may therefore be appropriate in phase three of the research design to identify requirements for alternative approaches to information systems strategic alignment. Surveys may also be used in phase five as a means of gathering reactions to the research hypothesis.

Research Method	Phase 3 Develop Research Theme	Phase 4 Construct Research Hypothesis	Phase 5 Test Research Hypothesis
Literature Survey	X		
Laboratory Experiment		X	X
Field Experiment		X	X
Survey	X	X	X
Case Study	X	X	X
Hermeneutics	X	X	X
Forecasting / Futures Research	X	X	
Simulation / Role Playing		X	X
Subjective / Augmentative		X	
Participant Observation	X	X	
Action Research	X	X	X

Table 1.1: Research Methods Evaluated for Inclusion in Research Design

A *case study* investigation retains the "holistic and meaningful" characteristics of reality (Yin, 1993, 1994). It can be used for descriptive and exploratory studies, theory building and theory testing. A case study may therefore be an appropriate research method in phase three, for identifying requirements; in phase four, for constructing a research hypothesis and in phase five, for testing the hypothesis.

Hermeneutics emphasises the examination of text to discover embedded meaning (Neuman, 1991). The applied social nature of the information systems discipline requires the meaning conveyed in words to be reviewed in phases three, four and five of the research.

Forecasting and *futures research* attempt to predict future events. The disadvantages of this method include the lack of knowledge concerning forthcoming events and the possible risk of self-fulfilling prophecies (Galliers, 1984, 1991a). However, the advantage of this research method is that it avoids basing research on existing relationships which may change.

Simulation and *role playing* attempt to imitate real world behaviour. These methods may be used in phases four and five of the research. The problem with these methods is that it may be difficult to construct simulations which sufficiently imitate reality.

Subjective / augmentative research is a creative method which is useful in theory building (Galliers, 1991a) and may be used in phase four to develop the hypothesis. It describes real world relationships, although its conclusions are based more on opinion and speculation than observation (Vogel & Wetherbe, 1984).

Participant observation requires the researcher to enter the situation to be investigated and attempt to adopt the perspectives of the people in the situation. The researcher may adopt a complete participant role, where the research objectives are concealed from the group observed, or adopt the role of 'participant as observer', informing the group of the research agenda (Frankfort-Nachmias & Nachmias, 1996). Entering and participating in the strategic planning activities of an organisation may be appropriate for developing and constructing the hypothesis.

Action research addresses a practical situation in a client organisation, whilst simultaneously increasing theoretical knowledge. It may be used in phases three, four and five of the research design. Action research is discussed further in the following section.

Appendix one documents the assessment of each of the methods against the criteria identified by Jenkins (1984), introduced in the previous section. Due to the interpretive nature of information systems research the results of all the research methods listed are affected by the subjective interpretation of the researcher, to varying degrees. Incorporating several methods in a research design attempts to compensate for potential bias of interpretation.

1.3.4 Research Design and Selected Research Methods

One research method cannot provide the richness needed for information systems research (Kaplan & Duchan, 1988) although a number of research methods may be incorporated into a research design (Mumford, 1984; Gable, 1994; Avison *et al.*, 1994). Checkland (1981) criticises the presentation of "methodological prescriptions" before a problem solved by their use can be demonstrated and Checkland & Scholes (1990) base their book on:

> "the belief that neither theory nor practice should dominate".

It is this view that has guided the selection of research methods to be incorporated into the research design illustrated in figure 1.1.

This section documents the selected research methods for each phase of the research identified.

Phase 3: Develop Research Theme

This phase of the research has three main objectives which are to:

1. Establish the theoretical foundation of the research.
2. Position the research in the context of existing material.
3. Identify the requirements for an alternative approach to the strategic alignment of information systems development.

It has been recognised that much survey material has already been collected by other researchers (section 1.2.2). A literature survey may therefore satisfy the three objectives of this phase. Alternative research methods to address the third objective of this phase, include case studies and surveys.

Case studies and participant observation suffer from the disadvantage that they are restricted to one company. Nissen (1984) highlights the danger that unless general laws are formed, social science research can result in a series of loosely related cases. Undertaking a case study in this phase may identify requirements which are not generally applicable. It was therefore decided that a case study in this phase of the research would provide limited information with which to develop a hypothesis.

Surveys overcome the limitation of case studies, seeking information common to many companies to provide generalisable statements (Gable, 1994). Conducting a survey involves the following series of tasks (Graziano & Raulin, 1993):

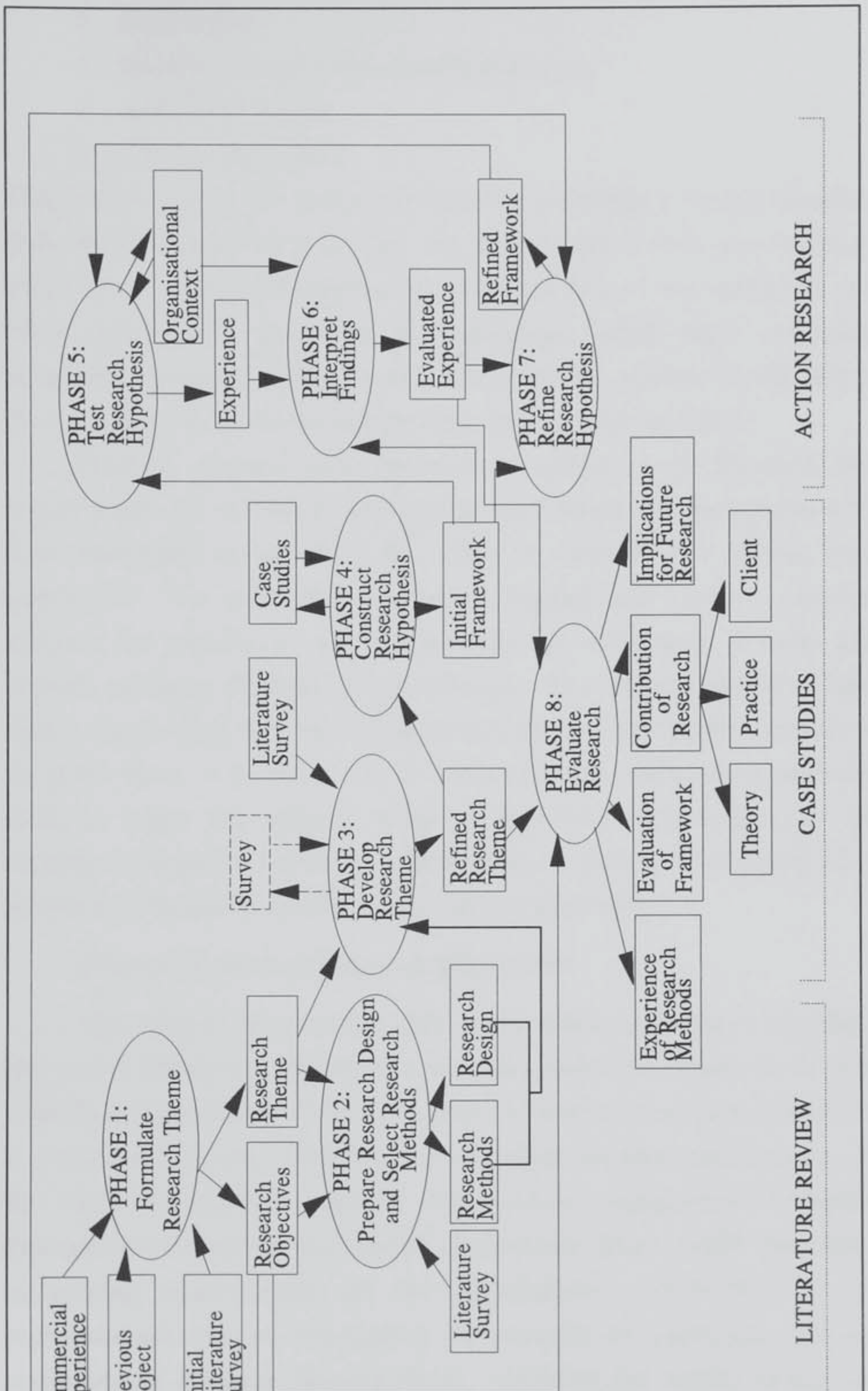

Figure 1.1: Research Design

1. Determine information required.
2. Define population.
3. Decide sampling frame and representative sample.
4. Decide how survey is to be administered.
5. Draft survey.
6. Pre-test survey on sub-sample and refine.
7. Administer survey.
8. Analyse the results.

This breakdown of the tasks involved in conducting a survey illustrates the main disadvantages of a survey, the time involved and cost incurred. In addition, the researcher requires an understanding of the subject in order to frame appropriate questions, the questions asked then determine the information obtained. There is also the possibility of bias of respondents and the risk that both questions and answers may be misinterpreted.

Previous surveys acknowledged in section 1.2.2 illustrate the low response rate for surveys in this subject. As a number of surveys have already been conducted in this area, the value of conducting a similar survey is questioned. The initial literature review suggests that previous surveys have assessed the importance and requirements for information systems planning without acting on the information collected. The research design in figure 1.1 shows that existing material will be initially used to develop the research theme. In phase three, a decision will be made whether sufficient reliable material exists to refine the research theme to be used in phase four, or whether insufficient material has been collected and a survey is required to obtain further information in specific areas, prior to phase four.

Phase 4: Construct Research Hypothesis

This research is concerned with constructing and testing a hypothesis in a real world situation. However, it was considered necessary to develop and refine the research hypothesis to a certain level of advancement prior to testing in a real environment. This decision was taken for two main reasons. Firstly, the client organisations entered are working organisations competing in dynamic environments and poorly formulated ideas could therefore have devastating consequences for the organisation. Secondly, the complex organisational context investigated for example by participant observation, could unduly influence the hypothesis, rendering the results of the research ungeneralisable. Constructing and refining an initial hypothesis prior to entering the client organisations provides the frame of concepts with which to subsequently conduct action research. The weakness of this path of action is the danger that the hypothesis could be imposed on the organisations without examining their specific situations. This issue is discussed in chapter four.

Existing case studies were identified as being sources of 'real' information which could be used to develop and test the research hypothesis. The disadvantage of case studies being subject to different interpretations by their subject, author and subsequent readers is acknowledged. In addition, case studies are often incomplete (Yin, 1994), restricting information to emphasise issues for discussion. Despite these limitations, the use of existing case studies in phases four and five was judged to be appropriate. This unconventional use of case studies supports a form of laboratory experiment to develop and refine the research hypothesis. The hypothesis can then be tested in action research to overcome the artificial limitations imposed during its construction.

Phases 5-7: Testing and Refining the Research Hypothesis

Action research was selected for testing and refining the research hypothesis in the real world. Rapoport (1970) defines the aim of action research as being to:

> "Contribute *both* to the practical concerns of people in an immediate problematic situation and to the goals of social science by joint collaboration within a mutually acceptable ethical framework".

A further aim of action research is added by Susman & Evered (1978), that is, to develop the problem-solving ability of the people in the problem situation.

Lewin (1947a, 1947b) has been described as the father of action research (Warmington, 1980), however, it is suggested that Lewin's work may be more appropriately labelled field experiments (Hult & Lunnung, 1980). Kemmis (1988) discusses the work of Collier between 1933 and 1945 who some researchers consider to be the father of action research rather than Lewin.

A comprehensive definition which captures the characteristics of action research identified by many researchers (Rapoport, 1970; Clark, 1972; Cunningham, 1976; Susman & Evered, 1978; Warmington, 1980; Wood-Harper, 1992) is offered by Hult & Lunnung (1980):

> *"Action research simultaneously assists in practical problem-solving and expands scientific knowledge, as well as enhances the competencies of the respective actors, being performed collaboratively in an immediate situation using data feedback in a cyclical process aiming at an increased understanding of a given social system, primarily applicable for the understanding of change*

> *processes in social systems and undertaken within a mutually acceptable ethical framework"* (original italics).

This definition emphasises action research as an integrated concept in which it is assumed both client and researcher will benefit.

West *et al.* (1995) identify two types of action research, the field study approach and the consultancy study approach. The distinction proposed between the two types of study is defined by positioning reflection towards 'theory' or 'action', illustrated in figure 1.2.

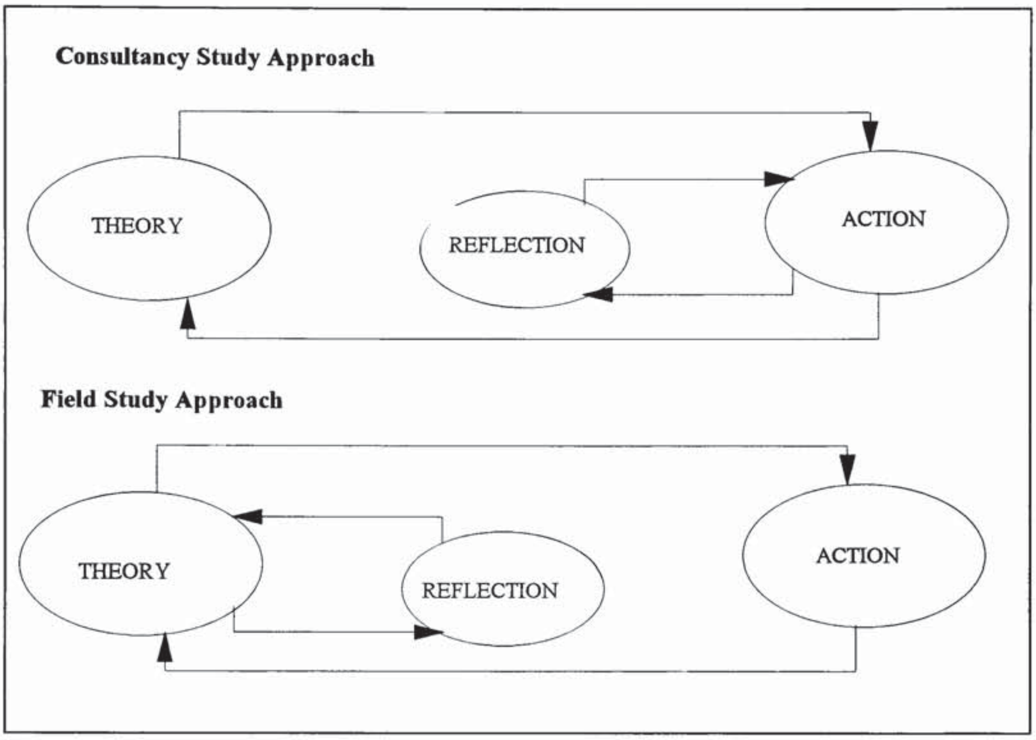

Figure 1.2: Two Approaches to Action Research
(Source: West *et al.*, 1995)

Action research studies have been criticised for lack of rigour and emphasis on action rather than research. It is the author's opinion that in balancing theory and practice, reflection in action research should consolidate the two activities. The absence of continuous consolidation within one study reduces the study to either consultancy activity, emphasising the improvement of an organisation's situation, or a field study, emphasising the collection of data to further knowledge. A third consolidated approach to action research is therefore proposed in this thesis, illustrated in figure 1.3, which will be evaluated in chapter five. Clark (1972) describes action research as evolving the future out of emerging opportunities and this thesis suggests that it is only by reflecting equally on both theory and practice that action research can achieve its aim.

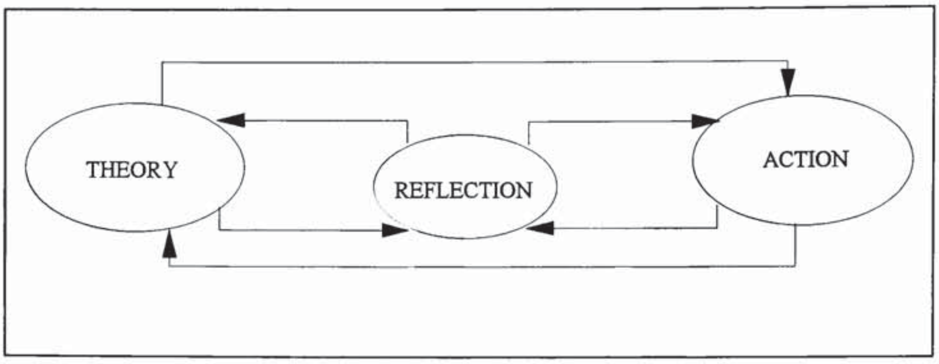

Figure 1.3: Consolidated Approach to Action Research

Many authors (Warmington, 1980; Checkland, 1981, 1994; Hindle *et al.*, 1995) emphasise the need for a framework to guide action research. By undertaking action research in phase five, the research hypothesis from phase four will provide the framework of concepts within which action research will be conducted. Checkland (1994) recognises that it is impossible to define a framework for action research until the problem situation has been entered. The framework guiding the action research will therefore be formed with the client, discussed in chapter four and evaluated in chapter five. Furnham & Pendleton (1991) outline the different characteristics of academic and business values which include differences in aims, timescales and types of solution required. The proposed consolidated approach to action research aims to reconcile these differences without sacrificing theory or practice.

Layder (1993) recognises that research methods need to be both systematic, to maximise opportunities for discovery and flexible, to respond to unanticipated problems and detours. The research design illustrated in figure 1.1 aims to achieve this balance.

1.3.5 Criteria for Evaluating Research

This research is to be evaluated in terms of its contribution to theory, practice and the client organisation. The research aims to contribute to the theory and practice of aligning information systems with the strategic direction of the company by:

1. Appraising existing methods of information systems strategic alignment.
2. Identifying requirements for a successful approach to the strategic alignment of information systems.
3. Developing and testing an approach which meets the requirements identified.

The contribution of the research to the client organisation includes the degree to which:

1. The situation is deemed to be improved by members of the organisation.
2. The problem-solving capabilities of the organisation have been strengthened.

This is in addition to any further aims defined by the client.

Clark (1972) includes appropriateness of research methods as a measure of research quality. Section 5.1 discusses the experience of applying the chosen research methods in this thesis. Mansell (1991) judges 'good' action research to improve both theoretical knowledge and the client situation, although Avison & Fitzgerald (1988) consider each action research study to further knowledge. The extent to which this research furthers knowledge is evaluated in chapter five. Robson (1993) suggests successful research develops from activity and involvement, convergence of activities, intuition, theory and real-world value. This thesis aims to illustrate the inclusion of all these elements in the research reported.

1.4 PLAN OF THESIS

This section outlines the research reported in this thesis. The structure of this thesis reflects the research design presented in the previous section. Figure 1.4 illustrates the development of the research theme. The research was initiated by previous assessments and experiences of the entity-relationship model. Section 2.1 discusses the role of the entity-relationship model within information systems development. Criticisms of the entity-relationship model led to the development of semantically richer extended entity-relationship models which slightly increased the semantic content of the entity-relationship model at the expense of added complexity. This led to the development of entity clustering techniques which provide high level abstractions of the entity-relationship models for improved client-analyst communication.

The separation of data modelling from data store design resulted in the extension of the entity-relationship model beyond database design. The technique of entity-relationship modelling has been adopted by a number of information systems strategic planning approaches, discussed in section 2.2, but it is reported that such approaches are not widely adopted (Premkumar & King, 1991). Two main reasons for this are found to be that the methods are not sufficiently flexible to address the particular requirements of an organisation and neglect the tools used in strategic management.

Section 2.3 investigates the trends and tools in strategic management. Strategic management requires diverse views, both internal and external to the organisation to be analysed. Each strategic tool provides one limited view of the strategic situation, however, strategic analysis requires a synthesis of these diverse views.

Chapter two develops the research theme providing the theoretical basis for the research hypothesis. Chapter three develops the research hypothesis that as strategic analysis requires a synthesis of diverse views and an aim of the Soft Systems Methodology is to attain a synthesis of views, strategic analysis may be an appropriate application for a soft systems approach. Using existing case study material, an initial framework is developed to support the strategic alignment of information systems development.

The further development of the framework using action research is detailed in chapter four. Figure 1.4 shows that the framework incorporates elements of the Soft Systems Methodology, tools of strategic analysis and entity clustering techniques. The framework aims to support information systems strategic planning and improve communication of information systems development at all levels in an organisation.

Chapter five reviews experience of the research methods applied and evaluates the framework proposed. The contribution of this research is presented in terms of the contribution made to the theory and practice of strategic alignment of information systems development and the contribution made to the client organisations. The implications of this research for future research are then reviewed. The thesis concludes by summarising the contribution of the research reported. Figure 1.5 illustrates the plan of this thesis, indicating the phases of the research design included within the structure of the thesis.

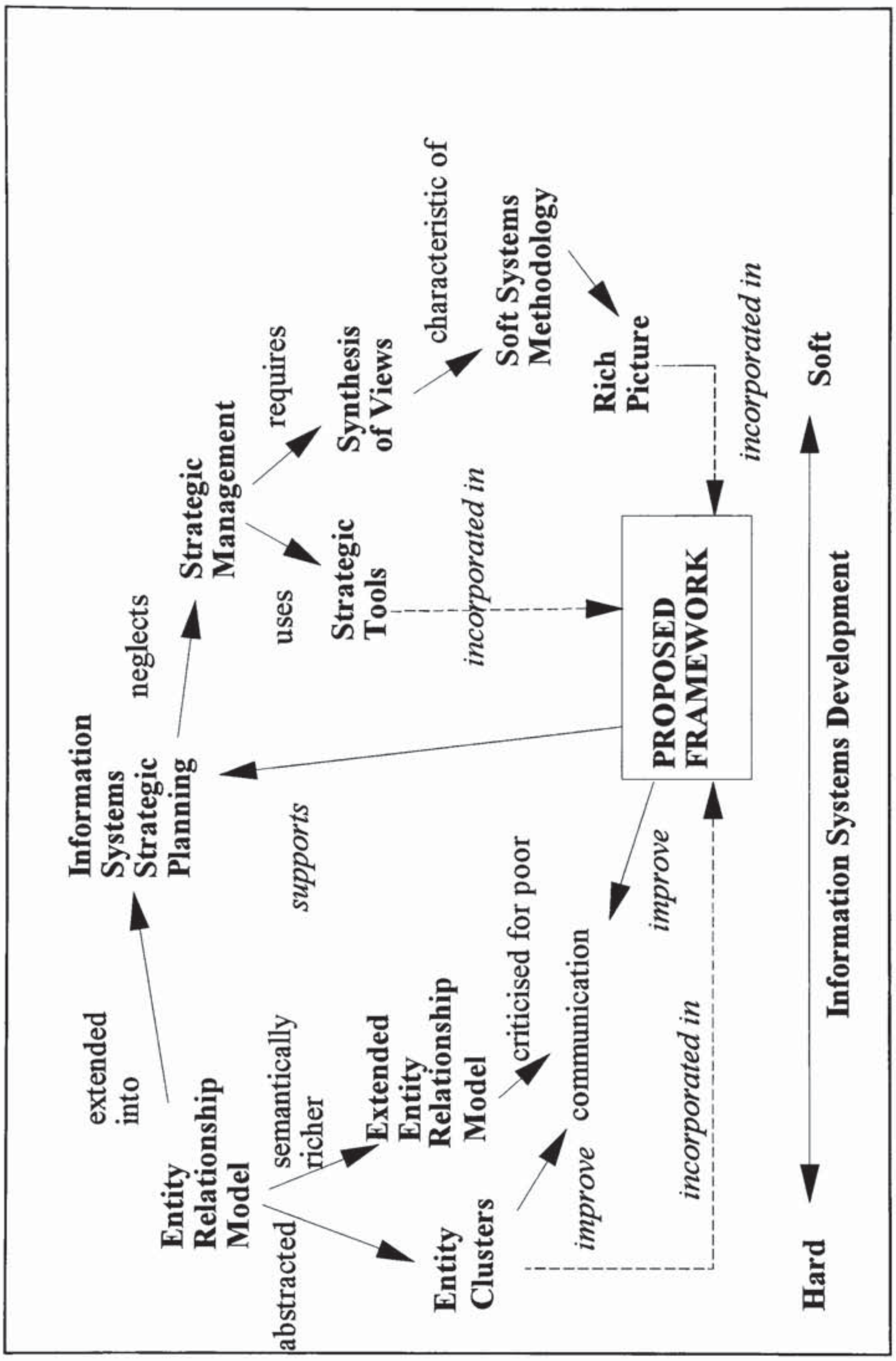

Figure 1.4: Progression of Research Theme and Development of Hypothesis

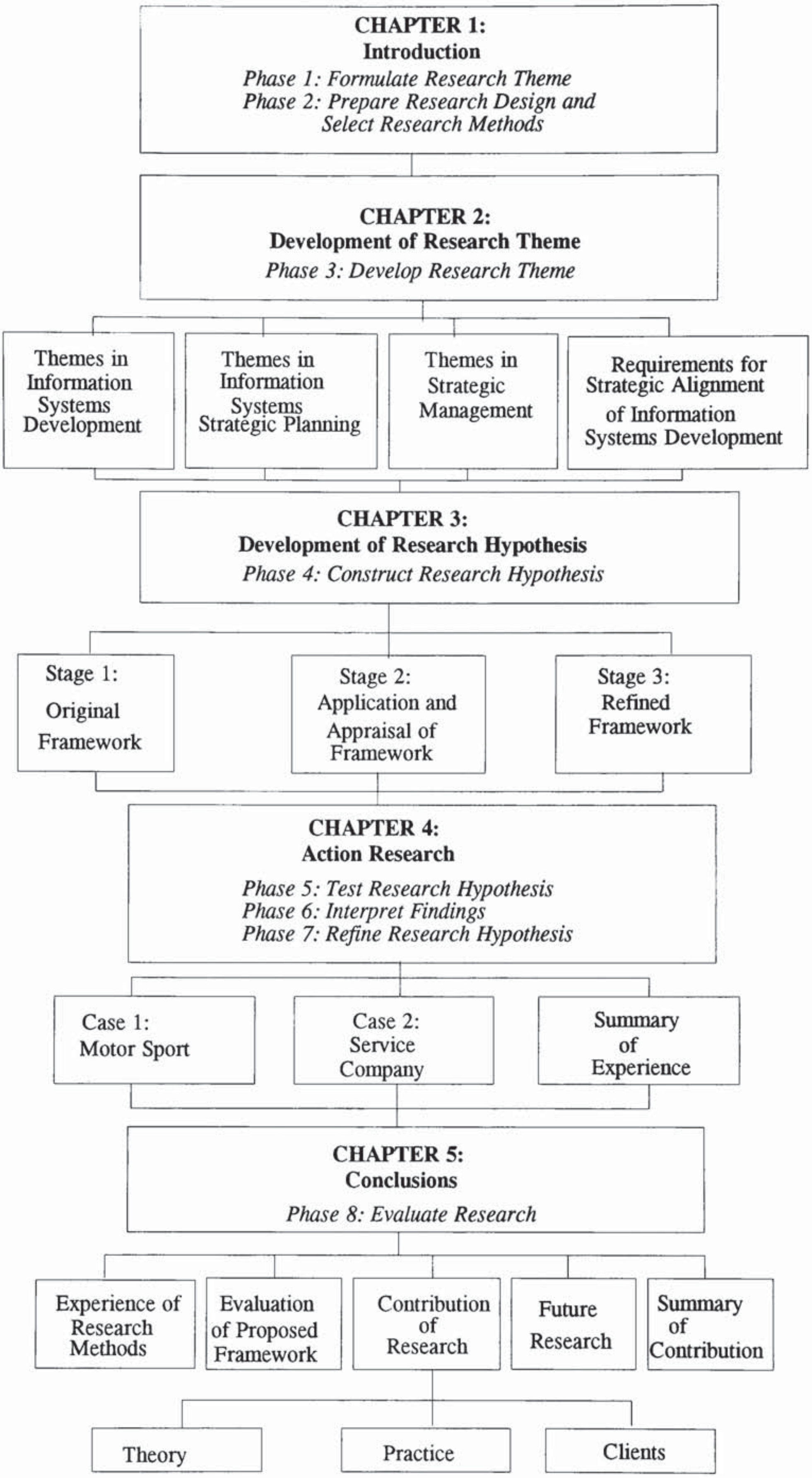

Figure 1.5: Plan of Thesis

CHAPTER 2

DEVELOPMENT OF RESEARCH THEME

This chapter establishes the theoretical foundation for the research reported later in the thesis, positioning the research in the context of existing material. The main concepts previously introduced are developed in three sections:

1. Themes in information systems development.
2. Themes in information systems strategic planning.
3. Themes in strategic management.

2.1 THEMES IN INFORMATION SYSTEMS DEVELOPMENT

The term 'information system' comprises of 'information' and 'system'; information may be defined as data with attributed meaning in a particular context (Checkland & Scholes, 1990; Wilson, 1990); a system may be defined as a combination of inter-related elements, organised in such a way to achieve a specified purpose. The compositional principle of model-theoretical semantics is that the intention of a phrase is composed of the intentions of its component parts (Johnson-Laird, 1983). Following this principle, an information system becomes a combination of inter-related elements, organised in such a way as to gather, process or present data with attributed meaning in a particular context. This definition of an information system omits the human aspect which attributes meaning to data. Stowell & West (1992) address this omission in their definition of an information system as:

> "The product of social interaction between human groups: it is a vehicle for communication which enables and supports the management of the business organisation".

Sherif (1988) describes information as the life-blood of an organisation; information systems development is concerned with analysing, designing, constructing and implementing systems for the "gathering, processing, storing, distributing, and use" (Avison, 1995) of this life-blood.

Some approaches to information systems development are criticised for being concerned with data rather than information (Patching, 1989), resulting in systems which provide volumes of facts when selected items of information are needed. The reason for this can be traced back to the definition of information as processed data which leads to the view that an information system, is a system to process data; raw data is input to the information system and after processing, refined data is output. Information systems developers focus on asking business clients to identify the data they require for their business activities, consequently, data models of requirements are created and validated. However, the resulting system delivers refined data which requires further substantial processing by the recipient to become information needed for decision-making.

Lewis (1994) makes the distinction that *data systems* are concerned with acquiring, storing and making facts accessible, whereas *information systems* provide decision-makers with data they perceive as information. This distinction between data and information can be summarised as 'relevance' (Patching, 1989). The development of information systems therefore requires:

1. An understanding of business activities.
2. A co-operative client-developer relationship to learn about business requirements.
3. A business-oriented means of communication with the client.

These issues will be explored in the following sections but the process of developing an information system, which provides the foundation for these sections, is first discussed.

2.1.1 Information Systems Development Process

Although the basic process remains the same, authors differ on the number and names of steps in information systems development (Gavurin, 1991; Jayaratna, 1994). Gladden (1982), for example, depicts a five phase 'waterfall' model representation of information systems development in which the deliverables from one phase are used in the succeeding phase. The early stages of systems development are elaborated in the seven stage development process described by Avison & Fitzgerald (1988). Despite extensive research, information systems development adopts a linear approach with the 'freezing' of requirements at some point (Benyon & Skidmore, 1987), supporting the systematic development of an information system to meet the requirements specified.

The most crucial step in the information systems development process is identifying what is required (Lewis, 1994). Defining the requirements for an information system determines the content of the resulting system and the problems it aims to address (Bento, 1994), the degree of clarity of the requirements definition setting the standard for the information system developed (Valusek & Fryback, 1985). Gladden (1982) identifies vague, incomplete or non-existent requirements as the chief villain of poor information systems development.

Pressman (1987) states that it is a myth that a general statement of requirements is a sufficient starting point for information systems development. The linear systems development process described starts with a defined set of agreed requirements, however, establishing an agreed set of requirements is itself problematic (Checkland, 1981). In addition, it is difficult to state all requirements explicitly at the start of the development process as the business client is not aware of the information required by the systems developers and the systems developers are not aware of all the information they need to ask the clients. As the systems development progresses, both client and developer learn about the system required. Iterative process models, such as prototyping, facilitate learning to overcome these initial difficulties in systems development.

Prototyping may be defined as:

> "The process of constructing and evaluating working models of a system in order to LEARN about certain aspects of the required systems and/or its potential solution" (Mayhew & Dearnley, 1990).

Prototyping shortens the elapsed time between establishing initial requirements and delivering a working model of the system with the prototype model forming the basis for further discussions between the client and the systems developer. Prototyping may be used to learn about, for example, the human-system interface, aspects of design and performance criteria, however, the strength of prototyping is in the definition of information systems requirements (Gavurin, 1991). The benefits of prototyping are attributed to improving communication between clients and developers.

Iterative process models require systems developers to retain contact with the business area throughout the development process. This facilitates continual learning about the business area in which the information system is to function. The systems development process becomes open to acknowledge and respond to changes in the business environment, allowing information systems to evolve, rather than be rigorously developed according to requirements specified one or two years earlier.

A number of problems with information systems development have been identified (Fitzgerald *et al.*, 1985; Avison & Fitzgerald, 1988), for example, the failure of the information systems development process to deliver a system which meets requirements, within the time and cost constraints imposed.

Penalty clauses and bonus incentives reflect the commitment in the construction industry to address similar problems. For example, the building engineering systems design process aims to complete projects on time and within budget constraints, continually investigating opportunities to eliminate or reduce costs (Merrit, 1979), questioning the cost effectiveness of every component. In information systems development, methodologies have been developed in response to problems in the information systems development process.

2.1.2 Information Systems Development Methodologies

Methodologies are needed to address problems in information systems development such as: the lack of clear development guidelines, poor client-developer communication, poor documentation and a tendency to move towards design too soon, before requirements are fully appreciated. The use of a methodology provides:

1. A systematic approach to information systems development.
2. Communication mechanisms.
3. Specified deliverables.
4. Measures of development progression.

In the information systems domain, the term 'methodology' has been established to mean the same as method (Jayaratna, 1993). Orr (1989) defines a method as a procedure or technique for performing part of the development process using tools; Avison & Fitzgerald (1988) define a methodology as:

> "A collection of *procedures, techniques, tools* and *documentation aids* which will help systems developers in their efforts to implement a new information system".

Two points should be noted about this definition. Firstly, methodologies can be used to maintain and enhance existing information systems, in addition to developing new systems (Kelleher, 1995). Secondly, a methodology is a tool to assist systems development and not a definitive approach to produce perfect systems. A methodology consists of phases to guide developers in selecting techniques appropriate at each stage in the development process.

A methodology is more than a collection of techniques as it is based on a philosophical view (Avison & Fitzgerald, 1988) which includes the paradigm and objectives of the methodology and the type of problems and environment which the methodology aims to address. Checkland (1981) describes the underlying philosophical view of a methodology as identifying *'what'* is needed. Methodologies differ in what is considered to be a 'good' information system, for example, the objective may be to develop an information system which is delivered on time and within budget; well documented; accepted by the clients.

The techniques in a methodology address *'how'* the need can be met (Checkland, 1981). Methodologies therefore address *'what'* is needed and *'how'* the need can be satisfied but the broader issue of *'why'* a need exists is overlooked.

In addition to aiding systems developers, many authors emphasise the role of a methodology as a problem-solving mechanism. Ellis (1995), for example, proposes that a:

> "Methodology is taken to be an organised set of methods or techniques which are employed to intervene in 'real world' problems to bring about change".

As a problem-solving mechanism, Jayaratna (1994) suggests a methodology consists of three main phases: problem formulation, solution design and design implementation. This research is concerned with problem formulation and the transition to solution design.

Methodologies provide a framework of action to support systems development but developers do not adhere to prescribed techniques (Westrup, 1993). One of the main reasons for this is cited as the need for flexibility in information systems development (Fitzgerald, 1994) because every information system development is unique (Avgerou & Cornford, 1993). Although a unique approach for each system development is not helpful, neither is it helpful to force a situation to fit a particular methodology; no amount of prescription caters for situated action (Suchman, 1987). Methodologies act as instruments of conformity and put obstacles in the way of revealing insights into the distinctive features of the development, only recording activity that fits the methodological template. Fitzgerald (1994) suggests methodologies are often generalisations from single cases which prescribe a complex approach of inflexible development. The prediction that systems developers would tailor methodologies to meet their needs (Fitzgerald *et al.*, 1985) has been realised (Fitzgerald, 1994).

Fitzgerald (1994) discusses a number of negative implications of using information systems development methodologies, such as:

1. Adherence to a methodology may overshadow the system development.
2. Adequate attention may not be given to social factors.
3. Contingency in systems development is not facilitated.

The benefits of using a methodology must therefore be evaluated against the possible negative implications of its use.

The design of information systems development methodologies has dominated two decades of research (Avgerou & Cornford, 1993), however, many of the methods in use today are based on concepts introduced in the period 1968-1977 (Blum, 1994). The development of tools and techniques has not kept pace with the increasing complexity of information systems (Galliers, 1987). Avgerou & Cornford (1993) suggest the methodology movement attempted to systemise practices too early and too strictly, prescribing methods and techniques before the nature of information systems development was understood.

A brief review of the frameworks proposed for comparing methodologies indicate the main areas in which methodologies differ, although there are a number of inherent problems with comparing methodologies:

1. The framework chosen affects the results of the comparison, prescribing the comparison criteria.
2. Methodologies are not static but are continually evolving.
3. Any comparison is based on subjective perception.
4. Information is not always available to compare methodologies against the same criteria.
5. Different methodologies may use the same terms to mean different things and different terms to means the same thing.
6. Categorisation of methodologies distracts from their purpose (Benyon & Skidmore, 1987).
7. A written account of a methodology is often over generalised.
8. The success or failure of a methodology may be attributed to the skill of the people using the methodology.

The advent of affordable computer aided software engineering (CASE) tools has prompted organisations to review their systems development methods and compare methodologies because many products support specific methodologies. Comparing methodologies (Cameron *et al.*, 1991):

1. Helps organisations choose which methodology to adopt.
2. Identifies the differences between methodologies.
3. Discovers the compatibility of methodologies.
4. Uncovers false assumptions held of a methodology.

Methodology comparisons should (Cameron *et al.*, 1991):

1. Identify strengths and weaknesses.
2. Illustrate differences and similarities.

3. Indicate the type of systems development suited to the methodology.

Cameron *et al.* (1991) suggest three areas of comparison, method notation, method rules and method results. In contrast, extensive feature analysis methods for methodology comparison have been developed. Although such comparisons are very thorough, there is the danger that overall significant differences and similarities may be overlooked. A range of comparison methods are reviewed in Avison & Fitzgerald (1988).

Jayaratna (1994) discusses the following approaches to compare methodologies:

1. Describe an ideal methodology and compare methodologies against this ideal. The problem with this approach is that constructing an ideal methodology is subjective.
2. Select features of a methodology for a generalised measurement tool. This needs to be supported by explicit theory.
3. Construct a test hypothesis about the features based on a study of methodologies. This requires a decision of what features to include.
4. A common reference framework is used by Jayaratna's 'normative information model-based systems analysis and design' (NIMSAD). This examines four issues: the methodology context, the methodology user, the methodology process and an evaluation of all three criteria.
5. A contingency framework to map methodologies to the environment. This may be considered a 'prescriptive' approach in that action is 'prescribed' contingent upon the assessment of certain characteristics. Episkopou & Wood-Harper (1986) propose an 'approach choosing and matching system' which assesses characteristics of the problem owner, problem content, problem solution, problem solving approach and formulates a problem solving system.

Avison & Fitzgerald (1988) examine methodologies using the comparative base of: philosophy; scope; models; techniques; tools; outputs; practice and product. Differences in philosophy are discussed in section 2.1.3 which examines a number of schools of information systems development; tools and techniques of the dominant systematic approach are then discussed in section 2.1.4.

Examination of the scope of methodologies reveals that many methodologies do not address the strategic phase of information systems development (Fitzgerald *et al.*, 1985; Avison & Fitzgerald, 1988). The strategic phase addresses aspects relating to the organisational context rather than being limited to the area under investigation (Avison & Fitzgerald, 1988). The practice of a methodology involves client-developer communication, models to assist areas of analysis and communication are explored in section 2.1.5. The organisational context of information systems development is discussed in section 2.1.6. A contrasting systemic approach to information systems development is then discussed.

2.1.3 Schools of Information Systems Development

Iivari (1991) conducts a paradigmatic analysis of seven schools of information systems development:

1. Software engineering.
2. Database management.
3. Management information systems.
4. Decision support systems.
5. Implementation research.
6. Sociotechnical approach.
7. Infological approach.

Other authors (Wood-Harper & Fitzgerald, 1982; Benyon & Skidmore, 1987) add:

8. General systems theory.
9. Soft systems approach.
10. Traditional approach.
11. Structured systems analysis approach.

Each of these schools will be briefly examined.

Software Engineering School

The major contributions of this school are abstraction mechanisms and process models (for example, Sommerville, 1989). The software engineering school focuses on information systems design and information systems evaluation. The ontological assumption of the school views an information system as a technical system with social implications. It adheres to the positivistic epistemology and is concerned with the cost effective development of software products.

Database Management School

The database management school has influenced the data-oriented view of information systems development, based on the philosophy that data are the fundamental building blocks of an information system. Data analysis defines the data structures in a system, independently of the individual applications that may be required (for example, Tsichritzis & Klug, 1978). The ontological assumption of this school is that data can be objectively observed. The school is concerned with managing the organisation's data resource.

Management Information Systems School

This school is concerned with organisation-wide information systems (for example, Davis, 1974). The focus of this school is on both information systems planning and information systems design but people are viewed only in the context of information processors.

Decision Support Systems School

Decision support systems are concerned with focusing the information systems development process on the design, implementation and evaluation of individual decision support applications (for example, Sprague Jr. & Carlson, 1982). The school adopts a descriptive view of data with a technical orientation. It is the only one of the seven schools discussed by Iivari (1991) which includes anti-positivistic ideas, emphasising human interpretation. The aim of decision support systems is to increase the effectiveness of organisations through improved decision making.

Implementation Research School

This school has contributed general insights into information systems development problems rather than specific development methods. Information systems are viewed as providing information to support decision making in organisations, exploring the implementation of information systems from a psychological perspective of ownership (for example, Swanson, 1988). Factors influencing the success of information systems implementation can be categorised as technical characteristics, client actions, attitudes towards the systems, decision style and situational factors. A deterministic view is implied by increasing the controllability of clients to ensure successful implementation. Voluntaristic elements are also recognised in that clients are the final arbiters of information systems success.

Sociotechnical Approach

The sociotechnical approach has made two main contributions to information systems development; the participative approach to development and emphasis on job satisfaction. The participative approach aims to ensure that the information system implemented is acceptable by facilitating participation of affected parties in the information system development, asserting the importance of human elements in information systems. An information system is perceived as both a technical system and a social system with emphasis on designing an information system that is acceptable to the clients (for example, Mumford & Henshall, 1979).

Infological Approach

This approach focuses on information system design and addresses the problem of defining the information to be provided by the system (for example, Lewis, 1993). It adopts a descriptive view of data as a symbol to represent information. A structured view of an organisation is adopted, although it is recognised that people may experience the same situation differently.

General Systems Theory Approach

This school attempts to understand the nature of systems, rather than being concerned with information systems development methods. It applies the concepts of systems theory as a guide to analysing and developing information systems (for example, Boulding, 1956).

Soft Systems Approach

This approach recognises that organisational problems are complex, involving inter-related 'soft' issues (for example, Checkland, 1981). In such situations, objectives for improving the situation are difficult to define as there are many different, valid views of the problem situation. The soft systems approach is discussed in section 2.1.7.

Traditional Approach

The traditional approach assumes an organisational problem exists which can be solved by the development of a computer-based information system. A formula of investigation, analysis, design and implementation is followed to develop the information system (for example, Daniels & Yeates, 1971). It is suggested that while this approach is suitable for automating existing data processing procedures, it is inappropriate for information systems development.

Structured Systems Analysis Approach

This approach provides tools for resolving some of the problems encountered with the traditional approach to information systems development such as conflicting departmental views and the difficulty of managing large projects. Analysis and documentation tools enable analysis of both the existing and proposed information systems (for example, Yourdon, 1989).

These schools are complementary, not mutually exclusive approaches to information systems development as each approach seeks different, but not alternative, objectives (Wood-Harper & Fitzgerald, 1982; Benyon & Skidmore, 1987; Iivari, 1991).

Information systems development has been dominated by the structured systems analysis approach, discussed in the following section. The soft systems approach to information systems development is receiving increasing attention in the information systems community and is discussed in section 2.1.8.

2.1.4 Structured Information Systems Development

Information systems development has been treated as an analytical process of decomposing goals into actionable steps. Structured systems development methods start with the premise of a defined problem and are solution driven (Jayaratna, 1992). Methodologies prescribe the stages, techniques and tools required to analyse, design, develop and implement a system to address the defined problem. This linear approach to information systems development is reflected in the wide range of CASE (computer aided software engineering) tools available to guide and support the development process.

Wood-Harper & Fitzgerald (1982) identify two basic paradigms which underlie information systems development methods: the science paradigm and the systems paradigm. The science paradigm forms the foundation of structured information systems development methods discussed in this section; the systems paradigm is discussed in section 2.1.7. The science paradigm manages complexity by reducing it to increasingly smaller areas for analysis, making complexity more manageable (Moyes, 1993) but losing the broader context. It embraces the ontological position of realism; realism adopts the stance that the universe of discourse consists of objects and structures which exist independently of any observer (Klein & Hirschheim, 1987). Structured information systems development methods encourage the construction of models to capture the objective reality observed.

Structured techniques force reality to be viewed within a particular framework which dictates what is observed. The entity-relationship model, for example, encourages a 'natural' view of the world consisting of entities and relationships to be adopted; process models advocate a view emphasising the processes present in the domain. This discussion is continued in the following section.

2.1.5 Models in Information Systems Development

A model is a subjective representation of some aspect of reality. A fundamental problem in information systems development is seeking richer models of reality (Beynon-Davies, 1991). Information systems developers need to understand the problems in the organisation which the information system aims to address. If the essential features of a problem can be identified, then the solution may become apparent (Benyon & Skidmore, 1987). Wilson (1990) warns that modelling can become an end in itself and as Checkland & Scholes (1990) remark, modelling is only a means to an end. Models may be used as the basis for communication and experimentation (Benyon & Skidmore, 1987), to aid thinking and illustrate concepts (Wilson, 1990).

Carter *et al.* (1984) describe a 'good' model as one that people 'feel' makes sense, commit themselves to and consider useful. Moyes (1993) and Chandler & Cockle (1982) suggest models are an integral part of our thinking; this is supported by McGarry (1981) who describes man as a pattern-forming creature, classifying experience, seeking relationships and generalisation. Wilson (1990) defines a model as:

> "Essentially a description of entities, processes or attributes
> and the relationships between them".

Theodoulidis & Loucopoulos (1991) suggest an information system can be viewed as a model of some part of the organisation, adopting this view, information systems development becomes a problem of model building. Information systems development involves viewing a problem from a certain point of view which assumes a specific way of thinking (Sol, 1992).

In information systems development, there has been much debate regarding the relative importance of data and processes (Blum, 1994). Process modelling has been dominated by data flow diagramming. This domination may be attributed to the simplicity of the model which uses four symbols to depict the underlying logic of a system (Gane, 1989). Data modelling has been dominated by the entity-relationship model and although the entity-relationship model is based on three constructs, it has been heavily criticised.

The terms data model, conceptual model and semantic model are used interchangeably in literature, although each term emphasises a specific aspect of representation. The term:

1. *Data model*: emphasises data structure.
2. *Conceptual model*: indicates installation independence.
3. *Semantic model:* incorporates the meaning attributed to the data.

During the period 1970-1975, Chen (1983) reports there was considerable debate concerning which of the three data models, hierarchical, network and relational, was superior. Each data model possessed specific advantages and disadvantages but it became apparent that a unified data model was required, independent of commercial database systems. The purpose of conceptual modelling is to provide an application and installation independent model of the database needed to support client requirements.

The International Organisation for Standardisation (Crockett *et al.*, 1991) identifies two principles to which conceptual models must adhere to capture all pertinent data. These principles are:

1. *100% Principle*: the model should provide an exhaustive description of semantics, to represent the meaning of all structures in the environment.
2. *Conceptualisation Principle:* the model should only contain properties of the system and therefore provide a closed system of the environment, independent of implementation.

The modelling process involves a number of layers of abstraction. Floyd & Keil (1983) and Nichols (1969) recognise that although it is necessary to reduce the semantic richness of reality to discover data structures, some properties are lost as an object is reduced to data about the object.

The entity-relationship model (Chen, 1976) has survived almost two decades of criticism to be accepted by commercial organisations around the world. The model is based on a natural view of the world, where reality consists of entities and relationships between entities. This view has since dominated conceptual modelling as entity and relationship concepts have been adopted to form the fundamental base for a generation of models. Chen (1976) described the entity-relationship model as an extension of the existing data models of the time, attempting to overcome the limitations of poor data independence exhibited by the network data models and retain semantic information lost by the relational model. Extended entity-relationship models aim to capture a further layer of semantic information beyond the basic structure of the data. A data model richer in semantic content is considered to be a closer representation of reality.

The creation of a perfect model of reality is both unattainable and undesirable; unattainable as a perfect model of reality is reality itself; undesirable as the purpose of a model is the separation and isolation of key elements from the complexity of reality for analysis. There is a danger that progressively richer models of reality may be too detailed for practical use

(Tomlinson, 1983). A model must therefore capture an appropriate degree of meaning relative to its use (Tsichritzis & Lochovsky, 1982; Chandler & Cockle, 1982).

Chen (1983, 1989) suggests that the popularity of the entity-relationship model may be attributed to:

1. The concepts of the model which are easy to understand.
2. The implementation independence of the model.
3. The formalisation of the entity and relationship concepts.

An alternative view is that the popularity of the entity-relationship model may be attributed to its diagramming technique (Date, 1990). Notation is important as the entity-relationship model is a tool for both thinking about problems (Howe, 1983) and providing a common frame of reference for communication (Kung, 1993).

A number of notations have been proposed for the entity-relationship model and Campbell (1992) suggests this is a sign of the lack of maturity of the technique. The entity-relationship model has many uses including client communication, database design and systems documentation, Campbell proposes that different notations should be applied to each use of the model.

Different authors propose advantages and disadvantages of specific notations. For example, Howe (1983) recommends use of the Chen notation as it does not permit uncommitted diagrams, where relationships are not shown by degree of membership. Different notations do not provide significant changes to the entity-relationship models, although it may be considered that some notations provide a clearer model than other notations.

There are a number of criticisms of the entity-relationship model. Firstly, the terms entity, relationship and attribute do not have single definitions and can be interpreted in different ways (Date, 1990). Howe (1983) states that the definitions are necessarily imprecise as there is no absolute way of classifying reality into entities and relationships. Nichols (1987) proposes:

> "The number of classifications regarding a particular event (i.e. its information potential) are infinite, while classification systems are finite. Thus classified data loses all information potential other than that possessed by the category in which it is placed".

Secondly, entity modelling is an objectivist approach which assumes reality consists of entities which can be identified. Klein & Hirschheim (1987) outline three anomalies with this approach:

1. *Frege's Puzzle of Denotational Meaning:* entity modelling states that the meaning of each instance of a class is defined by reference to the

object. Frege ascertained that meaning does not coincide with reference, for example, 'morning star' and 'evening star' both refer to the same object, the planet Venus, but do not have the same meaning.

2. *Wittgenstein's Puzzle of Rules of Correspondence:* the objectivist approach assumes that reality can be decomposed into a set of elementary states of affairs which can be described by a sentence. Wittgenstein could not find any direct correspondence between descriptions of sentences and states of affairs in the real world, as meaning of words change with social use.
3. *Austin's Puzzle of Performative Meaning:* Austin discovered that the same sentence can have a different meaning depending on the social context in which it is used. For example, 'the goods will be delivered on Tuesday', could be interpreted as a promise from a supplier, an estimate of what may happen or information passed between subordinates. The objectivist approach assumes correspondence between sentences and reality without consideration of performative meaning.

The datalogical approach extracts entities from the environment (Episkopou & Wood-Harper, 1986), however, it is argued that information is not an object to be identified but a pattern perceived in data (Boisot, 1994). Identifying entities is difficult; Lewis (1994) suggests entities cannot be identified without understanding the cognitive framework which identifies entities as being meaningful. This is illustrated in experiments conducted by Buzan (1993). A group of people of similar age and background were given a key word and asked to note ten associations with the key word. On average, no association was common to four members of the group. Although a few pairs of words were occasionally common to two people, most words were unique to one individual. This result raises a fundamental issue; if different people attribute different associations to a word, the formation of an entity model to reflect the associations between data in an organisation must be questioned.

An inherent difficulty of entity modelling is the assumption that words used and accepted, accurately describe reality. Words are not the most accurate tools for a complete analysis of reality but if a word works most of the time, it is not questioned; it is only when words cause problems that their use is scrutinised (Shekleton, 1991; Boisot, 1994). Entity modelling requires the use of words to be queried which questions a person's perception of reality and finally reality itself. Shekleton (1991) recognises three types of reaction to this: anxiety, defensiveness and avoidance. Entity modelling requires aspects of the business environment, which are taken for granted, to become questioned and defined. This is often perceived as a threat and defensive behaviour is initiated, particularly in instances where data sharing is required across organisational boundaries. Business areas defend *'their'* data, names and definitions. Shekleton concludes of entity modelling that although "The theory is simple. The practice is hard" as semantic modelling draws upon "ruminative and philosophical skills". Klein & Hirschheim (1987) adopt this view; as data modelling is a process of inquiry it cannot avoid philosophical assumptions. Shekleton (1991) poses two questions:

1. Why do we all agree that certain objects are the same 'thing'?
2. Who is the arbiter of this knowledge, of these groupings?

The answer to these questions can be found in cultural analysis. Language is a system of symbols by which members of a community give meaning to their environment (McGarry, 1981). This is discussed in chapter three.

Checkland (1981) argues that precisely defined terms are needed for intellectual argument. Pirsig (1991) points out that:

> "To define something is to subordinate it to a tangle of intellectual relationships. And when you do that you destroy real understanding".

This is illustrated by McGarry (1981) who notes that we can recognise a sparrow without being able to define one. Definitions are needed to communicate ideas (McGarry, 1981), however, effective communication is not reproducing an image in the mind of the recipient; effective communication modifies the recipient's view of the world (Boisot, 1994).

Communication is an important aim of any model. Most data models are not easily understood by business clients as the models are closer to computer constructs than organisational constructs (Tsichritzis & Lochovsky, 1982). Feldman & Miller (1986) suggest the usefulness of a model is inversely proportional to its size which follows the generally accepted view that a person can only adequately comprehend seven, plus or minus two, concepts at a time; errors increase when a larger number of concepts are presented (Miller, 1967).

Corporate data models covering large pieces of paper, joined by crossing relationship lines, are difficult both to comprehend and maintain. Although automated tools attempt to address these problems, there are limitations to how much information can be displayed on a screen or printed onto a piece of paper. The size of models is often artificially constrained to avoid connection and maintenance problems, resulting in a loss of information and incomplete models.

Entity model clustering (Feldman & Miller, 1986) addresses this issue. The technique produces a hierarchy of successively more detailed entity models similar to the decomposition of data flow diagrams. It may be regarded as an extension to the type hierarchy technique adopted by extended entity-relationship models.

Attempts to capture greater semantic meaning in conceptual models has focused on providing extensions to the entity-relationship model. The first extension appeared two years after the original proposal as work by Smith & Smith (1977) emphasised the need for abstraction hierarchies in database design. This was followed by the addition of subtypes to the relational model, to form the RM/T model by Codd (1979).

Further extensions to the entity-relationship model have followed the research proposals of Chen (1983):

1. Modelling of the concept 'time' (Moyne *et al.*, 1991; Theodoulidis & Loucopoulos, 1991).
2. Modelling of non-traditional data processing applications (Bosco & Gibelli, 1991; Gopinath *et al.*, 1992).
3. Modelling of dynamic behaviour (Lazarevic & Misic, 1991; Engels *et al.*, 1992).

These directions are illustrated in figure 2.1 and will be briefly described.

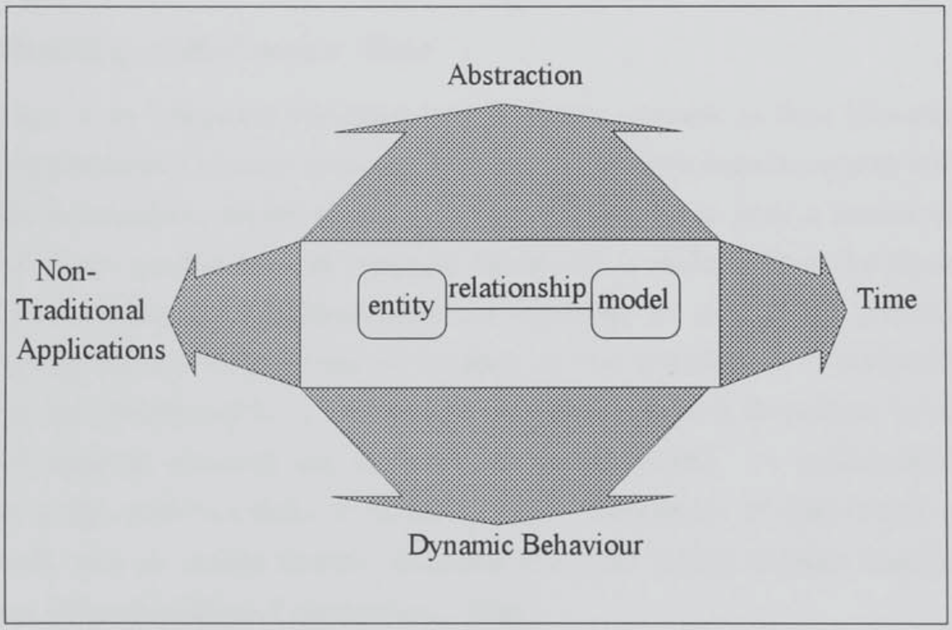

Figure 2.1: Extensions to the Entity-Relationship Model

Abstraction

It was recognised that in the real world, there are aggregation and generalisation relationships which could not be supported by the entity-relationship model. As the primary aim of a conceptual model is to model the real world using natural primitives, the lack of support for abstraction in the entity-relationship model was considered to be a significant omission.

Abstractions are the most common extensions to the entity-relationship model. A typical example of an entity-relationship model extended to support abstractions is given by Engels *et al.* (1992). Three types of abstraction are described:

1. *Aggregation:* implemented by object valued attributes, where the attribute domain is an entity type. This provides a method for hiding details about the world, simplifying complex structures.
2. *Association:* implemented by mutli-valued attributes.
3. *Specialisation and generalisation:* implemented using type constructs.

The extended entity-relationship model proposed by Engels *et al.* (1992) allows attributes to be specified as being optional. The combination of object and multi-valued attributes allows more complex structured entity types to be modelled. The model is supported by a SQL-type query language which is also used to express constraints on database states.

Modelling of the Concept 'Time'

Time is an important construct in information systems as time interacts with information in a number of ways. Information systems require current and historical information, details of the evolution of information over a period of time and future predictions. A temporal dimension is omitted from the three major data models and databases lack the capability to record and process time-varying aspects of information because of the omission of a temporal aspect at the conceptual level. Efforts to include a temporal dimension in all areas of database research are complex and multi-faceted. A fundamental problem is that there is a form of 'common sense' knowledge of time which is sufficiently rich to enable human communication but which defeats concise definition (Theodoulidis & Loucopoulos, 1991).

Extended entity-relationship models which accommodate a temporal construct at the conceptual level include:

1. *Time-Extended-Entity-Relationship Model:* A 'history-structure' augments the basic entity-relationship constructs which supports the

creation of new constructs, such as attribute-history. Each basic fact has a history which is formed by a domain of values as a function from a time domain. The history structure is a set of pairs consisting of time and value.

2. *Entity-Relationship-Attribute-Event Model*: This model associates a time period with every entity which reflects the situation where entities evolve during their existence. Relationships between entities and attributes of entities can be defined as being permanent or time-varying as a type 'event' is added as one of the basic constructs of the model.
3. *TEMPORA Model:* This model consists of two parts, an entity-relationship-time model and a conceptual rule language (Theodoulidis & Loucopoulos, 1991; Theodoulidis *et al.,* 1992, 1991). The entity-relationship-time model represents time as a class construct called time-period, defining entity and relationship classes as permanent or time-varying. A time-stamping approach is adopted as a time period is assigned to all time-varying information in the model.

Modelling of Non-Traditional Data Processing Applications

Database applications have evolved from traditional data processing systems to complex applications such as CAD (Computer Aided Design), CAM (Computer Aided Manufacture), CASE (Computer Assisted Software Engineering), office automation and geographical databases (Engels *et al.*, 1992). EAR-Impish is a database management system which extends the entity-relationship model to support both time related concepts and versions of entity and relationship instances (Bosco & Gibelli, 1991). Extensions to the entity-relationship model have been developed to support these characteristically different applications, for example:

1. *Software engineering methods* require powerful integrity constraints and version management facilities to describe, process and manage versions of instances of entities and relationships. EAR-Impish creates three system attributes, start-date of validity, end-date of validity and status which can be used to audit historical data in software engineering tools.
2. *Project management tools* require a hypothetical environment. A simulation facility is needed to allow the creation and manipulation of objects and relationships to perform 'what-if' analysis.
3. *Report generators and management tools* require facilities for document management. Access control and management of

documents which contain unstructured data is needed. An attribute type 'document' is introduced which can associate an attribute value with a file containing a stored document.

4. *Manufacturing systems* require facilities to model time sequences and ordering aspects of information flow in manufacturing processes. The 'factory of the future' concept aims to achieve increased profits and production from the automation of manufacturing processes. Moyne *et al.* (1991) propose extensions to the entity-relationship model to provide the data modelling required to support this concept. This is an example of how extending the entity-relationship model to incorporate a temporal dimension has increased the range of applications which the model can be used to represent.

Modelling of Dynamic Behaviour

A database represents both the static and dynamic aspects of an application. The static aspect describes the structural properties of data; the dynamic aspect describes the processes which are applied to the data. These two aspects have traditionally been modelled separately but Kung (1993) recommends an integrated approach. The advantages of an integrated approach are that it facilitates:

1. Better understanding of the system as interaction between the static and dynamic aspects is explicitly modelled.
2. Consistency checking between the two aspects.
3. Rapid prototyping since the data structures and algorithms can be derived mechanically from the single conceptual model.

Feldman & Fitzgerald (1985) also recognise that the development of a successful information system, requires both data and functional components to contribute to the success. They highlight two problems with this, firstly, the inadequacy of tools for accurately modelling detailed behaviour of data; secondly, functional models are less stable than data models. Feldman & Fitzgerald propose action modelling to address these problems. This is a function modelling technique specifically developed for use with entity modelling.

Action modelling is based on the strengths of the entity model and aims to inherit the same strengths as the entity model of expressive power; independence of detailed functions; abstraction to the level of detail required; relative stability; basis for communication. The functions the system is required to support are decomposed into actions; an action is an activity which relates to or acts upon an entity. Actions can have relationships with other actions;

pre and post conditions may be associated with an action to facilitate sequence, condition and iteration constructs.

Such extensions to the entity-relationship model reduce the level of simplicity and understandability of the models produced. The communication properties of a model, which are one of the main strengths of the entity-relationship model, are continually reduced by increasing the range of modelling constructs available.

Advantages of entity-based models include:

1. Well established and accepted technique.
2. Easy to transfer to a physical database model.
3. Simple but powerful method.
4. Based on philosophy that data is more stable than processes.
5. Verified by examining the operations and events the model is to support.

Disadvantages of entity-based models include:

1. Subjective model dependent on the skill of the modeller.
2. Some types of information cannot be modelled.
3. The model is not consistent as the same situation can be modelled in different ways.
4. Although the method is simple, it is difficult in practice.
5. Large models are difficult to comprehend.

Five abstraction concepts have emerged from studies in semantic modelling, which now form the basis of the object-oriented data model (Hughes, 1991). These are:

1. *Classification:* In the entity-relationship model, entities are classified in terms of their structure and relationships are used to model the interactions between entities. The class structure in the object-oriented model encompasses both properties and behaviour.
2. *Identification:* Classes and instances of classes can be uniquely identified as entity types. Entity types are identified by key attribute values which may change over time. In contrast, objects in an object-oriented model are identified by surrogates rather than their values, which is comparable with Codd's use of surrogates in the RM/T model.
3. *Aggregation:* This allows a combination of related objects to be grouped into a higher level object.

4. *Specialisation/Generalisation:* Common properties (and functions) form a generic object and subtypes of an object type may be defined to constrain values of attributes.
5. *Association:* Between objects.

The concepts of aggregation, specialisation and generalisation are the direct results of the work by Smith & Smith (1977). A key difference between the object-oriented model and extended entity-relationship models is the application of inheritance. In extended entity-relationship models, the inheritance of attributes is only between subtypes, whereas behavioural inheritance of methods may occur between different types in the object model. It can however be seen that the extended entity-relationship model provides the conceptual basis for the object-oriented approach to database design.

Extended models which attempt to capture a greater degree of semantic information offer only slightly more semantic interpretation than the entity-relationship model, at the cost of reduced simplicity. It is therefore suggested that it is not beneficial to attempt to extend the entity-relationship model any further. Attempts to move away from entity-based models have had limited success, drawing upon concepts used in artificial intelligence. Examples include:

Semantic Net: This is a directed graph of entities and binary relationships between entities (Frost, 1986). A semantic net can represent events, membership of sets, statements and subset relationships.

Functional Data Model: This model developed by Shipman (1981) is based on the structure of a semantic net. Each object has a set of functions which may be applied to it. Functions may provide values or connect the object to other objects. It is related to the binary-relational model and binary relations may be added to the database after implementation. The main limitation of this model is that it can become very large and cluttered.

Resource Activity Diagram: This model was developed by Campbell (1992) to aid client-developer communication. The model is built using the concepts of business resource and business activity; a business resource is defined as the objects required for the organisation to operate; a business activity is a function of the organisation to produce the products or services supplied.

Frame: A frame is a data structure which represents an entity type (Frost, 1986). It consists of slots which can either contain a value or point to another frame. An advantage of a frame is that generic properties can be accommodated and default values included. This facilitates the grouping of assertions which allow stereo-type structures to be represented.

Digraph: This is a technique described by Carter *et al.* (1984) using a box and arrow notation to represent objects and the associations between them. The digraph is a good method for representing relationships that are at one level in a fully defined hierarchy.

Venn Diagrams: Using overlapping and concentric areas, this technique illustrates relationships of inclusion and facilitates the modelling of relationships at multiple levels (Carter *et al.*, 1984).

Cognitive Mapping: This technique is described by Eden *et al.* (1983) as a technique to portray ideas, values and the relationships between them. A key concept is first identified and aspects which influence this concept are modelled by the inclusion of contrast and similarity poles. Concepts can then be clustered to relate to areas of concern.

Attribute Maps: This may be considered as an extension of the cognitive mapping technique. The key concept is first identified, positive and negative attributes to the objects are then modelled (Eden *et al.*, 1983).

Although various semantic models may be proposed, the models are ultimately mapped onto a physical structure of files, records and fields. This may suggest that further progress in semantic modelling awaits revolutionary developments at the physical level.

Crockett *et al.* (1991) suggest the main problem in assessing conceptual data modelling techniques is the lack of a defined set of criteria for comparison. In response, they propose a set of twelve criteria with which to assess data modelling techniques. This section presents the criteria proposed by Crockett *et al.* (1991) and assesses the entity-relationship model against this criteria:

Logical Foundation: The model should be able to adequately describe concepts in the real world. A minimum set of constructs which a model needs to be able to represent includes objects, object classes, attributes, attribute instances, domains, events and relationships. The entity-relationship model does not explicitly support the modelling of attribute domains and does not model events.

Simplicity: As models are used as a communication medium, simplicity of the model is an important property. It is suggested that a simple model is one which contains a maximum of twenty well-defined constructs and controls redundancy. The entity-relationship model may be considered simple in terms of the number of constructs it uses. However, the constructs are not well defined. The model therefore contains a degree of subjectivity in that the same situation can be modelled differently and different interpretations may be derived from the model.

Semantic Enrichment: Conceptual models should aim to capture as much semantic meaning as possible in order to aid communication between all levels of the organisation. The degree of semantic content of the model also determines the correctness of the database application. Extensions to the entity-relationship model have been proposed in order to capture greater semantic detail in the model.

Evaluation of Design: External validity of a conceptual model compares the model with reality. Internal validity is the degree to which the data model adheres to the rules imposed by the technique. External validity needs to be performed by business users, however, it is unreasonable to expect users to review an entity-relationship model unless they have been actively involved in its development. Although the limited notation supports discussion of the model with users, entity modelling does not directly lend itself to user participation. Entity-relationship modelling includes limited rules for internal validity reviews. It is important that strict adherence to modelling rules does not distract from building a model which accurately reflects reality.

Support Synthesis of Multiple External Views: Conceptual models should facilitate the integration of user views, addressing inconsistencies such as homonyms, synonyms, aggregated attributes and computed attributes. It is suggested that walkthroughs of entity models, data dictionary support, domain and attribute typing can assist in the identification and resolution of, for example, homonyms. As an objective technique, entity-relationship modelling aims to support different user views, although compromises are sometimes necessary.

Capture Relationship Properties: It is suggested that capturing as much information concerning the relationships between objects as possible, improves the semantic content of the data model. Relationship properties to be modelled include, name, cardinality, existence dependency, subtypes, exclusivity and inherited attributes. The degree to which these properties are supported in the entity-relationship model, depends largely on the notation used. Subtype and exclusivity properties are not included in the basic entity-relationship model but are supported by extensions to the model.

Support Multiple Relationship Types: Five generic relationship types are identified as: generalisation, aggregation, binary, n-ary and recursive. It is again suggested that the ability of a data model to support these relationship types increases the semantic and communication abilities of the model. The generalisation relationship of the form 'is-a', is supported by the extended entity-relationship model by subtypes.

Support Domain Definition: An attribute domain specifies the range of permissible values which an attribute can possess, increasing the semantic expressiveness of the model. The entity-relationship model does not support domains directly, but data dictionaries and automated tools which document the model often include such features.

Support Stepwise Refinement: Conceptual models should support multiple levels of abstraction to allow users of the model to view the enterprise at the level of detail required. This is facilitated in the extended entity-relationship model which supports type hierarchies. Feldman & Miller (1986) propose a technique of entity model clustering which extends type hierarchies to support layers of abstraction, improving the usability of large diagrams.

Support State Transformations: The model should be able to support basic transformations such as create, delete and update objects. In addition, it should support more complex operations such as sequence, selection and iteration. The entity-relationship model is not directly supported by a data manipulation language, such transformations are dependent on the physical implementation of the model. It is however, possible to walkthrough transformations to ensure an access path for the update or query is supported by the model.

Easy Transferability to Implementation: A model should be algorithmically transferable to physical implementation with the minimum loss of semantic detail. It is suggested that the data model should be algorithmically transferable to a relational model and include logical constructs which use the same terminology as SQL. The entity-relationship model can be easily transferred to the relational data model.

Support Textual and Graphic Display: In order to aid communication it is considered necessary for a data model to be able to support both graphic and textual display. Graphic display is important during design and for communication, however, textual display increases the amount of semantic content in the model. One of the strengths of the entity-relationship model is its diagrammatic technique. However, it requires data dictionary support, particularly for entity definitions, in order to assist in the identification of homonyms and synonyms.

Crockett *et al.* (1991) also suggest that two fundamental, though intangible parameters should be included in the assessment of models:

simplicity and usability. These are tenuous concepts which are difficult to measure but affect the acceptance of the model in organisations.

Entity modelling has extended from a database design model to managing the organisation's information resource (Benyon & Skidmore, 1987; Meador, 1990; Lewis, 1993). Two factors have influenced the progression of data modelling from a technical to a business technique:

1. Recognition that the development of information systems should be driven by business requirements.
2. Progression of computer systems from supporting data processing tasks to management information systems.

It is further suggested that the conceptual model of the future will require the ability to model more complex objects required by more sophisticated commercial applications, (Engels *et al.*, 1992). As data analysis is used earlier in information systems development, it encounters social and political, as opposed to technical, problems (Lewis, 1993). Benyon & Skidmore (1987) suggest that it is impossible to classify data analysis as an analysis or a design tool. However, Meador (1990) suggests that richer models are required if data analysis is to be used for analysis of information systems requirements.

A model richer in semantic content is considered to be a closer representation of reality. The degree of semantic content required in a model is dependent on a number of factors, such as the purpose of the model. This correlates with the subjective value of information being dependent on, for example, the task being undertaken.

Batra *et al.* (1990) define the existence of a 'semantic' distance between a person and a model; an 'articulatory' distance between a model and the area of reality being represented. Semantic distance is concerned with the difference between the meaning of the model and the person's knowledge of reality. Articulatory distance is the difference between the abstraction of reality represented in the model and actual reality. Figure 2.2 illustrates these distances between a house, a model of a house and a cognitive model of a house. The goal of any model is to minimise cognitive effort. A 'good' model is therefore one which minimises both semantic and articulatory distance.

Semantic distance can be bridged by the preparation of rich models which minimise the scope for interpretation by the use of a clear notation, reducing cognitive effort. The articulatory distance can be reduced by balancing the degree of the complexity captured in a model against the abstraction required to support understanding and communication.

Reality, cognitive model and model of reality shown in figure 2.2 can be related to the three worlds defined by Popper (1968):

1. *Reality:* Physical environment of objects.
2. *Subjective view of reality:* Social environment of subjective experience.
3. *Models:* Knowledge of statements and theories.

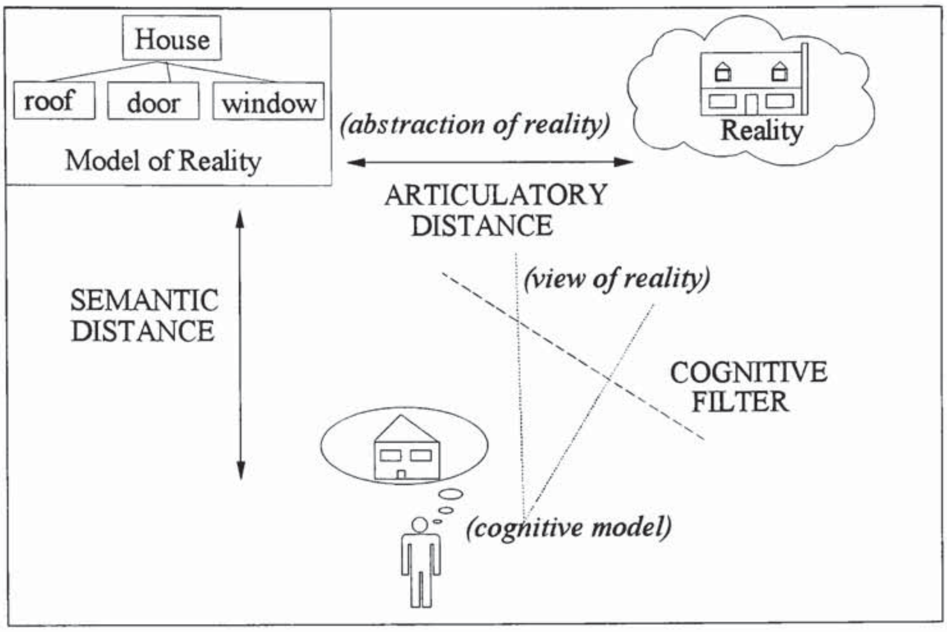

Figure 2.2: Semantic and Articulatory Distance

Tsichritzis & Lochovsky (1982) suggest that people-oriented modelling consists of two mappings. The first maps the real world into some basic human concepts that describe the application in a natural manner; this is called infological approach. The second maps the basic infological concepts into a corresponding datalogical representation. Awareness is required of the information 'lost' in translation between these mappings. This issue is further discussed later in the thesis.

The structured approach to information systems development operates at a single level of analysis (Lewis, 1994) only addressing the problem and not the nature of the intervention. Ellis (1995) identifies the following limitations of this approach:

1. Restricted to well-defined problems in which objectives are known and agreed.
2. Assumes power and conflict in the problem situation are irrelevant.
3. Difficult to model a pluralistic problem situation in which influence is endemic.
4. Assumes 'social facts' are objective.
5. Emphasises quantitative over qualitative measures.

Further limitations of this approach are highlighted in the following discussion of the organisational context of information systems.

2.1.6 Organisational Context of Information Systems

Information systems are not developed in isolation (Avgerou & Cornford, 1993) and the development of an information system must never become a goal in itself (Sol, 1992). Information systems development is part of the broader organisational context contributing to the attainment or non-attainment of the organisation's objectives. As information systems support organisations, information systems developers must understand the organisational context that the information system is to support by explicitly examining the purposeful activity the information system is to serve (Galliers, 1993a). This requires information systems to be viewed within the organisational context which gives them meaning (Checkland & Scholes, 1990; Howell, 1992).

Davies & Ledington (1991) encourage moving away from the view that information exists as an object that can be captured, capturing information cuts the object out of the context which gives it meaning. This separation of information from its context is proposed as being one cause of poor client-developer communication (Nielsen, 1982). The organisational context is a succession of situations to which actors respond (Suchman, 1987); purposeful action cannot be captured; it is an emergent property of interaction between actors and their environment.

Walsham (1991) reports different metaphors used to describe an organisation and examines how adopting a particular metaphor influences information systems development. For example the metaphor of an organisation as a:

1. *Machine:* ignores cultural issues and may lead to the development of inflexible and unacceptable information systems.
2. *Brain:* ignores cultural issues and self consciousness.
3. *Political system:* encourages systems development to analyse the impact of the information system on the work environment.
4. *Flux and transformation:* requires information to be collected that reflects the way in which the organisation is structured to view the world.

The premises of building engineering (Merritt, 1979) are that a building must be:

1. Constructed to serve a purpose.

2. Capable of withstanding normal usage for a reasonable period.
3. Aesthetically pleasing.

These premises are equally applicable to the development of an information system as an information system must:

1. Serve a purpose.
2. Endure normal usage for a reasonable period.
3. Be acceptable to the client.

In building engineering (Merritt, 1979) the owner or project sponsor, recognises the need for a building and then the goals, objectives, constraints and standards of the building development are established. Information systems development also begins with the informal perception of a need (Blum, 1994), rather than a statement of requirements. Systems development starts with the idea that organisational dysfunctionality exists and that information systems can contribute to reducing or eliminating the consequence of this dysfunctionality (Bento, 1994). Byrd *et al.* (1992) describe requirements analysis as including the following tasks:

1. Working with the clients to establish understanding of the organisational need.
2. Develop the objectives of the information system.
3. Define and evaluate alternative information systems.
4. Communicate results.
5. Perform a systems audit.

Gladden (1982) also emphasises the need to develop the objectives that the information system is to achieve as objectives are more stable than requirements with perceptions of a problem being subjective and change over time (Checkland, 1981).

Requirements are the difference between existing and desired conditions caused by a problem or opportunity (Valusek & Fryback, 1985); a problem is only a problem because people have objectives (Rock-Evans, 1992). This is illustrated in the following example from motorcycle speedway, the subject of action research discussed in chapter four. *[At the interval of the speedway meeting, the two teams have equal points. The first manager addresses his team and says, "We have a problem. What is going wrong? Our objective was to be at least six points in the lead at this point. Our objective is not being met. We have a problem". The second manager addresses his team and says, "We are doing well. Everything is fine. Our objective was to keep level with the other team and we have achieved it. Our objective is being met. We do not have a problem".]* Both teams are in the same position, but only one team perceives the situation as being a problem; this is because objectives are not being attained.

It is important to note that organisations do not have objectives, only people have objectives (Huse & Bowditch, 1973). Conflict is generated by the perception that others may interfere with the achievement of a person's objectives (Pinzón, 1993). Conflict must be solved, resolved or dissolved.

Suchman (1987) describes problem-solving as finding a path to a desired goal within certain conditions. The problem situation is the conditions and obstacles that obstruct progress to the goal. Some approaches act as if problem-solving was a mechanistic activity but understanding the problem requires involvement in a learning process (Davies & Ledington, 1991), information relevant to the problem situation emerges as the situation is explored. A successful methodology encourages participants to explore the potential implications of their actions (De Cindio *et al.*, 1982; Jayaratna, 1994). However, action to change the problem situation may be constrained by culture (Suchman, 1987), this is discussed in chapter three.

2.1.7 Soft Systems Approach to Information Systems Development

The objective reductionist approach to information systems development previously described, does not address the richness of the organisational context. In information systems development, soft issues such as ambitions, fears, opinions and values (Moyes, 1993) are important factors, although difficult to analyse. Problems belong to situations and are inseparable from them (Davies & Ledington, 1991); soft approaches to information systems development explore the richness and intricate complexity of the problem situation. In the Soft Systems Methodology (Checkland, 1981) analysis and understanding of the environment in which the problem lies leads to improvement (Episkopou & Wood-Harper, 1986). Checkland & Scholes (1990) recall:

> "What was found to be needed was a broad approach to examining problem situations in a way which would lead to decisions on action at the level of both 'what' and 'how'".

The Soft Systems Methodology assumes that both the definition of the problems and goals that the investigation aims to achieve are problematic (Ledington, 1992). The methodology is oriented to problem formulation, exploring the context of the situation, addressing the real world problems in all their richness (Checkland & Scholes, 1990). This contrasts to 'hard' approaches which are solution driven (Jayaratna, 1992).

The Soft Systems Methodology provides a means of exploring a complex situation without the imposition of rigid frameworks. It recognises the existence of subjectivity and encourages the exploration of different views of the situation. Examining differing aspects, opinions, objectives and beliefs which may prevail in the situation, leads to the formation of an 'integrated view', rather than the search for the 'objective' view of the problem domain. When the methodology is applied to information systems development it:

1. Recognises information systems development as an iterative learning process.
2. Embraces the systems paradigm to explore the emergent properties of information systems.
3. Provides soft tools to support the creative process of information systems development.

The essence of soft systems thinking (Checkland & Scholes, 1990) is that it:

> "Provides a coherent intellectual framework....as an *epistemology* which can be used to try to understand and intervene usefully in the rich and surprising flux of everyday situations".

Checkland (1981) originally described the Soft Systems Methodology in seven stages. Stage one is the unstructured problem situation and stage two is an expression of the problem situation. These initial stages attempt to establish a rich appreciation of the situation in which there is perceived to be a problem. Stages three and four leave the complexity of reality and enter a phase of systems thinking in which systems language is used to unravel the complexity of the real world. Stage three involves naming systems which may be relevant to the problem situation. The word 'weltanschauung', meaning world view, is used to reference a set of assumptions about the world which make a root definition meaningful and renders activities relevant to the situation (Checkland & Davies, 1986).

In stage four, conceptual models are constructed of the systems identified as potentially being relevant to the problem situation. These conceptual models are then taken into the real world in stage five, where they are compared with the perceptions of what exists in the real world. The purpose of this comparison is to generate debate in stage six, among people in the problem situation, in order to identify possible changes to the existing situation which are both desirable and feasible. This debate allows the implications of any changes proposed to be examined. In stage seven, agreed action is taken to improve the problem situation. These seven stages aim to create an open environment for learning and appreciating the richness of the problem situation (Davies & Ledington, 1991).

The seven stage model of the Soft Systems Methodology described, is criticised for implying that the methodology is a sequential process (Checkland & Scholes, 1990). Alternatively, the Soft Systems Methodology is portrayed as involving two basic streams of analysis, a logic-based stream of analysis and a stream of cultural analysis (Checkland & Scholes, 1990). This emphasises continual awareness of the cultural richness of the situation. In the seven stage model, cultural richness is 'lost' between stages one and two of the process.

The Soft Systems Methodology is doubly systemic (Checkland & Scholes, 1990): the process of investigation is a cyclical system of learning about the situation and system models are used to lead the debate. In contrast to the models used in 'hard' systems approaches, models in soft systems approaches do not attempt to accurately represent reality (Carter *et al.*, 1984). The soft systems approach acknowledges that reality can only be subjectively interpreted and that:

> "Any attempt to describe or model human action is inevitably a partial description which is only meaningful from a certain perspective" (Ledington, 1992).

Consequently, models are evaluated in terms of their perceived relevance to appreciating concerns in the situation. The Soft Systems Methodology belongs to the interpretivist perspective that reality is socially produced and cannot be understood independently of the actors that construct it (Howell, 1992). Hard approaches assume the analyst to be neutral, providing an objective view of the situation (Land, 1982), however, as a human being, an analyst possesses beliefs and values which affect their perception. Checkland (1981) therefore states that it is important to acknowledge the observer's relationship to the situation.

Ledington (1992) describes three modes of using the Soft Systems Methodology:

1. *Personal:* the user is the problem owner.
2. *Methodological transference:* an expert guides actors in using the methodology.
3. *Intervention:* the intervener assumes some degree of responsibility for the problem and seeks to bring change.

In a survey of twenty-five projects Kreher (1994) reported that the degree of intervention in a situation was a difficult issue. Intervention in a situation is discussed in chapter three.

Any account of a methodology describes an 'ideal' (Checkland & Scholes, 1990); applications of the Soft Systems Methodology have ranged from formal stage by stage applications called 'mode 1', to the internal method of Soft Systems Methodology in thinking mode, called 'mode 2'. The methodology evolves with each instance of its use (Atkinson, 1986), depending on context, use and users of the methodology. One of the main strengths of the Soft Systems Methodology is that it offers a means of organising and managing the learning process without imposing its own structure on the situation (Stowell *et al.*, 1991).

The initial stages of the Soft Systems Methodology, require a rich picture of the problem situation to be attained (Checkland, 1981). Despite the difficulty and importance of the initial stages, Checkland (1981) refutes arguments that more guidance is required. Checkland argues that guidance in these stages would reduce the methodology to being a technique with predictable results. In contrast, Tyrrell-Lewis (1994) offers a list of questions categorised under eleven headings to assist the attainment of a rich picture. These headings are objectives, visions, climate, decision-making, constraints, control, structures, data and processes, resources, weltanschauungen, change and variables.

The attainment of a rich picture, need not refer to a physical diagram (Lewis, 1992) although projects studied by Kreher (1994) demonstrated that rich pictures brought order to discussions and aided communication. A criticism of rich pictures as physical diagrams is that people may be apprehensive of drawing (Moyes, 1993). This is refuted by Checkland & Scholes (1990) who claim that skill in drawing is not essential. An alternative opinion is that the lack of automated drawing tools reduces the commercial adoption of the Soft Systems Methodology (Avison *et al.,* (1992). Example automated tools proposed include SSMITS (Soft Systems Methodology Integrated Toolset, Avison *et al.*, 1992) and SSAMT (Soft Systems Analysis and Modelling Tool, Davenport & Ayers-Hunt, 1995). In addition, an expert system has been developed to aid teaching of the methodology (Stowell *et al.*, 1991). The main criticism of automated support is that the rich pictures produced are clinical, lacking expression (Stowell *et al.*, 1991).

Research in tool support for the Soft Systems Methodology has raised a further debate concerning the use of standard symbols for constructing rich pictures. Moyes (1993) proposes a mapping and road sign based method which uses pre-printed symbols, replacing the need for drawing. Hirschheim (1988) states the lack of a fixed set of symbols, results in diagrams which are only meaningful to their creator. In reply, Lewis (1994) points out that as a team works together in a problem situation, standard symbols are not needed. Indeed, Hirschheim (1988) agrees that non-standard symbols permit a degree of intuitive support which is not possible in formal techniques. Lewis (1994) concludes that the use of standard symbols would result in unexciting, over simplistic diagrams which may be subject to misinterpretation by excessive use. Each application should find meaningful symbols with which to convey the feelings and interpretations of the situation (Checkland & Scholes, 1990; Lewis, 1994).

The richness of a rich picture diagram is derived from the level of coding at which it operates. Pictures operate at a lower level of coding than verbal descriptions and are therefore richer in information (Boisot, 1994). Rich pictures are described as being 'cartoon-like'; a cartoon is half-way between a picture and a photograph, selecting key features and depicting them with summary lines (Boisot, 1994). A cartoon gains its impact from the fact that the original is known and can be recognised; this is also true of rich pictures. The actors in the situation are aware of their environment and can recognise an expression of that environment in a rich picture.

A number of difficulties with the Soft Systems Methodology have been highlighted by various authors. There are two major weaknesses. Firstly, it is difficult to identify information categories from activity models (Checkland, 1992; Howell, 1992); this is addressed by interpretative forms of data analysis. Secondly, there is a gap between the outcome of the Soft Systems Methodology and standard approaches to information systems development (Curtis, 1989; Checkland, 1992). These weaknesses are discussed in the following section. Further difficulties of the Soft Systems Methodology identified include:

1. The rich picture representation of the problem situation is dependent on the skills of the analyst (Brown, 1992).
2. Progression between the stages is not formalised (Ledington, 1992).
3. There is a lack of credibility to explain power and conflict (Ellis, 1995).
4. There is a lack of rules for data collection and analysis (Brown, 1992). A trial and error approach is used to identify what may be relevant (Ledington, 1992).
5. No clear theory of organisational change (Ellis, 1995).

Within the Soft Systems Methodology, differences in perception are explored, discussion and debate will then lead to changes which are both desirable and feasible (Lewis, 1992). Jackson (1982) argues that the methodology maintains the status quo by ensuring proposals for change support the weltanschauung of the situation. This may not necessarily be a weakness of the Soft Systems Methodology as it ensures that the proposed changes are acceptable and are not in contention with the organisational culture.

In reply, Checkland (1982) argues that the learning which emerges from using the methodology may identify the need for radical or conservative change. The strength of the Soft Systems Methodology is that cultural analysis highlights the potential impact of changes proposed, permitting discussion of the implications arising from the changes proposed.

Davies & Ledington (1988) also explore the problem of convergent thinking when defining relevant systems. In order to overcome this, Davies & Ledington propose the use of creative techniques and metaphors to stimulate creative thinking. Kartowisastro & Kijima (1994) modify the Soft Systems Methodology for situations in eastern culture where direct debate is replaced by indirect debate. This entails group questions and answer sessions on the conceptual model and root definitions.

2.1.8 Debate in Information Systems Development

The debate in information systems development concerns whether 'hard' and 'soft' approaches to information systems development can or should be linked. Doyle *et al.* (1993) suggest:

> "The development of information systems is a purposeful activity which requires an understanding of both objective and subjective issues and ought therefore to make use of appropriate perspectives, models and frameworks, tools and techniques".

However, this view has some critics. The basis for this debate is that: the Soft Systems Methodology is appropriate for the initial problem-structuring phase of systems development; methodologies adopting the science paradigm are more appropriate to the later stages of development. The underlying issue is whether the diverse science and systems approaches to information systems development can or should be linked.

One view is that as methods are based on differing philosophies, synthesis is not possible (Probert, 1992). Table 2.1 summarises some of the differences between the continuous learning approach of the Soft Systems Methodology and the engineering approach of 'hard' science-based methods.

Basis for Comparison	Continuous Learning	Engineering
Systems View	Emergent	Reductionist
World View	Subjective	Objective
Context	Dependent	Independent
Aim	Improvement	Solution
Role of Developer	Participant	Observer
Framework	Iterative	Linear
Problem Definition	Vague	Precise
Process	Flexible and Systemic	Strict and Systematic
Client Role	Active	Passive
Concepts	Unrestricted	Restricted
Models	Informal	Formal
Automation	Discouraged	Encouraged
Type of Problem	Unstructured	Structured
Scope	Unlimited	Limited
Recommendations	People / Organisational Change	Information Systems
Improvement	Application	Version
Report of Failure	No	Yes
Solution	Creative	Standard
Documentation	Free Form	Prescribed
Cultural Analysis	Rich	Sparse
Change	Agreed	Imposed
Template	Guides Process	Frames View
Management	By Consensus	Formal
Approach	Reflective	Clinical
Disciplines	Social	Science
Training	Guidance	Course
Acceptance	Cautious	Wide Spread
Location	Organisational	Development
Climate	Anticipation	Fear
Ability to Participate	Willing	Unwilling

Table 2.1: Comparison of Learning and Engineering Approaches to Information Systems Development

An alternative view is that the methods are not exclusive but complementary approaches to information systems development (Checkland, 1992; Jayaratna, 1992). Mingers (1992) reports on a number of methods which have been proposed to integrate science and systems approaches to information systems development:

1. Standard Lancaster Method (Wilson, 1990).
2. Front-ending the Soft Systems Methodology onto structured design methods (Prior, 1992). This extends structured methods into

problem formulation but sacrifices the systemic nature of the Soft Systems Methodology.

3. Embedding science-based methods with the Soft Systems Methodology (Miles, 1988, 1992). Hard and soft approaches are used as appropriate during the systems development. This does not dilute the effectiveness of soft approaches (Doyle & Wood, 1991) but allows appropriate approaches to be adopted when required (Miles, 1988).
4. Multiview (Avison & Wood-Harper, 1990).

Other approaches which propose the integration of the Soft Systems Methodology with specific methods include linking it with:

1. A data focused approach (Lewis, 1993).
2. Jackson Systems Development (Doyle *et al.*, 1993).
3. Beer's viable systems model (Yu, 1993).
4. Grounded theory (Brown, 1992).
5. The Japanese KJ creative problem solving methodology (Senoh, 1990).
6. Object-oriented analysis (Dobbin & Bustard, 1994).

Many authors support the use of the Soft Systems Methodology as a precursor to 'hard' systems development approaches: Lewis (1993) proposes that the Soft Systems Methodology is a signal for information systems development; Miles (1988) suggests that as soft systems approaches address situations in which the definition of goals is problematic, hard and soft systems complement one another; Checkland (1992) recognises that learning of how people perceive the situation in the Soft Systems Methodology is important in conventional information systems development; the soft systems approach complements other approaches (Wood-Harper & Fitzgerald, 1982; Episkopou & Wood-Harper, 1986).

An alternative view is that as hard and soft approaches are based on conflicting epistemologies, the approaches are incompatible. For example, Doyle & Wood (1991) illustrate that science and systems-based approaches are not compatible at epistemological, methodological or technique levels. Jayaratna (1992) criticises the proposal of the Soft Systems Methodology as a precursor to hard systems development on the grounds that the benefits of the soft approach are lost in the transition.

Doyle *et al.* (1993) suggest that the Soft Systems Methodology can be augmented with structured techniques. This is supported by Jayaratna (1992) who advocates that structured techniques, graphs, formula and animation could be incorporated into a rich picture. In contrast, Doyle *et al.* (1993) argue that structured approaches cannot be augmented with the Soft Systems Methodology as this would reduce the Soft Systems Methodology to tools within a highly defined cycle. An example of the Soft Systems Methodology augmented with a structured technique is interpretative data analysis (Lewis, 1993, 1994).

Data is intrinsically meaningless, only becoming information when it is invested with meaning by people (Mingers, 1988). It is suggested that linking data modelling to the Soft Systems Methodology provides an effective means of linking the Soft Systems Methodology to data analysis (Miles, 1988). Lewis (1993) recognises that little work has been done to integrate the Soft Systems Methodology with data-focused approaches. However, as information is concerned with interpretation, data analysis can follow the learning process of the Soft Systems Methodology (Checkland, 1981; Davies & Ledington, 1991; Gregory, 1993).

Hitchman & Bennetts (1994) recognise that all data modelling implies interpretation which is explored by Lewis (1993, 1994) who has developed an interpretative form of data analysis to support conceptual models in the Soft Systems Methodology. The boundary of weltanschauung is used to replace the objective view which other forms of data analysis attempt to capture. This recognises that relevant systems are only meaningful with respect to a set of cognitive categories. By agreeing meaning and defining the categories, a data model is prepared to complement the conceptual model in the Soft Systems Methodology.

Hard systems thinking needs to be extended by soft systems approaches (Checkland, 1985) but work is still needed to forge this link (Checkland, 1992). Mingers (1992) argues that a way is required of combining approaches without compromising either. The issue of uniting the hard:soft division has been addressed by von Oech (1982), who differentiates between soft and hard thinking. Soft thinking seeks similarities and connections among items; hard thinking focuses on the differences between items. von Oech suggests the creative process of developing new ideas consists of a germinal phase and a practical phase.

Soft thinking is appropriate in the germinal phase when searching for new ideas; hard thinking is appropriate in the practical phase when evaluating ideas and preparing to take action. von Oech illustrates that both hard and soft approaches have their place and problems may arise if an approach is used inappropriately. For example, an over reliance on logical tools too early in the creative process can prematurely narrow thinking; soft thinking in the practical phase can hinder the execution of an idea.

This view may be applied to the process of developing information systems: the germinal phase of information systems development involves the identification of information requirements; the practical phase of systems development involves the design and construction of information systems. It follows that soft approaches are needed in the earlier stages of systems development and hard approaches are needed in the latter stages of design.

2.1.9 Summary of Themes in Information Systems Development

This section has recognised that human beings form an intrinsic part of information systems, as it is the subjective nature of humans which attributes meaning to data in a particular situation. The development of information systems is further complicated by the introduction of a group of people to develop an information system to be used by another group of people, with differing experience and values. The inherent complexity of the development task has been examined by a number of schools briefly outlined in section 2.1.3.

The structured approach to information systems development has risen to prominence, attempting to simplify complexity by the systematic formation of objective models with which to capture reality. This reductionist approach, although logically appealing, has failed to deliver appropriate information systems to meet the requirements of the human component of the information system. The failing of systematic approaches has led to increasing interest in systemic approaches, which can accommodate the subjective nature of information systems.

The question whether systematic approaches founded in the science paradigm and systemic approaches founded in the systems paradigm are exclusive or complementary, is the subject of much academic debate. This research asserts that the systematic:systemic debate is equivalent to hard thinking:soft thinking which has concluded that each approach is not 'right' or 'wrong' but that each offers a valid contribution to a problem situation. It is proposed that the combined application of systematic and systemic approaches enriches the analysis and design of information systems.

2.2 THEMES IN INFORMATION SYSTEMS STRATEGIC PLANNING

Recognition of information as a strategic resource implies a need to align information systems with corporate strategy (Rockart & Crescenzi, 1984).

Successful information systems planning is becoming a key determinant in the ability of a company to survive (Agarwal *et al.,* 1994). The objective of information systems planning is to match information systems resources to organisational objectives (Adriaans, 1993). This is achieved by analysing elements of the corporate strategy within the context of the potential contribution of information systems.

The information systems resource can assist an organisation to establish and maintain competitive advantage. Information systems can change both the product or service provided by the company, and the manner in which the company competes in its industry (Ives & Learmonth, 1984).

Parsons (1983) identifies six main areas in which information systems can contribute to establishing competitive advantages. These areas are:

1. Increasing the cost for a customer to switch suppliers.
2. Reducing dependence on a single supplier by reducing the cost of switching suppliers.
3. Supporting product innovation.
4. Sharing information and information technology with rivals.
5. Reducing production and distribution costs.
6. Gaining greater appreciation of customer base.

Although Parsons emphasises the role of information technology for competitive advantage, information and information systems can also contribute to the same areas. Information technology is the means for communicating information, supporting the implementation of information systems for strategic advantage.

Earl (1993) conducted a study to examine the intent, outcome and efforts of strategic information systems planning. The study revealed that organisations differ in their objectives of strategic information systems planning which in addition to aligning information systems with business needs, include to: seek competitive advantage from information technology; gain top management commitment; forecast information systems resource requirements; establish technological direction and policies.

A spectrum of information systems planning is identified by Wysocki & Young (1990) who differentiate between:

1. *Stand-alone planning:* either a corporate plan or an information systems plan is prepared.
2. *Reactive planning:* information systems plan is prepared to support the corporate plan.

3. *Linked planning:* information systems are matched to organisational needs.
4. *Integrated planning:* corporate and information systems plans are prepared interactively.

Integrated planning recognises that in addition to supporting corporate objectives, information systems planning can also influence corporate objectives (Barlow, 1990). Planning information systems in isolation from organisational strategy (stand-alone planning) can lead to the development of systems which do not fully serve the needs of the organisation. If information systems professionals are not involved during the formation of corporate strategy (stand-alone planning, reactive planning, linked planning), major information-based opportunities and threats may be overlooked (Martin, 1989).

Integrated planning therefore requires analysing corporate strategy in the context of information systems (Premkumar & King, 1991) and analysing information systems in the context of corporate strategy (Piercy, 1991). The strategic alignment of information systems development to provide continued support to the attainment of corporate objectives requires integration of corporate planning and information systems planning.

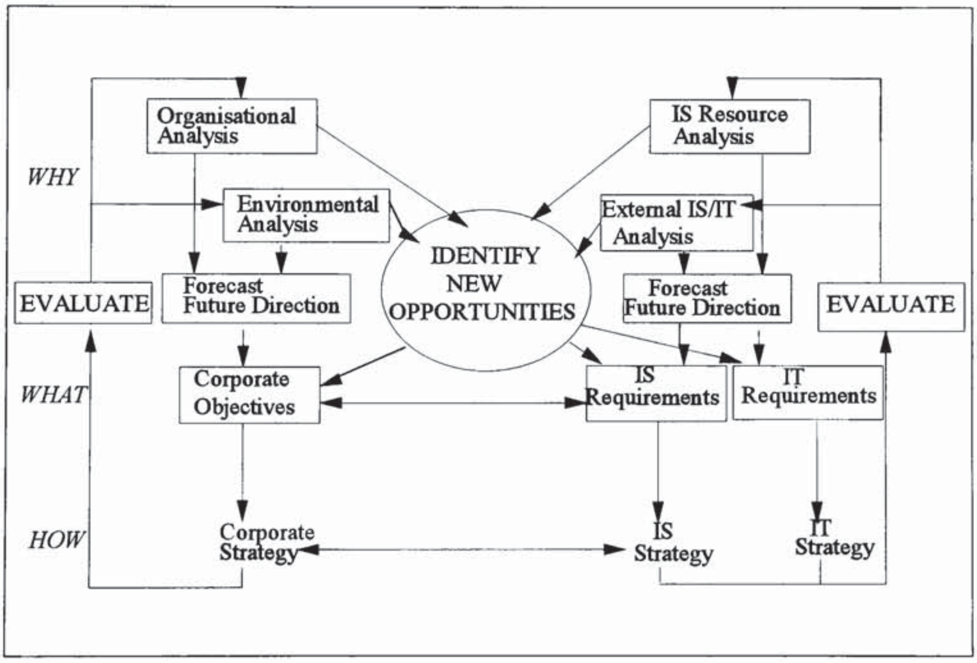

Figure 2.3: Corporate Planning and Information Systems Planning

Figure 2.3 shows that the formation of an information systems strategy follows a similar path to the formation of corporate strategy, to be discussed later in chapter 2.3. The future direction and vision of the organisation is forecast, following an internal analysis of the organisation and an external analysis of its environment. Achievable, measurable objectives are defined and communicated to pursue the forecast vision of the organisation. The means to attaining these objectives is then planned. As the internal and external environments change, continual reappraisal is required to adapt to evolving threats and opportunities. This section examines attempts to integrate corporate and information systems planning illustrated in figure 2.3.

Premkumar & King (1991) surveyed the use of information systems planning methods in 240 companies. The results of the survey revealed that 12% of companies favour Information Engineering; 8% of companies use Business Systems Planning; 6% adopt Value Chain Analysis; 6% apply Critical Success Factor Analysis; 13% use other methods with 55% of companies following proprietary methods. These and other information systems planning methods are compared in this section.

2.2.1 Appraisal Criteria for Information Systems Strategic Planning Approaches

Before comparing approaches to information systems planning it is first necessary to establish the criteria for comparison. Some of the difficulties encountered when comparing methodologies were discussed in section 2.1.2. Avison & Fitzgerald (1988) suggest that it is meaningless to compare methodologies without stating the purpose of the comparison; the purpose of comparing approaches to information systems planning in this section is to satisfy the objectives of the research stated in section 1.2.3. The comparison seeks to identify significant characteristics to be included or avoided in information systems planning approaches.

Although Boynton & Zmud (1987) compare strategic information systems planning approaches against eleven planning behaviours, the six phase approach for comparing methodologies proposed by Avison & Fitzgerald (1988) was chosen to provide the foundation for the comparative base used in this section. The rationale for this decision was that the six phases:

1. Provide an adequate level of detail to provide an overview of the different approaches available.
2. Encompass a broad range of comparative features.
3. May be extended to meet the particular requirements of comparing approaches to information systems planning.
4. Are sufficiently broad to be applicable to a range of differing approaches and encompass the restricted availability of information without compromising the results of the comparison.

The six phases forming the basis for comparing approaches are:

Philosophy: The basic philosophy embraced by a methodology forms the foundation for the approach and techniques incorporated in the methodology. Four elements are examined: paradigm, objectives, domain and application target. Omerod (1993) classifies methodologies as being either data or decision-oriented; data-oriented methodologies focus on the data needed to support the organisation; decision-oriented methodologies identify the critical tasks and opportunities in the organisation. Dantzig (1990) identifies three approaches to information systems planning: demand-driven, data-driven and retrospective analysis methods:

1. Demand-driven approaches are based on methods to assess the return on investment of an information systems development; projects are selected which offer the maximum rate of return.
2. Data-driven approaches rely on the development of a comprehensive corporate data model.
3. Retrospective analysis methods evaluate the effectiveness of the current information systems provision and analyse opportunities to improve the service provided.

Models: Models are fundamental to strategy formulation and information systems development as a means of analysis and communication. Structured models dictate the aspects of reality which are observed and captured in the approach. Examination of the models used in a methodology therefore reveals the aspects of the world which are regarded relevant by the approach.

Tools and Techniques: Methodologies differ in the combination and application of tools and techniques recommended. The aim of this research is to improve the strategic alignment of information systems development. An overview of the combination of tools and techniques used in current approaches is important in meeting this aim.

Scope: Information systems development methodologies differ in the range of stages of the information systems development process addressed. In this comparison, scope refers to the coverage of stages in the formation of corporate strategy, information systems planning and information systems development addressed by the information systems planning method. Figure 2.3 will be used to form a comparative base with which to examine the scope of information systems planning approaches. Reviewing the scope of each approach will indicate key differences in the process prescribed by different approaches.

Outputs: The deliverables from an approach are important, providing tangible evidence that a phase of the approach has been completed. In addition, the outputs of the approach indicate whether the objectives have been achieved.

Practice: For commercial organisations it is important to examine the practical requirements of using the approach. This includes details of the personnel involved; the skills required; specific requirements of the approach; time-scales for conducting the study; time-scales for repeating the process.

For the purpose of this research, two phases have been added to the comparative framework of Avison & Fitzgerald (1988) for the comparison of information systems planning approaches. These are:

Integration: This focuses on the relationship between the corporate strategy and the information systems strategy using the spectrum of information systems planning of Wysocki & Young (1990).

Strengths and Weaknesses: This research aims to build upon existing strengths and overcome weaknesses in current approaches. The perceived strengths and weaknesses of each approach are therefore important. This criteria examines the strengths of the approach cited by proponents of the approach and explores observed and cited criticisms.

Further justification for using this comparison criteria is that it encompasses various forms of categorisation proposed by other researchers. For example, Galliers (1991b) categorises strategic information systems planning approaches as being business or technology-focused; strategic or issue-based; reactive or proactive. These categories are explored under the headings of philosophy, objectives and integration, used in section 2.2.3. Earl (1993) categorises strategic information systems planning approaches as being business-led, method-driven, administrative approach, technological approach or organisational approach. The above criteria embeds all of these categories:

1. The *business-led* approach to strategic information systems planning suggests that the business plan drives strategic information systems planning; this is examined in terms of whether the approach adopts a stand-alone, linked, reactive or integrated degree of integration.
2. The *method-driven* approach suggests that strategic information systems planning requires a formal method; this is examined through the criteria of philosophy, method and practice.
3. The *administrative* approach proposes formal procedures for resource allocation which is examined in the techniques and practice criteria of the evaluation.

4. The *technological* approach supports the use of information systems-oriented models of the business; this is examined with the criteria of models, techniques and outputs.
5. The *organisational* approach proposes continuous integration of information systems in an organisation, supporting organisational learning; this is examined under the headings of philosophy and practice.

Flynn & Arce (1995) criticise evaluation frameworks for comparing approaches to strategic information systems planning (Boynton & Zmud, 1987; Lederer & Sethi, 1988; Earl, 1989) which examine approaches at too high a level, failing to explore the full nature of the approaches. In contrast, Flynn & Arce propose a four stage comparative framework consisting of direction, outputs, inputs and management. Each of these stages has been addressed in the extended form of Avison & Fitzgerald's (1988) criteria adopted in this section. In addition, the comparative basis used in this research attempts to explore the depth of strategic alignment by examining the coverage of the stages of strategic planning, information systems planning and information systems development, and the integration between these stages.

2.2.2 Appraisal of Information Systems Strategic Planning Approaches

The following methodologies and frameworks have been compared against the criteria outlined in the previous section, where information has been available:

1. Business Process Reengineering.
2. Information Architectures.
3. Lee & Gough's Approach.
4. Emberton & Mann's Methodology.
5. Strategic Alignment Models.
6. Critical Success Factor Analysis.
7. Information Engineering.
8. Business Systems Planning.
9. Business Systems Development Method.

The purpose of this section is not to describe the different approaches but to compare key aspects of the differing approaches which may affect their application. Appendix two details the result of these comparisons.

Business Process Reengineering

Business process reengineering was defined by Hammer (1990) as the use of information technology to redesign business programmes. It may therefore be considered to be a broad approach to information systems strategic planning. However, information technology is not a mandatory component of business process reengineering (Hammer & Champy, 1993) as business processes existed and evolved prior to computerisation (Teng *et al.*, 1994).

Two main themes in business process reengineering are radical change and change across functional boundaries in an organisation (van Ackere *et al.*, 1993). Dixon *et al.* (1994) compare business process reengineering with a programme of continuous improvement; business process reengineering involves a radical change of direction which then evolves through continuous improvement. The impetus for the radical change may be reactive or proactive; reactive in that a real or perceived crisis may instigate dramatic organisational, cultural and technological change; or proactive in that the difference between future and current capabilities of the organisation may be too great and therefore radical change may be needed to realise the strategic vision.

Teng *et al.* (1994) define business process reengineering as:

> "The critical analysis and radical redesign of existing business processes to achieve breakthrough improvements in performance measures".

Business process reengineering may assist an organisation to reduce costs, improve competitiveness and increase productivity. As it is capable of achieving 'breakthrough performance', business process reengineering should be approached strategically (Teng *et al.*, 1994). Direct management in business process reengineering is also needed as a radical change in the strategic direction of the organisation may be required (Dixon *et al.*, 1994).

van Ackere *et al.* (1993) identify three critical issues for business process reengineering. Firstly, an understanding and evaluation of present business processes is necessary. Techniques such as value chain analysis (discussed in chapter 2.3) can assist in the identification and analysis of business processes. Secondly, each aspect of the process needs to be questioned. Dixon *et al.* (1994) recognise that business process reengineering is most successful when it adopts a strong customer focus. The customer resource life-cycle (discussed in chapter 2.3) can assist in establishing both current and future customer needs by examining customer processes. Thirdly, creativity is required to derive new business processes.

Teng *et al.* (1994) identify two dimensions of business processes, the degree of mediation and the degree of collaboration; the degree of mediation of a business process refers to the number of steps involved in the process; the degree of collaboration refers to the exchange of information between parties during the process. The aim of a new process is to reduce both of these dimensions.

Information technology may adopt a facilitating role in process redesign (Teng *et al.,* 1994) increasing flexibility, improving communication and integrating the organisation (Dixon *et al.,* 1994). However, it is important to recognise that the goal of business process reengineering moves beyond maximising existing information technology (van Ackere *et al.,* 1993).

Three features of business process reengineering are project management, team building and benchmarking (Dixon *et al.,* 1994):

Project Management: Reengineering projects require visionary leadership to prevent haphazard changes (Teng *et al.,* 1994), ensuring changes are channelled towards the same strategic direction. Project management must balance rigorous risk analysis, mandatory to radical change, with the creativity required for innovation. Due to the radical nature of the reengineering projects, project duration and goals are often unspecified. Business process reengineering changes the direction of the organisation, continuous improvement is then undertaken to keep the organisation on the desired course. Reengineering projects therefore do not end but dilute into streams of continuous improvement.

Team Building: The potential specification of radical change across functional boundaries during business process reengineering requires a project team which crosses functional and hierarchical divides. The long duration of reengineering projects restricts membership of the reengineering team to the duration that an individual's expertise is required. This restriction promotes continuous participation within the team. In contrast to structured approaches of strategy formation which separate strategy formation from strategy implementation, reengineering project teams are involved in both the design and implementation of business process reengineering. This encourages the trust, commitment and communication needed for successful implementation of radical change. Business process reengineering is described as translating the organisation's change of direction into action, adopting a systemic approach:

> "Strategy is developed across functions right from the start so the firm can function as a whole rather than as the sum of its parts" (Dixon *et al.,* 1994).

Benchmarking: This is a method of comparing critical processes in a company with those of more successful competitors (Williamson, 1993) establishing targets for which the organisation may aim and surpass.

Benchmarking discovers the elements which can make a difference to the organisation and establishes standards for these elements; facilitating the sharing of knowledge and experience, preventing complacency. It requires determining current measures, identifying which companies are superior and then establishing targets for improvement. Benchmarking differs from total quality management; total quality management focuses on areas within the organisation that can be improved; benchmarking compares practices with other companies.

Business process reengineering adopts a decision-oriented approach to information systems planning, matching information systems resources to corporate objectives. Retrospective analysis of current information systems may need to be conducted to determine the current level of information systems support to corporate benchmarks, however, a weakness of this approach is that the competitive direction of the organisation is not considered.

Information Architectures

An information architecture is a high level map of the information requirements of an organisation. It shows how information categories relate to business processes and how information categories are connected. The architecture provides a guide for information systems development, becoming more critical as information systems development is decentralised (Brancheau & Wetherbe, 1987).

The benefits of this approach include management involvement, improved understanding of business processes and a systematic approach to the analysis of information requirements.

Dantzig (1990) criticises the use of information architecture for information systems planning and suggests that:

> "Data-driven IS planning should instead be viewed by management as a valuable *implementation tool* required for the development of large integrated systems and to be used after the strategic planning process".

In contrast, Galliers (1992, 1993b) emphasises the development of an information architecture, as opposed to the development of specific information systems. This is based on the concern that information systems will require continuous modification whereas the information architecture will remain stable. A number of practical difficulties encountered by companies which have attempted to build an information architecture are reported by Kim & Everest (1994). These difficulties include, unrealistic scope, unmaintainable output and only short-term commitment to the study.

Lewis (1994) suggests that data-oriented approaches view data rather than information as the corporate resource, leading to the development of data systems as opposed to information systems. The first stage of data-oriented methodologies identifies the entities which are important to the organisation. However, relevant entities cannot be identified without examining the cognitive frameworks which identify entities as meaningful in the situation (Lewis, 1994; Leifer *et al.*, 1994; Orlikowski & Gash, 1994). Further criticisms of this approach are summarised in appendix two.

Lee & Gough's Approach

Lee & Gough (1993) propose an integrated framework for information systems planning. The philosophy underlying the framework is that in order to improve the effectiveness of information systems planning, the framework needs to address socio-technical problems. The framework is cyclical supporting organisational learning, first activating business change and then pursuing strategic value. The framework consists of five phases:

Perception Phase: The aim of this initial phase is to create a proactive environment which recognises the value of information systems. This is achieved through individual and group learning sessions co-ordinated by a facilitator. During these sessions, four areas are explored. Firstly, the organisation is analysed in terms of its mission, goals, strategies and structure. The strategic opportunities offered by information systems are then considered. The seven S's (Waterman Jr. *et al.*, 1992) are explored before finally, the session concludes with a review. Lee & Gough suggest that the implementation of the resulting plan is enhanced by this learning process.

Evaluation Phase: In this phase, current business problems are explored and the strategic value of existing information systems is assessed. Tools used in this phase include critical success factor analysis, systems audit grid and analysis of business function chains.

Selection Phase: Information systems developments are prioritised in this phase based on their strategic value and the organisational needs. Information documented in previous phases is used to assist in prioritising information systems.

Construction Phase: This phase aims to produce a set of preliminary information systems plans to link information systems developments with the business strategy.

Review Phase: The effectiveness of information systems planning is assessed in this phase using a multi-dimensional approach which evaluates the achievement of the plan, and the role and impact of individual systems developed.

The scope of this approach ranges from strategic analysis to information systems planning but the approach does not address the integration of information systems planning and information systems development. The deliverable from the approach is an action plan which is later supported by a review procedure to assess the effectiveness of its implementation.

This approach was applied by three sets of stakeholders in an organisation, top managers, senior staff and information systems professionals. Following the application of this approach, it is stated that users became more proactive and information systems developments were seen to be initiated by business change.

A weakness of this approach is that information derived during the construction of the information systems plan is not used for the development of the systems identified. Although it is suggested that the approach allows information systems to be seen to be derived from business change, it is not clear how this is actually achieved. Furthermore, strategic analysis is focused on the learning sessions in the early stages of the framework. Many of the strategic analysis, evaluation and implementation methods discussed in section 2.3 are not incorporated into this approach. Little attention is given to environmental analysis and future forecasting to assess the long-term direction of the organisation in its competitive environment.

Emberton & Mann's Methodology

Emberton & Mann (1988) propose a methodology based on the view that the techniques used should be consistent at all levels of the process. A systematic approach is proposed which reviews current and projected future information needs. The methodology consists of five stages:

Corporate Analysis: Structured interviews are conducted with senior managers to review the organisation. The deliverables from this stage are a business functional model, a corporate data model, a statement of the organisational objectives, critical success factors and key business issues.

Technical Strategy Formation: In this stage a usage matrix is prepared which maps entities in the corporate model to candidate computer systems identified in corporate analysis. The matrix is used to quantify technical priorities and form the strategic systems portfolio.

Evaluation: The candidate systems are prioritised in this phase in terms of key business issues which they address. This stage involves risk analysis to establish the risk involved in both developing and not developing the systems identified.

Strategy Development: This stage produces a detailed information systems plan in terms of manpower and capacity planning.

Report Production: This stage brings together the deliverables from the study to ensure conclusions are supported. The deliverables include a corporate data model, a corporate business model, critical success factors, business benefits, technical priorities, technology strategy, subject databases, manpower plans and a development schedule.

Benefits cited for this methodology are that the deliverables are easily understood by non-technical management and that the documentation is maintained during the implementation of the plan. A weakness of this methodology is that there is no direct link between corporate strategy and information systems strategy. In addition, the methodology lacks analysis of the environment and the strategic direction of the organisation.

Strategic Alignment Model

A number of strategic alignment models have been proposed:

Burn (1993) proposes a strategic alignment model which aims to align the formulation of information systems strategy with the organisational strategy using a two phase framework; phase 1: organisational alignment phase; phase 2: information systems alignment phase; each of which are supported by strategic analysis techniques. The model focuses on the need to align organisational and information systems planning styles.

The framework supports the development of an audit portfolio, focusing on the selection of strategies for information systems planning appropriate to the stage of information systems growth in the organisation. The strength of this approach is that it recognises the contribution of strategic analysis techniques for information systems strategic planning.

Liang & Tang (1992) propose a competition-oriented approach to analyse the potential competitive advantage of strategic information systems. This approach enhances traditional cost-benefit analysis for evaluating and justifying the development of strategic information systems.

Liang & Tang propose a framework 'value-advantage-risk' which evaluates strategic information systems against three dimensions; the potential value of the system; the extent to which the system may contribute to attaining competitive advantage; the risks associated with the project. The framework requires future events to be predicted, the reliability of results from this framework is questioned due to the many uncertainties involved. However, it is suggested that over time, organisations can learn and adapt from previous experience by comparing predictions against reality.

Mehrez *et al.* (1993) propose a methodology for the design and selection of information systems based on multiattribute theory. The methodology consists of the following main stages:

1. Definition of the organisational objectives mapped to business processes.
2. Translate organisational objectives into computer-related goals.
3. Identify alternative information systems processes for each computer-related goal.
4. Identification and selection of information system.
5. Prepare information system proposal.

This methodology assumes the prior existence of a corporate strategic plan which defines the organisational goals. It neglects the potential contribution of information systems and information technology to establishing and sustaining competitive advantage, adopting a reactive approach to information systems planning. A formal process is proposed for defining systems to meet corporate objectives. This mechanistic approach neglects the softer, creative issues which are associated with corporate strategy.

Critical Success Factor Analysis

Rockart (1979) recognised that the information needs of senior managers were not as clearly defined as the needs of functional managers. In response to this difficulty, Rockart proposed an approach which identifies the information needs of senior management by defining the indicators for factors which are essential to the survival of the organisation. Executives are interviewed for between three and six hours, focusing on the current information needs of individual executives based on the success factors principle. As humans can only perceive bounded rationality, the identification of critical success factors through interviews is influenced by the human ability to evaluate probability and causality, in addition to suffering the biasing effect of available data (Raghunathan *et al.,* 1989). There are four main sources of critical success factors: the structure of the specific industry; the competitive strategy of the organisation; environmental factors and temporal factors. The critical success factor approach helps managers to determine the key indicators on which they need to focus; develop measures for these factors and define the information to be collected to monitor these factors.

Boynton & Zmud (1984) suggest that as critical success factor analysis identifies the key areas that dictate organisational success, critical success factor analysis can be used to prioritise information systems development to address critical areas of concern in an organisation. They propose that critical success factor analysis provides a means of bridging the gap between corporate strategy and information systems analysis, providing a focal point for directing information systems development. However, Rockart (1979) suggests:

> "Let me stress that the CSF approach does not attempt to deal with information needs for strategic planning. Data needs for this management role are almost impossible to preplan. The CSF method centers, rather, on information needs for management control where data needed to monitor and improve existing area of business can be more readily defined".

Byers & Blume (1994) have developed a four phase approach to tie critical success factor analysis to information systems development. *Phase 1: Information Gathering:* structured interviews identify objectives, critical success factors and information requirements of functional areas. *Phase 2: Information Summarization:* information collected from phase one is summarised using venn diagram or matrices to identify commonalities. This information is then examined to identify areas where information systems can be constructed or enhanced to meet business objectives. Obstacles impacting critical success factors are also reviewed. *Phase 3: Information Systems Tactical Planning:* critical success projects are defined and prioritised to address business issues. Projects are prioritised against the significance to the business, current level of support to the business objectives and the disadvantage of pursuing a project against other options. *Phase 4: Information Systems Implementation:* quarterly meetings are required between information systems developers and business managers to ensure priorities are modified as the business plans change.

Critical success factor analysis focuses information systems development on organisation wide collective learning, developing a close partnership between information systems developers and the business. Strategic information systems planning becomes part of business planning as information systems achieve strategic credibility and information systems developers become business partners. However, Boynton & Zmud (1984) recognise that the flexibility of the critical success factor approach which allows the approach to be tailored to the specific needs of an organisation, may be considered an over casual approach to information systems planning.

Information Engineering

Information Engineering (Martin, 1989) is an integrated methodology to link information systems with the organisational objectives. The premise of Information Engineering is that data is central to information processing. Information Engineering is a data-driven approach which aims to establish an infrastructure that connects information to business functions. The methodology consists of four levels with seven stages.

Level 1: Stage 1: Information Systems Planning: The aim of this stage is to develop an information strategy plan by identifying the goals of the organisation and the opportunities for establishing a competitive advantage from information technology. Three architectures are constructed for planning purposes. The first is the information architecture which defines the data and functions of the organisation to direct and control information systems development. The second architecture is a business systems architecture which documents the grouping of systems necessary to support the business which is later used to prioritise the information systems to be developed. Thirdly, a technical architecture documents the technical direction of the organisation in terms of hardware, software and communication technology. The steps required to construct these architectures include:

1. Computerise the organisational chart.
2. Identify company objectives and strategies.
3. Examine technological trends.
4. Determine the critical success factors for the organisation.
5. Determine the problems, opportunities and information needs of the company through management interviews.
6. Record all information in an automated encyclopaedia.
7. Develop a corporate model of business functions.
8. Develop a corporate entity model.
9. Map the entities to business functions.
10. Analyse current systems.
11. Prioritise information systems developments within the plan.

Level 2: Stage 2: Business Area Analysis: The objective of this stage is a more detailed analysis of the data and processes in a selected business area. The results of this analysis are a fully normalised data model, a process decomposition diagram, a process dependency diagram which models the relationship between processes and an entity/process matrix. End-user involvement is needed in this stage due to the level of detail required.

Level 3: Stage 3: Business Systems Design: This stage produces a business systems specification for each process in the business area, independently of technology requirements. This is a stable design which only changes as business requirements change. The documentation for this specification includes information flows and user procedures. User involvement in this stage is facilitated by joint application design workshops. As the user is responsible for the systems specification, the approach ensures that user needs are met by the resulting system.

Level 3: Stage 4: Technical Design: This documents the data and software needed to support the business systems specification. It includes screen and report design, dialogue design, systems testing and implementation planning.

Level 4: Stage 5: Construction: Computer systems are developed in this stage from the designs of stage three. This stage includes data storage structures, operations procedures and interface design. Action diagrams are then used to support automation of code generation. The information held and maintained in the encyclopaedia speeds up the development process.

Level 4: Stage 6: Transition: The change over to the new system is prepared in this stage. Software developed is installed and acceptance testing is undertaken.

Level 4: Stage 7: Production: After the systems have been installed, they are evaluated and maintained as required.

Information Engineering uses both data and activity-oriented techniques. Table 2.2 indicates the techniques used in stages 1-5.

The methodology recognises that the representation of complex systems requires different types of diagrams to represent the complexity. Models are a fundamental part of the methodology, based on the philosophy that diagrams are the most appropriate form of communication. Models recommended include entity models, function hierarchy diagrams, process dependency diagrams, process action diagrams, data flow diagrams, bubble charts, preliminary data structure design, systems structure design, data navigation diagrams and transition schedules. The diagrams are linked through the use of automated diagramming tools which enable changes in one design to be automatically reflected in other diagrams.

It is suggested that Information Engineering is more appropriate for large organisations and database applications rather than real time systems. In addition, the volume of information collected during the study requires automated support to maintain it. The methodology addresses strategic planning through to information systems development and implementation.

Stage	Techniques
Information Strategy Planning	Subject area modelling. Functional decomposition. Assess existing files and systems. Problem analysis. Cluster analysis. Distribution analysis. Business systems architecture. Technical architecture.
Business Area Analysis	Entity-relationship modelling. Canonical synthesis. Entity life-cycle analysis. Process decomposition. Process dependency analysis. Process logic analysis. Action diagramming. Consistency checking. Responsibility analysis. User view analysis. Analysis of existing systems. Transition analysis.
Business Systems Design	Preliminary data structure design. Procedure decomposition. Data flow diagramming. Data access mapping. Dialogue flow design. Layout design. Prototyping. Action diagramming.
Technical Systems Design	Data storage design. Action diagramming. Distribution design. Operational design. Transition design.
Construction Design	Data description. Code generation. Test data generation. Performance analysis.

Table 2.2: Techniques used in Information Engineering

Martin (1989) proposes the following advantages of Information Engineering:

1. Steers a company to achieve its goals. Although Information Engineering matches information systems to corporate goals, it does not address the formation of the goals.
2. Identifies technological opportunities. However, effective analysis of the external competitive environments beyond technological concerns is not supported which limits the effectiveness of technological analysis.
3. Anchors data processing expenditure in strategic planning. Although systems developments are prioritised, lack of environmental analysis limits the effectiveness of the strategic plan.
4. Increases maintainability of systems. This is achieved through the copious documentation maintained by an automated encyclopaedia. However, the encyclopaedia can only assist in the maintainability of systems redesigned using Information Engineering and cannot assist in the maintenance of existing systems.
5. Integrates systems company wide with the aim of redesigning all systems.
6. Supports user involvement through joint-application development sessions.
7. Provides an effective way of creating a 'computerised company' with all information documented in the encyclopaedia, although this excludes soft information.

Information Engineering is a data-oriented, objective-driven approach (Finkelstein, 1989) based on the principle that underlying data structures provide a stable infrastructure for systems development. However, it is important that while focusing on the formation of a data architecture, the mission and objectives of the organisation are not neglected. Information only has meaning in context (Galliers, 1992), this thesis suggests that the corporate strategy provides the context for organisational information and therefore information systems requirements should not be considered independently of strategic analysis.

Business Systems Planning

Business Systems Planning is described as a structured methodology to translate business objectives into information requirements (IBM Corporation, 1984). The methodology consists of thirteen main activities:

1. *Gaining commitment:* Senior management commitment is required to attain the strategic view of the organisation to which the organisation is committed.
2. *Preparing study:* Interviewees are identified and company information is collected.
3. *Starting the study:* Presentations are given by the sponsor and information systems manager detailing current status, objectives and problems.
4. *Defining business processes:* Business processes are identified and defined.
5. *Defining business data:* Business entities are identified and defined.
6. *Defining information architecture:* Business entities are mapped to business processes to create the information architecture used for resource planning.
7. *Analyse current system support:* Current data processing support for the business is assessed, forming recommendations for future action. A matrix is prepared to map business processes to the organisation to show areas responsible for business processes.
8. *Interviewing executives*: Executives are interviewed to validate information collected and determine business objectives, problems and information needs.
9. *Defining findings and conclusions:* Problems identified by executives are mapped to business processes to show how 'better' information may address the problems. Business priorities are then developed.
10. *Determining architecture priorities:* The sequence of application developments is prepared.
11. *Reviewing information resource management:* Changes needed in the information systems function to manage and implement the information systems identified are defined.
12. *Developing recommendations:* Recommendations are prepared to support management decisions on action to be taken based on architecture priorities.
13. *Reporting results:* Findings and recommendations are then reported to executives.

The basic principle of Business Systems Planning is to align information systems with business objectives, however, identification of these objectives is not considered until activity eight, after much analysis has already been undertaken. Identification of business objectives earlier in the study may enable processes to be reviewed in the context of business objectives.

The two main techniques used in Business Systems Planning are business process modelling and business data modelling. The outputs from the methodology include the problems analysis sheet, information architecture, application ranking, required application report, work plan, process/organisation matrix, process/data class matrix, systems/process matrix and a present systems/data class matrix.

In contrast to Information Engineering, the scope of Business Systems Planning is from strategy formation to information systems analysis. It does not specifically address information systems development, creating only an environment and an initial plan of action. The relationship between the information systems developed and the business objectives is indirectly recorded in the recommendations report prepared in activity thirteen.

Wysocki & Young (1990) identify three main criticisms of Business Systems Planning. Firstly, it is difficult to implement. Secondly, information is only obtained by interviewing executives which neglects the techniques used by executives to reach their conclusions. Thirdly, there is a risk of competitive opportunities being missed. The focus of the study is on the internal organisation, neglecting analysis of the external environment. Information systems are developed to support the business plan and the potential contribution of information and information technology to the business plan is overlooked.

Business System Development Method

Business System Development Method (IBM Corporation, 1992) aims to respond to some of the criticisms of Business Systems Planning. In particular it addresses the problem that Business Systems Planning does not lead directly to information systems development. In addition, the method recognises that developing enterprise models is not a suitable means to bridge the gap between corporate strategy and information systems development (IBM Ltd., 1992). Enterprise models are based on functional decomposition. Although this has the advantage that it covers the whole organisation, it leaves detailed analysis to individual business areas. Functional decomposition encounters problems of how to divide the organisation and to what level of detail to investigate.

It asserts that in the 1970s, problems in information systems development were technical but in the 1990s the problems are business-oriented (Lissoni, 1993). The Business System Development Method offers a business-oriented approach to address business problems, emphasising the business and not information systems development (IBM Ltd., 1992). Three models are developed:

Business Model: The critical elements of the business that must be successfully managed are first analysed and defined across the organisation. This model is constructed once and extended as the business moves into new areas.

Need Model: This model identifies the objectives and information needs associated with each business area.

Solution Model: Several solution models are built and evaluated before a chosen solution is developed in greater detail. The separation of the business model and the solution model allows constraints introduced into the solution to be highlighted.

Zachman's information architecture (1987) introduced the idea of different perspectives; these perspectives were solution driven. In contrast, the idea of different perspectives has been developed in the Business System Development Method to recognise different perspectives of the organisation.

The method consists of four basic activities:

Map: The nature of the business is first rigorously defined so that requirements can be expressed against it.

Need: The objective of this task is to identify and define the information systems needed to satisfy business requirements. It involves identifying and forecasting business and information systems requirements. The boundary of each system proposed is described in terms of the business map.

Shape: The technical system required to meet the business need is defined and developed

Run: The solution is implemented in the business environment.

The Business System Development Method places emphasis on the business need as opposed to the business solution. This relates to the 'why' aspect discussed in chapter one.

Cited benefits of the Business System Development Method (IBM Ltd., 1992) include:

1. A single business model is constructed which eliminates the need to reconcile separate data and process models.
2. Senior managers are only needed to assist construction of the business model by communicating the strategies and vision of the organisation.

3. A means of evaluating proposed information systems developments is provided to ensure the proposals meet the needs and strategies of the business as a whole.
4. The functional specification forms a common framework to allow developments to be phased.
5. The final result is not a set of applications or a set of business systems but one business system, built in stages, providing integrated support to the strategic vision of the organisation.

An advantage of the method is that it can be used for procedural or object-driven approaches, however, a difficulty of the method is that it is not easy to use as it challenges current thinking in the organisation.

Appendix two documents the detailed appraisal of information systems planning approaches against the eight phase comparative framework.

2.2.3 Strategic Data Planning

Data-oriented approaches to information systems strategic planning are failing to meet their expectations (Goodhue *et al.,* 1992). Firstly, data-oriented approaches are expected to result in the implementation of integrated information systems. This is an objective of Information Engineering which assumes that all information systems are to be redesigned, collecting all organisational information in an automated encyclopaedia. In practice, the amount of work involved in such a task, in addition to the organisational risk of redesigning critical information systems, results in an incomplete implementation of the information systems strategy.

The implementation of integrated information systems requires the data resource to be shared. Organisational control is required to resolve conflicts of data ownership and responsibility, balancing data integration with the need for local flexibility. Data sharing must therefore be critical to organisational success in order to justify the requirement to address the organisational, cultural and political problems arising from data integration.

Secondly, data-oriented approaches are expected to construct and implement a data architecture. The construction of a corporate data architecture is a time-consuming task of unrealistic scope (Kim & Everest, 1994). Goodhue *et al.* (1992) suggest that strategic data planning is an inappropriate method of forming a data architecture; this research proposes that a data architecture is inappropriate for information systems strategic planning. The organisational value of the architecture is achieved through the development and implementation of information systems identified from the architecture, however, a weakness identified of data architectures is that they are often not implemented as a result of the long timescales required for both their construction and implementation. It is further suggested by Goodhue *et al.* (1992) that data architectures should be stable within an industry and therefore organisations should seek to implement an 'industry data architecture' as opposed to developing a corporate data architecture.

Thirdly, organisations expect to be able to identify information systems development priorities from the strategic data plan. In practice, it is difficult to identify the information systems projects which will have the most strategic impact on the organisation. Information systems developments are therefore prioritised on the basis of available resources as opposed to strategic value. It is further suggested that the amount of detail accumulated in such data-oriented approaches restricts creativity and strategic thinking.

Fourthly, a rethinking of business processes is expected to result from the data-oriented approach to information systems strategic planning. The construction of a data architecture could be used as the basis for business process reengineering, however, the data-oriented approach is criticised for focusing on detail, whereas it is necessary to take a higher-level view of the organisation, in order to rethink business processes.

A final expectation cited for strategic data planning is that it will assist in the education and communication of business information to information systems development. However, a new understanding of the organisation is difficult to attain and communicate in data-oriented terms. Goodhue *et al.* (1992) suggest that a richer form of strategic data modelling is required to realise this expectation.

Goodhue *et al.* (1992) conclude that before embarking on a strategic data planning approach it is first necessary to consider how the resulting data architecture will be used. In addition, it is suggested that efforts should be focused on developing a generalised or industry-specific data architecture as opposed to the development of individual corporate architectures.

2.2.4 Summary of Information Systems Strategic Planning

Information Engineering is an example of the data-oriented planning approaches which initiated this research. The methodology requires a high level data model to be prepared in stage one, which is then expanded in stage two with the addition of attributes, resulting in a normalised data model for each business area. Stage three creates logical submodels for the systems investigated which are then adapted to conform to the requirements of the specific database management systems of the target environment. In stage four, denormalisation of the logical model may be required to meet performance criteria.

An advantage of this data-oriented approach is that information systems planning and development are integrated by the corporate data model. In addition, management involvement in the identification of entities to be included in the high level data model is required. Data-driven approaches provide a systematic means to analysing information requirements.

There are a number of weaknesses of this approach:

1. It is assumed that a corporate data model is a stable basis from which to develop information systems.
2. In practice, data-driven approaches result in the development of complex systems that do not focus on satisfying the critical information needs of the organisation.
3. In prioritising information systems development projects, the criticality of the project to the organisation is not considered.
4. A great deal of investment in time and effort is required to conduct the study and develop the information systems identified.
5. It takes between ten and eighteen months to complete the initial study to prepare an information systems plan.
6. The plan is often difficult to implement.
7. In preparing the information systems strategy, current systems are not evaluated and potential opportunities and threats imposed by new technology are not evaluated.
8. Little attention is given to organisational strategic analysis.

Data-oriented approaches to information systems planning are based on good design techniques, however, applying design techniques to a different set of problems is problematic. Lissoni (1993) recognises that for example:

1. Isolating data and process aspects is inappropriate for studying an organisation.
2. Entity-relationship modelling is not appropriate to the real world where there is a need to model the whole business and not functional views of the business.
3. Methods distinguish between conceptual, logical and physical models but each of these merge into the next.
4. Few methods distinguish between business and technical constraints.

Lissoni (1993) recognises that:

> "The real cost of system development is not the time to build: it is the cost to the business of systems that don't support the business, that are not integrated across the business, and that duplicate data and function, across the business".

Business Systems Planning and Information Engineering largely neglect the wide range of tools and techniques used in the formation of strategy. Their approach to strategic information systems development may be regarded as an extension of information systems development methodologies based on the science paradigm. Both methodologies seek to attain the agreed and defined objectives of senior management, however, neglect the strategic management tools for forming objectives. The methodologies assume the prior existence of objectives and seek to record these for information systems planning. In effect, the methodologies seek the statement of requirements which is needed to commence systems development. Both Business Systems Planning and Information Engineering omit the provision of tools with which to explore the internal and external environment, to establish corporate objectives. This omission retains the separation of strategic planning and systems development. The following chapter proposes that effective integration of strategic information systems planning and development requires the integration of experience in both areas.

2.3 THEMES IN STRATEGIC MANAGEMENT

Strategic management is concerned with the general direction of a business, rather than daily operations (Robson, 1994). Johnson & Scholes (1993) present a model of strategic management consisting of three interlocking elements:

1. *Strategic Analysis:* concerned with the environment; resources; expectations; objectives; power and culture.
2. *Strategic Choice:* involving the generation of options; evaluation of options and the selection of strategy.
3. *Strategy Implementation:* concerned with people and systems; resource planning and the organisational structure.

These elements are examined within the ten schools of strategic management defined by Mintzberg (1990b) discussed in section 2.3.1. The two dominant schools of strategic management schools, the design school and the learning school, are examined further in sections 2.3.2 and 2.3.4. In chapter three, parallels are proposed between these schools of strategic management and the dominant schools of information systems development, discussed in section 2.1.3.

In chapter one, the '5Ps' of strategy (Mintzberg, 1987) were presented, defining strategy as being a plan, ploy, position, pattern and perspective. These dimensions of strategy are explored within the relevant schools of strategic management.

The formation of a corporate strategy has a dual role of creating an appropriate mission and positioning the organisation to accomplish that mission (Scott-Morton, 1988). This requires both an external analysis of the environment and an internal analysis of the capabilities of the organisation (Gillenson & Goldberg, 1984). Strategic management is therefore complex, requiring many diverse elements to be analysed and evaluated. The importance and difficulty of this process is reflected by the development of techniques to guide the construction of models which isolate elements of strategy to aid strategic analysis. This is discussed in section 2.3.3.

This section examining themes in strategic management, concludes by exploring trends in the strategic management process.

2.3.1 Schools of Strategic Management

Mintzberg (1990b) defines ten schools of strategic management. This section examines the premises of each of these schools. The first three schools can be summarised as adopting a prescriptive approach to strategy formation; the configurational school embraces an integrated approach to strategy formation and the remaining schools focus on specific aspects of strategy.

Design School

This school adopts the premise that strategy formation should be a conscious process of thought which is the responsibility of one person. The model of strategy formation must be kept simple and explicit, complete, unique strategies emerge from the formation process (for example, Andrews, 1980). After the strategy has been formed it is passed to other people to implement but Mintzberg (1990b) criticises this two step approach of separating formation and implementation. The prescriptive nature of this school results in a strategy formation process which is inflexible to new findings. This school is discussed further in the following section.

Planning School

The premises of this school are similar to those of the design school with the additional premise that strategy formation is a formal process. The planning school emphasises the decomposition of strategy formation into distinct steps supported by checklists and techniques. Complete strategies emerge from the formation process to be implemented by decomposing the strategy into objectives, budgets and plans (for example, Ansoff, 1965). As the design school, it adopts the premise that strategy formation is the responsibility of one person. Failures of this approach to strategic management demand more sophisticated techniques. The major criticism of this school is that strategy is an integrating concept, requiring synthesis which is not supported by the decomposition and formalisation of the planning school.

Positioning School

The positioning school prescribes strategy formation as a formal analytical process, focusing on the selection of specific strategies relating to positions in the market (for example, Porter, 1980). Planners adopt the role of analysts providing the strategist with the results of market calculations, the strategist then selects a strategy which is implemented as the market dictates. A weakness of this school is that strategy selection may be biased, for example, a strategy may be selected because it is supported by the most data. The positioning school is also biased towards large firms where market power is greatest.

Entrepreneurial School

This school adopts the premise that strategy exists as a perspective in the mind of a leader; strategy is a vision of the organisation's future. The process of strategy formation is semiconscious, rooted in the experience and intuition of the visioner (for example, Cole, 1959). In contrast to the prescriptive schools, strategy formulation and implementation are closely tied through personalised feedback of actions.

Cognitive School

It is a premise of the cognitive school that strategy exists as a concept in the mind of an actor. Strategy formation is a cognitive process, synthesising soft information into new perspectives (for example, March & Simon, 1958). As a person has limited cognitive capabilities the process of strategy formation may become biased and distorted. Strategies formed are difficult to attain and difficult to change. Styles of strategy formation vary with the differing cognitive capabilities of individuals.

Learning School

The premise of the learning school is that strategy emerges over time; the complex and dynamic nature of the environment is considered to preclude deliberate strategy formation. Strategy formation becomes a learning process of retrospective thinking to understand action as strategies appear as patterns of the past (for example, Cyert & March, 1963). This approach is common in organisations during periods of dramatic environmental change. A criticism of this school is that disjointed activities may reduce the effectiveness of the organisation and the learning process may also incur significant costs.

Political School

In this school, strategy formation becomes a process of bargaining and negotiation. Political strategies are formal positions or ploys rather than perspectives (for example, Perrow, 1970). Micro politics are challenges for power within the organisation occurring in periods of organisational change, either imposed externally or arising internally from realignment. Macro politics promote the organisation's welfare through aggressive political strategies, reflecting the organisation's power relative to the external influences that surround it.

Cultural School

While politics fragment an organisation, culture integrates individuals as it is an established pattern of shared beliefs. The premise of this school is that strategy formation is a process of collective behaviour based on shared beliefs; strategy is a perspective founded on cultural values (for example, Rhenman, 1973). A weakness of this school is that culture does not encourage strategic change, but promotes stagnation. Culture is difficult to build and recreate but can easily be destroyed by imposing a strategy which conflicts with cultural values.

Environmental School

The environmental school adopts the premise that the environment consists of forces which drive an organisation into a specific market niche. Strategies are positions in the environment where an organisation is sustained (for example, Pfeffer & Leblebici, 1976). The process of strategy formation adopted in this school is passive, driven by environmental forces.

Configurational School

The premise of this school is that strategy formation is episodic; a particular type and form of organisation is matched to a particular type of environment for a period of time (for example, Miles & Snow, 1978).. The strategy process can be any of those previously discussed in other schools, for example, the strategy process can be conceptual, formal, analytical, visionary, cognitive, emergent, political, cultural or passive. The resulting strategy may take the form of plans, patterns, ploys, positions or perspectives. It is the premise of the configurational school that each form of strategy is appropriate at a particular time and in a particular context. Over time, patterns may be identified to form cycles of strategy formation. The problem with this is that pattern recognition is subjective and a configuration may be distorted by explanation.

These ten schools of strategic management are typically viewed as alternative approaches to strategy formation. In contrast, Johnson & Scholes (1993) suggest these are not mutually exclusive approaches and that in many organisations managers see strategies developing through a mix of processes. However, problems arise if different parts of the organisation see different influences as the development of strategy. Davies (1993) proposes a strategic action process which integrates the planning and learning schools with the visionary approach of the entrepreneurial school. The premise of the strategic action process is that strategy is a pattern of continuous improvement between current performance and vision, recognising that as a vision is accomplished, another vision must be created to maintain momentum.

The strategic action process provides a framework for an experimental approach to strategy, designed to change the environment rather than react to it. It is an iterative learning cycle moving vision into action, consisting of the following interdependent stages:

1. *Performance and vision:* a statement of what the organisation intends to achieve.
2. *Evaluate:* assess the firms current performance and future prospects.
3. *Enquire:* assess the vision to ensure it is realistic and relevant.
4. *Innovate:* creativity to identify strategic options available to address the gap between the vision and current performance.
5. *Choose:* decisions of customer, market, product, supplier, structure, distribution and competitive advantage to develop.
6. *Commit:* gain commitment for strategy moving beyond communication to empowerment.

7. *Design:* ensure organisational structure supports strategy.
8. *Action:* leading back to continual learning.

This process allows organisations to learn from their current actions and adjust through continual learning.

2.3.2 The Design School of Strategic Management

The basic framework of this school underlies all prescriptive approaches to strategy formation (Mintzberg, 1990a) and therefore warrants further discussion in this section. Prescriptive schools treat strategic planning as an analytical process of decomposing goals into actionable steps (Mintzberg, 1990a); the mission of the organisation is decomposed into a number of goals; each goal is subdivided into strategies to attain the goal; strategies lead to specific plans which guide decision-making and determine actions to be taken.

The basic model of the design school (Mintzberg, 1990a) can be summarised as:

1. Appraise the threats and opportunities in the external environment, identifying key success factors.
2. Appraise the internal strengths and weaknesses of the organisation, identifying distinctive competencies.
3. Create alternative strategies within the context of social responsibility and corporate values.
4. Evaluate alternative strategies.
5. Implement agreed strategy.

A number of techniques to assist these stages of strategic analysis, strategic choice and strategy implementation are discussed in the following section. This model illustrates the mechanistic approach of the design school to reduce uncertainty (Nohria & Berkley, 1994). The reductionism evident in this approach eliminates the inherent integrative perspective of strategic management (Teece, 1990). The following premises underlying the design school were introduced in the previous section:

1. Strategy formation should be a controlled, conscious process of thought.

This emphasises the attention of the design school on forming strategy rather than emphasising the actions required to implement the strategy. Strategy formation as a conscious process of thought denies the incremental and emergent properties of strategy.

2. Strategy formation is the responsibility of one person.

This premise denies the full participation of actors in an organisation and precludes external actors from the process. This relegates the organisational environment to being an input to strategy formation as opposed to being an intrinsic part of the process in which the organisation is to interact.

3. *The model of strategy formation must be kept simple.*

In the design school, strategy formation is a conscious process of thought of one person. Cognitive limitations force the process of strategy formation to be kept simple.

4. *Strategies should be unique.*

The design school concentrates on the process by which strategies should be developed, rather than the content of these strategies. The specific situation of the organisation and its environment are valued rather than a system of general variables, allowing strategies to be tailored to each situation.

5. *Strategies emerge from the design process fully formulated.*

This assumes the strategist can define and evaluate strategies before selecting the strategy to be implemented, promoting strategic direction rather than strategic action.

6. *Strategies should be explicit.*

A strategy must be sufficiently explicit to promote action; this requires the strategy to be kept simple to aid communication and understanding. The strategy reduces the complexity of the organisation and its environment to the minimum aspects relevant to corporate survival.

7. *Only after the strategy is fully formulated can it be implemented.*

This premise promotes strategic design rather than strategic action, following the rationality of diagnosis, design and action. The separation of design and implementation suggests that the organisational structure and activities change each time a new strategy is formulated.

Four criticisms of the design school (Mintzberg, 1990b) are, firstly, how can an organisation know its strengths and weaknesses? Implementing strategic change involves risk and uncertainty; it is therefore not possible to know in advance whether an established competence will be a strength or a weakness.

Secondly, the design school promotes the view that organisational structure is determined by strategy. However, assessment of the organisation's capabilities which are input to the strategy process, implicitly includes the existing organisational structure. The structure of the organisation plays a part in determining the strategy; both strategy and structure support the organisation and neither takes precedence.

Thirdly, the formation of explicit strategies promotes inflexibility and assumes that future conditions can be predicted. By focusing direction, the strategy implementation excludes peripheral vision and impedes strategic action. Finally, the separation of formulation and implementation can incur resistance to change from members of the organisation.

Kotter & Schlesinger (1979) identify four main reasons why change is resisted:

1. Members of the organisation perceive they will lose something of value as a result of the change.
2. The implications of the change are not understood and are perceived to cost more than the anticipated benefits.
3. The members of the organisation assess the situation differently from the initiator of the change.
4. There is fear that the change requires new skills which they may not possess.

One of the ways cited to address such resistance is to encourage participation in the design and implementation of the change process. The design school does not facilitate such participation and promotes resistance to changes proposed.

Mintzberg (1994a, 1994c) identifies three fallacies of strategic planning inherent in the design school. These are:

1. *Fallacy of prediction:* The world is assumed to remain static during the planning process, remain stable as the strategy is implemented and change as predicted following the implementation.
2. *Fallacy of detachment:* The formation of strategic plans must be separate from the implementation of strategic plans. The strategist must be sufficiently distanced from the details of the organisation and its context to view the overall situation.
3. *Fallacy of formalisation:* Strategy must be formed from a sequential process of analysis through to implementation. Strategy requires creativity that formalisation discourages. Mintzberg (1994a) suggests that between the hard technique of planning and the soft images of managing, synthesis is lost in analysis.

Mintzberg (1994a) summarises these fallacies into the grand fallacy that:

> "No amount of elaboration will ever enable formal procedures to forecast discontinuities, to inform detached managers, to create novel strategies".

Strategy formation is responsible for directing the path of an organisation requiring a rich understanding of the organisation and the dynamic environment with which it interacts. Techniques to assist strategic management are examined in the following section.

2.3.3 Techniques in Strategic Management

Bowman (1990) suggests that strategy can be considered to be an exercise in design; a process of changing an existing situation into a preferred situation. This section examines some of the many techniques proposed to assist in the design process. The three elements of strategic management: strategic analysis, strategic choice and strategy implementation (Johnson & Scholes, 1993) have been adopted to provide a framework for this discussion.

Strategic Analysis

Strategic analysis examines the strategic position of the organisation. It requires an external analysis of the organisation's environment and the position of the organisation in that environment. Poor strategy is often attributed to inadequate awareness of the external environment (Houlden, 1990). Aaker (1984) suggests external analysis includes investigation of four elements: customers, competitors, the industry and the environment.

Customers are the most important group of people an organisation must consider. An organisation is in business to serve its customers' needs, it is therefore necessary to identify the needs and motivations of the organisation's customer profile. This provides the basis for defining the product or service to be supplied.

The **customer resource process** (Ives & Learmonth, 1984) focuses on the relationship between a company and its customers. The technique aims to identify the activities within the customer process to which the company could add value. The basic customer resource process contains the following stages: determine the requirements for the product or service; select source; order; authorise payment; acquire product; record delivery; check delivery as specified and take action if not; control access and use; upgrade if conditions change; repair if necessary; transfer / dispose as necessary; account for cost. Each of these activities are considered in terms of how the company could add value to the customer.

It is necessary to identify both current and potential *competitors* (Aaker, 1984). In particular, it is important to understand the performance objectives, strategies, strengths and weaknesses of competitors. This enables the organisation to exploit the weaknesses of competitors and neutralise or by-pass their strengths. In addition, it helps predict competitors' reaction to the organisation's strategy. The dominant technique in this area is the **five forces**

model (Porter, 1980) which provides a structured means for analysing the competitive environment. This is based on the five basic forces of competition, which are:

1. *Threat of new entrants:* The degree of threat posed by new entrants to the market depends on the extent to which barriers to entry exist. These are determined by the characteristics of the industry and the concentration of organisations in the industry. Industrial barriers include government legislation, capital requirements to enter the market and the relative importance of economies of scale. Barriers arising from organisational concentration include the degree of product differentiation and brand loyalty, the switching cost incurred by customers for changing suppliers, access to distribution channels and the degree of expected retaliation.
2. *Bargaining power of suppliers:* The power of suppliers is greatest where there are major differences in the resource supplied. The power of suppliers is reduced as the availability of substitute supplies increases and the cost of changing suppliers is reduced. There is the additional threat that the supplier may integrate forward in the supply chain.
3. *Bargaining power of customers:* The power of customers is high when there are alternative sources of supply and the cost of changing suppliers is low. There is also the threat of backward integration by the buyer in the supply chain, if satisfactory prices and supplies cannot be obtained.
4. *Threat of substitutes:* Johnson & Scholes (1993) identify three key questions to be addressed when assessing the threat of substitutes. Firstly, determine whether the substitute offers a higher perceived benefit or threatens the obsolescence of a company's product or service. Secondly, assess the ease with which the customer can switch to the substitute. Thirdly, examine the extent to which the threat of substitution can be reduced by increasing switching costs.
5. *Competitive rivalry:* Intense rivalry between competitors reduces organisational profits. Factors contributing to increased competitive rivalry include: low product differentiation, low switching costs, a high number of organisations of similar size and high exit barriers.

This structure focuses attention on the organisation's relationship with business partners, identifying the dominant forces in the market place which require further investigation. The potential threat of these five forces needs to be evaluated so that mechanisms for countering the threats can then be established.

Industry analysis examines the size, structure and growth prospects of the industry. An industry, like a product, has a four stage life cycle (Robson, 1994): development, growth, maturity and decline. In the development phase, the industry has few buyers, few competitors and demand is largely unknown; as the industry grows, more buyers encourage the entry of competitors. At this stage, products and services are undifferentiated and demand exceeds supply; saturation of buyers is reached with repeat purchases as the industry matures. Competitors fight to maintain the market share and efficiency is emphasised. As the industry moves into decline, buyers become few and competitors are forced to leave the industry as supply exceeds demand.

Environmental factors are explored in PEST (political and legal, economic, socio-cultural, technological) analysis (Johnson & Scholes, 1993) which provides a checklist of influences to investigate. These are:

1. *Political and Legal:* for example, environmental protection, foreign trade regulations.
2. *Economic:* for example, inflation, unemployment and interest rates.
3. *Socio-cultural:* for example, population demographics and income distribution.
4. *Technological:* for example, new developments, spread of technology and the transfer rate of obsolescence. Both the current and forecast maturity of technology needs to be evaluated.
   Following this assessment, the company needs to decide whether it is to take a leader or follower stance in the industry. The benefits and risks associated with experimenting with new technology must be compared against the risk of lost opportunities.

PEST analysis can be used to identify key assumptions from which to develop possible future scenarios. This provides a basis against which strategic options can be evaluated.

A further technique to explore environmental analysis is the **TOWS** (threats, opportunities, weaknesses and strengths) matrix (Weihrich, 1986). This is a conceptual framework in which to match the threats and opportunities in the external environment, against the weaknesses and strengths of an organisation compared with those of its competitors. It is also known as SWOT (strengths, weaknesses, opportunities and threats) analysis; the TOWS matrix is preferred by those who argue that external analysis of opportunities and threats should precede internal analysis of strengths and weaknesses.

A threat may be defined as a trend or event that may result in a down-turn of sales and profits (Aaker, 1984). Conversely, an opportunity is a trend or event that may result in an up-turn of sales and profits. Houlden (1990) suggests that it may be difficult to decide if a feature of the environment is an opportunity or a threat. As organisations are dynamic, several matrices may be required to illustrate past, present and future scenarios. After applying the TOWS matrix, a company may choose to:

1. Minimise both weaknesses and threats.
2. Minimise weaknesses and maximise opportunities.
3. Maximise strengths and minimise threats.
4. Maximise strengths and opportunities.

The second element of strategic analysis is resource analysis. This explores the internal capabilities of the organisation. Techniques for resource analysis include: resource audit, systems reference model, systems audit grid, value chain analysis, product portfolio analysis, core competencies, SWOT analysis and critical success factor analysis. Each of these techniques will be briefly described.

A **resource audit** can be useful in understanding the capabilities of the organisation (Johnson & Scholes, 1993) as it aims to establish the organisation's resource base. Resources can be grouped under four headings of:

1. *Physical resources*: this includes the age, condition, location and capacity of machinery.
2. *Human resources:* the skill base of the organisation.
3. *Financial resources:* sources of cash flow, control of debtors and creditors.
4. *Intangibles:* brand names, company image and contacts.

Johnson & Scholes (1993) do not include the information systems resource in this audit. Two models can be used to assess the information systems resource, the systems reference model and the systems audit grid.

The **systems reference model** represents the current role of information systems in the company. Different categories within the business environment may require a different role of information systems support. The model plots the value and importance of current information systems in the company against the anticipated role of systems being developed. Figure 2.4 illustrates the four quadrants of: support, factory, turnaround and strategic. The support sector indicates that information systems are being utilised for traditional data processing tasks such as accounting. These information systems are not critical to the main business function or to the success of the company but are operationally desirable. The factory sector represents currently automated operations which do not require further investment, success depends on the efficient control of day-to-day events. The turnaround sector indicates the development of new systems which can increase business growth and profitability. The strategic sector indicates that utilisation of information systems is critical to the success of the company, therefore forward planning is extremely important in this area.

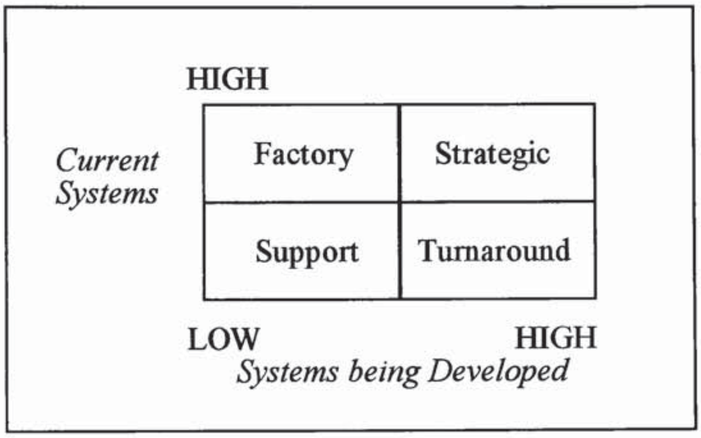

Figure 2.4: Systems Reference Model
(Source: McFarlan & McKenny, 1983)

The model focuses attention on the current role of information systems and promotes discussion on whether this role is appropriate. The main disadvantage of the model is that it has limited usage in isolation. The model plots the current role of information systems but does not assist in introducing opportunities to change that role.

The **systems audit grid** illustrated in figure 2.5, audits the asset base of information systems in the organisation. Current information systems are assessed in terms of technical quality and value to the business.

Section (A) includes information systems which have a high business value but are of poor quality; investment in these systems may be required. Section (B) includes information systems which have a low business value and a low technical quality; these systems need to be re-evaluated and perhaps eliminated. Section (C) includes information systems of high business value and high quality; these systems require continued investment for maintenance and enhancement. Section (D) includes information systems of low business value but high technical quality; these systems need to be reassessed and further investment considered in terms of increasing their business value.

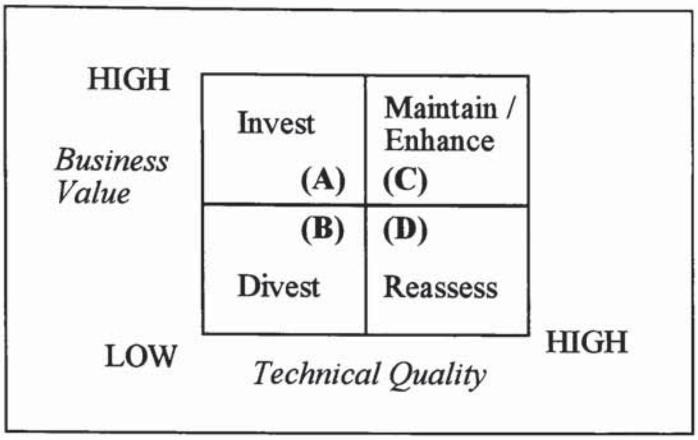

Figure 2.5: Systems Audit Grid
(Adapted from: Ward *et al.*, 1990)

Business value is evaluated by the users of the system and includes such aspects as the level of impact the system has on the business, how easy the system is to use and how frequently the system is used. The technical quality of the system is evaluated by the development staff in terms of system reliability, ease of maintenance and cost effectiveness.

The systems reference model and the systems audit grid establish the current use of information systems and indicate some areas where improvements could be made. Information collected here needs to be related to other techniques discussed later in this section. Techniques such as value chain analysis and critical success factors analysis can identify new opportunities for information systems and align information systems to support business needs.

Value chain analysis is a framework in which to identify opportunities for establishing a competitive advantage. Aaker (1984) describes competitive advantage as involving key success factors of the market, which are both sufficiently substantial to make a difference and are sustainable despite environmental change. This technique examines the activities which underpin the business. A number of activities are completed in the creation of a product and each activity adds value to the product. Value chain analysis is a systematic approach to examine each activity in the value chain to identify ways in which costs can be reduced, product differentiation can be established and competitive scope may be changed. Emphasis is moved away from cost to value as value is added to the product at each stage through the value chain.

Porter & Millar (1985) distinguish primary activities from activities which support the production process. Primary activities include inbound logistics, operations, outbound logistics, marketing, sales and service. Support activities include infrastructure, human resource management, technology development and procurement. As value chain analysis involves the analysis of all activities in the creation of a product, it may be considered a predecessor of business process reengineering which Teng *et al.* (1994) define as:

> "The critical analysis and redesign of existing business processes to achieve breakthrough improvements in performance measures".

Product portfolio analysis examines the strength of individual products or services in an organisation's portfolio within the market. The Boston Consulting Group popularised the growth share matrix introduced by General Electric in the 1970s. It is a two dimensional matrix to categorise the products, services or business areas in a company according to their current status and predicted growth. A number of variations have been developed from the business segmentation model illustrated in figure 2.6.

The business segmentation model plots the current market share secured along the horizontal axis; the vertical axis represents the growth forecast for the market.

The quadrants are labelled as:

1. *Dead Dog:* Products in this area have a low share of a low growth market. Products are in a weak competitive position and need to be reassessed as current and future prospects are limited.
2. *Cash Cow:* Business areas in this quadrant have a large share of a low growth market. Heavy cash flows may be 'milked' for investment in other areas. This illustrates a stable area and the company may consider further investment to expand the area.
3. *Wild Cat:* Products in this area have a low share of a high growth market. A decision needs to be taken whether to remain in this niche market or invest to increase the market share. It indicates an area of high potential, suggesting further investment.
4. *Stars:* Business areas in this quadrant have a high share of a high growth industry, indicating a strong area of the company. Further investment may be required to attain the maximum benefit from this area.

This model assumes that growth and market share are major factors affecting performance (Hussey, 1982), however, the axes can be replaced by other factors considered relevant. For example:

1. *Competitive position model* plots the current share of the market secured by a business area against an estimate of the future potential of the market.

2. *Mission analysis* plots current revenue generated by an area against the future revenue the area is forecast to generate.

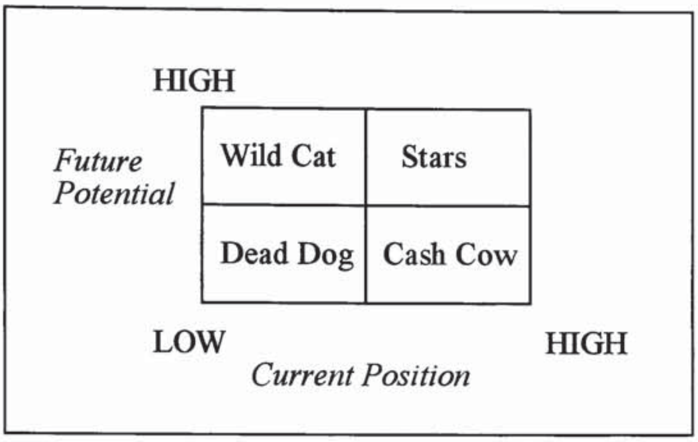

Figure 2.6: Business Segmentation Model
(Adapted from: Hussey, 1982)

The use of a matrix raises fundamental questions about the organisation for discussion. As with all models, it needs to be used with care, as decisions are not automatic. The two-by-two matrix has become widely accepted as the 'Boston Box' (Houlden, 1990) and has been adopted by other techniques such as the business relevance model (Porter, 1980) and the systems reference model (McFarlan & McKenny, 1983). One difficulty with the matrix is how to position products within the matrix (Houlden, 1990). In an attempt to address this difficulty, Aaker (1984) uses a three-by-three matrix where each axis is graded high, medium and low. Aaker describes two applications of this matrix: *industry attractiveness* which plots the growth of the industry against the ability of the business area to compete in the industry; *directional policy matrix* which plots the prospects of the business sectors against the company's ability to compete.

Doyle (1991) criticises the unnecessary simplification of the 'Boston Box' for obscuring insights. Doyle argues that the matrix encourages reality to be distorted to comply with the framework.

Core competencies are strengths that give the organisation an edge over its competitors (Grønhaug & Nordhaug, 1992) which may be identified from value chain analysis or SWOT analysis. Johnson & Scholes (1993) suggest four questions need to be considered to determine the robustness of a core competence. Firstly, who owns the core competence? is it an individual or the organisation as a whole? Secondly, how durable is the competence to, for example, technological change? Thirdly, how transferable is the competence? This examines the extent to which a competitor may also acquire the competence. Finally, how replicable is the competence, for example, can competitors create a similar resource base?

SWOT analysis (Weihrich, 1986) has previously been discussed. It provides a mechanism for examining the organisation in the context of its environment. This is important as organisational strengths and weaknesses may not be relevant in the development of the environment. The technique summarises the relationship between environmental influences and the strategic capability of the organisation.

Critical success factor analysis (Rockart, 1979) assists managers to identify their information needs. A critical success factor is a business activity which must be successful for the organisation to succeed. Rockart (1979) identifies four main sources of critical success factors: the industry, competitive strategy, environmental factors and temporal factors. This was discussed further in section 2.2.2.

The third element of strategic analysis is expectations. These are the expectations of individuals external and internal to the organisation. The attitude of individuals will be strongly influenced by the organisational culture which is discussed separately. As stakeholder expectations may differ, it is necessary to understand expectations in the context of the power which the stakeholders exhibit. This is relevant in assessing possible reactions to change introduced through strategy. The **power / dynamism matrix** provides a means of plotting stakeholders to assess where support is lacking (Johnson & Scholes, 1993). This is illustrated in figure 2.7. The most powerful group of people are those in sectors (A) and (C). Sector (A) represents the most difficult group of people as they are powerful and their views are difficult to predict.

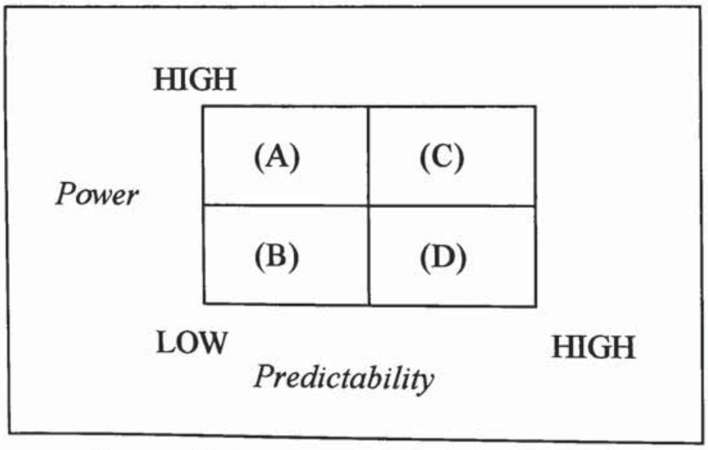

Figure 2.7: Power / Dynamism Matrix
(Adapted from: Johnson & Scholes, 1993)

A development of this matrix is the **power / interest matrix** which classifies stakeholders in relation to the power they hold and their level of interest in the organisation. The key stakeholders are those who exhibit high levels of both interest and power in the organisation. This matrix identifies those groups who may block or facilitate strategic change.

The fourth element of strategic analysis is objectives. This embraces the mission of the organisation which defines the purpose for the organisation's existence, addressing fundamental issues of who the organisation serves, what their needs are and how the organisation is to meet these needs (McTavish, 1995). In recent literature, mission has been referred to as strategic vision. The mission statement communicates a vision of what the organisation aims to become, to all parties involved in realising the vision.

The importance of strategic vision is reiterated by respondents of surveys reported by Coulson-Thomas (1992). Strategic vision is important for:

1. Aligning people in the organisation (Hardaker & Ward, 1987; Parikh & Neubauer, 1993).
2. Retaining the focus on what is important (Covey, 1989).
3. Inspiring people in the organisation (Parikh & Neubauer, 1993).
4. Providing a framework for the organisation (Covey, 1989).
5. Forming the basic foundation on which the organisation is built (Parikh & Neubauer, 1993).

McTavish (1995) proposes a framework of four factors which can be mapped to techniques to form a mission. These factors are:

1. Customer function (for example, customer resource process).
2. Technology dimension (for example, the technology evaluation and forecast model).
3. Customer segment dimension (for example, market sector analysis).
4. Stage in value chain (for example, value chain analysis).

The strategic vision should be competitive but realistic in the market place (Parikh & Neubauer, 1993); this requires reflective, intuitive and integrative thinking. Reflective thinking requires viewing the world differently and perceiving a measurable image of the future. Intuitive thinking explores the fundamental aspects that the organisation wants to achieve. Integrative thinking synthesises reflective and intuitive thinking into a unique vision. Problems are often experienced with the implementation of vision (Coulson-Thomas, 1992) as everyone in the organisation must be committed to the vision. Commitment to attaining the vision cannot be achieved without involvement in the formation of the vision (Covey, 1989).

Bartlett & Ghosshal (1994) propose vision is:

> "Working to embed a clearly articulated, well-defined ambition in the thinking of every individual while giving each person the freedom to interpret the company's broad objectives creatively".

This can be achieved by building on the philosophy and value of beliefs in the organisation. Cultural analysis embracing values and beliefs, is discussed later in this section. The ultimate aim of strategic vision (Bartlett & Ghosshal, 1994) is to ensure that everyone in the organisation:

> "Not only understands how his or her role fits into the company's overall organizational purpose but also how he or she might contribute personally to create it".

After forming a corporate mission, Hardaker & Ward (1987) suggest it is necessary to identify the critical success factors needed to achieve the mission. Critical success factors must be both necessary and sufficient for achieving the strategic vision; corporate objectives can then be established. An objective is a general statement of measurable results. Gillenson & Goldberg (1984) identify three necessary characteristics of objectives. Objectives need to be:

1. *Actionable:* the assigned responsibility of an individual or department.
2. *Achievable:* perceived as possible.
3. *Measurable:* to prove their attainment.

Objectives then need to be translated into measurable goals (Bartlett & Ghosshal, 1994); a goal is a statement of what is to be accomplished.

The fifth element of strategic analysis is power, that is, the extent to which individuals or groups can 'persuade' others to follow certain actions (Johnson & Scholes, 1993). Sources of power include hierarchical position, individual or group influence and control of resources. Power can be assessed by examining the indicators of power, such as status in the organisational hierarchy, claim of resources (for example, the size of a department), representation (for example, position on the board of directors) and symbols (such as personal offices and secretaries).

The sixth element of strategic analysis is cultural analysis. Johnson (1992) proposes a cultural web as a device for undertaking a cultural audit of the organisation. The web explores the nature of the organisation in cultural terms, revealing how the organisational culture may influence or restrict the implementation of strategic change. The cultural web examines the following aspects of culture:

1. *Symbols:* which represent the nature of the organisation, for example, the type of organisation and terminology used.
2. *Power structures:* the managerial groups associated with the core beliefs of the organisation.
3. *Organisational structures:* including informal working relationships which represent important activities.
4. *Controls:* measures and rewards.
5. *Rituals and routines:* regular meetings.
6. *Stories:* histories and events.

In contrast to this cultural web, Robson (1994) adopts a narrow view of cultures, recommending McGregor's (1960) Theory X and Theory Y as a sufficient means of cultural analysis.

Strategic Choice

After a rich understanding of the strategic situation of the organisation has been obtained from strategic analysis, attention moves to strategic choice. This involves the generation, evaluation and selection of strategic options.

Johnson & Scholes (1993) assert that generating strategic options incorporates three decisions. The first decision is on what basis the organisation is to compete. Porter (1980) argues that there are three generic strategies a company may adopt, these are low-cost production, product differentiation and market segment focus. The **strategy clock** (Johnson & Scholes, 1993) is a means with which to examine the implications of strategic options.

The numbers on the strategy clock shown in figure 2.8 represent strategic routes. Route 1 entails reducing prices and reducing the perceived value of the product or service to focus on a price sensitive segment of the market. Route 2 seeks to reduce prices but maintain the quality of the product. There is a danger that this route could lead to a price war between competitors. Route 3 is a hybrid strategy of routes 2 and 4, perceived added value to the customer is increased, while simultaneously reducing prices. This route is criticised on the basis that reducing prices should not be necessary with price differentiation.

Route 4 offers the customer perceived added value over competitors' products at a similar or higher price. This aims to achieve a higher share of the market. Route 5 offers a higher perceived value to the customer at a higher price to focus on a particular market segment. Routes 6, 7 and 8 are described as failure strategies; route 6 seeks to increase prices without increasing the perceived value to the customer; route 7 increases prices while reducing perceived value to the customer; route 8 reduces the perceived value while maintaining current prices.

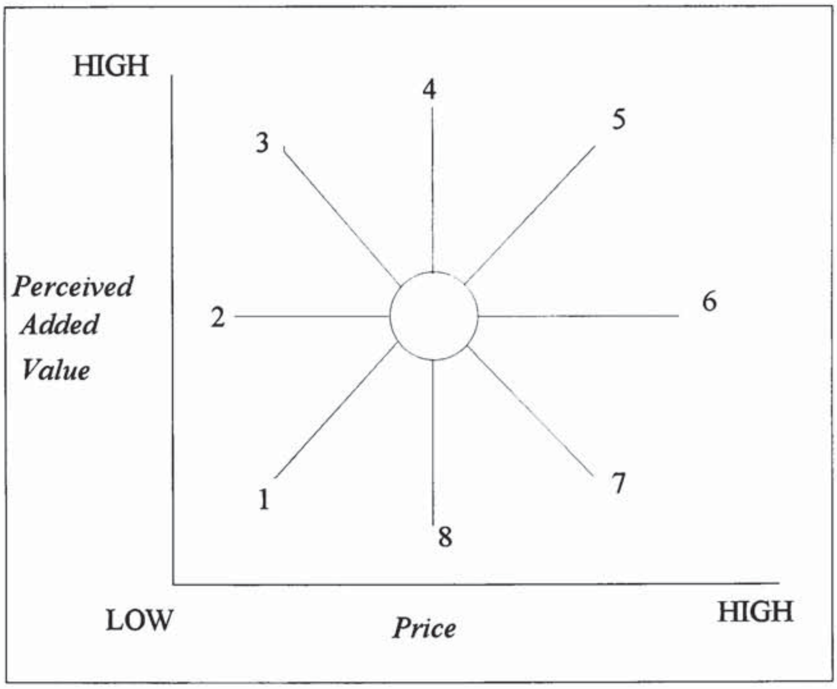

Figure 2.8: Strategy Clock
(Adapted from: Johnson & Scholes, 1993)

The **strategic options generator** is a technique closely associated with the five forces model and value chain analysis. This model addresses potential threats to the company and considers the use of various 'weapons' to counter threats. The three threats to the company, suppliers, customers and competitors are listed across the top of the table shown in figure 2.9; 'weapons' which the company may use to counter the threats are listed down the table. The main advantage of the table is that it focuses on the potential threats to the company and stimulates discussion on how the threats may be countered.

The second decision in generating strategic options is which strategic direction to pursue; directions include related developments, related diversification and unrelated diversification. Related development may involve seeking new products or new markets in which to compete. Related diversification moves beyond the present product or market but remains in the same industry. It may involve:

1. *Backward integration* to develop activities currently performed by suppliers.
2. *Forward integration* to develop activities currently performed by customers.

3. *Horizontal integration* to develop activities complementary to the organisation's existing activities.

Unrelated diversification involves developments outside the current industry.

Aston University

Illustration removed for copyright restrictions

Figure 2.9: Strategic Options Generator
(Source: Rackoff *et al.*, 1985)

The third decision in generating strategic options is how to pursue the generic strategies and strategic directions. The three main methods are internal development, acquisition and joint venture. Internal development involves adjusting current organisational activities and introducing new activities as required. Acquisition or merger buys the knowledge and resources required to extend the product and market range of the organisation. Cost efficiency and market knowledge are the primary incentives for pursuing this option. Joint ventures are an alternative means of obtaining the necessary knowledge and materials through co-operation with other organisations whilst retaining independence.

Strategic options need to be evaluated against three criteria (Johnson & Scholes, 1993): suitability, feasibility and acceptability. Suitability assesses the extent to which each option appropriately addresses the strategic situation explored through strategic analysis. For example, would the strategy exploit the strengths of the company and the opportunities in the environment previously identified? Feasibility examines the practicalities of implementing the strategy, for example, can the necessary resources be attained? Finally, an otherwise logically coherent strategy may fail to produce the expected results, if the strategy is unacceptable. Perlitz (1993) depicts organisations as icebergs; at the top one sixth of the iceberg above the water are the dominant parameters of strategy; objectives, markets and finance. The five sixths of the iceberg below the water represent the neglected parameters of strategy; the soft issues of values, team building and behaviour. Acceptable strategies are those that are in harmony and not conflict with these soft issues. This raises the issue of to whom should the strategy be acceptable? An effective means of addressing this issue is to explore possible perceived negative effects of the strategy. For example, increased pollution to the environment may not be legally acceptable. The strategy must 'fit' the cultural environment and be acceptable to employees and stakeholders.

Many of the techniques for strategic analysis can be used for evaluating and selecting strategies (Johnson & Scholes, 1993). For example, scenarios constructed during strategic analysis can be used to explore the suitability of a strategic option. Additional evaluation methods include financial models such as profitability analysis and cost benefits analysis.

Strategy Implementation

Implementing the selected strategy involves three aspects: resource planning, organisational structure, people and systems. Resource planning is the allocation of resources in the organisation. Johnson & Scholes (1993) suggest the approach to resource allocation depends on two factors; the perceived degree of change and the extent of central allocation in the organisation. Approaches to resource allocation include the use of a formula, free bargaining between divisions, open competition between divisions and imposed priorities.

Strategy implementation requires the organisational structure to be re-examined. This requires decisions to be taken concerning the degree of centralisation and devolution in the organisation. Mintzberg (1992) depicts the organisation as comprising of six basic parts: the operating core, the strategic apex, middle line, techno-structure, support staff and ideology. The size and importance of these parts in an organisation contribute to the organisational configuration.

Vandermerwe (1994) uses the brain as a metaphor for organisations. The interconnection and interactions of the brain, depict the organisational network as a flexible architecture for bringing the resources together for a customer-focused organisation. The suitability of the metaphor is illustrated as:

1. Brains have built-in redundancy and organisations must incorporate a degree of contingency in the resource planning.
2. Every area of the brain distributes information to every other part. While each area of the brain is specialised by nature, the brain works in a generalised manner as a whole. Organisational departments need to interact to form the corporate whole.
3. The brain learns incrementally in a programme of continuous improvement. Organisational learning is discussed in the following section.

Vandermerwe (1994) concludes:

> "Whether their structures drive strategy, or their strategies gradually lead to new structures, what is inevitable is that they move away from pyramids and concentrate efforts on delivering value at the critical moment of truth, where company and customer meet".

Effective organisational change is the relationship between structure, strategy, systems, style, skills, staff and superordinate goals (Waterman Jr. *et al.*, 1992). These are interconnected elements as a change in any of the components can affect the relationships among them (Aaker, 1984). Systems in this context refer to control systems, strategic change may require changes to be made to control systems to monitor performance of the organisation. Consideration must also be given to reward systems as important issues need to be identified for inclusion in the reward systems in order to influence behaviour.

Pettigrew & Whipp (1992) summarise five characteristics demonstrated by companies which have successfully implemented strategic change. These are:

1. An understanding of their environment.
2. Implementation of change in accordance with the organisational culture and capabilities.
3. Integration of human resource management within strategies.
4. Coherent change across all aspects of the organisation.
5. Change agent develops a context for change.

Organisations and their environments are dynamic; corporate success depends not only on profits, but also on the organisation's ability to react quickly and effectively to changes (Battaglia, 1991). Planning is an iterative process as plans should support and facilitate, not restrict change. The following section examines how change is managed in the learning school of strategic management.

2.3.4 The Learning School of Strategic Management

Mintzberg (1987) defines strategy as being both a plan and a pattern. This definition is criticised for incorporating opposites, plans and non-plans (Kenyon & Mathur, 1993), however, both definitions are valid (Mintzberg, 1987, 1994d; Johnson & Scholes, 1993). Strategy as a plan is intended strategy; strategy as a pattern is realised strategy. An intended strategy may not be fully realised and patterns may appear without preconception.

The term deliberate strategy represents intended strategy that is realised while emergent strategy refers to patterns which emerged but were not expressly intended. Individual actions converge over time into patterns. Perfect realisations imply perfect predictions concerning the future and at the other extreme, no realisation implies problems may exist in the strategic management of the organisation. In reality, some planning is needed, incorporating sufficient flexibility for adaptation as necessary. Literature embedded in the design school, explores deliberate strategy formation at the exclusion of emergent elements. This situation is reversed in the learning school.

Perlitz (1993) attributes strategic failures to four main factors. Firstly, the use of simplistic models and prescriptive approaches which do not represent the richness of the strategic situation. Secondly, strategies fail to be implemented because they are not communicated in meaningful terms to the people responsible for implementing the change. Thirdly, lack of involvement by employees in strategic planning results in resistance to change. Finally, prescriptive approaches to forming a strategy lack creativity. These relate to the fallacies of strategic planning identified by Mintzberg (1994a,c).

Strategy formulation is responsible for directing the path of an organisation which requires a rich understanding of the organisation and the dynamic environment in which it interacts. Continued corporate success requires a continuous flow of new ideas to vanquish competition. Mintzberg (1994c) suggests that strategy formulation should include strategic thinking; strategic thinking is about synthesis involving intuition and creativity.

Criticism of premises underlying the design school and the fallacies it has embodied, has led to the rise of three premises of the learning school:

1. Strategy formulation is a creative process.
2. Strategies have emergent properties.
3. Strategy is a learning process.

Each of these propositions will now be examined.

Strategy Formulation is a Creative Process

The mechanistic approaches based on the design school, aim to reduce uncertainty, continually searching for better models of how an organisation should work (Nohria & Berkley, 1994). The simplicity of the 'Boston Box' has been widely accepted and extensively applied, however, it is argued that the complexity of an organisation cannot be understood using a two dimensional matrix (Doyle, 1991). Ketelhöhn (1994) suggests that such simplistic models are communication tools and not decision-making frameworks.

Rather than reducing uncertainty and complexity, a learning approach to strategy formation exploits uncertainty and complexity (Nohria & Berkley, 1994). In this approach, models are tools for shaping action as opposed to an expression of some portion of reality. This follows Mintzberg's (1994c) argument that strategy functions beyond the boxes of simplistic models, to produce new perspectives.

Premkumar & King (1991) revealed that 55% of companies favoured proprietary methods for strategic planning. This supports the view that standard checklist approaches are not suitable for creative strategy formulation. Particular issues worthy of analysis will depend on the specific strategic situation of an organisation (Bhide, 1994).

Mintzberg (1994c) argues that information supplied to senior management lacks the richness needed to support the creative art of crafting a corporate strategy. In particular, the information presented to managers tends to be overly aggregated, excluding qualitative factors and omitting important nuances. Mintzberg further suggests that the most effective managers rely on the softest forms of information such as gossip and hearsay.

Strategy formulation as a creative process requires richer models which accommodate soft information, complexity and uncertainty; shape action and facilitate flexibility to represent important issues specific to the strategic situation.

Strategies have Emergent Properties

Organisations are complex systems with numerous events occurring simultaneously (Nohria & Berkley, 1994). Reducing this complexity rejects the synergistic properties of the organisation. The cost of this rejection is the risk that changes in one area of the organisation may have an undesirable and unanticipated effect in another area of the organisation. The intricate relationship between different areas of an organisation can only be appreciated as the synergistic properties of the relationship are explored. The reductionist approach to strategy formulation does not facilitate such depth of inquiry.

An organisation is a complex system of subsystems. The aim of strategic planning is to give direction to the organisation as a whole. For the organisation to proceed to its strategic goal, all sub-systems must be correctly aligned with that aim. Furthermore, the interconnections between subsystems, both tangible and intangible cannot be neglected. Reductionist approaches disregard the force of emergent properties in an organisation. However, if the power of emergence is not harnessed with the strategic direction of the company, there is a risk that emergence will operate in an inconsistent direction, against the strategic direction.

The implementation of strategy causes change in the organisation and its environment. The synergistic effect of such change needs to be explored by adopting a holistic view of strategy formation. Reductionist techniques focus on specific elements of strategy, whereas a holistic focus requires an integrated, synergistic view of strategy formulation. Recognition that strategies have emergent properties requires a means with which to explore emergence in strategy formulation.

Strategy is a Learning Process

A premise of the design school is that explicit strategies emerge fully formulated from the design process to be passed to others in the organisation to implement (Mintzberg, 1990a). This premise is subject to the fallacies outlined earlier. Ketelhöhn (1994) argues that effective management is not formulating strategies to be implemented by others. Ketelhöhn recognises that the key to a successful organisation is the ability to continually overcome competition which requires continual improvement.

The sequential process of strategy formation needs to be replaced with a recursive, self-reflective process (Nohria & Berkley, 1994). It is essential that an organisation continually learns from the results of strategic planning for three reasons. Firstly, it is unrealistic for organisations to expect to find the 'right solution' first time (Ketelhöhn, 1994). Secondly, the organisation and its environment are continually changing. Thirdly, the implementation of strategy initiates change, for example, it may prompt a response from customers and competitors. Continual learning is needed to refine strategies and to keep them relevant in both the long and short term.

Day (1994) describes a learning organisation as being open to acknowledge and respond to opportunities. This allows strategies to evolve (Bhide, 1994) as the strategic situation changes. In this way, companies can retain a degree of control in their current situation rather than rigorously implementing a strategy to address the situation as it appeared perhaps twelve months earlier.

From interviews with one hundred of America's fastest growing companies, Bhide (1994) reports executives spend little time planning. Only 28% of the companies interviewed have formulated a complete business plan as analysis can delay the seizing of opportunities. Executives in these companies screen opportunities quickly and briefly analyse ideas focusing on a few important issues before taking action. Attention is focused on four basic questions: what needs to be done? how does it need to be done? who needs to do it? and why does it need to be done? The 'why' question feeds into the other three questions (Cunningham, 1994).

Grundy (1994) defines learning as:

> "A conscious or subconscious process of developing or adapting perspectives to make better sense of the world".

Organisational learning is the ability of an organisation to change in order to attain its goals, or change the goals by means of information and communication. Mills & Friesen (1992) describe organisations as learning in three ways: through individuals, by systemising knowledge into practices and absorbing other organisations. Characteristics of a learning organisation are:

1. Commitment to making learning accessible to everyone in the organisation and embodying it in procedures.
2. Mechanisms for renewal within the organisation.
3. Openness to the outside world to be responsive to changes in the environment.
4. Move towards a network organisational structure for close communication.
5. Empowerment of employees.

Strategic learning is concerned with resolving issues that are complex involving uncertainty and interdependence. Grundy (1994) identifies key phases in strategic learning as:

1. *Surfacing:* identify hard and soft issues.
2. *Analysing*: understanding how issues interrelate.
3. *Reshaping:* searching for ways of resolving issues.
4. *Targeting:* identify desired outputs.
5. *Resolving:* programming how the target can be achieved within the constraints.
6. *Experimenting:* taking first steps to test success of chosen path.

Strategic learning involves constant feedback (Cunningham, 1994) to monitor conditions enabling behavioural re-adjustment to be made; this requires learning and action loops to be linked (Grundy, 1994). Strategic analysis and evaluation techniques can be used in the learning cycle for reflection and filtering of experience.

Johannessen (1995) distinguishes between single-loop, double-loop and deuterolearning. In single-loop learning, a design failure may manifest in an error which is then reported to the people responsible for correcting the error. With double-loop learning, in addition to reporting the error, a suggestion is made as to how the error could be corrected. Deuterolearning recognises that work operations can be improved without any indication of an initial error.

Cultural differences impact organisational learning in different countries (Muller & Watts, 1993). In America, emphasis is given to an individual learning by experience which contrasts with the emphasis on collective learning in Japan. The Japanese approach to quality management is an incremental cyclical learning process called the Kaizen approach. The Kaizen management style relies on a foundation of gradual change, building cultural awareness of quality. Kaizen is a customer-focused, team-oriented process that is clearly communicated. Britain was the first country to focus on action learning although difficulties are experienced learning across organisational boundaries. In Germany, intensive learning in the form of apprenticeships and future education programmes are part of organisational learning. Bhide (1994) recommends that strategies:

> "Evolve through a seamless process of guesswork, analysis and action".

2.3.5 Debate in Strategic Management

Respected authorities on strategic management, Mintzberg and Ansoff, lead a heated debate in the discipline concerning the design school and the learning school of strategic management.

Mintzberg (1990a) reviewed the basic premises of the design school and reported that in addition to being planned, strategy can also emerge. This prompted a critical response from Ansoff (1991).

Ansoff (1991) reports that Mintzberg (1990a) suggests that all prescriptive approaches to strategy should be "committed to the garbage heap of history". Mintzberg (1991) refutes this claim, denying that strategies should never be made explicit. Ansoff (1991) defends forty years experience in a prescriptive school, however, it should be noted that Mintzberg (1991) positions Ansoff's work in the planning school and not the design school of strategic management debated by Mintzberg.

Ansoff (1991) argues that Mintzberg:

1. Only uses a single source of evidence.
2. Provides subjective and not factual evidence.
3. Promotes an irrational 'trial and error' approach to strategy formation.
4. Ignores a priori strategy formation.

Ansoff concludes that Mintzberg's arguments are methodologically weak and contradict factual evidence.

Mintzberg (1991) replies:

1. The chosen evidence typifies the body of knowledge on the subject.
2. Ansoff does not include factual evidence either, only referring to his own work.
3. The rational approach to strategy formation often fails.
4. He is well aware of a priori strategy formation and the problems that it causes.

This debate continues in 1994 as Ansoff (1994) replies to Mintzberg's (1994a) suggestion that strategic planning, as defined by Ansoff (1965) is dead and that strategic analysis is replaced by strategic synthesis (Mintzberg, 1994b).

Ansoff (1994) replies:

1. Mintzberg's understanding of strategy froze in 1965; strategic planning has changed since 1965; but it is not dead, rather it has evolved with environmental change.
2. Mintzberg ignores material which contradicts his views, neglecting Ansoff's work since 1965. Ansoff suggests that Mintzberg is fixated in 1965 to promote his own prescription.
3. Mintzberg's framework is a child's perception of an adult world. The framework proposed is a novice invention of what companies are using.
4. Different environmental challenges require different planning responses.

Kenyon & Mathur (1993) suggest this debate is basically a problem of linguistics. The problem arises because Mintzberg uses the term strategy to represent an unconscious process that can only be defined ex post. Kenyon & Mathur (1993) conclude that Mintzberg's reservations concerning formalised planning do not warrant extending the term strategy to include opportunistic actions.

Muller & Watts (1992) describe the alternative to the design school as being 'muddling through'. This is refuted by Johannessen (1995) as constant change is necessary to achieve organisational aims. The design school tries to develop better models of the organisation (Nohria & Berkley, 1994), however, analytical techniques can lead to paralysis (Langley, 1995). In contrast, the learning school gives action priority over design (Nohria & Berkley, 1994):

> "An action perspective grasps organisations as complex systems where many different things are always happening at once, where the global behaviour of the organisation as a whole is grasped as "emergent" out of local and individual action rather than any top down plan or design".

2.3.6 Summary of Themes in Strategic Management

Strategy formation addresses the fundamental questions of the organisations posed by Weihrich (1986) as:

1. What is the business?
2. Who are the customers?
3. Where are the customers?
4. What do the customers want?
5. What should the business be?

Managers have limited cognitive capacity to examine all the internal and external forces influencing the organisation therefore models are needed to reduce the complexity of strategy formation (Carroll *et al.*, 1993). Models do not provide prescriptions for action but are tools to help focus attention on particular elements of the situation. The effectiveness of models, as the effectiveness of any tool, depends on craftsmanship. In addition to assisting in strategic analysis and design, models also assist with strategy implementation, providing the means for communicating strategy, which is a necessary precursor to action.

Scott-Morton (1988) reasons that if strategy is a creative process, techniques have limited value; models can stimulate ideas, aid consensus and maintain perspective but no model is a substitute for analysis and common sense (Seeger, 1984). All models, to some degree, bias judgement by their simplicity (Seeger, 1984; Carroll *et al.,* 1993), when selecting techniques, Hussey (1982) advises:

1. Use judgement supported by experience.
2. Define the purpose of using the technique.
3. Establish the accuracy of the technique.
4. Evaluate the cost-effectiveness of applying the technique.
5. Assess the speed and frequency with which the technique can be applied.

However, Doyle (1991) argues that the appropriateness of a technique may not be apparent until after it has been applied. This is captured by Gillenson & Goldberg (1984) that:

> "Sorcery, luck and inspiration are the essence of strategic planning".

Furthermore, implicit in this quotation is the indication that design, emergence and vision are complementary components of corporate survival. This viewpoint is reiterated in the statement of five important skills for managers (Wrapp, 1967) which can be mapped to elements of the learning school of strategic management:

1. Keep many pipelines of information open *(strategic analysis)*.
2. Concentrate on a limited number of significant issues *(design models)*.
3. Identify the corridors of comparative indifference *(power and culture)*.
4. Give the organisation a sense of direction *(vision)*.
5. Spot opportunities and relationships in the stream of operating decisions *(emergence)*.

Bowman (1990) indicates that strategic thinking has passed through four stages:

1. 1940s-1950s: emphasised budgetary controls.
2. 1960s: emphasised long range planning balanced across all functions.
3. 1970s: emphasised strategic planning focusing on the industry.
4. 1980s: emphasised global competitiveness and strategic treatment of all resources.

A fifth stage may be added:

5. 1990s: emphasises strategic learning and creativity.

Methods to address the strategic treatment of information systems planning, discussed in section 2.2, remain rooted in stage four.

2.4 REQUIREMENTS FOR THE STRATEGIC ALIGNMENT OF INFORMATION SYSTEMS DEVELOPMENT

This section summarises the problems identified with current approaches to information systems strategic planning and formulates the requirements for an approach to align information systems development with the strategic direction of an organisation.

2.4.1 Problems with Information Systems Strategic Planning

Doyle (1991) identifies the following twelve problems with information systems frameworks:

1. *There are many frameworks:* this may be considered to facilitate customer choice or it may suggest that none of the frameworks are adequate.
2. *Frameworks are limited:* each framework focuses on a specific aspect of the strategic situation at the exclusion of other significant influences.
3. *The search for an appropriate framework is costly:* it may not be possible to determine the usefulness of a particular framework until after it has been applied to the situation.
4. *Relativity of place and industry:* it is suggested that the usefulness of frameworks is limited to particular industries in the countries in which the frameworks were developed, as opposed to being generally applicable.
5. *Time relativity:* frameworks are time independent.
6. *Frameworks affect the environment they purport to explain:* by aiming at the target, the target is displaced, therefore frameworks represent historic as opposed to future situations.
7. *Frameworks and first user advantage:* a framework offers benefits only to the first user of the framework, after which its effectiveness dilutes.
8. *Frameworks become cages:* a framework provides insight but inhibits vision.
9. *Truth is elsewhere:* by seeking alternative frameworks in search of a 'true' representation of the situation, avoids thinking about the situation.
10. *Unnecessary simplification:* the two-by-two framework of the 'Boston Box' over simplifies the situation, obscuring insight and distorting reality.
11. *What to do with the framework:* frameworks are passive and fail to mobilise strategic thinking.
12. *Problems may be undiscovered:* frameworks are only directed towards known problems, there may be other problems in the organisation left undiscovered.

In the turbulent business environment companies seek continued competitive advantage to sustain survival. Brancheau & Wetherbe (1987) suggest that competitive advantage results from the recognition of opportunities through creative innovation, rapid and effective implementation is then needed to take advantage of opportunities.

Earl (1993) identifies the following features of strategic information systems planning which result in dissatisfaction:

1. Resource constraints.
2. Information systems plan not fully implemented.
3. Lack of top management acceptance for the plan.
4. Length of time involved in conducting and implementing the plan.
5. Poor user-information systems developer relationship.

These problems with strategic information systems planning are categorised by Lederer & Sethi (1992) as being:

1. *Resource-related:* limitations of time, money, personnel and management support.
2. *Process-related:* limitations of analysis.
3. *Output-related:* limitations of comprehensiveness and appropriateness of the information systems plan.

Earl (1993) also categorises problems with strategic information systems planning approaches into three areas, method, implementation and process. These problems and those identified by Lederer & Sethi (1992) are summarised in table 2.3 and correspond to the weaknesses of strategic information systems planning approaches presented in section 2.2.2. These features need to be avoided in future proposals for strategic information systems planning.

2.4.2 Requirements for Information Systems Strategic Planning

Recommended success factors for strategic information systems planning (Earl, 1993) include:

1. Top management involvement.
2. Top management support.
3. An available business strategy.
4. Study the business before technology.
5. Good information systems management.

These factors need to be considered in future proposals for strategic information systems planning.

Galliers (1991) confirms management attitude and commitment as being key considerations of strategic information systems planning and adds two additional considerations as: the current business strategy with respect to information technology and the ability to measure the benefits of strategic information systems planning.

Method	Implementation	Process	Resource	Output
Lack of strategic thinking.	Information systems not developed.	Lack of line management participation.	Excessive timescales and resource requirements.	Difficult to secure top management commitment.
Excessive internal focus.	Implementing projects and data architecture identified requires substantial further analysis.	Low management ownership of philosophy and practice.	Success depends on team leader and it is difficult to find a team leader to meet criteria.	Management hesitant.
Lack of analysis of the technological environment.	Resources unavailable.	Inadequate user awareness and education.	Many support personnel are required for data gathering and analysis.	No training provided for information systems function.
Lack of analysis of the strengths and weaknesses of the information systems function.	Technological constraints.	Poor user-information systems development relationship.	Methodology lacks computer support.	Plan fails to provide priorities for developing specific databases.
Too much/little attention to data architecture.	Organisational resistance.	Ignores implementation issues.	Ineffective resource allocation mechanism.	Post-analysis required after study is complete.

Table 2.3: Problems with Strategic Information Systems Planning Approaches

An objective of this research is to overcome weaknesses and develop the strengths observed and cited for the information systems strategic planning methods listed in section 2.2.2. The strengths and weaknesses of these approaches were first summarised and then reorganised to form the following requirements for an alternative approach to strategic information systems planning. These requirements are presented below adopting the same structure as appendix two for examining approaches to information systems strategic planning.

1 Philosophy

Values information systems in terms of their potential strategic value to the organisation; aligns information systems with business objectives; steers the organisation to achieve its goals; supports radical change; adopts a holistic view of information systems planning; provides a means for organisational learning; strategic direction of the organisation is explicit; information rather than data is viewed as the corporate resource.

Objectives:

Identify and prioritise information requirements against business objectives; review strategic value of existing information systems; develop insight into information services that can impact the organisation's competitive position; acknowledge the potential contribution of information systems and information technology to establish and sustain competitive advantage.

Domain:

Flexible to be used in different types, sizes and complexities of organisations.

2 Models

Single business model constructed therefore no reconciliation is required between data and process models.

3 Tools / Techniques

Recognise the contribution of strategic analysis techniques for information systems planning; strategy founded on data and functional analysis, within the context of the corporate strategy which identifies data and processes as being meaningful.

4 Scope

Internal organisational analysis; information systems resource analysis; external analysis; external information systems and information technology analysis; forecast future direction of the organisation; forecast future direction of information systems and information technology; corporate objectives; information systems requirements; information technology requirements; corporate strategy; information systems strategy; information technology strategy.

5 Output

Information architecture is a more stable deliverable from the planning process than the identification of individual information systems; deliverables understood by non-technical management; information systems plan which focuses on satisfying the critical information needs of the organisation.

6 Practice

Information systems development proposals are evaluated against organisational needs; increases credibility of information systems in the business; cross functional teams bridge the departmental boundaries; integration of specification and implementation of changes within the same team, shows organisational commitment to change; promotes information systems development and business interaction; promotes understanding of business needs; promotes a proactive culture as the value of information systems development to the organisation is visible; employees at all levels of the company participate in the learning sessions; documentation is to be maintained during the implementation of the plan; senior management are committed to the study; serves as the top level of structured analysis; identifies technological opportunities; improves maintainability of information systems; procedure-driven or object-driven development approaches can be used; communicate business knowledge to information systems developers; provides reliable management information; builds robust systems with little overlap; does not place emphasis on data and processes which may change; maintains realistic scope; encourages long-term commitment to the study; information systems planning is an on-going activity; analyses current information systems; assesses the criticality of information systems projects to the organisation; relatively short timescales required for conducting the methodology; the information systems identified are developed; a review procedure evaluates the success of the plan; the prior existence of a corporate strategic plan is not assumed; avoids a formal mechanistic approach for defining information systems to meet corporate objectives which may neglect the softer, creative issues which are associated with corporate strategy; simple approach which does not require a large amount of data to be analysed; easy to implement.

7 Integration

Deliverables from the corporate systems strategy are used for individual system implementation projects; organisational objectives are mapped to business processes; translates business objectives into information requirements; provides effective support to business plans; information systems plans implemented; integrated coverage of the systems development process.

2.4.3 Summary of Research Theme Development

From the development of the research theme, this thesis proposes that:

1. ***Individual Models of Strategic Analysis are Limited, a Combination of Strategic Models is Required for Strategy Formation***

Standard models for strategic analysis are criticised for leading to similar solutions (Ciborra, 1994) involving arbitrary and simplistic comparison (Angell, 1990). The dynamic and ambiguous complexity of the future cannot be reduced to simplistic structures (Angell, 1990).

Each strategic model focuses attention on specific aspects of the strategic situation reducing the complexity of strategy formation (Carroll *et al.*, 1993), therefore a combination of models is needed to examine a strategic situation from differing positions. Ward *et al.* (1990) recognise the need for a broader perspective to strategic planning which encompasses analysis of pressure groups and stakeholders, in addition to external analysis and internal business planning.

2. ***Information Systems Planning is Continuous***

Robson (1994) points out that information systems planning is not a 'one-off' task but a continuous cycle embedded in business planning. Angell (1990) suggests that:

> "The question managers confront is not just how to integrate IS strategies to corporate strategies, but how to relate information systems to a continually changing context".

Information systems strategic planning has been dominated by the prescriptive approach of the design school of strategic management. Increasing support for the learning school of strategic management needs to be reflected in approaches to information systems strategic planning.

3. Strategy Formulation, Information Systems Strategic Planning and Information Systems Development Need to be Integrated

Lee & Gough (1993) suggest that information systems planning methodologies fail because little attention is given to the link between information systems and organisational factors. Information systems planning methods identify what information systems are needed but do not plan the information systems identified in detail. This results in an action plan to align information systems with the strategic direction which must then be implemented. An approach is therefore needed which moves beyond the action plan, to support the development of the information systems identified.

Burch (1990) describes strategic planning, information systems strategic planning and information systems development as interrelated cogs which drive the organisation. An integrated approach is needed to reflect their interrelated roles in the sustaining of organisational survival.

4. Information Systems Strategic Planning Requires Organisational Learning

Ciborra (1994) suggests that strategic information systems:

> "are developed close to and serve the grassroots of the organization where its core competencies and skills are daily deployed and perfected. This entails a different style of design, more germane to prototyping, learning and innovation, than to the structured analysis of a business strategy and its straightforward translation into information systems requirements".

In the conclusion of phase three of this research to develop the research theme, a decision point was reached whether sufficient reliable material had been collected or whether further information was required to develop the research theme by the use of surveys, prior to constructing the research hypothesis in phase four.

Developing the research theme has revealed that a number of surveys have been conducted to explore the requirements of and problems with approaches to information systems strategic planning. Planning is pointless without action (Hussey, 1982), the decision was therefore taken that this research could offer a greater contribution to the theory and practice of information systems strategic planning by exploring a means to address the identified requirements, than by further extending surveys in this area.

Key requirements of information systems strategic planning can be summarised as the need for flexible responsive frameworks (Barlow, 1990) which incorporate a composite view (Emberton & Mann, 1988), supporting a degree of creativity applicable in diverse and complex situations (Gillenson & Goldberg, 1984), integrating information systems and business domains (Burn, 1993), in an evolving model (Atkinson, 1990). It is this view which is developed in the following chapter.

CHAPTER 3

DEVELOPMENT OF RESEARCH HYPOTHESIS

In this chapter the hypothesis is constructed, from the development of the research theme in chapter two, that strategic analysis is a suitable application of soft systems analysis. The foundation of an initial framework developed to align information systems planning and development is first presented. The application of the framework using case study material is then discussed before refinements to the framework are proposed.

3.1 STAGE 1: ORIGINAL FRAMEWORK

A number of related proposals led to the construction of the initial framework to support the strategic alignment of information systems development. These included the following assertions:

1. Problems in client-systems developer communication may be attributed to cultural conflict.
2. Parallel trends are observed in information systems development and strategic management.
3. The soft systems approach is compatible with strategy formulation.
4. Information systems planning and information systems development should be united as opposed to disjoint activities.
5. Strategic alignment of information systems development requires a flexible guiding framework rather than a methodology.

Each of these assertions is discussed below.

3.1.1 Problems in Client-Systems Developer Communication may be Attributed to Cultural Conflict

In Shah & Dingley (1994) and Shah, Dingley & Golder (1994), the author introduces the concepts of 'culture' and 'tribe' into the discussion of the relationship between business users and information systems developers. Previous research has focused on identifying particular barriers to user-systems developer communication and on ways of eliminating these barriers. In contrast, it is suggested that much can be learnt through the recognition of cultural differences inherent to the differing roles of the user and systems developer. It is proposed that attempts to remove communication barriers, which are culturally inherent, are misplaced as maintenance of cultural identity is essential to the individual in order to function effectively as a member of their tribe, whether it is the 'tribe' of developers or the 'tribe' of users. Communication problems within the systems development process may be addressed by a mutual understanding of cultural differences between the 'tribes' of users and systems developers. This degree of understanding can only be achieved through effective communication which acknowledges and respects differing cultures.

Strategic analysis crosses existing departmental boundaries, functions and hierarchies which Galliers (1987) suggests may be "accidents of time and are frequently out of kilter with current and future organisational objectives". A fundamental principle on which the framework is to be based is that everyone in the organisation contributes to the success or failure of the organisation and effective communication is imperative beyond departmental boundaries. The framework will therefore need to work beyond organisational boundaries, recognise that differing departments may hold different values and aim to consolidate, as opposed to dismiss, differing views to be channelled towards the attainment of the strategic direction.

3.1.2 Parallel Trends are Observed in Information Systems Development and Strategic Management

The premises underlying the design school of strategic management identified by Mintzberg (1994) are equally applicable to the dominant science paradigm of information systems development:

1. *Fallacy of Prediction:* client requirements, the organisation and the environment are supposed to remain static during the information systems development.
2. *Fallacy of Detachment:* information systems analysis must be separate from design and implementation issues.
3. *Fallacy of Formalization:* information systems must be formed from a sequential process of analysis through design and implementation.

The premises of the design school are being replaced by growing support for strategy formation and information systems development as creative, holistic learning processes. This requires richer, flexible models with which to explore domains. In information systems development, this requirement is being met by the Soft Systems Methodology. This thesis proposes that the Soft Systems Methodology can also meet the changing requirement of strategic management. It is further suggested that the Soft Systems Methodology is a key to align information systems development with the strategic direction of the organisation.

Information systems development, like strategic planning, has been treated as an analytical process of decomposing goals into actionable steps. Structured systems development methods start with the premise of a defined problem and are goal-oriented. Methodologies prescribe the stages, techniques and tools required to analyse, design, develop and implement a system to address the agreed problem.

In contrast to the engineering-based process models, the learning process model views information systems development as individual and collective learning. Information systems development methodologies based on this view, embrace the following premises of an action approach to strategic planning:

1. Iterative design as a learning process. A premise of structured methodologies is that an information system emerges from the process which satisfies client requirements. The sequential process of information systems development needs to be replaced with an iterative process.
2. Systems paradigm of emergent properties. The systems paradigm offers an alternative approach to systems development. The paradigm embraces a holistic view that the richness of complexity is lost by reductionism. Complexity cannot be understood by analysing individual components as reducing complexity rejects the synergistic properties of information systems. The cost of this rejection is the risk that a change in one aspect of the system, may have undesirable and unpredictable changes in other areas of the system.

Tools of the science paradigm impose frameworks on reality, dictating the view observed. Mintzberg (1994) stated strategy functions beyond the boxes of simplistic models; this is also true of information systems. Objective methods act as instruments of conformity and obscure valuable insights into the distinct features of individual information systems (Avgerou & Cornford, 1993).

In contrast, tools of the systems paradigm provide a means of exploring the complexity of reality, without the imposition of rigid frameworks. The aim of this exploration is to attain an appreciation of the problem situation and to investigate how the situation may be improved. Soft methods adopting this paradigm, encourage the exploration of different viewpoints and the wider implications of systems development, such as those listed by Kensing (1982).

3.1.3 The Soft Systems Approach is Compatible with Strategy Formulation

Mintzberg (1994) suggests that strategy formulation should involve strategic thinking. Strategic planning, like the Soft Systems Methodology, aims to analyse a situation and results in a specification of requirements; systems development is then undertaken to develop the systems required to support the strategic plan. The strategy provides the basis for translating abstractions such as competitive advantages, into concrete, implementable terms.

A soft approach is therefore appropriate to support the creative art of strategic thinking. This is supported by Fink (1994) who recognises that:

> "The trend towards a richer and multiperspective approach to ISP is reflected in the Soft Systems Methodology (SSM) or Checkland's methodology. It is a high level analysis technique which allows different perspectives of the problem situation through the active involvement of the users and by identifying attitudes, policies and structures that require change".

This view is further supported by Galliers (1992, 1993a) who suggests that information systems planning is a suitable application for the Soft Systems Methodology which places emphasis on the attainment of a shared understanding and clarifies the activities needed to satisfy objectives. It provides a means of exploring a problem situation without the imposition of restrictive frameworks, supporting the synthesis of different views, providing the context for information systems planning.

The suitability of the Soft Systems Methodology to strategic planning is demonstrated by examining the similarity of their aims. Firstly, strategic planning aims to analyse a strategic situation to seek sustainment or improvement of the situation; the Soft Systems Methodology aims to explore a problem situation to seek possible improvements to the situation. Secondly, strategic planning culminates in a specification of requirements to improve or maintain the strategic position; the Soft Systems Methodology offers an agenda of actions, to improve the problem situation, for discussion. Thirdly, information systems development may be undertaken to support the requirements of the strategic plan or to improve the problem situation. Finally, structured information systems methods are used to develop the information systems required to support the strategic plan, or to improve the problem situation.

The application of the Soft Systems Methodology for strategic information systems planning has been explored by Wilson (1990) and Galliers (1992, 1993a). Wilson (1990) has extended the basic approach to the Soft Systems Methodology to determine the information requirements needed to support the organisational activities. This emphasis on organisational activities is reflected by the formulation of root definitions based on primary tasks.

The first stage of Wilson's approach is to analyse the current situation which involves the analysis of many complex and diverse factors in both the organisation and the external environment. Although structured strategic planning tools may be criticised for their limited focus, they do provide limited guidance in analysing a vast area. The previous chapter identified the inclusion of strategic techniques as a requirement of information systems strategic planning approaches.

Wilson also uses the existing organisational structure to identify the information requirements of individual managers, based on the activities for which they are responsible. This may lead to problems as organisational boundaries may no longer support organisational objectives (Galliers, 1987).

Galliers (1987) suggests that a technique is needed which: places information in the context of activities, linked to the plans and objectives of the organisation; does not emphasise the existing organisational structure and does not rely on examination of existing systems.

Galliers (1992, 1993) proposes a scenario-based approach, the first stage of which is project preparation. The importance of obtaining a 'project sponsor' from senior management is recognised in the previous chapter. Galliers divides Wilson's stage 'analyse current situation' into two phases to analyse both the internal organisation and the external environment, recommending the use of specific strategic information systems planning techniques in each phase. Galliers (1992) states that the aim is to synthesise the range of views provided by techniques to identify the strengths and weaknesses of the organisation. From this strategic analysis, a number of different scenarios for the future of the organisation may be identified, which allow strategies to be formulated and provide a basis for root definitions. The comparison of existing information needs and organisational requirements, forms recommendations for the development of a flexible information architecture.

Previous proposals for the adoption of a soft approach to information systems strategic planning (Galliers, 1992, 1993; Wilson, 1990) propound the complete application of the Soft Systems Methodology. Phases of the methodology are extended as necessary to address the specific aspects of strategic planning.

Fink (1994) recognises that reconciling different perspectives in the Soft Systems Methodology is problematic. Wilson (1990) embraces the principle of root definitions to address this difficulty, whilst Galliers (1992, 1993) proposes the exploration of scenarios. This research questions the use of these approaches. Strategic analysis requires an exploration of the internal and external strategic elements, essential to corporate success and corporate survival, whilst 'resolving' internal conflict may be required, short-term survival requires immediate attention to potential threats and opportunities in the external environment.

The soft systems approach is compatible with strategy formulation for the following reasons. Firstly, analysts cannot comprehend information requirements unless the organisational direction is known (Avison, 1992) and the Soft Systems Methodology can be used to structure strategy and planning activities (Jayaratna, 1992). Secondly, people are an organisation's most powerful resource in attempts to attain competitive advantage (Moyes, 1993). Many models enforce standard views to gain competitive advantage, whereas soft systems analysis retains the creativity which Doyle (1991) recognises is lacking in passive frameworks. Thirdly, the successfulness of any plan is determined by its implementation, which reflects people's commitment to the plan. Wilson (1990) suggests that soft systems analysis encourages commitment and ownership of the resulting plans. Finally, Checkland & Scholes (1990) suggest that soft systems analysis offers a reflective process through which organisations can continually review their strategies, thereby supporting organisational learning.

3.1.4 Information Systems Planning and Information Systems Development Should be United as Opposed to Disjoint Activities

During strategic planning and information systems planning, much information is collected concerning the strategic position of the organisation and the information systems needed. Many of the information systems planning methods evaluated in chapter 2.2 supported little integration between the stages of strategic planning, information systems planning and information systems development. It is suggested that information systems planning methodologies fail because little attention is given to the link between information systems and organisational factors (Lee & Gough, 1993). This thesis suggests that treating these stages as disjoint activities may result in a loss of information between the stages. It is proposed that closer integration between these stages may:

1. Reduce the time taken for each stage as subsequent stages have access to information that has already been collected.
2. Improve organisational understanding of the corporate position and the role of information systems in the organisation.
3. Improve understanding of the strategic information systems required and hence aid their development.

3.1.5 Strategic Alignment of Information Systems Development Requires a Flexible Guiding Framework Rather than a Methodology

Premkumar & King's survey (1991) revealed that only 22% of respondents use a commercial information systems planning methodology. One of the factors contributing to the non-acceptance of commercial methodologies is that the methods are not sufficiently flexible to address the particular requirements of a situation. Organisations function within in a dynamic environment and the specific strategic situation of an organisation at a particular time is unique. The cost of generality of commercial methodologies is the loss of value and usefulness to individual organisations. The particular issues worthy of analysis will depend on the specific nature of the situation (Bhide, 1994). This thesis proposes that organisations need a flexible framework with which to guide strategic information systems planning and development, as opposed to a prescriptive methodology which fails to address their immediate situation.

3.1.6 Additional Material

The following additional material contributed to the framework developed.

Notation

Notation and information representation are key contributors to effective communication which Boisot (1994) defines as modifying the recipient's view of the world. McGarry (1981) offers the following distinctions:

1. *Signal:* a sign with emphasis on some conceptual action; a stimulus requiring a response.
2. *Sign:* physical evidence of the immediate physical presence of the thing or event represented; action is perceived as having significance beyond itself.

3. *Symbol:* a special sign that represents an object, idea, event that elicits the same response as if the thing represented was present.
4. *Iconic symbol:* conveys meaning across language barriers.

Models used in the framework proposed will use iconic as opposed to symbolic notation where possible. A symbol is a conventional sign used to typify an object, whereas an icon is an image or metaphor used to present an impression. Symbolic notation may be considered to limit creative thinking and impose greater preconceptions on the interpretation of the resulting diagram. A rich notation is considered necessary since the modelling of the organisation, beyond data and processes, imposes heavy requirements on modelling languages (Opdahl & Sindre, 1994).

Radiant Thinking

Section 2.1.5 outlines cognitive mapping which is described by Eden *et al.* (1983) as "exploring beneath the surface of words", allowing consideration of personal attributed meaning. Buzan (1993) suggests that today's 'information explosion' is partly caused by the assumption that text is the only vehicle for learning, analysis and communication. This assumption results in excessive note-taking in which time is wasted as unnecessary notes are recorded, read and searched.

A mind map is an expression of radiant thinking, a technique proposed by Buzan (1993) which starts with a central concept and associated words then radiate from the central point. Radiant thinking reflects how information is associated in the human brain; themes radiate from the central image as branches with a key image or key word to form a nodal structure. Mind maps use colour, image, emphasis and association, embracing a range of cortical skills thereby promoting mental receptiveness and stimulation. The diagrams in the proposed framework aim to encapsulate the holistic synergistic qualities of radiant thinking in strategic analysis.

Funnel and Filter

The funnel and filter mechanism was developed by the author during a previous project to model a text database for project management. A common structure for a project was first identified, this is illustrated in figure 3.1. The starting point for a project is the identification of an initial requirement which may then be refined and formally defined as the project title. The agreed title becomes the central core of the project which is constantly referenced to constrain the project. From the initial requirement, further ideas and issues develop, each of which may be further developed and related to other points.

As the project continues, more information is collected and ideas develop within the boundaries imposed by the project title.

A project results in deliverables which provide tangible evidence that the project is complete. In the same way that a project title is a focal point from which related ideas span, the project deliverables draw together the ideas and material collected during the project. Common elements run through the centre of the project into which the material may be divided. Although these divisions are dependent on the type of project being undertaken, the template shows divisions of project management and quality which may be relevant to most projects. These two elements may be controlled or monitored in a number of ways including meeting and reports, such control mechanisms focus on a selection of the project material at an instance in time.

A number of people are involved in a project each of whom may focus on a section of the project or a collection of the material; this may be defined as view of the project material. It is these views which comprise the project that a text database is designed to support. As the template shows, a project contains a mass of information which cannot be singularly divided into neat sections because of the many interrelationships.

It is proposed that the funnelling and filtering of information in a unifying framework can assist in supporting the integration required to establish and maintain the strategic alignment of information systems development. Individual strategic analysis techniques filter specific aspects of the strategic situation; the combination of these views needs to be funnelled into a specific strategic direction. Information collected during strategic analysis can be funnelled into information systems development projects where the information can be filtered for use in individual information systems developments. The funnelling and filtering of information in strategic planning, information systems planning and information systems development may facilitate greater integration between these disparate stages.

3.1.7 Initial Framework

Two stages for information systems strategic planning were identified, stage one strategic analysis and stage two strategic action.

Stage 1: Strategic Analysis

This stage requires the strategic direction of the organisation to be explored through internal analysis of strengths and weaknesses and external analysis of opportunities and threats. Integrated information systems strategic planning requires the information systems resource, as other resources, to be examined during this internal and external analysis.

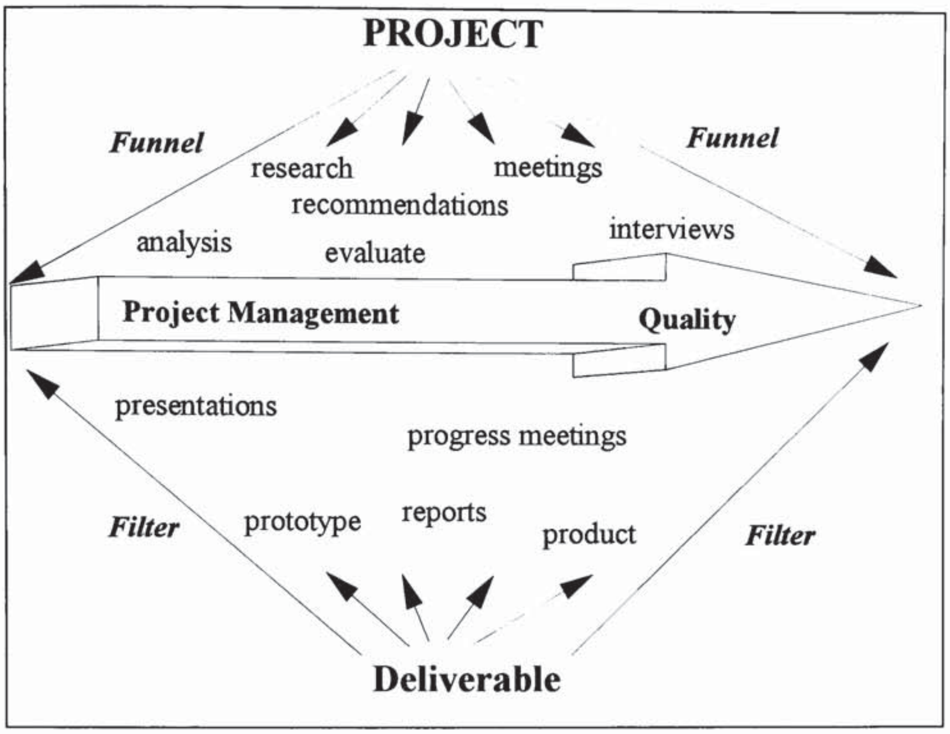

Figure 3.1: Funnel and Filter Model

Strategic analysis of the corporate situation comprises of five aspects illustrated in figure 3.2. However, the strategic situation cannot be fully appreciated by examining these individual components; the synergistic effect of these components must also be examined.

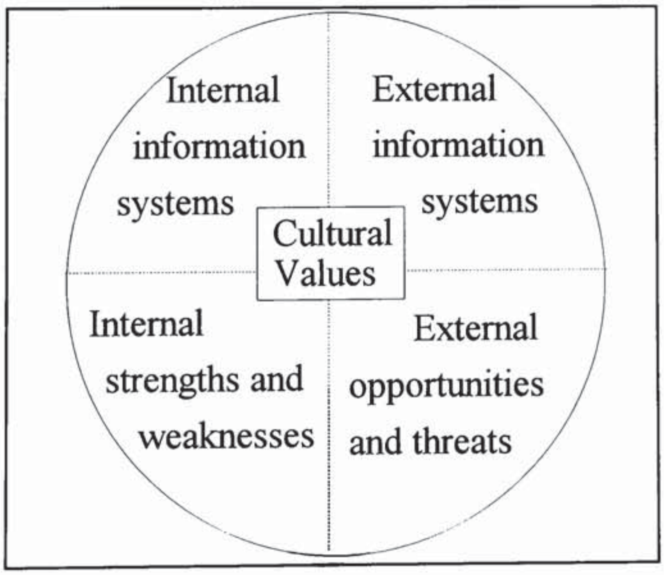

Figure 3.2: Strategic Analysis Model

The previous chapter identified a range of strategic techniques which may assist in strategic analysis. Some of these techniques have been mapped onto the diagram in figure 3.3.

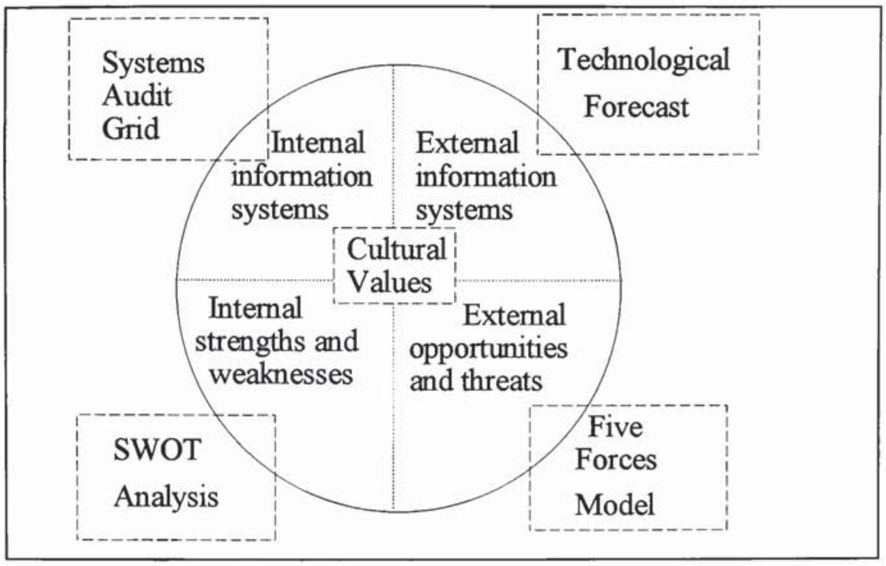

Figure 3.3: Strategic Analysis Model with Strategic Tools

The requirements identified for information systems strategic planning rejected prescriptive approaches which fail to address the specific needs of the situation. Doyle (1991) also identified a number of criticisms of strategic frameworks listed in section 2.4.1. Therefore, although the use of specific strategic analysis techniques may be recommended in this stage, the selection of techniques to be used is delegated to the discretion of the analyst. The rationale for this decision is that it will provide the flexibility for organisations to incorporate their existing strategic planning techniques and the use of complementary techniques will be suggested without the imposition of a rigid framework. It is recognised that guidelines are needed to assist organisations in the selection of appropriate techniques. Appendix three lists the guidelines derived from chapter 2.3, adopting the three phase model of Johnson & Scholes (1993).

Strategic analysis techniques are criticised for oversimplifying the situation, as Mintzberg (1994) recognises, strategy operates beyond the boxes of strategic analysis. The aim of this first stage of the framework is to provide a rich appreciation of the strategic situation, using strategic analysis techniques where appropriate. A danger of using strategic analysis techniques is that attention is directed towards applying the techniques as opposed to the information derived from using the techniques. The purpose of this initial stage is therefore to summarise the strategic situation explored with the guidance of strategic analysis techniques. A rich iconic notation is necessary to represent this information, moving beyond the objective view provided by each individual technique, to explore the synthesis of the techniques. This is illustrated in figure 3.4.

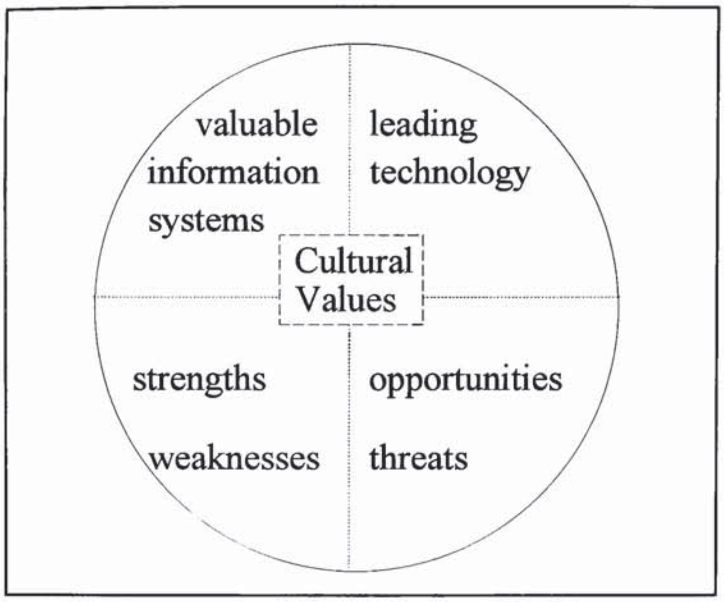

Figure 3.4: Formation of a Situation Summary Diagram

The steps in this stage of strategic analysis are:

1. Identify strategic analysis techniques for internal and external analysis, using the guidelines provided and previous experience of strategic techniques in the organisation.
2. Apply the strategic analysis techniques.
3. Summarise the information content derived from the application of each technique using a rich notation.
4. Review the relationship between the information summarised in the diagram.
5. Add any further information considered relevant to the strategy.

The deliverable from this stage is the situation summary diagram which can then be used in stage two, strategic action.

Stage 2: Strategic Action

Action needs to be taken to address or sustain the strategic situation summarised in the diagram created in stage one. It is proposed that the situation summary diagram should be used in stage two, as opposed to disregarding the information collected. It is anticipated that from the situation summary diagram, key areas of concern will be evident that may be addressed by the allocation and deployment of the information systems resource. In this stage, specific information from the situation summary diagram is extracted for inclusion in the stage two deliverables. The information extracted from the situation summary diagram is relevant to the development of a specific information system to address the situation summarised in stage one. It is proposed that the re-use of information between stages one and two will increase the integration between the stages of planning and development and reduce the time taken for information systems development, as the diagram provides a starting point from which the information systems development may progress.

As the deliverable from stage two is derived from the situation summary diagram of stage one, the same rich iconic notation will be adopted. The purpose of stage two is to justify the development of an information system by aligning information systems development with the strategic direction of the organisation. A justification alignment diagram is therefore constructed in stage two from the following steps:

1. Identify the key areas of concern from the situation summary diagram.
2. Explore how information systems development can contribute to these areas.
3. For each potential information system identified, extract the relevant information from the situation summary diagram to form the justification alignment diagram.

As a business-oriented vehicle for user-systems developer communication, the justification alignment diagram provides the starting point from which information systems development may progress. The diagram may then be enhanced with more detail as the information systems development continues.

This two stage framework, illustrated in figure 3.5, forms the initial framework to address the requirements of an approach to support the strategic alignment of information systems development identified in section 2.4.

3.2 STAGE 2: APPLICATION AND APPRAISAL OF FRAMEWORK

The framework in figure 3.5 was applied to a number of case studies which are briefly described in appendix four. This section discusses the experience gained from applying the framework to these case studies.

3.2.1 Preparing for the Study

Methodologies such as Business Systems Planning (IBM Corporation, 1984) recognised the importance of an initial stage to prepare for the start of the study. In this stage, the analyst enters the organisation and both the analyst and the organisation commence a familiarisation process. The need to balance an appreciation and understanding of the organisation's situation whilst maintaining an objective view of the situation is discussed in Shah & Dingley (1994).

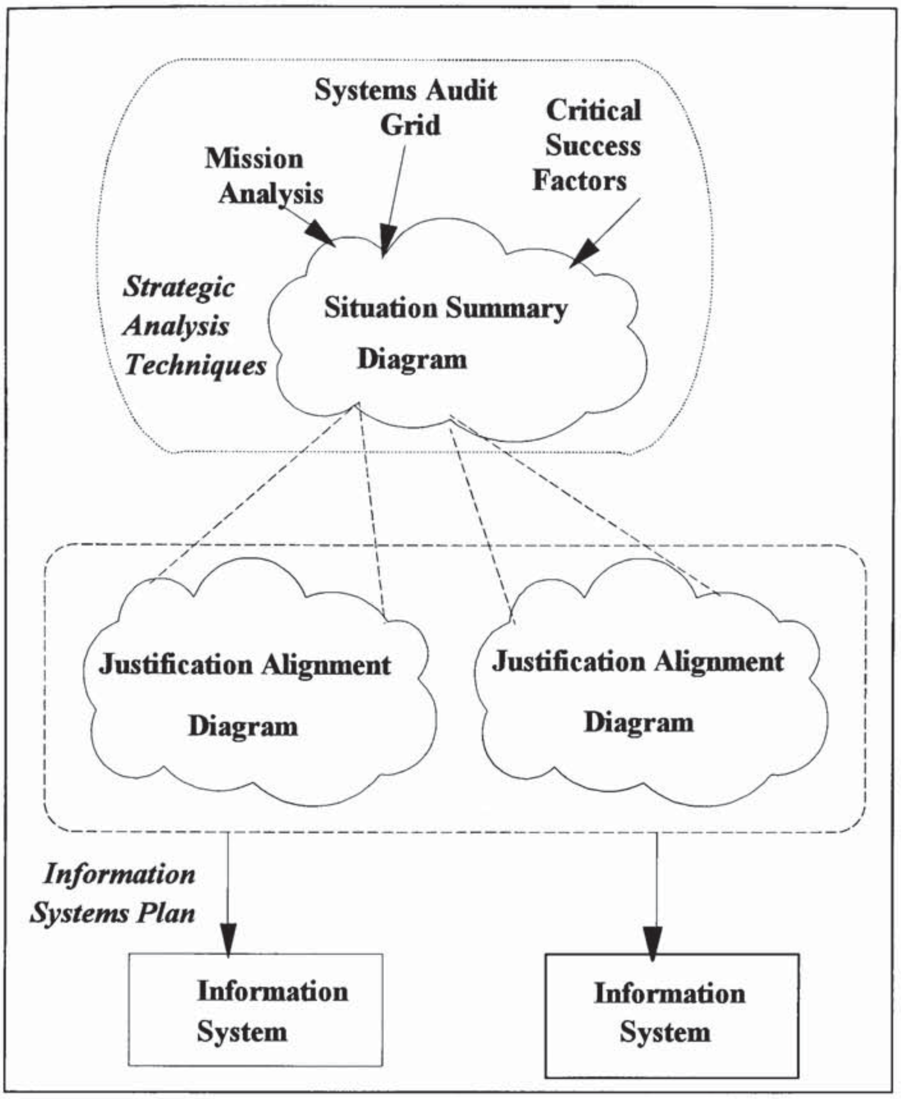

Figure 3.5: Initial Strategic Alignment Framework

During the case studies it became necessary to document information relating to the organisation which did not directly relate to the organisation's strategic situation. In case one, information such as the nature and location of the hospital records department was documented as case notes separate to the application of the framework because although relevant to the case study, the information did not directly relate to the strategic situation explored and summarised in the situation summary diagram.

In case three, an additional corporate summary diagram was added to the framework. The purpose of this diagram is to summarise the organisation entered, providing a means to document information attained at the start of the study. The corporate summary diagram has been proposed as an additional optional stage to the framework in section 3.3. This is an optional stage as if the framework is applied by employees within the organisation, this familiarisation stage may be considered unnecessary.

3.2.2 Situation Summary Diagram

It was proposed that the situation summary diagram should summarise the strategic situation of the organisation using a rich notation and adopting a formal underlying framework of strategic analysis techniques. From the case studies, five issues were evident. Firstly, the rich iconic notation proposed for the situation summary diagram was found to be inappropriate for the case material used. This finding may be a weakness of the nature of the case material used; a weakness of using case material which prohibits interaction and communication with the people directly involved in the situation described; a weakness of the proposal. The proposal may therefore need to be modified to permit the strategic situation to be documented by any appropriate means.

Secondly, the situation summary diagram was intended to summarise the strategic situation of an organisation. Although the case study material did not support strategic analysis, this stage of the framework provided a means with which to summarise the situation of an organisation at a point in time. This was particularly important in the first case as it supported longitudinal analysis as the situation evolved.

Thirdly, a formal framework of strategic planning techniques was proposed to underlie the situation summary diagram. Although the case material did not provide sufficient information to evaluate this proposal, in case one, a formal structure relevant to the case study was extracted. This structure which included elements of structure, culture, procedure, location and communication was used as the basis for the situation summary diagrams constructed to analyse the effects of changes proposed and reported in the case study. The underlying structure of the situation summary diagram provided a consistent base for comparisons, identifying conflicts between cultural values and the changes proposed.

Fourthly, the addition of colour within the diagrams was considered. Foley (1993) reports that since the earliest times, colour has been used for visual symbolisation. Table 3.1 compares the symbolism of de Bono's (1992) 'Thinking Hats' to symbolise different aspects of creative thinking with the symbolic representations of colour reported by Foley.

Colour	Colour Symbolism (Foley, 1993)	Thinking Hats (de Bono, 1992)
WHITE	peace, light	neutral, carry information
BLACK	night, evil	stern, restrictions
RED	aggression, danger, threat, strength, stop	fire, intuitive feelings
YELLOW	sun, light, heat, power, glory	sunshine, optimism, feasibility, benefits
BLUE	height, depth, truth, integrity	overview, agenda, organising, summary
GREEN	growth, hope, freedom, prosperity	rich growth, new ideas, possibilities

Table 3.1: Comparison of the Symbolic Representation of Colour

During the application of the proposed framework to the case study material, colour was used to test whether the symbolic use of colour enriched understanding. The following colour symbolism was adopted: black, restrictions; red, threats; yellow, benefits; blue, facts and green, opportunity.

Although Buzan (1993) encourages the use of colour in mind mapping, proposing that colour stimulates memory and creativity, the symbolic use of colour in the proposed framework increased rather than reduced the cognitive effort required to interpret the models. Rather than reducing the semantic distance between the model of the situation and the mental model of the situation, the addition of symbolic colour, increased the semantic distance. It was concluded that whilst colour may be visually appealing, encouraging creative thinking and aiding recall, the symbolic use of colour is inappropriate for strategic analysis.

Finally, soft systems analysis, which this diagram aims to embody, encourages cultural aspects of the situation to be explored. Hofstede (1991) proposes that culture is manifested in:

1. *Symbols*: words and objects which have meaning only to those who share the culture.
2. *Heroes*: people who possess characteristics prized in the culture.
3. *Rituals:* collective activities considered essential to the culture but which are not mandatory to the achievement of goals.
4. *Values:* preferences between states of affairs.

These four categories were used to assist the exploration of cultural influences in the strategic situation. This was particularly useful in case one where it became evident that changes proposed and implemented were in direct opposition to the organisation's culture. Cultural analysis has been added to the refined framework.

3.2.3 Justification Alignment Diagram

In case one, the justification alignment diagram indicated the main areas from the situation summary diagram which would be affected by the changes proposed. This suggests that the justification alignment diagram may be used to represent changes other than the development of information systems, although the lack of material in the case study restricted learning more about the justification alignment diagram in practice. As the purpose for the justification alignment diagram was stated as being to justify the information system to be developed, it was considered that a more appropriate name for this diagram would be justification alignment contour as the resulting model provides an outline for the information system to be developed

In addition, a contour may be defined as a line on a map joining two points of the same altitude. In case three, the justification alignment diagram was used to map corporate objectives to the perceived benefits of membership of the association and then to map the objectives to the plan. In this way the justification alignment diagram aligned the planned action of the organisation with the strategic direction proposed.

It was proposed that the justification alignment diagram would be derived from the situation summary diagram. Using the same elements in the justification alignment diagram and the situation summary diagram clearly showed the areas affected by changes in proposed case one, and supports the reuse of information at each stage in the framework.

3.3 STAGE 3: REFINED FRAMEWORK

A composite framework to integrate strategic information systems planning and development has been formed, consisting of three stages:

1. *Stage 1:* Corporate Summary Diagram.
2. *Stage 2:* Situation Summary Diagram.
3. *Stage 3:* Justification Alignment Contour.

The framework recognises that little attention has been applied to the transfer of strategic plans from the director's 'planning office' to the systems-developer's workbench. Figure 3.6 shows a framework which focuses on the information transfer between planning and development activities, addressed through the integration of the formulation and implementation of information systems strategic planning.

3.3.1 Stage 1: Corporate Summary Diagram

This stage examines the mission of the organisation, equating to the 'prepare for study' activity of Business Systems Planning (IBM Corporation, 1984). It may be considered to be a 'familiarisation' stage to ensure a clear understanding of the mission and activities of the organisation is held by all participants in the study. This is an optional stage as some organisations may be satisfied that a clear understanding of the corporate mission has already been established.

3.3.2 Stage 2: Situation Summary Diagram

This stage explores the current strategic direction of the organisation and aims to synthesise the views attained of the strategic situation from established strategic planning techniques. This allows an organisation to apply the techniques with which it is familiar, suitable to its industry and current situation. Guidelines are provided to assist an organisation in the selection of a balanced portfolio of techniques.

Strategy formulation is more than just a review of the current situation; it requires ideas to be generated to further improve the corporate situation identified. Strategy formulation requires both structured tools with which to focus on specific areas of complexity and a soft approach to support the creative art of strategic planning which acknowledges differing views and the importance of subjective experience.

The situation summary diagram may be regarded as a 'rich picture' which summarises the exploration of the strategic situation to identify new opportunities. The situation can be explored through the synthesis of structured strategic planning methods resulting in the formation of a situation summary diagram.

The situation summary diagram is a physical diagram, using a rich notation. This differs from a rich picture in the Soft Systems Methodology which need not be represented as a physical drawing (Lewis, 1992). A formal framework of strategic planning techniques underlies the construction of the situation summary diagram. The situation summary diagram summarises the strategic situation, absorbing and integrating different views examined by various strategic planning techniques.

3.3.3 Stage 3: Justification Alignment Contour

From the strategic situation summarised in stage two, one or more information systems may be identified as being required. In this stage a justification alignment contour is prepared for each information system needed to support or facilitate corporate objectives. A justification alignment contour is an outline of the system to be developed derived by extracting relevant components from the situation summary diagram. It initiates the systems development process and is circulated to all participants in the development, providing information regarding the strategic role of the development.

The purpose of the justification alignment contour is to *justify* the system to be developed, thereby *aligning* development with the corporate strategy. It provides the starting point for development, using the information collected during strategic planning. A *contour* may be defined as an outline or a line on a map joining points of the same altitude; the justification alignment contour provides an outline of the system to be developed; bringing information systems planning and information systems development into line with the strategic direction of the company.

3.3.4 Summary of Composite Framework

The framework proposed provides a means with which to explore the strategic situation of an organisation, simultaneously retaining established strategic planning techniques and releasing unnecessary simplification. This is important for two reasons. Firstly, companies who have invested time and money establishing a strategic planning programme will be reluctant to change to new techniques. Secondly, as strategic planning determines the future survival of the company, the risks associated with using unfamiliar methods may be considered to be too great. The freedom provided by the situation summary facilitates the synthesis of strategic planning techniques necessary for strategic thinking.

The soft systems approach is oriented to problem formulation *(WHAT)* and structured methods are design-oriented *(HOW)*. The framework proposed provides an iterative mechanism for the application of both soft and structured strategic planning techniques to determine the nature of the problem and opportunities with which the organisation is presented, justifying *WHY* an information system is needed to support the corporate strategy. The situation summary diagram releases strategic planning from the unnecessary simplification imposed by conventional structured matrices, facilitating the synthesis of strategic planning techniques considered necessary for strategic thinking. Key concepts unearthed in the planning phase, constructing the situation summary diagram, are analysed in more detail during the development phase, constructing the justification alignment contour. The justification alignment contour aims to transfer some of the richness of strategy formulation to information systems development, a necessary requirement for closer integration between information systems planning and development (Galliers, 1992). The following chapter discusses the further development of this framework through action research.

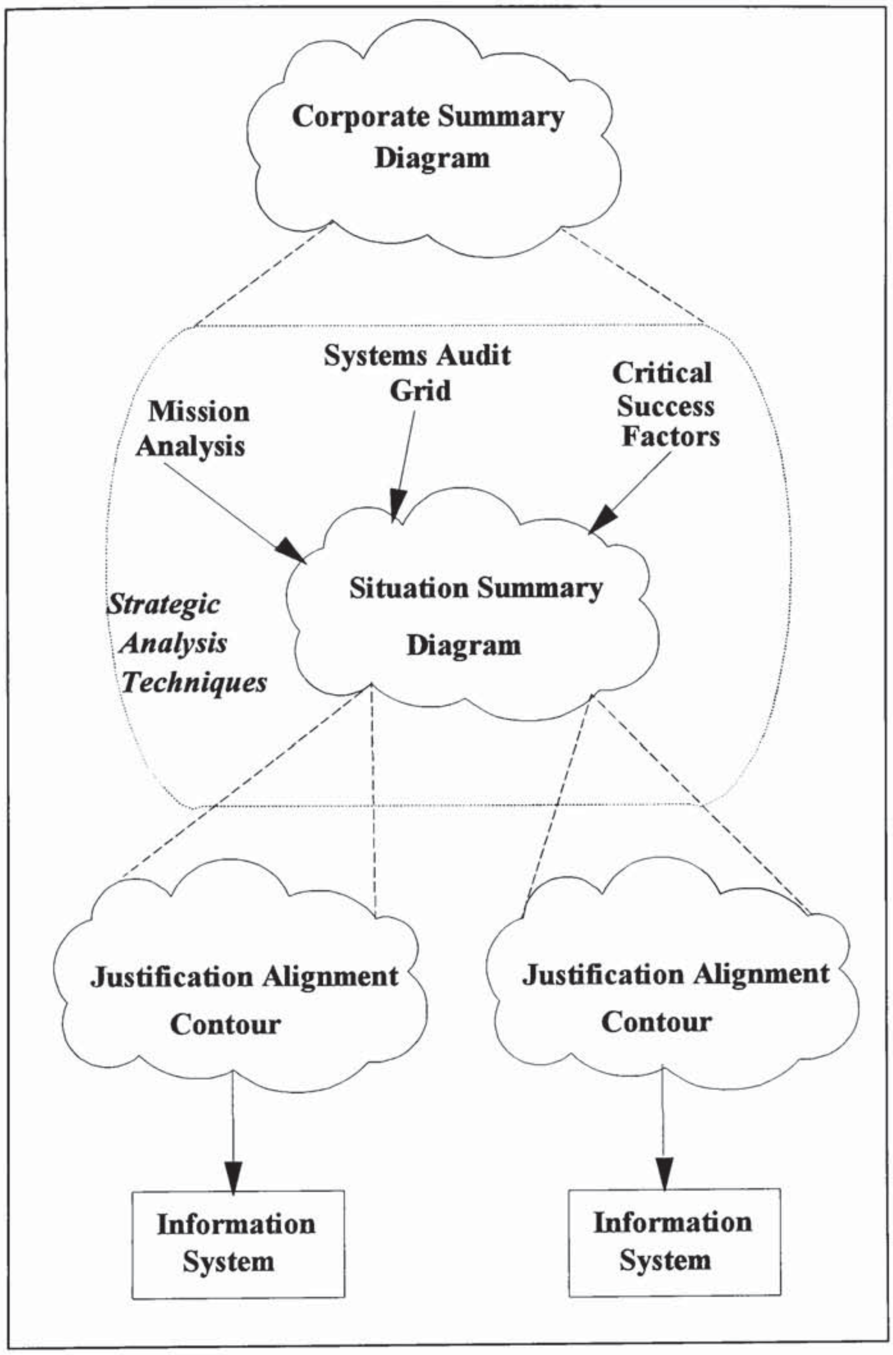

Figure 3.6: Refined Strategic Alignment Framework

CHAPTER 4

ACTION RESEARCH

This chapter reports the action research conducted in two organisations. The selection of organisations and the framework of action research used is first discussed, the detailed cases which describe the interaction between theory and practice are then presented. The chapter concludes by summarising the experience of action research.

4.1 INTRODUCTION TO ACTION RESEARCH

The selection of organisations in which to conduct action research represented a critical point in the research design. This section first affirms the importance of the selection task, before discussing the main factors influencing the choice of organisation. The section concludes by presenting the framework used to guide action research in the selected organisations.

4.1.1 Importance of Organisation Selection

Action research was incorporated in the research design to conduct phases five, six and seven of the research, to test the research hypothesis, interpret findings and refine the research hypothesis. The choice of organisation was important as the selected organisation would influence further development of the research hypothesis. Doyle (1991) criticises information systems planning frameworks which assume specific types of organisation, industry or culture. It was therefore important to select an organisation in which the framework could be developed without limiting the future applicability of the framework to other organisations and industries. The choice of organisation would therefore be a key factor in assessing the quality of the research conducted.

4.1.2 Selection of Organisation

An organisation was needed which:

1. Recognised the need to align all resources, including the development of information systems, with the strategic direction of the organisation.

2. Agreed to re-examine the strategic direction of the organisation to facilitate an integrated approach to information systems strategic planning.
3. Currently used strategic planning tools to be incorporated into the framework.
4. Agreed for the researcher to enter the problem situation.
5. Granted permission for staff in the organisation to participate in the research.

In selecting an appropriate organisation, the researcher was aware of two potential dangers, reported in section 1.3.4. Firstly, by constructing the initial framework, prior to entering a client organisation, there was the danger that the framework would be imposed onto the organisation without thoroughly examining the organisation's specific situation. Secondly, that the refinement of the framework could be unduly influenced by the complexity of, perhaps an inappropriate, organisational context, rendering the results of the research ungeneralisable.

Checkland (1981) reports that methodology descriptions report an ideal state which needs to be adapted to the specific organisational context. The search for a client organisation was not concerned with finding an ideal client, but an organisation which recognised the need for strategic alignment of resources, could potentially provide generalisable results and was willing to participate in the research.

Eight organisations were initially considered: a car manufacturer, construction company, sportswear company, independent retailer, events organisation, sports centre, service company and motorcycle speedway organisation. Factors influencing the clients selected included the size, structure and cultural environment of the organisation.

Six of the organisations were rejected for the following reasons:

1. The organisation was considered to be too large or too distributed to accommodate with the resources available.
2. The organisation was considered to be too small or too independent to derive generalisable results.
3. The management style or organisational culture was considered to be a potential threat to the action research.

Two clients were selected in order to develop the framework and demonstrate its use in different contexts. In addition, the acceptance of two clients provided contingency in the research. Justification for the individual clients selected is included in the cases described.

4.1.3 Consolidated Approach to Action Research

Section 1.3.4 briefly outlined two types of action research identified by West *et al.* (1995), the consultancy study approach and the field study approach. In contrast, a consolidated approach to action research is proposed in this thesis, in which neither theory nor practice dominates, but both are balanced and consolidated within reflection.

Kolb (1984) proposes a four phase model of experiential learning which combines experience, perception, cognition and behaviour to provide a 'holistic integrative perspective on learning'. Figure 4.1 illustrates that the consolidated approach to action research can be mapped onto Kolb's model of experiential learning. Kolb's model was used to guide the consolidated approach to action research conducted and is used to structure the research reported in sections 4.2 and 4.3.

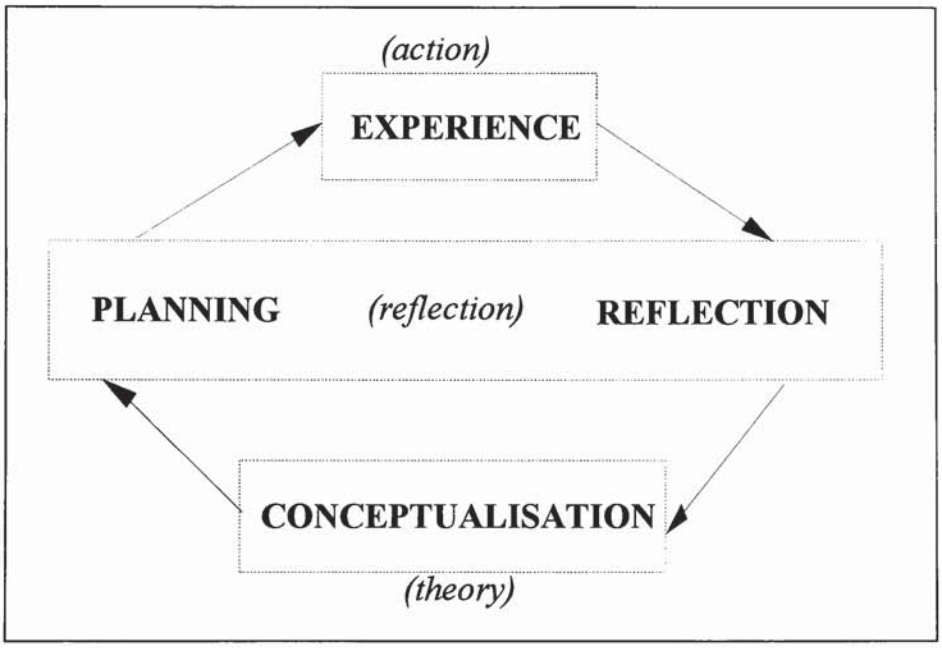

Figure 4.1: Consolidated Approach to Action Research Mapped to Kolb's Model of Experiential Learning

4.2 CASE 1: MOTORCYCLE SPEEDWAY

This section reports the action research conducted within the sport of motorcycle speedway. An overview of the sport is provided in appendix five. Justification for selecting this client organisation is first presented, the application and development of the strategic framework at a number of levels within the sport is then reported. The purpose of this chapter is to report the experience of the action research conducted. This section therefore adopts the cyclical nature of Kolb's model of experiential learning which guided the research undertaken.

4.2.1 Justification for Selecting Motorcycle Speedway Case

The research was initiated by the appointment of a new manager of the Speedway Control Board which controls motorcycle speedway in England, Scotland, Wales, Channel Islands and the Isle of Man. The manager considered that the strategic direction of the organisation needed to be reviewed if the sport was to survive into the next century. Although the exact nature of the situation was not clearly defined, it was considered that the situation summary diagram could assist in exploring the strategic situation of both the speedway control board and the sport in general. Analysis of the initial feasibility of the study is reported in section 4.2.2.

A potential concern was that the nature of the case would limit the generalisation of results from the research. However, the feasibility study revealed that the broad nature of the sport would enrich rather than limit the research conducted. The case met all of the requirements identified in section 4.1.2 with the exception that it was not evident that strategic planning techniques were currently used.

4.2.2 Feasibility of Motorcycle Speedway Case

The feasibility of this case was explored through two cycles of Kolb's (1984) model, entering the model at the experience phase.

Experience: a meeting took place with the newly appointed manager of the Speedway Control Board (S.C.B.) in which the structure and purpose of the control board were discussed. The Fédération Internationale Motocycliste (F.I.M.), concerned with two and three wheel motor vehicles, works with the Fédération Internationale Automobile (F.I.A.) concerned with four wheel motor vehicles to control motor sport. The Royal Automobile Club (R.A.C.) represents the British interests on the F.I.A. indirectly through the F.I.M. and delegates control of motorcycles in Britain to the Auto Cycle Union (A.C.U.). A tripartite agreement between the R.A.C, A.C.U. and S.C.B. delegates control of motorcycle speedway to the S.C.B. although the A.C.U. remains responsible to the F.I.M. for the conduct of the sport. This situation is unique to Great Britain as in other countries speedway is directly controlled by the A.C.U.

At the meeting, the manager explained some of his concerns about the control board and the sport in general. The sport of speedway has changed and is continuing to change, the S.C.B. must be re-examined to ensure it supports the needs of the changing sport. Compared with the large crowds of the 1950s, the sport in Great Britain is in decline, although British League speedway is still considered to the hardest and toughest in the world. In addition to the threats to the survival of the sport imposed by the entertainment industry, new opportunities are available, such as satellite television and proposals to change the world speedway final which determines the world champion, to adopt the grand prix format of other motor sports. The S.C.B. and everyone involved in the sport needs to ensure the sport addresses these threats and opportunities to ensure continued survival of the sport.

Reflection: from the meeting it was evident that the manager was aware that the sport was changing and the S.C.B. may no longer support the needs of the sport. In order to analyse the strategic situation of the control board, the sport which it aims to control needs to be examined. This would require co-operation at all levels in the sport including riders and officials.

Conceptualisation: the S.C.B. requires an internal analysis of the strategic position of the control board to be conducted, in addition, an external analysis of the strategic situation of the sport and the environment in which the sport exists is required. The situation summary diagram could be used to explore these three levels of strategic analysis required, the justification alignment contour could then be used to develop information systems required to address the strategic situation depicted. The co-operation of riders and officials is necessary to appreciate the needs of the sport but the S.C.B. does not have direct control over riders and officials, other than through licensing. Wider commitment than the S.C.B. needs to be attained for the study before it can be accepted.

Planning: contact representatives of the sport at rider and stadium levels to establish the degree of commitment to and participation in the study. Identify potential resistance to the study and estimate the size and scope of the study to be conducted.

Experience: a number of speedway riders, stadium officials and staff of the speedway control board were contacted to briefly discuss the study. Although many riders had hectic international schedules, all the riders contacted arranged time to discuss the study. Everyone contacted agreed that the study was needed and confirmed their participation. A further meeting with the manager of the S.C.B. confirmed the study would be restricted to motorcycle speedway in Great Britain and would exclude study of the F.I.M. and F.I.A.

Reflection: initial experience of entering the situation suggested that the culture of the situation was dominated by motivation and enthusiasm for the continued success of the sport. People at all levels of the sport were eager to participate in the study, dedicated to improving the sport in any way possible.

Conceptualisation: the culture of the situation appeared to encourage the creativity of strategic thinking proposed by the framework. However, there was concern that the results of the case would only be relevant to the particular sport investigated and that the experience gained would not be transferable to other industries.

Planning: continue with the study but reduce the scope of the study to include representatives from the twenty-seven stadiums and two hundred riders; find an alternative case to support the experience attained in this case; agree the study with the manager of the S.C.B.; undertake stage one of the framework to construct a corporate summary diagram. This optional stage is needed for the researcher to become familiar with the organisation of the S.C.B.

4.2.3 Corporate Summary of Speedway Control Board

The corporate summary diagram shown in figure 4.2 was constructed from analysis of speedway regulations (S.C.B., 1993) and meetings with the manager of the S.C.B., documented through the following cycle of Kolb's (1984) model.

Experience: the scope of the study was reduced to focus on the S.C.B. and representative riders and officials from the sport. A meeting was arranged with the manager of the S.C.B. to appreciate the purpose of the S.C.B. and to become familiar with the work of the organisation. At the suggestion of the manager, this meeting was held at a speedway stadium, whilst a speedway meeting was in progress, in order to place the discussion in context.

Figure 4.2 illustrates that the S.C.B comprises of four directors, two appointed by the R.A.C. and two appointed by the A.C.U. These directors do not directly contribute to the S.C.B. but are required to attend annual meeting at the S.C.B. to oversee the work of the board. The manager of the S.C.B., supported by clerical staff, is directly responsible for all operations of the S.C.B. Speedway officials are licensed by the S.C.B. to represent the S.C.B. at all race meetings conducted in England, Scotland, Wales, Channel Islands and the Isle of Man.

The objective of the S.C.B. cited from the speedway regulations, (S.C.B., 1993) is the "encouragement, protection, development and control of motorcycle speedway racing". Four duties are undertaken by the S.C.B. to attain this objective (S.C.B., 1993):

1. Supervise and control all meetings.
2. Organise or allocate organisation of international events in its territory.
3. License tracks, promoters and other officials.
4. Conclude agreements with British Speedway Promoters' Association (B.S.P.A.) and Speedway Riders' Association (S.R.A) appropriate for the good conduct and furtherance of the sport.

The following actions are taken in the conduct of these duties:

1. Supervise and control all meetings.

The supervision and control of all meetings is achieved through administering the speedway regulations and the licensing of tracks and officials, discussed as a separate duty.

At the end of every speedway meeting within the territory of the S.C.B., the referee for the meeting sends the following information to the control board: the speedway meeting certificate; the medical officer's certificate; a completed programme of the meeting's results; a copy of the referee's comments documented in the speedway track records book for the stadium; a report on the meeting; details of any protests or penalties imposed; an incident report detailing any accidents which may have occurred during the meeting. An automated system is currently used by the S.C.B. to record the receipt of all the required documentation from a referee following a meeting.

During a race meeting, the referee is required to complete or collect from other officials, the listed documentation. Referees have requested that the amount of documentation required is reviewed with the aim of reducing the amount of writing required during a meeting.

The S.C.B. is not usually in attendance during a meeting and must therefore rely on the referee and the clerk of the course, in addition to the other officials appointed, to ensure the meeting conforms to regulations. During a meeting, the referee has the authority to act on behalf of the S.C.B. if regulations are breached. After the meeting, appeals can be made against rulings, in such cases, tribunals are held which have the legal status of a court of law.

2. Organise or allocate organisation of international events in its territory.

Before a track can be used for an international event a licence, in addition to the track licence to permit league speedway racing, is required. An international licence can only be issued if the track meets additional regulations imposed by the F.I.M. For example, F.I.M. regulations specify the minimum length of the track, the length of the straight of the track, the bend of the track, the number of obstacles in the 20 yard zone; that a rider must sign-in attendance within a specified period prior to the start of an international meeting; riders in an international meeting must be paid by promoters before practice sessions can commence and that the payments should be made in a suitable currency, such as Swiss-Francs.

F.I.M. regulations also require a jury to preside over international meetings. The jury consists of the president, a delegate and the referee who are responsible for disciplinary matters arising during the meeting, such as the late arrival of a rider for a practice session.

3. *License tracks, promoters and other officials.*

Tracks: a track is inspected by the S.C.B. prior to a licence being issued to permit the use of the track for speedway racing. A checklist is used during the inspection and separate checklists apply depending on whether the track is to be used for training, league racing, or whether F.I.M. regulations apply. After a track licence is issued, the S.C.B. inspects the track once during the year without prior notification, to ensure that the track conforms to regulations.

Promoters: the promoter is the only official that the S.C.B. interviews before issuing a licence. A promoter must be a member of the B.S.P.A. and must demonstrate sufficient available finance to undertake the position. The promoter must therefore not be currently bankrupt and must not have a criminal record. The promoter is responsible for appointing the other officials required by the regulations, which include:

1. Team Manager: responsible for the full attendance of the team, arranging replacement riders if necessary.
2. Clerk of the Course: responsible for ensuring that the medical officer is present, the medical officer's certificate is signed prior to commencement of the meeting and for presenting riders' licences to the referee.
3. Machine Examiner: ensures machinery and riding helmets conform to regulations.
4. Time Keeper: records the time of each heat.
5. Starting Marshall: ensures the starting area complies with regulations and controls riders at the start tapes.

Both the clerk of the course and the machine examiner are required to attend an annual seminar to be updated on changes in regulations. The S.C.B.

also has three licensed technical stewards who can dismantle engines for inspection, if required. Previously inspections could only check that tyres, silencers and dirt deflectors complied with regulations. Technical stewards investigate complaints after a meeting and are only required to be in attendance during international meetings. An automated system is used by the S.C.B. for recording the licensing of officials.

4. *Conclude agreements with B.S.P.A. and S.R.A appropriate for the good conduct and furtherance of the sport.*

The S.C.B. has a technical subcommittee comprising of representatives from the B.S.P.A. and S.R.A. to address the introduction of technical changes in speedway regulations. For example, meetings are held to discuss whether the speedway regulations should be changed to permit leading link forks and lay-down engines to be used in league racing.

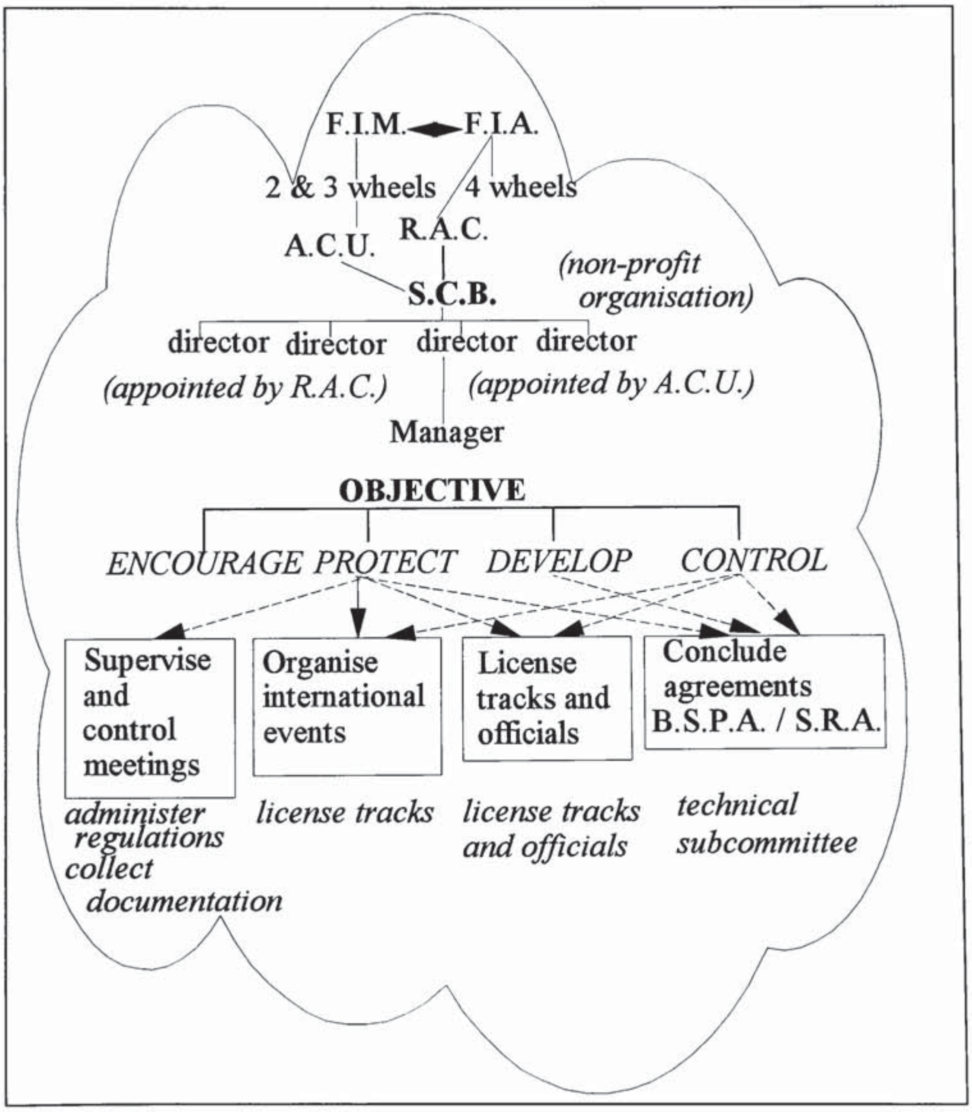

Figure 4.2: Corporate Summary Diagram of S.C.B.

Reflection: from the corporate summary diagram illustrated in figure 4.2 it is evident that the duties of the S.C.B. to control and protect the sport of speedway are emphasised. The current duties undertaken by the S.C.B. do not reflect the stated objectives to encourage and develop the sport.

During the formation of the corporate summary diagram, the following points were noted but not recorded in the corporate summary diagram:

1. Referees have requested that the amount of documentation required is reviewed with the aim of reducing the amount of writing required during a meeting.
2. An automated system is currently used by the S.C.B. to record the receipt of all the required documentation from a referee following a meeting.
3. A checklist is used during the inspection of a track.
4. An automated system is used by the S.C.B. for recording the licensing of officials.

These points are not directly relevant to the corporate summary diagram but need to be considered in the situation summary diagram.

Conceptualisation: as a non-profit organisation, the S.C.B. lacks the conventional 'bottom-line' of organisations. Drucker (1990) suggests that non-profit organisations need to pay particular attention to four areas: mission, results, marketing of services and strategies to obtain money. Drucker recognises that the non-profit organisations exist to instigate change in individuals and society. The S.C.B. exists to instigate change in the sport of speedway. Drucker proposes two rules for non-profit organisations, firstly, allocate resources to obtain maximum results; secondly, know the customers. Further investigation is needed to determine who are the customers of the S.C.B. Finally, Drucker suggests that non-profit organisations should move away from fund-raising, asking for money because there is a need, towards fund-development, creating a constituency which supports the organisation because it deserves support. This requires definition of results and measurement of results to report to contributors; identification of the customers; specification of service goals and acceptance of information responsibility by everyone in the organisation.

Planning: from the conceptualisation, the situation summary diagram needs to focus on the following areas: customers; funding; strengths and weaknesses of the control board; opportunities and threats in the environment which the S.C.B. needs to address. It should then be possible to identify the areas in which allocation of resources will achieve maximum results for the

S.C.B. An outline framework for the situation summary diagram is shown in figure 4.3 with possible strategic techniques identified from the guidelines provided in appendix three, which may assist in the strategic analysis.

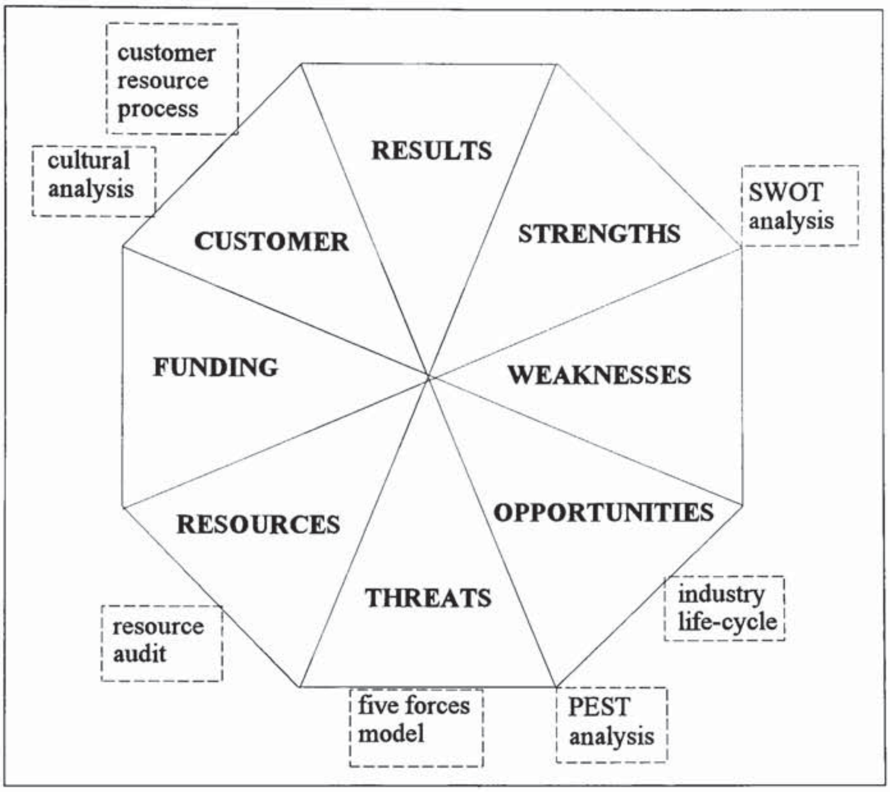

Figure 4.3: Framework for Situation Summary Diagram of S.C.B.

4.2.4 Situation Summary of Speedway Control Board

The framework in figure 4.3 was used to explore the strategic situation of the S.C.B.

Experience: each of the eight areas shown in figure 4.3 were separately analysed and are illustrated in figure 4.4. The manager of the S.C.B. was first questioned about the funding of the organisation. The main source of funding is provided by promoter subscriptions to the control board, this is supplemented by fines imposed on riders for breach of regulations.

A number of potential customers can be identified for S.C.B. including, speedway riders, promoters, officials, the general public and the F.I.M. The S.C.B. serves the needs of: riders by providing a code of rules and a governing body to enforce them; promoters and officials by granting licences to enable them to perform their duties; the general public by providing and enforcing rules to ensure public safety whilst at a speedway stadium; F.I.M. by controlling the sport of speedway within the specified territory.

The tangible results of the S.C.B. are the speedway regulations published annually and the licences issued. As a control board, the intangible results of the S.C.B. are considered to be more significant, that is, the safe and fair conduct of speedway meetings. However, it is only when a problem occurs, such as a breach of rules or rider injury, that the 'results' of the S.C.B. are questioned. It is therefore the potential failings of the S.C.B., rather than its positive results, that are recognised.

The S.C.B. manager considers that the independence of the board is both a strength and a weakness of the organisation; independence is a strength in that the board presides over the sport ensuring fair and safe competition; independence is a weakness in that the S.C.B. most often balance the conflicting interests of promoters and riders. The independence of the S.C.B. may further be perceived as a weakness in that as a non-profit organisation the board suffers from a lack of investment. The independence of the board also offers the opportunity for the S.C.B. to market the sport in the best interests of all parties. Changes in the sport at international level have opened promotion opportunities, however, the lack of available finance prevents the S.C.B. from seizing these opportunities.

There is a threat to the survival of the S.C.B. from the B.S.P.A. Speedway promoters have differing priorities, for example, some promoters aim to win the league, whilst others aim to maintain a stable level of spectator attendance. The S.C.B. has to balance the different priorities of promoters and this often causes conflict between the S.C.B. and the B.S.P.A., to the extent that the B.S.P.A. have proposed that the S.C.B. should be abandoned.

Analysing the sport in terms of the four stage industry life-cycle suggests that the growth period of the sport was in the 1950s when many stadiums opened and regularly received capacity crowds. The sport may now be considered to be a period of decline as spectator numbers are falling and many stadiums are fighting closure.

PEST analysis of environmental factors identifies 'legal' changes to the sport at international level which may offer new opportunities for the sport. One of the main threats to the survival of the sport is identified by socio-cultural analysis, that is, the entertainment industry as a whole is now so wide and diverse that competing for attention is proving to be harder for minority sports. Technological developments in the environment focus on the technological design and improvement to the performance, safety and reliability of speedway motorbikes.

Applying the five forces model of competition shows that the S.C.B. is not threatened by new entrants to the sport as this is restricted by the F.I.M. New stadiums may enter the sport if the S.C.B. issues the necessary licenses, although this is a threat to other stadiums and not a threat to the S.C.B. The bargaining power of customers is a threat to the survival of the S.C.B. as promoters can decide that the control board is no longer required and responsibility for the sport could return to the A.C.U. The threat of substitutes and competitive rivalry are not relevant to the S.C.B. but are threats to the sport as a whole. As a spectator sport, speedway faces competition both from other sports and other forms of entertainment, competing for public attention.

The S.C.B. has limited physical, human, financial and information systems resources with which to pursue its objectives. The main work of the S.C.B. is conducted by the manager with part-time clerical support. Responsibility for control of individual speedway meetings is delegated to officials licensed by the S.C.B. and paid by the stadium promoter. The strategic situation revealed through the analysis of the eight areas in figure 4.4 is summarised in figure 4.5.

Reflection: safety and other intangible deliverables are the primary concern of the S.C.B., however, the focus on controlling the sport neglects the interests of the speedway promoters. As promoters provide the main source of funding to the organisation and have the power to dismiss the S.C.B., promoters pose a major threat to the continued existence of the S.C.B. The strategic direction of the S.C.B. needs to address the discrepancy identified between its objectives and duties and either identify the needs of promoters or seek an alternative primary source of funding.

Conceptualisation: the structure in figure 4.3 guided the analysis of the strategic situation summarised in figure 4.5. This structure helped to focus attention on specific, potentially problematic areas of the situation of the S.C.B. However, it was found that some of the techniques suggested in figure 4.3 were inappropriate to the situation. For example, the customer resource process was not used as the identification of the customer to the S.C.B. was unclear. Cultural analysis was also not undertaken as it would have only explored the manager's view of the culture within the sport. At this stage, the situation summary diagram was limited to the internal analysis of S.C.B., with external influences only appreciated from the perspective of the S.C.B. manager. The next stage requires external analysis to identify the needs of promoters in an attempt to reduce the threat promoters pose to the S.C.B.

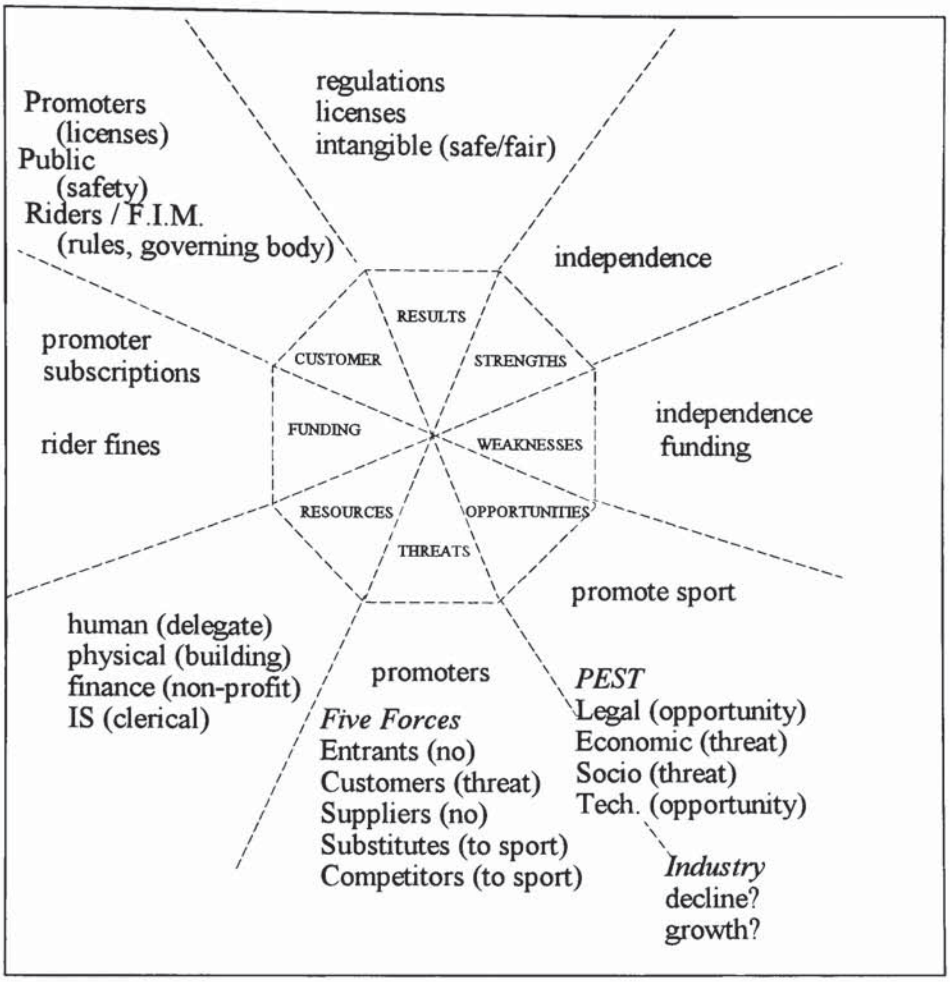

Figure 4.4: Intermediate Situation Summary Diagram for S.C.B.

As shown in figure 4.4 the application of strategic analysis techniques attained specific perspectives of the strategic situation. Figure 4.5 extracts the information content derived from using specific techniques into one diagram to summarise the results of the analysis.

Planning: arrange meetings with riders, promoters and other speedway officials to undertake an environmental analysis of the S.C.B. The aims of these meetings are to identify the:

1. Differing roles in the sport.
2. Perceptions held concerning the S.C.B.
3. Needs of the differing roles.
4. Opportunities and threats in the sport to which the S.C.B. may contribute.
5. Ways in which the S.C.B. may encourage and develop the sport.

Specific tasks to be undertaken include identifying interviewees and planning the interviews.

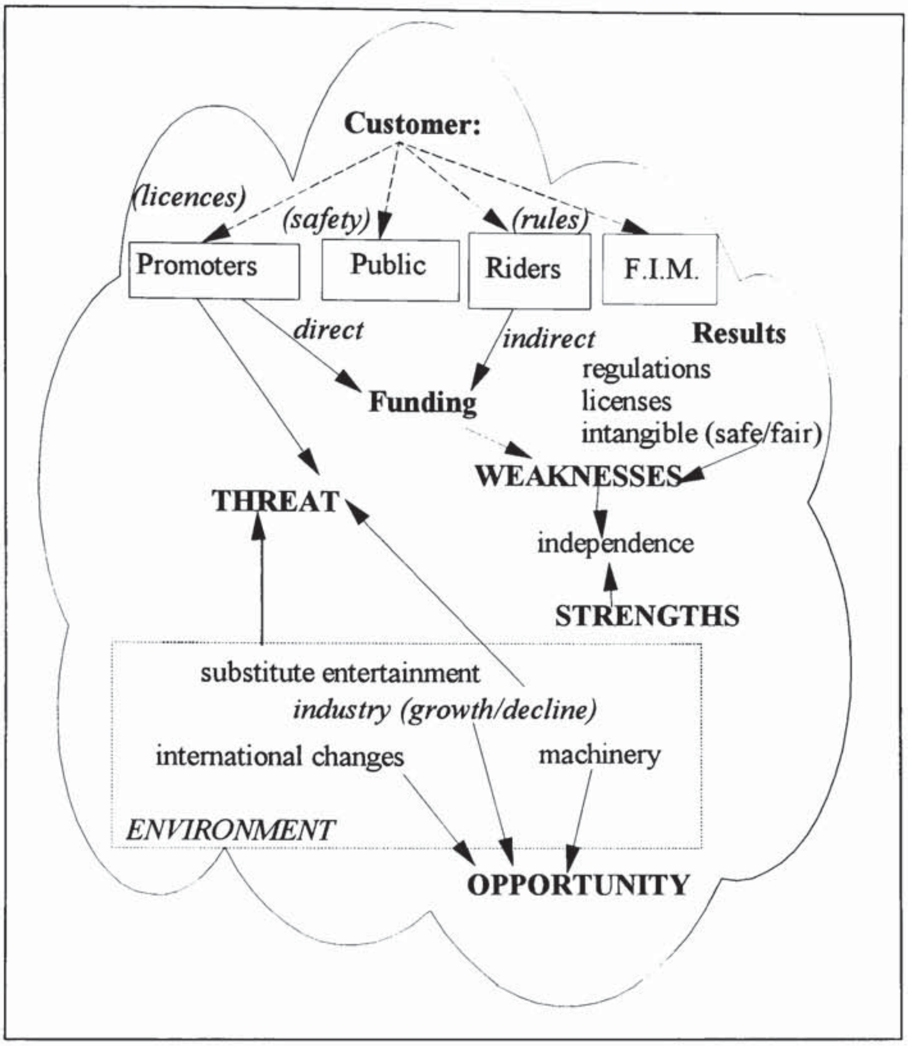

Figure 4.5: Situation Summary Diagram for S.C.B

Identifying interviewees.

"Everything good about the sport is Sam Ermolenko" (MBI Video, 1992) is one of the accolades given to the 1993 World Speedway Champion. Everyone involved in the sport from spectators to riders describe Sam Ermolenko as being the most exciting and most professional rider in speedway racing. Securing the support of the world champion to this research was therefore a key factor in establishing credibility to the contribution made to the S.C.B. A number of other riders were identified for interview to represent the variety of nationalities and range of experiences competing in British league speedway.

In addition, representative officials including promoters, referees, team managers, mechanics, announcers and journalists were identified for interview in order to attain a rich understanding of the sporting environment which the S.C.B. aims to control and develop.

Prepare interviews.

Before preparing the interviews, a number of speedway meetings were attended around the country to see the interviewee 'at work', in order to attain an appreciation of their role and working environment. This also provided the opportunity to talk informally with spectators of the sport, to gain a richer appreciation of the sporting environment. During this time, the cultural differences, particularly between British and American riders became evident. It is suggested that cultural differences affect communication (Shah & Dingley, 1994; Shah, Dingley & Golder, 1994), for this reason, videos of riders and officials being interviewed were reviewed prior to undertaking the interviews planned (MBI Video, 1992) in order to attain an appreciation of cultural differences which may affect communication. This provided information concerning some of the pressures on speedway riders and demonstrated the differing styles of British and American riders both on and off the track.

Separate checklists of questions and key areas to cover during the interviews with riders, promoters, referees, team managers, mechanics, announcers and journalists were prepared and modified as the interviews were undertaken. All groups were questioned regarding their role in the sport, information needs, perception of the S.C.B, in addition to their view of the strengths, weaknesses, opportunities, threats and critical success factors of the sport.

Experience: the information attained during the interviews is summarised in appendix six.

Figure 4.6 is a corporate summary diagram for the sport of motorcycle speedway. The diagram shows that speedway regulations impose restrictions on tracks, motorbikes, officials, team and league construction. A stadium has an address, owner, lease details and a range of facilities. The race track has a size and shape, a licence for the type of racing which can be undertaken on the track, a lap record, a safety fence, type and depth of shale, a surface and a condition. A team consists of seven riders, a manager, captain, promoter, team average and position in the league. Speedway motorbikes have a specification imposed by the speedway regulations and a technical set-up required for each track. Spectators are the main source of funding for the sport, paying a remittance to the stadium which is used to pay riders and speedway officials.

Reflection: the corporate summary diagram of the sport of speedway suggests that the sport exists to serve the needs of its customers, the spectators, who provide the main source of income for the sport. The regulations governing the sport, do not include the stadium and the facilities offered at a track. If the sport exists only as a means of public entertainment, the sport omits to address stadium facilities which are a key feature in the entertainment package bought by the spectator.

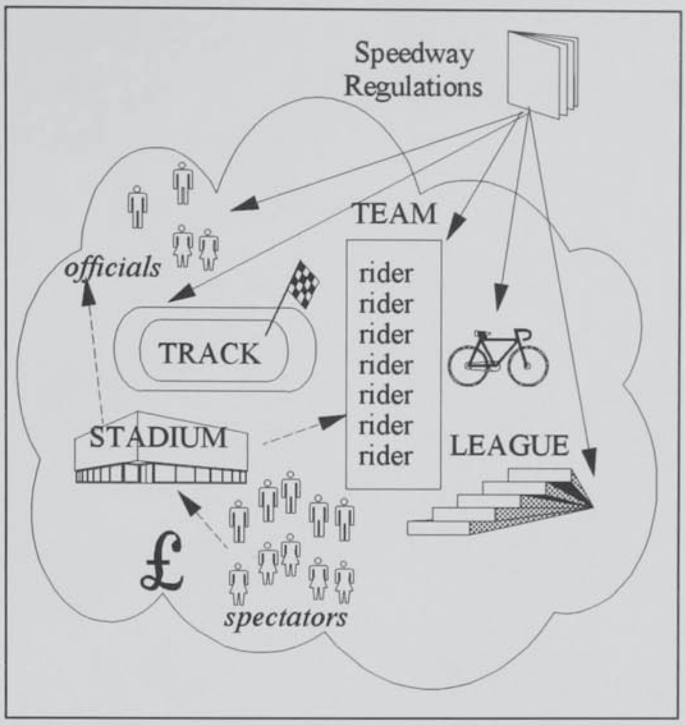

Figure 4.6: Corporate Summary Diagram of Motorcycle Speedway

Conceptualisation: as a non-profit organisation, the sport needs to identify its mission, customers and services (Drucker, 1990). In particular, the mission of the organisation which defines the purpose for the sport's existence needs to be explored. This requires addressing fundamental issues of the sport which participants may resent being questioned.

Planning: figure 4.7 represents a structure of strategic techniques with which to explore the strategic situation of the sport.

Experience: the structure in figure 4.7 was used to explore the strategic situation of motorcycle speedway. Each of the areas in figure 4.7 were separately analysed, this is illustrated in figure 4.8.

As customers of the sport, both riders and supporters seek excitement. Speedway is a a professional motor sport and a high standard of professionalism of both riders and the presentation of the sport is expected. Spectators expect to be entertained and value the charismatic showmanship of the riders' performance on the track. Despite the high standards of the top professional riders, being a family sport, spectators value the opportunity to approach riders. As all motor sports, speedway is dangerous and safety as well as entertainment, is a critical success factor for the sport.

The resources available to the sport are the licensed riders, officials and tracks, funded by the entrance fees and sponsorships. As a major resource, the loss of stadiums is a current threat to the sport, which must compete both with other forms of sport and means of entertainment, within the restrictions of the economic climate. Ecology poses a threat to the motor sport which burns fuel, resulting in noise and air pollution. New technological developments however, continually seek to address such issues.

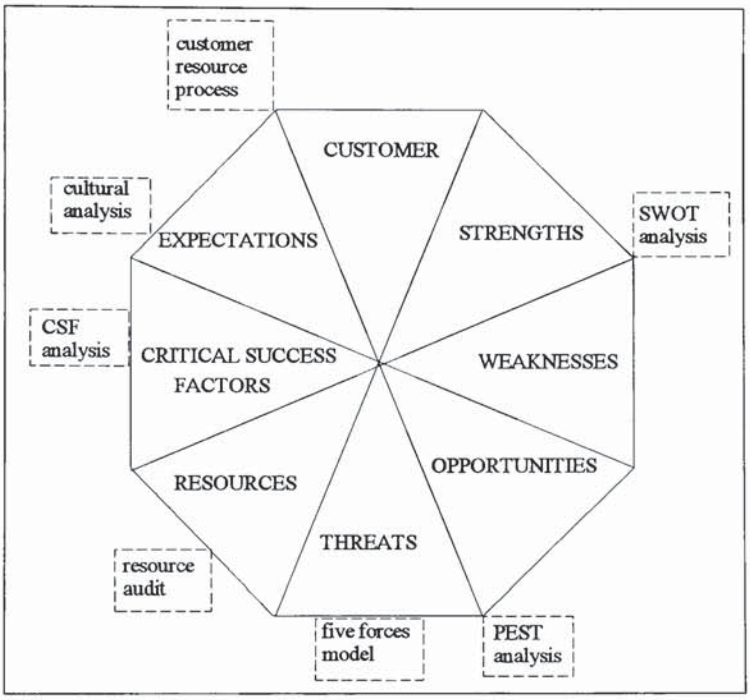

Figure 4.7: Framework for Situation Summary of Motorcycle Speedway

A number of legal changes are being proposed within the sport, which include replacing the current one meeting world final with the grand prix format used in other forms of motor sport to determine the world champion. This proposal has opened opportunities for media coverage of the grand prix, offering further opportunities for sponsorship.

Increased publicity highlights a number of weaknesses in the sport. Lack of national media attention results in a lack of investment in stadiums which are now old and dilapidated. New opportunities for media coverage are threatened by the state of the stadiums portraying an amateur image of the sport. The sport, particularly in Britain, is suffering from the lack of training provided to nurture new riders. Increased public interest questions the lack of British riders competing in the British speedway league.

Despite these weaknesses, speedway is a fast, colourful and exciting sport. Dedicated riders and supporters encourage the friendly family atmosphere which does not require supporters to be segregated. British league speedway is highly regarded with the variety of tracks of varying sizes, shapes and surfaces, providing excitement to both riders and spectators.

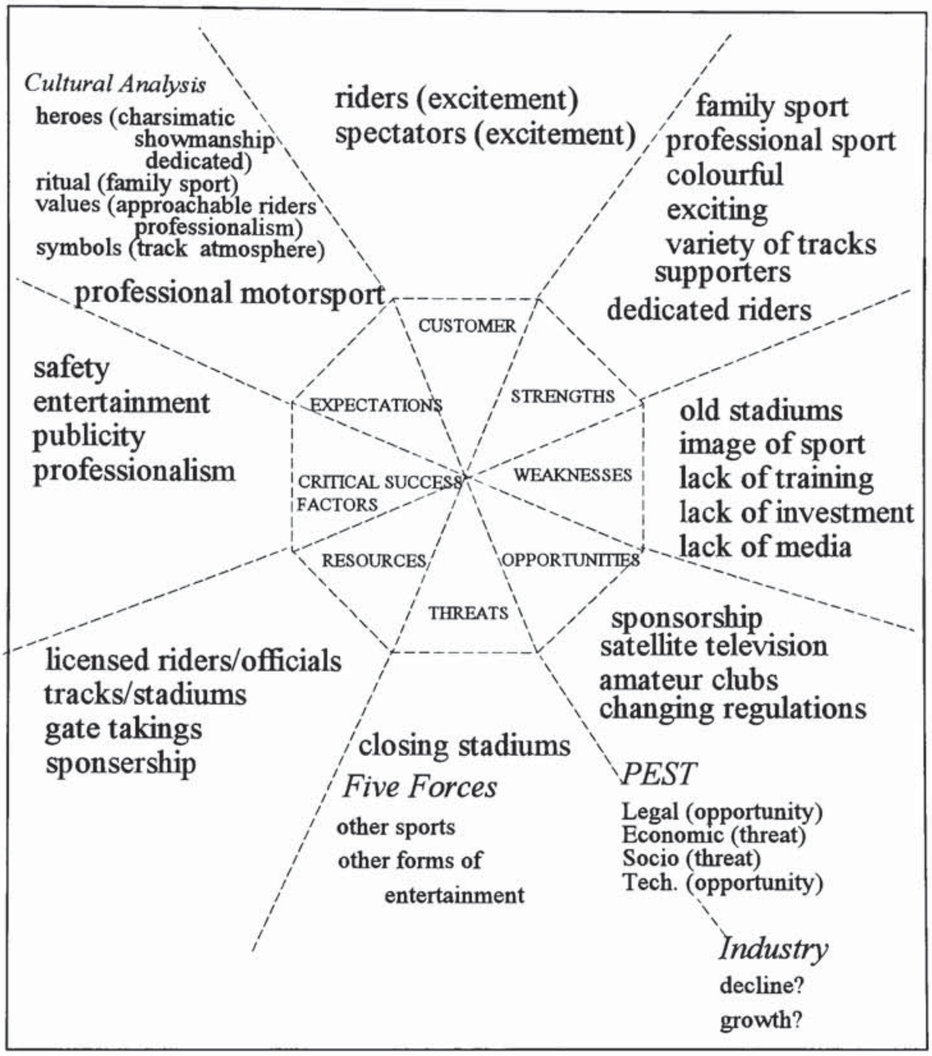

Figure 4.8: Intermediate Situation Summary Diagram for Motorcycle Speedway

The strategic situation revealed through this analysis is summarised in figure 4.9.

Reflection: speedway is a family sport and the approachability of riders, even at the highest levels, is much valued. Old stadiums used for greyhound racing and the 'working class' image of the sport contrasts the professional view of the motor sport. Legislative changes in the sport provide new media opportunities to address the problems and weaknesses of the sport caused by lack of investment. The sport needs to act quickly to ensure that current problems, such as poor stadium facilities, do not threaten sponsorship potential. In seizing the opportunities of new media coverage, sponsorship and the grand prix style format, the cultural values which maintain local support must be accommodated and not compromised. The aim of fulfilling the excitement and entertainment needs of riders and supporters must not be overlooked in attempts to secure sponsorship and media coverage.

Conceptualisation: the structure in figure 4.7 provided guidance in the construction of the situation summary diagram, however, it was found that the structure, as opposed to the suggested strategic techniques was the most valuable. The techniques prompted ideas as to the issues to be considered in each section of the structure. In preparing the intermediate situation summary diagram from the structure, relationships and conflict of interest between the information derived in each sector of the framework became apparent. However, the discipline of using the structure ensured that a thorough analysis of the situation was undertaken, prior to summarising the information content in figure 4.9.

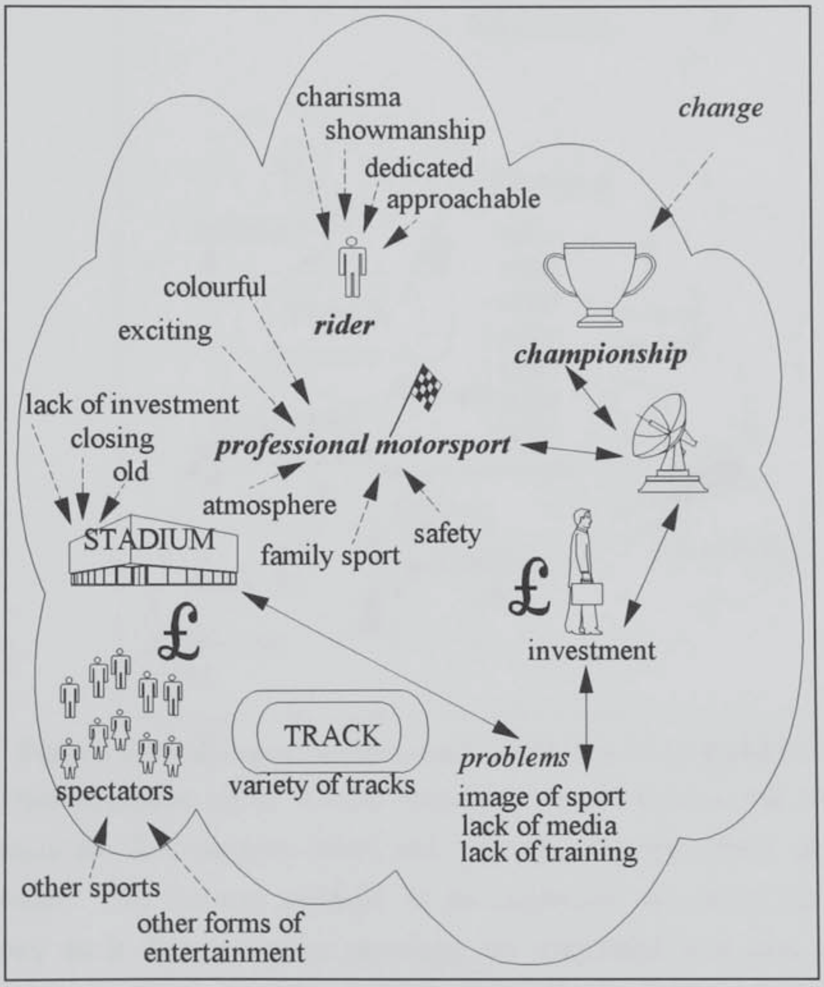

Figure 4.9: Situation Summary Diagram for Motorcycle Speedway

During the construction of the situation summary diagram in figure 4.9, it was found useful to include markers on the diagram to indicate strengths, weaknesses, opportunities and threats in the situation, symbolised by stars, crosses, open doors and hammers, respectively. These symbols were excluded from the final diagram because it was considered that current opportunities may also be potential threats to the sport. Increased media attention and investment may be considered to be major opportunities to the sport, however, they may also be considered to threaten cultural values, for example, increasing the profile of the sport may require security to be increased, rendering riders unapproachable by the general public.

Planning: after reviewing the sport as a whole, it is necessary to reduce the focus to the level of a stadium.

Experience: figure 4.10 is a corporate summary diagram which represents the role of a speedway stadium, derived from interviews with representative promoters in British league speedway.

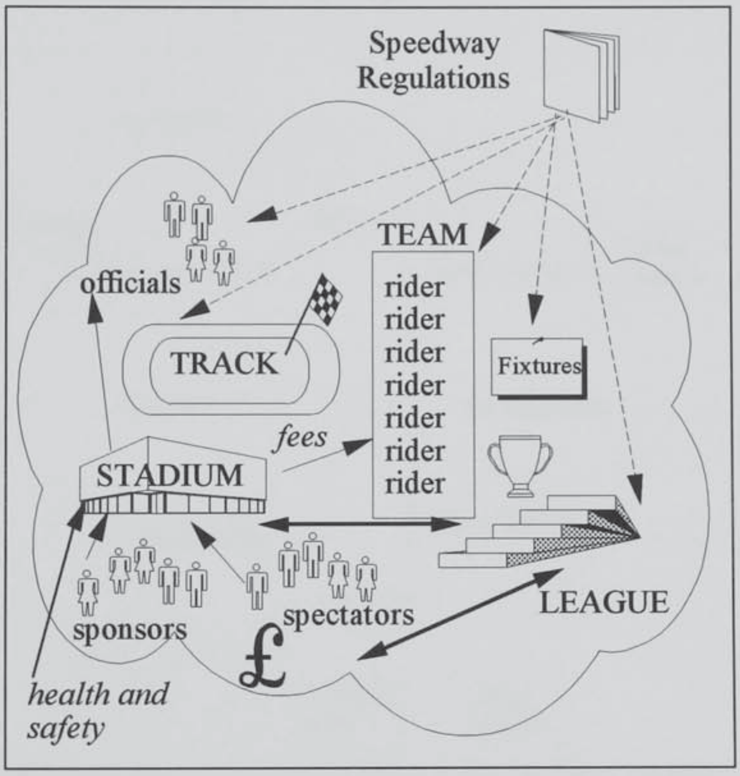

Figure 4.10: Corporate Summary Diagram of a Speedway Stadium

The promoter must operate speedway as a business and the diagram represents the fees paid to riders and officials, collected from sponsors and spectators. The fixtures calendar is an important aspect of the corporate summary as it dictates when meetings are scheduled and gate-takings are received from spectators. The position of the team in the league influences the finance available from spectators and sponsors. The promoter is responsible for selecting a team of seven riders within the constraints imposed by the speedway regulations, to maximise the potential performance of the team and influence the finance available.

The stadium must offer certain facilities to riders, specified by the speedway regulations. In addition, as a public place, the stadium must conform to health and safety regulations.

Reflection: the corporate summary of the speedway stadium omits the inclusion of motorbikes, focusing only on financial aspects, operating within the restrictions imposed.

Conceptualisation: the corporate summary of the speedway stadium in figure 4.10 is similar to the corporate summary of the sport depicted in figure 4.6, for this reason, the same layout was adopted by both diagrams. In examining the strategic situation of the stadium it is necessary to identify the customer of the stadium and their needs.

Planning: figure 4.11 represents a structure of strategic techniques with which to explore the strategic situation of the stadium.

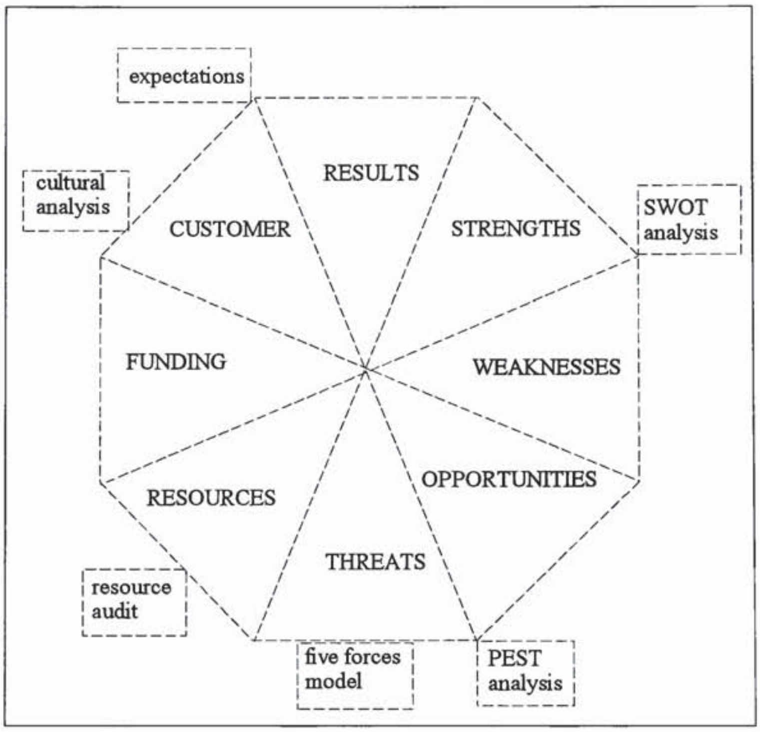

Figure 4.11: Framework for Situation Summary Diagram of Speedway Stadium

Experience: the structure in figure 4.11 was used to explore the strategic situation of a speedway stadium. Each of the areas in figure 4.11 were separately analysed, this is illustrated in figure 4.12.

Figure 4.12 identifies two potential customers of the stadium, spectators who want to be entertained and riders and other speedway officials who seek employment. The results of the stadium can be measured in terms of the financial stability of the business and the position of the team in the league. An intangible result of the stadium is the reputation of the promoter as perceived by riders, spectators and sponsors. A good reputation for developing new riders can be a strength of the stadium, attracting riders and spectators to the stadium. A good track is also a strength of the track as in addition to facilitating exciting racing, the condition and dimension of the track affect the licensing of the stadium by the F.I.M. for international events.

Limited finance and the threat of injury to riders are areas of weakness stadiums must address. The majority of stadiums in Britain are not owned by speedway promoters and are under the constant threat of being sold to housing developers. There is little threat of new stadiums entering the sport and the location of existing stadiums limits direct competition between stadiums. The threat of alternative sports and means of entertainment competing for public attention is a common threat to all stadiums.

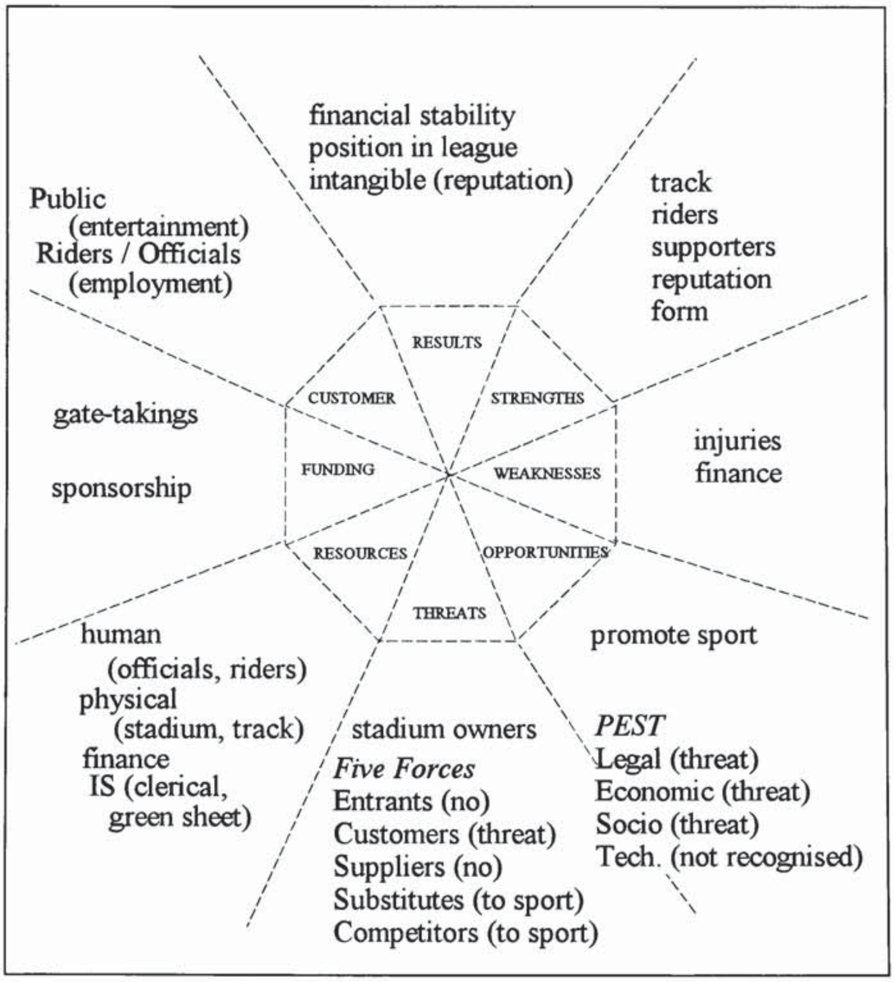

Figure 4.12: Intermediate Situation Summary Diagram for a Speedway Stadium

Resources available to the stadium include the licensed riders and officials signed by the stadium. Information systems available support the finance and accounting business of the stadium. A key source of information is the 'green sheet', this is a monthly publication of riders' averages over a six week period. It is the averages stated on the green sheet which promoters must use when forming or changing the team.

Reflection: as sponsors provide an additional source of income to the stadium, they may be regarded as an additional customer of the stadium. All potential changes in regulations and economic climate are viewed as potential threats to the stadium which does not acknowledge opportunities offered by new technology. This view is nurtured by the lack of available finance to seize opportunities recognised. The business-orientation of individual stadiums prevents collaborative ventures to seize available opportunities in the sport. The sport and stadiums suffer from a lack of promotion, resulting from lack of investment. However, appendix six reports that many people involved in speedway consider there to be a number of opportunities from which all stadiums could benefit, if they worked together. The geographical dispersion of tracks, prevents direct competition between stadiums and therefore it is historical and cultural as opposed to economic factors which is restricting the sport. This situation is summarised in figure 4.13.

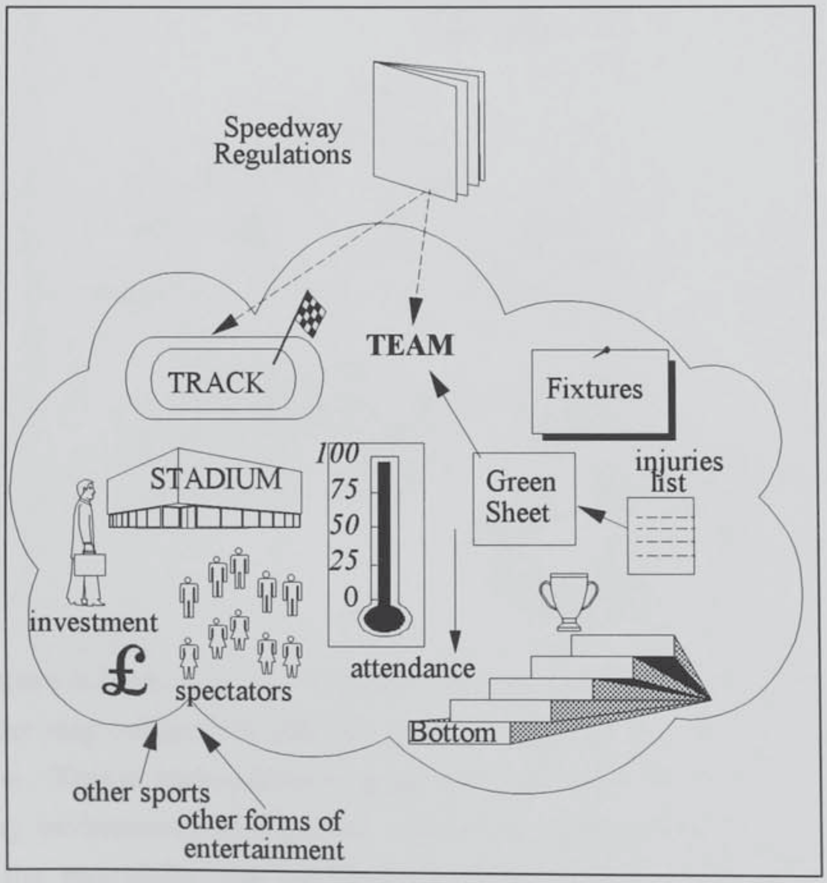

Figure 4.13: Situation Summary Diagram for a Speedway Stadium

Figure 4.13 illustrates the relationship between performance in the league and falling attendance of spectators. As gate-takings and sponsorship are the only sources of finance for the stadium, maintaining and improving attendance is a critical success factor for all stadiums. Injuries are major threats to the success of team. When riders are injured a replacement rider needs to be found from analysis of the green sheet average and the fixture list to identify a suitable replacement.

Conceptualisation: the business-orientation of the stadium differs from the non-profit situations of the S.C.B. and the sport itself. Figure 4.13 does not represent the cultural influences which may be restricting the collaboration between promoters. Limiting the scope of the study to representative stadiums prevented this area being further explored.

Planning: after reviewing the sport as a whole, it is necessary to examine the situation of the most critical element of the sport, that is the situation experienced by speedway riders.

Experience: figure 4.14 is a corporate summary diagram which represents the role of a speedway rider, derived from interviews with riders of varying abilities and nationalities competing in British league speedway.

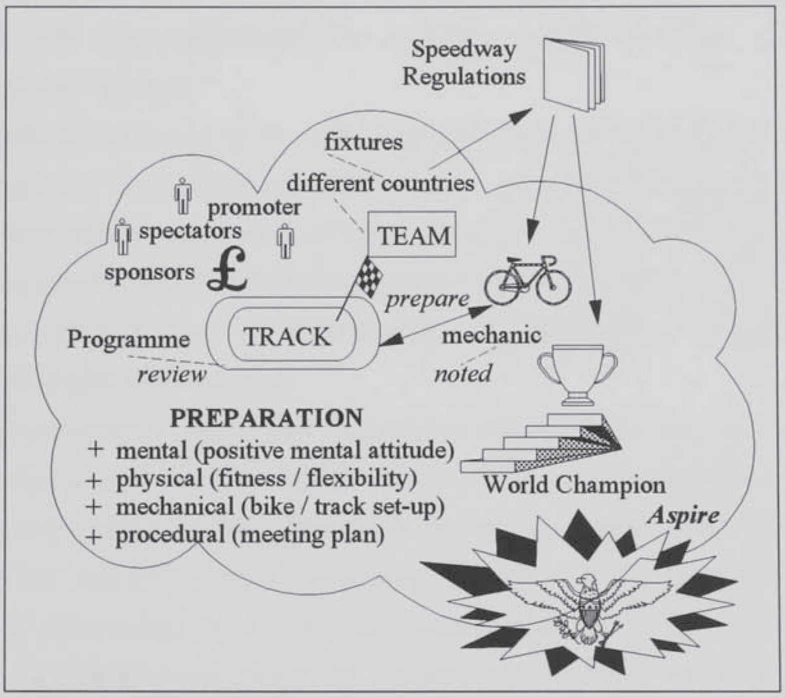

Figure 4.14: Corporate Summary Diagram of a Speedway Rider

A rider may compete in different teams in different countries during the same season. Teams, team members, promoters and supporters are generic to the working environment of the rider. Speedway regulations restricting the set-up of the motorbike, the composition of the team and format of the meetings, differ between countries. Preparation is a key element reiterated by all riders interviewed and can be broken down into four main areas. All riders agree that mental, physical and mechanical preparation is imperative to both safety and success on the track. However, the fourth level of preparation, labelled as 'procedural' in figure 4.14, was not explicitly stated by all riders. Procedural preparation encompasses individual race plans for international meetings, research of opposition and team tactics.

The relationship between the rider and mechanic is important, particularly in individual meetings. The mechanic is responsible for noting any changes made to the set-up of the bike during the meetings, for future reference. Specific details about the set-up of the motorbike include tyre pressure, fuel concentration, ignition, carburettor, gearing and timing. The set-up of the bike is determined by the size and shape of the track; condition of the track; surface of the track; preparation of the track and weather conditions.

A completed programme of a meeting is used by the rider and the team to review both their individual performance and their performance against the opposition. Details in the programme include the composition of both teams, individual averages of riders, the format of the meeting, composition of each heat, results of each heat, comments relating to accidents, re-runs, exclusions, engine failures and rider replacements in each heat and the final individual and team scores of the meeting.

The symbolic inclusion of an eagle represents the mutual intense desire of all riders to aspire to the highest possible levels of professional achievement.

Reflection: much preparation is undertaken prior to the sixty seconds of racing on the track by which the performance of a rider is measured. Courage, skill and determination must be accompanied by intelligence, diligence and precision to maximise each second.

Conceptualisation: from the experience reported it was found that detailed information was derived which could not directly be included on the corporate summary diagram, but should not be lost as a result of its exclusion. This information was documented separately, however, if the framework was supported by automated tool support, information such as the details concerning a particular track could be documented 'behind the icon' of the track. Hiding the details in this way would ensure the communication potential of the diagram is not hindered by too much information, but would also ensure that the information identified was not lost.

Planning: preparation has been identified as a critical success factor to a speedway rider, the opportunities and threats which may enhance or hinder preparation need to be examined. Figure 4.15 proposes a structure to assist the formation of a situation summary diagram for speedway riders.

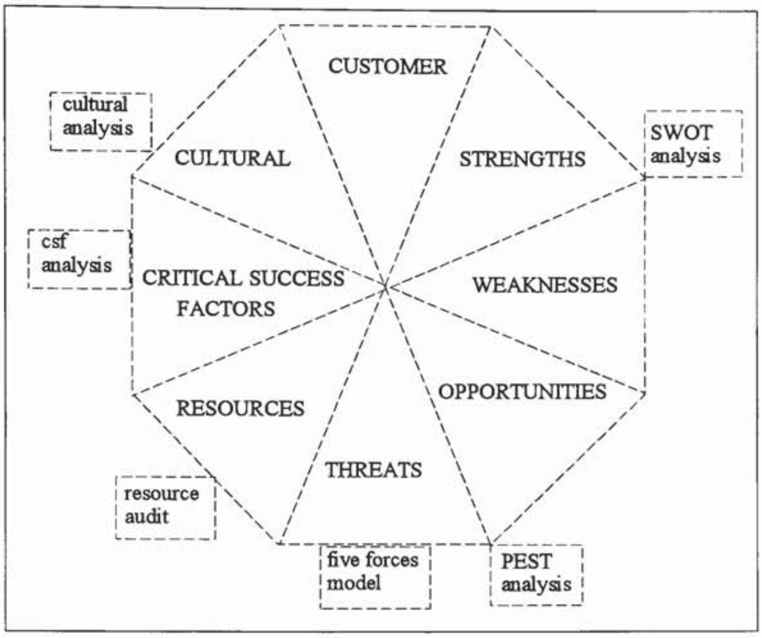

Figure 4.15: Framework for Situation Summary Diagram of a Speedway Rider

Experience: the structure in figure 4.15 was used to explore the strategic situation of a motorcycle speedway rider. Each of the areas in figure 4.15 were separately analysed, this is illustrated in figure 4.16.

The customer of the rider may be considered to be the rider himself, who wants success, excitement and long-term security for his family. Alternative customers may considered as the teams to which the rider belongs, demanding loyalty and commitment, and the supporters who want to be entertained.

Team and spectator support are strengths of the speedway rider, as are mechanics and equipment and the rider himself. However, when things go wrong, unreliable machinery and personal injuries can be weaknesses the rider must address. Lack of preparation, including personal fitness are weaknesses that can impede a rider's performance and threaten safety on the track.

New technology, sponsors and success are mutually related opportunities which a rider seek to maximise. Advancements in technology may aid the rider's performance, contributing to success; success at the highest levels provides perhaps the greatest opportunities to riders by encouraging sponsorship both directly from equipment manufacturers and from additional finance with which to purchase new equipment. Changes in equipment may require changes in speedway regulations governing the use of technology. Regulations may therefore be perceived as potential threats or opportunities to the use of technology. Investment is affected by the wider economic climate and may be hindered by poor and inaccurate perceptions of speedway riders.

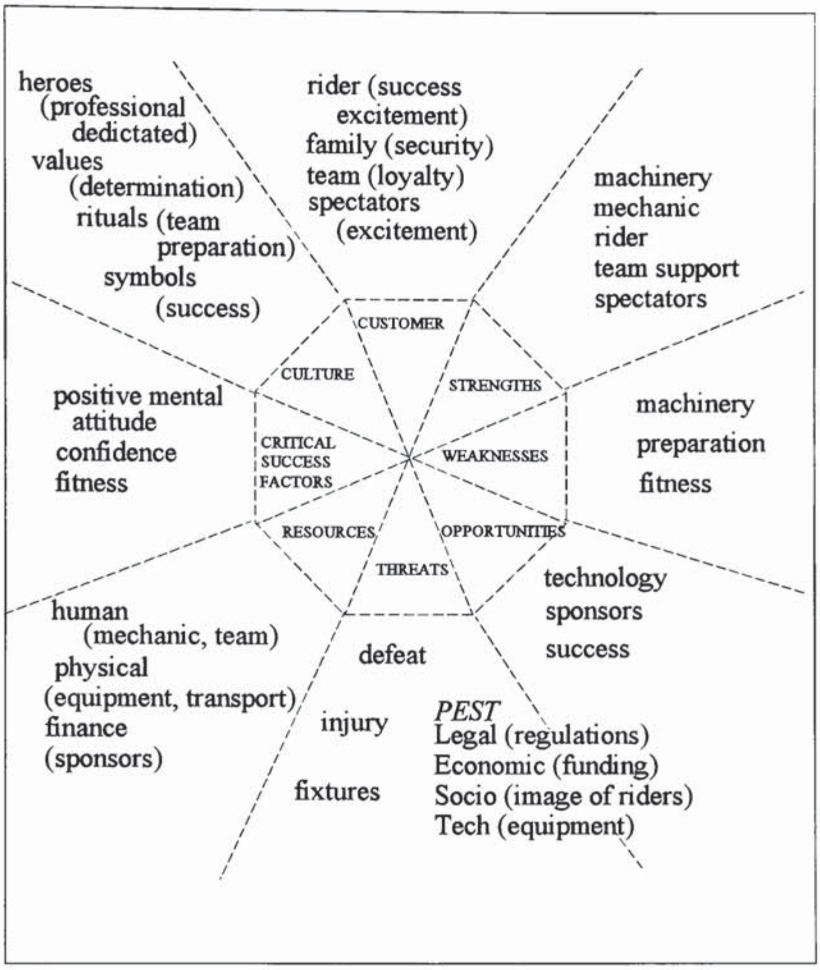

Figure 4.16: Intermediate Situation Summary Diagram for a Speedway Rider

The primary threat acknowledged by all riders is the threat of defeat; the second threat is that of injury. In addition, the number of fixtures to which a rider is committed each year can reduce the available time for preparation, threatening success.

Resources available to the rider include the human resources of mechanics and team members and physical resources of machinery, workshop facilities and transport. Although lack of funding is a threat, particularly to new riders, financial resources are not identified as critical success factors by the riders. Critical success factors identified relate only to the mental and physical preparation of the rider himself.

Cultural analysis identifies that riders value dedication, determination and professionalism, epitomised by speedway legends. The symbols of riders are symbols of success and triumph, avoiding the unthinkable threat of injury or fatality. Cultural rituals may be examined at an individual level, for example, rituals of preparation; at team level, for example, the celebration and acknowledgement of success; international level, for example, formal ceremonies. Figure 4.17 summarises the situation analysed of the speedway rider.

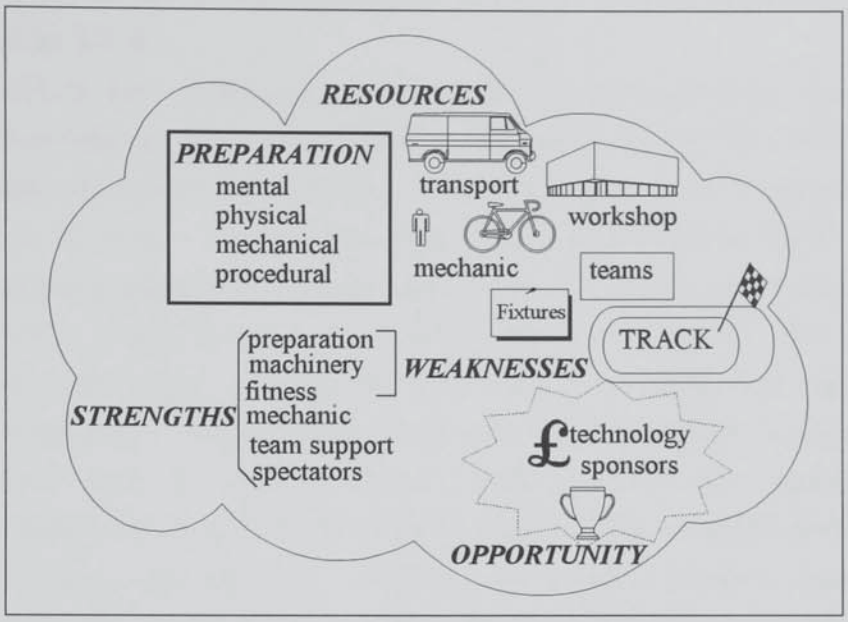

Figure 4.17: Situation Summary Diagram for a Speedway Rider

Reflection: although speedway riders are considered to be an integral part of the sport, there is a relationship of mutual dependency between riders and spectators upon which the sport of speedway depends.

The dedication and motivation of riders is reflected in that defeat is the major threat to success acknowledged by all riders and in the cultural analysis, which value determination and professionalism. The threat of defeat and injury was omitted from figure 4.17 at the request of the riders. A positive mental attitude is critical for success in motor sport and the riders view was that this should be reflected in the summary of the situation.

Preparation is a key element of the speedway rider, impacting the identified areas of strengths and weaknesses. The diagram depicts preparation as one of the resources available to the rider with which to open and seize opportunities.

Conceptualisation: during the construction of figure 4.17 with riders, groupings of strengths, weaknesses, resources and opportunities were maintained, as riders considered that this was a more useful representation of their situation. Some symbolic notation also emerged to represent the core elements of preparation and the potential opportunities 'waiting' to be seized.

Planning: it is necessary to summarise the overall situation of the speedway control board explored from different perspectives with the S.C.B. manager. From this analysis, action plans to address the situations summarised can then be formed and implemented.

4.2.5 Justification Alignment of Speedway Control Board

Experience: using the situation summary diagrams shown in figures 4.5, 4.9, 4.13 and 4.17, the overall situation of the S.C.B. was examined with the manager of the S.C.B.

The S.C.B. aims to encourage, protect, develop and control the sport of motorcycle speedway. The current duties undertaken by the S.C.B. emphasise the protection and control of the sport, at the exclusion of duties to encourage and develop the sport. The customers providing funding for the S.C.B. are identified as being speedway promoters and riders. The S.C.B. is under threat by the B.S.P.A. which questions the need for the control board. The main deliverables of the board are intangible in the form of ensuring safe and fair conduct of the sport. This intangible result only becomes evident in negative circumstances when an incident occurs which questions the regulations enforced. The S.C.B. therefore needs firstly, to address the mismatch between its current duties and objectives, secondly, to examine positive, tangible outcomes with which promoters can identify from their licensing subscriptions.

Speedway is a professional motor sport and proposed changes to the manner in which world championships are contested, accentuate the professional nature of the sport, aligning it with the practice adopted by other motor sports. These changes aim to raise the profile of the sport, stimulating media and investment opportunities. The professionalism of the sport is not reflected by the quality of speedway stadiums, which suffer from lack of investment. This has an adverse cyclical affect, in that the poor status of stadiums reduces media coverage, reducing investment needed to improve the stadium facilities.

Speedway stadiums are often rented by speedway promoters who adopt a business-oriented view of the sport, capturing the primary source of funding in the sport from spectators. Promoters are concerned with achieving and sustaining high levels of attendance. Spectators pay to be entertained, attendance falls when the racing provided at the stadium fails to be exciting. Injured riders and a losing team are weaknesses the promoter needs to address. In providing entertainment, promoters neglect the contribution of the stadium facilities.

Speedway riders must manage their working life, maximising the potential of available resources. Riders are aware of the cyclical affect as achievement increases the opportunities to attain sponsorships, providing opportunities to invest in new equipment which may contribute to further success. Dedicated professionalism is the input to this cycle, maximising current resources by careful preparation and professional conduct, positions the rider to succeed. It is this initial input to the cycle, missing in the stadium:investment cycle, which international changes aim to address. These changes are insufficient to break the cycle, which requires a contribution from stadiums themselves. A further difference between the situation of riders and promoters, is that whilst pursuing ardent competition on the track, riders work together as team to consolidate their resources. This degree of co-operation is not evident at promoter level, even though the geographical location of stadiums prevents direct competition for supporters.

Reflection: the S.C.B. could actively encourage the improvement of stadium facilities through regulations, however, this may fuel conflict between the S.C.B. and the B.S.P.A., and may result in the further loss of stadiums unable to update the facilities specified; the S.C.B. needs to explore how it can directly contribute to the development of the sport, providing tangible results of funding; the S.C.B. may examine how it could improve the interaction between itself and promoters; the S.C.B. may examine the regulations with the aim of improving the situation of the promoter, whilst not compromising the safe and fair conduct of the sport; the S.C.B may examine its procedures with the aim of redesigning them if necessary; the S.C.B. needs to explore how it may contribute to the development of the sport. As lack of training is a weakness in British speedway the S.C.B. may explore options such as the sponsorship of a junior rider, donate an award to a junior rider, sponsor a meeting for junior riders, providing an opportunity for promoters to review new talent, establish a training programme or training facilities in the sport; the independence of the S.C.B. provides the opportunity for the board to promote the sport in the best interests of all parties; the S.C.B. may intervene to encourage collaboration between promoters.

Changes to the nature and conduct of the sport are out of the scope of this project, as this area requires the support of the F.I.M. However, key areas of concern are the lack of training and investment in the sport at all levels.

Promoters could explore ways in which stadium facilities could be enhanced to directly contribute to the entertainment package offered to spectators, particularly on occasions where the racing is cancelled due to adverse weather conditions; spectators value the opportunity to approach riders and promoters may examine how this can be further developed; promoters may examine their procedures to identify areas of potential improvement; investment is required for the survival of each stadium in the British league and the loss of one stadium has implications for the remaining stadiums, it is therefore necessary to examine how stadiums may pool their limited resources for mutual benefit. Specific ideas suggested to promoters are listed in appendix seven.

Conceptualisation: the levels of situation summary diagram exploring differing depths of the sport provided a valuable means with which to fully appreciate the sport which the S.C.B. aims to govern. On reflection, the situation summary diagrams lack procedural detail which should have been encouraged through the use of techniques such as the customer resource life-cycle and resource audits.

Planning: review situation summary diagrams adding procedural detail where required. Construct justification alignment contours to align the deployment of resources with the situations represented.

Experience: three critical success factors can be identified for promoters, relating to attendance, teams and stadiums. Attendance of spectators provides the main source of income for everyone involved in the sport. It is recognised that improvements to stadium facilities may increase attendance. If a stadium provided a range of entertainment facilities, the loss of earnings from the cancellation of a meeting due to bad weather, would be reduced. In turn, attendance would provide more available finance for investment purposes. Promoters may therefore need to explore options such as the renting of entertainment equipment; inviting a speedway video company to provide entertainment when a meeting is cancelled; arrange evenings when riders can be available to socialise with supporters. One of the factors affecting attendance is the quality of the racing, which is determined by the quality of the track and the team.

Speedway tracks need to be well maintained, however, a major problem in Britain is that speedway stadiums and tracks are not owned by promoters and are continually under threat of closure. Promoters therefore need to explore options to own their stadiums. Lack of money prevents promoters from purchasing stadiums themselves but some stadiums have established joint ventures with other sports to provide shared facilities to overcome this problem. In other countries, speedway stadiums form part of the community recreation facilities, the possibility of council-owned sports facilities which can accommodate speedway racing could be explored. Staff at the stadium contribute to the entertainment pack offered, therefore enthusiastic and motivated staff are important.

Spectators want to see good racing, rider injuries are a weakness promoters must address quickly by arranging for a suitable replacement to join the team. Selecting a quality team within the regulations imposed by the S.C.B. and identifying replacement riders when needed is an important responsibility of the promoter. An automated information system may be able to assist the promoter in this task, although it is recognised that social issues are important when selecting a coherent team of riders.

Investment opportunities needed to improve stadium facilities and secure contracts with top-class riders, could be seized from collaboration between promoters. However, cultural barriers appear to prevent collaboration and such resistant takes time both to become established and overcome. As promoters refuse to collaborate on their own initiative, action is needed to encourage this interaction from a higher authority such as the speedway control board.

These three critical success factors, and the possible areas of action needed to address them, are illustrated in figure 4.18. An outline of an information system to assist promoters in the formation and reformation of teams is shown in figure 4.19, derived from the situation summary diagram of figure 4.13.

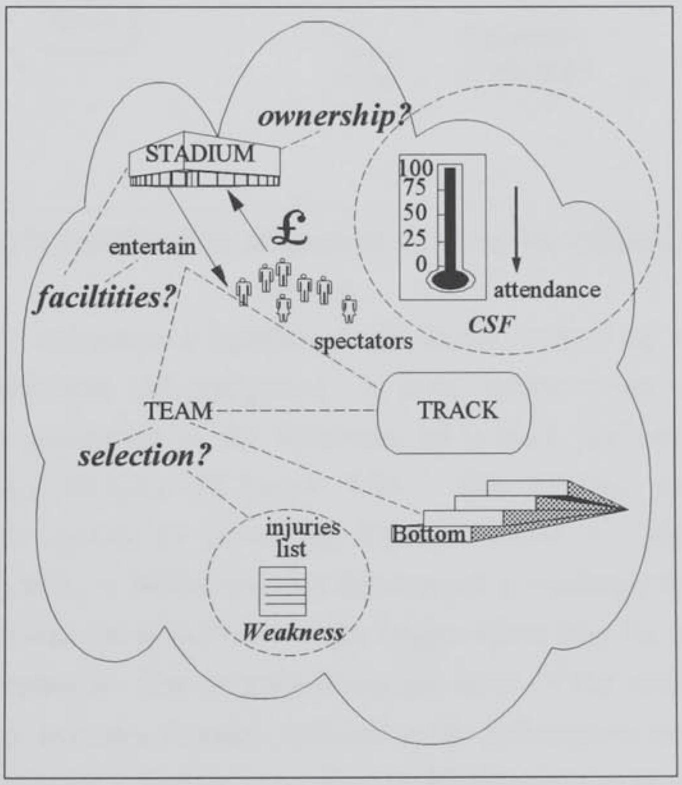

Figure 4.18: Justified Plan for a Speedway Stadium

Reflection: figure 4.18 identifies three critical success factors for promoters to address and the relationships between them. Attendance is critical to the stadium and is falling. Spectators pay to be entertained and the range of entertainment facilities offered and the means of possibly extending this range is one area requiring further investigation. The entertainment provided by the speedway racing is determined by the track and the team. Injuries are a weakness of the team which must be accommodated by the reformation of the team with replacement riders. The stadium itself is under threat and the options for securing ownership of the stadium need to explored.

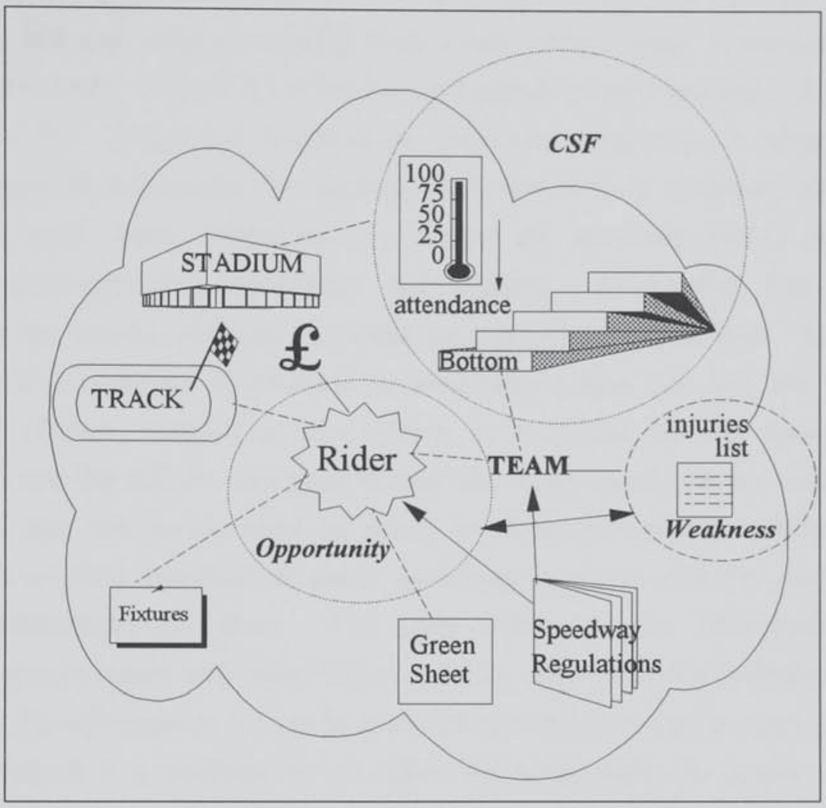

Figure 4.19: Justification Alignment Contour for a Rider Selection System

Figure 4.19 represents a justification alignment contour to address the issues of team selection and reselection. It is an outline of an information system to assist promoters in the formation of a team, derived from the situation summary diagram of figure 4.13. The diagram justifies the importance of the system by identifying that attendance, a critical success factor for the stadium, is falling and that injuries are a weakness to the team, affecting the performance of the team in the league which may be contributing to the falling attendance. The diagram illustrates some of the main concepts, from the situation summary diagram, relevant to the information system. This is considered to provide a starting point for the development of an information system to address the situation identified.

Conceptualisation: figure 4.18 provides a plan identifying the main areas of concern which promoters need to address. These areas also need to be considered by the S.C.B. to identify how the board may provide support to promoters. Figure 4.19 justifies the possible need for an information system to assist in the selection of riders for a team and identifies the main objects which comprise the system. Using information directly from the situation summary diagram, facilitates integration between the stages of strategic planning and strategic action.

Planning: figures 4.18 and 4.19 to be discussed with the representative promoters, although action resulting from these outline plans is outside the scope of this study. Figure 4.18 will be considered in the formation of plans for the S.C.B. Construct justification alignment contours to align the deployment of resources with the situations represented for a speedway rider.

Experience: three critical success factors for speedway riders can be identified as preparation, investment and training. Preparation has been subdivided into mental, physical, mechanic and procedural preparation. Mental and physical preparation is personal to individual riders and has not been considered further; mechanical preparation is restricted by the speedway regulations and the S.C.B. may need to consider the procedures for changing regulations and the involvement of riders in these procedures; procedural preparation requires information about speedway meetings and the past and current performance of riders. The main source of this information is completed programmes and race videos. A key issue is in the indexing and retrieval of this information for use by both riders and future media coverage.

Investment is a problem for all riders but particularly for junior riders who lack sponsorship. Continual lack of finance prevents junior riders from purchasing the equipment they need to improve in the sport. This affects their motivation and has resulted in many riders leaving the sport.

Lack of training is a further problem for riders and includes lack of time on the track, lack of tuition and difficulties in identifying and attaining programmes and videos for analysis. These areas are illustrated in figure 4.20.

Reflection: figure 4.20 identifies the main areas of concern for speedway riders of preparation, investment and training, to lead to success. Retrieval of information to assist in mechanical and procedural preparation is weakness. The S.C.B. needs to consider these areas to examine options for encouraging and developing the sport.

Conceptualisation: although specific plans were not derived to assist the situation of a speedway rider explored, the diagrams prepared may assist the S.C.B. in examining areas in which it may contribute. In addition, the diagrams provide a useful means of communication to junior riders of the sport.

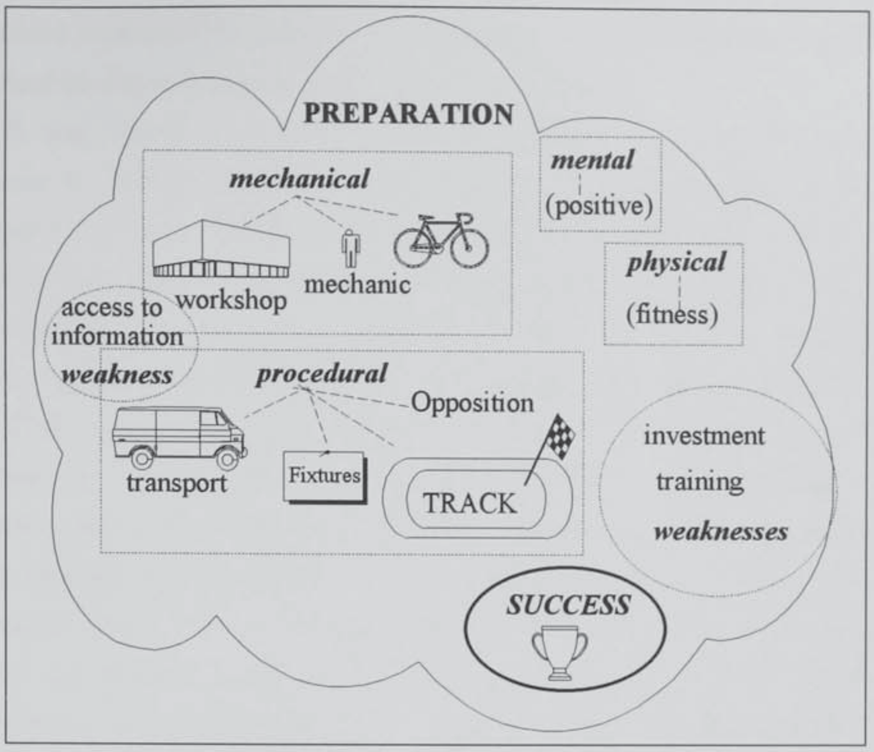

Figure 4.20: Justified Plan for a Speedway Rider

Planning: key areas of concern derived for speedway riders and promoters need to be explored by the S.C.B. to identify how the board may contribute to the sport.

Experience: the situation summary diagram for the S.C.B. lacks procedural detail, although from the interviews conducted, two areas of concern were identified. Firstly, referees have complained about the amount of writing required to complete documentation during a meeting. The S.C.B. is currently reviewing the documentation with the aim of preparing forms to reduce the volume of writing required to complete the documentation. Secondly, clerical staff have requested an automated information system to assist in the allocation of referees to meetings.

From the promoter and rider situations investigated, three areas which the S.C.B. could explore to meet its aims of encouraging and developing the sport are the promotion of the sport, sponsorship opportunities and training facilities. A strength of the S.C.B. is its independence which could enable it to pursue promotion of the sport in the best interests of all involved. It has been recognised that collaboration between promoters may assist in addressing the major threat posed by lack of investment in the sport. The S.C.B. may explore ways of encouraging the collaboration of promoters by the formation of 'package deals' which demonstrate how uniting resources could be mutually beneficial. For example, the S.C.B. could negotiate an advertising contract for a televised commercial, prepare a cost/benefit report which demonstrates the individual investment required by a group of stadiums.

It was identified that one option for securing the survival of speedway stadiums in Britain, would be adopt the policy of integrating speedway stadiums into the community recreation facilities. The S.C.B. may consider exploring how this is undertaken in other countries and initiate contact with local councils. As the primary source of funding to the S.C.B., promoters need tangible results from the board, in encouraging collaboration and investment, the S.C.B. must avoid using its power to 'force' promoters to take action. Enforcement of collaboration through regulations would further distance promoters from the board and have little real effect. This was evident by a recent attempt by the S.C.B. to encourage promoters to contribute to the training of junior riders. Changes in regulations required each promoter to appoint an official training instructor at their track who would take responsibility for ensuing that riders received adequate training before riding. This was in response to a fatality caused by a junior rider using inappropriate bike-settings for a track. Although promoters appointed training instructors, this regulatory action failed to be effective as the training instructor was appointed in 'name only' and did not actively assist in the training of riders.

The future of the sport lies with junior riders; if the S.C.B. is committed to encouraging the sport, active encouragement for junior riders is required. The board may investigate sponsorship options for junior riders which could include sponsoring awards in recognition of achievement, or sponsor an annual meetings for junior riders to compete. In addition to sponsorship, junior riders suffer from a lack of training facilities and access to training information. The S.C.B. needs to investigate how training facilities could be funded and how access to information could be improved.

These areas are illustrated in figure 4.21.

Reflection: figure 4.21 identifies the three areas of promotion, sponsorships and training which the S.C.B. may explore to address the situation of the sport. Currently, the S.C.B. does not conduct any duties relating to its objective to develop and encourage the sport. Investigating options concerning training and sponsorships of junior riders would address this omission.

A threat to the survival of the S.C.B. is identified from promoters, utilising the strength of independence of the board for promoting the sport, could be utilised to the mutual benefit of promoters and riders. Both promotion and training requires access to text and image-based material and the access to this information may need to be improved.

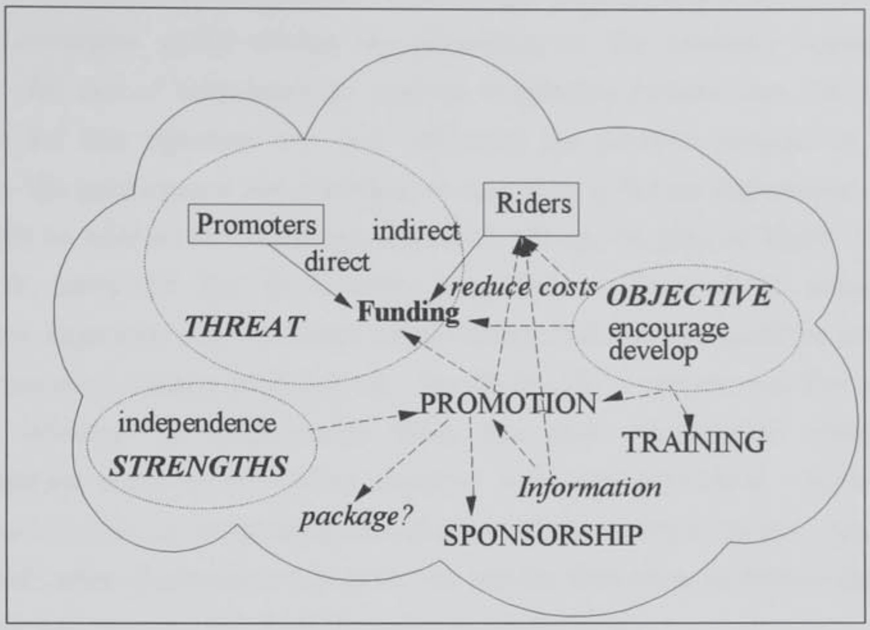

Figure 4.21: Justified Plan for the S.C.B.

The S.C.B. can actively assist promoters by reducing the costs incurred by promoters through the allocation of referees to meetings. Figure 4.22 represents a justification alignment contour for this information system.

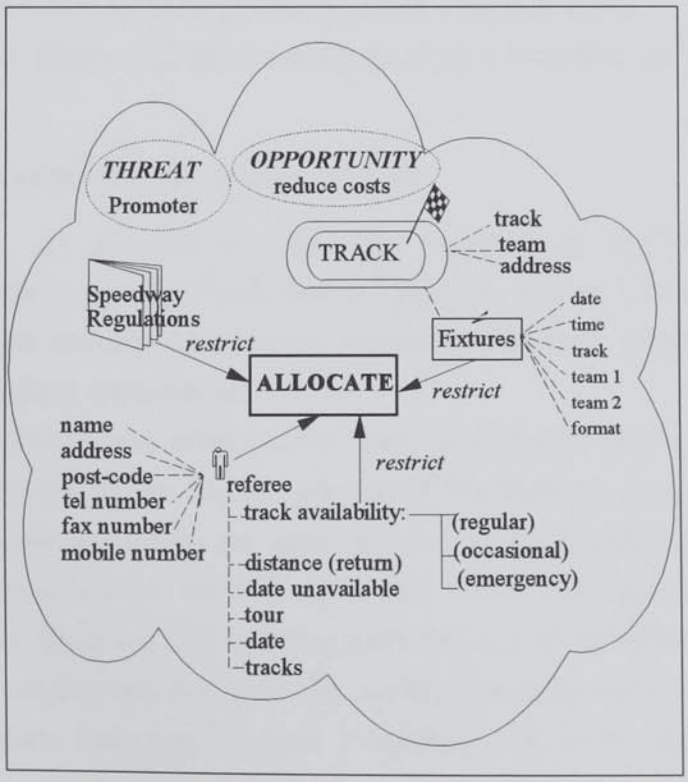

Figure 4.22: Justification Alignment Contour for a Referee Allocation System

Conceptualisation: ideas for addressing the situations explored were suggested by participants without reference to the guidelines provided on strategic choice and implementation. Although participants had found strategic analysis techniques useful during the formation of the situation summary diagrams, the use of techniques to explore alternative actions was rejected. The basis for this rejection was that following the detailed analysis of the situations, the participants felt confident to use their previous experience and new insight to address the situations identified. From the plan in figure 4.21, the S.C.B. extracted the three areas identified to form three separate justification alignment contours onto which further information could be added as the areas were further investigated. As the S.C.B. manager was the only available resource to take action from the plan constructed, detailed implementation plans of the action required were not developed. Lack of procedural information in the situation summary diagram, hindered the creation of the justification alignment contour for the referee allocation system of figure 4.22 which was constructed from the notes in appendix six.

Planning: the development of the information system required by the S.C.B. to allocate referees to stadiums is to be undertaken, however, the further implementation of figure 4.21 is considered to be out of the scope of this research as it requires direct operational action from the S.C.B. manager. It is necessary to reflect on the experience gained from this study.

Experience: figure 4.22 has been assigned to a volunteer of the S.C.B. for development.

4.2.6 Reflection of Motorcycle Speedway Case

Reflection: the previous sections have reported the application and development of the composite framework proposed in section 3.3 contributing to the theory and practice of strategic information systems planing, action research and the client organisation.

Strategic analysis was conducted at many levels in the sport. Although this case was initiated by the S.C.B., analysis of the strategic situation of the sport and key elements within the sport needed to be investigated and the results of this investigation contributed to the action plan derived for the S.C.B. The case illustrated the differing contributions of individual strategic techniques and emphasised that it is the holistic situation derived from the information content delivered by each technique that is of value to the organisation.

It is hoped that everyone who participated in the research benefited from gaining insights into the sport. The S.C.B. identified a weakness in the pursuit of its current objectives and developed a deeper understanding of the sport it aims to control. In particular, a root cause of the threat to the board's survival was identified in that promoters could not identify any tangible results of the organisation it was funding.

The nature of the study did not support the development of the guidelines to assist in the selection of appropriate techniques for analysing and implementing strategic options. This impeded analysis and development of stage three of the framework to prepare justification alignment contours. It was necessary to analyse the environment of the client and this analysis resulted in the identification of plans to assist in improving the situations explored. However, these plans could not be implemented as they required a further level of analysis which was beyond the scope of this project.

Conceptualisation: the use of Kolb's (1984) model of experiential learning provided a structure with which to conduct and report the interaction between theory practice during the action research. The framework forced the researcher to reflect and conceptualise from the experience in the client organisation, avoiding the situation where the complexity of the situation overly influenced the research conducted. In addition, this separation of theory and practice, increased both appreciation of the client's situation and understanding of the contribution to the situation offered by the composite framework.

Implementation of the composite framework used a variety of notations with the differing participants. This suggests that the iconic notation originally proposed may, in some circumstances, be unsuitable as a means of representation and communication of information. All diagrams were initially hand-drawn with the participants in the study, they were then redrawn using a drawing package, before being rechecked by the participants. It was necessary to reproduce the diagrams to aid clarity of documentation. Although during the construction, the diagrams were meaningful to the creators, over time, this meaning was reduced. Recreating the diagrams aided recall in three ways. Firstly, the act of recreating the diagrams, forced the researcher to review the diagrams and recall the events surrounding their construction, reinforcing recall of the diagrams. Secondly, formalising soft diagrams through the use of automated tools is criticised for producing diagrams which are clinical and lack expression (Stowell *et al.*, 1991). However, the experience of this research was that by reproducing the diagrams, reinforced the meaning attributed to simple icons in the clinical representation. Further, the clinical nature criticised, was found to aid clarify and understanding of the situation. Thirdly, the formal diagrams aided understanding when the diagrams were later revisited.

A formal framework of strategic techniques underlies the construction of the situation summary diagram. Although Checkland (1981) argues that guidance in rich picture construction reduces the Soft Systems Methodology to a technique, this research found that at the strategic level, guidance is required to examine the strategic situation from different viewpoints. This research confirms the views of Jayaratna (1992) and Doyle *et al.* (1993) that soft approaches can be augmented with structured techniques. The use of the situation summary and justification alignment contours used in this case aims to address the need identified by Mingers (1992), to combine systematic and systemic approaches which compromising either.

During the case, it became evident that the process of constructing the corporate summary diagram, situation summary diagram and justification alignment contour was more valuable than the physical diagrams produced. This is supported by the experience of rich picture building (Lewis, 1992). The stages of the composite framework have been changed to corporate summary, situation summary and justification alignment to reflect this experience.

Stage one, the corporate summary, was originally considered to be an optional stage which would only be necessary for an analyst unfamiliar with the organisation. The experience in this case suggests that conducting this stage can reveal useful insights into the organisation. For example, a mismatch was apparent between the objectives of the organisation and the duties it performed.

During stage two, it was considered that techniques such as the customer resource life-cycle and the resource audit, which had been identified from the guidelines provided, were inappropriate. However, in stage three it became apparent that the situation summary diagrams lacked procedural detail which these techniques may have provided.

Cultural analysis was conducted during stage two using the four elements of cultural analysis of Hofstede (1991). Analysis of the cultural elements of heroes, values, rituals and symbols provides a sufficient degree of cultural appreciation of the situations, supporting experience from the case studies. This analysis approach may therefore be added to the guidelines.

The initial cultural differences apparent between British and American riders was reiterated throughout the interviews and emphasised in the comment that America has a team while Britain has seven individual riders. American riders refused to talk of 'problems' speaking only of 'opportunities'. In speedway it is evident that Americans focus on results with little interest in excuses for failure and this is supported by the international observation of Walmsley (1986) who describes Britain as a nation working within natural boundaries which America is always aiming to breach. A number of interviewees commented on the natural professionalism and showmanship of American riders, describing the loss of top American riders to British league speedway as a major threat to the sport. This also supports Walmsley's observation that sport in America is considered to be a branch of show-business, whilst Britain is respected for sportsmanship. The experience of this research recognises that:

> "speedway is international and whatever language we speak we are all working for the same cause" (Herman & Farmánek, 1993).

The dedication of all those involved in speedway experienced during these interviews is reiterated by Herman & Farmánek (1993) who note that the determination to win has a cost as riders may devote their lives or health to speedway. In this analysis of the sport, it must be remembered that speedway is a professional motor sport and as such, riders risk their lives for public entertainment.

Planning: the changes to the framework identified need to be reviewed in the following application of the framework. Particular attention is required in the following case to examine the application of the later stages of the framework which were not explored in this case.

4.3 CASE 2: SERVICE COMPANY

This section reports the action research conducted within a company which provides service support to plant equipment in the construction industry. The company is a subsidiary of an international organisation. Justification for selecting this client organisation is first presented, the application and development of the strategic alignment framework is then reported. This section adopts the cyclical structure of Kolb's (1984) model of experiential learning which guided the research undertaken.

4.3.1 Justification for Selecting the Service Company

The research was initiated by the restructuring of the subsidiaries of a construction plant equipment manufacturer which resulted in a number of redundancies around the country. The responsibilities of a service manager at one branch were extended to manage the service departments of five branches, including his own, under the new title of 'regional service director', replacing the service managers at these branches. The manager was concerned that the extended responsibilities required a strategic approach across the branches. The feasibility study suggested that the situation summary diagram could assist in exploring the strategic direction of the five branches, in addition, the justification alignment contour would provide guidance for the deployment of resources aligned with the strategic direction across the branches.

4.3.2 Feasibility of Service Company Case

The feasibility of the framework to assist both the client organisation and the further refinement of the framework was explored through one cycle of the model in figure 4.1, entering the model at the experience phase.

Experience: an initial meeting was held with the new service director who explained that he had previously been responsible for the service department at one branch in which he had progressed through the company from apprentice. He was now required to manage the equivalent departments at other branches in addition to his own. The director requested help to identify a means of exploring the different needs at each branch and to form a plan for the operation and management of the branches. A key requirement would be a flexible repeatable procedure which the director could use after the action research had ended.

A service department consists of a number of engineers with differing skills, fulfilling four basic functions. Firstly, the department is required to undertake pre-delivery inspections (PDI) of all new equipment sold by the sales department before the new owners take delivery of the equipment. Secondly, the department provides a repair service for customers; thirdly, the department undertakes warranty and servicing of equipment sold and finally, the department conducts damage assessment for insurance purposes. The different branches serve different customers with emphasis on different types of equipment.

Reflection: the new responsibilities require the director to investigate the areas for which he is now responsible. This immediate need may encourage the participation of the employees at the different branches. In addition, the changing role of the director requires a repeatable means with which to conduct strategic analysis and implementation across the branches.

Conceptualisation: as a new director with sudden strategic responsibilities, existing strategic planning techniques are lacking. The case will therefore not assist analysis of how the framework may be accommodated within existing planning procedures. However, the manager is keen to learn of the process by which the framework is applied, in order to continue using the framework, if appropriate, beyond the timescales of the action research. The immediate situation of the organisation may encourage participation and commitment to the study and the requirement of the organisation to adopt a repeatable process may compensate for the disadvantage that current strategic planning techniques are lacking.

Planning: agree scope of study with the director; attain agreement to contact employees at all branches; prepare a corporate summary of the service department.

4.3.3 Corporate Summary of Service Company

Experience: as the manager is keen to learn about the process of applying the framework, steps for the construction of the corporate summary were first outlined and then applied. The steps identified for the construction of a corporate summary are:

1. Prepare diagram.
2. Define corporate requirements.
3. Map requirements to diagram.
4. Note any questions / comments.

These steps were then applied:

Prepare diagram.

The director was asked to describe his company as if briefing a new employee. The following description adopts the order of the description. Background information to support the icons in figure 4.23 is included in brackets:

"This is the service department operating within a group of companies. The corporate flag flies over everything we do. The company produces a large range of construction machinery. The branch consists of the office block, a large equipped workshop, paint shop and yard. (The offices have recently been refurbished and all administrative staff have been issued with uniforms for the first time). The machines may be repaired in the workshop or at the customer's site which helps us maintain a good relationship with all our customers. (When they wish to buy a new machine they often come to us and we then contact the sales team).

The engineers have specialist knowledge of all the products in the range and are regularly sent on training courses and take exams to keep up-to-date with all the latest machine modifications. The engineers have fully equipped vans to allow them to conduct repairs at the customer's site. We service and repair machines; prepare quotations for insurance companies and provide specialist services (for example, we designed and modified a machine to meet the specific needs of a customer. A machine was needed to assist in canal dredging but standard machines were too big for the tow paths. The smaller machines in the range lacked the power and stability needed). Before a new machine is delivered to a customer, we carry out a Pre-Delivery Inspection (PDI).

We have recently been awarded BS5750; we are very proud of this and inspectors from BS5750 can come and check to ensure that we are maintaining standards. Competition comes from three main sources. Firstly, from other manufacturers, as we CAN service the machines of other manufacturers they CAN service ours. (Long term relationships with customers help to reduce this kind of competition). The second form of competition is from companies which are set up just to repair machines. Thirdly, large companies are starting to set up their own in-house repair service to reduce costs. There are a number of such service branches around the country."

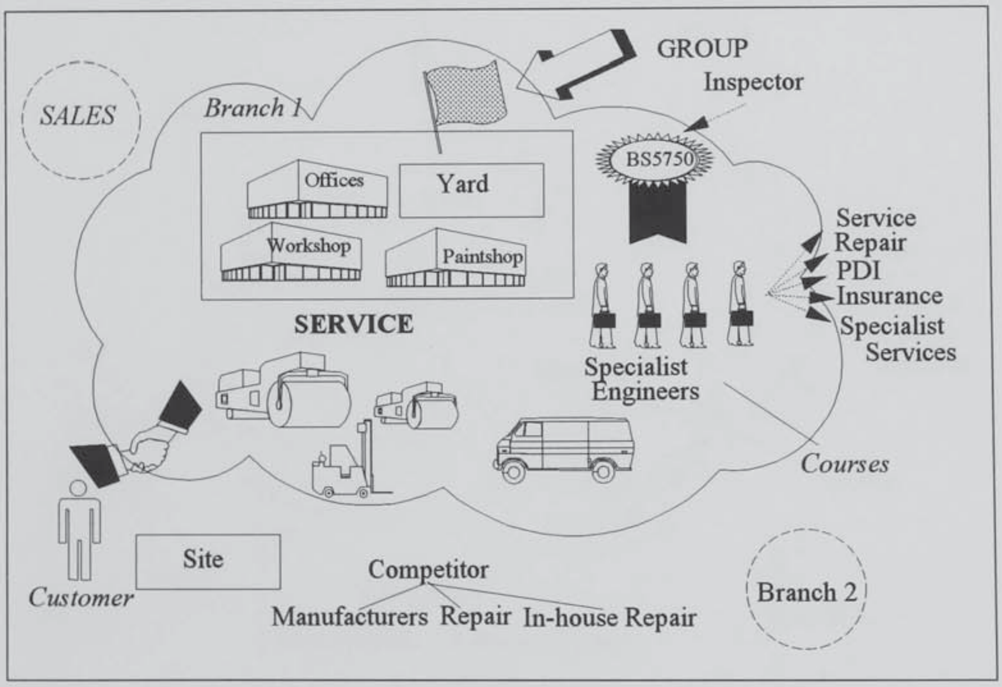

Figure 4.23: Corporate Summary of Service Company

Define corporate requirements.

The following corporate requirements were identified:

A provide a high quality service to customers.

B secure long term contracts with customers.

C cultivate brand loyalty.

D become a self-sufficient unit.

Map requirements to diagram.

Figure 4.24 maps the corporate requirements to the corporate summary of figure 4.23. The corporate requirement to 'provide a high quality service to customers' is addressed by maintaining: a wide range of machines to meet customer needs, so that customers need not approach our competitors; fully equipped workshops, so that all repairs can be conducted on the premises; a fleet of equipped vans, so that repairs can be completed at customer sites, reducing the machine down-time for the customer; training engineers, to deal with any problem on any machine; providing specialist services to meet all the customer's requirements; branches around the country, to provide a quick response service.

Long term contracts with customers' are secured by maintaining: good customer relations; a range of vehicles and services to meet customer needs; specialist staff to provide good service. Brand loyalty is cultivated by good customer relations; providing a range of products; specialist engineers and the corporate image. The department can become self-sufficient by maintaining equipped facilities and trained engineers to meet all repairs.

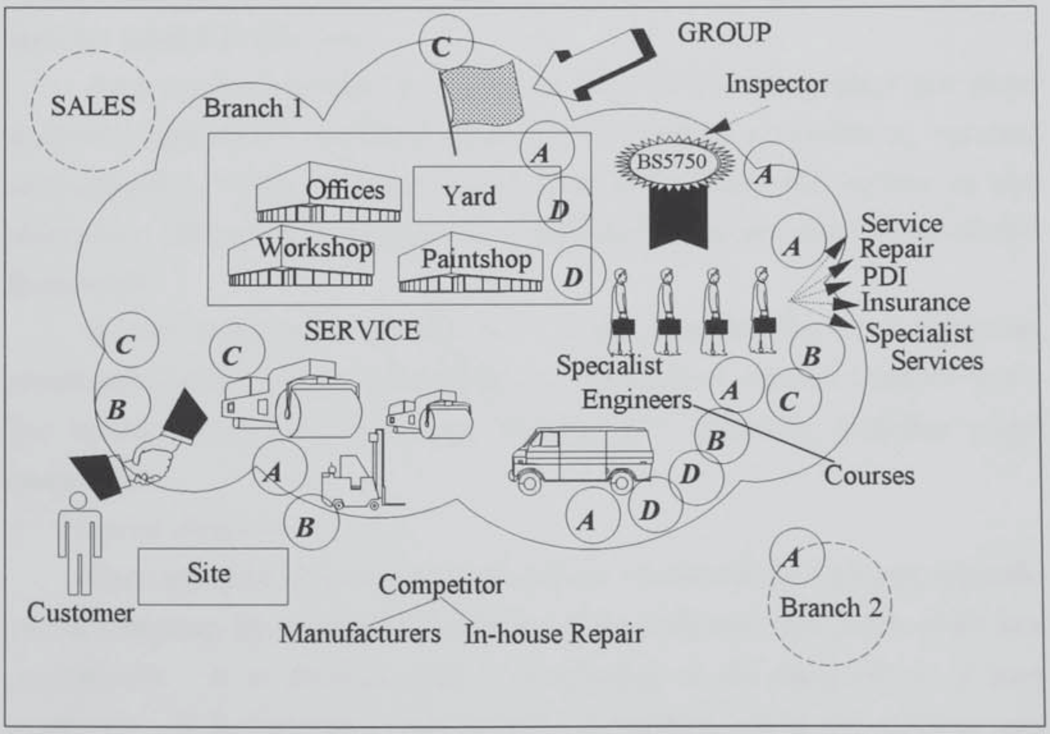

Figure 4.24: Corporate Requirements Mapped to Corporate Summary of Service Company

Note any questions / comments.

"We have invested a large amount of money refurbishing the offices and providing clerical staff with uniforms to help with the company image, but the majority of customers never enter the offices. On the rare occasion when a customer does come to the branch, they are dealt with in the yard office by the foreman. We have invested a lot of money which does not directly support our main objectives. However, the uniforms may improve morale, symbolising the professionalism of the parent company, which may improve customer service.

We sponsor a number of our engineers who compete in a variety of sports, such as hover-craft racing. We have painted and sign-written hover-crafts and motorbikes in the paint shop - perhaps we could provide a wider painting service rather than just the product range?"

Reflection: a basic appreciation of the corporate situation of the director was attained. Four corporate requirements were identified and mapped onto the situation which revealed that the recent expenditure did not directly contribute to these requirements. Insights into the situation gained by the director were noted.

Conceptualisation: in the previous case, objectives were mapped onto duties of the organisation; in this case, corporate requirements were mapped to the corporate summary reflecting the different focus of the organisations. This case may benefit from a more procedural focus than the first case, perhaps because the speedway control board was at higher authoritative level than the director studied in this case.

As a service organisation, Bitran & Lojo (1993) recommend that three segments need to be reviewed, these are the internal environment, external environment and the customer interface which delivers the service to the customer. These areas need to be examined during the next stage of the framework.

A key requirement of this case is the formalisation of the process conducted so that it can be adopted by the organisation after the research study has ended. The following steps describe the corporate summary stage undertaken:

1. Prepare diagram.

The corporate summary diagram may be considered to represent a profile of the company, illustrating the purpose of the company and some of its key components. It is developed as a description of the company to a new employee. It is important that initially 'everything' is noted without any analysis as this will provide useful insights later in the analysis. Extra notes may be noted as supporting information if required. The diagram addresses questions such as: what does the company do?, what is the structure of the company?, what products or services does the company provide?, who are the customers?, who are the main competitors?, how does the company differ from its competitors? and what pressures influence the company?

2. *Define corporate requirements.*

When the corporate summary reaches a 'natural' point of exhaustion, the main corporate requirements are defined. Corporate requirements address questions such as what does the company aim to achieve? and what are the most important factors to ensure the continued survival of the company?

3. *Map requirements to diagram.*

Each corporate requirement is labelled for identification. The corporate summary diagram is then examined to identify which aspects of the diagram influence the attainment of the corporate requirements. Labels are then added to the Corporate Summary Diagram (CSD) to indicate which elements affect the requirements, identifying interdependencies between requirements. The grouping of requirements around specific aspects of the model highlights the most important assets or issues which must be preserved to meet requirements. These are the elements which have the potential to make the greatest contribution to assist in achieving the corporate requirements.

4. *Note any questions / comments.*

Any questions or comments which arise throughout the analysis processes must be noted. They may be recorded as supporting information to an icon on the diagram, although a separate list of questions should also be maintained which then becomes an action list of 'things to follow up'.

Planning: having attained a shared understanding of the organisation, the specific strategic situation of the department needs to be examined through the formation of a situation summary, focusing on the three areas identified by Bitran & Lojo (1993).

4.3.4 Situation Summary of Service Company

Experience: the following stages were identified and applied for the preparation of a situation summary diagram:

1. Define business requirements.
2. Prepare situation summary diagram.
3. Review situation summary diagram.

1 Define business requirements.

Table 4.1 defines the business requirements for each of the corporate requirements identified from the corporate summary. Each of these requirements is then assessed in terms of whether they currently offer a strength, weakness, opportunity or threat to the situation.

Corporate Requirement	Business Requirements	Assessment (S-strength, W-weakness, O-opportunity, T-threat)
A Provide high quality service to customers	Training Equipment Spare parts Fast turnaround Flexible to needs	S T Loss of equipment S T Staffing levels S
B Secure long term contracts	Good service Good customer relations Range of products Competitive prices	T competitors S S / O specialist service S negotiation
C Cultivate Brand Loyalty	High standards Good service Corporate stamp Company history Wide range of products	S S rely on staff S S brief employees S
D Self-sufficient	Long term contracts Large customer base Sell more machines	O O O every customer contact

Table 4.1: Assessment of Corporate Requirements for Service Company Case

Notes:

"A number of vans have been stolen and the yard has been broken into a number of times; a fast response to customers requires an adequate number of engineers but recent redundancies and a freeze on apprenticeships has meant that sometimes there are more customers than can be adequately serviced, however, at other times there is insufficient work; we can not use contract staff as this would jeopardise our high standards of trained engineers; many companies are trying to do their own repairs with non-standard parts, which is becoming an increasing threat; we can compete competitively on price if a customer says they can get the service cheaper we can negotiate terms; good service relies on the staff and so we must invest in them; every customer contact is an opportunity to increase their loyalty to the company."

Prepare diagram.

Strategic planning techniques identified from the guidelines in appendix three to explore the three critical segments of service organisations identified by Bitran & Lojo (1993) are: the customer resource process to explore the customer interface; the five forces model, the four stage industry life-cycle and PEST analysis to assist analysis of the external environment; a resource audit and cultural analysis to analyse the internal environment. The application of these techniques is summarised in figure 4.25.

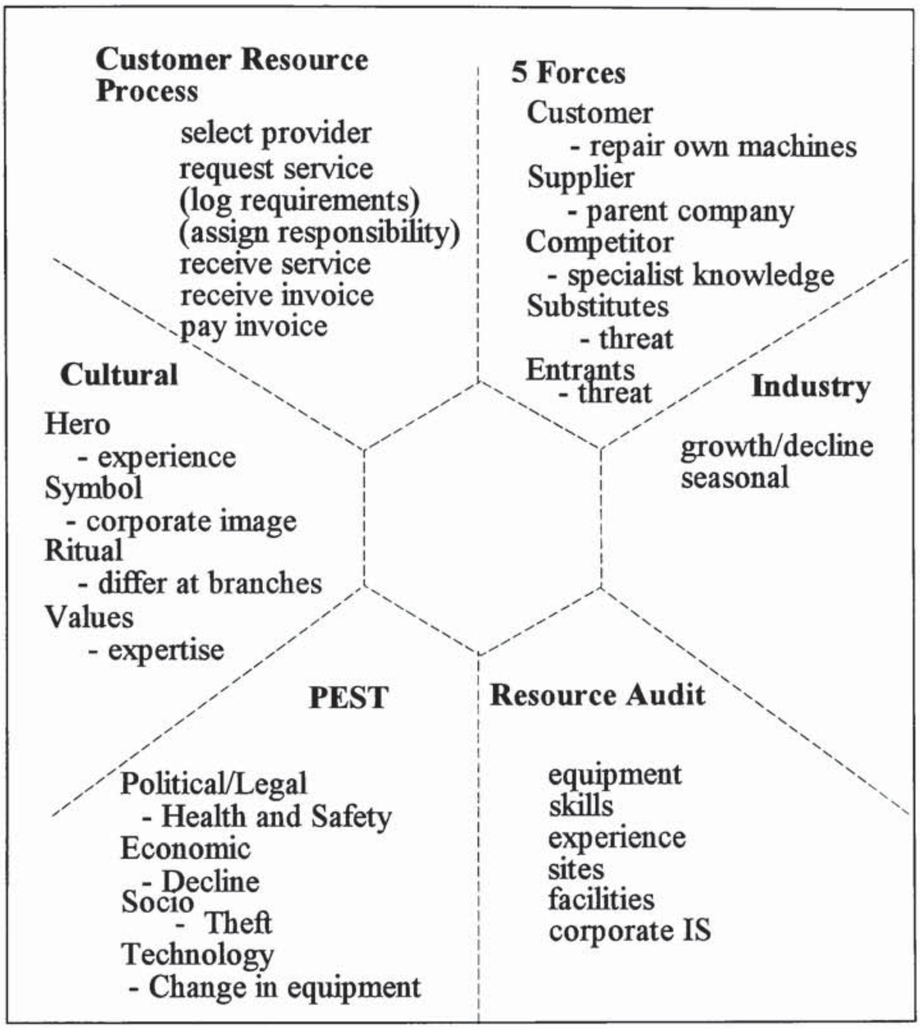

Figure 4.25: Framework for Situation Summary of Service Company

The situation summary in figure 4.26 illustrates the business requirements identified in table 4.1, that:

1. A sufficient level of trained engineers must be maintained in order to provide a responsive and flexible service to the customer.
2. A wide range of flexible services must be provided to the customer.
3. High standards must be maintained in keeping with the company image and to retain BS5750 approval.

The diagram summarises the situation as: customer service is vital to the survival of the company and the customer must be viewed as 'number one'. The aims are to increase the customer base, increase sales and increase long-term contracts, all of which rely on good customer relations. The company has to compete for a customer's business against other manufacturers, specialist repair services and the customer's own engineers. The company provides a range of services and other companies do not support such a wide range. The company has a number of fully equipped facilities to meet customer needs and engineers are fully trained in the whole range of products and services. Some engineers specialise in particular types of machines or problems.

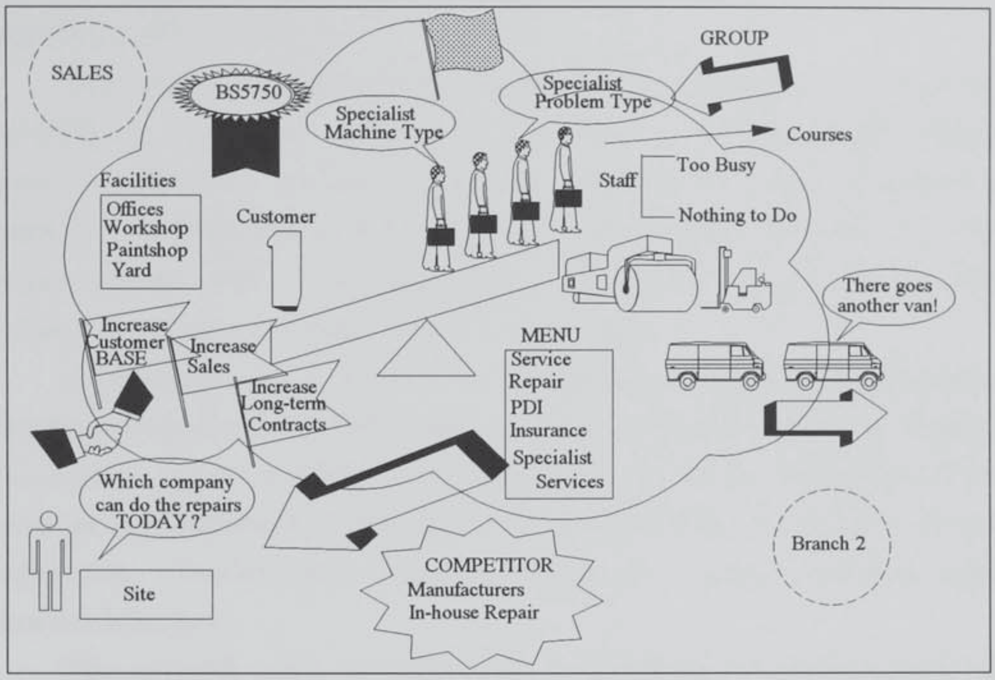

Figure 4.26: Situation Summary for Service Company

Key problems are how to: balance customer needs with adequate staffing levels; reduce the number of vans lost; balance the workload as staff either have too much work or not enough work to do; increase the customer base. The strengths of the situation are the: wide product range; specialised staff; range of services supported; flexible service and high standard of facilities. Weaknesses in the situation are: staffing levels and the loss of equipment. Threats to the situation are the loss of equipment, in-house repair services and unhappy staff when there is insufficient work available. Opportunities in the situation are to exploit existing facilities, second staff to/from other branches as required and to increase long term contracts.

Review situation summary diagram.

Emphasis on facilities in the corporate summary diagram is not reflected in the situation summary diagram. This is acceptable as the comment has already been made that refurbishment of offices does not directly contribute to the corporate requirements.

Reflection: the situation summary was first conducted for the director's own service department, before conducting the situation summary for each of the additional branches. However, it became evident that the situation for the service department at each branch was similar, differing only in two areas; the primary type of equipment serviced at each branch and the cultural rituals developed at each department. For example, the customers at one branch were primarily farmers, using a different range of equipment than customers at another branch which were mainly construction companies. The director and service foremen at each branch, agreed that figure 4.26 summarised the situation of the department.

The main threat to the service department is customers and competitors repairing the machinery. This threat is reduced as the equipment becomes more technologically advanced, requiring specialist skills and equipment to maintain. In addition, the branches have the advantage that they are part of the parent company who is a leading manufacturer of plant equipment, providing detailed knowledge and training to the departments.

A common threat throughout the industry is that of theft; the director has developed a number of policies which need to be extended across the branches. The decline or growth of the industry is in dispute and the departments focus more on seasonal trends which affect both the workload and the type of work undertaken. Further investigation is needed to compare seasonal trends between branches.

The resource audit was particular valuable to the director and was conducted in greater detail than is shown on the diagram. Specific types of equipment and skills at each branch were recorded, providing a detailed asset base for the director. This was valuable as the director began to perceive the collective resources available with which to provide customer service, beyond the geographical boundaries of the branches. Paper-based information systems are used to log customer queries, engineers' time sheets and update service records maintained for each machine. Automated information systems, developed and maintained by the parent company, include a parts catalogue and an invoicing system, which are out of the scope of this study.

Conceptualisation: identifying business requirements from corporate requirements provided a more detailed procedural focus to identifying problem areas, which was lacking in the previous case. This also highlighted the difference between the corporate summary and situation summary stages, demonstrating their differing emphasis. The major contribution of this stage has been the realisation that geographical boundaries of the branches can be breached to meet the requirements defined, providing the best service to customers. The specific steps identified for this stage are:

1. *Define business requirements.*

For each corporate requirement, identify the: critical success factors on which the attainment of the requirement depends; corporate strengths which contribute to meeting the requirement; corporate weaknesses which impede attainment of the requirement; threats which could prevent the requirement being achieved and opportunities which could contribute to the attainment of the requirement. This stage develops the results of the previous analysis and requirements. A more detailed focus is directed to the attainment of corporate requirements.

2. *Prepare situation summary diagram.*

Identify and apply strategic planning techniques selected from the guidelines in appendix three. Summarise the information content derived from these techniques in a situation summary diagram. The diagram uses similar notation to the corporate summary diagram, however, the situation summary diagram should be constructed without reference to the corporate summary diagram. The situation summary diagram should diagrammatically express: current difficulties identified which threaten the attainment of the corporate requirements; pressures both internal and external within which the company must perform; business requirements which must be attained to meet the corporate requirements and factors on which the attainment of the business requirements depend.

3. *Review situation summary diagram.*

The situation summary diagram is compared against the corporate summary diagram and any comments or questions must be noted. It is important to review elements of the corporate summary diagram which are not included on the situation summary diagram and elements of the situation summary diagram which are not included on the corporate summary diagram. The corporate summary diagram and situation summary diagram should not be identical and the exclusion of items from a particular diagram is acceptable. Comparison of the diagrams and 'justification' of the elements excluded can provide further insights into the situation.

Planning: following the analysis of the situations at each branch, it is necessary to identify potential systems for improvement and formulate a management plan.

4.3.5 Justification Alignment of Service Company

Experience: the following steps were applied:

1. Identify potential systems.

2. Prepare justification alignment contour(s).
3. Extend justification alignment contour(s).
4. Identify process requirements.
5. Map justification alignment contour to relational or object model.

1. Identify potential systems.

From the construction and analysis of the situation summary diagram, two information systems were identified as being required to address the situations depicted; a call logging system and a staff skill system to provide the best possible service possible to customers, maximising utilisation of the complete asset base across the geographical branches. Other actions arising from questions and queries noted include: analysis of equipment loss; review procedures for negotiating contracts and the secondment of staff between branches.

2. Prepare justification alignment contour(s).

CALL LOG SYSTEM:

The call log system addresses the business requirements to provide a wide range of flexible services to the customer and maintain high standards in keeping with the company image.

The following elements are extracted from the situation summary diagram: customer, as the customer sends the call request for an engineer; customer site and company van, to illustrate that a repair may be performed at the customer site; range of services, to illustrate the type of services which a customer may request; range of facilities, to illustrate available resources to respond to the customer; range of products, as a call will relate to a product; engineers, who will provide the service requested depending on type of product or problem; the aims of the system, to improve customer service and customer relations, which relate to the business requirements to increase the customer base, increase sales and increase the number of long-term contracts; the investment in the system is justified by the view that the customer must be the number one priority; BS5750, which dictates certain regulations; corporate flag, as the system must reflect the corporate image; branch two, as the system will be installed at all sites. This is illustrated in figure 4.27

STAFF SKILL SYSTEM:

The staff skill system illustrated in figure 4.28 supports the business requirement to maintain a sufficient level of trained engineers in order to provide a responsive and flexible service to the customer. The central image of the diagram illustrates the purpose of the system, to help balance customer needs with an adequate number of staff. The diagram illustrates the problem that staff currently have either too much or too little work and branch two is shown to represent that the same problem occurs across the country.

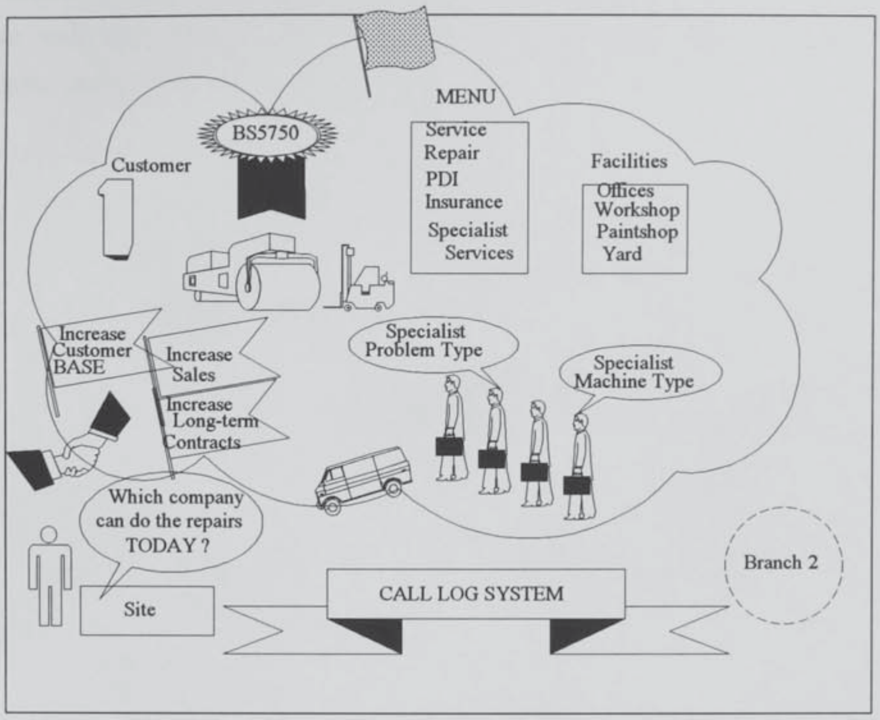

Figure 4.27: Initial Justification Alignment Contour for Call Log System

Engineer skills relate to particular machine or problem types and an engineer's experience is related to the courses he has attended. The system aims to assist in balancing customer needs against the skilled resources available to improve customer service and thus assist in increasing the customer base, increasing sales and increasing the number of long-term contracts. This requires the system to be responsive to customer needs. The corporate flag illustrates the corporate stamp of the system which must follow the guidelines of BS5750.

3. *Extend justification alignment contour(s).*

The richness of the justification alignment contour needs to be reduced for information systems development. The extended justification alignment contour attempts to reduce the richness of information attained and provide information systems development with a more objective document of information requirements. The justification alignment contour is first stripped of all elements except those about which information is needed. For example, from figure 4.27, the items 'which company can do the repairs today?', 'increase customer base', 'increase long-term contracts' and 'increase sales' are removed. A call log system needs information about the customer, machine and the type of problem and therefore these items are retained. The rich notation of the justification alignment contour is then removed and replaced by labelled circles to represent these objects. Specific details which need to be known about the object can then be added to the diagram, for example, name of customer. Figure 4.29 shows the extended justification alignment contour for the call log system and figure 4.30 shows the extended justification alignment contour for the staff skill system.

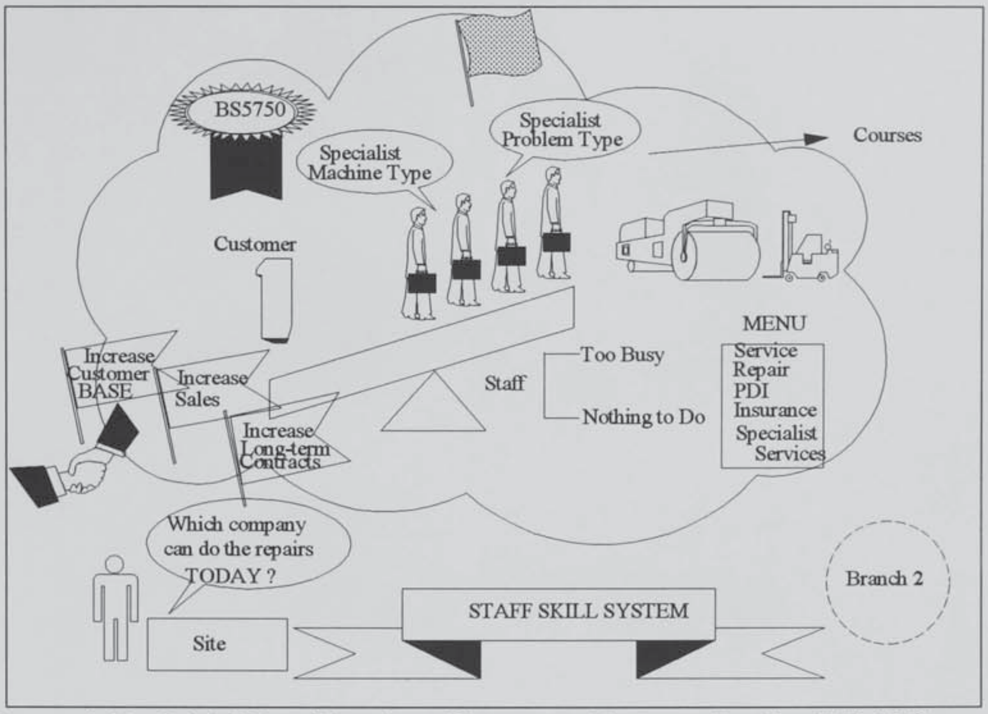

Figure 4.28: Initial Justification Alignment Contour for Staff Skill System

4. *Identify process requirements.*

Process requirements identified for the call log system include: receive customer call; create customer; update customer details; log call; log problem; check service agreement; evaluate urgency of problem; allocate engineer; create problem report; update call status; change urgency of problem; change engineer allocation; update machine history; update report details; check status of all calls at two hourly intervals; report action on completion; update engineer experience; pass information to invoicing system; pass information to payroll system.

Process requirements identified for the staff skill system include: create employee; create course entry; update course entry; update experience; update employee details.

5. *Map justification alignment contour to relational or object model.*

This is to be undertaken by company analysts.

Reflection: two information systems were identified from the process of summarising the situation. A justification alignment contour was produced for each system which identified key elements of the system extracted from the situation summary diagram and justified the development of the system. These justification alignment contours were then extended by the addition of information concerning the key elements identified. The extended diagrams were then passed to internal analysts to use in the development of the information systems identified.

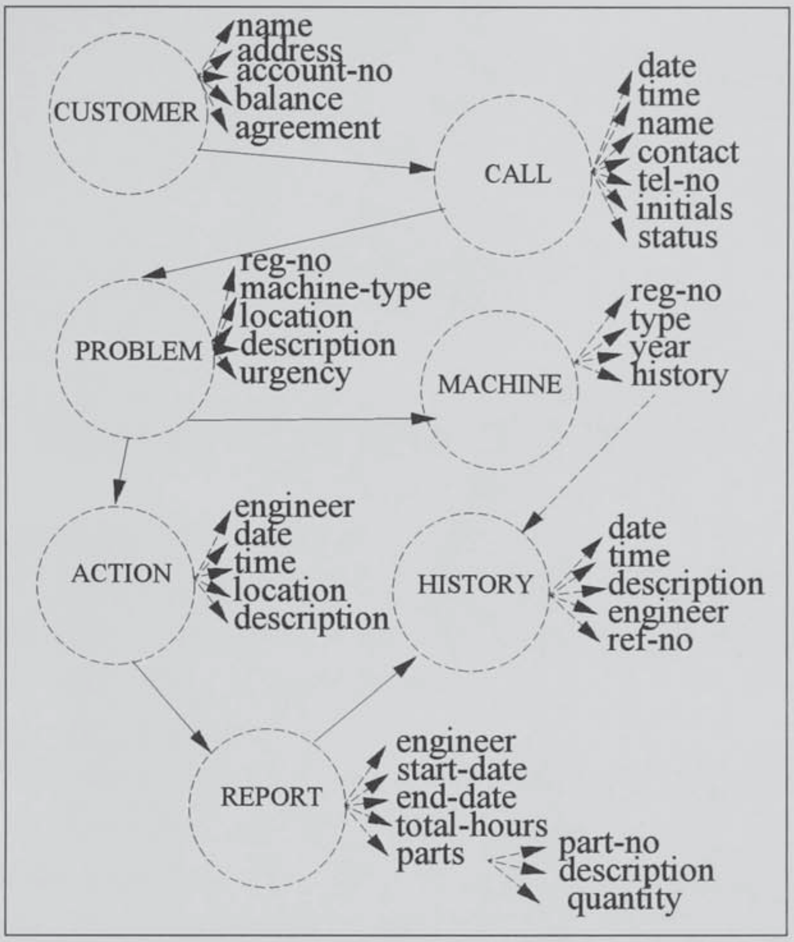

Figure 4.29: Extended Justification Alignment Contour for Call Log System

Conceptualisation: the following steps were conducted in the formation of the justification alignments contours:

1. Identify potential systems.

From the situation summary diagram potential information systems are identified to address the situation described in the situation summary diagram. The systems identified must address one or more of the following:

1. Potential threats to the corporate position.
2. Weaknesses identified in the current situation.
3. Improve current strengths.
4. Take advantage of opportunities identified.

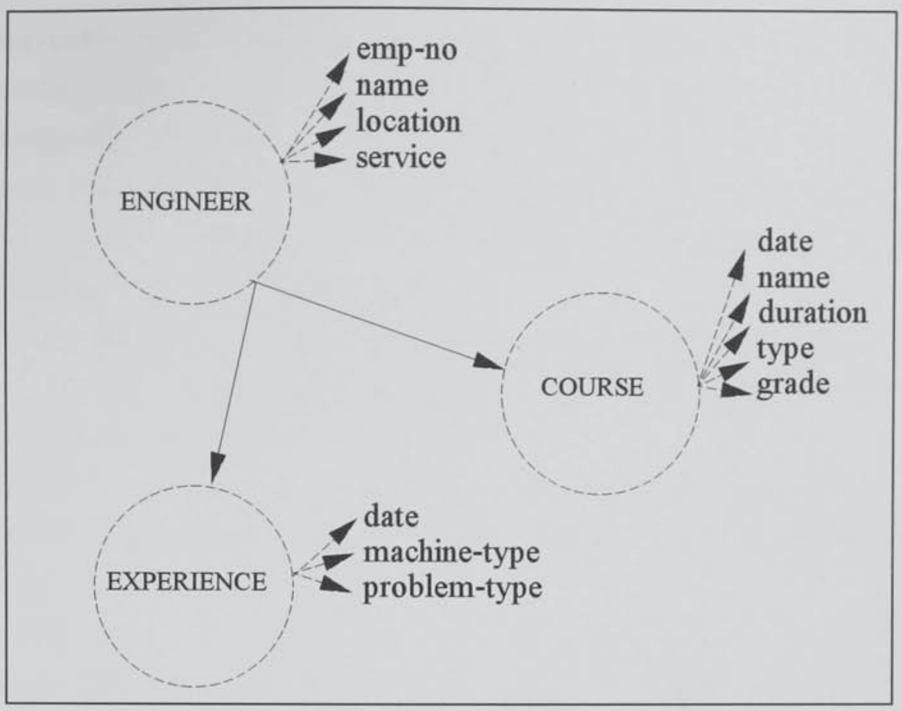

Figure 4.30: Extended Justification Alignment Contour for Staff Skill System

2. *Prepare justification alignment contour(s).*

A diagram is prepared by extracting aspects of the situation summary diagram which are relevant to the systems identified. This includes:

1. The purpose of the system.
2. Main components.
3. Aspects of the corporate position which the system is to address.
4. Information relevant to the development.

The justification alignment contour provides an outline of the system which illustrates the purpose of the system and some of the main elements of the system derived from the situation summary diagram.

3. *Extend justification alignment contour.*

The justification alignment contour is extended for each system by considering the information requirements, that is, the information needed about the key items included in the justification alignment contour in order to fulfil the requirements of the system. This may lead to the identification of further items for inclusion on the model. The justification alignment contour is first stripped of all elements except those about which information is needed in order for the system to operate. Each item is then illustrated by a circle and information concerning the item is added.

4. *Identify process requirements.*

Initial process requirements are identified by analysing the relationships between the elements of the extended justification alignment contour (EJAC).

This highlights the main business rules which must be supported by processing. Consideration must then be given to how the elements of the extended justification alignment contour are created, modified and deleted. Individual data items are then examined to identify any associated processes. A data flow diagram may be created to outline the flow of data through the system, to identify any omissions or inconsistencies.

5. *Map justification alignment contour to relational or object model.*

Circles on the justification alignment contour represent elements which can be represented as relations or objects.

Planning: it is necessary to implement the systems identified, review the plan and framework proposed, and to reflect on the experience gained during this study.

Experience: the justification alignment contours and extended justification alignment contours have been passed to the analysts in the parent company for development. Documentation for applying the framework has been passed to the director, to meet the initial requirements of the study.

4.3.6 Reflection of Service Company Case

Reflection: from applying the framework, the director recognised the need to combine the resources available at all branches, as opposed to managing each branch individually. Bitran & Lojo (1993) identify the interface between the company and the customer as being critical in a service company. Analysis of this interface identified the need for a call logging system to identify the needs of the customer and allocate the most experienced, available engineer from across the branches of the company. This required more detailed records of an engineer's experience to be available. Previously, engineer allocation had been the responsibility of the foreman at each branch, using his own knowledge of his engineers' skills.

The director required a repeatable process which he could continue to use after the study had been completed. Detailed documentation derived during the application of the framework with the director, was issued to the director on completion of the study. Further contact with the director has shown that the information systems identified have been implemented and the framework is currently being used to explore the relationship between the service departments and the parts departments in the organisation.

Conceptualisation: this case provided the opportunity to examine the application of the later stages of the framework which were not explored in the first case. Requirements for two information systems to support the corporate situation were identified. Justification alignment contours were developed to justify and outline these systems, however, their development was allocated to the parent company and contact was not permitted with the analysts developing the systems using these models. It is suggested that the justification alignment contours can be mapped to relational and object-oriented models, although this requires further investigation.

The director required a repeatable process for strategic alignment and this forced the director and researcher to think about the process which was being applied. This has resulted in the formalisation of the process described in this case.

During the case, the need for automating the diagrams became apparent as information to support the icons needed to be recorded. This supports the view of Avison *et al.* (1992) who suggest that automated tool support for soft analysis is required. Automation of the framework would allow the diagrams to be used at different levels of abstraction, temporarily hiding details to focus attention on key areas of concern.

Planning: further research is needed to explore the detailed implementation of systems outlined in the justification alignment contours and the possible automation of the framework.

4.4 SUMMARY OF EXPERIENCE

This section summarises the experience gained from the two cases of action research conducted. The experience is reported under three headings of:

1. Experience of applying the framework.
2. Experience of client organisations.
3. Experience of action research.

The section concludes with a statement of further research required to refine the framework proposed.

4.4.1 Experience of Applying the Framework

Both cases of action research contributed to the further development of the framework. The importance of what was initially considered to be an optional stage of corporate summary, was highlighted in both cases where insights into the situation were gained. This demonstrated that re-evaluating the objectives and activities of an organisation is a valuable exercise.

As with the Soft Systems Methodology, the process of preparing the diagrams of corporate summary, situation summary and justification alignment contour became more important than the resulting diagrams. For this reason, the notation used and the construction of the diagrams differed throughout both cases. It was found that lack of a formal notation, permitting participants to express whatever they considered to be significant to the situation in whatever form they wished, promoted participation in the framework. The notation used must therefore be left to the discretion of the participants involved in the study.

The need for automation of the framework became evident as a requirement was identified to document supporting information 'behind' the icons on the diagrams. Automation would also support levels of abstraction required to temporarily hide information to aid clarity and focus attention on specific areas of the diagram. The framework aims to facilitate the re-use of information between the stages of the framework and this could be enhanced by automated tool support.

The underlying structure used to guide development of the situation summary was beneficial in both cases of action research. It provided a means of focusing attention on key areas of the strategic situation. The situation summary diagram then provided a means of synthesising the information content derived by the strategic techniques. This was valuable as when applying techniques there is the danger that the application of the technique distracts attention from thinking about the situation being explored. The situation summary diagram provided a means of addressing this problem.

The justification alignment contour serves a dual purpose of communicating both an outline of an information system to be developed and the strategic requirement for the system, derived from the strategic analysis. Chapter 2.1 outlined some of the arguments relating to automation of soft systems analysis and the use of guidelines in conducting soft analysis. The experience of these cases suggests that both guidelines and automation are necessary for conducting soft systems analysis in organisations, particularly if the analysis is to be conducted by participants in the situation, as opposed to an external consultant.

The primary requirement for applying the framework is willingness to follow the guidance of the framework. If either of the managers involved in the cases had suggested that the corporate summary stage was unnecessary, valuable insights into the situation would not have been revealed. This is evident in the case of motorcycle speedway, where specific strategic analysis techniques identified as being potentially valuable to the situation were rejected as being inappropriate. Later in the study it became evident that the summary of the situation lacked procedural analysis which the recommended strategic analysis techniques may have provided.

In both cases, the guidelines in appendix three were used to guide the selection of strategic analysis techniques used in summarising the current strategic situation. However, the guidelines were not used in the selection or implementation of strategic options. In both cases, participants considered that the insight and deeper appreciation of the situations attained was sufficient to enable them to identify potential actions. Adherence to the recommended guidelines was not enforced, resulting in an area of the proposed framework remaining undeveloped in action. This may have been a weakness in the client organisations selected as both managers had authority to take action, controlling their area of responsibility. The need for strategic choice and implementation techniques may have been more apparent if the scope of the studies had been wider.

The framework is iterative supporting organisational learning. Both cases benefited from the studies, developing a deeper appreciation of their situations, however, both managers recognised that having gained a deeper understanding, they then needed to reapply the framework in more depth.

For the framework to be applied, co-operation and communication is required by many participants in the situation. Both cases benefited from committed participants and potential organisations were rejected on the basis that the political nature of the cultural environment was considered to threaten the successful completion of the study. The culture of the organisation must therefore be carefully considered before undertaking the study. Other cases were rejected because resources were unavailable to manage the scope of the study. Before applying the framework, the scope and the availability of personnel to undertake interviews and be interviewed needs to be assessed.

In the second case, having applied the framework with the researcher, the director is now applying the framework alone. External facilitators are not required to conduct the study. The framework requires personnel to interview, analyse and communicate the situation with those involved in the situation.

4.4.2 Experience of client organisations

The organisations entered differed in a number of ways which enriched the experience of developing the framework through action research. The first case started with a controlling body of a branch of motor sport but in order to investigate how the organisation could contribute to the sport, an understanding of the sport and the major actors within the sport was required.

This enabled the framework to be applied at a number of levels within the sport which demonstrated the application of the framework at different levels. The level entered in both cases, was labelled as being corporate, although it is recognised that a higher authority existed, which was beyond the scope of the study.

Involvement in the client organisations demonstrated that the process of analysis was more important than the tangible deliverables produced from the study, both organisations benefited from an enriched appreciation of their situations. In the first case, the client organisation attained a deeper understanding of the sport and its role within the sport. In the second case, the director attained an understanding of his new responsibilities. Although both cases resulted in a number of actions being proposed, the major benefits were attained by the act of intervention which encouraged participants to reflect on their situations, from differing viewpoints, using different analytical techniques.

The two clients had differing requirements from the study. The S.C.B. needed to re-examine its role in a changing environment. This was achieved by applying the framework at different levels within the sport, enriching appreciation of the environment the S.C.B. is to control. The director of the service company needed to identify the needs of each branch for which he was responsible, plan for their operation and management and establish a repeatable process for strategy formation. Through applying the framework, the director's perception of the branches changed, affecting his approach to managing the branches. After participating in the implementation of the framework, the director adopted the framework as a key management tool in his new role.

Applying the framework in the client organisations demonstrated the importance of participation in organisational learning. The framework attempts to support the formation and implementation of strategy as a creative process, providing a flexible means to accommodate soft information. However, the success of this approach is dependent upon the participation and co-operation of those involved in the organisations. Although the frameworks can encourage participation by avoiding complex rules and notations for its application, it is ultimately dependent upon the people involved in the study. The framework can support organisational learning, however, the organisation must first want to learn.

4.4.3 Experience of action research

The ethical implications of action research extend beyond issues of respect and confidentiality (Robson, 1993) requiring the researcher to:

1. Learn and observe organisational protocol.
2. Involve all participants affected by the situation, reducing suspicion and resistance to change.
3. Report progress, keeping the client informed.
4. Gain explicit authorisation for examining documentation and accepting responsibility for maintaining confidentiality.
5. Make the research procedure known to avoid suspicion.
6. Retain authority to report findings to the academic community.

Kolb's (1984) model of experiential learning provided a structure with which to conduct and report the interaction between theory and practice during both cases of action research. The separation of theory and practice enforced by the model, increased both appreciation of the client's situation and understanding of the contribution to the situation offered by the composite framework.

The composite framework taken into action research had been developed using case study material. This prevented the specific situations of the organisations unduly influencing the framework, although the researcher was aware of the possibility that the 'solution' of the framework may be imposed without appreciating the specific nature of the situations entered. For this reason, the feasibility of each case was examined before commitment was made to undertake action research in the organisation.

Particularly in the first case, where the situation was dominated by very dedicated and enthusiastic clients, there was the danger that the specific nature of the situation would out balance the theoretical aspects of action research. However, it was found that adherence to the cycle in figure 4.1 maintained the balance between theory and practice, resulting in a contribution to the experience of both.

The composite framework could not have been refined without the action research conducted. For example, the importance of the corporate summary stage of the framework was not appreciated, however, the clients' attained valuable insights into their situations during this stage. The development of the framework had focused on the construction of diagrams, but the action research demonstrated that the process of creating the diagrams was more valuable than the resulting diagrams from each stage.

Prescriptive approaches to information systems strategic planning were criticised in chapter 2.2; the action research conducted in two different organisations, demonstrated the need for a flexible framework to guide information systems strategic planning. The combination of experience in the client organisations and the theoretical foundation of the framework derived from research reported in chapters two and three of this thesis, has resulted in a flexible framework to support the strategic requirements of differing organisations.

4.4.4 Further Developments of Framework

Although the development of the composite strategic alignment framework was enhanced by the action research conducted in the client organisations, the nature of the organisations also restricted the development of the framework in some areas. Further action research is required to develop the following areas identified.

Firstly, the research conducted did not develop the guidelines prepared to assist organisations in the selection of strategic techniques which may be appropriate to their situation. The framework needs to be used in an organisation which has an established strategic planning process, in order to investigate how existing planning techniques can be incorporated into the framework. In addition, the guidelines developed for selecting strategic techniques to aid strategic choice and implementation were not used in the client organisations, further action research is needed to examine this area.

Secondly, the client organisations lacked an established information systems function. Research needs to be conducted to examine the integration of the framework into established approaches to information systems development.

Thirdly, external analysis of information systems and information technology was not explored in the organisations. This resulted in a reactive as opposed to an integrated approach to information systems strategic planning. Further studies need to be conducted in other organisations to demonstrate how the framework may support an integrated approach to information systems strategic planning.

CHAPTER 5

CONCLUSIONS

This chapter reviews experience of the research methods applied and evaluates the framework proposed. The contribution of this research is presented in terms of the contribution made to the theory and practice of strategic alignment of information systems development, in addition to the contribution made to the client organisations. The implications of this research for future research are then reviewed. This thesis concludes by summarising the contribution of the research reported.

5.1 EXPERIENCE OF RESEARCH METHODS

Checkland & Scholes (1990) emphasise the need for research proposals to be 'proven' in real world situations, however, there is a danger that in testing and refining methods to address the specific concerns of one situation, the results may be too specialised for more general application. Boulding (1956) sets the sacrifice of content as the price of generality and suggests that:

> "between the specific that has no meaning and the general that has no content there must be...an optimum degree of generality".

This research has attempted to attain an optimum degree of generality, balancing the specific requirements of the client organisations with those of the wider audience of the information systems community.

As stated in section 1.3.1, the appropriateness of the research methods to the objectives of the research is one measure of the quality of the research undertaken (Clark, 1972). The use of case study material in phase four of the research design provided valuable material with which to develop the initial framework. This allowed a more developed framework to be refined through applied research in the real world than would have otherwise been possible.

Many research methods may be used within the specified approach of 'applied research'. It is therefore necessary to justify the claim that the research reported was conducted by action research, as opposed to other forms of applied research.

Fine distinctions form the boundaries separating the applied research methods of consultancy, participant observation, participatory action research and action research.

Consultancy requires an external investigator to diagnose a situation and present recommendations for action (Whyte *et al.,* 1991). The client adopts a passive role as a source of information to the external expert. Furnham & Pendleton (1991) explore a range of differences between the roles of an 'academic' and a 'consultant'. They suggest that the aim of a consultant is to find a cost effective solution to an urgent practical problem, in contrast, an academic aims to gain insight and knowledge about a complex situation in order to develop an elegant solution to a problem of low urgency.

The roles of researcher and client in the research reported do not conform to this description of consultancy. Firstly, the researcher did not diagnose the situation and did not present recommendations. Secondly, both clients were not passive sources of information. The studies were jointly initiated by the researcher and the client; the researcher identified a general problem of strategic information systems planning; the clients recognised general concerns within their organisations. The researcher and clients then worked together to explore the situations. The composite framework was used by the researcher to guide the exploration, however, continual reflection of its use and the client environments prevented prescriptive adherence to the framework. As the studies progressed, both researcher and clients gained insight into the situations from which ideas for improvement emerged. The researcher did not leave the clients with a set of recommendations for action. The clients were left with greater awareness of their organisations' complexity and increased understanding of tools and techniques with which to pursue ideas for further exploration and improvement of their situation.

Participant observation requires the researcher to attain membership of the group studied (Frankfort-Nachmias & Nachmias, 1996). The researcher participates in everyday life, attempting to minimise intrusion, to learn about human activity from an insider's perspective (Jorgensen, 1989). There is a danger that the researcher becomes too immersed in the situation that it becomes difficult to form a practical perspective. Although in both cases reported, the researcher was accepted by the clients and learnt aspects of language, culture and work activities, complete membership and participation were neither sought nor achieved. The researcher did not participate in the daily activities of either client; the researcher worked with the clients to investigate their organisations which was not a daily activity. The studies were acknowledged as independent projects initiated by specific concerns. By working with the clients over a period of time, an understanding of daily tasks was attained, but not by active participation in these tasks.

Participatory action research requires members of the organisation to actively participate throughout the research process (Whyte *et al.,* 1991). The members of the organisation are both subjects and co-researchers forming the initial research design, specifying and testing the hypothesis, making informed choices and generating commitment to results (Argyris & Schön, 1991). The researcher adopts the role of coach or facilitator bringing expertise to the company and guiding the client through the formation and application of the research process.

The research reported could not be described as participatory action research for the following reasons. Firstly, the initial research design was formed prior to the identification of appropriate client organisations and therefore the clients did not participate in the construction of the research design or hypothesis. Secondly, although aware of the research being conducted, the client actively participated in improving their situation, rather than in the formation and application of the research design. In the second case reported, the client was interested in the framework being applied but was not concerned with the theoretical foundation of the framework.

Action research requires active participation by the members of the organisation to investigate and improve their situation. The researcher has responsibility to contribute both to the improvement of the client's situation and to further knowledge in the academic discipline. Action research differs from participatory action research in that the client does not directly contribute to the research design. However, the actions of the client will indirectly influence the research activity through the researcher's reflection and conceptualisation of experience with the client.

In the research reported, both researcher and clients actively participated in meetings to explore and analyse specific situations. Away from the clients, the researcher reflected and conceptualised the experience, drawing on other sources of information, forming plans to guide further action with the clients and to refine the composite framework. As participatory action research was not undertaken, the reflection and conceptualisation by the clients between meetings, concerning their situation, is not documented. However, from the insight brought to meetings, it is evident that reflection and analysis continued in the absence of the researcher.

From this research, eight criteria have been identified to distinguish between applied research methods:

1. Initiator of study.
2. Client's role in the research.
3. Researcher's role in the research.
4. Client's awareness of the research agenda.
5. Client's objectives.
6. Researcher's objectives.
7. Contribution to client.
8. Contribution to research.

Table 5.1 compares applied research methods against this criteria, demonstrating that the research reported was action research.

The fine distinctions between these research methods can be further demonstrated using Kolb's (1984) model of experiential learning. All applied research methods involve action, reflection and theory to differing degrees. Figure 5.1 illustrates that each method places slightly more emphasis on different stages in the Kolb model.

Adopting the role of a consultant, the researcher has the objective of forming recommendations to the client. Although this will require experience, reflection and conceptualisation to diagnose the situation and choose appropriate action, the emphasis is placed on the formation of *plans* (recommendations) given to the client.

In participant observation, the researcher is concerned with experiencing life as a member of particular group. Although the researcher may then reflect and conceptualise this experience to formulate future plans, the main emphasis of the method is *experiencing* life of the group.

Both the client and researcher are involved in all four aspects of the model during participatory action research. However, the continual participation of the clients in the research design will encourage the client to continually reflect on their experience, emphasising the *reflection* phase of the model.

In action research, the researcher aims to balance commitments to both client and the research discipline. This requires specific emphasis on reflection, conceptualisation and planning to reflect on client's experience, conceptualise the experience for academia and form plans for both the client and the research discipline. However, it is in the *conceptualisation* phase that these commitments are most evident as a means of consolidating reflective action and theory.

Criteria	Consultancy	Participant Observation	Participatory Action Research	Action Research
Initiator of Study	Client	Researcher	Client	Researcher
Client's Role in Research	Passive source of information	Passive source of information by observation	Active participation in research design	Active participation in problem solving
Researcher's Role in Researcher	External expert	Internal member of group	External facilitator or coach	Internal participant in problem solving and externally contribute to theory
Client's awareness of research agenda	Aware of consultant but research agenda unknown	May be unaware of researcher	Helps create research agenda	May be aware of research agenda but uninterested
Client's objective	Receive solution to defined problem	Perform daily activities without disruption	Active participation in formulation and action of research to improve situation and learn from expert	Improve their situation
Researcher's objective	Attain facts and recommend action, gaining experience	Gain experience and understanding of group	Identify and facilitate problem definition and improvement	Improve client's situation and contribute to research

Table 5.1: Comparison of Applied Research Methods

Criteria	Consultancy	Participant Observation	Participatory Action Research	Action Research
Contribution to Client	Set of recommendations	Work activities	Informed choice of action and improved problem solving abilities	Improved understanding of situation and in problem solving abilities
Contribution to Research	Case study analysis of recommendations	Document of a group's way of life; understand social actions in context	Causal inferences of human behaviour	Development and testing of hypothesis in real world

Table 5.1: Comparison of Applied Research Methods (continued)

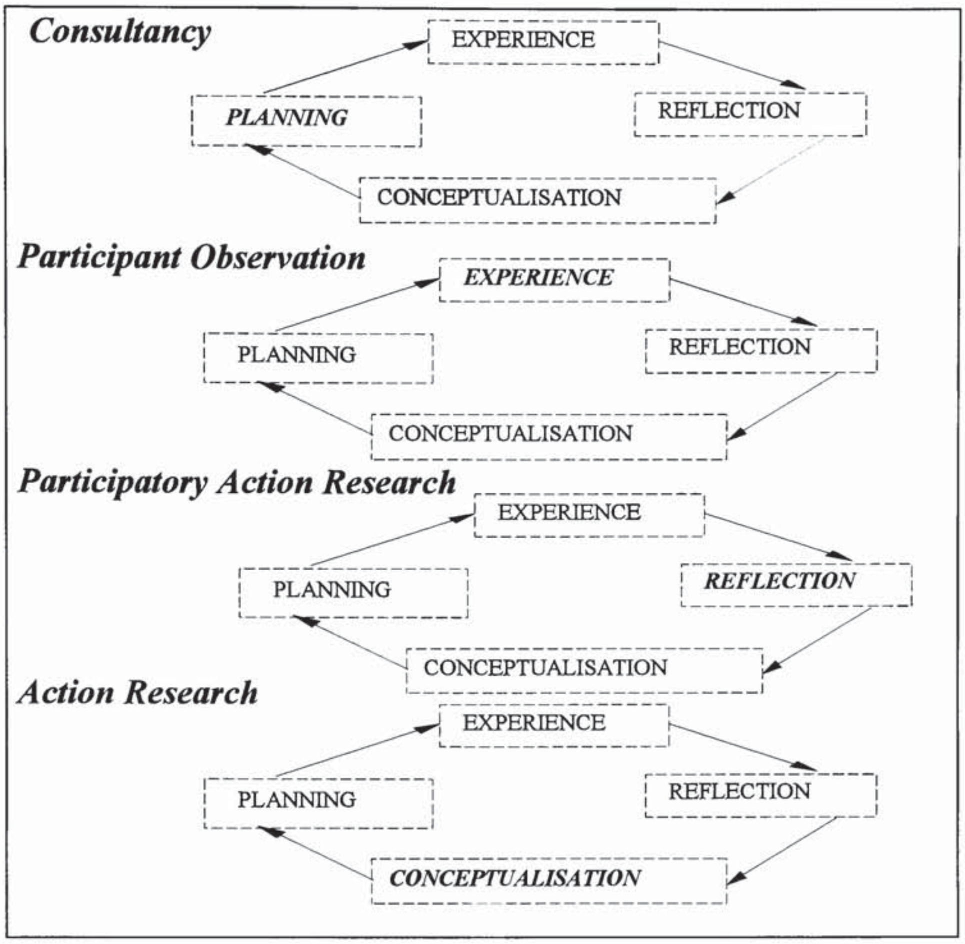

Figure 5.1: Applied Research Methods and the Kolb Cycle of Experiential Learning

Two types of action research, the field study approach and the consultancy study approach proposed by West *et al.* (1995), were introduced in chapter one. The comparative base proposed by West *et al.* (1995) to compare approaches to action research has been adopted in table 5.2. The table illustrates how the consolidated approach to action research proposed and adopted in this thesis, combines the strengths of the field study and consultancy approaches, aiming to consolidate theory and practice through reflection.

Grundy & Kemmis (1981) identify a number of practical issues concerning action research:

1 Is the Source of the Research, Theory or Practice?

This research started with a perceived problem from the author's commercial experience, the significance of this problem was then supported in a review of published literature. Further literature reviews provided the theoretical foundation for the research hypothesis which was refined through practice.

Issue	Field Study	Consultancy	Consolidated
Planning and implementing the study	Plan how to implement action research	Dictated by client	Build client requirements into plan
Engaging willing and able collaborators	Difficult to gain commitment; difficult to engender joint learning; need to protect against withdrawal	Organisation interested in study; hidden agendas	Organisation interested in study
Outlining the programme of action research	How can it be managed?	Demands of live situation difficult to follow plan	Use Kolb (1984) model of experiential learning
Writing-up study	Can become anecdotal; may be valid and rigorous	Requires client confidentiality	Client confidentiality; use Kolb (1984) model of experiential learning
Problem of 'rigour'	Detailed records must be kept	Difficult to keep detailed records	Experience enriches records by reflection and conceptualisation
Ethical concerns	How much attention to solve problem?	Should research be declared?	Research must be declared; problem must be satisfied
Knowing when to stop	When we have learnt enough	Study may not fulfil research need; client demands may move away from study	Learning continuous and can stop at the end of each cycle; must accept flexibility and emergence of situation
Learning	Researcher's introspective learning	Client and researcher learn about problem situation	Client and researcher learn about problem situation

Table 5.2: Comparison of Approaches to Action Research

2 Who Initiates Action Research?

The researcher identified the need for action research to refine the research hypothesis. Members of the organisations in which the action research was undertaken were concerned with their situations and recognised the need for action to be taken to improve the situation.

3 Who Owns the Research Project?

Action research aims to contribute both to theoretical knowledge and to improve a practical situation. Neither of these aims can be compromised if action research is to be successful, however, when entering a commercial organisation, the researcher's primary responsibility must be to the organisation as inappropriate action may have severe consequences for the organisation. The clients of the action research are therefore the primary owners of the research project and it is the responsibility of the researcher to conceptualise experience from the specific situation to improve theoretical knowledge of the area.

4 What Issues, Areas or Tasks are the Subject of Action Research?

The framework prepared prior to entering the client organisations formed the subject of the action research. The issues explored included the strategic situation of the organisations, the use of information systems to improve or maintain the strategic position, the process of strategic planning and information systems strategic planning in the organisations. The areas of the research were dictated by the problem areas identified in the organisations.

5 What Constitutes Data for Action Research?

Data for the action research reported includes the documentation of the:

1. Related theoretical material.
2. Appreciation of the problem situation from internal documentation, interviews and observation.
3. Planned actions.
4. Experience of the action taken.
5. Reflection of the action taken.
6. Conceptualisation of the learning accumulated both specific to the situation and generalisable to other situations.

6 How is Data Analysed?

In this thesis, data was analysed by reflection and conceptualisation as human action can only be explained retrospectively. It is analysed in terms of the relevance to the situation and its impact on improving the situation. Action research also requires data to be generalised for use in other situations to contribute to the wider theoretical base.

7 How is Action Research Reported?

Action research has two audiences, the client and the wider professional community. Although action research may be documented and reported in written form to the client, a written report does not fully reflect the richness of the contribution of the research to the organisation. In contrast, written reports are the main means of communication with the professional community, documenting the contribution of the research to the theoretical foundation of the profession.

8 Does Action Research Result in Significant Change?

Every action research project results in learning; for the client, external intervention raises questions and issues which are buried in the complexities of daily operations. Increasing awareness of underlying issues which may be problematic may be regarded as 'significant change' in the client organisation. Action research aims to involve members of the organisation and this should result in providing the organisation with additional knowledge and skills for continual improvement in the organisation. In the wider professional community, significant change is only possible if the research is both widely reported and accepted. Due to the specific nature of action research, it is difficult for one project to result in major generalisations. Each project therefore makes a limited contribution to theoretical knowledge which requires further validation in alternative situations.

Grundy & Kemmis (1981) suggest further research is needed for the continued development of theory and practice of action research in the following areas:

1 Patterns of Development

This research started with a common problem, literature and case study reviews were used to develop a hypothesis which was then tested and refined in action research. The danger with this approach is that the hypothesis may be applied to the client situation without recognising the specific problems in the organisation. However, without the initial hypothesis, there is the danger that in attempting to improve the client situation, the results of the research may not be generalisable to other situations. In addition, when immersed in the problem situation it is difficult to undertake the theoretical research which may benefit the situation.

2 Feasibility of Different Data Gathering Techniques

This research used five main sources of data, academic and commercial literature, published case studies, internal client documentation, interviews with clients and observation of client practices. It is proposed that the richness of the client situation can only be appreciated through detailed interviews and observation of the situation. This requires the development of a co-operative, trusting relationship between the client and the researcher; action research cannot be successfully conducted without mutual trust and respect between clients and researcher. This research has demonstrated the appropriateness of soft data gathering techniques for attaining a rich appreciation of the problem situation and communicating understanding to those involved in the situation.

3 Role of Communication

Action research may be called communication based research as it cannot be conducted without effective communication between all participants in the research. This requires a high degree of awareness of the potential problems of communication discussed in Shah & Dingley (1994) and Shah, Dingley & Golder (1994).

4 Role of Facilitator

The role of the facilitator is two-fold; firstly, to provide participants with a means of collaboration to address their immediate situation; secondly, to increase the problem-solving abilities in the organisation, facilitating continual organisational improvement. In order to be effective, the facilitator requires an in-depth understanding of the client situation. This raises questions regarding the degree of involvement and detachment of the facilitator, discussed in Shah & Dingley (1994) and Shah, Dingley & Golder (1994).

5 Practical Prospects of Action Research

A correlation is evident between action research, organisational learning and the Soft Systems Methodology. As organisations continue to recognise the need for continual improvement, it is asserted that the action research will receive increasing attention in all areas of commercial application.

5.2 EVALUATION OF PROPOSED COMPOSITE FRAMEWORK

Three specific objectives of this research were stated in section 1.2.3. These were firstly, to identify the factors to facilitate the strategic alignment of information systems development; these factors were reported in chapter two. Secondly, to develop an alternative approach for information systems strategic planning that meets the requirements identified; the requirements of such an approach were identified in section 2.4 and developed in chapters three and four. Thirdly, to establish the requirements and limitations of the proposed approach; this was indicated in chapter four and will be discussed further in this section.

Section 2.4 outlined the requirements of an approach to information systems strategic planning based on a comparison of a number of approaches. As the comparative base outlined in section 2.2.1 was used to evaluate existing information systems strategic planning approaches and to determine the requirements of an alternative approach, this base will also be used to evaluate the proposed framework in this section.

1 Philosophy

The framework adopts a decision-oriented, integrated approach to align information systems development with business objectives. The strategic situation of the organisation is explored and information systems are valued in terms of their strategic value to the organisation. The iterative approach adopted by the framework supports organisational learning. ***Objectives:*** the objectives of the framework are to identify and prioritise information requirements against business objectives, reviewing the strategic value of information systems in the organisation. ***Domain:*** the action research conducted demonstrated that the framework can be used in different types and complexities of organisations, although the framework needs to be tested for its applicability in larger organisations.

2 Models

Three main models are constructed, the corporate summary diagram (CSD), the situation summary diagram (SSD) and justification alignment contour (JAC). The corporate summary diagram represents a profile of the company, illustrating the purpose of the company and some of its key components. The situation summary diagram explores the current strategic position of the organisation and aims to synthesise the views attained of the strategic situation from established strategic planning techniques. The justification alignment contour justifies the development of an information system, providing an outline of the system to be developed, aligning information systems planning and development with the strategic direction of the company.

The first case of action research demonstrated that the corporate summary diagram and the situation summary diagram could be applied at different levels of analysis in an organisation and its environment. The second case of action research demonstrated that the justification alignment contour could be extended to form an information model to be used during information systems development.

3 Tools / Techniques

The contribution of strategic analysis, strategic choice and strategic implementation techniques is recognised and the framework provides guidelines to encourage the use of a range of strategic techniques. As the framework progresses to information systems development, data and process modelling techniques may be used.

4 Scope

The scope of the framework supports the stages of: internal organisational analysis; information systems resource analysis; external analysis; external information systems and information technology analysis; forecast future direction of the organisation; forecast future direction of information systems and information technology; corporate objectives; information systems requirements; information technology requirements; corporate strategy; information systems strategy and information technology strategy.

5 Output

The deliverables include the corporate summary diagram, situation summary diagram(s) with supporting information and a justification alignment contour for each information systems development identified. These deliverables are understandable by non-technical management.

6 Practice

The framework requires co-operation and participation throughout the organisation to facilitate organisational learning. Sufficient resources need to be allocated to release staff at all levels in the organisation to participate in interviews, in addition to the staff required to conduct the interviews. The approach does not require an external consultant or excessive staff training.

As information systems development proposals are evaluated against organisational needs, credibility of information systems is increased in the organisation. The close integration between strategic planning, information systems strategic planning and information systems development promotes understanding of the business needs. Procedure-driven or object-driven development approaches may be used to develop the information systems identified.

The framework recognises strategic planning is an on-going activity and provides a means to assess the strategic value of all resources, including the information systems resource as the strategic situation of the organisation changes. The prior existence of a corporate strategic plan is not assumed. Re-application of the framework is required to evaluate the success of the plan. The reason for this is that analysing the situation and deploying resources to address the situation changes the situation summarised.

7 Integration

Strategic planning, information systems planning and information systems development are integrated as the re-use of information from each stage is encouraged throughout the framework. Corporate objectives are mapped to current activities; the information requirements for these activities, information systems and information technology to support these activities are explored.

8 Strengths

The strengths of this approach include the use of strategic planning techniques; integration of strategic planning and information systems planning; re-use of information to link information systems planning and information systems development; encourages participation at all levels in the organisation; supports organisational learning; reviews strategic value of existing information systems; prioritises information systems development based on strategic value; conducts internal and external strategic analysis; explicit consideration is given to the strategic situation of the organisation; an existing corporate strategy is not assumed; the deliverables are understood by all participants; organisational objectives are mapped to business processes; business knowledge is communicated to information systems developers; cultural analysis is conducted.

Weaknesses: of this approach include the requirement of management commitment; need for full participation by members of the organisation; commitment of human resources; management support is required to authorise investigation of fundamental aspects of the organisation; it is untested in large organisations with strong information systems planning and development functions; the scope of the study needs to be carefully assessed prior to commencing the approach; organisational culture may threaten the success of the study; the review procedure is implicit in the re-application of the framework; immediate urgency of a strategic situation may detract from long-term planning; automation of the framework is required.

The approach may therefore be inappropriate in organisations where a dominant management culture is present as the framework relies on full participation of employees at all levels in an organisation. The study requires the basic objectives and tasks of the organisation to be reviewed, which again, may be resisted in some organisations. The approach is therefore suited to organisations committed to change and organisational learning, which acknowledge the strategic value of its employees, encouraging participation.

This requires management commitment to release the resources required to conduct the study.

5.3 CONTRIBUTION OF RESEARCH

The contribution of this research to the theory and practice of strategic alignment of information systems development and the contribution made to the client organisations is now evaluated.

5.3.1 Contribution to the Theory of Strategic Alignment of Information Systems Development

This thesis commenced with the premise that data-driven approaches to information systems strategic planning were inappropriate. Although data analysis is a useful tool for database design, its use beyond database design is questioned.

Themes in information systems development were first examined within the structure of the information systems development process. Problems in information systems development have led to the development of prescriptive methodologies and techniques to assist the process. These methodologies may be positioned within a number of schools of information systems development. The systematic structured approach to information systems development, founded in the science paradigm, has dominated information systems theory and practice, prescribing objective techniques with which to frame reality.

The entity-relationship model, which has dominated data analysis, was reviewed and extensions to the model have been explored. Extensions to the entity-relationship model reduce its simplicity and this thesis suggests that further attempts to extend the model are inappropriate. An alternative, richer form of representation is required which minimises cognitive effort by seeking to reduce the semantic distance between a person and a model and the articulatory distance between the model and the reality represented. The search for a richer model, led to the investigation of the soft systems approach to information systems development. This recognises information systems development as an iterative learning process, embracing the systems paradigm and provides soft tools to support the creative process of information systems development.

The debate whether systematic and systemic approaches to information systems development can or should be linked is acknowledged. This thesis supports and demonstrates the view that systematic approaches need to be extended by systemic approaches to enrich information systems planning and development.

Themes in information systems strategic planning were explored, identifying previous research in this area. A number of information systems strategic planning approaches were analysed extending the comparative framework of Avison & Fitzgerald (1988) developed to compare methodologies. The results of this comparison, reported in appendix two, were used to identify the requirements for an alternative approach to information systems strategic planning. A weakness identified in a number of approaches was the lack of integration between the stages of strategic planning, information systems strategic planning and information systems development. Specifically, many approaches assumed the prior existence of a corporate strategy and neglected strategic techniques used to formulate a corporate strategy.

This research aimed to address this omission and examined themes in strategic management. A number of schools of strategic management were identified. The thesis recognises that strategic management, as information systems development, has been dominated by systematic, reductionist approaches and techniques. In addition, as in information systems development, a learning approach to strategic management is recognised which asserts that strategy formulation is a creative, learning process and that strategy has emergent properties. The debate in strategic management concerning prescriptive and emergent approaches to strategy formulation is acknowledged.

This thesis asserts that the fallacies of prediction, detachment and formalisation of the design school of strategic management are also applicable to the dominant science paradigm of information systems development. Both strategic management and information systems development recognise the need for richer, flexible models to support holistic learning. This thesis proposes that the soft systems approach which meets this need in information systems development, is also appropriate to strategic management.

Following the development of the themes in information systems development, information systems strategic planning and strategic management and the construction and refinement of a composite framework, this thesis offers the following contribution to the theory of strategic alignment of information systems development:

1. Individual models of strategic analysis are limited, a combination of strategic models is required for strategy formation.

2. Information systems planning is continuous, requiring organisational learning.
3. Parallel trends are observed in information systems development and strategic management, the soft systems approach is therefore compatible with strategy formulation.
4. Strategy formulation, information systems strategic planning and information systems development need to be integrated.
5. Strategic alignment of information systems development requires a flexible guiding framework rather than a methodology.

5.3.2 Contribution to the Practice of Strategic Alignment of Information Systems Development

A three stage composite framework is proposed to contribute to the practice of strategic alignment of information systems development. This framework avoids the fallacies of the design school of strategic management which suggests that an explicit strategy is produced by the conscious process of thought which is the responsibility of one person. Premises of the learning school of strategic management are adopted by the framework which recognises that strategy emerges from a creative process of learning.

Organisational learning consists of six phases of surfacing, analysing, reshaping, targeting, resolving and experimenting (Grundy, 1994). Application of the framework in client organisations has shown that it directly supports the first four phases of organisational learning, although further research is required to examine the contribution of the framework to the last two phases of learning. However, the framework promotes participation, facilitating learning in organisations and reducing resistance to changes proposed.

Bhide (1994) recognises that particular issues worthy of strategic analysis will depend on the specific situation of an organisation, prescriptive approaches which fail to address the needs of an organisation are therefore rejected. The proposed framework aims to provide flexibility and guidance to meet the specific needs of an organisation at a particular time.

Soft approaches to information systems development and strategic management permit the synergistic properties of relationships to be explored. This is demonstrated in stage two of the framework. The strategic situation is first explored through the application of strategic analysis techniques. Doyle (1991) recognises that when attention is focused on applying a technique, it can distract from thinking about the situation being explored. The situation summary diagram addresses this problem by requiring the information content derived through application of strategic techniques to be synthesised into a summary of the strategic situation. This encourages relationships between the information derived from different strategic techniques to be explored.

The situation summary diagram is a 'rich picture' derived from structured strategic techniques supporting the view of Jayaratna (1992) and Doyle *et al.* (1993) that soft systems approaches can be augmented with structured techniques. This also demonstrates that structured approaches need to be extended by soft approaches (Checkland, 1985, 1992) without compromising either (Mingers, 1992). Checkland (1981) argues against providing guidance in the construction of rich pictures as this reduces the methodology to a technique. This view is refuted by Tyrell-Lewis (1994) who offers guidance in rich picture formation. It is also refuted by the experience of this research which demonstrates the need for guidance to explore the strategic situation of an organisation.

A rich iconic notation was first recommended for use in all three models to reduce the semantic and articulatory distances in the models produced. However, action research suggests that the form of representation used should be determined by the participants. This encourages participation and as the models are a means of communication as opposed to a means of documentation, notation restrictions unnecessarily increase cognitive effort. The models embrace the principles of radiant thinking as a nodal structure is developed within the models as relationships between key elements are explored.

The framework adopts the funnel and filter principle, described in section 3.1, to support the funnelling and filtering of information between the stages of the framework. The purpose of this is to unite the stages of strategic planning, information systems strategic planning and information systems development through the re-use of information, communicating business knowledge to information systems development.

Table 2.3 outlines problems with current approaches to information systems strategic planning, under the headings of method, implementation, process, resource and output. It is necessary to consider how the proposed framework contributes to reducing the problems in these areas.

Method: The framework addresses the problems of lack of strategic thinking, excessive internal focus and the lack of analysis of the technological environment, through the use of strategic analysis techniques in the construction of the situation summary diagram. The experience of applying the framework in client organisations is insufficient to demonstrate whether the problems of too much/too little attention to data architectures and lack of analysis of the information systems function have been addressed by the framework.

Implementation: Problems of information systems not being developed, resources unavailable, technological constraints and organisational resistance were not encountered by the client organisations. However, the implementation of the information systems identified did require further analysis to be conducted and some implementation issues were out of the scope of the action research studies.

Process: Application of the framework did not encounter problems of lack of line management participation, poor client-developer relationship, inadequate user awareness or low management ownership. However, this may be attributed to investigating the feasibility of the cases prior to applying the framework.

Resource: The action research demonstrated that the framework requires automated tool support and requires the participation of a number of employees. Further work needs to be completed to assess whether success of the approach is dependent on the team leader and whether the resources and timescales required are excessive.

Output: In the client organisations, securing management commitment was not problematic and staff training was not directly required. The approach does require a review to be conducted to re-assess the strategic situation. This review is in the form of re-applying the framework to explore the strategic situation which will have changed as the result of the previous intervention.

5.3.3 Contribution to the Client Organisations

The contribution of the research to the client organisation includes the degree to which: the situation is deemed to be improved by members of the organisation; the problem-solving capabilities of the organisation have been strengthened; in addition to any further aims defined by the client.

The first client required the speedway control board to be re-evaluated to examine if the board still met the changing needs of the sport it aimed to control. At the end of the action research, the situation of the client was improved as a rich understanding of the environment which the board controlled and the board's role within the sport was attained. The problem-solving capabilities of the organisation had been improved by the appreciation that the board needs to be aware of the issues within the sport it aims to control, identify a means of satisfying its 'customers' and ensure that the duties of the board are aligned with its objectives.

Specific contributions to the speedway control board include:

1. The corporate summary stage identified inconsistency between the objectives of the control board and the duties it undertakes.
2. The situation summary identified a number of opportunities for the control board to exploit its strength of independence to promote the sport.
3. A requirement was identified to manage the information resource within the sport, improving access to information for both the training of riders and to support renewed media interest in the sport.
4. The situation summary stage discovered perhaps the underlying cause of conflict between the board and promoters, which threatens its existence. It was identified that as customers of the control board, providing the major source of funding for the board, promoters lacked tangible deliverables from the control board.
5. As analysis was conducted at the levels of the speedway control board, the sport, stadium and riders, the control board gained a rich appreciation of its environment, identifying a number of potential areas to investigate further, in order to support the needs of promoters and riders.
6. Although not directly clients, promoters and riders who participated in the study benefited from exploring their situations, identifying key areas of concern, and investigating potential means for improvement.

The second client had three specific requirements of the study. These were to identify the needs of each branch; develop a plan for the management of the branches and to learn a repeatable procedure which could be adopted by the organisation. These needs were satisfied. At the end of the action research, the situation of the client was improved as the director's appreciation of how the branches needed to be managed was changed. The problem-solving capabilities of the organisation were improved by the adoption of the framework after the direct intervention of the researcher had ended.

Specific contributions to the service company include:

1. The corporate summary provided a means of gaining insight into how the corporate requirements related to the organisational situation.
2. The corporate summary diagram was regarded as a 'corporate statement' by the director to be continually revisited and used to familiarise new employees with the company.

3. The situation summary stage provided a means with which the new director could explore the strategic situation of his area of responsibility.
4. The situation summary identified the requirements for the branches to be treated as a set of collective resources to be deployed to meet the needs of the customer. This differed from the established perception of available resources being restricted by geographical location.
5. Recognising the branches as a resource base, required two information systems to be developed to provide the best customer service. These information systems were specified and developed.
6. Following the initial application of the framework, the director has adopted the framework as a key tool in managing the branches.

The major contribution to both clients was the intangible benefits of increased understanding of their individual situations and the means with which the situations may be explored. This extended beyond the diagrams and actions which can be reported.

5.4 FUTURE RESEARCH

A number of proposals for the further development of this research may be identified:

5.4.1 Guidelines for Application of Strategic Planning Techniques

Chapter two asserted the importance of strategic planning techniques in an integrated approach to the strategic alignment of information systems development. Following a review of strategic planning techniques, guidelines were developed to assist organisations in the selection of strategic planning techniques which may assist exploration of their strategic situation. These guidelines were not modified by the action research undertaken. Further research is required to develop these guidelines.

5.4.2 Automated Tool Support

An aim of the composite framework proposed is to integrate strategic planning, information systems planning and information systems development. As automated tool support is used in information systems development, automated tool support needs to be extended to strategic planning and information systems strategic planning (Shah & Dingley, 1993). The proposed framework encourages the re-use of information from strategic planning through to information systems development; automated support may further assist this close integration. The need for automated support was evident in section 4.3 where the need to 'show and hide' information became apparent. However, the dispute concerning the use of automated tool support for soft systems analysis is acknowledged. Automation of the framework therefore needs to be explored through further research.

5.4.3 Integration with Information Systems Development Methods

The two client organisations of action research did not currently use any commercial methodology for information systems development. Further research is needed to explore how the composite framework would integrate with commercial information systems development methods. In particular it is necessary to examine more closely how information captured during strategic planning and information systems planning could be used in information systems development approaches.

5.4.4 Longitudinal Study

Continual learning was identified in chapter two as being a requirement of information systems strategic planning. Longitudinal studies are needed to explore how the framework supports continual learning, maintaining strategic alignment of information systems development.

5.4.5 Further Studies

The composite framework has only been used by two clients, further research is needed to explore the use of the framework in other organisations. Specifically, research needs to be conducted to examine the application of the framework in organisations which already have a formal basis for strategic planning, as this was lacking in the client organisations. Section 5.2 identifies a number of limitations of the framework which need to be explored in a wider range of organisations.

5.5 SUMMARY OF CONTRIBUTION

The theme of this thesis, the strategic alignment of information systems development, was developed through research in the areas of information systems development, information systems strategic planning and strategic management. This section summarises the contribution made to each of these areas and to research methods in the information systems discipline.

5.5.1 Contribution to Information Systems Development

A set of thirty criteria has been identified and applied to compare the soft learning approach to information systems development with the hard engineering approach. From this comparison it is asserted that the systemic:systematic debate is equivalent to hard:soft thinking; each offers a valid contribution to a problem situation. The combined application of systemic and systematic approaches therefore enriches analysis and design of information systems.

This is demonstrated in the construction of the situation summary diagram. Structured techniques frame individual views of a situation. Soft notation is then used to synthesise the information content derived from applying the structured techniques, enriching understanding and analysis of the situation.

Through the development of the composite framework, it was hypothesised that colour would enrich understanding and interpretation of models. However, it was found that the symbolic use of colour increases rather than reduces the semantic distance between a person and a model. The addition of colour in modelling notation therefore increases cognitive effort in semantic modelling.

The debate concerning the use of automated tools to support soft analysis has been acknowledged. In the action research conducted, diagrams were hand-drawn with the client and then reproduced using an automated drawing package. The process of reproducing the diagrams aided recall of meetings, encouraged reflection and supported further analysis. However, this experience affirms that the process of constructing the diagrams is more valuable than the resulting diagrams.

5.5.2 Contribution to Information Systems Strategic Planning

Although in the information systems discipline, much attention has been given to *what* information systems are needed and *how* the need can be meet, *why* information systems are needed is often overlooked. Information systems planning approaches have been compared using a set of criteria which integrated previous forms of categorisation proposed. This comparison revealed information systems strategic planning approaches extend information systems development techniques into planning activities, neglecting techniques of strategic management used to formulate organisational strategy. Effective information systems strategic planning requires close integration of strategic analysis and information systems planning. This integration cannot be satisfied by passing a statement of organisational objectives or critical success factors from strategic planning to information systems planning. Closer integration can be facilitated by the re-use of information gathered from strategic analysis throughout information systems planning and development.

Information systems planning methodologies were found to be too inflexible to meet the individual needs of an organisation at a particular point in time. A flexible guiding framework is therefore needed for information systems strategic planning rather than a prescriptive methodology. The composite framework proposed meets this need.

5.5.3 Contribution to Strategic Management

Information systems planning is a continuous activity requiring organisational learning. A fifth stage of strategic learning, has been recognised and added to the stages of strategic thinking defined by Bowman (1990).

Parallel trends in strategic management and information systems development have been identified. Fallacies of the design school of strategic management are equally applicable to the science paradigm of information systems development. Premises of the learning school of strategic management are similar to those of soft systems approaches to information systems development. Individual models of strategic analysis are limited, framing individual views of a strategic situation. A combination of strategic models is therefore required to explore the internal and external environments for strategy formulation. It is proposed that strategic management can be supported by a soft systems approach to combine diverse views framed by individual strategic management techniques. This is demonstrated by the situation summary diagram in the composite framework developed.

5.5.4 Contribution to Strategic Alignment of Information Systems Development

Effective strategic alignment of information systems development requires information systems development, information systems strategic planning and strategic management to be integrated. Attempts to achieve this integration have suggested tentative links between these activities. For example, organisational objectives are captured and passed to the information systems planning activity; information systems development techniques such as entity relationship models are used in information systems strategic planning to prepare an information architecture; organisational objectives are mapped onto the information architecture; information systems plans are then passed for development. Closer integration between these activities is needed and can be facilitated by using information from strategic analysis throughout information systems planning and development for the effective strategic alignment of information systems development.

A composite framework has been presented to support the strategic alignment of information systems development. The framework combines structured strategic analysis techniques within a soft systems approach to align information systems development with the strategic direction of an organisation. The justification alignment contour justifies the need for an information system to be developed, in terms of its direct contribution to the corporate strategy and provides a starting point for information systems development.

5.5.5 Contribution to Information Systems Research

This thesis offers the following contribution to research methods in the information systems discipline. Argyris & Schön (1991) state that:

> "From the action researcher's perspective, the challenge is to define and meet standards of *appropriate* rigour without sacrificing relevance. And, for this purpose, action research needs three things: a way of representing research results that enhances their usability, a complementary way of constructing causality, and an appropriate methodology of causal inference".

The use of Kolb's model of experiential learning (1984) meets these needs. It provides a guiding framework within which the researcher can structure and document the action research to balance the requirements of theory and practice required for consolidated action research.

Two approaches to action research have previously been identified, the field study approach and the consultancy approach, reflecting emphasis on theory and action respectively. In contrast, a consolidated approach to action research has been demonstrated, balancing theory and action through reflection and conceptualisation.

There are fine distinctions between applied research methods which are founded in the social sciences. This research has identified and applied a set of criteria to distinguish between the applied research methods of consultancy, participant observation, action research and participatory action research. The criteria provides guidance for the conduct of applied information systems research.

This thesis proposes a composite framework for the strategic alignment of information systems development. The theoretical foundation of the framework is derived from a combination of common themes identified in information systems development and strategic management. Action research has been undertaken to identify the limitations of the framework in practice. The extent of these limitations needs to be further investigated in a wider range of organisations which may lead to further development of the framework. It is envisaged that the proposed framework is sufficiently flexible to address the needs of a variety of organisations and to accommodate any modifications identified by future research.

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APPENDICES

APPENDIX 1

RESEARCH METHODS EVALUATION

Results of comparing the research methods in section 1.3.3 with the criteria identified by Jenkins (1984), listed in section 1.3.2.

Literature Survey

1. *Cost of applying the research method:* time taken collecting and reviewing material.
2. *Type of variables supported:* not applicable.
3. *Control of variables in testing hypotheses:* not applicable.
4. *Potential for researcher to affect the outcome:* danger that only material which supports the researcher's view is collected.
5. *Extent to which the research setting approximates the real world:* information available is subject to access restrictions and limited to the type of information documented.
6. *Internal validity of the method:* not applicable.
7. *External validity of the method:* not applicable.
8. *Repeatability of method:* repetition of the survey is possible. Results of the literature survey may differ as a result of individual differences in perceived relevance of material.
9. *Number of design options:* not applicable.
10. *Effectiveness of the method:* it is an efficient method of obtaining a comprehensive review of existing research in the area.
11. *Nature of findings:* both quantitative and qualitative results are possible.
12. *Time horizon:* information documented reports on past and predicted future events.

Laboratory Experiment

1. *Cost of applying the research method:* time taken to prepare and conduct experiment.
2. *Type of variables supported:* independent and dependent variables can be supported.
3. *Control of variables in testing hypotheses:* researcher has a large degree of control over variables.

4. *Potential for researcher to affect the outcome:* repeatability of experiments in the laboratory compensates for the researcher's ability to influence results.
5. *Extent to which the research setting approximates the real world:* laboratory does not provide a sufficiently rich representation of the real world for information systems research.
6. *Internal validity of the method:* the high degree of control of variables in the laboratory supports internal validity of the research.
7. *External validity of the method:* the unrealistic laboratory setting restricts the applicability of results to the real world.
8. *Repeatability of method:* potential for the research to be repeated is high.
9. *Number of design options:* pre and post tests can be conducted although their relevance is limited by the shallow research environment of the laboratory.
10. *Effectiveness of the method:* limited by the lack of resemblance of the research environment to the real world.
11. *Nature of findings:* emphasis is on attaining quantitative results.
12. *Time horizon:* present.

Field Experiment

1. *Cost of applying the research method:* time taken in preparing and conducting the study.
2. *Type of variables supported:* independent and dependent variables can be supported.
3. *Control of variables in testing hypotheses:* researcher has limited control of variables.
4. *Potential for researcher to affect the outcome:* the researcher may affect the outcome of the research by their presence in the field.
5. *Extent to which the research setting approximates the real world:* the research setting is the real world.
6. *Internal validity of the method:* reduced by the complexity of the real world.
7. *External validity of the method:* determined by the typicality of the research environment.
8. *Repeatability of method:* although other field studies can be carried out, the same environment cannot be used again as the research will have changed the environment.

9. *Number of design options:* pre and post tests can be performed in the field.
10. *Effectiveness of the method:* comprehensive results can be obtained and therefore the effectiveness of the method is high.
11. *Nature of findings:* both quantitative and qualitative results are possible.
12. *Time horizon:* present.

Survey

1. *Cost of applying the research method:* high in terms of the amount of preparation for conducting the survey and the time taken to administer the survey and analyse the results.
2. *Type of variables supported:* independent and dependent variables supported.
3. *Control of variables in testing hypotheses:* researcher can control variables by the selection of the research sample.
4. *Potential for researcher to affect the outcome:* the outcome of the survey is affected by the phrasing of questions in the survey.
5. *Extent to which the research setting approximates the real world:* although the survey is conducted in the real world, there may be differences between what respondents say they do and what they actually do in the real world.
6. *Internal validity of the method:* limited by possible misinterpretation of questions and answers.
7. *External validity of the method:* there are limitations of the extent to which findings can be generalised as responses may be affected by a wide range of unknown factors.
8. *Repeatability of method:* the survey can be repeated with comparative samples.
9. *Number of design options:* surveys can be used to conduct pre and post tests to measure the effect of experiments.
10. *Effectiveness of the method:* effective means of collecting a large amount of data.
11. *Nature of findings:* qualitative and quantitative results are supported.
12. *Time horizon:* information collected can relate to past, present or future conditions.

Case Study

1. *Cost of applying the research method:* time taken to collect information in the research environment.
2. *Type of variables supported:* dependent variables emphasised.
3. *Control of variables in testing hypotheses:* little control of variables is possible.
4. *Potential for researcher to affect the outcome:* presence of researcher can affect the research environment.
5. *Extent to which the research setting approximates the real world:* research setting is the real world.
6. *Internal validity of the method:* internal validity of the method is low due to the subjective interpretation of the researcher.
7. *External validity of the method:* findings are specific to the case study.
8. *Repeatability of method:* research can only be undertaken in a similar environment as the environment is changed by undertaking the case study.
9. *Number of design options:* pre and post tests are possible to measure the effect of experiments.
10. *Effectiveness of the method:* limited by the lack of generalisability of results.
11. *Nature of findings:* case studies emphasise qualitative results.
12. *Time horizon:* present conditions are explored.

Hermeneutics

1. *Cost of applying the research method:* time taken to collect written material or document conversations, in addition to time taken to conduct analysis.
2. *Type of variables supported:* both independent and dependent variables are supported.
3. *Control of variables in testing hypotheses:* not applicable.
4. *Potential for researcher to affect the outcome:* the outcome is affected by the method used to collect the text to be analysed and by the subjective interpretation of the material by the researcher.
5. *Extent to which the research setting approximates the real world:* information may be gathered from the real world but examination of the material may be in a laboratory.
6. *Internal validity of the method:* limited by the subjective material gathered and the interpretation given by the researcher.

7. *External validity of the method:* limited by the subjective material gathered and the interpretation given by the researcher.
8. *Repeatability of method:* material can be examined by another researcher, however, the results would be different due to subjective interpretation of researcher.
9. *Number of design options:* pre and post tests are possible to measure change of attitudes.
10. *Effectiveness of the method:* assumes words are accurate means of conveying subjective experience and that a deeper understanding of a situation can be achieved by subjective interpretation.
11. *Nature of findings:* findings are qualitative.
12. *Time horizon:* material collected can related to past, present of forecast future conditions.

Forecasting / Futures Research

1. *Cost of applying the research method:* time taken to collect information on which to base predictions.
2. *Type of variables supported:* both independent and dependent variables are supported.
3. *Control of variables in testing hypotheses:* not applicable.
4. *Potential for researcher to affect the outcome:* danger of self fulfilling prophecies.
5. *Extent to which the research setting approximates the real world:* unknown due to predictive nature of method.
6. *Internal validity of the method:* low due to the subjective interpretation of the researcher.
7. *External validity of the method:* limited to the extent to which predictions are based on generalisable conditions.
8. *Repeatability of method:* limited due to the subjective nature of the researcher.
9. *Number of design options:* not applicable.
10. *Effectiveness of the method:* limited to the quality of information on which the predictions are based and future conditions are anticipated.
11. *Nature of findings:* findings are qualitative.
12. *Time horizon:* future conditions are forecast.

Simulation / Role Playing

1. *Cost of applying the research method:* time taken to collect information on which to base simulations, conduct role plays and evaluate results.
2. *Type of variables supported:* both independent and dependent variables supported.
3. *Control of variables in testing hypotheses:* possible through preparation of simulations.
4. *Potential for researcher to affect the outcome:* outcome affected by the preparation of the material used in the role plays.
5. *Extent to which the research setting approximates the real world:* depends on the richness of the simulation although perfect simulation is not achievable.
6. *Internal validity of the method:* high due to the restricted environment.
7. *External validity of the method:* findings are generalisable to the extent that the simulation represents the real world.
8. *Repeatability of method:* simulations can be repeated although different participants are needed. This is because if the same participants repeat the study their actions will be affected by their experience of the previous study.
9. *Number of design options:* pre and post test are possible.
10. *Effectiveness of the method:* dependent upon the richness of the simulations.
11. *Nature of findings:* findings are qualitative.
12. *Time horizon:* present and future conditions can be tested.

Subjective / Augmentative

1. *Cost of applying the research method:* time taken to prepare and collect material to conduct study.
2. *Type of variables supported:* independent and dependent variables can be supported.
3. *Control of variables in testing hypotheses:* not applicable.
4. *Potential for researcher to affect the outcome:* high as conclusions are dependent on subjective nature of researcher.
5. *Extent to which the research setting approximates the real world:* real world relationships are explored although the full richness of the real world is not explored.

6. *Internal validity of the method:* low due to subjective nature of research method.
7. *External validity of the method:* low due to subjective nature of research method.
8. *Repeatability of method:* not possible as results are dependent on subjective researcher.
9. *Number of design options:* not applicable.
10. *Effectiveness of the method:* valuable method for forming hypotheses.
11. *Nature of findings:* findings are qualitative.
12. *Time horizon:* present.

Participant Observation

1. *Cost of applying the research method:* time taken to identify suitable group, achieve acceptance by group, participate in group activities and leave the group.
2. *Type of variables supported:* dependent variables can be supported.
3. *Control of variables in testing hypotheses:* not possible.
4. *Potential for researcher to affect the outcome:* study is affected by the presence of the researcher in the situation even if complete participant role is adopted.
5. *Extent to which the research setting approximates the real world:* the research setting is the real world.
6. *Internal validity of the method:* low due to complexity of real world environment.
7. *External validity of the method:* determined by the typicality of the research environment selected.
8. *Repeatability of method:* not possible because of the real world environment.
9. *Number of design options:* pre and post tests are possible.
10. *Effectiveness of the method:* valuable method for finding out about real world.
11. *Nature of findings:* findings are qualitative.
12. *Time horizon:* present situation.

Action Research

1. *Cost of applying the research method:* time taken to collect information on relevant theory and attain a rich understanding of the

situation. This method is a cyclical study which requires continuous action and reflection.

2. *Type of variables supported:* dependent variables supported.
3. *Control of variables in testing hypotheses:* little control of variables is possible.
4. *Potential for researcher to affect the outcome:* study is affected by the presence of the researcher in the situation.
5. *Extent to which the research setting approximates the real world:* the research setting is the real world.
6. *Internal validity of the method:* low due to complexity of the real world environment.
7. *External validity of the method:* researcher must balance both theory and practice to ensure that findings are generalisable to other organisations.
8. *Repeatability of method:* method cannot be repeated in the same environment as the study changes the environment.
9. *Number of design options:* pre and post tests are possible, however, many of the benefits of the study are intangible.
10. *Effectiveness of the method:* dependent upon the balance of theory and practice maintained by the researcher.
11. *Nature of findings:* findings are qualitative.
12. *Time horizon:* present situation.

APPENDIX 2

EVALUATION OF STRATEGIC INFORMATION SYSTEMS PLANNING APPROACHES

Summary of the evaluation of strategic information systems planning approaches, listed in section 2.2.2.

BUSINESS PROCESS REENGINEERING

*1 **Philosophy:*** decision-oriented approach to strategic information systems planning; adopts a systemic approach to analyse the organisation as a whole; initial radical change is followed by a programme of continuous improvement. ***Objectives:*** redesign business to achieve breakthrough performance; aim to reduce costs, increase competitiveness and increase productivity; react to real or perceived crisis; proactive recognising current restrictions. ***Domain:*** corporate organisation and its competitors.

*2 **Models:*** organisational processes are modelled to identify, compare and measure elements which can make a difference to the success of the organisation.

*3 **Tools / Techniques:*** to understand and evaluate current business processes e.g. value chain analysis; to measure and analyse each aspect of a business process e.g. customer resource life-cycle; to measure the degree of mediation i.e. the number of steps in a process; to measure the degree of collaboration i.e. the exchange of information during a process.

*4 **Scope:*** organisational analysis; environmental analysis limited to competitor benchmarking; information systems resource analysis; external information systems and information technology analysis limited to competitor benchmarking.

*5 **Output:*** aspects of business processes to be measured and the unit of measure for benchmarking; redesign and implementation of business processes.

*6 **Practice:*** direct management involvement is required; information technology adopts a facilitating role; cross functional and cross hierarchical teams specify and implement changes; membership to the team is restricted to the duration of useful contribution; the goals and duration of reengineering projects are not specified; in order to determine key performance indicators for benchmarking, collaboration with competitors is required.

7 ***Integration:*** information systems plans are linked to corporate objectives but there is no separation between specification and implementation of changes.

8 ***Strengths:*** cross functional teams bridge the departmental boundaries; radical change is supported; integration of specification and implementation of changes within the same team, shows organisational commitment to change. ***Weaknesses:*** lack of environmental analysis may neglect threats and opportunities present in the environment; lack of external information systems and information technology analysis may overlook threats and opportunities present in the environment; co-operation from competitors is required; strategic direction of the organisation is only implicitly recognised in terms of management involvement in the project team; assumes all aspects of processes which are critical to corporate success can be measured.

INFORMATION ARCHITECTURES

1 ***Philosophy:*** data-driven approach to strategic information systems planning based on the view that data represents the fundamental 'building blocks' of an organisation. ***Objectives:*** identify the data needs of the organisation to form a map of information requirements. ***Domain:*** internal organisational analysis.

2 ***Models:*** entity model; process model; entity/process matrix.

3 ***Tools / Techniques:*** entity modelling; process modelling; entity/process cross-referencing.

4 ***Scope:*** organisational analysis limited to the data requirements of processes; information systems requirements may be determined from the information architecture.

5 ***Output:*** information architecture to guide the development of information systems required to support the organisation.

6 ***Practice:*** organisation-wide study by analysts to determine business data needs in a 'one-off' study; architecture needs to be updated as the business changes; difficult to maintain architecture; management involvement is required; study takes between ten and eighteen months to prepare the information architecture.

7 ***Integration:*** no link between data requirements and organisational strategy; information systems plan 'stands-alone' from the corporate plan;

information systems requirements are passed to development, separating information systems planning and development, although the entity models may be used by the development team.

*8 **Strengths:*** information architecture is a more stable deliverable from the planning process than the identification of individual information systems (Galliers, 1992, 1993b). ***Weaknesses:*** data-driven plan should be used as an implementation tool after strategic planning (Dantzig, 1990); unrealistic scope to prepare a corporate information architecture; the corporate information architecture is difficult to maintain; there is often only short-term commitment to the study; current information systems are not analysed; opportunities and threats may be neglected by the lack of external analysis; the criticality of information systems projects is not assessed as information systems are prioritised by implementation requirements; the plan results in the specification of complex information systems which do not focus on satisfying the critical information needs of the organisation; information systems identified may not be developed; data rather than information is viewed as the corporate resource; it is not possible to identify entities without examining the cognitive framework which gives them meaning (Lewis, 1994), which is provided by the corporate strategy.

LEE AND GOUGH'S APPROACH

*1 **Philosophy:*** retrospective analysis followed by a decision-oriented approach; information systems planning can be improved by addressing socio-technical problems. ***Objectives:*** identify strategic opportunities for information systems; support organisational learning; activate business change; pursue strategic value of information systems. ***Domain:*** internal organisational analysis.

*2 **Models:*** systems audit grid; business function chain.

*3 **Tools / Techniques:*** critical success factor analysis; strategic function chain; systems audit grid; stages of growth model; analysis of business function chain; multi-dimentional assessment.

*4 **Scope:*** organisational analysis; corporate objectives; information systems resource analysis; information systems requirements.

*5 **Output:*** action plan for information systems development.

*6 **Practice:*** individual and group learning sessions co-ordinated by facilitator; analyse organisation in terms of mission, goals, strategies and structure; assess strategic opportunities for information systems; review business problems; prioritise information systems development in terms of strategic value; involves senior management.

*7 **Integration:*** reviews strategic position and the contribution of information systems to the strategy, linking strategic planning to information systems planning; the prioritised information systems plan is then passed to information systems development.

*8 **Strengths:*** reviews strategic value of existing information systems; prioritises information systems based on strategic value; promotes a proactive culture as the value of information systems development to the organisation is visible; employees at all levels of the company participate in the learning sessions; adopts a holistic view of information systems planning. ***Weaknesses:*** strategic techniques are not used in strategic analysis; information collected during planning is not used in information systems development; no environmental analysis is conducted; no explicit consideration of future direction is given, this is only implicit by the participation of senior management.

EMBERTON AND MANN

*1 **Philosophy:*** data-driven, decision-oriented approach; single approach to short-term and long-term planning; techniques used should be consistent at all levels. ***Objectives:*** to bring together material from strategic analysis in order to substantiate conclusions and ensure that the strategy deliverables are maintainable. ***Domain:*** internal organisational analysis.

*2 **Models:*** entity model; entity-system matrix; data model; functional model; systems integration model; strategic systems portfolio.

*3 **Tools / Techniques:*** usage matrix maps candidate computer systems to the corporate data model; risk analysis; data modelling; functional modelling; critical success factor analysis.

*4 **Scope:*** organisational analysis; organisational objectives; information systems requirements; information technology requirements.

*5 **Output:*** business functional model; corporate data model; statement of organisational objectives; critical success factors; key business issues; information systems plan; corporate business model; business benefits; technical priorities; technical strategy; subject databases; manpower plans; information systems development schedule; strategic systems portfolio.

*6 **Practice:*** structured interviews with senior management to review the organisation.

*7 **Integration:*** information systems planning is linked to corporate strategy using the objectives identified through interviews with senior management; business and data models used to prioritise information system plans are used as the basis for information systems development, linking information systems planning and information systems development; the deliverables from the corporate systems strategy, the corporate data model, systems function charts and the technical strategy are used in individual implementation projects.

*8 **Strengths:*** deliverables understood by non-technical management; strategy founded on data and functional analysis; documentation is to be maintained during the implementation of the plan; flexible to be used in different types, sizes and complexities of organisations; information systems plans implemented by system architecture; deliverables from the corporate systems strategy are used for individual system implementation projects. ***Weaknesses:*** limited attention to strategic analysis; lack of environmental analysis; long timescales required for conducting the methodology; there is no review procedure to evaluate the success of the plan; information systems planing is considered to be a 'one-off' activity; emphasis is placed on data and processes which may change.

STRATEGIC ALIGNMENT MODELS

Burn's Approach

*1 **Philosophy:*** retrospective approach; information systems and information technology can lead or follow the corporate strategy, react or initiate change; select information systems planning strategy to match the stage of information systems growth in the organisation. ***Objectives:*** to provide a framework in which to explore the issues of follower or leader, reactor or initiator of change; to align the formation of information systems strategy with organisational strategy. ***Domain:*** internal organisational analysis.

*2 **Models:*** organisational cultural audit; information systems alignment.

*3 **Tools / Techniques:*** organisational context (e.g. Nolan, 1979); strategic approach (e.g. Miles & Snow, 1978); functional implementation (e.g. McFarlan & McKenny, 1982).

*4 **Scope:*** organisational analysis; information systems resource analysis.

*5 **Output:*** organisational cultural audit.

*6 **Practice:*** middle and senior management workshops.

*7 **Integration:*** corporate strategy and information systems planning are linked, corporate objectives are identified through interviews with senior management.

*8 **Strengths:*** recognises the contribution of strategic analysis techniques for information systems planning. ***Weaknesses:*** no link to the implementation of the information systems plans.

Liang and Tang's Approach

*1 **Philosophy:*** demand-driven; competition-oriented approach to analyse the potential competitive advantage of strategic information systems. ***Objectives:*** evaluate strategic information systems opportunities against the potential value of the system; extent to which competitive advantage can be attained and the risks associated with the project. ***Domain:*** internal and external organisational analysis.

*2 **Models:*** Miles & Snow (1978); Cash *et al.*, (1988); decision tree.

*3 **Tools / Techniques:*** value analysis; advantage analysis; risk analysis; decision tree analysis.

*4 **Scope:*** information systems plan.

*5 **Output:*** justification of information systems projects.

*6 **Practice:*** estimating factors required; use of public database; classification of follower or leader stance.

*7 **Integration:*** information systems planning adopts a reactive approach to the strategic plan, although the value of information systems is measured in terms of the potential competitive advantage to be gained.

*8 **Strengths:*** values information systems in terms of their potential strategic value to the organisation; provides a means for the organisation to learn and improve in its estimating ability. ***Weaknesses:*** there are many uncertainties that must be estimated; expert judgement to estimate values is subjective and may be erroneous.

Mehrez *et al.*'s Approach

*1 **Philosophy:*** current methodologies aimed at translating corporate strategic plans into information systems plans are not grounded in mathematical or economic theory; the result of this is that there is no assurance that the information systems resource allocation is optimal - it may only be a local maximum; a theoretical foundation for information systems planning is needed; based on multiattribute theory. ***Objectives:*** to provide a foundation to inspire progress in theory-based approaches to information systems planning. ***Domain:*** internal organisational analysis.

*2 **Models:*** matrix of business processes and organisational objectives.

*3 **Tools / Techniques:*** map business processes and organisational objectives matrix to a matrix of organisation objectives; translate mapping into vectors of computer-related goals; remove redundant goals; ordinal ranking of costs and benefits of computer-related goals used to select projects; information systems alternatives selected by weighting of project utilities.

*4 **Scope:*** organisational analysis; information systems plan.

*5 **Output:*** business processes; computer-related goals; brief analysis of information systems; prioritised information systems.

*6 **Practice:*** requires participation of key decision-makers; methodology could be applied by practitioners but the objective was to inspire future progress in theory-based approaches; computer-assistance recommended; can be used in organisations of any size and complexity.

*7 **Integration:*** reactive to organisational objectives.

*8 **Strengths:*** organisational objectives are mapped to business processes. ***Weaknesses:*** assumes prior existence of a corporate strategic plan; neglects potential contribution of information systems and information technology to establish and sustain competitive advantage; formal mechanistic approach for defining information systems to meet corporate objectives neglects the softer, creative issues which are associated with corporate strategy; complex methodology requiring a large amount of data to be analysed.

CRITICAL SUCCESS FACTOR ANALYSIS

*1 **Philosophy:*** decision-oriented approach; managers are familiar with the identification of critical success factors; critical success factors bridge the gap between corporate strategy and information systems strategy. ***Objectives:*** to identify the critical success factors of the organisation; to identify the critical areas where information systems support can be targeted. ***Domain:*** internal organisational analysis.

*2 **Models:*** venn diagrams; matrices.

*3 **Tools / Techniques:*** critical success factor analysis; venn diagramming; information summarisation.

*4 **Scope:*** organisational analysis; corporate objectives; information systems requirements; information systems strategy.

*5 **Output:*** critical success factors; prioritised information systems plan.

*6 **Practice:*** requires quarterly meetings between business and information systems managers to ensure information systems plans adapt to business change; may use prototyping to translate critical success factors into information needs; systems analysts require thorough knowledge of the organisation; requires an executive sponsor; systems analysts require training in critical success factor analysis; interview senior executives for between three and six hours; guidelines are given to assist in interviews; need to discuss organisational issues and not information technology issues in interviews; interviews are conducted at all levels in the organisation.

7 ***Integration:*** corporate strategy and information systems strategy are linked; no link between information systems planning and information systems development.

8 ***Strengths:*** provides effective support to business plans; develops insight into information services that can impact the organisation's competitive position; received enthusiastically by senior managers who easily identify with the concept of critical success factors; serves as the top level of structured analysis; identifies and priorities information requirements against business objectives; promotes information systems and business interaction; promotes understanding of business needs; increases credibility of information systems in the business. ***Weaknesses:*** the more removed managers are from senior positions, the more difficult it is to identify critical success factors; difficult to identify information needs from critical success factors; critical success factors inherit managers' bias which may be influenced by recent events; there are no measures of information systems success; as business priorities change, information systems plans change which hinders information systems development.

INFORMATION ENGINEERING

1 ***Philosophy:*** data-driven approach to information systems planning; diagrams are the most appropriate form of communication. ***Objectives:*** to integrate information systems in a company; support needs of senior managers; focus information systems development on the goals of the business; increase the value of information systems to the business; manage the information resource so that it is accessible when needed; reduce the timescale of the information systems development process; ease the problems of maintaining information systems; involve users in the planning and development of information systems; improve communication between all parties involved in the development of an information system; co-ordinate the development of systems in an organisation; aim to redesign all information systems and collect all organisational information in an automated encyclopaedia. ***Domain:*** internal organisational analysis; external technological analysis; most suitable to large organisations; suitable for database-type applications as opposed to real-time systems.

2 ***Models:*** entity models; function hierarchy diagrams; process dependency diagrams; process action diagrams; data flow diagrams; bubble charts; preliminary data structure design; systems structure design; data navigation diagrams; transition schedule; normalised data model; process decomposition diagram; entity/process matrix.

3 ***Tools / Techniques:*** subject area modelling; functional decomposition; problem analysis; cluster analysis; distribution analysis; entity modelling; canonical synthesis; entity life-cycle analysis; process decomposition; process dependency; action diagramming; transition analysis; data flow diagramming; dialogue flow design; data storage design; operational design; transition design; normalisation; critical success factor analysis.

4 ***Scope:*** corporate objectives; external information systems and information technology analysis; forecast future information systems and information technology direction; information systems strategy; information technology strategy; information systems requirements; information technology requirements; information systems development.

5 ***Output:*** information architecture; business systems architecture; technical architecture; organisational goals; prioritised information systems strategy; information technology strategy; corporate objectives; critical success factors; problems, opportunities and information needs; screen, report and dialogue design; data storage structures; operations procedures; interface design.

6 ***Practice:*** end user involvement is required; joint application development sessions; automated support is required to document the volume of information collected.

7 ***Integration:*** corporate strategy, information systems planning and information systems development are integrated.

8 ***Strengths:*** steers the organisation to achieve its goals; identifies technological opportunities; improves maintainability of information systems by complete and automated documentation; integrated coverage of the systems development process; supports user involvement. ***Weaknesses:*** does not address the formation of corporate goals; corporate objectives may change during the long implementation process of the information systems strategy; external analysis is limited to technological opportunities and threats.

BUSINESS SYSTEMS PLANNING

*1 **Philosophy:*** retrospective, data-driven approach to information systems planning. ***Objectives:*** to translate business objectives to information requirements; provide an information systems plan to support business needs, integrated with the business plan; provide a method for management to establish information systems priorities; develop information systems with a long life based on business processes, unaffected by organisational change; efficient and effective allocation of information systems resource to support business goals; provide a high return on the investment in information systems; improve the relationship between users and development staff by being responsive to user requirements and priorities; identify data as a corporate resource to be planned, managed and controlled. ***Domain:*** internal organisational analysis.

*2 **Models:*** entity model; process model; process/organisation matrix; data/process matrix; system/process matrix.

*3 **Tools / Techniques:*** entity modelling; process modelling; process/organisation mapping; data/process mapping; system/process mapping.

*4 **Scope:*** corporate objectives; information systems resource analysis; information systems requirements; information systems strategy.

*5 **Output:*** information architecture; problems analysis sheet; application ranking; required application report; work plan; process/organisation matrix; process/data matrix; system/process matrix; current information systems/data matrix.

*6 **Practice:*** senior management commitment required to sponsor study; information is collected by interviews; executive interviews are conducted to collect and validate information; executives are interviewed to determine business objectives, problems and information needs.

*7 **Integration:*** corporate strategy and information systems strategy are linked but the methodology stops at information systems plan.

*8 **Strengths:*** translates business objectives into information requirements; senior management are committed to the study. ***Weaknesses:*** stops at information systems plan therefore systems planned may not be implemented; basic principle is to align information systems with business objective, but the identification of business objectives is not completed until activity eight, after much analysis has already been conducted; strategic analysis and strategic analysis tools are not incorporated, organisational objectives are identified from executives interviewed; difficult to implement the methodology; risk of competitive opportunities and threats being missed due to the lack of environmental analysis.

BUSINESS SYSTEMS DEVELOPMENT METHOD

*1 **Philosophy:*** problems are business-oriented not technologically-oriented so business-oriented approach is needed; enterprise models are not suitable to bridge the gap between corporate strategy and information systems developments; decision-driven. ***Objectives:*** to respond to criticisms of Business Systems Planning, for example, Business Systems Planning does not lead to information systems development; enable managers to communicate the business vision to the information systems development staff; information systems development to support the business vision; build information systems to meet business needs; build integrated, robust information systems. ***Domain:*** internal organisational analysis; external analysis.

*2 **Models:*** business model; needs model, solution model.

*3 **Tools / Techniques:*** business analysis; objectives analysis.

*4 **Scope:*** organisational analysis; environmental analysis; forecast future direction; corporate objectives; external information systems and information technology analysis; forecast future direction of information systems and information technology; information systems requirements; information technology requirements; information systems strategy; information systems development.

*5 **Output:*** business model; needs model; solution model; one business system is developed in a number of stages.

*6 **Practice:*** senior management assist in the construction of the business model, communicating strategy and vision.

*7 **Integration:*** corporate strategy and information systems strategy are integrated; information systems planning and information systems development are linked.

*8 **Strengths:*** single business model constructed therefore no reconciliation is required between data and process models; information systems development proposals are evaluated against organisational needs; one business system is developed in stages to support the strategic direction; procedure-driven or object-driven development approaches can be used; aligns information systems with business objectives; communicate business knowledge to information systems developers; provides reliable management information; builds robust systems with little overlap. ***Weaknesses:*** challenges current organisational thinking therefore the methodology is difficult to use; lack of strategic analysis; long development period for the completed implementation of the business model; it is stated that during the construction of the business model, only critical data and processes are considered, neglecting 'today's organisation', however, neglecting immediate threats may prevent survival to implement long-term plans.

APPENDIX THREE

GUIDELINES FOR SELECTING STRATEGIC TECHNIQUES

STRATEGIC ANALYSIS

Strategic analysis examines customers, competitors, the industry and the environment, in addition to a resource analysis of the internal environment.

Customers

The customer resource process (Ives & Learmonth, 1984) may be used to identify the activities within the customer process to which the company could add value.

Competitors

The five forces model (Porter, 1980) provides a structured means for analysing the five basic forces of competition, allowing the organisation to exploit the weaknesses of competitors and neutralise or by-pass their strengths.

Industry

The four stage life-cycle (Robson, 1994) of development, growth, maturity and decline can be used to examine the size, structure and growth prospects of the industry.

Environment

PEST (political and legal, economic, socio-cultural, technological) analysis (Johnson & Scholes, 1993) provides a checklist to assist analysis of the environment.

TOWS (threats, opportunities, weaknesses and strengths) matrix (Weihrich, 1986) may also be used for environmental analysis, matching the threats and opportunities in the external environment, against the weaknesses and strengths of an organisation compared with those of its competitors.

Resource Analysis

A resource audit (Johnson & Scholes, 1993) may be conducted to analyse the internal capabilities of the organisation, establishing the organisation's resource base.

The systems reference model (McFarlan & McKenny, 1983) may be used to assess the information systems resource, examining the current role of information systems in the company.

The systems audit grid audits the asset base of information systems in the organisation, assessing current information systems in terms of technical quality and value to the business.

Value chain analysis (Porter & Millar, 1985) may be used to identify opportunities for establishing a competitive advantage, examining the activities which underpin the business.

Product portfolio analysis examines the strength of individual products or services in an organisation's portfolio within the market.

SWOT analysis provides a mechanism for examining the organisation in the context of its environment, summarising the relationship between environmental influences and the strategic capability of the organisation.

Critical success factor analysis (Rockart, 1979) assists identification of information needs based on business activities which must be successful for the organisation to succeed.

Expectations

The power / dynamism matrix provides a means of assessing the relative power and support of stakeholders (Johnson & Scholes, 1993).

The power / interest matrix is a development of this matrix which classifies stakeholders in relation to the power they hold and their level of interest in the organisation.

Objectives

Mission analysis (McTavish, 1995) is a framework of four factors (customer function, technology dimension, customer segment dimension and stage in value chain) which can be mapped to techniques to form a mission.

Power

Power in the organisation can be assessed by examining the indicators of power, such as status in the organisational hierarchy, claim of resources, representation and symbols.

Cultural

The cultural web is a device for undertaking a cultural audit of the organisation, examining symbols, power structures, organisational structures, controls, rituals and routines, stories (Johnson & Scholes, 1993).

Theory X and Theory Y (McGregor, 1960) adopts a narrow view of cultural analysis, focusing on motivational factors.

STRATEGIC CHOICE

Strategic choice involves the generation, evaluation and selection of strategic options.

Strategic Analysis

The strategy clock (Johnson & Scholes, 1993) is a means with which to examine the implications of strategic options.

The strategic options generator is a technique closely associated with the five forces model and value chain analysis, which addresses the potential threats to the company.

Strategic Direction

Directions include related developments, related diversification and unrelated diversification.

Three methods to pursue strategic directions are internal development, acquisition and joint venture.

Evaluate Strategic Options

Strategic options can be evaluated against the criteria of suitability, feasibility and acceptability (Johnson & Scholes, 1993).

Many of the techniques for strategic analysis can be used for evaluating and selecting strategies.

STRATEGY IMPLEMENTATION

Implementing the selected strategy involves three aspects: resource planning, organisational structure, people and systems. This requires decisions to be taken concerning the degree of centralisation and devolution in the organisation.

APPENDIX 4

CASE STUDIES

CASE 1: CHANGING COMPLEX INFORMATION SYSTEMS: MEDICAL RECORDS AT ANNERSLEY HOSPITAL.

Source: Berridge, J., (1980), 'Changing Complex Information Systems: Medical Records at Annersley Hospital', in: Paton, R., Brown, S., Spear, R., Chapman, J., Floyd, M. & Hawthorne, J., (ed.), (1984), *Organizations: Cases, Issues, Concepts,* Harper and Row, London, pp.6-11.

Case Notes

1. Long stay psychiatric and geriatric hospital; 600 beds; suburb of a large town.
2. Wood/metal huts; medical records called 'The Shack'; dilapidated on the outside but warm on the inside.
3. Hospital role changing to become the centre for psychiatric treatment in the area with less beds and more patients treated as out-patients.
4. New facilities have been built for out-patients.
5. Function of medical records has changed from a storage activity to a resource centre, as documents become more complex and information is demanded from outside the hospital and from the government for national statistics and specialised research.
6. The medical records has a high success rate based on informal working practices, but relationships with new external staff are strained.
7. The changes have resulted in an increased workload and a study by the regional Organisation and Methods team show the location of medical records with regard to clinics as being inefficient.
8. The standard form of an integrated medical records departments is to be adopted.
9. The new location is to be fully equipped to cope with future demands.

10. The reporting structure has changed with the introduction of a Medical Records Officer between the records supervisor and the unit manager.
11. The filing section has been renamed the Records Library.
12. New procedures are introduced for stream-lined efficient operation.
13. Security is imposed by a glass screen segregating the records library, restricting entry to the department and staff are not expected to leave the area except at appointed times.
14. External communication is via messenger to prevent unnecessary interruption and impose professional standards.
15. New procedures include fixed breaks; all work to be cleared by the end of the day and the introduction of tracer cards.
16. Service deteriorates with 'coldness' of area; failure rates are high; records are left unfiled; there are arguments with other areas over late, missing records and the teamwork has gone.
17. Stricter supervision to address falling quality results in increased workload as faster turnaround is required to rectify errors.
18. Crisis arises as consultant waits three and a half hours for records of a patient admitted urgently. This revealed case notes in desks, reports unfiled, pending and unaccountable racks of files.
19. In response, the procedures were reviewed and staff were briefed to ensure that they knew the procedures to follow, supervision was increased and a school leaver was employed.
20. In time, the service improved and complaints were reduced but staff turnover increased and the supervisor sought early retirement.

Rationale for Selecting the Case Study

This case study was selected for three reasons. Firstly, it details a number of changes and the consequences of those changes, on a working environment over a period of time. Secondly, the situation summary diagram summarises a situation and a justification alignment contour aims to represent the changes needed to address the situation; this longitudinal case provides an opportunity to model action taken and the consequences resulting. Thirdly, although strategic tools are not used, the case provides a significant contribution to the appreciation of cultural influences.

Aims of Using the Case Study

There are five main aims of using this case study:

1. Establish key factors to be considered or monitored when changing a working environment.
2. Explore the relationship between cultural factors in the working environment.
3. Examine the relationship between the situation summary diagram and the justification alignment contour.
4. Construct and examine a formal structure for the situation summary diagram.
5. Illustrate the differences between the situation summary diagram, the justification alignment contour and rich pictures previously prepared for the case study.

Application of the Case Study

The case reports:

Changing role of hospital records	(SSD1).
Reaction to accommodate changes	(JAC1).
Problems with the new area	(SSD2).
How the problems were addressed	(JAC2).
The crisis	(SSD3).
Action taken after the crisis	(JAC3).
Resulting situation	(SSD4).

SSD1

Figure A4.1 shows that the situation in medical records filing does not appear problematic to the members of the department. Changes in the hospital function have resulted in increased workloads and wider external contact. The department has responded to this challenge by working through breaks when necessary. Relationships with external staff are strained but this has brought the team closer together (tribe unites against the perceived threat from an external source, Shah & Dingley, 1994; Shah, Dingley & Golder, 1994). The problem is perceived by the Regional Management Services Department's Organisation and Methods team. The location of the records department being at the opposite end of the hospital from where the records are needed in outpatient clinics by appointment clerks is considered to be inefficient. The solution proposed is the adoption of the standard form of an integrated medical records department.

JAC1

Figure A4.2 indicates the main areas from SSD1 which will be affected by the application of the standard form of integrated medical records department.

SSD2

Figure A4.3 shows the lack of consideration for cultural issues resulted in the imposition of changes which directly opposed cultural values. The demise of these values is reflected in the corresponding reduced quality of service. The symbol 'bloodhound' is given to the Medical Records Officer. Formal procedures for work and communication are at the expense of teamwork; rigid procedures of work and security are at the expense of informality and flexibility; lack of external contact costs recipriocy and co-operation; formality of accommodation costs homeliness and rituals of teamwork. This change is evident in the change of name from the 'Shack' to the 'library'.

JAC2

The response to these problems was procedural changes to pass records to clinics earlier, allowing time to correct errors, shown in figure A4.4. In addition, increased supervision was imposed to ensure adherence to procedures.

SSD3

The seriousness of the declining service was highlighted by a consultant who had to wait more than three and a half hours for a patient's records. This incident brought the status of disarray of the records library to the attention of the medical records officer and the unit administrator. This is shown in figure A4.5.

JAC3

To address the situation, the Medical Records Officer reviewed all procedures and ensured the procedures were clearly understood, shown in figure A4.6. Increased supervision of procedures directly (by himself) and indirectly (via the records supervisor) was also considered necessary. This is the first time staff are considered in the 'solution' to the problem and here is it only to ensure that procedures are understood and correctly applied.

SSD4

The changes imposed were not consistent with the culture analysed in SSD1. In SSD4, illustrated in figure A4.7, this has finally resulted in staff leaving the department. A new addition to the diagram is the high level of supervision in the situation.

Discussion

SSD4 appears to represent the situation required of smooth operation of procedures, although staff turnover is now a problem. In SSD1, the problem appeared to be the location of the records library. In retrospect, the question must be considered whether the department could have been relocated whilst retaining the cultural values which contributed to the quality of service delivered. A further question is raised whether this would have been desirable as even in the initial stages of change, external parties were 'concerned' at the informality of the records department.

Review of Aims

Five aims were stated for using this case study:

1. *Establish key factors to be considered or monitored when changing a working environment.*

   The study highlighted the following factors to be considered when changing a working environment: structure, location, accommodation, office layout, function, procedures, security, communication. Although the case focused on medical records, the department was directly affected by wider changes in the hospital and the health service which were not fully explored in the case.

2. *Explore the relationship between cultural factors in the working environment.*

   The importance of considering the cultural impact of changes was demonstrated supporting the view that culture can only be understood in the social context which gives it meaning (Shah & Dingley, 1994; Shah, Dingley & Golder, 1994). Cultural values were sustained by the accommodation, layout, flexible and informal security, working and supervisory procedures which were changed.

3. *Examine the relationship between the situation summary diagram and the justification alignment contour.*

   The justification alignment contour could be used to represent changes other than the development of information systems, although lack of material in the case restricted learning more about the justification alignment contour in practice. Using the same elements in the justification alignment contour and the situation summary diagram clearly showed the areas affected by the change.

4. *Construct and examine a formal structure for the situation summary diagram.*

The situation summary diagram showed synthesis of various aspects of the situation, although strategic tools were not used. The framework underlying the situation summary diagram supported continuity to examine aspects of change in the justification alignment contour and continuity to reflect how the situation had been affected by the changes imposed.

5. *Illustrate the differences between the situation summary diagram, the justification alignment contour and rich pictures previously prepared for the case study.*

Rich pictures of the case study represent the whole case study, the situation summary diagram and the justification alignment contour trace changes to the situation and their resulting effect. Specific differences between the situation summary diagram and a rich picture are that a different notation is used; colour is used to aid clarity; rich pictures lack a framework to track change over time; the situation summary diagram looks as explicit representations of culture, explicitly states tasks and is more structured.

Additional Experience

Experience of the case study was limited by the material included in the case study, the view imposed by the writer of the case study and the interpretation of the material. However, the following areas require further consideration. Firstly, it is necessary to consider whether the situation summary diagram and justification alignment contour are models of reality or thinking about reality. Secondly, colour was used in the initial diagrams; investigation is needed to consider if the use of colour adds meaning to the diagrams. Thirdly, further research is required to investigate whether a corporate summary diagram needed to begin the study.

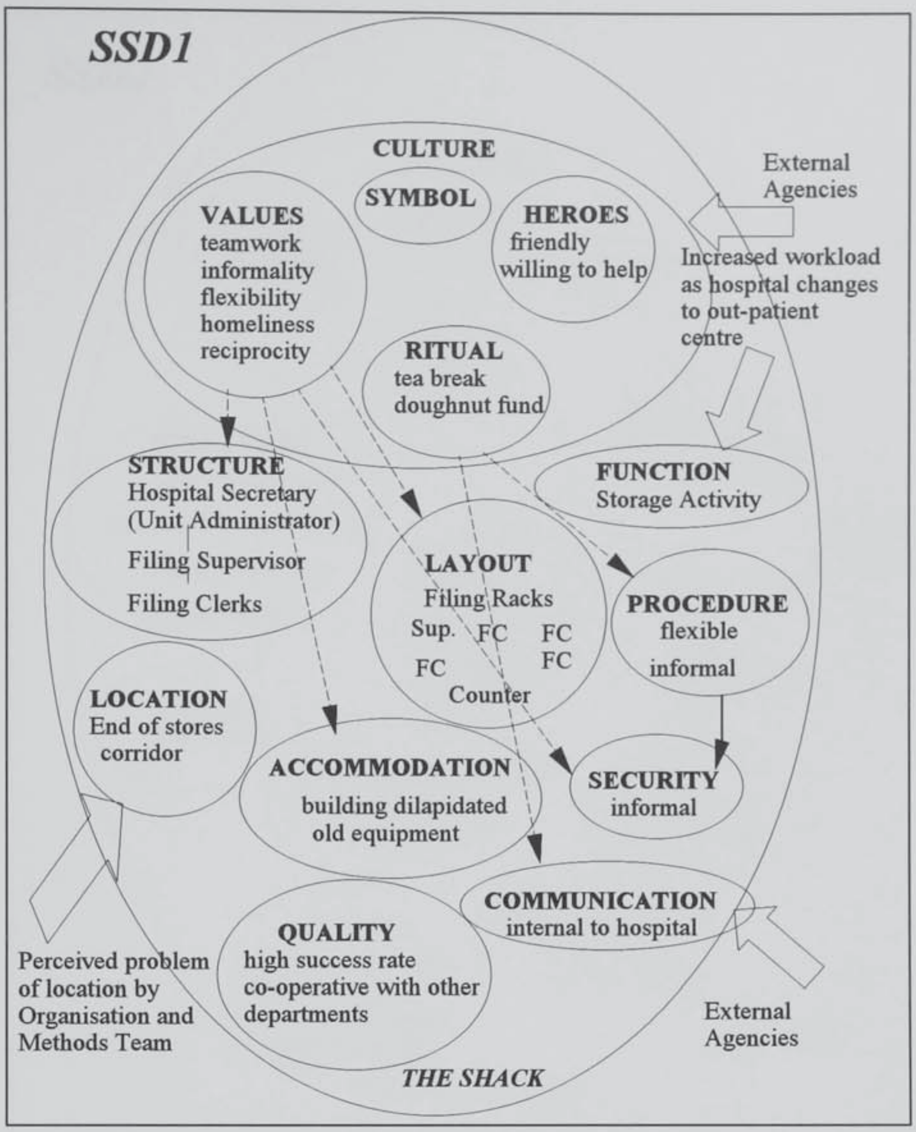

Figure A4.1: Situation Summary Diagram 1

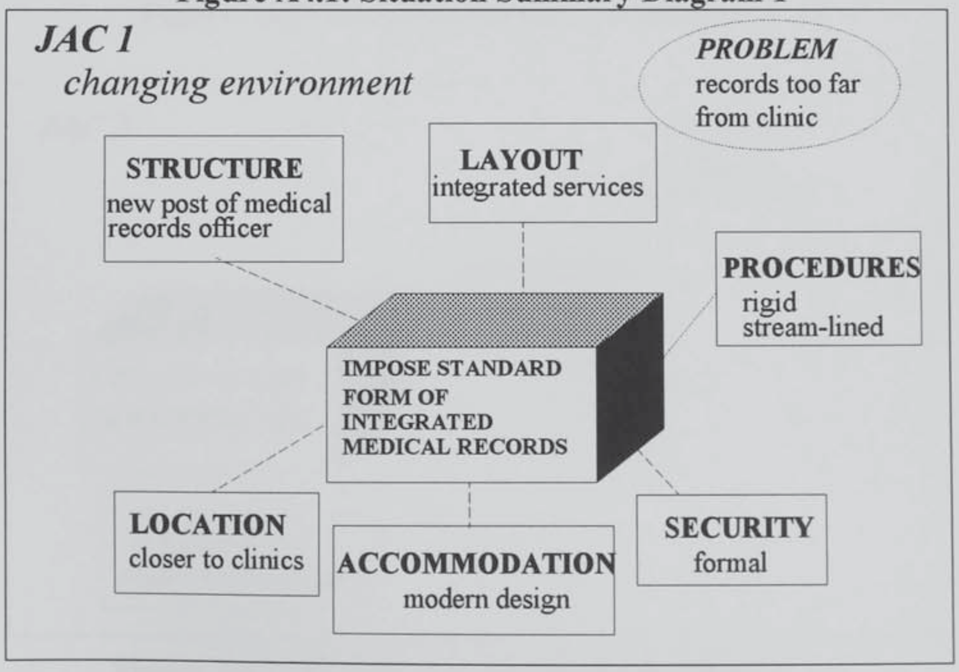

Figure A4.2: Justification Alignment Diagram 1

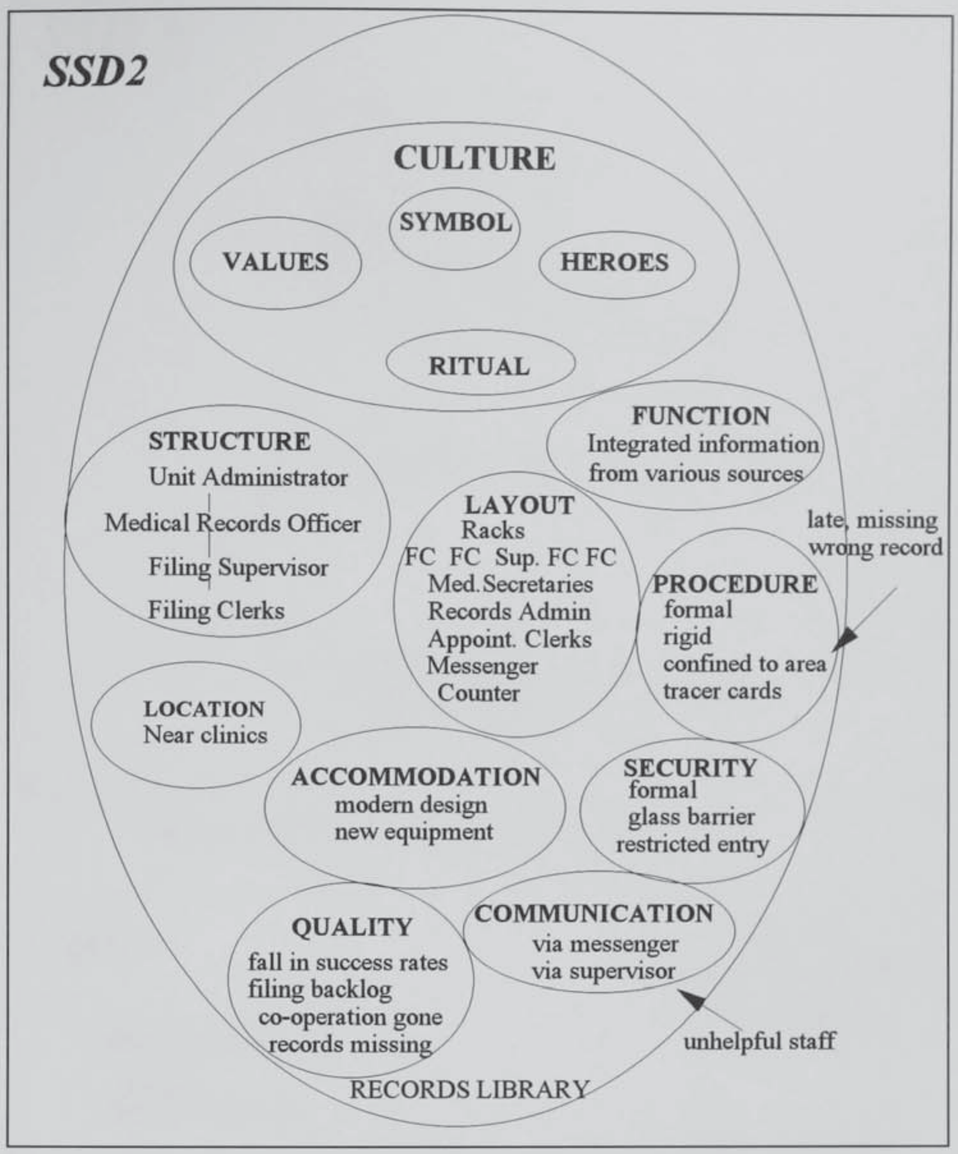

Figure A4.3: Situation Summary Diagram 2

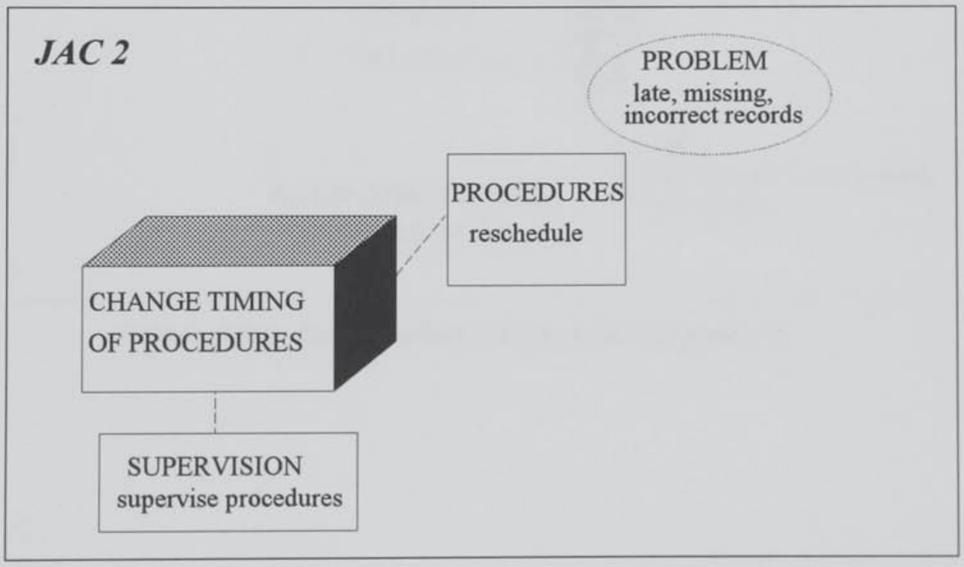

Figure A4.4: Justification Alignment Diagram 2

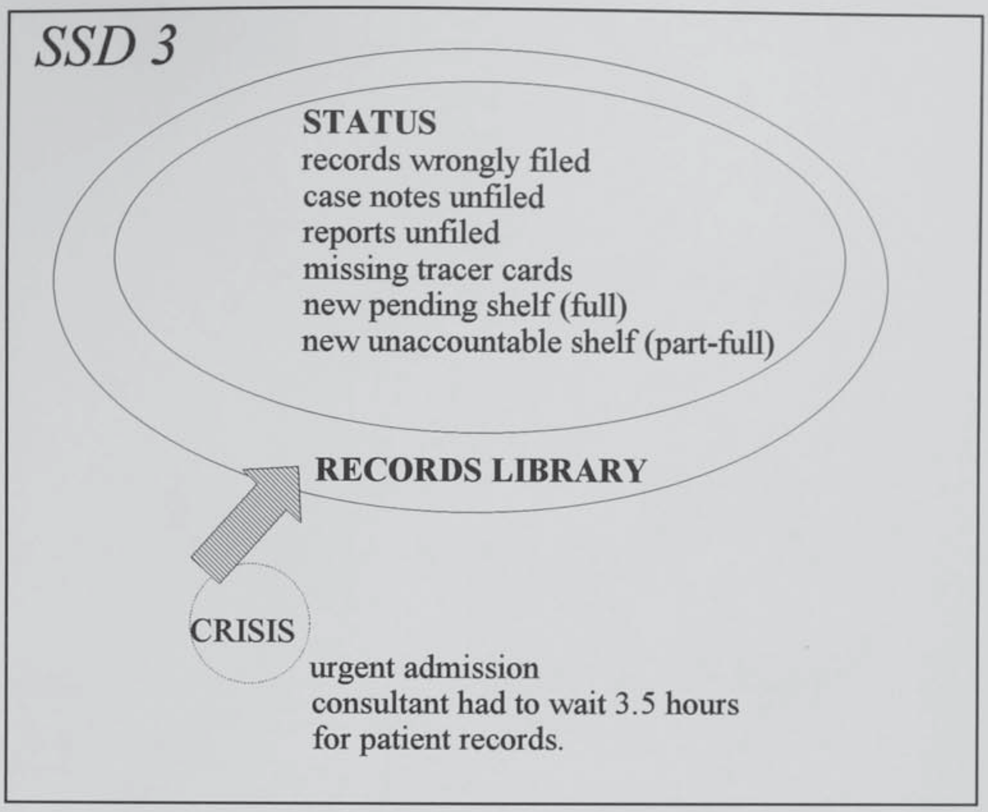

Figure A4.5: Situation Summary Diagram 3

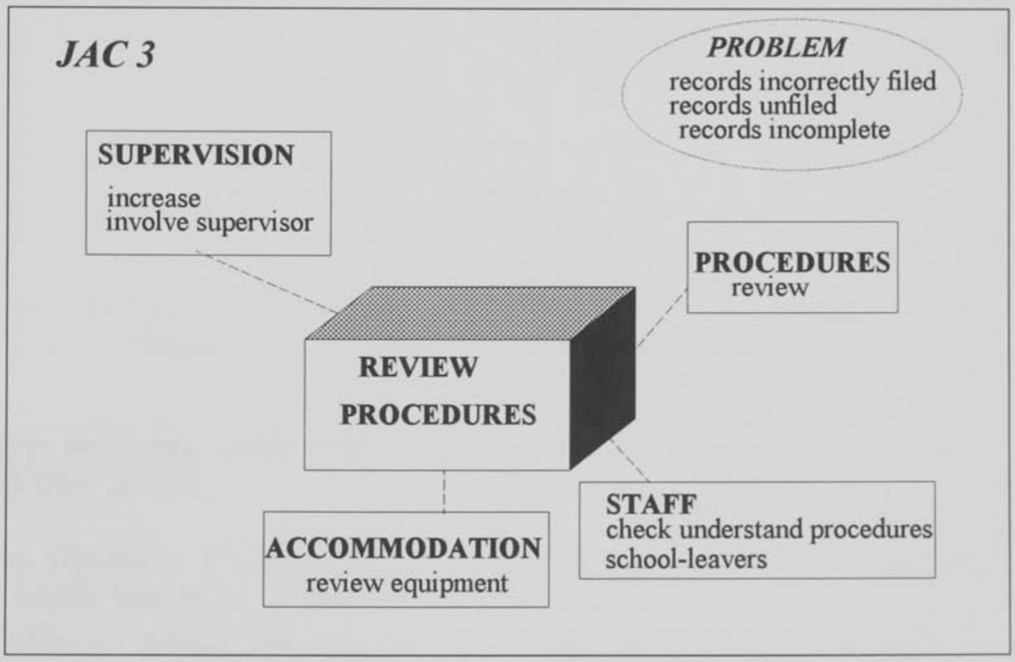

Figure A4.6: Justification Alignment Diagram 3

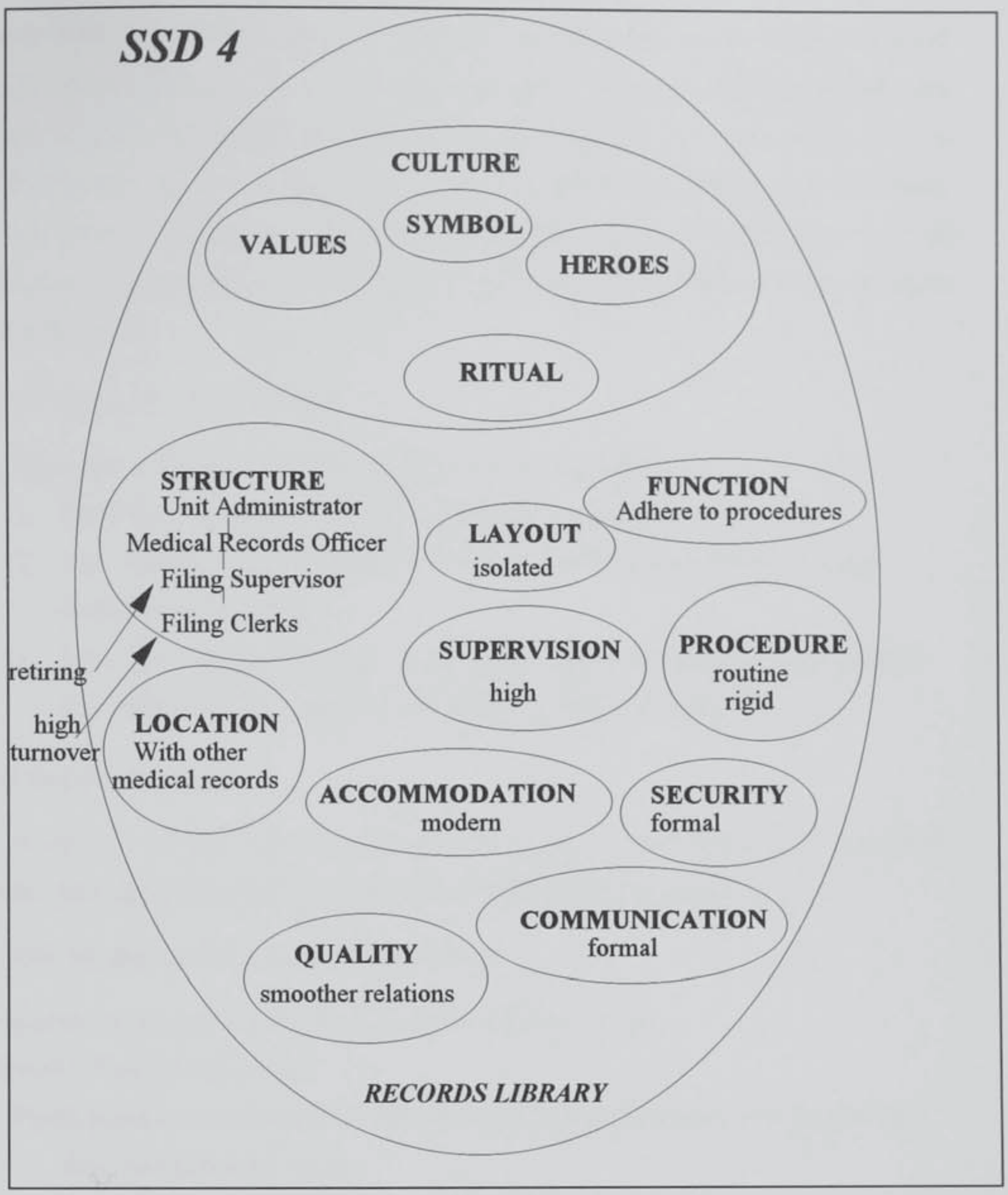

Figure A4.7: Situation Summary Diagram 4

CASE 2: INFORMATION AND LIBRARY SERVICES DEPARTMENT IN ICI ORGANICS

Source: Checkland, P. & Scholes, J., (1990), *Soft Systems Methodology in Action,* John Wiley, Chichester, pp.59-81.

This is a documented case of a use of the Soft Systems Methodology which led to new conceptualisation of the department.

Rationale for Selecting the Case Study

This case study was selected for two main reasons. Firstly, it details the cyclically use of the Soft Systems Methodology by practitioners in a problem situation. This is important as the proposed framework aims to adopt the synergistic principles of soft systems analysis without the complete adoption of the Soft Systems Methodology. Analysis of this case study may therefore highlight the differences to be evaluated between the proposed framework and the Soft Systems Methodology. Secondly, the basis for the case study was to rethink the role of the department in the organisation, looking at the basic 'business' of the department and future capability. Understanding the core of the business is a key element of strategic analysis which justifies further analysis of this case study.

Aims of Using the Case Study

The aims of using this case study were to identify:

1. How the Soft Systems Methodology is used in action.
2. The strengths and weaknesses of the Soft Systems Methodology from the case study.
3. How the composite framework would have been used, highlighting key differences from the Soft Systems Methodology.

Use of the Case Study

Activities of the Soft Systems Methodology were listed and compared with the corresponding action of using the composite framework.

Use of the Soft Systems Methodology

1. *Explain rudiments of the Soft Systems Methodology.*
2. *Record finding out phase:*

   Participants are reluctant as the problem situation forms the context of their professional lives.

   Structures and processes of the department are recorded.

   Enabled the relationship between structure and process to be discussed.

   Looked at various roles of the department.

   Revealed the importance of maintaining relationships with the users.
3. *Expressions of problems:*

   Twenty-six problems were identified.

   Relevant systems expressed as root definitions and conceptual models.

   Sharpened ideas on problematic issues.

   Introduced models for structured debate.
4. *Formal expression of root definition:*

   Showed change in perceptions.
5. *How the 'system' could be improved:*

   Compared activities with the real world.

Checked if the activity existed in the real world: in what form? how is it perceived? how is it judged? are changes feasible? are changes desirable?

6. *Take action.*

Use of Composite Framework

1. *Corporate Summary Diagram:*

   Identify objectives.

   Identify processes.

   Identify structure and location.

   Map processes and objectives.

   Look at cultural values, symbols, rituals and heroes.

2. *Situation Summary Diagram:*

   Identify strategic analysis techniques for internal and external analysis (SWOT, Critical Success Factors Analysis).

   Apply the strategic analysis techniques (identified, problems, opportunities, threats, weaknesses, critical success factors, context of department, changing environment).

   Summarise the information content derived in a diagram.

   Review the relationship between the information summarised.

3. *Justification Alignment Contour:*

   Identify areas of concern from the situation summary diagram (extract problem themes and related factors).

   Explore how information systems development can contribute to these areas.

Reflection of Case Study

The purpose of using the case study was only to show how the composite framework differed from the Soft Systems Methodology. It is recognised that the usefulness of the case material is limited as in the same way that it can not be shown that a methodology was successful, it cannot be shown that application of the composite framework would have been 'useful' in this case. In addition, the material documented in the case study limits the application of the case study, particularly in relation to the justification alignment contour.

Review of Aims

The use of the Soft Systems Methodology in action is demonstrated in the steps listed. The strengths of using the Soft Systems Methodology demonstrated in this case are that it facilitates change in group perceptions, encourages creative thinking and structures debate.

The weakness of using the Soft Systems Methodology demonstrated in this case is that there is a lack of rigour in the early stages of the method.

The use of composite framework is demonstrated in the steps listed:

1. The framework does not require explanation of using the method at the start of the study.
2. More structured and rigorous analysis is supported in the initial stages.
3. The framework examines the relationships between objectives and processes rather than between structure and processes.
4. The appraisal of current activities is conducted in the situation summary diagram, whereas in the Soft Systems Methodology this is not considered until activity five.

Conceptualisation of Experience

The Soft Systems Methodology only looks at the structure, processes and climate of the situation but the composite framework focuses on elements of culture which can affect the organisation if neglected.

It is important to evaluate the existing activities early in the study as this may reveal problems and strengths to be addressed.

In the Soft Systems Methodology few people were involved in the study. A wider view of the situation is needed to consider everyone affected by proposed changes. The role of the department in the case study was changing so other departments affected by the change should have been consulted. However, it is noted that it is difficult from a case study to appreciate the complexities of the situation as they were experienced at the time.

The importance of psychological ownership and participation was demonstrated in the study.

There is a danger that the structure of the situation summary diagram oversimplifies the richness of the situation so it is important that relationships are explored.

CASE 3: CUSTOMER SERVICES AND SOFTWARE ASSOCIATION

Source: Customer Services and Software Association, (1994), *Annual Review 1994,* Customer Services and Software Association, London.

Source: Customer Services and Software Association, (1994), *What do You Get by Belonging to CSSA?,* Customer Services and Software Association, London.

This is not a case study but has been included in this section as published material from the Customer Services and Software Association was used in the refinement of the proposed framework.

Rationale for Selecting the Material

This material was selected in order to analyse the documented relationship between corporate vision, critical success factors and objectives within an organisation. The Customer Services and Software Association was previously known and the Computing Services Association.

Aims of Using the Material

The aim of using this material was to explore the relationships between the corporate summary diagram, situation summary diagram and justification alignment diagram.

Use of the Material

The following stages were applied:

1. *Corporate Summary Diagram:*
   Identify objectives.
   Identify processes.
   (figure A4.8)
2. *Situation Summary Diagram:*
   Identify the vision, mission, critical success factors and objectives of the company.
   Relate the critical success factors to the corporate objectives.
   (figure A4.9)
3. *Justification Alignment Contour:*
   Map corporate objectives to the perceived benefits of membership of the association.
   (figure A4.10)
   Map objectives to the plan for 1994.
   (figure A4.11)

Reflection of Study

The diagrams show how information can be 'funnelled and filtered' between the models, supporting the principle of reusing information collected during different stages of the strategic analysis. In addition, mapping critical success factors to objectives, objectives to benefits and benefits to the corporate plan, increased understanding of the organisation and could be of use to highlight areas of weakness and discrepancy in the organisation.

Review of Aims

The study provided useful insights into the links between the three stages proposed and highlighted the value of conducting the corporate summary.

Conceptualisation of Experience

The corporate summary is a useful task to identify areas where the organisation lacks activities to fulfil its aims and objectives. Re-use of information can be facilitated at the three levels within the model.

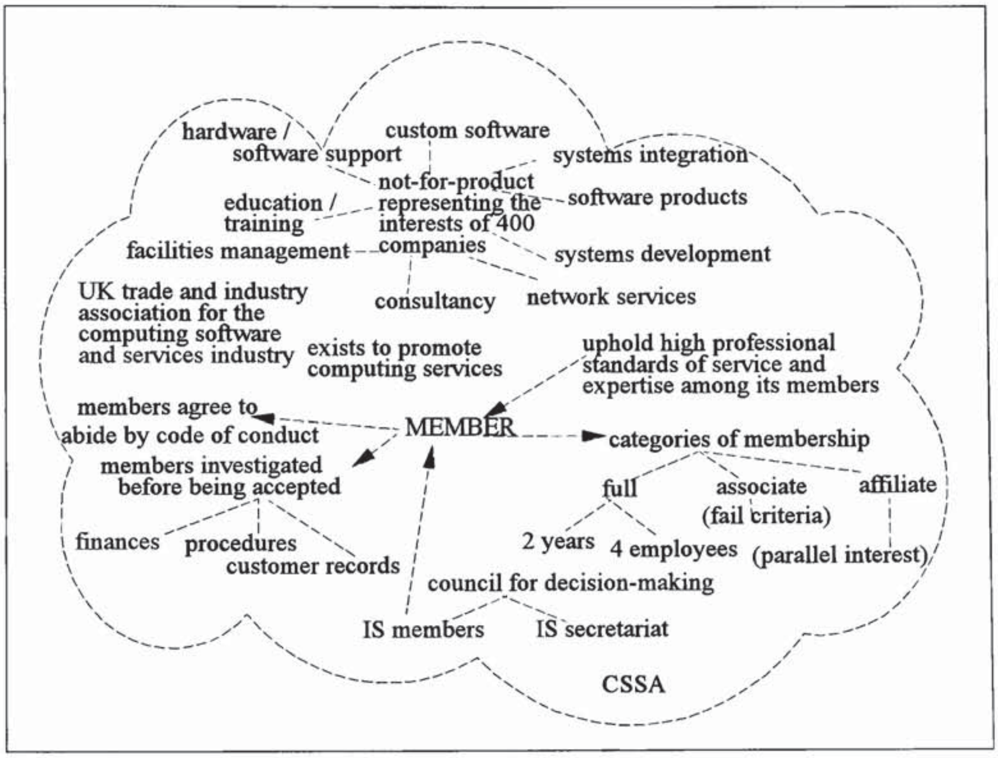

Figure A4.8: Corporate Summary of CSSA

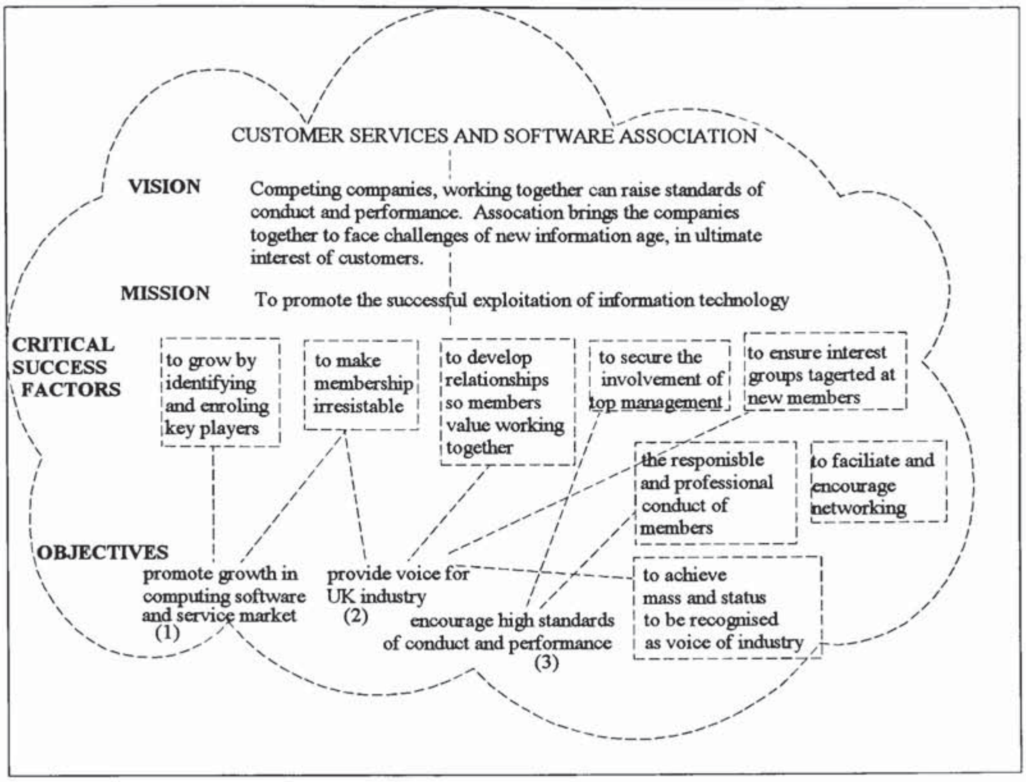

Figure A4.9: Strategic Summary of CSSA

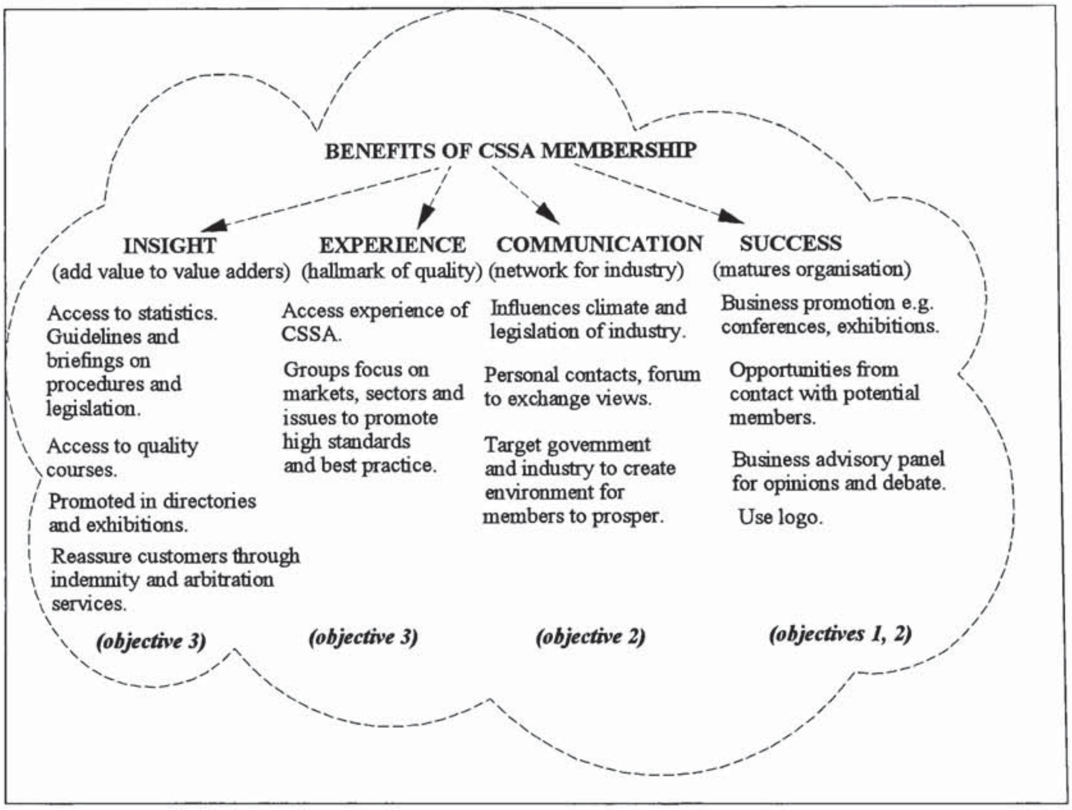

Figure A4.10: Justification Alignment of CSSA

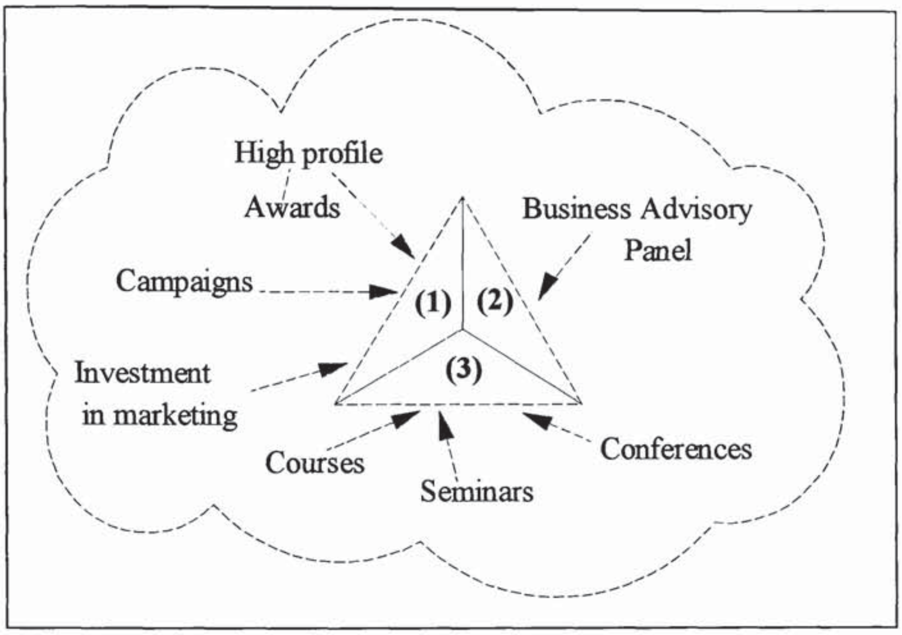

Figure A4.11: CSSA Plan Mapped to Objectives

APPENDIX 5

OVERVIEW OF MOTORCYCLE SPEEDWAY

Motorcycle speedway was pioneered in Australia and is now represented in Great Britain, Finland, France, Holland, Belgium, Germany, Austria, Hungry, Italy, Switzerland, Rumania, Bulgaria, Yugoslavia, Russia, Poland, Czechoslovakia, Asia, Mongolia, Japan, South Africa, America, Canada, Argentina and New Zealand. Britain is considered to be the "cradle of speedway" (Herman & Farmánek, 1993) with British league racing judged to be the hardest and toughest in the world. For this reason, riders across the world bid for places in British league racing.

In Britain, there are twenty-seven licensed tracks. At the start of each year, tracks must apply to operate during the season which commences in March and concludes in October. After being granted a license, the promoter and team manager must select and secure seven riders to comprise their team for the season. Each rider has a points average which relates to the average number of points the rider attains in a meeting. The points average is either based on the rider's performance during the previous season in British league racing or assessed based on performance in international meetings. A limit is set on the total points available to the team, for example, currently the total average points of the team must not exceed forty-six points.

Two teams compete in a race meeting in the British league. A meeting consists of a number of heats in which two riders from each team compete. A formal league plan is issued to determine which riders compete in a specific heat based on their position in the team, although there are additional rules which permit rider replacements to be made under certain conditions during the meeting. A heat consists of a clutch start of four laps of an oval shale track, which is approximately 355 metres in length, lasting approximately 60 seconds.

Points are awarded to riders in the following order: three points are awarded for wining the race; two points are awarded for finishing the race in second place; one point is awarded for third place; no points are awarded for finishing the race in last position. In addition, bonus points are awarded if members of the same team finish the race in first and second place or second and third place. For example, if a member of the team wins the race he is awarded three points, if another member of the same team finishes the race in second place, the rider in second place will be awarded two points plus one bonus point. Bonus points are not included the team score but are awarded to an individual rider. The reason for this is that part of the rider's wage is calculated on the number of points he is awarded in a meeting, the award of bonus points avoids the situation where members of the same team are competing against one another. These rules only apply to league meetings, alternative rules may apply to challenge or benefit meetings.

Teams in the same league compete against each other twice, once at their home track and once at the track of the opposition. At the end of a meeting, the wining team is awarded one point. An extra point is awarded to the team which wins on aggregate over the two meetings. These points determine the position of the team in the league.

APPENDIX 6

SUMMARY OF MOTORCYCLE SPEEDWAY INTERVIEWS

Rider Preparation

At the start of the season, riders are issued with a league fixture list which details the date, time, venue, opposition and format of the meeting they are required to attend. Verbal reminders of any changes or additions to the fixture list are given by the team manager during the season. Preparation is continuous, beginning at the start of the season when the racing schedule is issued. Bikes and engines are prepared for a particular track, settings are determined by the size and shape of the track, the condition of the track (whether it is slick or heavy), the preparation of the track, weather conditions and previous experience of the track.

Preparation may also include looking at the consistency of the opposition, although this level of preparation varies between riders. Some riders follow the progress of other riders through speedway magazines, teletext and videos. Videos of meetings are sometimes viewed by riders to analyse the style of a rider and the race line they follow around the track.

For a major international meeting, a successful meeting is dependent on the focus and relationship between the rider, the bike and the mechanic; everything else that is going on around the rider, both on and off the track, should be ignored. The aim is always to win the meeting, even if it is a qualifying meeting where the top x number of riders progress to the next stage of the competition. The objective is to win the first few heats so that the rider then only needs a few extra points to ensure that he qualifies. If the rider does not win the first few heats, then the meeting programme needs to be examined to identify what the rider needs to do in his remaining rides in order to qualify.

Review of Performance

After a race meeting, the rider has a detailed discussion with his mechanic about all the mechanical adjustments that were made to the bike during the meeting. The mechanic is responsible for documenting all the changes made in the 'rider notebook' for future meetings at the same track. Changes made during the meeting may include adjustments to the carburettor, tyre pressure, ignition and fuel concentration.

The most important document after the meeting for a rider is the completed programme from the meeting. This identifies the performance of the rider during the meeting against the opposition. When reviewing the meeting, the rider considers the general track conditions and how they changed during the meeting; the races which went particularly well or particularly badly; his performance against individual riders. The video of the meeting may be of particular importance to inexperienced riders to help them review the riding line of the track.

An experienced rider may only be concerned with the number of points they scored in a meeting, on the basis that if they did not win a heat then something went wrong which needs to be identified. For example, there may have been a problem with the set-up of the bike which should have been detected, corrected and resolved before the next heat.

Teams

The promoter works in isolation during the winter and is the first to be informed of changes in regulations. The team manager and team captain may be involved with team selection or they may have to work with the team that the promoter has selected. The promoter has a points quota with which to form the team for the season. The first task is to choose the top three riders for the team and remove their points from the quota; this determines the strength of the team. A list of all riders' 'green sheet average' is then attained and potential riders are noted. In selecting the remaining four riders it is important to consider the personal relationships between the riders to ensure a coherent team is attained, in addition, it is necessary to consider which riders compete well on the shape and conditions of the home track. The promoter must also consider which riders are currently unsigned by a team and individual rider contracts as the club may not be able to afford the riders wanted. The consistency of the middle and bottom riders in the team determines the depth of the team.

It is important that the riders, team captain, team manager and promoter all work well together for the riders to perform well as a team. The order of riders in the team is determined by the meeting schedule issued by the S.C.B. The top riders compete in heats one, three and four and are given positions one, three and five within the team format. It is then necessary to examine how well a rider is able to compete with other riders on the track and how well the rider races with the rest of the team. For example, two riders who cannot 'team ride' well could be sent out together in the same heat as they will each 'look out' for themselves. The number two rider in the team is required to enter a heat with the top riders from both teams and therefore needs confidence to attain third place in the heat.

Guest riders may replace a rider who is unable to compete in a meeting as a result of injury. When selecting the guest rider it is first necessary to look at the average score of the rider being replaced. The average score of the guest rider may be equal to or less than the rider he is replacing. Further considerations then include identifying riders available to attend the meeting, who rides the track well, the current form of the rider and how comfortable the rest of the team are with the guest rider as it is important that the team accepts the guest rider as a team member for the duration of the meeting.

The team captain's job is to help the team which may mean lending a wheel, answering questions or just phoning them when they are feeling down. Each member must give 100% to the team, be dedicated and loyal to team. The members must get on well with each other and there must be some team spirit which is epitomised by the captain. Speedway is dangerous and it makes a difference to be part of a supportive team. A good team is one which at the start of the year has the potential for improvement.

At the start of a meeting, the team may discuss what went right and wrong during the previous meeting. Prior to a meeting, the team walk around the track together looking at the track conditions, for example, the consistency of the dirt on the track, any holes or bumps in the track and the camber of the track, track conditions at the starting gate and the safety fence. During the meeting, if things are not going well for the team or if the meeting is being very closely contested, the team may be called together for a brief meeting.

A good club starts with an enthusiastic promoter and this enthusiasm is then transmitted through the team manager and team captain to the team. A good club makes guests feel welcome and has loyal supporters.

On the Track

Before leaving the pits it is important to identify the other riders in the heat. The most experienced rider of the partnership may tell their partner to try to be up with them at the first bend, so that the more experienced rider can team ride with them against the opposition. If there are riders of equal experience to the most experienced rider, then he will tell his partner that he will do what he can to support him, but realistically he knows his partner will not be with him at the front. Team riding is the close riding of two riders in the same team, blocking the track to prevent, perhaps stronger riders, passing to win the race. When team riding, the rider on the outside of the track moves into the corner first and it may be necessary to indicate to their partner to hold their riding line to block the threat of the opposition. Each member of the team has a job to do, to ride to their average. If a team member has a six point average, then their job is to get six points in the meeting. If everyone in the team does their job then the team wins the meeting. The 'problem' is when a rider tries to do more than he can; he tries too hard to get more points than is expected of him; going for a second place rather than settling for a third place; then he makes mistakes and loses the one point he should have secured.

Experienced riders are aware of everything that happens on the track and know intuitively who is behind them on the track. A rider can hear the bike approaching from behind and if necessary may get a glimpse of the riding leathers, body colours or the front of the bike to identify the rider. Experienced riders can sense the presence of other riders on the track and if he chooses to 'go high' then the other riders are forced to 'go low', and he knows what will happen as he knows would happened if he went 'low'. At the start line, an experienced rider even knows which wheel moved first.

A good race is when there is plenty of over-taking or close racing with each rider trying all the way. A good meeting consists of good racing overall; two individual riders pushing each other all the way; a fast track; smooth presentation of the meeting, and most of all, the riders enjoying the racing on the track.

Rider

The history of a speedway rider can be attained by exploring programmes, videos, fan clubs, portfolios, newspaper clippings and magazine reviews. A good rider must be professional, intelligent, have experience on the track, gating ability, courage, determination and be comfortable with his machinery.

Tracks

The size, shape, condition, surface, preparation and weather conditions are key factors affecting a track. A good track to ride has the disadvantage that the opposition can also ride the track well. Home track knowledge includes experience of the width of the track, consistency of the shale, depth of the shale, the safety fence and the riding line of the track. Tracks are basically circular and the fastest way round the tack is by going smoothly into the straight and out of the corner, so the power of the bike is not shut-off. If a rider takes the fastest line round the track and is going as fast as he can, then no one should be able to pass him.

Regulations

Each year riders are issued with the book of speedway regulations from the speedway control board. Supplementary regulations are issued when required for specific meetings.

Speedway Control Board

The general view of the riders is that the S.C.B. does a good job, although there is the concern that regulations can never go far enough in terms of safety.

Training

Riders need information about safety equipment, mechanical equipment and the suppliers of equipment. In Poland and Sweden, each track has a training coach, in Great Britain, rider training is lacking. Speedway schools teach the following basic aspects of speedway riding:

1. Bike control.
2. Bike response.
3. Clutch control.
4. Feel of the bike.
5. Slide into corner.
6. Exit from corner (learn to exit a corner before learning approach to corner).

The three key factors of speedway riding are:

1. Speed into the corner.
2. Approach to the corner.
3. Entrance into the corner as this affects the exit out of the corner.

New riders need to practice and watch race videos in detail. Electronic devices are available to improve hand and eye co-ordination and a chassis may be mounted on a spring to simulate the effect of cornering, however, nothing replaces time on the track.

International Racing

Although each country has its own governing body, the speedway regulations are similar in all countries. In Sweden the league format is the same as Great Britain and Poland adopts a similar format. In Denmark each meeting is a four team tournament consisting of fifteen heats with one rider from each team competing in a heat, followed by a nominated riders heat.

In Great Britain speedway is a business but overseas, speedway is a club, a social event with the stadium an integral part of the local facilities run by volunteers. Abroad, tracks are wider and purpose built whilst in Britain many tracks were built for greyhound racing. Abroad, supporters support speedway whereas in Britain, fans support individual teams.

America has a team but Britain is said to have seven riders. British riders are very complacent whilst Americans are very positive, coming to Britain as teenagers with nothing to do but work on their bikes and their work and dedication pays off.

Manufacturers

A rider may approach a manufacturer for sponsorship but top riders are approached by manufacturers in order to encourage other riders to use their equipment. Manufacturers earn 20% of the speedway revenue. As a result of the large sums of money involved at the higher levels of competition, riders may, for example, send their engines abroad each week to be adjusted.

Promoter

The club must be run as a professional business as the promoter pays the riders and speedway officials. Promoters are concerned with making money which comes primarily from charging spectators to enter the stadium. British spectators support a team, however, persistent poor performance of a team results in a loss of support. In addition, spectators want to be entertained and wining the meeting may not be sufficient to maintain interests. Many clubs have realised that the charismatic personalities and showmanship of American riders satisfy the entertainment need of the public.

A second source of revenue is secured by sponsorship contracts with local businesses. This places greater pressure on the team and individual riders to be successful, increasing the profile of local businesses. Riders are continually seeking sponsors but are rarely approached. It is important that riders look after the sponsors they have.

Refereeing

Refereeing has not changed over the years except that now some referees are questioning the formality of the job for example, why is it necessary for a referee to wear a shirt and tie? why must a referee not support a team or talk to riders or discuss decisions? There is a core of referees who believe in the need to 'beat the rider' but that is not what the job is about. In many cases referees are treated better and earn more than the riders who are risking their lives on the track.

Until two hours prior to the start of the meeting, the promoter may decide to cancel a meeting due to poor track conditions and inform the referee of this decision. Less than two hours prior to the start of the meeting, the referee must meet with the two team captains to decide whether the track is safe to ride, however, team captains are under pressure to race as the promoter loses money if a meeting is cancelled.

Referees do not need to prepare for a meeting, although they must arrive at the stadium at least an hour before the programmed start-time. At the start of the season, each referee completes a form stating whether they can attend meetings at each track regularly, occasionally or only in an emergency. The referee must also state his travelling distance to each stadium and the specific dates when he will be unavailable. Referees are then given a grade A-D which determines the amount they are to be paid by a promoter to attend a meeting. In addition, referees may specify a tour of which there are separate allowance rates to allow a referee to attend consecutive meetings in a region over three to four nights. All this information is used when allocating referees to meetings. Although the nearest referee available is the most appropriate, there is a regulation which specifies that a referee can only attend a meeting at a specific stadium once every four weeks.

Referees are informed of regulations by the S.C.B. and after licensing, referees are not retested. During a meeting, the referee completes the track record book and collects the medical certificate from the doctor in attendance, meeting certificate from the track marshal, the riders and officials attendance sheet and the incident report from the time-keeper. If a referee fines a rider, the money is collected by a referee the following week. During a heat, the referee presses two buttons, one for the green light to start a race, one for the red light to stop the race if for example, an accident occurs. The referee pays particular attention to the first and second bends of the track where accidents may occur, making decisions instantly by helmet colour, unaware of the individual rider.

During the meeting, the referee may communicate with the clerk of the course for team changes and may choose to speak with a rider about a complaint. The referee may ask the starting marshal or clerk of the course to warn a rider about his conduct at the start gate and that if the rider persists in this action, he may be fined.

Announcer

The announcer's job is to be informative, unbiased and give no comment which may incite the crowd. This requires the announcer to speak clearly and present accurate information to the spectators to aid the enjoyment of the sport. The announcer must help to ensure that the meeting is carried out smoothly; helping out in any way possible. For example, making announcements for the safety exits to be cleared and reporting lost children.

At the start of the year, a fee is agreed with the promoter for attending all home speedway meetings. If at a later stage, the announcer is unavailable for a meeting, he must give four weeks notice to the promoter and try to find a replacement announcer. Before a meeting, the announcer spends about five minutes with the promoter. The promoter informs the announcer of any 'special' requirements for that evening, for example, to announce sponsorships or 'coming attractions'.

Journalist

During a meeting the journalist notes controversial issues, good racing, crashes, close scores, tense atmosphere and last heat deciders. At the start of the season, riders may ask journalists who has signed for which team. The journalist must spend time socialising with riders before and after a meeting to establish and maintain a good relationship with the riders, which is essential for the mutual benefit of riders and journalist.

Critical Success Factors for Speedway Riders

1. Positive mental attitude.
2. Confidence.
3. Fitness (flexibility, mobility and general fitness).
4. Preparation of gears, tyre pressures and engine timing for the track and track conditions.
5. "If you are perfectly prepared then you are ready to seize any opportunity = luck" (anon.).

Strengths of the Sport

1. Family sport.
2. Colourful.
3. In a world final, individual loyalties are transferred as riders are knocked out until at the end, everyone supports the winning rider.
4. Variety of tracks in Britain.
5. Professional motor sport.

6. Fast, exciting.
7. Local team support.
8. Riders approachable.

Weaknesses of the Sport

1. Safety fences.
2. Dwindling supporters.
3. Lack of television coverage.
4. Lack of media promotion (e.g. newspapers).
5. Lack of junior training.
6. Lack of investment.
7. Image of motorbikes, noisy, dirty, cold, wet.
8. Poor public facilities, stadiums are run down.
9. Stadiums are not owned by speedway managers and are therefore under constant threat from housing developers.
10. National press is only interested in scandal and large transfer fees of football.

Opportunities in the Sport

Opportunities are there but are not being taken, for example, if nine Midland tracks paid £1000 each it would buy a thirty second advertisement on local television at the start of the season. Riders and promoters only think of the costs of spending money now, rather than in the investment potential of the future.

1. Availability of new equipment and changes in regulations to permit the use of the equipment.
2. Proposed adoption of grand prix format.
3. Proposed grand prix coverage by Sky television.
4. Proposed changes to league formats.
5. Amateur clubs.
6. Sponsor for the league.

Threats to the Sport

1. Defeat.
2. Injury.
3. Insufficient preparation time on the track or bike.
4. Too many other sports and forms of entertainment.
5. Ecology, environmental factors of noise pollution, burning of fuel.

6. Loss of top international riders. These are the riders the spectators want to see but more and more riders are realising that the demands of the British league are too tough to enable them to ride in the British league and pursue an international career.