

Chapter 4

A HIGH LEVEL ANALYSIS OF THE SOFT SYSTEMS APPROACH

“The aim of education is the knowledge,
not of fact, but of values”¹

W R Inge. Dean of St Paul's

4.1 INTRODUCTION

The revered and industry proven academic research of Beer, Churchman, Checkland, Ackoff and Mitroff and Mason into the complexities of the soft systems approach, is in the opinion of the author, highly representative of this concept from a holistic point of view. Furthermore, the research in this thesis will be limited to the work of these authors as they were specifically selected for their appropriateness to this research. It would however be naïve, not to acknowledge the work of other influential academics in the field of soft systems methodologies, which regrettably will be limited to a select few and a brief overview of these methodologies will be provided at the end of this chapter for the purpose of completeness.

The following problem solving methodologies will be analysed at a high level in this chapter:

- The Viable Systems model of Beer (Organisational cybernetics).
- Churchman's Social Systems Design.
- Checkland's Soft Systems Methodology.
- Ackoff's Interactive Planning.
- Mitroff and Mason's Strategic Assumption Surfacing and Testing Methodology.

¹ From: The Church is the World. October 1932.

- The analytical process followed thus far, is graphically depicted in Figure 4.1, which places the chapters in context with the overall thesis objectives, and furthermore indicates the relative positioning of this chapter.

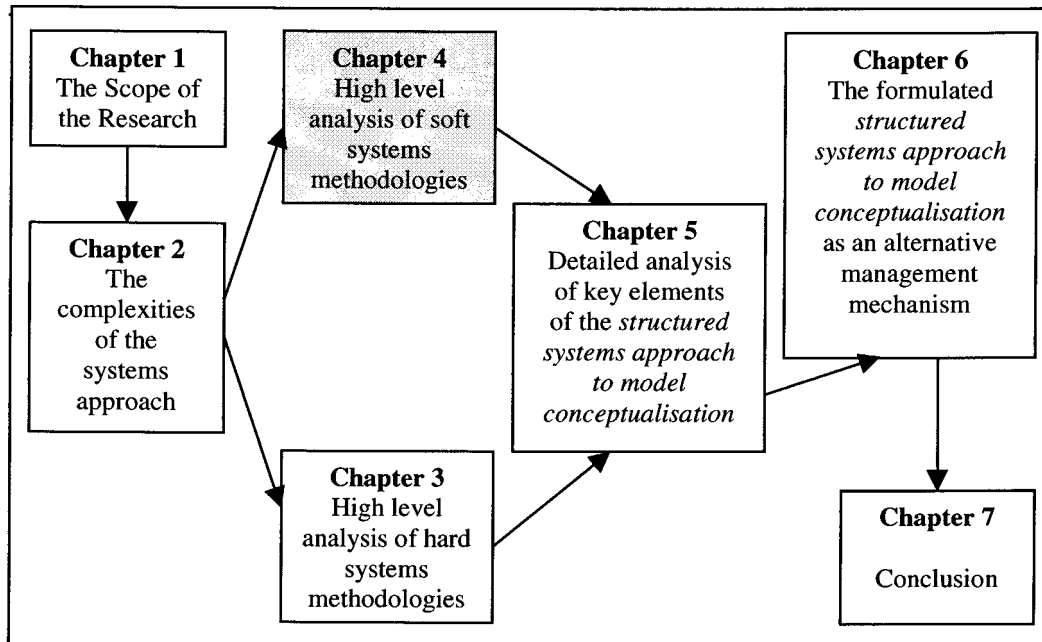


Figure 4.1: Chapters in context of the overall research

An analysis of Figure 4.1², shows Chapter 1 as the overall research approach to the thesis. Chapter 2, contains a number of key elements (complexities), which are explained in lieu of the high level analysis of hard systems contained in Chapter 3, and the high level analysis of soft systems, contained in this chapter. Key elements from the high level analysis of hard systems and soft systems methodologies, will serve as preliminary input mechanisms to Chapter 5, where the elements will be further analysed in detail to ultimately culminate in a formulated *structured systems approach to model conceptualisation*. Chapter 6 will depict the *structured systems approach to model conceptualisation* as an alternative management mechanism in practice, while Chapter 7 will contain a summary of the thesis content.

To ensure that the entities under discussion are not only appropriately placed within context of soft systems, but also within context of the overall research of

² Arrows in Figure 4.1 represents 'information flows' (inputs) from one chapter to the other.

this thesis, the classification of systems falling within the ambit of the systems approach depicted in Figure 2.1, is repeated here as Figure 4.2 for ease of reference.

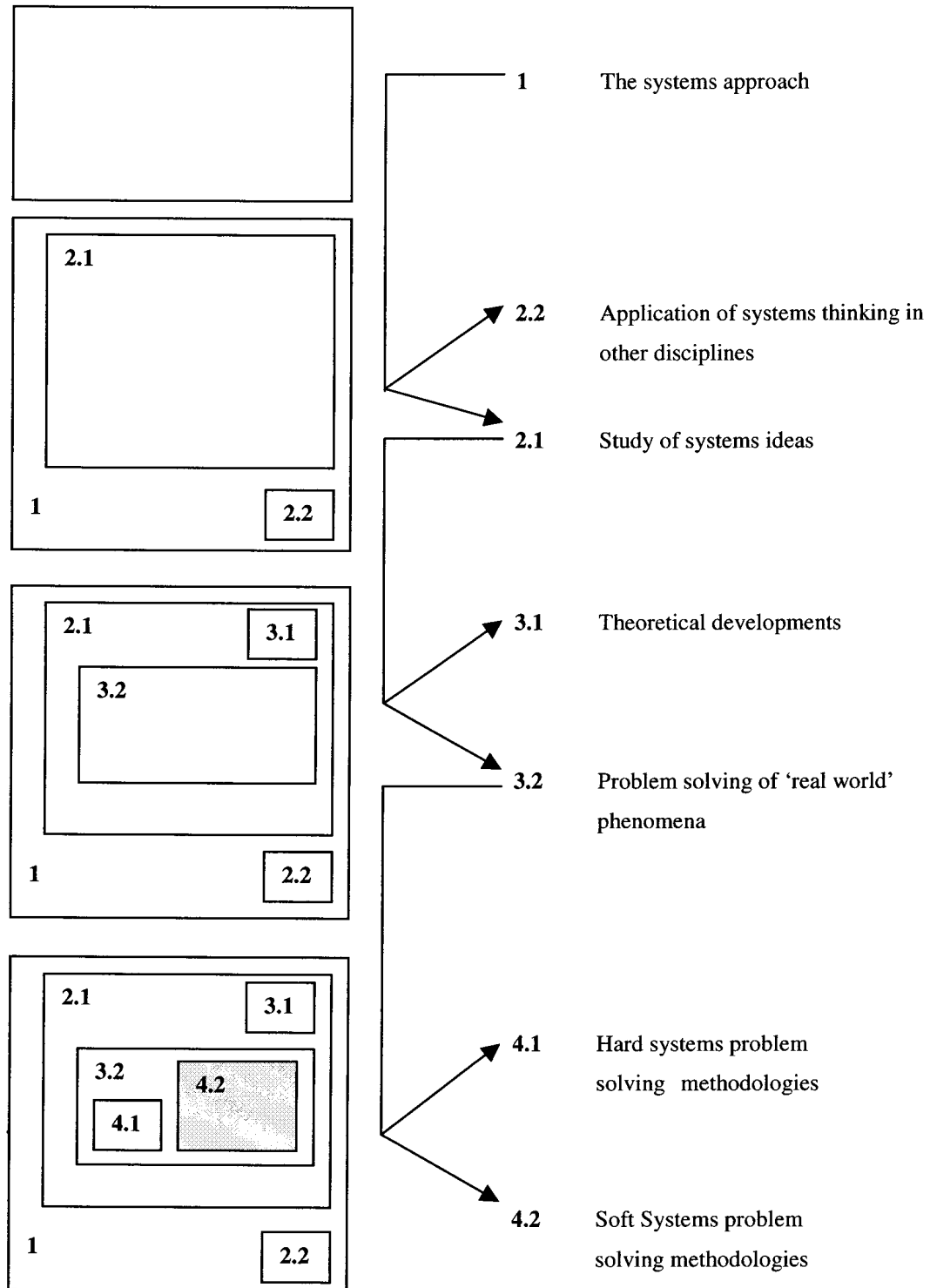


Figure 4.2: Classification of systems falling within the context of the systems approach

4.2 BEER'S VIABLE SYSTEMS MODEL

4.2.1 BACKGROUND

The traditional company organisational chart is, for Beer [22] totally unsatisfactory as a model of a real organisation, offering his Viable System model as a more useful and suitable alternative option. Beer's model consists of five sub-systems – System One to System Five. According to Jackson [80], citing Beer (1979), the same model is derived from cybernetics and can therefore be applied to firms and organisations of all kinds³. Beer [23], in a later work presents the model in the form of a 'managers guide', the intention being to aid application of the principles to complex phenomena pertaining to management *per se*.

According to Jackson [80], a system is viable if it can respond to environmental changes, and to remain viable, has to achieve requisite variety with the complex environment with which it is faced. Beer sets out a number of strategies that can be used by managers to balance the variety equations, the most important of which involves 'variety engineering', previously discussed in Chapter 3, Paragraph 3.5.3. Having previously created some understanding of 'organisational cybernetics' *per se*, (refer Chapter 2, Paragraph 2.5) the philosophy and principles of the Viable Systems model of Stafford Beer, which is intimately associated with this concept, require closer scrutiny.

4.2.2 PHILOSOPHY OF THE VIABLE SYSTEMS MODEL

The philosophy that drives Beer's (1979) view of cybernetics cited by Watkins [177], concerns the kind of changes to be experienced in the Twenty First Century. Beer (1979) is of the opinion that 'new ways' are required to deal with difficulties associated with changes. The main points are summarised by Flood and Jackson [56] as follows:

³ The reader is cautioned to view this statement against the background of the analysis of cybernetics (Refer Chapter 2, Paragraph 2.5), where a clear distinction is made between 'organisational cybernetics' and 'management cybernetics'.

- Organisational and social problems arise because of new degrees of complexity (organisational, technological, informational and so on) and are characterised by interdependency.
- Scientifically based management taking advantage of technological advances (e.g. increased information processing capability) is vital because more traditional approaches are quite simply too trivial, and in isolation are not well worked out. Therefore, a scientific model that is based on cybernetic principles and which encompasses many ideas from management science is fundamental in our efforts to deal with modern complexities.
- Since control is the main concern, the best approach is to replicate a well tried and tested control system, this being evident in the neuro-cybernetic processes of the human brain and nervous system as it has evolved over millennia (the same control model can, however, be derived from cybernetic first principles and is applicable to all systems.)
- Organisations ideally are ordered so as to achieve efficient and effective realisation of set goals, although the goals themselves have to be continually reconsidered in response to a rapidly changing environment through self-questioning, learning and by assessing future scenarios.

4.2.3 PRINCIPLES OF THE VIABLE SYSTEMS MODEL

The principles that underpin the approach, are all cybernetic in nature and outlined by Flood and Jackson [56] as follows:

- Recommendations endorsed by the Viable Systems model do not prescribe a specific structure, rather they are concerned with the essentials of organisation and maintenance of identity. They are, therefore, relevant to all types of enterprise, whether small, medium or large, in all types of industry. The structural outline of the Viable Systems model is completed with one of the basic concepts developed by Beer [22], namely the concept of a 'recursion levels'. In its most elementary formulation according to Hobeke [75], the 'Recursive System Theory' reads as follows:

"In a recursive organizational structure, any viable system contains and is contained in a viable system".

Furthermore, the notion of recursion is fundamental so that vertical interdependence can be dealt with. Recursion means that the whole system is replicated in the parts so that the same viable system principles may be used to model a sub-system (a division) in an organisation, and its supra-system (that of which the system is a part or a division of).

- In any viable unit, horizontally interdependent sub-systems (divisions) are integrated and guided by the viable unit's 'meta-system', or 'higher' management levels.
- Sources of command and control are of particular concern and in the Viable Systems model these sources are spread throughout the architecture of the Viable Systems model, which enhances self-organisation and localised management of problems.
- Emphasis is placed on the relationship between the viable unit and its environment in terms of influencing and being influenced by it and particularly on using this relationship to promote learning.
- There are many other cybernetic principles that make up the viable system view, from rather simple notions of feedback to important principles such as the 'Law of Requisite Variety' (refer Chapter 3, Paragraph 3.5.3), that is, the variety of the controller must be equal to, or greater than that which is being controlled.

4.2.4 CONSTRUCTION OF THE VIABLE SYSTEMS MODEL

This highly complex model consists of basic building blocks forming the core of its structure and is comprehensively discussed by Beer [22] in his work *'Brain of the Firm': 'The Managerial Cybernetics of Organization'*. Using the abbreviated analysis of Clemson [39], as opposed to the comprehensive study of Beer [22], the interactive components, which forms an operational unit are shown in Figure 4.3.

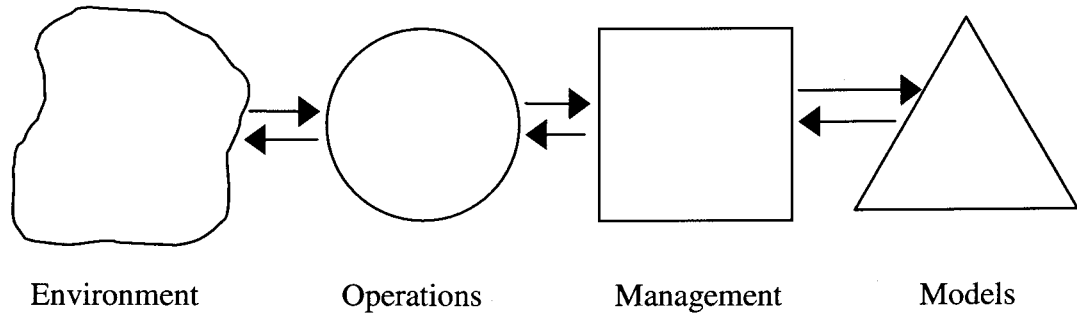


Figure 4.3: An operational unit dissected to show the major interactions [39]

Figure 4.3 can be analysed as follows:

- **Environment:-** The amoeboid shape is represented as an operational unit within an organisation.
- **Operation:-** Imbedded within the environment with a flux of interaction between the 'environment' and the 'operation'.
- **Management:-** (Of the operation) There is a clear distinction between the 'operation' and 'management' thereof.
- **Models:-** As in the case between management and operation, a clear distinction exists between the 'management' and the 'models' of the organisation or unit that the management holds. These models may be partially explicit (e.g. a computer simulation), but they are always at least partially (and often almost entirely) implicit, buried in people's heads in the form of biases, prejudices or guesses etc. In whatever form these models exist, they constitute the management's view of the unit that is being managed.

Figure 4.4 depicts an operational unit showing the parts environment, operations, management, and models embedded within one another.

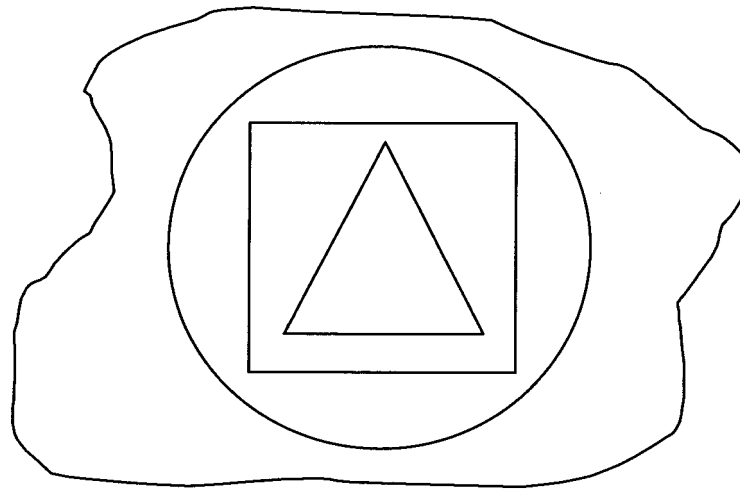


Figure 4.4: An operational unit showing the parts embedded [39]

To represent a whole organisation, Figure 4.3 can be expanded to reflect a set of related operational elements as depicted in Figure 4.5

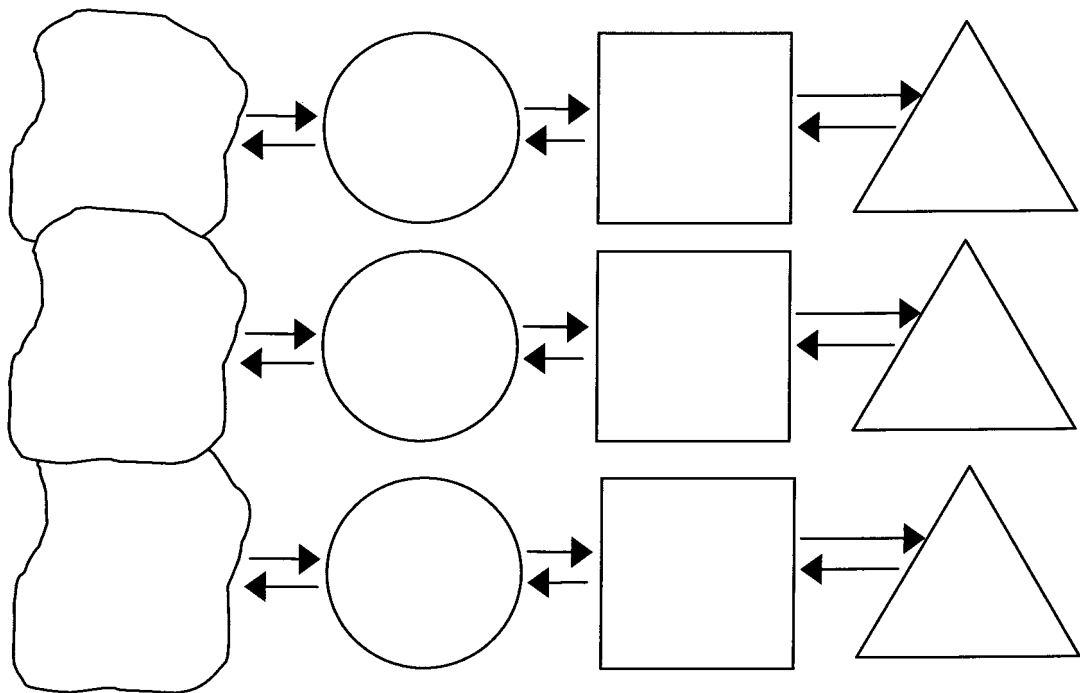


Figure 4.5: A set of related operational elements [39]

The five components making up the Viable Systems model (System One to System Five) can be analysed as follows:

- **System One:-** By linking the interaction of views of each manager in charge of each unit and the direct interaction which flows from one operation to the other, the set of related operational elements depicted in

Figure 4.5 can be redrawn to collectively make up an organisational entity, termed 'System One' by Beer [23] and depicted in Figure 4.6.

In summary, the following key aspects concerning 'System One' are applicable [56]:

- System One parts are directly concerned with implementation.
- Each part is autonomous in its own right.
- Each part exhibits all the features of a viable system itself.
- Each part connects to its local environment and so absorbs much of the overall variety.

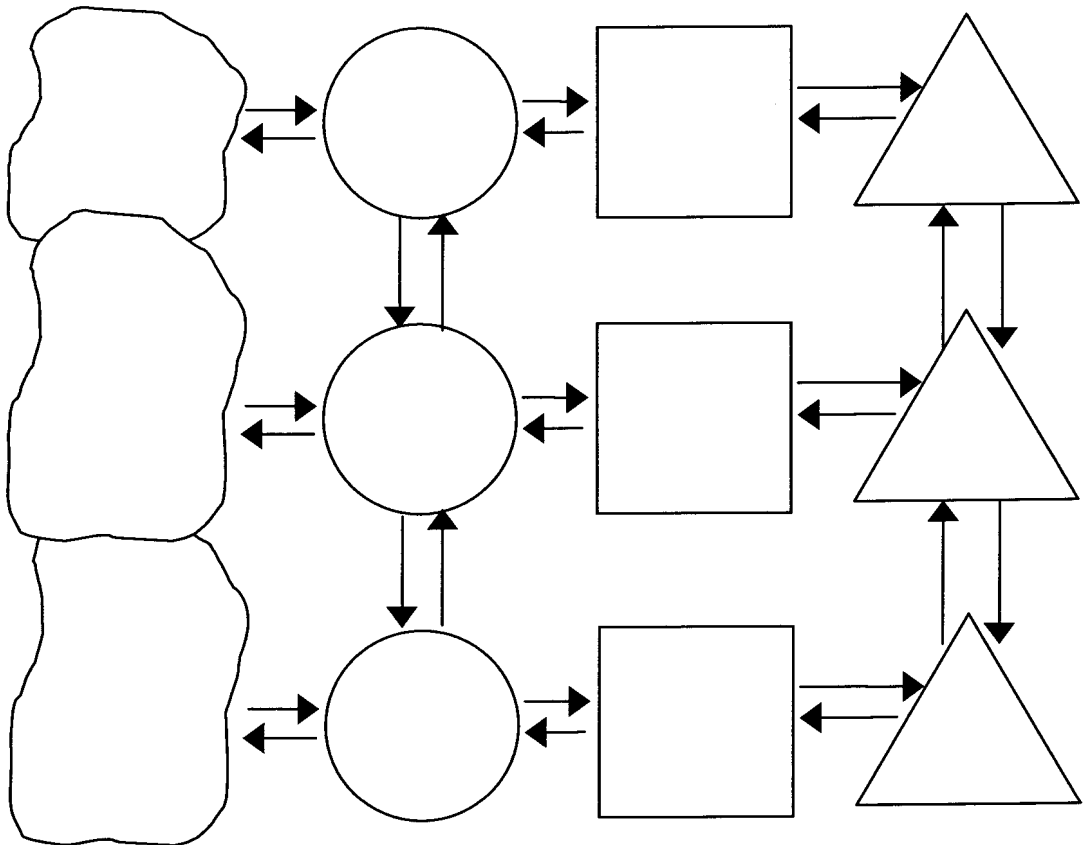


Figure 4.6: 'System One': A set of operational elements which collectively make up an organisational entity [39]

- **System Two:-** This system, 'the co-ordination channel' prevents the various operational units from affecting each other adversely through inadequate co-ordination to operate effectively, the function of system two must operate as a real-time co-ordinated mechanism for the operational elements.

In summary, the following key aspects concerning System Two are applicable [56]:

- Co-ordinates the parts that make up System One in a harmonious manner.
- Dampens uncontrolled oscillations between the parts.
- **System Three:-** This system is charged with maintaining 'internal' homeostasis (audit) which may include the following tasks:
 - Ensure that its organisation, as an entity, produces the outputs that the larger organisation requires of it.
 - Ensure that its internal operational elements each produce the outputs that it is assigned to produce.
 - Ensure that its internal operational elements are able to secure resources that they need to function.
 - Ensure that the workings of its internal operational elements are co-ordinated and do not generate vicious cycle effects.
 - Be concerned about the possibility of synergistic relationships among its operational units.

In summary, the following key aspects concerning System Three are applicable [56]:

- A control function that ultimately maintains internal stability.
- Interprets policy decisions of higher management.
- Allocates resources to the parts of System One.
- Ensures effective implementation of policy.
- Carries out 'audits' using the System Three auditing channel.
- **System Four:-** This system is charged with the 'external' and the 'future', as contrasted with System Three, which deals with the 'internal' and the 'now' and, which may include the following tasks:
 - Create an explicit model of the organisation – 'what' does the organisation do and 'how' does it do it?
 - Model the organisation's environment.

- Given that the organisation has a model of itself and a model of its problematic environment, it now is tasked to build its 'desired' future.

In summary, the following key aspects concerning System Four are applicable [56]:

- An intelligence gathering/reporting function that captures all relevant information about a system's total environment.
 - Provides a model of the organisation's environment.
 - Distributes environmental information upwards or downwards according to its degree of importance.
 - Brings together internal and external information in an "operations room" - an environment for decision.
 - Rapidly transmits urgent information from Systems One, Two and Three to System Five.
- **System Five:** This system has, as its primary function, the maintenance of creative tensions between Systems Three and Four. This implies that System Five has to maintain a balance between 'stability' entrenched within the context of System Three, and 'change' entrenched within the context of System Four. Furthermore, System Five is typically a function of the organisation's executive management. Thus, System Five, which provides 'identity', would also be able to maintain the proper balance between System Three and System Four.

In summary, the following key aspects concerning System Five are applicable [56]:

- Is responsible for policy.
- Responds to significant signals that pass through the various 'filters' of Systems One, Two, Three and Four.
- Arbitrates between the sometimes-antagonistic internal and external demands on the organisation as represented respectively by Systems Three and Four.
- Represents the essential qualities of the 'whole system' to any 'wider system' of which it is a part.

The completed structure of the Viable Systems model can now be graphically summarised by expanding Figure 4.6 as follows, using the following set of conventions as suggested by Clemson [39], and ultimately culminating in Figure 4.7.

- **System One:-** The collection of operational elements.
- **System Two:-** The co-ordinating function.
- **System Three:-** The 'internal' and 'now' management function.
- **System Four:-** The 'external' and 'future' management function.
- **System Five:-** The closure and identity management function.
- **Recursion:-** Level 'N' of recursion – one level in a hierarchy of autonomous entities, each of which has a System One, a System Two, a System Three, a System Four, and a System Five.

Analysing the Viable Systems model holistically, the concept is made up of an arrangement of five (Systems One to Five) functional elements that are interconnected through a complex of information and control loops (communication links) [56] as depicted in Figure 4.7. Emphasis on recursion allows the utilisation of the 'same' basic model to represent, for example, a company and its divisions together with the wider organisations of which it may also be a functional part.

Of importance is the presence of information and control loops (information links), depicted by \longrightarrow in Figure 4.7, interconnecting System One to System Five. The information flowing around the various system entities present within the model contains information about how the different parts of the organisation and the organisation as a whole are performing in relation to their respective functions.

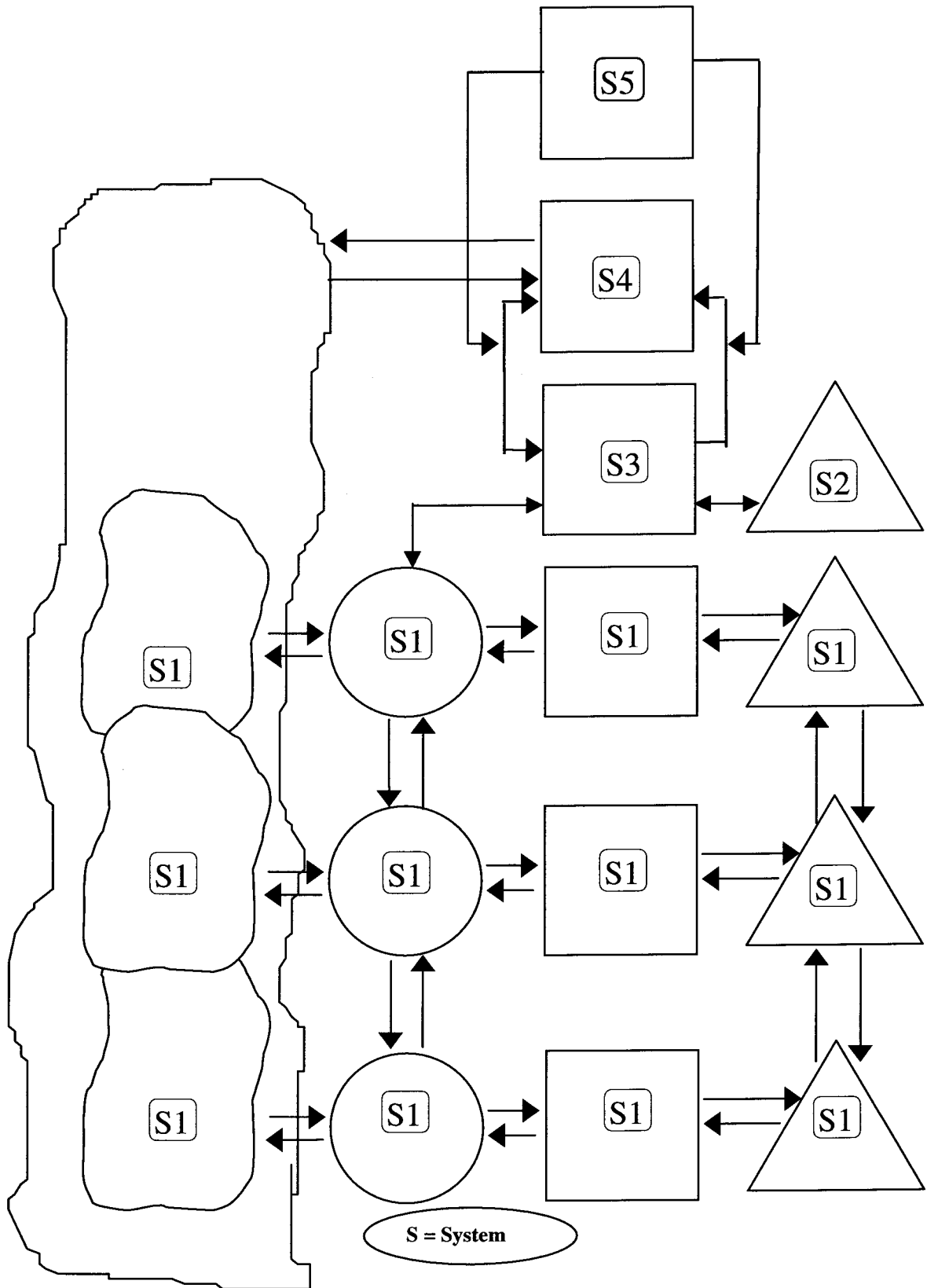


Figure 4.7: Outline of the structure of the Viable System model [39]

4.2.5 ADVANTAGES OF THE VIABLE SYSTEMS MODEL

The Viable Systems model offers the following notable advantages:

- There is a strong focus on organisational structure, communication and control processes.
- There is a distribution of control and authority (decision making and problem solving) to the correct levels.
- There is a distinct focus on relationships between the units within the organisation, their environments and the overall environment within which the organisation operates.

4.3 CHURCHMAN'S SOCIAL SYSTEMS DESIGN

4.3.1 INTRODUCTION

In an analysis of Churchman's Social Systems Design, it is interesting to note that Churchman [34] is of the opinion that:

"The systems approach consists of a continuing debate between various attitudes of mind with respect to society".

Churchman's perspective on systems thinking is the result of careful and profound philosophical exploration. The works of Churchman, while rewarding, is difficult to interpret even by the standards of revered academics in the likes of Checkland [29], Jackson [80] and Flood and Jackson [56] (by their own submissions). The work of Churchman relating to his Social Systems Design, is primarily contained within the ambit of the following academic publications:

- '*The Systems Approach*' [34].
- '*The Design of Inquiring Systems*' [35].
- '*The Systems Approach and its enemies*' [32].

4.3.2 SOCIAL SYSTEMS DESIGN EXPLAINED

In his book *'The Design of Inquiring Systems'*, Churchman [35], considers that the most important intellectual activity is 'the formulation of social systems'. The book's method is to examine the work of five historical figures – Leibniz, Locke, Kant, Hegel and Singer, taking them to be designers of systems to produce sure knowledge. In an attempt to analyse Churchman's social systems design, Jackson [80], Checkland [29], and Flood and Jackson [56], take the four aphorisms that Churchman use in his book *'The Systems Approach'* [34], and expand upon them. The four aphorisms (my italics) are:

- *"The systems approach begins when first you see the world through the eyes of another"*.
- *"The systems approach goes on to discovering that every world-view is terribly restricted"*.
- *"There are no experts in the systems approach"*.
- *"The systems approach is not a bad idea"*.

4.3.2.1 THE FIRST APHORISM ANALYSED

The first aphorism, *"The systems approach begins when first you see the world through the eyes of another"*, contains lessons from philosophers Kant and Hegel.

- According to Kant cited by Flood and Jackson [56] and Checkland [29], we all tell a particular 'story of the world' (*'Weltanschauung'*), based on our own, taken for granted, *a priori*, assumptions. However, it is as well to recognise that there are other equally legitimate stories based upon alternative sets of *a priori*, assumptions. Once we recognise this, we are *en route* for the systems approach, because it becomes clear that 'subjectivity' must be embraced in systems thinking, different evaluations of what we want to attain from systems, and of their current state of performance, are possible. The only way of grasping the 'whole system' is to sweep in as many different perspectives as possible.
- According to Hegel cited by Jackson [80], it is wise for systems designers to recognise that there are many possible world-views (*'Weltanschauungen'*), constructed upon alternative sets of taken-for-granted assumptions. Once

accepted, it becomes clear that subjectivity should be embraced by the systems approach. Systems designers must accept that completely different evaluations of social systems, their purpose, and their performance can and do exist. Churchman (1970) cited by Jackson [80], is of the opinion that the only way we can get near to a view of the whole system, is to look at it from as many perspectives as possible.

4.3.2.2 THE SECOND APHORISM ANALYSED

The second aphorism, "*The systems approach goes on to discovering that every world-view is terribly restricted*", according to Flood and Jackson [56], and Jackson [80], opens the way for Churchman to a different understanding of 'objectivity'. Subjectivity is no longer to be rigorously excluded, but must be included in any definition of objectivity – so that the restrictive nature of any one world-view can be overcome. Furthermore, although every world-view is terribly restricted, it is also likely to be highly resistant to change. Certainly, worldviews cannot be seriously challenged by presenting them with new facts, which they will simply interpret according to their fixed presuppositions. All this adds up to the need for a dialectical approach to objectivity, which can be based upon the work of Hegel, the nineteenth-century German philosopher who introduced the notion of 'synthesis of opposites'.

Hegel's central idea according to Pascale [123], and shown schematically in Figure 4.8, is that one entity (which he called 'thesis', when juxtaposed with its opposite 'anti-thesis'), can generate a new configuration that both include and transcends the fundamental elements. This phenomenon is known as Hegel's dialectic.

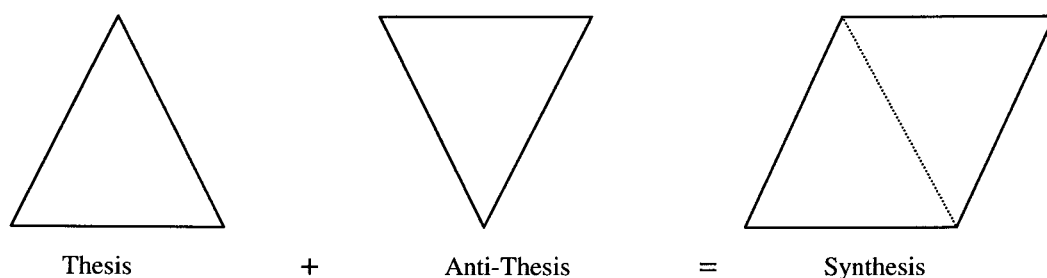


Figure 4.8: Hegel's Dialectic [123]

The analogy that can be drawn from this is that a prevailing worldview (thesis) should be confronted by another worldview based on entirely different assumptions (anti-thesis), in order to bring about a richer (more 'objective') appreciation of the situation, expressing elements of both positions while going beyond them as well (synthesis). The dialectical process advocated by Churchman can, according to Jackson [80], be represented as consisting of the following steps:

➤ **Thesis:-**

- Understand decision maker's proposals.
- Understand the '*Weltanschauung*' that makes these proposals meaningful.

➤ **Antithesis:-**

- Develop an alternative '*Weltanschauung*'.
- Make proposals on the basis of this '*Weltanschauung*'.

➤ **Synthesis:-**

- Evaluate data on the basis of both '*Weltanschauungen*'.
- Arrive at a richer appreciation of the situation.

4.3.2.3 THE THIRD APHORISM ANALYSED

The third aphorism, "*There are no experts in the systems approach*", according to Jackson [80], should be taken to heart most strongly by systems designers. When it comes to matters of aims and objectives, which inevitably involve ethical considerations and moral judgements, there can be no experts. Systems designers, because they seek to take on the whole system, may become arrogant in the face of opposition from apparently sectional interests. It is incumbent on them to listen to all 'enemies' of the systems approach (such as religion, politics, ethics, and aesthetics), since these enemies according to Churchman [32], reflect the very failure of the systems approach to be comprehensive.

4.3.2.4 THE FOURTH APHORISM ANALYSED

With the fourth aphorism, "*The systems approach is not a bad idea*", Churchman tries to capture the spirit of his mentor, the pragmatist philosopher, E.A. Singer, (a former civil engineer [108a]) who advocates the attempt to take on the 'whole

system'. Increasing purposefulness and participation in system design, through the process of dialectically developing world-views, is a never-ending process. Hence, Churchman [35] writes:

“The Singerian inquirer pushes teleology to the ultimate, by a theory of increasing or developing purpose in human society; man becomes more and more deeply involved in seeking goals”.

Churchman [35], is of the opinion that there is a need to help bring about a (Lockean) consensus around a particular world-view so that decisions can be taken and action occur. Before this world-view can congeal into a *status quo*, however, it should itself be subject to attack from forceful alternative perspectives.

4.4 CHECKLAND'S SOFT SYSTEMS METHODOLOGY

4.4.1 INTRODUCTION

Inspired by Churchman's Social Systems Design [34] discussed in Paragraph 4.3, Checkland [29], developed his Soft Systems Methodology for use in ill-structured or messy problem contexts where there is no clear view on what 'constitutes a problem', or what action should be taken to overcome the difficulties being experienced. In terms of the complex phenomena executive management are faced with, Checkland's Soft Systems Methodology has the potential to prevent them from rushing into poorly thought-out solutions based on preconceived ideas about an assumed problem [56].

It is of importance to note that since systems models are always used in the methodological scheme, Checkland's Soft Systems Methodology, clearly assumes that pluralistic issues are tied in with complex issues of organisational structure and process [56]. The analogy can thus be made that Checkland's Soft Systems Methodology, has clear tangent planes with Beer's Viable System model discussed in Paragraph 4.2.

4.4.2 PHILOSOPHY OF THE SOFT SYSTEMS METHODOLOGY

According to Flood and Jackson [56], the philosophy of the Soft Systems Methodology breaks away from the traditional, hard view of the nature of problems. The Soft Systems Methodology, by contrast, believes the problem situations arise when people have contrasting views on the 'same situation'. The notion of a plurality of possible viewpoints, and consequently acceptance of many 'relevant problems' emerges. 'What should be done?' -becomes the main focus of the Soft Systems Methodology. To answer this question, the Soft Systems Methodology attempts to draw in and explore a diversity of viewpoints as part of the decision making and intervention process.

Two distinct paradigms present in systems thinking are identified by Checkland [29], namely:

- Paradigm 1, the hard paradigm, the real world is assumed to be systemic and the methodologies used to investigate such reality are systematic.
- Paradigm 2, the soft paradigm, turns things around stating that the real world is problematic, but the process of enquiring into it, the methodologies, may be systemic. This transfers the notion of systemicity from the world to the process of enquiry into the world.

4.4.3 PRINCIPLES OF THE SOFT SYSTEMS METHODOLOGY

The four main principles of the Soft Systems Methodology according to Checkland [29], are summarised by Flood and Jackson [56] and concerns the elements of learning, culture, participation and two modes of thought.

- **Learning:-** Checkland [29], talks of the Soft Systems Methodology in terms of 'management', seeking to achieve organised action, coping with an ever-changing flux of interacting events and ideas. Learning is about perceiving and evaluating parts of the flux with new perceptions, evaluations and actions emerging.
- **Culture:-** The idea of culture powerfully states that there are organisational and/or social constraints in the real world, which potential changes,

recommended by intervention, must meet. This reinforces the idea of the cohesiveness of social rules and practices.

- **Participation:-** The element of participation is such an important factor in the Soft Systems Methodology, that it would be invalid in its own terms.
- **Two modes of thought:-** The process of the Soft Systems Methodology, can be distinguished in two modes of thought, namely:
 - Abstract and ideal systems thinking.
 - Specific context-related, real world thinking.

4.4.4 SOFT SYSTEMS METHODOLOGY

According to Checkland [29], the Soft Systems Methodology contains two sets of activities namely:

- The first being Stages 1, 2, 5, 6 and 7, which represents real world activities necessarily involving people faced with complex phenomena.
- The second being Stages 3 and 4, which are systems thinking activities, which may or may not involve those in the problem situation.

Figure 4.9, the Soft Systems Methodology, represents a chronological sequence of the stages of the methodology and is to be read from Stage 1 to Stage 7⁴.

The seven stages making up the Soft Systems Methodology, can be analysed as follows [29], [56], [80]:

- **Stage 1:- The problem situation: Unstructured** (refer Figure 4.9, Stage 1).
- **Stage 2:- The problem situation: Expressed** (refer Figure 4.9, Stage 2).

These two phases are termed 'expression' by Checkland [29] during which an attempt is made to formulate the richest possible picture, 'not of the problem', but 'of the situation' in which there is perceived to be a problem.

⁴ While Figure 4.9 represents a chronological sequence of events for the Soft Systems Methodology and a logical sequence which is most suitable for describing it, but which does not have to be followed when using the methodology.

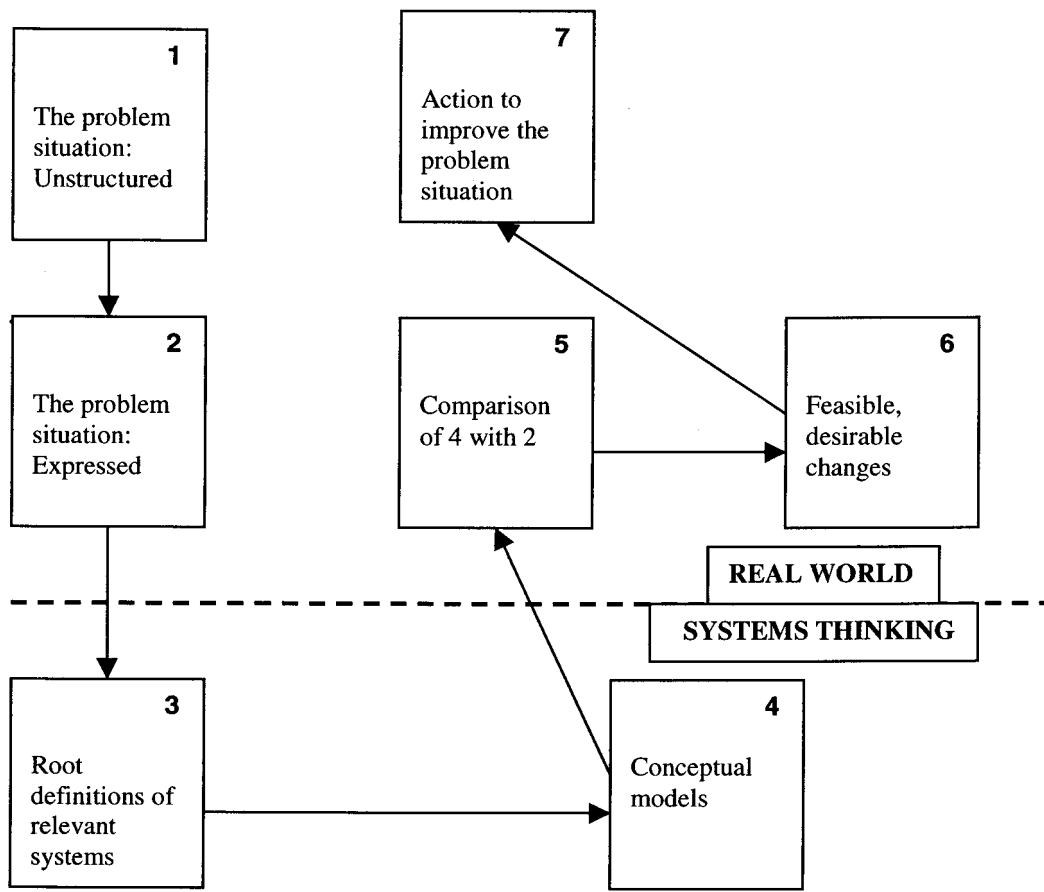


Figure 4.9: The Soft Systems Methodology in summary [29]

Flood and Jackson [52], uses the term 'finding out' for these two phases as it refers to the gathering of information about structure and process by observation, collecting secondary data, and importantly through informal interviews. An alternative approach is to move on to Stages 3 and 4 of the methodology (in this regard, see Footnote 4 of this chapter), as a way of promoting Stages 1 and 2. This is done by developing 'primary tasks' root definitions and conceptual models, which must be relevant to the situation, and then comparing these to the real world using the comparison to guide the 'finding out'.

➤ **Stage 3:- Root definitions of relevant systems** (refer Figure 4.9, Stage 3). While Stages 1 and 2 help in the creation of diverse relevant systems, which are pure views of purposeful activity that may promote action for improvement in the problem situation, Stage 3 is concerned with expanding each of these into concise well formulated verbal statements (root definitions). The aim is to draw out the essence of what is to be done, why it is to be done, who is to do it, who is to

benefit or suffer from it and what environmental constraints limit the actions and activities. This is achieved by formulating the statement around the following six elements:

- **Customers:-** The victims/beneficiaries of the purposeful activity.
 - **Actors:-** Those who do the activities.
 - **Transformation process:-** The purposeful activity, which transforms an input into an output.
 - **'Weltanschauung':-** The view of the world that makes the definition meaningful⁵.
 - **Owners:-** Who can stop the activity.
 - **Environmental constraints:-** Those constraints in its environment that the system takes as given.
- **Stage 4:- Making and testing conceptual models** (refer Figure 4.9, Stage 4). In this stage, a model is formulated of the activity system needed to achieve the transformation described in the definition. The model can now be built to accomplish what is defined in the root definition⁶. Furthermore, the resulting model, when complete, is not a state description of any actual activity system. It is in no sense a description of any part of the real world, it is simply the structured set of activities which logic requires in a notional system, which is to be that defined in the root definition. The whole purpose of this approach is to generate radical thought by selecting some views of a problem situations possibly relevant to improving it, working out the implications of those views in conceptual models and comparing those models with what exists in the real world situation. A conceptual model is constructed by drawing out the minimum number of verbs that are necessary to describe the activities that would have to be present to carry out the task named in the root definition. These are then logically ordered according to how they depend on each other and how they would work together in the real system. According to Checkland [29], the final model should represent a compilation of 'management' components, which arguably have to be present if a set of activities is to comprise a system capable of purposeful activity.

⁵ In this respect, refer to Chapter 2, Paragraph 2.8 and to Churchman's 'Social System Design' (refer Paragraph 4.3 of this chapter), for tangent planes to the concept 'weltanschauung'.

⁶ The root definition from Stage 3, is an account of what the idealised system is, while the conceptual model built directly from the root definition in Stage 4, is an account of the activities which the system must do in order to fulfil the requirements of the root definition.

Furthermore, the final model should follow Churchman's [35] nine conditions that determine a system⁷. The components of the model according to Checkland are as follows: *S* is a formal system if, and only if:

- *S* has an on going purpose or mission.
 - *S* has a measure of performance.
 - *S* contains a decision-taking process.
 - *S* has components, which are themselves systems having all the properties of *S*.
 - *S* has components, which interact, which show a degree of connectivity such that effects and actions can be transmitted through the system.
 - *S* exists in wider systems and/or environments with which it interacts.
 - *S* has a boundary, which separates it from the wider systems and/or environments with which it interacts.
 - *S* has resources, which are at the disposal of the decision-taking process.
 - *S* has some guarantee of continuity.
- **Stage 5:- Comparing conceptual models with reality models** (refer Figure 4.9, Stage 5). According to Checkland [29], the comparison is the point at which intuitive perceptions of the problem are brought together with the systems constructs, which the systems thinker asserts to provide an epistemologically deeper and more general account of the reality beneath surface appearances. Furthermore, it is the comparison stage, which embodies the basic systems hypothesis that system concepts provide a means of teasing out the complexities of 'reality'. Flood and Jackson [56] summarises this step and describes the aim behind the comparison stage as being essentially to generate debate about possible changes that could be made to bring improvements in the problem situation. The authors [56] continue and expand on the following steps suggested by Checkland [29] to make full use of the potential of the comparison:
- From a number of models, identify the main differences that stand out against current perceptions.

⁷ For an analysis of Churchman's [35] nine conditions of a system, refer to Chapter 2, Paragraph 2.2.

- Compile a formal listing of formal differences for each conceptual model and annotate with questions for which answers need to be sought in the situation itself.
- Compile a scenario – describing how the system captured in the conceptual model is expected to behave into the future.
- Construct a model of the part of reality similar to the model, with a view to mapping between the two, which may highlight significant differences worthy of discussion.
- **Stage 6:- Feasible, desirable changes** (refer Figure 4.9, Stage 6). Changes of three kinds are possible, namely changes in structure, changes in procedures and changes in attitudes. According to Checkland [29], the purpose of Stage 6 is to use the comparison between conceptual models and 'what is' to generate discussion of changes of any or all of the three kinds of changes listed above.
 - Changes in structure:- Structural changes are changes made to those parts of reality which in the short term, in the on-going run of things, do not change. Furthermore, structural changes may be made to organisational groupings, reporting structures, or structures of functional responsibility.
 - Procedural changes:- Procedural changes are changes to the dynamic elements namely the processes of reporting and informing all of the activities, which go on within the static structures.
 - Changes in attitude:- This term is extended to include such things as changes in influence, and changes in the expectations which people have of the behaviour appropriate to various roles, as well as changes in the readiness to rate certain kinds of behaviour 'good' or 'bad' relative to others – changes, in fact, in what Vickers [174] terms an 'appreciative system'⁸.
- **Stage 7:- Action to improve the problem situation** (refer Figure 4.9, Stage 7). This final stage according to Checkland [29], involves the implementation of the defined changes which should meet two criteria:
 - That the changes are arguable systemically, 'desirable' as a result of the insight gained from selection of the root definitions and conceptual model building.

⁸ For an analysis of 'appreciative systems', refer to Chapter 2, Paragraph 2.8.

- That the changes are culturally feasible given the characteristics of the situation, the people in it, their shared experiences and their prejudices⁹.

4.5 ACKOFF'S INTERACTIVE PLANNING

Ackoff, as in the case of Churchman, has been much influenced by the pragmatist philosophy of E.A. Singer. Churchman's interpretation of this philosophy created a new understanding of 'objectivity' (refer Paragraph 4.3.2.2) in the systems approach which Ackoff endorsed, thus contributing to this new understanding of the concept.

4.5.1 PHILOSOPHY OF INTERACTIVE PLANNING

For Ackoff (1974b), cited by Jackson [80], the conventional view that objectivity results from constructing 'value-free' models is a myth, as purposeful behaviour cannot be 'value-free', but rather 'value-full'. Ackoff describes 'objectivity' as:

"the social product of the open interaction of a wide variety of individual subjectivities".

From this, according to Flood and Jackson [56], a number of significant Ackovian conclusions can be drawn namely:

- Planning and design requires wide participation and involvement.
- 'Rationality', should be seen interactively.
- The idea that one of the major banes of the professional planner's life, how to quantify quality of life so that it is possible to plan well for others, can be side-stepped once it is recognised that people should plan for themselves.
- All that is needed is a planning methodology, which can be used with the aid of professional planners, and which makes the ideals and values of the users thereof paramount.
- It is a changing world in which planners have to operate and Ackoff believes that in order properly to appreciate these changes, we need a changed

⁹ Of value is the work done by Watkins [177], and Watkins *et al* [178], on 'Change Management', which pertains to 'change' in organisations, subjected to forced interventions.

conception of the world and a changed conception of the nature of corporations. It is then only that we will be able to recognise what kind of planning approach is required by the new circumstances.

Ackoff's general philosophical orientation takes on a precise form when it is related to the profound changes, he believes, advanced industrial societies are undergoing. About the time of World War II according to Ackoff [8], [10], the 'machine age' (associated with the industrial revolution), began to give way to the 'system age'. The latter characterised by increasingly rapid change, interdependence, and complex purposeful systems, which require greater emphasis be put on learning and adaptation if any kind of stability is to be achieved. This according to Ackoff cited by Johnson [81], in turn requires a radical reorientation of the various '*Weltanschauungen*'.

To react to a changing '*Weltanschauung*', and complex phenomena pertaining thereto, demand, according to Ackoff (1981b) cited by Jackson [80], 'interactive planning', (which according to Ackoff [7], includes the concept of 'contingency planning'), all of which has the aim to confront 'messes'¹⁰. Against the background of Ackoff's philosophy that planning should be participative and should be about enabling others to plan effectively for themselves, Ackoff [10] sets the scene by analysing the attitudes management have in respect of planning. The author [10], classifies these attitudes to be either 'inactive', 'reactive', 'preactive', or 'interactive', which can be summarised as follows:

- **Inactivism:-** Inactivists are satisfied with the way things are and the way things are going. Hence, they believe that any intervention in the course of events run a great risk of making things worse. Their management philosophy is conservative. They take a 'do-nothing' posture, trying to 'ride with the tide' without 'rocking the boat'. Furthermore, their management philosophy is conservative and needless to say, they do not believe in planning.

¹⁰ 'Messes' according to Flood and Jackson [56] can be defined as: "Sets of highly interdependent 'problems', where 'problem' formulation and structuring assume greater importance than 'problem solving' using conventional techniques". Ackoff cited by Mitroff and Linstone [108a], defines a 'mess' as: "Every human problem associated and inextricable involved with every other human problem".

- **Reactivism:-** Reactivists prefer a previous state to the one they are in. They are generally dissatisfied with the way things are going and hence they resist to most changes. Reactive managers feel more comfortable with the old and familiar than with the new and unfamiliar. Important is that reactivists try to solve problems by unmaking change – by returning to a previous state in which the problem did not exist. Furthermore, unlike inactivists who try to ride with the tide, the reactivist tries to swim back against it. They do not plan ahead, they react back.
- **Preactivism:-** Preactivists believe the world is changing in significant ways and that these changes present significant opportunities as well as serious threats. In general, they are satisfied with the way things are going, but not with the way things are. Hence, they are preoccupied with predicting and preparing for the future. Preactive planning and problem solving is based more on logic, science and experimentation than on common sense, intuition, and judgement. Preactive decision-makers tend to define the system to be treated in terms of the resources over which they have direct control. The uncontrollable is treated as environment. The management philosophy of the preactivist is liberal, as he seeks change 'within' the system, but not 'of' the system.
- **Interactivism:-** Interactivists are dissatisfied with both the current state of affairs and the way they are going. They have a 'make-it-happen' attitude toward the future. They believe we are capable of influencing, if not controlling, many future changes in such a way as to significantly improve or detract from the quality of life. They try to change the nature of systems so they can 'prevent' not merely prepare for, problems, and to 'create', not merely exploit, opportunities. Interactivists are as willing to manipulate a system's structure, functioning, organisation, and personnel as they are to manipulate its resources. To deal effectively with complex phenomena, interactivists maintain, one must be able to determine both what it has in common with previously experienced phenomena, and how it differs from them. Furthermore, preactive planners prepare for the future by attempting to control its effects on the system planned for.

4.5.2 PRINCIPLES OF INTERACTIVE PLANNING

According to Ackoff [10], the principles of Interactive Planning are based on four operating principles, namely the 'participative' principle, the principle of 'continuity', the principle of 'co-ordination', and the principle of 'integration'. The principle of co-ordination and the principle of integration are combined in some cases [56] [80], into one principle, namely the 'holistic' principle due to the fact that the act of planning is viewed as a simultaneous and interdependent action affecting many parts and levels of the system.

- **The participative principle:-** The principle that planning should be participative rests upon two connected ideas in Ackoff's thought. The first is that the process of planning is more important than the actual plan produced. It is by being involved in the planning process that members of the organisation come to understand the organisation and the role they can play in it. The second idea is that all those who are affected by planning should be involved in it, which stems directly from Ackoff's philosophical argument that 'objectivity' in social systems is 'value full'.
- **The principle of continuity:-** The values of the organisation's stakeholders will change over time and this will necessitate corresponding changes in plans. Furthermore, unexpected events will occur. The plan may not work as expected or environmental changes may occur. No plan can predict everything in advance, so plans, under the principle of continuity, should be constantly revised. Furthermore, actual performance of plans should be continually compared with expected performance, and where these deviate significantly, the producers of the deviation should be identified and appropriate corrective action should be taken.
- **A principle of co-ordination:-** According to this principle, all functions of a system should be planned for interdependently, which states that units at the same level should plan together and at the same time – because it is the interactions between units rather than their independent actions, which give rise to most difficulties.
- **A principle of integration:-** According to this principle, units at different levels should plan simultaneously and together, because decisions taken at one level will usually have an effects at other levels as well.

4.5.3 INTERACTIVE PLANNING METHODOLOGY

According to Ackoff [10], there are five phases to Interactive Planning. These, however, must be regarded as constituting a systemic process, so the phases may be started in any order,¹¹ and none of the phases let alone the whole process should ever be regarded as completed. The five phases are:

- Formulating the 'mess',¹².
- Ends planning.
- Means planning.
- Resource planning.
- Design of implementation and control.

Each of these entities will be analysed, first in terms of Ackoff's [10] views, and then expanded upon in terms of Flood and Jackson's [56], interpretation thereof.

- **Formulating the 'mess':-** This action determines the design of a desired future. This requires specifying goals, objectives, and ideals – short-run, intermediate, and ultimate *desiderata*. Three types of study are required in formulating the 'mess' namely:
 - Systems analysis.
 - An obstruction analysis.
 - Preparation of reference projections.
- **Ends planning:-** This action determines how to get there (an idealised design) – the invention of new, or selection of available ways of getting there. This requires specifying the courses of action, practices, programs, and policies to be used, by going through the following three steps:
 - Selecting a mission.
 - Specifying desired properties of the design.
 - Designing the system.

Idealised design is meant to generate maximum creativity among all the stakeholders involved, and to ensure this, only two types of constraint upon the design are admissible namely:

¹¹ Observe a similar situation in the use of the 'soft' systems methodology (refer Paragraph 4.4.4, Footnote 3).

¹² Refer to Footnote 10 of this chapter for a definition of the concept 'mess'

- It must be technologically feasible.
- It must be operationally viable.

The following outline for a responsive decision system is provided by Ackoff, and contains the following five essential functions:

- Identification and formulation of problems.
 - Decision-making.
 - Implementation.
 - Control.
 - Acquisition or generation, and distribution of the information necessary to carry out the other functions.
- **Means planning:-** This action determines what types of resource and how much of each is required to use the specific means. This involves specifying what is required, when, and where, and how it is to be required or generated. Four types of resource are usually involved:
- Men.
 - Money.
 - Equipment and facilities.
 - Materials and energy.
- It is of interest to note that the resource types as identified by Ackoff [10], very closely maps to the views of Forrester [59a], who recognises that any economic or corporate activity consists of:
- Flows of money.
 - Orders.
 - Materials.
 - Personnel.
 - Capital equipment.
- **Resource planning:-** This action determines the organisational requirements and design of organisational arrangements that makes it possible to go down the prescribed paths effectively.
- **Design of implementation and control:-** This action determines the design, implementation and control of planning decisions – their maintenance or improvement under changing conditions and with the acquisition of new information and knowledge that experience with the plan can bring.

4.6 MITROFF AND MASON'S STRATEGIC ASSUMPTION SURFACING AND TESTING

The inspiration for Mason and Mitroff's Strategic Assumption Surfacing and Testing methodology [108], can be mapped back to Churchman's [32], [34], [35], four aphorisms analysed in Paragraph 4.3.2 of this chapter, which serves as the underlying thinking of their approach to systems analysis.

4.6.1 PHILOSOPHY OF STRATEGIC ASSUMPTION SURFACING AND TESTING

The specific philosophy of Strategic Assumption Surfacing and Testing according to Mitroff and Mason [108], is based on four arguments about the 'nature of problems' and their alleviation.

- First, it is argued that most strategic problems in organisations are 'wicked problems' of organised complexity, which exhibit the following characteristics:
 - Interconnectedness.
 - Complicatedness.
 - Uncertainty.
 - Ambiguity.
 - Conflict.
 - Societal constraints.

Furthermore, these characteristics spell difficulty for the policymaker who seeks to serve a social system by changing it for the better due to the fact that most management science methods are only suitable for simple 'well structured problems'.

- Second, most organisations fail to deal properly with 'messes' because they find it difficult to challenge seriously accepted ways of doing things.
- Third, and stemming directly from Churchman [32] [34] [35], challenging currently preferred policies necessitates the generation of radical different policies or theories, since data alone, which after all can be interpreted in terms of existing theory, will not lead an organisation to change its preferred way of doing things.

- Finally, it is recognised that tensions may well ensue from this process, since its success depends upon the different groups being strongly committed to particular policy options.

4.6.2 PRINCIPLES OF STRATEGIC ASSUMPTION SURFACING AND TESTING

From the philosophy of Strategic Assumption Surfacing and Testing [108], are derived four clearly articulated principles, which are incorporated into the methodology, namely:

- **Adversarial:-** This is based on the premise that the best judgement on the assumptions necessary to deal with a complex problem is rendered in the context of opposition.
- **Participative:-** This is based on the premise that the relevant knowledge necessary to solve a complex problem is distributed among a group of individuals and that the relevant resources necessary to implement the solution are also distributed among a group.
- **Integrative:-** This is based on the premise that a unified assumption set and action plan are needed to guide decision making and that a differentiation process of participation and adversarialness can be synthesised into a unified whole.
- **Managerial Mind Supporting:-** This is based on the premise that exposure to assumption deepens the manager's insight into an organisation and its policy, planning, and strategic problems.

These principles are employed throughout the following five phases of Strategic Assumption Surfacing and Testing described in Paragraph 4.6.3.

4.6.3 METHODOLOGY OF STRATEGIC ASSUMPTION SURFACING AND TESTING

The methodology underpinning Strategic Assumption Surfacing and Testing [108], has five phases:

- **Phase 1 - Group formation:-** The aim of this stage is to structure groups so that the productive operation of the later stages of the methodology is facilitated. The principles for group formation are:
 - To minimise the interpersonal conflict within a group by forming a group that has maximum interpersonal similarity and affinity. The point is that the members of the group need to get along well with one another.
 - To maximise the differences in knowledge and problem perspective between groups. The point is that each group as a whole will bring different information, habits and thought, and basic assumptions to bear on the problem.
- **Phase 2 - Assumption surfacing:-** Each group should develop a preferred strategy/solution. The aim of the assumption surfacing is then to help each group uncover and analyse the key assumptions upon which its preferred strategy/solution rests. Three techniques assume particular importance in assisting this process, namely:
 - Stakeholder analysis. According to Mitroff and Mason [108], there is a strong theoretical reason derived from the concept of teleological¹³ systems for surfacing assumptions by means of a stakeholder analysis. The authors [108] are of the opinion that a business firm may be conceived of as the embodiment of a series of transactions among all of its constituent purposeful entities, that is, its stakeholders. Furthermore, the final outcome of an organisation's plan will be the collective result of the effects of the individual actions taken by its stakeholders, and thus a strategy may always be thought of as a set of assumptions about the current and future behaviour of an organisation's stakeholders.
 - Assumption specification.
 - Assumption rating.
- **Phase 3 – Within group dialectical debate:-** The first step is to eliminate the bias of irrelevancy and this is done whereby each group takes each assumption in turn and negates it. They then simply ask themselves, if the opposite (i.e., the counter-assumption) of any particular assumption were true, does it have any significant bearing on the strategy chosen? A 'no' answer indicates that

¹³ In this respect, refer to Chapter 2, Paragraph 2.2, Footnote 1.

the assumption is not very relevant for the problem. The thus windowed assumption set is now ready for the stiffest test within each group, with any assumption accepted as a strategic premise meeting two criteria:

- It should have a significant bearing on the outcome of the strategy chosen and implemented.
- It should be as 'self-evident' and 'certain to be true' as possible.
- **Phase 4 – Between group dialectical debate:-** A dialectical debate occurs when a situation is examined systematically and logically from two or more points of view. The objective of a dialectical debate between groups is to improve the final judgement on assumptions by subjecting them to the strongest possible critical evaluation.
- **Phase 5 - Synthesis:-** The aim of synthesis stage, is to achieve a compromise on assumptions from which a new higher level of strategy/solution can be derived.

4.7 OTHER INFLUENTIAL SOFT SYSTEMS THINKERS

As indicated in the introductory section of this chapter, it would be naïve not to acknowledge the work of other revered and influential academics in the field of the 'soft' systems approach. The work of the following academics fall in this category:

- The Total Systems Intervention of Flood and Jackson.
- Critical Systems Heuristics of Ulrich.
- Unbounded Systems Thinking of Mitroff and Lintstone

The primary sources for the ensuing high level analysis of the above systems methodologies are Flood and Jackson [56] and Jackson [80]. The entities pertaining to each of the above, can be described as follows:

- **Total System Intervention:**
 - **Philosophy:-** The philosophy underpinning the Total Systems Intervention is 'critical systems thinking', and the brainchild of Flood and Jackson [56]. Critical systems thinking makes its stand on three positions namely:

- Complementarism.
- Sociological awareness.
- Human well being and emancipation.
- **Principles:-** There are seven principles embedded in the three phases of the Total Systems Intervention. These are:
 - Organisations are too complicated to understand using one management 'model' and their problems too complex to tackle with a 'quick fix'.
 - Organisations, their strategies and the difficulties they face should be investigated using a range of systems metaphors.
 - Systems metaphors, which seem appropriate for highlighting organisational strategies and problems, can be linked to appropriate systems methodologies to guide intervention.
 - Different systems metaphors and methodologies can be used in a complementary way to address different aspects of organisations and difficulties they confront.
 - It is possible to appreciate the strengths and weaknesses of different systems methodologies and to relate each to organisational and business concerns.
 - Total Systems Intervention sets out a systemic cycle of inquiry with iteration back and forth between the three phases.
 - Facilitators, clients and others are engaged at all stages of the Total Systems Intervention process.
- **Phases:-** The three phases of Total Systems Intervention are labelled:
 - Creativity.
 - Choice.
 - Implementation.
- **Critical Systems Heuristics:**

According to Flood and Jackson [56], and Jackson [80], there has been a gap in the systems tradition, in that there has been no systems approach, which has provided a means for critically reflecting, either upon the goals attained and means used by hard systems thinking, or upon the nature of the consensus achieved and the changes brought about through soft systems thinking. This gap

according to the authors [56] [80], can be filled by the critical systems heuristics of Ulrich. The aim of the approach is nothing less than to set out an appropriate philosophy for an emancipatory systems approach, and to develop a method which can be used by planners to reveal the 'normative content' of actual and proposed systems designs. Ulrich distances himself from the currently dominant use of the systems idea in what he calls 'Systems Science'. As in the case of Mitroff and Mason, Ulrich also follows Churchman in sharing the opinion that it is the 'human problems' which make management science difficult.

➤ **Philosophy:-** For Ulrich, the purpose of systems thinking is scientific to influence planning and design so as to secure an improvement in the human condition. The 'systems approach' is therefore, an exercise in practical reason, not theoretical reason. Its aim is to help us decide what 'ought' to be done, not to produce knowledge of 'what is'. The main issue is, for Ulrich, that he finds the two classical epistemological positions relating to practical reason namely the 'systems approach' and the 'dialectical approach' to be untenable. For this reason, Ulrich advocates to extend science and rationality to the matter of 'ends', but to do so in a way which is eminently practicable in the 'here and now' of everyday circumstances.

➤ **Principles:-** Critical Systems Heuristics is about the design and assessment of purposeful systems, and the principles which guide the practice thereof are:

- The concept of 'purposefulness'.
- The systems idea.
- The moral idea.
- The guarantor idea.

The latter three are 'quasi-transcendental', taken from Kant's notions of 'world', 'man' and 'God'.

➤ **Methodology:-** The methodology of Critical Systems Heuristics falls in two parts namely:

- The first part is concerned to help planners to make transparent to themselves and others the presuppositions that inevitably enter into social system designs. To assist with this, 12 'critically heuristic categories' are established which can be used to interrogate systems designs and potential designs.

- The second part offers a practical tool which ordinary citizens can use to engage planners in rational discourse about the partiality of their plans, and is called the 'polemical employment of boundary judgements'.

➤ **Unbounded Systems Thinking:**

Key elements pertaining to Mitroff and Lintstone's '*Unbounded Systems thinking*' is contained in Chapter 5, Paragraph 5.3.

5 CONCLUSION

Soft systems methodologies the subject analysed at a high level in this chapter included:

- The Viable Systems model of Beer (Organisational cybernetics).
- Churchman's Social Systems Design.
- Checkland's Soft Systems Methodology.
- Ackoff's Interactive Planning.
- Mitroff and Mason's Strategic Assumption Surfacing and Testing Methodology.

Furthermore, the analysis included popular problem solving methodologies of other influential 'soft' systems thinkers namely:

- The Total Systems Intervention of Flood and Jackson.
- Critical Systems Heuristics of Ulrich.
- Unbounded Systems Thinking of Mitroff and Lintstone.

Chapter 3 and Chapter 4 also signify an end to the high level analysis of the soft systems and hard systems methodologies, which was underpinned by the details of the complexity of the systems approach from Chapter 2. Key criteria from the these high level analysis of hard systems and soft systems methodologies, will serve as preliminary input mechanisms to Chapter 5, where these criteria will be further analysed in detail to ultimately culminate in a formulated *structured systems approach to model conceptualisation*, the objective of this thesis.