

Chapter 5

DETAILED ANALYSIS OF THE KEY ELEMENTS OF THE STRUCTURED SYSTEMS APPROACH TO MODEL CONCEPTUALISATION

“Education is what survives when what has been learnt, has been forgotten”¹

Professor B F Skinner

5.1 INTRODUCTION

Chapter 5, in the opinion of the author, is one of the key chapters in this thesis, as the chapter contents are focused on a detailed analysis of all of the elements, which will ultimately culminate in the formulated *structured systems approach to model conceptualisation*. The analytical process followed thus far, is graphically depicted in Figure 5.1, which places the chapters in context with the overall thesis objectives, and furthermore indicates the relative positioning of this chapter.

An analysis of Figure 5.1², 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 Chapter 4). Key elements from the high level analysis of hard systems and soft systems methodologies, will serve as preliminary input mechanisms to this chapter, where the elements will be further analysed in detail to ultimately culminate in a formulated *structured systems approach to model conceptualisation*. Chapter 6 depicts the *structured systems approach to model conceptualisation* as an alternative management mechanism in practice, while Chapter 7 contains a summary of the thesis content.

¹ New Scientist. 21 May 1964.

² Arrows in Figure 5.1 represents ‘information flows’ (inputs) from one chapter to the other.

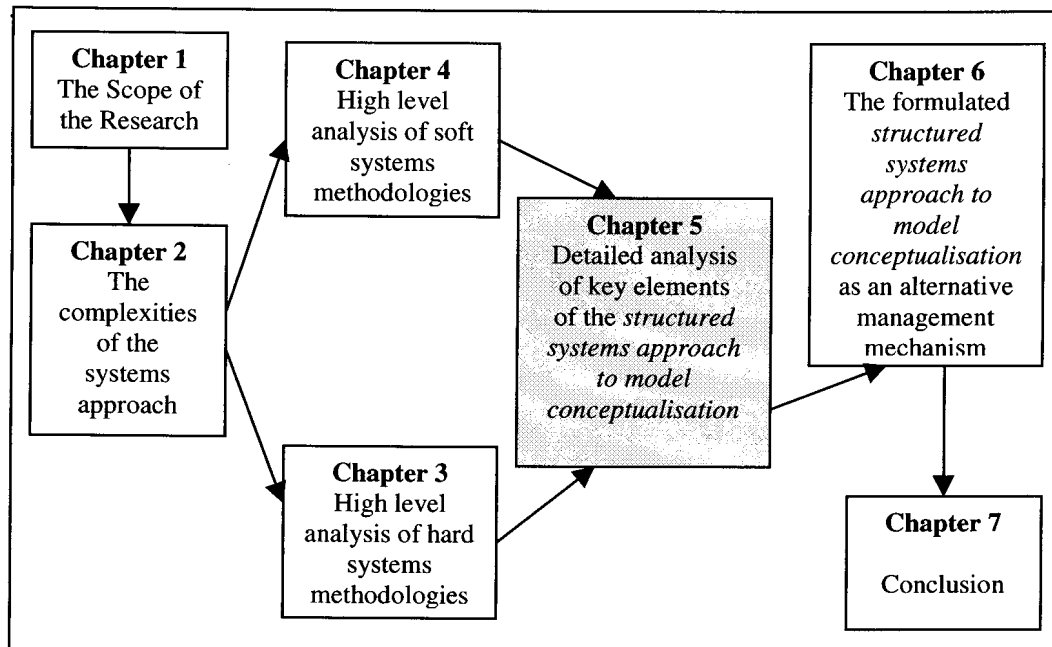


Figure 5.1: Chapters in context of the overall research

An important fact, which must be brought to the attention of the reader, is that in this chapter an ‘approach’³ will be formulated, namely the *structured systems approach to model conceptualisation*, which must be clearly distinguished from the process of building a ‘model’⁴. This sequence of events, formulated here in its most basic format, is clearly depicted in Figure 5.2. This ‘approach’⁵ will primarily be concerned with the development of principles concerning the use of systems ideas in solving unstructured complex phenomena which confront executive management. The thesis deals with an ‘approach’ as opposed to a ‘model’, due to the fact that the research is focused on unstructured complex phenomena, which are invariably societal and organisational based and, which require systems-integrated solutions to solve. Randers [126], adds credibility to this thesis content and objectives, when he makes the following, very important statement, in particular with respect to why the crux of this thesis pertains to an ‘approach’ as opposed to a ‘model’, when he states that:

³ See Chapter 2 Paragraph 2.4, for a detailed analysis of the concept ‘approach’.

⁴ See Chapter 2 Paragraph 2.7, for a detailed analysis of the concept ‘model’.

⁵ The reader is cautioned that ‘elements’ of the concept ‘model’ are incorporated within the ambit of the approach, which is formulated in this thesis. In particular the attention of the reader is drawn to Phase 8 described in Paragraph 5.6.1 of this chapter, where the concept ‘model’ is used with reference to ‘the pilot’.

“Because there is no educational text on model conceptualisation, the sequence of presentation in published papers describing models are commonly mistaken for the actual steps in the creation of those models”.

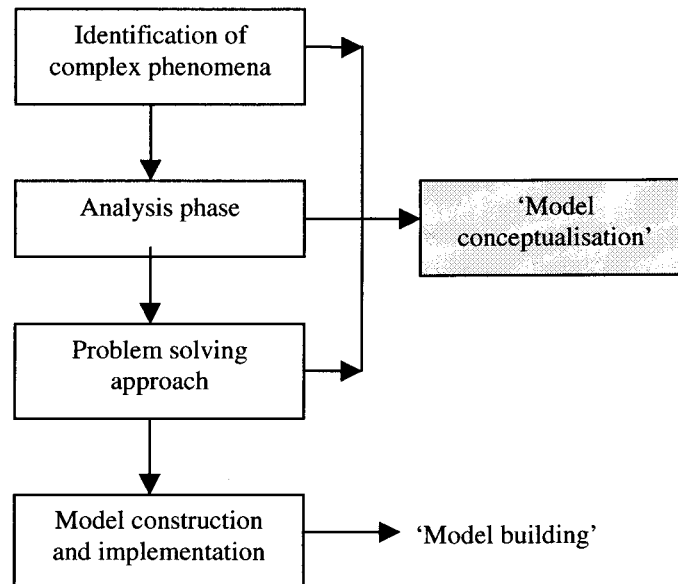


Figure 5.2: Conceptual sequence of events pertaining to ‘model conceptualisation’ and ‘model building’

An ‘approach’ as suggested in this thesis, should, according to Randers [126], deal with amongst others the following issues:

- How is the problem chosen?
- How does one achieve a useful perspective on the problem area?
- How does one succeed in capturing the essentials of a complex, real world phenomenon in a relatively simple model.

In view of this author, a *structured systems approach to model conceptualisation* to solve unstructured complex phenomena, will ensure that all of the variables pertaining to the unstructured complex phenomenon are selected, considered and structured to culminate in a feasible and viable systems model. In support of the authors ‘thinking’, the wisdom of the revered Dr. John D. Sterman [161], who is of the opinion that one should, “beware the analyst who proposes to model entire social or economic systems, rather than the problem”. Furthermore, it is of

importance to note that the concept of a *structured systems approach to model conceptualisation*, is in line with:

- The approach of Clark and Augustine [36], who are of the opinion that, “to pursue a modelling methodology, we must identify a complete and relevant set of information attributes, assign different dimensions to these attributes, and test the performance of the system on these several dimensions”.
- The approach of Forrester [59], who is of the opinion that, “the obvious purpose and test of a model of an industrial system is its ability to predict a specific future action”. From this the obvious analogy can be drawn that the quality of input to a model, has a direct bearing on the model’s ability to accurately predict the future action.
- The approach of Ackoff [9], who is of the opinion that, “In dealing with a problematic situation, a decision maker must develop a concept – a representation or a model – of it”. “He attempts to solve the problem as he conceives it”. “Thus, if his conception is wrong, the solution to the problem as conceived may not solve the problem as it exists”

While a more general approach to problem solving will suffice for day to day organisational problems, unstructured complex phenomena would require a different approach, due to the fact that, according to Emery and Trist [48], and Watkins [177], [178], the environmental contexts in which organisations exist are themselves changing at an increasing rate towards increasing complexity and very often as a result of a forced intervention. The ‘characteristics’ of organisational environments demand consideration if there is to be an advancement of the understanding in the behavioural sciences, specifically under the impact of technological change⁶, which more often than not occurs as a result of a forced intervention [177], [178].

This chapter has been noted as one of the key chapters of this thesis, as it is within the ambit of this chapter that the *structured systems approach to model conceptualisation* will be formulated. Against this background, and to place the *structured systems approach to model conceptualisation* firmly in perspective to

⁶ See Chapter 2 Paragraph 2.10, for a detailed analysis of the concept ‘technological change’.

the research as a whole, the author deems it necessary to re-examine the initial objectives set in the early stages of the research, to force a refocus on the key issues pertaining to the research problem. This will be addressed in Paragraph 5.2 under the heading of: ‘Refocus on Initial Objectives’. In addition, and perhaps controversial, the author will introduce his personal ‘reasoning’ and ‘thinking’ underlying the formulation criteria of the *structured systems approach to model conceptualisation*, which will be addressed in Paragraph 5.3 under the heading: ‘Reasoning and Thinking: A Perspective’. Furthermore, before the construction elements of the *structured systems approach to model conceptualisation* can begin, assumptions pertaining to the process will be listed to ultimately facilitate a seamless transition to Chapter 6, where the *structured systems approach to model conceptualisation* will be introduced as an alternative management mechanism for executive management.

5.2 REFOCUS ON INITIAL OBJECTIVES

The following extracts from earlier chapters are repeated here *verbatim*, the purpose being to place the formulation process of the *structured systems approach to model conceptualisation* firmly in perspective to the research as a whole, and to refocus on the key issues pertaining to the research problem. This refocus on initial objectives, furthermore re-emphasises the complexity of the task of the executive management when dealing with unstructured complex phenomena, namely that they (executive management), can be compared to passengers on an aircraft, which they not only fly, but are busy redesigning in flight [162].

Extract from the thesis Abstract:-

- The negative side of this trend, is that the engineer who primarily has had training in the engineering profession, a discipline grounded in analytical and reductionist thinking, now finds himself in the position of executive management, hardly equipped with the multi-faceted management skills typically demanded from an executive with respect to ‘model conceptualisation’, where the focus is typically concentrated on the handling of unstructured complex phenomena, which invariably are societal and organisational based, viewed as ‘systems problems’ within a particular world

view or '*Weltanschauung*', and which require systems-integrated solutions to solve.

- While this thesis has at its core the objective to introduce the concept of a *structured systems approach to model conceptualisation* into the realm of executive management within a broader context, it is in view of the author the most suitable structured mechanism specifically aimed at the engineer in the emergent role of executive management dealing with unstructured complex phenomena.
- A further consequence of this thesis, is that the author succeeds to bridge the gap between 'hard' and 'soft' systems methodologies, by combining the two disciplines to form a 'midway approach' in solving unstructured complex phenomena. In addition, the research findings show that such an approach manifests as an essential mechanism for modern executives to facilitate the resolution of unstructured complex phenomena within their respective organisations in a structured way. Furthermore, the research findings show that management philosophies formulated by revered academics during the Twentieth Century, can be applied with success to Twenty First Century unstructured complex phenomena, thus becoming an accepted alternative management mechanism for this purpose.
- This thesis then, is about both a *structured 'systems approach' to model conceptualisation* and 'systems practice' and the relationship between the two entities, aimed at dealing with unstructured complex phenomena within the ambit of executive management. From this the conclusion can be drawn that the systems dynamics of the formulated *structured systems approach to model conceptualisation* specifically applied to the art of executive management, can be used to structure the outcomes of paradigm shifts introduced into organisations as a result of unstructured complex phenomena.

Extract from Chapter 1, Paragraph 1.1.1:-

- While this thesis has at its core the objective to introduce the concept of a *structured systems approach to model conceptualisation* into the realm of executive management within a broader context, it is in the view of the author the most suitable structured mechanism specifically aimed at the engineer in the emergent role as the executive decision maker dealing with unstructured complex phenomena in the Twenty First Century.

Extract from Chapter 1, Paragraph 1.2:-

- Field research by the author into unstructured complex phenomena associated with executive management, show that such entities are not commonly dealt with in terms of the systems approach [59a], [90], [152], [105], [126]. Furthermore, the literature search cited in this thesis and academic readings commonly associated with work of this nature, also did not return a single reference where the systems approach *per se*, specifically addressed ‘model conceptualisation’ to solve unstructured complex phenomena pertaining to executive management over a spectrum of disciplines in a structured way.

Extract from Chapter 1, Paragraph 1.4:-

- Can the systems approach, which is currently embedded in academic literature in various authoritative publications in various forms and permutations, be applied to model conceptualisation to solve unstructured complex phenomena from an executive management perspective?

Extract from Chapter 1, Paragraph 1.3:-

- The ultimate objective is to provide the engineer as emergent executive with a structured mechanism to address model conceptualisation in the quest to solve unstructured complex phenomena.

5.3 REASONING AND THINKING: A PERSPECTIVE

This author’s attitude toward management philosophy is one of reverence for the great thinkers of the past, and confidence in his own personal and practical experience spanning some 32 years at various managerial levels. Furthermore, of pioneering originality regarding modern contemporary systems thinking to address unstructured complex phenomena, hence the author’s reading far beyond normal academic requirements with readings in the likes of Charles Peirce’s ‘*Theory of Scientific Method*’ and Immanuel Kant’s ‘*Critique of Pure Reason*’. The ‘reasoning and thinking’ of the author has at its source the wisdom of Reilly [129], referring to Pierce’s pragmatism where:

“Knowledge must involve a reference to experience; and this reference is an expectation, an imaginary (in the case of theoretical knowledge) anticipation of experience”.

The rationale behind this being that knowledge, which has no possible bearing on any experience – brings no expectation whatever – would be information concerning a dream. And the fact that, in the words of Ackoff [3], “theories taught in management schools are often useless when applied to practical business”. The most complete statement of this position within a systematic theory is to be found in Immanuel Kant’s ‘*Critique of Pure Reason*’, which first appeared in 1781 and cited by Churchman and Ackoff [30a], in three separate extracts as follows:

“There can be no doubt that all our knowledge begins with experience”.

“But though all our knowledge begins with experience, it does not follow that all arises out of experience”.

“By way of introduction or anticipation we need only say that there are two stems of human knowledge, namely, sensibility and understanding . . .” “Through the former, objects are given to us; through the latter they are thought”.

With this in mind, based on the personal and practical experience of this author⁷, ‘reasoning and thinking’ as depicted in this thesis, are selectively based on the ‘Ways of Knowing’ as contained in Mitroff and Lintstone’s [108a], “*The Unbounded Mind*”, which has as its objective the breaking of the chains of traditional business thinking. Mitroff and Lintstone’s ‘Ways of Knowing’ can be summarised as follows:

- **Agreement: The first way of knowing:-** Achieved through the use of an inquiry system⁸ in the likes of Delphi⁹ where the main characteristics pertaining to problem solving (where possible) are imbedded in the concepts of:

⁷ See also Chapter 1, Paragraph 1.6.

⁸ Defined by Churchman [35], as ‘a system of interrelated components for producing knowledge on a problem or issue of importance’.

⁹ Rowe, G. Bolger, F. Wright, G. ‘*The Delphi Method: An Investigation of Richness of Feedback and Change in Majority/Minority Opinions*’ *Technology Forecasting & Social Change*. Vol. 39, No. 3, May 1991.

- Group participation¹⁰.
- Interaction of responses over various rounds.
- Anonymity of responses.

While agreement and consensus are important in reaching conclusion and in achieving the necessary support to address complex phenomena, a *caveat* must be observed, as with all things human, they cannot be followed exclusively, nor are they the ultimate consideration for deciding all important questions.

- **The world as a formula: The second way of knowing:-** Most of the academic literature cited in this thesis, contains mathematical models to help visualise complex phenomena. As a matter of fact, in the words of Toffler cited by Mitroff and Lintstone [108a], “no matter how ‘hard’ the final output may appear, all models are ultimately and inescapably, based on ‘soft’ assumptions”. “Moreover, decisions about how much importance to assign to any given variable or its weighting, are frequently ‘soft’, intuitive and arbitrary”. This most appropriate conclusion against the background of the complex phenomena which is being dealt with in this thesis, which invariably are societal and organisational based, viewed as systems problems and, which require systems-integrated solutions to solve. The analogy can be drawn from the words of Mitroff and Lintstone [108a], that, “if we have to have precise definitions of complex problems before we can proceed, and if in order to obtain such precise definitions we need to base them on the adoption of a single scientific discipline or profession, then precision and clarity may lead us deeper into deception and not rescue us from it”. “By selecting a single scientific discipline or profession, we cut off innumerable other pathways that we could have chosen to explore the nature of our problem”.
- **Multiple Realities: The third way of knowing:-** Ever since Emmanuel Kant, educated people have realised that both the experience of reality as well as its description are heavily dependent on the structure of our minds, much more so than empiricists would have us believe. Contrary to the common-sense notion that reality is ‘something out there’ uninfluenced by human minds, we humans contribute a great deal of our nature to what we experience as reality and how

¹⁰ This approach, in particular with respect to executive decision making, maps to the views of Beer [22], who is of the opinion that executive decision making is an elaborate interactive assemblage of elements. Beer [22], calls this a ‘thinking shop’ after the Greek ‘*phrontisterion*’.

we describe it. To this author, the following issues are of particular importance having direct bearing on the practising executive and the thesis *per se*:

- Due to the fact that long and arduous years are involved in mastering a particular discipline, the academic/professional mind easily becomes a prisoner of a particular way of viewing the world. For this reason, according to Mitroff and Lintstone [108a], crossing academic disciplines or professional boundaries (as in the case of engineers drawn into other disciplines than engineering¹¹), the experience is worse than crossing foreign cultures – it constitutes culture shock of the highest order, culminating in the requirement for ‘change management’ becoming a necessity in any organisation subjected to complex phenomena, especially should it take place against the background of a forced intervention [177], [178].
- The fact that complex phenomena can be defined in different ways, and furthermore, that such problems are problematic and of immense significance, which would require the executive manager to see a range of different representations of the phenomenon, in order to participate actively in the problem-solving process and not merely be a static recipient of the end results.
- The fact that complex phenomena invariably contains societal organisational based issues, viewed as ‘systems’ problems, which require systems-integrated solutions [68], forces the executive manager not to be purely formalised and in addition, depend on the exercise of wisdom. Wisdom, according to Churchman [31], “is the one factor that cannot be cast into mathematical formula or procedure”.
- **Conflict: The forth way of knowing:-** The analytical reasoning, which is appropriate to address complex phenomena, the ability to zero in on the critical assumptions or key premises that underlie the phenomenon. This can only be achieved if analytical skills are honed in building models and determine solutions therefrom, however, more important is to challenge the assumptions on which the models rest. According to Mitroff and Lintstone [108a], what is required is an intense, explicit debate between two polar

¹¹ See Chapter 1, Paragraph 1.1.1.

positions to enable the executive to be in a much stronger position to know the assumptions of the two adversaries and as a result, clarify his or her own assumptions.

- **Unbounded Systems Thinking: The fifth way of knowing:-** In terms of this thinking, ‘everything interacts with everything’, that all branches of inquiring depend fundamentally on one another, and that the widest possible array of disciplines, professions, and branches of knowledge – capturing distinctly different paradigms of thought – must be consciously brought to bear on the solving of complex phenomena.

It is the intention to formulate the *structured systems approach to model conceptualisation* in such a manner as to be an incumbent alternative approach to executive management for the purpose of ultimate model building based on:

- Personal and practical experience of the author combining the knowledge pools gleaned from years spent at lower, middle, senior and executive management levels, thus breaking the chains of traditional business thinking.
- Lessons learned from the author’s own judgement errors in solving unstructured complex phenomena.
- Proven management philosophies of revered systems thinking academics gleaned from primarily ‘soft’ and ‘hard’ systems thinking methodologies.
- Contains the elements of practicality, validity, feasibility and reliability gleaned from ‘world best practice’ initiatives observed by the author in the US, EC including the UK and the Far East.
- Manifest as a recognised alternative approach for executive management in their quest to solve unstructured complex phenomena.

Although not exactly within context, support for this type of formulation approach comes from Takahashi and Takahara [167] who is of the opinion that:

“A reality itself is so complex that we cannot directly analyse it and obtain effective information from it to improve present situations including problems”. “To attack the reality it is necessary not only to analyse precisely individual elements, but to ‘recognize’ the situations

in question as a whole entity and ‘abstract’ essential factors to be examined”.

This view of Takahashi and Takahara [167], also serves as impetus to the author’s ‘reasoning’ and ‘thinking’ in respect to the approach in solving unstructured complex phenomena. Based on the above entities, the formulation approach, which has a holistic base, is graphically depicted in Figure 5.3, the key elements forming the assumptions discussed in Paragraph 5.4.

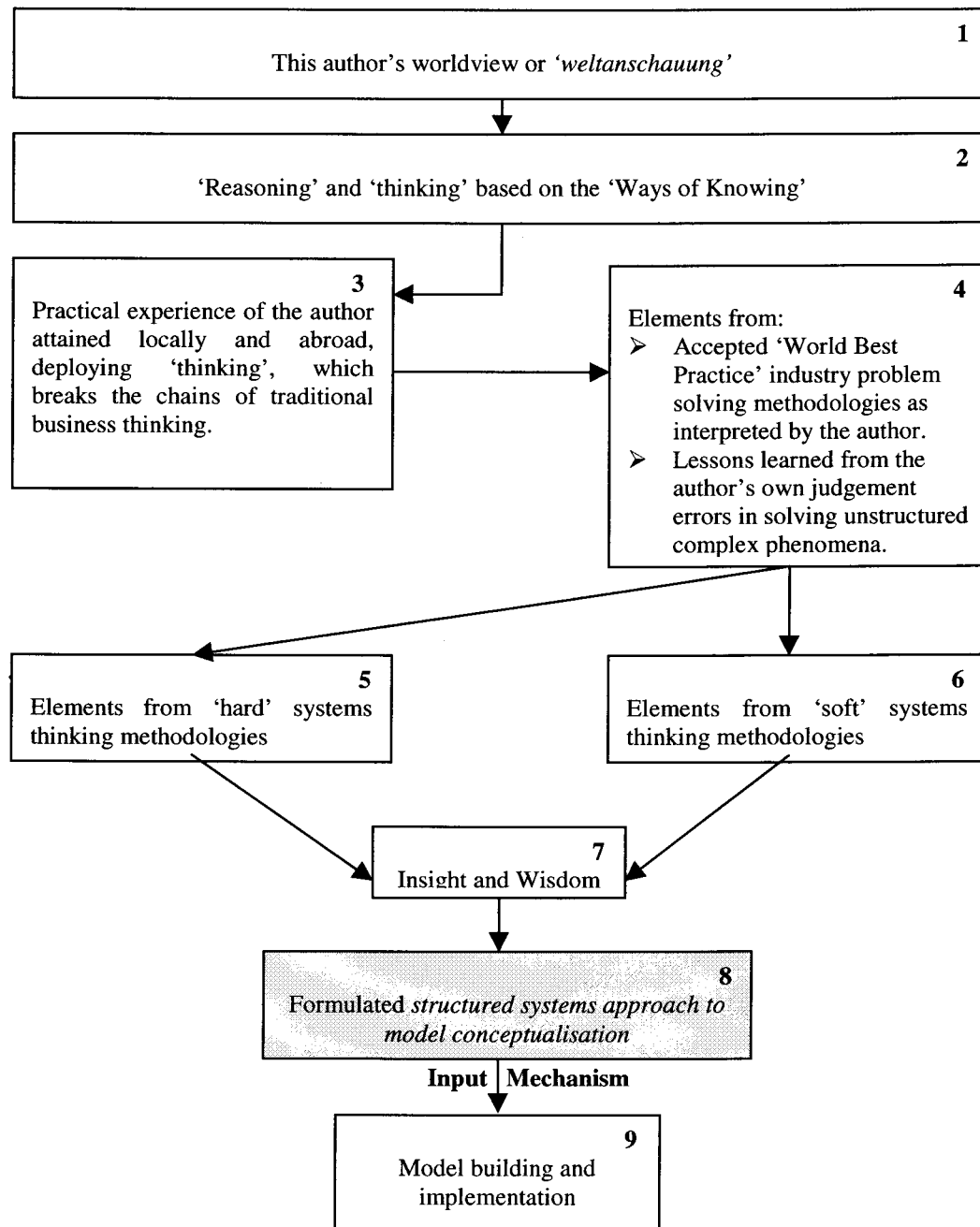


Figure 5.3: Formulation approach

5.4 ASSUMPTIONS

The following assumption applies to the formulation process of the *structured systems approach to model conceptualisation*:

- ‘The Ways of Knowing’ as described in Paragraph 5.3 of this chapter, will govern some of the key ‘reasoning’ and ‘thinking’ to be deployed in the formulation of the approach to model conceptualisation.
- The *structured systems approach to model conceptualisation* will represent an ‘approach’ to the formulation of a model.
- The *structured systems approach to model conceptualisation* in itself will not represent a model
- Soft systems thinking will be the ruling maxim to the formulation of the *structured systems approach to model conceptualisation*, but not limited thereto as a finely tuned equilibrium will be maintained between soft and hard approaches. This ‘thinking’ is in line with ‘the world as a formula’ of ‘the second way of knowing’, described in Paragraph 5.3 of this chapter.
- The *structured systems approach to model conceptualisation* will be designed as to become a ‘logical’ approach for executive management to address unstructured complex phenomena.
- Judgement errors in the past on the part of the author in solving unstructured complex phenomena (herein presented as part of the personal and practical experience) serving as impetus to the formulation of the *structured systems approach to model conceptualisation*. While not exactly within context, but highly appropriate, Abel-Hamid and Madnick [1] cite Boddie (1987) who argues that “we reject one of the most basic engineering practices: identifying and learning from our mistakes”, the principles of which is also underwritten by Paich and Serman [121].
- Wisdom, the overriding element in the formulation of the *structured systems approach to model conceptualisation* is not based on the premise of ‘*doing the right things*’ (my italics), but rather on ‘*doing things right*’ (my italics). Wisdom according to Churchman [35], “is the one factor that cannot be cast into a mathematical formula or procedure”. The same maxim applies to unstructured complex phenomena when dealing with organisational and societal problems causing dynamic paradigm shifts within an organisation. In

stead of a mathematical formula or procedure, ‘wisdom’ is the only solution whereby a fine balance can be achieved between ‘over control’ and chaos¹².

- To formulate a *structured systems approach to model conceptualisation* from a holistic perspective where the whole entity pertaining to the complex phenomena under analysis is examined as part of the ultimate solution.
- The formulation of the *structured systems approach to model conceptualisation* will represent a finely tuned balance between ‘over control’ and ‘chaos’ which can be selectively compared with the ‘Scylla’ and ‘Charybdis’¹³ in Greek mythology and the ‘Yin’ and ‘Yang’ from Chinese ontology. This would imply that a finely tuned balance is observed between the ‘hard’ and ‘soft’ issues as depicted in Table 5.1. Furthermore, this ‘thinking’ is in line with ‘the world as a formula’ of ‘the second way of knowing’, described in Paragraph 5.3 of this chapter.
- The worldview or ‘*weltanschauung*’ as personally perceived by the author, will apply in the formulation of the *structured systems approach to model conceptualisation*. In making this statement, it is acknowledged by the author that while the ‘*weltanschauung*’, which will be upheld in the formulation of the approach to model conceptualisation in this chapter and in the case study to be discussed in Chapter 6, are based on his ‘own’ *a priori* assumptions, there may be other equally legitimate views based upon alternative sets of assumptions. It is these ‘other equally legitimate views based upon alternative sets of assumptions’, which is of absolute vital importance in the formulation of the *structured systems approach to model conceptualisation*. These ‘other equally legitimate views based upon alternative sets of assumptions’, which bring to the fore the ‘subjectivity’ of the systems approach and, which will ensure that unstructured complex phenomena pertaining to the ‘whole system’ are grasped, and that as many as feasible possible different perspectives are swept in.

¹² As illustrated in Table 5.1.

¹³ With acknowledgement to Loutjie Bouwer. Johannesburg, April 2000.

The author wishes to draw the attention of the reader to the fact that some of the most powerful statements in this thesis are contained within the ambit of the above paragraph. This has been done intentionally, as these ‘assumptions’ forms the backbone to the *structured systems approach to model conceptualisation*.

Hard Executive Management Issues	Soft Executive Management Issues
Purpose	People
Environment	Management
Strategy	Vision
Structure	Commitment
Systems	Style
Fit	Split
Growth	Development
Control	Autonomy
Efficiency	Innovation
Cost control	Service
Executive decision making	Measured outcomes

Table 5.1: Observed balance between ‘hard’ and ‘soft’ issues.

The author acknowledges the work and time of prominent and lesser known academics cited in this thesis, however equally acknowledges the personal contributions of successful executives around the globe who contributed their ‘thinking’ in the creation of ‘World Best Practice’ industry standards in their quest in solving complex phenomena in their own respective organisations. All of this contributed to this author’s own understanding of the concept over the years, actively practising a philosophical approach in solving unstructured complex phenomena. The works of these executives, most likely, will never be formally documented, but never-the-less, elements of their collective contributions will ultimately culminate in some form or other as an integral component of the *structured systems approach to model conceptualisation*.

5.5 ORGANISATION STRUCTURE: FACILITATING THE APPROACH TO MODEL CONCEPTUALISATION

This thesis is not about organisation structure *per se*, however, the *structured systems approach to model conceptualisation* would demand that a structured organisation structure be in place to facilitate such a process, and thus forming an integral part thereof. It is suggested that, by restructuring the organisation in a particular way, the approach to model conceptualisation, and for that matter, the process of solving unstructured complex phenomena by executive management can be enhanced, thus the key, according to Senge [153], “is not getting the right strategy, but fostering strategic thinking”. The attention of the reader is drawn to the fact that, based on the above reasons, the ‘Structure Formulation and Approach’ discussed in Paragraph 5.5.1 of this chapter, is represented by Phase 6 of the model conceptualisation process.

The information technology industry, in particular information technology functioning in large corporate conglomerates, to which the author has a close association, often prides itself in analysing any technology failure to the point of the ‘root cause’ thereof, and taking the appropriate remedial action, to not only remedy the failure at point of impact, but also in taking remedial action to remedy the failure at source and to avoid a similar occurrence of the failure in the future. The same situation however does not appear to prevail in some organisations where unstructured complex phenomena are equally experienced as a everyday occurrence. At these organisations, failures are invariably remedied at the point of impact (where it happens), and remedied at this very point, thus the results of the failure is rectified as opposed to the ‘root cause’ thereof, leaving open the possibility for a reoccurrence of the same problem.

While the information technology industry is cited here as an example of being diligent in their analysis of root cause failures, it would be extremely naïve to uphold this view for all information technology driven organisations, without the required *caveats*, that this industry too falls prey to such reoccurring complex phenomena. According to Abel-Hamid and Madnick [1], “the record shows that

the software industry has been marked by costly overruns, late deliveries, poor reliability and user-dissatisfaction”.

While acknowledging the listed *caveats*, but primarily taking selective lessons from the information technology industry’s approach to root cause failures, the task of the operating executive in dealing with unstructured complex phenomena, would be greatly facilitated should the structural ‘foundations’ of the organisation (it’s individual system entities) be so positioned as to facilitate root cause analysis of unstructured complex phenomena at source in an attempt to stop re-occurrences of the same problems. A precipitation of ‘root cause’ failures could culminate in ‘chaos’, making the organisation un-manageable as all energy would be directed at the result and for that matter, re-occurring results of the failure as opposed to its ‘root cause’. In such a situation of ‘chaos’, what is required is to call halt, cancel the current organisational structure, suspend all the routine regulative mechanisms and bring the situation ‘back to normal’, by restructuring in such a way as to strike a balance between over control and chaos. Support for this approach comes from Reagan-Cirincione *et al* [127], citing Morris (1972), who is of the opinion that, “the things which go wrong may very well stem from the inadequacy of the structures we unconsciously impose on our available information”.

It is most important to bring to the attention of the reader the underlying rationale of all of the above and on which the organisational approach described below, will be based upon namely, causal loop diagrams and reinforcing and balancing processes. These entities have been deliberated at length in Chapter 2, Paragraph 2.9, the importance of which cannot be overemphasised.

The reader is cautioned that this suggested organisational restructuring approach merely create ‘structured foundations’, where control and order can be regulated with the objective to facilitate the solving of unstructured complex phenomena. Using the analogy of the fable of the ‘three little pigs’, where a house (organisation) built from bricks and mortar have a better chance to survive the onslaught of unstructured complex phenomena. The realities of the boundaries of ‘real world’ phenomena however remain, as they are not rectilinear, but

amorphous. Philosophically, Hegel's Axiom of Internal Relations¹⁴, shows that the boundaries drawn to contain a system are purely conventional. A further objective of this 'midway approach' between over control and chaos, is that it automatically discounts the vast amount of proliferating information about world situations that is accessible to the executive and focuses on the issues of real importance namely the root cause of unstructured complex phenomena.

Should an organisation structure be formulated using this 'midway approach', it should be done in such a manner as to automatically correct small and large errors alike, and in the course of correcting them, report on them according to whatever criteria are laid down. Furthermore, the requirement is to restructure in such a way as to be totally organised and the inherent systemicity thereof has a teleological¹⁵ context. The reader is cautioned that extremes in the formulation of organisation structures are a trap commonly experienced specifically if the 'perfect' system is sought. According to Selznick [150], deviations from the formal system tend to become institutionalised, so that 'unwritten laws' and informal associations are established. This creation of 'informal structures' within various types of organisations, has received explicit recognition since 1941 [138]. In view of Beer's [22] approach to organisation levels¹⁶, it is with irony to note his views on the complexity of the subject, which reads as follows:

"For someone to be able to grasp the complexity of the sum of all the levels of an organization, the volume of his or her head should grow exponentially with the number of levels he or she encompasses"

It must be emphasised, that it is not suggested in this thesis that the traditional organisational chart, which in some cases could be extremely complex, be scrapped in favour of, for instance, the 'drastic' Viable Systems model¹⁷ of Stafford Beer, in spite of the fact that it involves "a process of consciously creating a future" [75]. The proposed organisational structure, which is proposed

¹⁴ Refer to Chapter 2, Paragraph 2.2.

¹⁵ Refer to Chapter 2, Paragraph 2.2, Footnote 1.

¹⁶ Refer to Chapter 4, Paragraph 4.2.

¹⁷ Refer to Chapter 4, Paragraph 4.2.

to facilitate the solving of unstructured complex phenomena, should, in addition to the criteria listed above, contain the following:

- Have a dialectical approach to objectivity whereby equilibrium can be achieved when opposites are juxtaposed, very much in line with Hegel's Dialectical approach¹⁸.
- Contain elements of functional restructuring in such a way as to facilitate both centralisation and de-centralisation, and that all parts irrespective of being centralised de-centralised, essentially have the same goals and values as the total organisation.
- All operational units operating as a integrated 'systems' within the organisation must map the organisational structure of the greater organisation. This implies levels of recursion of each autonomous entity within the greater organisation. Furthermore, the notion of 'recursion' is fundamental so that vertical interdependence can be dealt with. As defined before, 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, that organisation and its supra-system (that of which the system is a part or a division of).
- Maps to the definition of a 'system' as defined by Vickers (1984) and cited by Strümpher [165], where a 'system is defined as, "a regulated set of relationships, and the key to its understanding is the way in which it is regulated". The attention of the reader is drawn specifically to this definition as the whole concept pertaining to the proposed organisation structure is formulated in terms of this definition. The importance of the definition cannot be overemphasised and for this reason, the interpretation of the definition is repeated yet again *verbatim*, as not to lose the true meaning of the author [165]:
 - *"The first aspect that Vickers' definition captures is that anything that we care to group together and label as an entity proves upon further investigation to be constituted from more relationships".*
"In fact why we care to label an entity as such is because the

¹⁸ Refer to Chapter 4, Paragraph 4.3.2.2.

constituent relationships show resilience or stability through time, i.e., ‘it’ persists”. “It is precisely because the relationships hang together through time that we observe them (it) in the first place”. “One perspective on relationships then is this stability, which I will call the structure”. “By structure I therefore mean those relationships that remain relatively unchanged through the period of interest to the inquiry”.

- *“A second aspect touched by Vickers’ system definition is that there is a dynamic dimension to the relationships”. “This perspective on systems relationships, which I will call the process dimension, refers to the altering or changing of relationships over the time frame of the enquiry”. “Process refers to the matter/energy and/or information flow, and their transformations, which place within the entity, as well as between the entity and its environment, during the timeframe of interest in the inquiry”. “Process describes the logical thinking of inputs to output(s)”. “It should be borne in mind that definitions of input and output depend on how the systems boundary is drawn, which is by no means determined absolutely”. “Whereas structure describe ‘static’ or (relatively) unchanged relationships, the process perspective describes the changes in relationships within the time frame of interest”.*

- The proposed organisational structure ultimately be made up as “an integrated whole whose essential properties arise from the relationship between the parts” after Capra [27].

5.5.1 STRUCTURE FORMULATION AND APPROACH

The attention of the reader is drawn to the fact that this paragraph is represented in Phase 6 of Figure 5.5 shown in Paragraph 5.6.1. Figure 5.4 is a graphical presentation of the proposed organisational structure, the details of which are discussed in detail below:

- **External Environment:-** The external environment is shown as Frame 1 and charged with the objectives of the greater organisation or operational unit which includes the mission of the entity, ‘what’ the organisation or organisational unit does and ‘how’ it is accomplished. This ‘external environment’, only implies the ‘model’ on which the organisation or operational unit is based.
- **Model:-** The model shown as Frame 2, represents the organisation or operational unit infrastructure environment and its interrelated communication, information, process flows and respective recursion levels. Furthermore, the model depicts the approach with respect to centralisation or de-centralisation of the organisation or operational unit. The model has tangent planes to each of the entities, which makes up the organisation or operational unit.
- **Internal Environment:-** The internal environment is shown as Frame 3, and is charged with the objectives of the internal mechanics of the organisation or operational unit, which could include the following:
 - 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 coordinated and do not generate vicious cycle effects.
 - Be concerned about the possibility of synergistic relationships among the organisation’s operational units.
 - The internal environment has tangent planes to each of the entities, which makes up the organisation or operational unit.
- **Executive Management:-** Executive management shown as Frame 4 has as its prime responsibility the solving of unstructured complex phenomena pertaining to the organisation or operational unit. In addition, other charges may include:
 - Exercising a dialectical approach to objectivity.
 - Maintain equilibrium and stability when opposites are juxtaposed within the organisation or operational unit.
 - Handling all organisation or operational unit policy decisions.

- Handling all arbitration issues between external and internal environments.
- Functions as defined in Chapter 1, Paragraph 1.1, Footnote 4.

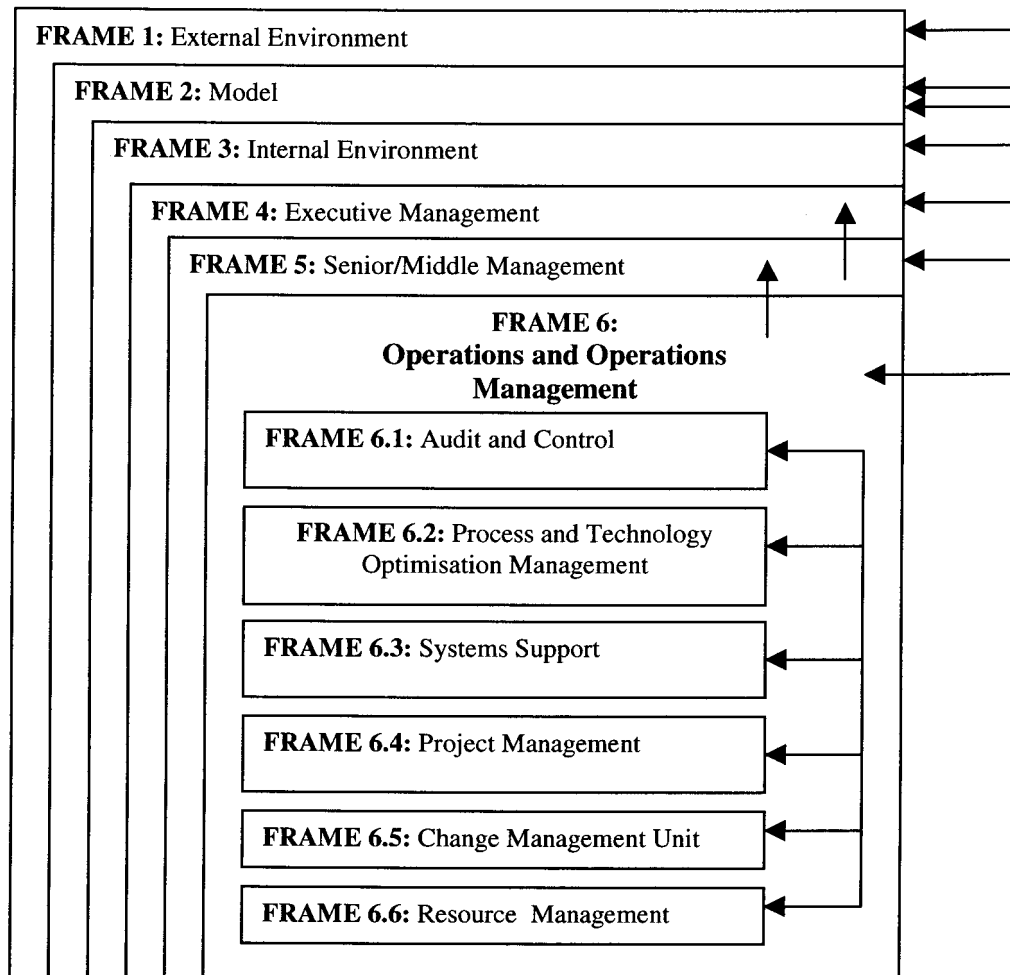


Figure 5.4: Proposed Organisational Structure for an Organisation or Operational Unit within an organisation (Representing Phase 6 shown in Figure 5.5).

- **Senior and Middle Management:-** Shown as Frame 5, senior and middle management has the ‘traditional’ responsibility of dealing with operational management issues. Within the context of this proposed structure, they have an additional function with respect to group participation in support of executive management in the solving of unstructured complex phenomena, literally operating as a ‘think shop’. This approach maps to ‘the first way of knowing’ described in Paragraph 5.3 of this chapter and furthermore maps to the ideas of Morecroft [111], and Simon [195], the latter who is of the opinion that individuals who are faced with complex choices are unable to make objectively rational decisions because:

- They cannot generate all the feasible alternative courses of action.

- They cannot collect and process all the information that would permit them to predict the consequences of choosing a given alternative.
- They cannot value anticipated consequences accurately and select among them.
- **Operations and Operations Management:-** Operations and operations management are shown as Frame 6, which consist of six separate interrelated entities namely:
 - **Audit and Control:-** Audit and control, shown as Frame 6.1, represent the ‘traditional’ audit and control functionality, which have the primary objective of ‘watchdog’, to ensure quality of outputs, risks are adequately monitored and that processes, procedures and controls are meticulously being adhered to. Furthermore, within the context of this proposed structure, the audit and control component will serve as input mechanism to executive management in the identification of elements attributing to unstructured complex phenomena. “Organisations do not look for problems until someone is dissatisfied”, according to Glass (1977) cited by Abel-Hamid and Madnick [1]. It is for this very reason, that it is a requirement to structure an organisation in such a way as to identify in advance potential complex phenomena, as opposed being deluded into a false sense of security, which may breed complacency and possibly even enforce dysfunctional behaviour should it be assumed that the organisation is sound. This approach maps to the views of Senge [153], who is of the opinion that, “in an increasingly dynamic, interdependent, and unpredictable world, it is simply no longer possible for anyone to figure it all out at the top”. The author [153] continues his wisdom with the opinion that, “in the old model, ‘the top thinks and the local acts’, must now give way to integrated thinking and acting at all levels”. This view is also supported by Morecroft [113], when he views a business or social system as a set of decision making ‘players’ whose decisions and actions are coupled.
 - **Process and Technology Optimisation Management:-** This entity, shown as Frame 6.2, has at its core, sustained process improvement and technology optimisation. Process improvement does not only involve improvement to functional processes, but also the interactive flows within

the organisation or operational unit, which flows from one entity to the other. In addition, sustained process improvement serves as the coordinating channel between the various operational entities to ensure that an equilibrium is maintained within the organisation and the organisation and the external environment. Supporting sustained process improvement at each level of the organisation or operational unit, is sustained technology optimisation through computerisation, automation and new technology innovation.

- **Systems Support:-** This entity shown as Frame 6.3, forms the crux of the organisation or operational unit with respect to vital back office functionality. The traditional perception is that this entity is no more than a 'support' function, which is manned by lower level staff taking care of remedial and repetitive support type functions and not really part of the 'bigger picture'. This perception also lays the foundation for operational disaster forming the breeding ground for unstructured complex phenomena. No matter how sophisticated a front office environment is, being equipped with the latest technology and manned by competent staff all with tertiary qualifications, without a suitable and equipped systems support infrastructure, the organisation or operational unit is set for failure. The organisational structure proposed in this thesis, presupposed that systems support should form the 'heart beat' of any organisation or operational unit.
- **Project Management:-** This entity shown as Frame 6.4 suggest that 'all' organisational or organisational unit initiatives require a planned, ordered and structured project management approach, irrespective of the size of the initiative. The approach would include feasibility and viability studies, and business plans, which are supported by well-formulated project and execution plans.
- **Change Management Unit:-** This entity shown as Frame 6.5 is perhaps the most ignored and neglected function within organisations and operational units. Having made this statement, it is ironic that societal problems form the core of unstructured complex phenomena, which invariably manifest as a result of change management being neglected or totally being ignored in the face of change, irrespective of origin. Issues

such as communication, morale, well-being, career path, aspirations, worker satisfaction, union relations, salary negotiations, employee benefits, new processes, technology innovation, and resistance to change are all elements, which could potentially lead to societal problems within the organisation or operational unit thus creating the inevitable unstructured complex phenomenon. The presence of a change management unit and ‘change agents’ within an organisation or operational unit are considered an absolute requirement within the ambit of the suggested organisational structure. Furthermore, this approach is in line with ‘multiple realities’ of ‘the third way of knowing’ described in Paragraph 5.3 of this chapter.

- **Resource Management:-** This entity shown as Frame 6.6, should be clearly distinguished from the ‘change agents’ described under the change management unit. The ‘traditional’ roles of resource management responsible for counselling, job interviews, job descriptions, job evaluations, skills analysis, job seat profiling, disciplinary hearings, salary negotiations, promotions, bonus payments, leave administration and training, remains within the definition of resource management under the suggested structure. In addition however, the suggested structure adds productivity management, time and motion studies and job fit to the list.

The importance of structure in the ultimate practice of building and simulating models of social systems can be found within the context of the phrase “behaviour is the consequence of structure” [133]. Behaviour here denotes dynamic behaviour, phrased in terms of graphs over time, while structure refers to feedback structure: A circular causal complexity composed of stocks (levels), flows (rates), and information links. Furthermore, the phrase is, at the same time, a good conjecture, an article of faith, and a proposition repeatedly verified in the practice of building and simulating models of social systems [133]. The inclusion of organisation structure within the ambit of the process of model conceptualisation confirms the notion that, ‘everything interacts with everything, that all branches of inquiring depend fundamentally on one another, and that the widest possible array of disciplines, professions, and branches of knowledge – capturing distinctly different paradigms of thought – must be consciously brought to bear on the

solving of complex phenomena'. Furthermore, this 'thinking' is in line with 'unbounded systems thinking' of 'the fifth way of knowing', described in Paragraph 5.3 of this chapter.

5.6 FORMULATION OF THE STRUCTURED SYSTEMS APPROACH TO MODEL CONCEPTUALISATION

Soft systems thinking will be the ruling maxim to the formulation of the *structured systems approach to model conceptualisation*, but not limited thereto as a finely tuned equilibrium will be maintained between soft and hard approaches, and between over control and chaos. From a holistic perspective, elements of the hard systems approach will be deployed to take advantage as far as possible of the empirical analytical methods employed in the natural science. Adapted from Checkland [29], this presupposes that real world problems can be addressed on the basis of the following four assumptions:

- There is a desired state of the system, S_1 , which is known.
- There is a present state of the system, S_0 .
- There are alternative ways of getting from S_0 to S_1 .
- It is the role of executive management to find the best means of getting from S_0 to S_1 .

5.6.1 THE DYNAMIC PROCESS OF MODEL CONCEPTUALISATION

The process of model conceptualisation is shown graphically in Figure 5.5. Each of the phases of the process are discussed in detail below:

- **Phase 1:-** The strength of the *structured systems approach to model conceptualisation*, lies within the premise that executive management formulate their solutions to unstructured complex phenomena by using inter-disciplinary teams. One of the main reasons for using inter-disciplinary teams, is to ensure that conclusions are reached based on secure scientific methods, and not falling into the trap of unsolved issues drawn out in time, or alternatively to prevent them from rushing into poorly thought-out solutions based on preconceived ideas about an assumed problem. Furthermore, the principles of group participation using inter-disciplinary teams, maps to the

‘agreement’ of ‘the first way of knowing’, described in Paragraph 5.3 of this chapter.

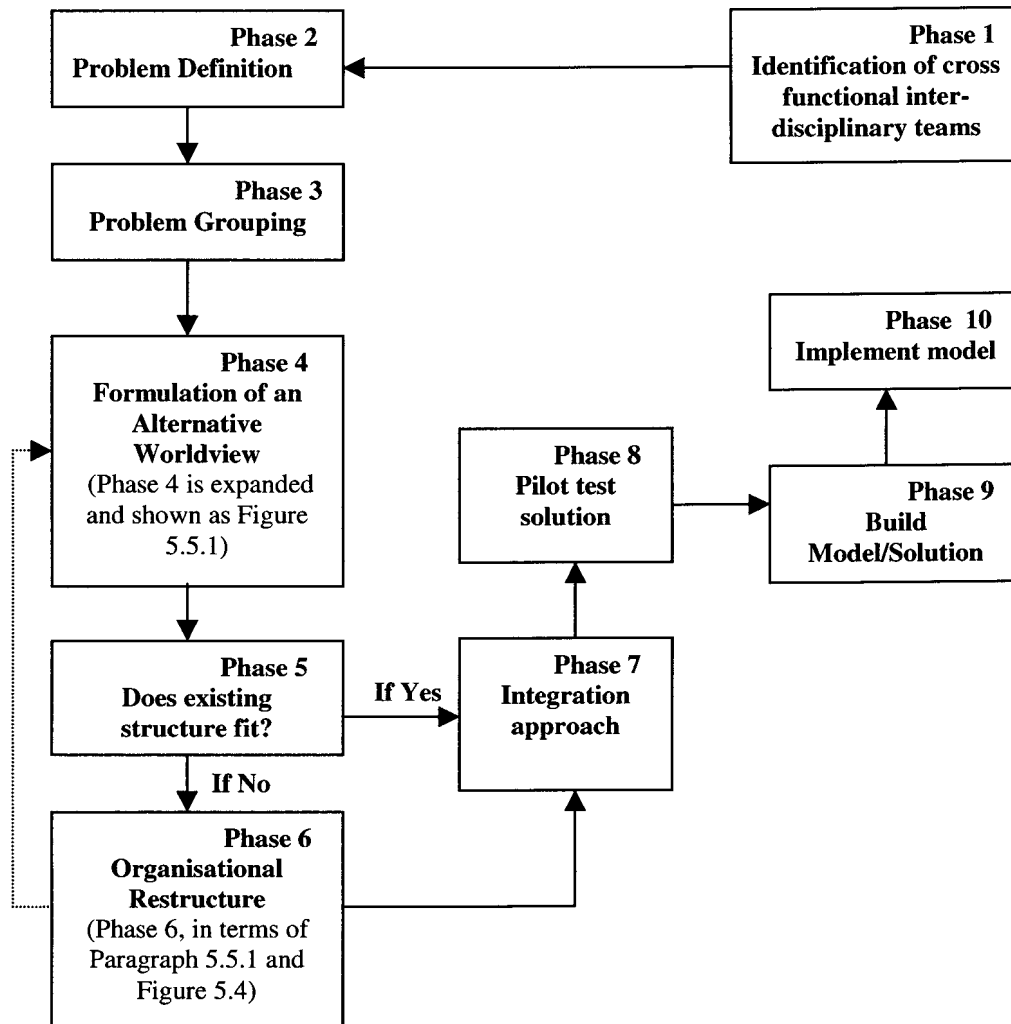


Figure 5.5: Model Conceptualisation Process (Includes Figure 5.4, which is represented by Phase 6, and Figure 5.5.1, which is presented by Phase 4)

- **Phase 2:-** This phase deals with the identification of the problem, commonly termed the ‘problem definition’. Within the context of a ‘research and development’ style analysis, this phase forms the ‘analysis’ part where one would try to build up the understanding of the problem by ‘taking it apart’. This, can typically be achieved by gathering information about structure and process by observation, and the collecting of secondary data through informal interviews. This phase also maps to the first phase of the decision making

process from systems dynamics¹⁹ namely, ‘to appreciate in a broad sense the situation of concern and to develop a non-precise understanding of the dynamics’. Furthermore, this is also in line with ‘conflict’ of ‘the forth way of knowing’, described in Paragraph 5.3 of this chapter.

- **Phase 3:-** In this phase, the opposite of the process followed in the previous phase applies, whereby we would try to understand how the problem elements would fit into the larger system by grouping them together in terms of their tangent planes. This action equates to the assembling of the explanation of the parts into an explanation of the whole. More generalised, each item, in terms of its functions within the ‘whole’, will be grouped together in terms of their tangent planes. A different approach is to deploy the concept of ‘variety reduction’²⁰, which will enhance the understanding of the difficulties and ways in which the problem elements should be dealt with. This phase also maps to the second stage of the decision making process from systems dynamics²¹ which determines that, “this broad understanding needs to be translated into ideas about how to improve problematic aspects, which require deeper investigation into the structure that underlies behaviour”. The aim is to draw out the essence of ‘what it 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 facilitates or limits the proposed actions and activities’. A natural extension to Phase 3, is the aim to formulate the ultimate *desiderata*, the objective of Phase 4, where an ‘alternative worldview’ will be formulated. The reader’s attention is drawn to the fact that the problem grouping phase shown in Phase 3, has tangent planes to the integration approach phase, shown in Phase 7. The tangent planes are vested in the principle of ‘project management’, as it is in this phase that the planning pertaining to the integration approach phase is initiated, in particular with reference to ‘how to get to the pilot’, the invention of new, or selection of ways of getting there. This requires specifying the courses of action, practices, programs and policies to be used. Furthermore, this phase is meant to generate maximum creativity amongst the members of

¹⁹ Refer to Chapter 3, Paragraph 3.6.4.

²⁰ Refer to Chapter 3, Paragraph 3.5.3.

²¹ Refer to Chapter 3, Paragraph 3.6.4.

the interdisciplinary teams in lieu of the creation of an alternative worldview shown in Phase 4.

- **Phase 4:-** This phase deals with the subjectivity of the *structured systems approach to model conceptualisation* and has been formulated from various conceptual ideas of the author from his own field experience, including those of the revered academics Hegel, Kant, Churchman, Checkland and Beer. These conceptual ideas, are primarily based on the following premises:

- Recursion.
- Causal loop diagrams and reinforcing and balancing processes.
- Alternative sets of assumptions.

These premises are juxtaposed to culminate in an ‘alternative worldview’ or ‘*Weltanschauung*’, the latter, which has two perspectives, namely:

- A microscopic view.
- A telescopic view.

This phase is best described if its individual parts are analysed, which is shown in Figure 5.5.1. In terms of Figure 5.5.1, the objective of the alternative worldview (shown in Frame 6) is to challenge (subjectively) a prevailing worldview (shown in Frame 4). Alternative sets of assumptions (shown in Frame 3) are considered the anti-thesis component of the process, and in line with ‘multiple realities’ of ‘the third way of knowing’, described in Paragraph 5.3 of this chapter. This ‘alternative sets of assumptions’, hold nothing more than when a problem situation arise and people have contrasting views on the ‘same situation’. Increasing purposefulness and sustained improvement, are achieved through causal loop diagrams and reinforcing and balancing processes (shown in Frame 2) and recursion processes (shown in Frame 1), which is applied to not only the prevailing worldview (shown in Frame 4), but also the alternative worldview (shown in Frame 6 and represented by Frame 1.1 and Frame 2.1)). This ultimately results in the continuous development of dialectic worldviews – becoming a never ending process and culminating in the principle of ‘continuity’. Should a worldview congeal into a *status quo*, it should have been subjected to forceful alternative perspectives, as upheld in this phase. The alternative worldview will represent the richest picture, ‘not of the problem’, but ‘of the situation’, in which there is perceived to be a problem. Synthesis of opposites (shown in Frame 5)

requires closer scrutiny. Having challenged the prevailing worldview with the alternative sets of assumptions produced a set of conceptual entities, which would represent a synthesis of opposite ideas. It is of importance to note that in all of the problem solving handled by the author, it is most unlikely that all of the views emerged as being the ‘same’ idea in symbiotic unison. The concept ‘synthesis of opposite ideas’, are:

- Exact and concise formulated verbal descriptions of not only unstructured complex phenomena, which require solutions, but also the root causes of such phenomena.
- Pure views of purposeful potential activity, which represents a viable and feasible solution to the phenomena.
- That the views must be ‘technologically’ viable.

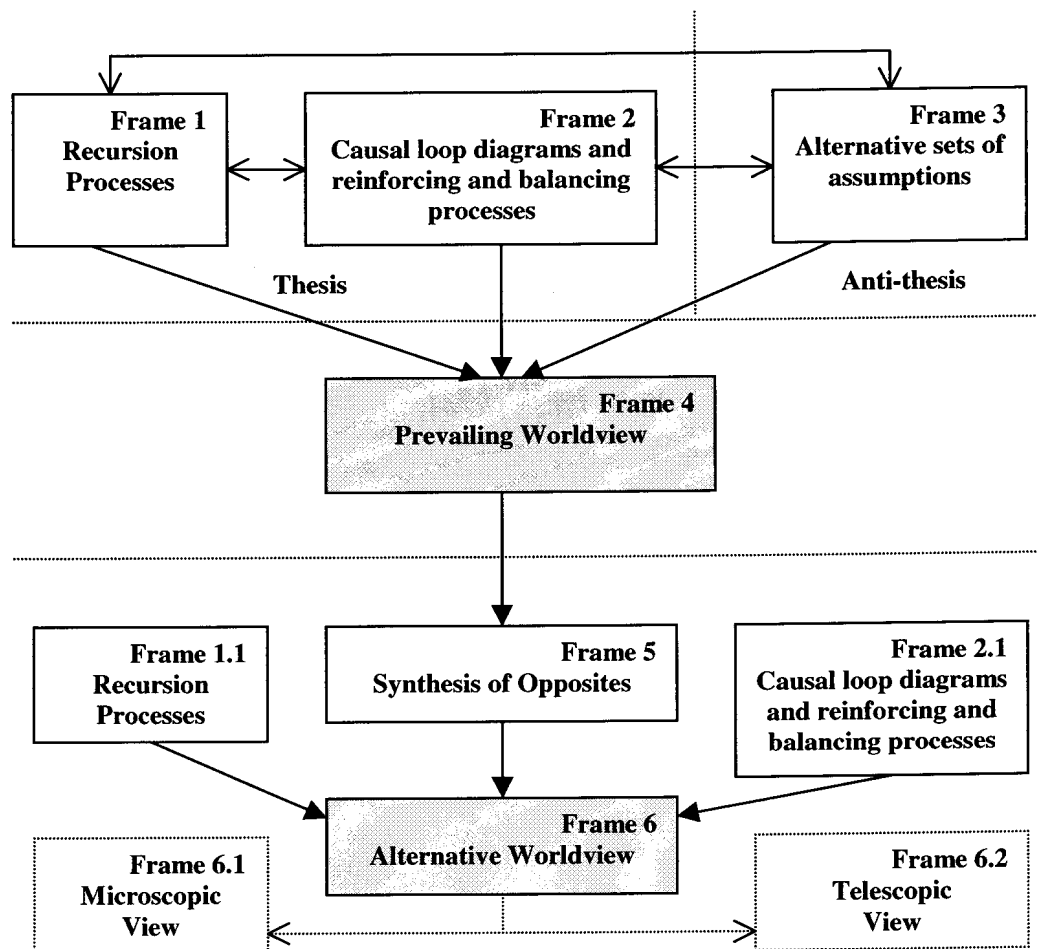


Figure 5.5.1: Alternative Worldview (Represented by Phase 4 in Figure 5.5)

- Before the synthesis of opposites (shown in Frame 5) can be transformed into the alternative worldview, the synthesis of opposites ideas must be subjected further to ‘radical’ thought, by selecting ‘one’ solution and furthermore, improving it further to ultimately culminate in a real world solution. This equates to a set of ‘management principles’, which have to be present if a set of activities is to comprise a system of purposeful activity being the telescopic view shown in Frame 6.2. It would be naïve to assume that only ‘one’ solution can manifest from the synthesis of opposite ideas. If this occurred in a simulated environment, it could indeed be possible, however, this thesis is about real world situations thus creating its own complexity and also its own simplistic remedial mechanisms. Sets of structured activities, can now be further compared whereby intuitive perceptions of the problem are brought together to provide an epistemologically, deeper and more general account of the realities beneath surface appearances, being the microscopic view shown in Frame 6.1. This gives effect to the basic systems hypothesis that systems concepts provide a means of ‘teasing out’ the complexity of ‘reality’. This ‘further comparison’ gives effect to the concept of ‘interaction of responses over various rounds’ being part of ‘agreement’ of ‘the first way of knowing’ described in Paragraph 5.3 of this chapter. The concepts ‘telescopic’ and ‘microscopic’ views, has at its core the concept of ‘interactivism’ previously described in Chapter 4, Paragraph 4.5.1, which follow strictly the approach for true interactivists.
- **Phase 5:**-The ultimate *desiderata* formulated in Phase 4 as an ‘alternative worldview’, must now in this phase be mapped to the existing organisational infrastructure of the organisation. Should it be found that the alternative worldview maps to the existing organisational infrastructure, the next step in the process can be initiated whereby the integration approach phase, shown in Phase 7 can be formulated. Should it be found that the alternative worldview does not map to the existing organisational infrastructure, the organisation is required to restructure in the next phase. It is of the utmost importance to note that the alternative worldview formulated in Phase 4, may include an organisation restructuring.

- **Phase 6:-** In this phase, the restructuring process flowing from the previous phase must take place as described in Chapter 5, Paragraph 5.5.1 and associated Figure 5.4.
- **Phase 7:-** This phase, which can only be initiated ‘after’ the alternative worldview has been incorporated into either the existing infrastructure (refer to Phase 5) or into the restructured infrastructure (refer to Phase 6). Key elements listed below ideally form part of this phase in the form of ‘formal structured project management’ operating within the context of ‘continuity’ as described in Chapter 4, Paragraph 4.5.2.
 - Timeframes to pilot, model building and ultimate implementation.
 - Resource allocation.
 - Budgetary considerations.
 - Materials.
 - Equipment.
 - Physical location.
 - Project planning.
 - Planning decisions.
 - Communication, external and internal.
 - Change management.
 - Executive buy-in.
 - Staff acceptance.
- **Phase 8:-** Phase 8 represents the pilot, the future environment of the system, the latter which, will be represented as a quantitative model that simulates its performance under different operational conditions. The ‘pilot’ as described is a ‘representation’ of the ‘ultimate model’, which will be constructed in Phase 9. For this reason, it is of importance for the reader to orientate himself with the ‘role of models’ as described in Chapter 2, Paragraph 2.7. The pilot is based on the concept of ‘negative feedback’, whereby the pilot’s output is compared with either a predetermined ‘objective’ or ‘goal’. Should the system not achieve the objective or goal, then the margin of error (the negative feedback), becomes the basis for adjustments of the pilot design to bring it closer to realising the objective or goal. The comparisons referred to in this stage is of vital importance being essential to generate ‘further’ debate about possible changes that could be made to bring improvements to the problem

situation, which would be the impetus to rerun the pilot. This is also in line with ‘conflict’ of ‘the forth way of knowing’, described in Paragraph 5.3 of this chapter.

- **Phase 9 and Phase 10:-** Phase 9 (build model/solution), and phase 10 (implement model), strictly fall outside the ambit of the *structured systems approach to model conceptualisation*. They are however included to complete the process from a holistic perspective.

5.7 CHAPTER FIVE IN SUMMARY

Chapter 5 contains an analysis of the key elements of the *structured systems approach to model conceptualisation*. The importance of this chapter calls for a detailed summary of the model conceptualisation process to aid the reader to fully comprehend the complex, yet logical approach to the concept. This summary contains the following important elements:

5.7.1 HOLISTIC APPROACH

This author approached the proposed model conceptualisation process by providing a simplistic holistic conceptual sequence of events pertaining to ‘model conceptualisation’ and ‘model building’, which is shown in Figure 5.2 (refer to Paragraph 5.1). Figure 5.1 furthermore, has the objective to show that a clear distinction can be made between the two elements, and emphasises that what is proposed in this thesis is not a ‘model’, but an ‘approach’ to the formulation of a model.

In addition, ‘model conceptualisation’ is placed in perspective as an entity, which encompasses the variables of identification, analysis and approach to problem solving as opposed to the entities, ‘model construction’ and ‘model implementation’. This author supports this perspective by citing authoritative academics in this field namely:

- Clark and Augustine [36].
- Forrester [59].
- Ackoff [9].

5.7.2 REFOCUS ON INITIAL OBJECTIVES

Key extracts from earlier chapters are repeated *verbatim*, the purpose being to place the formulation process of the *structured systems approach to model conceptualisation* firmly in perspective to the research as a whole, and to refocus on the key issues pertaining to the research problem. This refocus on initial objectives, furthermore re-emphasised the complexity of the task of the executive management when dealing with unstructured complex phenomena, namely that they (executive management), can be compared to passengers on an aircraft, which they not only fly, but are busy redesigning in flight [162].

5.7.3 REASONING AND THINKING: A PERSPECTIVE

This perspective, primarily philosophical in content, is combined with the ‘reasoning and thinking’ and personal field experience of this author, to culminate in a problem solving approach for the executive of the Twenty First Century.

Some of this author’s ‘reasoning and thinking’, is based on the ‘Ways of Knowing’ of Mitroff and Lindstone [108a], which primarily deals with the entities, which are appropriately annotated throughout the process of formulating the *structured systems approach to model conceptualisation* and listed below:

- Agreement.
- The world as a formula.
- Multiple realities.
- Conflict.
- Unbounded systems thinking.

5.7.4 ASSUMPTIONS

The assumptions which pertains to the formulation approach to model conceptualisation are graphically depicted in Figure 5.3. Key elements of this formulation approach starts with the author’s worldview or ‘*weltanschauung*’, ultimately culminating in the formulated *structured systems approach to model conceptualisation*. Key elements forming the assumptions are based on:

- Reasoning and thinking.
- This author's practical field experience.
- Accepted world best practice, industry problem solving methodologies.
- This author's own judgement errors in solving unstructured complex phenomena.
- Hard systems thinking methodologies.
- Soft systems thinking methodologies.
- Wisdom. This overriding element is utilised to ensure that the formulated *structured systems approach to model conceptualisation* is not based on the premise of 'doing the right things', but on 'doing things right'.
- The balance between 'over control' and 'chaos' – a 'midway approach', which is demonstrated in Table 5.1 reflecting the balance between 'hard' and 'soft' issues.

5.7.5 THE CONSTRUCTION ELEMENTS OF THE STRUCTURED SYSTEMS APPROACH TO MODEL CONCEPTUALISATION

The model conceptualisation process, which is depicted in Figure 5.5, consists of nine phases namely:

- **Phase 1:-** Problem definition.
- **Phase 2:-** Identification of cross-functional interdisciplinary teams.
- **Phase 3:-** Problem grouping.
- **Phase 4:-** Formulation of an alternative worldview.
- **Phase 5:-** Structural fit decision.
- **Phase 6:-** Organisational restructuring.
- **Phase 7:-** Integration approach.
- **Phase 8:-** Pilot test solution.
- **Phase 9:-** Build model.
- **Phase 10:** Implement solution.

Phase 4, due to its complexity is further analysed and expanded upon, the pertaining process, which is depicted in Figure 5.5.1. Furthermore, Phase 6, due to the significant importance of the concept is further analysed and expanded upon, the pertaining process, which is depicted in Figure 5.4 as a proposed

organisational structure for an organisation or organisational unit within an organisation. In both Phase 4 and Phase 6, the elements of recursion, causal loop diagrams and reinforcing and balancing processes are emphasised.

5.8 CONCLUSION

In this chapter, the key elements of the *structured systems approach to model conceptualisation* has been analysed in detail to culminate in a structured approach to be applied by executive management in their quest to solve unstructured complex phenomena.

This process can be viewed as a culmination of the previous chapters, in particular Chapter 2, where selected complexities of the systems approach were discussed. Chapter 3 and Chapter 4 contained the elements, which formed the crux of reasoning, namely hard and soft problem solving methodologies.

The process used to formulate the *structured systems approach to model conceptualisation* was highlighted through a series of graphical depictions of the process contained in:

- **Figure 5.3:** - The formulation approach.
- **Figure 5.4:** - Proposed organisational structure.
- **Figure 5.5:** - Model conceptualisation process.
- **Figure 5.5.1:** - Alternative worldview.

In Chapter 6, the formulated *structured systems approach to model conceptualisation* will be put to test as an alternative management mechanism by means of a case study. Furthermore, the case study will serve as validation for the *structured systems approach to model conceptualisation*.