

**APPLYING SYSTEMS THINKING AND ACTION
RESEARCH TO IMPROVE A PROBLEMATIC
SITUATION ON A LARGE PROJECT**

by

Allen Harold Lang

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PREFACE

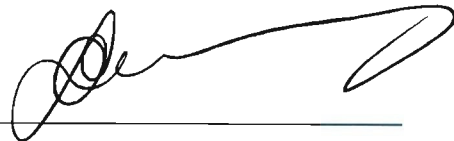
The research for and compilation of this dissertation represents original work by the author.

Primary and secondary sources have been used as the sources of information. Where secondary sources have been used, acknowledgements to the respective authors have been referenced in the text and publication details recorded in the reference list.

This work has not been previously accepted in substance for any degree and is not being concurrently submitted in candidature for any degree.

This work is being submitted in partial fulfilment of the academic requirements for the degree of Master of Commerce.

I would like to take this opportunity to thank all the lecturers and staff of the leadership centre for all the encouragement that they gave me during my period of study at the Leadership Centre and especially to Shrivaar Singh for the generous support and supervision during the compilation of this dissertation.



Allen Harold Lang

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ABSTRACT

Formal project management methodologies and processes play a vital role in organisations that run large complex projects and programmes. Is it possible that these methodologies and processes can end up defeating the purpose for which they are introduced? Can these methodologies actually cause projects to fail by becoming the focus of attention? If so, what can be done to reverse this bizarre situation?

This study intends to give some insights into these complex questions. Methodologies that are not usually used in such environments are applied to a particular messy situation on a project in an attempt to bring about some relief.

The events took place in a conservative, rapidly changing and highly politicised organisation that had embarked on a programme comprising many large inter-dependent projects that needed to be implemented in an aggressive time frame. A particular large and complex project was running into trouble due to, in no small measure, the strict enforcement of onerous project management procedures. The project team was becoming demoralised and very stressed, which aggravated the situation further.

Project managers usually adopt a “hard” approach to making changes. The aim of this research is to see whether using a “softer” approach in the environment described above could alleviate the situation. In this study, systems thinking and action research form the core of the multi-methodological approach to understanding the problem situation and identifying appropriate interventions to bring about improvements. Given the culture of the organisation concerned, will the application of these methodologies improve the situation by bringing the project back on track and improve staff morale?

Other concepts that play a role in this study include complexity theory and the learning organisation that are deemed essential to the understanding of the holistic picture.

“This we know. The earth does not belong to us; we belong to the earth.
This we know. All things are connected like the blood that unites one
family. All things are connected.
Whatever befalls the earth befalls the sons and the daughters of the earth.
We did not weave the web of life; we are merely a strand in it.
Whatever we do to the web, we do to ourselves.”

(Chief Seattle)

TABLE OF CONTENTS

PREFACE	ii
ABSTRACT	iii
TABLE OF CONTENTS.....	v
LIST OF FIGURES	viii
LIST OF TABLES.....	viii
LIST OF ACRONYMS USED.....	viii
Chapter 1 INTRODUCTION AND PROBLEM DESCRIPTION	1
1.1 Introduction.....	1
1.1.1 Preface	1
1.1.2 Structure of this Chapter.....	2
1.2 Projects within the Organisation.....	3
1.2.1 Overview of the Organisation.....	4
1.3 The Work Allocation Project.....	7
1.3.1 Overview of the Salient Aspects of the Project with Respect to this Study.....	7
1.4 Description of Problem Situation to be Addressed.....	9
1.5 Project Management Methodology and Processes	10
1.5.1 Problematic Concerns of the Project Management Methodology.....	10
1.5.2 Ownership of the Project Management Methodology.....	12
1.5.3 The Impact of Change on Project Objectives.....	13
1.5.4 Description of the Change Management Process	13
1.6 Expectations of this Study	14
1.7 Assumptions	15
1.8 Motivation for doing this Study.....	16
1.9 Delimitation of this Study.....	18
1.10 Significance of the Study.....	18
1.11 Conclusion	19
1.12 Structure of the study.....	20
Chapter 2 SYSTEMS THINKING AND ACTION RESEARCH	21
2.1 Introduction.....	21
2.2 Systems Thinking	22
2.2.1 Why Systems Thinking	22
2.2.2 Definition of a System	22
2.2.3 Description and Theory of System Thinking.....	23
2.2.4 Alternative to System Thinking.....	24
2.2.5 Why Systems Thinking is Advantageous for the Analysis of this Study.....	26
2.2.6 Systems Thinking and Organisational Culture.....	27
2.2.7 Systems Thinking as Applied to Project Management.....	29
2.2.8 Tools of Systems Thinking.....	31
2.2.9 Choice of Systems Method.....	37
2.2.10 The Learning Organisation / Experiential Learning.....	41
2.2.11 Insights from Complexity Theory	44
2.3 Action Research.....	46
2.3.1 An Introduction to Action Research.....	46
2.3.2 Definition of Action Research.....	47
2.3.3 Distinguishing characteristics of action research	47
2.3.4 Variations of action research	48

2.3.5	Designing an action research project.....	49
2.4	Conclusion.....	49
Chapter 3	SYSTEMS THINKING: GAINING AN UNDERSTANDING OF THE PROBLEM SITUATION	50
3.1	Introduction.....	50
3.2	Description of Current Situation.....	51
3.2.1	Need for Changes on the Project.....	51
3.2.2	Decision Considerations Regarding Change Requests.....	54
3.2.3	Leadership within the organisation.....	56
3.2.4	The Existing Change Management Process.....	56
3.3	The Need for Process Change.....	59
3.4	The Role of the Project Manager in Clearing Obstacles.....	60
3.5	Can Systems Thinking be Applied to Project Management?.....	61
3.6	Applying a Systems Thinking Approach to the Problem Situation.....	64
3.6.1	Rich Picture.....	64
3.6.2	Systems Map.....	65
3.6.3	Influence Diagram.....	67
3.6.4	Multiple Cause Diagram.....	70
3.6.5	Sign graph.....	71
3.7	Using Systems Thinking to Identify Points of Intervention.....	75
3.7.1	System Culture and the Role Of Politics.....	76
3.8	Conclusion.....	78
Chapter 4	ACTION RESEARCH: A MEANS OF IMPROVING THE PROBLEM SITUATION.	80
4.1	Introduction.....	80
4.2	Use of Action Research in the Context of the Project.....	80
4.3	Approach to action research in the given situation.....	81
4.4	Steps taken – First Iteration using Participatory Action Research.....	82
4.4.1	Participatory action research.....	82
4.4.2	Current Problem Situation Description.....	83
4.4.3	Action Research Steps.....	83
4.5	Second Iteration of the Action Research: Using Soft Systems Methodology (SSM).....	87
4.5.1	Application of Soft Systems Methodology (SSM).....	87
4.5.2	Problem Situation Unstructured: Examine the Problem Situation (after the initial change).....	89
4.5.3	Problem Situation Structured: Cultural analysis.....	91
4.5.4	Problem Situation Structured: The Problem Situation Expressed as a Rich Picture.....	92
4.5.5	The Root Definition of the System of Interest.....	94
4.5.6	The Conceptual Model.....	95
4.5.7	Comparison of the Conceptual Model with the Real World Situation.....	96
4.5.8	Definition of desirable and feasible changes.....	98
4.5.9	Action to be taken to improve the problem situation.....	99
4.5.10	Implementation of New Process.....	101
4.5.11	Observations and Analysis of the Intervention.....	101
4.5.12	Reflections on the Outcome with the View to Identifying Further Improvements.....	102
4.6	Conclusions.....	103

Chapter 5	OBSERVATIONS AND STUDY CONCLUSION	105
5.1	Introduction.....	105
5.2	Using Systems Thinking in a Project Environment.....	105
5.3	Moving Towards a Learning Organisation.....	108
5.4	Using Action Research for Learning and Implementing Improvements.....	110
5.5	Complexity, Chaos and Knowledge Management	113
5.6	Understanding the Impact of Culture using Systems Thinking.....	117
5.7	Organisational benefits resulting from this study.....	119
5.8	Problem situation revisited	120
5.9	Recommendations.....	121
5.10	Recommendations for further research.....	122
5.11	Conclusions	123
REFERENCES		126
APPENDIX A.....		134
APPENDIX B		139
APPENDIX C		141

LIST OF FIGURES

Fig. 1.1	Systems map indicating organisation structure relevant to this study	5
Fig. 2.1	Problem situation classification and systems approaches	39
Fig. 2.2	Kolb's learning cycle.	43
Fig. 3.1	Project life cycle phases	51
Fig. 3.2	Key project boundary conditions	63
Fig. 3.3	Rich picture of the problem situation	65
Fig. 3.4	Systems map of a project	66
Fig. 3.5	Systems map of the change request management as a system	68
Fig. 3.6	Influence diagram of change request management system	69
Fig. 3.7	Multiple cause diagram illustrating the negative influence of the administration on the project.	71
Fig. 3.8	Sign diagram illustrating the various reinforcing and balancing loops in the project documentation system.	72
Fig. 3.9	Influence diagram of the stakeholders	74
Fig. 4.1	Rich picture depicting the problem situation	93
Fig. 4.2	Conceptual model	97
Fig. 5.1	Building a climate of trust within an organisation	116

LIST OF TABLES

Table 2.1	Summary of systems thinking tools and their applicability to this study.	32
Table 2.2	Aims of hard and soft systems thinking	34
Table 2.3	Three primary systems approaches	40
Table 3.1	Systems thinking tools used in this chapter.	51
Table 3.2	Bate's 6 dimensions of organizational culture.	77
Table 4.1	CATWOE description and identification with respect to the root definition	95

LIST OF ACRONYMS USED

BO	Business Operations Business Unit
IT	Information Technology Business Unit
OS	Operational Systems Business Unit
QA	Quality Assurance
SOSM	System of Systems Methodologies
SSM	Soft Systems Methodology
TSI	Total Systems Intervention

CHAPTER 1.

INTRODUCTION AND PROBLEM DESCRIPTION

1.1 Introduction

1.1.1 Preface

As a consultant project manager in a large conservative and bureaucratic organisation, the existing procedures that were embedded in the project management methodology were considered a major contributory factor causing the Work Allocation Project that the author was managing to slip its target dates. During this time, he had also embarked on a master of commerce degree in project leadership and management. This course focused on systems thinking and complexity theory and showed how sustainable improvements to problem situations involving human activity systems could be achieved by adopting a systemic approach. Most of the case studies that were covered on the course involved projects of a social (or “soft”) nature. Very little literature was found to be available concerning the application of systems thinking to projects that had a large IT component.

The author thus chose to use learnings from his studies to establish how well the theory could be applied to a real problem situation in a “hard” project environment in order to bring about improvements to what was potentially a disastrous situation. By applying the suitable and relevant theory, the author intended to bring about changes to the project in order to identify where to intervene and then to select an appropriate intervention that would bring the Work Allocation Project back on track for successful delivery. In the process, it was hoped that the new techniques that were being introducing for problem identification and improvement would bring benefits to both the organisation and the participants in the form of new knowledge that could be applied elsewhere when required.

The author decided to use systems thinking and action research as the two main drivers from his studies to provide the methodology for this exercise. But how could systems thinking (as advocated by both Senge and Checkland amongst others) be used

to analyse and understand the situation within the organisation and project where a “hard systems approach” is the usual way of tackling problems? In order to bring about changes to the problem situation, it was felt that action research would provide a research and learning component, as well as assisting in the identification of appropriate actions to bring about improvements. In particular, the soft systems methodology of Checkland is used as the primary source for this activity. Given the existing politics and culture of the organisation, would management be prepared to support this systemic approach? And was there any way that the author could use this opportunity to contribute towards making the organisation more open to becoming a learning organisation? The main source for the theory on learning organisations is also derived from Senge. Kolb and Argyris provided further insights into the theory of learning. Throughout this study reference is made to the effect of complexity theory as it relates to organisational change and the primary source for this theory is Stacey.

The author has spent more than 20 years as an engineer and project manager involved on technical projects and have always dealt with problems using a reductionist approach. Although the human aspects of working in an organisation have always been an important factor for him, management of projects has meant that the driving of tasks to completion was of paramount importance. Thus in the case under study here one may think that the problem could easily be solved just by replacing one process with another simpler process. However, when considering the very onerous and strict bureaucratic practices within the organisation and understanding the reason behind these practices is related to the culture where there is little trust in its people, the value of systems thinking becomes very apparent. Adopting a systems thinking approach was therefore a paradigm shift for the author and it was with some apprehension that he went forward with this study.

1.1.2 Structure of this Chapter

This chapter will provide an overview of project management in organisations and describe how project management methodologies evolved in the organisation under discussion. It will also describe how these methodologies have contributed significantly to the problem situation. The process at the heart of the problem will be described as it relates to the Work Allocation Project and how it affected the people

working on the project. The relationship of the various organisational structures that are associated with the problem situation will be introduced. Some of the theory that will be addressed in later chapters of this document will be mentioned. This chapter will also deal with the expectations, applicability, assumptions and motivation for this study and describe the structure of the rest of the dissertation.

1.2 Projects within the Organisation

Over the past decade, many large corporate organisations in South Africa have moved to the concept of “managing by projects”. The project management methodologies adopted by these organisations have either evolved in-house over the years to suit the particular requirements of the specific organisations, or methodologies have been bought from specialist consultancies. There are advantages and disadvantages to both approaches and unless the adopted methodology takes account of many factors within the organisation such as culture, management maturity, degree of flexibility, size and type of projects, the effectiveness with respect to meeting the objectives can be severely diminished.

Simon *et al* (cited by Howick & Eden, 2001) suggest that a project management team should not assume that there would be no problems on the project. Managers need a new way to look large complex projects, especially when they form part of larger programmes. Systems thinking introduces a way of doing this. Senge (1990) says “the art of systems thinking lies in being able to recognize increasingly (dynamically) complex and subtle structures ... amid the wealth of details, pressures and cross currents that attend all real management settings. In fact, the essence of mastering systems thinking as a management discipline lies in seeing patterns where others see only events and forces to react to”. Complexity theory may be used to point towards a more practical way of taking the future into account (Rosenhead, 1998). To cope with change, modern organizations need to blend agility with direction, creativity with control and flexibility with structure (Partington, cited by Steyn, undated). Farmer & Martin (2000) suggest that in large complex organisations it is preferable that such changes begin at the edges where it is either overlooked or tolerated. Only when these changes are seen to be viable, is it likely to be accommodated at the centre of the organisation.

In order to provide an understanding of the problem situation, the structure of the organisation needs to be explained as it pertains to the project. Also, since the Work Allocation Project is part of a larger programme, the dependencies between this project and others in the programme need to be briefly described.

1.2.1 Overview of the Organisation

For the purposes of this study, the company can be considered as comprising 3 separate business units: Operational Systems (OS), Information Technology (IT) and the Business Operations (BO). All the projects undertaken by the company have large IT and business re-engineering components.

The OS is responsible establishing the future system needs of the Business and for setting the strategic direction of the systems that are to be implemented by the company over the next 5 to 10 years. It is also responsible for delivering the new systems to the BO. The IT is responsible for providing the IT infrastructure (including all computer hardware, software and related support) to the OS for verification prior to implementation in the BO and support to BO once the systems have been implemented. The BO (sometimes referred to as the Business) is the user of these systems and is the operational arm of the company that interfaces to its customers. The BO is also seen as the customer of the OS and the IT. Fig. 1.1 provides a systems map indicating the relationship of the various components of the organisation as they relate to this study. The Strategic Governance Council is responsible for the formalisation of project management methodologies and procedures within the organisation as well as for ensuring the adherence to these by all role-players. This council will be discussed in more detail later in this chapter.

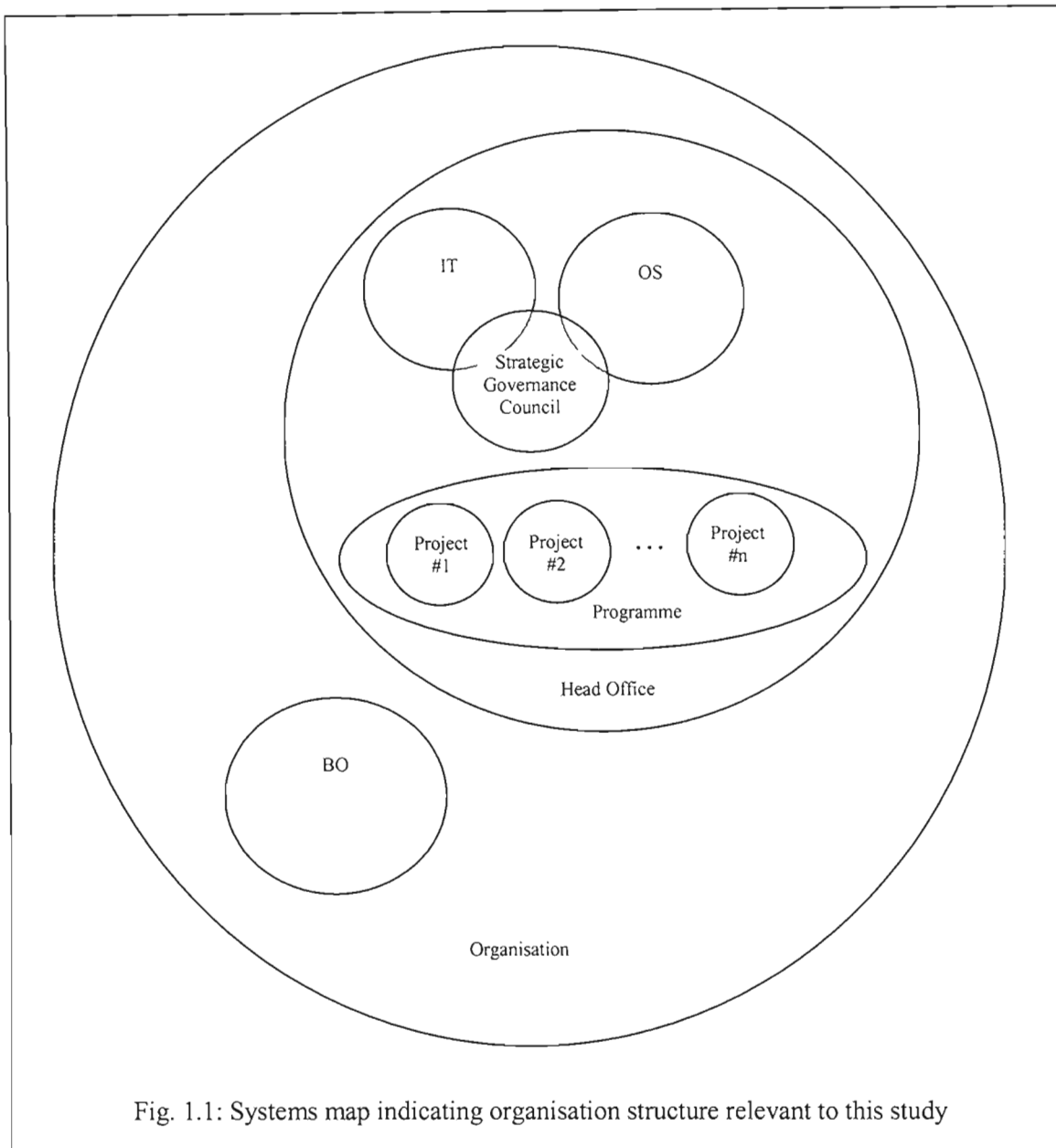


Fig. 1.1: Systems map indicating organisation structure relevant to this study

At present, the organisation is in the process of implementing a 5-year programme in which most of the existing systems are being replaced in order to provide a more efficient service to its many external customers as well as effecting significant cost benefits. This programme comprises a large number of projects, many of which have multiple dependencies on others. Due to the very high cost of this programme, it is imperative that the financial benefits are achieved quickly in order to obtain the necessary return on investment. The target completion dates were committed to the board of directors with little if any consultation with the resources responsible for the implementation of the projects, resulting in timelines that the project teams consider unrealistic when considering the complexities involved. There are numerous

dependencies that exist between the projects, many of which are running in parallel with others. These interdependencies that exist between the projects are important in defining the sequence in which the projects must be implemented. This means that a particular project may not be implemented before other projects have been implemented due to these dependencies. Hence a delay in any one project can have severe repercussions on the entire programme.

After establishing the future requirements of the business from the BO, the OS must work with the BO to develop new business procedures that will allow the company to function more efficiently and provide an improved service to its customers. Once these requirements have been defined, the OS and the IT go through a process of procuring a software package that is best suited to meet these needs. In many cases, the software package that is purchased (often from an overseas vendor) does not provide exactly what the business requires and this necessitates changes to the way in which the BO will need to operate. The structure of the organisation is changing frequently which implies that, by the time a new system is ready to be implemented, it will no longer meet the requirements of the new business model. This is often the cause of friction between the various business units: the BO is viewed as being resistant to change; the OS wants to meet its committed timelines almost to the exclusion of whether the new system meets the business requirements; and the IT wanting to reduce the project scope due to their excessive workloads. The OS and IT usually resist requests for changes. On the other hand, it is sometimes necessary to make changes to the new system. This would be the case, for example, when new information is obtained that leads to a better understanding of the purchased system's capabilities. The OS has to evaluate these requests for changes and must ensure that those requests that are considered essential are included in the software delivered by the IT. However, due to the very aggressive and strictly enforced timelines that exist, additional time for these changes to be made is seldom given. It can thus be seen that the relationships between the various business units are often strained due to the conflicting requirements: OS to deliver a quality solution on time according to the agreed (minimum) requirements; BO to obtain the best possible system functionalities for its users and the company's customers; and the IT to deliver a quality product with a minimum of defects that meets the requirements.

In addition, managing of projects in such a highly political and stressful environment requires more than the usual set of project management skills in order to maintain working relationships between all the parties as well as deliver the scoped products on time and within budget.

1.3 The Work Allocation Project

The author manages a very large project with an approximate value of R300,000,000 and which has more than 200 active project team members including a vendor from an overseas country. The project (called the Work Allocation Project), when implemented in the BO, will have thousands of users who are employed by the organisation and will influence the millions of customers that this company has.

1.3.1 Overview of the Salient Aspects of the Project with Respect to this Study

The IT components of the system to be developed by the Work Allocation Project include:

- A vendor supplied software package,
- A new application (system) developed in-house by the IT,
- The modification by the IT of 5 other existing systems, and
- A further 3 existing systems that were utilised, but not changed.

The IT systems that were the components of the solution to be provided to business had many connections (interfaces) to each other and these had to be defined very accurately. Each IT system had its own sub-project manager and team responsible for the development of the required enhancements for this solution. The main software package and specific enhancements required by the Work Allocation project were developed by the vendor overseas. In the case of the in-house systems, the development teams were remote from each other, some even in different cities. This implied that a lot of the initial designs were done independently based on the specifications provided in the earlier phase of the project. Communication between the teams was not satisfactory.

Although the Work Allocation Project followed the prescribed process (common to most project management methodologies) by defining the project scope and the user

requirements specifications in the early phase of the project, these were done at a relatively high level. It was only when the IT project team were at a relatively advanced stage of design that certain questions were asked in order to clarify what was thought to be relatively minor issues. In the process of determining the solution for these, it was found that significant changes would be required to the designs of almost all the components systems. In many cases the high level designs had already been baselined*.

It must be noted that the actual scope of the solution was not being changed. In certain cases, for example, screen layouts of systems needed to change in order to accommodate what the user actually wanted, and in other cases the software interfaces between the systems had to be changed. Also, as one issue was resolved in meetings and workshops, others surfaced, in some cases re-opening issues that had previously been deemed as solved. It took a further 12 weeks of intensive workshops to resolve most of the key issues. In the process, a total of 341 issues had to be resolved.

Many in the Work Allocation Project team felt that the only way forward was to slip the project timelines to accommodate these changes. However, senior management of the three business units were adamant that the end date of the Work Allocation Project would not be changed. This gave rise to a very tense and stressful relationship between the project team members of the OS and IT. In order to protect the IT, the project manager responsible for all IT aspects of the project insisted that each and every “change” resulting from the 341 issues mentioned above must be handled using the prescribed change management process. This would have meant many additional weeks delay to the project in order to allow the documents to be updated and re-baselined before the development work could proceed. As the overall project manager, it was the authors responsibility to find a way to minimise the impact of this by ensuring that the target dates of the Work Allocation Project were met, while still providing the IT a measure of protection.

* A document becomes baselined when it has been reviewed by stakeholders and is then approved by a predefined approval authority dependent on the type of document.

1.4 Description of Problem Situation to be Addressed

During the lifecycle of a project, experience in this organisation has shown that many changes are required. These changes fall into various categories. These include:

- Changes in the scope of the project;
- A change to the project timelines either as a result of a scope change, or for other reasons;
- Changes to the budget, for example if the anticipated cash flow was not achieved.

In addition to the above change types, many specific changes were required to be made to the designs of the various subsystems while the business requirements were being solidified. The number of these changes increased dramatically as the project approached the end of the design phase. The existing bureaucracy that would be required to process all of these changes would impose unacceptable delays on the project.

A serious shortcoming of the existing change management process (which is discussed later in this chapter) is that it takes a long time before approval is obtained so that the required work may be done. No work related to a change request may be done without all the necessary approvals. This caused confusion for the project team on this project, because the designers and other role-players were not sure whether the proposed changes would be approved. This in turn slowed down the progress of the designs while the approvals were awaited. The excessive amount of change requests also added an unusually heavy load to the various approval boards, which slowed them down further.

The dilemma facing the project manager on the Work Allocation Project was how to resolve this situation. Whatever was proposed had to be acceptable to and in line with the requirements of the Strategic Governance Council. Various ideas were mooted such as making the changes without following the change management process or changing the process in order to minimise the amount of bureaucracy required. Due to the conservative culture within the organisation, strong resistance was anticipated from many of the stakeholders to any initiative that was not in line with existing

procedures. Time was also a critical factor, as a solution to this situation was needed rapidly.

Since the above problem situation arose at work while the author was busy also with his studies, he decided that it would provide a viable and interesting scenario that could be used to establish whether improvements could be brought about by applying his newly acquired knowledge on systems thinking and action research.

1.5 Project Management Methodology and Processes

Project management methodologies are important in organisations that run projects in order to provide for a consistent and standard way of managing projects. Once there is a defined methodology, improvements to the discipline of project management can be brought about. A project management methodology also eases the movement of project managers across projects. It is especially important to have a methodology across a programme since it will facilitate standardised management reporting. Many organisations view a project management methodology as a means to improve the probability of successfully delivering projects. The methodology should be constantly revised based on lessons learnt.

1.5.1 Problematic Concerns of the Project Management Methodology

Organisations that embark on many projects should continuously review their methodologies as a process of improvement. To achieve this, the organisation will hold sessions in order to learn lessons from what went well on the project, what could be improved, and in the latter case, what actions are necessary so that the mistakes are not repeated. These sessions would be held at the end of the project or at specific points within the lifecycle of the project. Usually this results in “improvements” to the project management methodologies by instituting more onerous procedures that need to be adopted by the project teams. In organisations that have run many projects over the years, this can result in a very complex series of procedures that need to be enforced as the project management methodology or process. Eventually, the organisation may lose focus on the actual projects being run and spend more energy on following the procedures in the mistaken belief that as long as the methodologies are religiously followed, the projects cannot fail, which is a classic case of goal

displacement. Such is the situation in the organisation that will be discussed in this study. This appears to confirm the contention of Cooke-Davies (2003) who maintains that it is very easy for project management to descend into value destroying bureaucracy.

Over the years the organisation has developed a sophisticated project management methodology. This methodology has evolved as a result of:

- Trial and error over a large number of projects that have been implemented;
- Knowledge gained from project managers joining the organisation from other companies;
- Tools and project management methodologies being purchased with little regard to the existing culture and modus operandi of the organisation; and
- Contracting professional organisations that specialise in implementing project management methodologies, again with little regard to the existing culture and modus operandi of the organisation.

The result has been a conglomeration of processes and tools that have been incorporated into the existing project management practices that are now used in the IT and OS.

When projects are completed and evaluations held to consider what was done well and what areas of the project management practices needed to be improved, the processes grew even more burdensome. More documents were added as deliverables for each project, often without adding much value and usually not being particularly appropriate for other projects.

Cooke-Davies (undated) says that “projects are important to industry, but project performance continually disappoints stakeholder expectations. Organizations react to this performance problem in many ways, and purchase consultancy, training, methods and tools as possible solutions [but] there is no published evidence that any of these solutions are consistently successful in improving project performance”.

To compound the issue, administrative skills are not widely distributed throughout the organisation. There is a strong school of thought within the organisation that feels most projects are late due to the heavy and largely unnecessary burden of

administration and document requirements that are coupled to the running of a project. Snowden, in his keynote address to the Knowledge Management in Europe claims: “Communities of practice too often try to formalize the informal, which is why they fail and end up killing the natural community they were meant to strengthen” (cited by Zijlstra, 2003).

1.5.2 Ownership of the Project Management Methodology

The project management methodology that is used on all projects undertaken by the organisation has been put in place and is controlled by the Strategic Governance Council. Supporting the Strategic Governance Council are quality assurance representatives who are assigned to the projects. This council is chaired by the head of the quality assurance department and comprises other senior managers from within the OS and IT. Their primary function is to act as custodians of this methodology and to introduce improvements when required. Any proposed changes to the methodology must also go through a lengthy process of discussions, approvals and trials before it is officially incorporated. This can take many months.

Conformance reports that outline the performance of the project managers with respect to their conformance (or otherwise) to the methodology are produced regularly and issued to the senior management of these business units. Should anything go wrong with the projects, this report is used as the first step in looking for what went wrong and who to blame. The project managers and the project teams view this as a lack of trust in their integrity to do what needs to be done to deliver successful projects. Maccoby (2003b) says that in order to build the kind of trust required for an organisation to function requires confidence that others can and will keep their commitments. This does not mean that there should not be a verification process to ensure standards are being met, but Maccoby points out that obsessive managers can take this verification to extremes. Urquhart (2002) claims that over one third of a company’s budget may be spent on administrative functions such as controls, procedures and reports and that these controls exist due to managements mistrust of employees. One of the qualities that define a trusting workplace, according to Urquhart, is that rules should be treated as a guideline and not a solution.

1.5.3 The Impact of Change on Project Objectives

During the course of a project, no matter how well planned and controlled, there will inevitably be changes to the scope, the project schedule and the budget. One of the most common disruptions to large and complex projects is the change requests that occur during the project life cycle. Possible reasons for change requests will be discussed later. When change requests occur on a large complex project, they become very difficult to cost properly and can increase the complexity of the project out of proportion to the work that is directly attributable to the change request itself (Eden *et al.*, 2000).

To understand the effect of changes on a project involves an extensive amount of work that is frequently neglected with the result that the cost and time impact of the change request will be underestimated. The change process implemented on a project must be agreed to and understood by all parties working on the project as well as by the client. The number of change requests submitted during the course of the project will also influence the amount of disruptions and delays that the project experiences. As a result of too many change requests that need to be considered, vicious cycles are set up that contribute to the costs of the disruptions and delays (Eden *et al.*, 2000).

Although there will inevitably be some changes required to the initial goals of a project, these should be kept to a minimum and be tightly controlled to prevent the project slipping out of control. Uncontrolled project changes are one of the main causes of project failure (Kerzner, 1998). In order to make changes to a project baseline (be it the project scope, budget or schedule), it is essential to follow a well-defined process in order to protect the project baseline. This process must be incorporated into the project management methodology.

1.5.4 Description of the Change Management Process

Change management is a central aspect of project management (Yeo, 1993; Stretton, 2000). The success of a project is often dependant on how well changes are managed. In order to protect the committed timelines, it is necessary to protect the agreed scope of the projects very carefully. To do this, there is a very rigid change control process that has evolved over the years and which has been adopted by all three business

units. The change control procedure has itself undergone many changes as different types of changes have been identified. Each type of change needs to be managed in a slightly different manner. In order to ensure that the scope is tightly managed on the Work Allocation Project there has been an insistence that in addition to the normal process, every change request must be approved by three executives as well as a minimum of three relevant senior project team members before it may even be considered.

A request for a project change needs to go through various stages before it is accepted as part of the project baseline. The process required that the change request gets approved for investigation purposes by three change management boards. Once the impact of the change has been determined, it needs to go before all three boards again in order to get approval to make the changes. This process can often take anything from 2 weeks to 4 months to complete, depending on the complexity of the change and the number of other projects-in-process or operational systems it impacts.

A simplified process flow of the change management process is provided in Appendix A.

1.6 Expectations of this Study

There are a number of expectations that the author has in doing this study. He expects to obtain a clearer understanding of the messy situation. With this improved understanding it is anticipated that an appropriate intervention point can be identified. Once this has been done and the particular intervention decided upon, it would show how process changes could be implemented in a very structured, rigid and conservative organisational environment. If successful, it should not only improve the situation on the Work Allocation Project, but could open the way to revising other process which are deemed to be inappropriate to specific circumstances on other projects within the organisation.

More importantly, it will allow the other project managers to use similar techniques in future and to grow the company into more of a learning organisation. It will foster closer ties between the project managers and the Strategic Governance Council

members, and in so doing, it will give the project team members a sense of empowerment.

Finally the author expects that, if this study produces positive outcomes, he will be more willing to apply the theory that he has acquired with more confidence in future to the benefit of both his customers and himself.

1.7 Assumptions

A potential problem using action research is that it encourages a democratic participation of the participants. In project management as applied in the organisation under discussion, there is a heavy emphasis on hierarchical structures and the culture is very much one of top down command and control. The use of action research in these circumstances is thus risky, as it is counter to the existing culture.

In the light of the above, the following assumptions are thus made:

- ◇ The organisation will appreciate the need to improve the existing process and provide support and tolerance in the pursuit of enhanced efficiencies within the existing structures;
- ◇ The Strategic Governance Council will be prepared to consider either changing an existing process or adopting a new process;
- ◇ The stakeholders will support the initiative to seek a more efficient and appropriate process for their needs;
- ◇ The stakeholders will be prepared to participate in the methodology used to analyse the problem and look for an appropriate solution;
- ◇ The stakeholders will allow sufficient time for the new process to be given a chance to work and that if the process needs to be enhanced, there will be tolerance for this to be done;
- ◇ The introduction of a new process to handle project changes will not adversely affect the existing contract that is in place between the organisation and the vendor. (The contract references all procedures that need to be followed by the vendor in the execution of the contract).

1.8 Motivation for doing this Study

Having consulted to this organisation for a number of years in the project management field, the author had become acutely aware of the inefficiencies and inappropriateness of the project management methodologies that are being used. The approach discussed in this dissertation questions the suitability of these processes given the current stressful situation in the OS and the IT and suggests a way of tailoring those aspects of the project management methodology that are seen to be inhibiting the delivery of the projects. This is important considering the large number of projects that have to be implemented over the next 5 years, the limited available resources and the very aggressive timelines assigned to the programme.

As the author has a technical background and spent many years as part of project teams in many organisations, he has developed an understanding of both sides of the argument. With the new learning's that he gained while studying in the Leadership Centre programme, the author acquired an insight as to how one can overcome the divergent viewpoints and achieve a mutually acceptable solution. Although the example used as a case study in this exercise may be deemed quite minor in nature, the impact of allowing the project manager to be seen to be supporting the project team by minimising the perceived bureaucracy on the one hand, while ensuring that quality principles are maintained on the other must not be underestimated.

Project management methodologies and related procedures have evolved within organisations in order to minimise the risk of failure of projects. However the affect of the organisation's culture has a huge bearing on how these evolve and especially how they are implemented within the organisations. The author does not believe that one can underestimate the importance of the organisation's culture in this regard.

A key skill for managers in complex and changing environments is a tolerance for ambiguity (Snowden, undated). It is unfortunate that almost all managers today have been trained in the discipline of scientific management and are hence intolerant to such ambiguity. Snowden adds that the single major challenge for organisations today that are operating in the emerging knowledge economy is to break the mould of this

management thinking. For traditionally trained managers, this would require “unlearning” to first take place before new learning can commence.

Systems thinking increases the likelihood that the required and intended consequences will be produced. The author believes that by doing this exercise it will assist him in consolidating the knowledge that he had accumulated over the past 18 months, especially with respect to action research and applying it using systems thinking in a very practical situation that would not normally be amenable to this type of intervention. Furthermore, if as a result of this exercise the organisation takes a next step to becoming a learning organisation, then at least some small benefit will have been realised in this respect.

The project team members tend to see the project manager’s function as that of a policeman in order to ensure that the processes are strictly enforced and adhered to. By leading a team that will try to make a particularly bureaucratic process more use-friendly and less of a burden and thereby allow the project team to concentrate on the important work, it is the opinion of the author that a more positive view of the project manager will emerge. This should translate into improvement in team functioning.

If this exercise is successful, the author hopes to indicate that the project team members can and should play a constructive role in the determination of more suitable project methodologies that should be adopted on large complex projects. In so doing, it would demonstrate that the team members are appreciative of the need for controls and processes on a project, but that these also need to be tempered with the particular requirements of the specific project.

Finally, by making use of the systems thinking and the action research paradigms, the author would be demonstrating to the organisation a methodology that will encourage the process of continuous improvement by not only considering the technical, but also the human aspects that make up projects.

1.9 Delimitation of this Study

This study will not critique project management methodologies in general, nor will it consider the specific project management processes that are in place in the organisation under consideration. It is also not the intention to apportion any blame for the situation that the Work Allocation Project was in at the time that this study commenced.

One needs to be cognisant of the particular culture within the organization as well as the personalities involved, as these would play an important role in determining whether or not this type of approach would work in a specific organisation. While this study will discuss the organisational structure, culture, climate and politics as required when using systems thinking, no attempt will be made to change the culture of the organisation.

In companies where project management methodologies are provided as a guideline and can be tailored to suit particular situations, or where the project management processes are not as onerous as those in the organisation under discussion, the approach adopted in this dissertation will not be directly applicable. The same is true for organisation where there is sufficient trust in their project management teams to do what is in the best interests of the project and the organisation.

1.10 Significance of the Study

The manner in which the action research was conducted in accordance with a systems thinking paradigm would be beneficial to project managers who find themselves in a similar situation to the one described herein. More generally, this study will be useful to organisations that have inflexible processes in place and which would like to move towards becoming a learning organisation. It will demonstrate the advantages of action research and how, if used with a systems thinking approach, the users of the processes can become empowered to bring about significant improvements and real benefits to the organisation.

The study would also be applicable to non-project oriented organisations that have rigid processes. In particular, if one considers how bureaucracy is stifling productivity

within the parastals and government agencies in South Africa, the approach described in this dissertation could be used to investigate options for an alternative model of service delivery in these organisations. Solutions derived using this methodology would empower the employees to take ownership of new and more efficient ways of serving the public.

Organisations that are less mature with regard to the project management processes should also take note of the research so that when their processes are developed, they make allowances for specific projects to tailor processes to their own needs where appropriate.

1.11 Conclusion

By the end of this study, the situation on the Work Allocation Project had improved significantly. Not only had the morale of the staff improved, but also the project was well on track to meet its original timelines. The author had achieved the goal that he had set for himself, which was to get a better understanding of the theory that had been learned during his studies and how these could be applied to a real problem situation. Through the requisite research that the author needed to do in order to get more information on the various fields, he increased his knowledge significantly and also found additional areas of interest that he will continue to research. He had also established that the use of systems thinking definitely had a role to play in problem solving when working in project environments that were more technical in nature and realised the importance of causal relationships in analysing messy situations.

The participants who worked with the author on the action research aspects of the study came away with an improved appreciation of the importance of spending time and effort in understanding perspectives and mental models of others. In engaging this problem situation, the approach adopted called for the team to look further than a particular event. A pattern was identified in the behaviour of the system and a solution implemented in which the structure of the change management system was revised. This resulted in a sustained improvement from which the entire Work Allocation Project benefited.

The study also showed how the application of systems thinking as a precursor to the use of an action research methodology could add value and expedite the process of improvement. This dual methodological approach is something that the author had not seen in any case studies.

1.12 Structure of the study

Chapter 2 will provide the theoretical base and conceptual framework on which the study will be founded. In particular, it will provide an overview of relevant action research and systems thinking theories on which this study is based.

Chapter 3 applies the systems thinking theory that is described in chapter 2 in order to contextualise the problem situation. It will establish whether a project may be considered as a system. A systems thinking methodology will be used in order to obtain a better understanding of the problem situation. This is done using various tools derived from the systems approach.

Action research is considered appropriate in a situation where the participants recognize the existence of inadequacies of their existing processes and wish to intervene to make improvements after analysis of the situation using a structured approach. Chapter 4 will make use of two different action research methodologies to both analyse the problem situation further and to look for appropriate interventions to improve the messy situation. It will contain the design and description of the research models and locate these in the paradigms used in the study. Each of the approaches will result in action that will produce changes to the project system.

Finally, chapter 5 will cover the main findings of the study, show how these complement the knowledge previously acquired and how it may be applicable to the author in future. It will also contain a section on recommendation to anyone who may wish to apply this methodology in similar circumstances. A reflection on the learning experience gained in the process of this work will be provided.

CHAPTER 2.

SYSTEMS THINKING AND ACTION RESEARCH

2.1 Introduction

This study involves the application of systems thinking and action research in order to better understand a messy situation, to identify an appropriate intervention point and to decide on what changes to introduce in order to bring about improvements to the situation. The purpose of this chapter is to provide the relevant theoretical background to the main subject areas that will be considered; i.e. systems thinking, learning organisations, complexity theory and action research. The application of systems thinking is covered in chapter 3 while the action research aspect of the study is described in chapter 4.

This chapter will provide an insight into the relevant theories on systems thinking by means of a literature survey, together with a brief description of the alternative options that exist to the systems thinking paradigm. Available and appropriate systems thinking tools will be discussed. This will include a discussion on the Hard Systems Approach and Soft Systems Methodology that are used on hard and soft complexities respectively. Also, this chapter will cover the theory of the action research paradigm as a means of doing research into a problem situation as well as making relevant changes in order to bring about improvements. The various methodologies that exist for doing the research and subsequent actions will also be discussed.

The organisation, while implementing good practices and processes with respect to project management, continues to make the same mistakes in many projects undertaken. This is indicative of the fact that it is not functioning as a learning organisation. Some discussion on learning organisations will therefore be included in this chapter, since the use of systems thinking and action research will contribute to some parts of the company understanding and adopting concepts that will bring it closer to becoming a learning organisation. By embarking on action research, it is again anticipated that there will be an appreciation of the advantages of participative democratic principles that can be applied to achieve a successful transformation in what has been a rigid process.

2.2 Systems Thinking

2.2.1 Why Systems Thinking

Systems thinking is one of the two methodologies used in this study to understand and ultimately introduce change to a situation, the other being action research. This section will provide a definition of a system and give a description of the systems thinking paradigm. This is put in context by considering the alternative approaches that are used when studying systems. Reasons are given as to why systems thinking would be advantageous to this study and the benefits that its practitioners derive by using it. There is also a discussion on how it may be applied within a project environment. Many of the tools that are available to the practitioner will be introduced.

2.2.2 Definition of a System

Although there are many definitions of a system, the one that will be used is from Lane (2000) where a system is defined as follows:

- A system is an assembly of components connected together in an organised way.
- The components are affected by being in the system and the behaviour of the system is changed if they leave it.
- This organised assembly of components does something.
- This assembly as a whole has been identified by someone who is interested in it.

Other characteristics of a system include the fact that:

- Systems change in response to feedback; and
- Systems maintain their stability by making adjustments that are based on feedback.

In order to consider the impact of a system, it is important to observe how its structure (i.e. the interconnectivity of the system components) influences the system behaviour and hence its emergent properties. When considering complex and highly structured situations that can be well defined, especially in terms of inputs and outputs, the reductionist approach (see later) is well suited to problem solving. However, in human activity systems, this structure is very subtle - the interrelationships between people are affected by the negative and positive feedback loops that can generate unintended results. Sometimes the effect of these interrelated activities are only evidenced after a lengthy

period of time has elapsed, it thus becomes difficult to visualise the whole pattern of change. There is thus a tendency to focus on snapshots of isolated parts of a system resulting in deeper problems not getting solved (Senge, 1990). In order to cope effectively with the understanding of such systems, one needs a new way of thinking (Stacey, 1993). Systems thinking gives the practitioner the ability to see things or systems as wholes rather than the different individual components.

2.2.3 Description and Theory of System Thinking

Traditional management, bureaucrats and politicians address problems use linear thinking decisions based on simple cause and effect relationships that are, in turn, based on the events that they experience. This is due to their inability to comprehend the complex and interactive behaviour of their social organisations. Systems thinking was developed as a response to the rapid technological complexities that confronted engineers and scientists and stressed the relationships and processes that made up the organisational context, as opposed to the separate entities (Cooper, 1998). It was developed from three pathways during the latter half of the 20th century (Stacey, 1993). The three strands are:

- General systems theory
- Cybernetics
- Systems Dynamics.

A criticism of early systems theories was that organisations were considered as physical entities with clear boundaries, structures and functions (Stacey, 1993). A further criticism was that it presented people as deterministic and ignored aspects of emotion, conflict, culture, politics and ethics. These critics included Churchman (who focussed on boundaries and ethics), Ackoff (who developed interactive planning) and Checkland and Scholes who were responsible for the development of soft systems thinking.

There are different ways to look at systems. Of particular importance to this study is the classification of purposeful activity of human beings (including organisations, industrial activity, and political systems) as human activity systems by Checkland (1981). These are referred to as soft systems. Such a system will either be a subsystem within a greater system, or a larger system incorporating smaller subsystems (Wilson, 1984).

Systems thinking is used to help people view the world from a broad perspective that includes structures, patterns, and events instead of just focusing on the events themselves (McNamara, 1999). Senge (cited by Larsen *et al*, 1996) asserts that linear and mechanistic thinking is becoming less effective to address the problems that face us today, since many issues are interrelated in ways that disregard linear causation. In analysing a problem using systems thinking, there are four phases that the practitioner should go through (Thorpe, 2000). These are: sensing, understanding, deciding and acting. This ties in with Kolb's learning cycle explained later in this chapter.

Systems thinking also:

- Provides a means of recognising multiple perspectives of different stakeholders and placing the result in the organisational context by combining multiple mental models;
- Is a discipline for seeing situations in a holistic context, for seeing the interrelationships between the components of the system and the environment instead of the component itself, and viewing patterns of change instead of a static snapshot of the world (Senge, 1990);
- Provides a paradigm, method and language that allows for the building of better mental models, simulating them more reliably and communicating them more effectively;
- Provides an approach that helps to build mental models that are more harmonious with reality and allows for the accurate simulation of these models, thereby increasing the likelihood that the intended consequences will be achieved.

An advantage of systems thinking is that it also requires that practitioners consider the unintended consequences of changes that are introduced into a system (Bellinger, undated).

2.2.4 Alternative to System Thinking

Before continuing to look at the systems thinking methodology and how it may be used to create a better understanding of a problem situation, it is useful to consider what alternatives could be used to achieve the same goal. There are a number of different ways to look at a particular situation that may be considered as "tools for thought" (Lane,

2000). People tend to think about situations in a way that is unique to their experiences and culture. There are two usual ways in which thinking about a situation occurs: logical and causal. Logical thinking uses reason as its driver and has three key elements: it attempts to be objective; its conclusion always follows a premise; and it is sequentially structured. It is a useful way of thinking about hard problems (i.e. those that treat people as passive observers and therefore do not have an emotional component) where it can help lead to a clear and sensible decision. Causal thinking permits the linking of activities or events together. It is similar to logical thinking. Understanding causality is also an important aspect of systems thinking.

A disadvantage of both logical and causal thinking is that they tend to focus on a particular situation or event and attempt to form general principles or patterns from these, while ignoring subjective elements. A second problem is that these types of thinking tend to ignore the emotional and subjective factors. In the case of a complex system, logical and causal thinking will seldom be able to predict the behaviour of the system or recognise the unintended consequences that may arise from a given change. Also, both these types of thinking do not take into account the feedback loops that are characteristic of complex systems.

Both causal and logical thinking are typical of the scientific method where, over time, scientific knowledge has been developed by adopting analytical methods in order to understand problems. This has been achieved by breaking problems into smaller components and then studying each in isolation, since it is easier to understand single cause and effects. Conclusions are then drawn about the whole (Larsen *et al*, 1996). This is the reductionist approach, which artificially restricts the system components in order to make experiments repeatable. It has proved very effective in practice over the years to the extent that reductionism has become embedded in our language, literature and thought (Lane, 2000). Traditional bureaucratic theory did not take into account the interconnectedness of the components. The traditional view of an organisation is thus to look at its component functions as opposed to a systems view that looks at the whole organisation.

Systems thinking takes a holistic approach that complements reductionism and can be used in situations where a reductionist approach is inappropriate. The reductionist

approach breaks a situation into smaller pieces and tries to draw inferences from these smaller parts. When that doesn't work, these parts are broken into even smaller parts, etc. A holistic or systemic approach looks at the behaviour of the whole and, if that doesn't yield the desired result, the next step is to look at an even bigger "whole" of which it is a part (Lane, 2000). It allows situations to be explored from new perspectives where different boundaries are tested in order to generate a better understanding of the situation, irrespective of its complexity.

2.2.5 Why Systems Thinking is Advantageous for the Analysis of this Study

Systems thinking provides a new paradigm for the study of social organisations and the management thereof (Kast & Rosenzweig, undated). It provides for a fundamentally different view of the reality of situations within social organisations than traditional logical- or causal- type thinking. It is used extensively to investigate relationships between components within the organisation and to study the environmental interfaces. Although systems concepts are more difficult to understand, systems thinking does provide for a more thorough understanding of complex situations and thereby increases the possibility finding more appropriate actions to resolve problematic situations (Kast & Rosenzweig, undated).

There are a number of benefits that leaders can derive from using systems thinking.

These include:

- 1) More effective problem solving, as the real causes of the problems are identified due to the leader having a holistic view of the organisation (system).
- 2) More effective leadership since the leader will hold a clear understanding of the overall nature and needs of the organisation.
- 3) More effective communications, as it will be on-going reaching the entire organisation. In order to achieve this, the leader needs to understand all the parts of the organisation and how they relate to each other.
- 4) More effective planning by identifying the desired goals and the metrics that are required to indicate that the goals have been achieved. It will also require the identification of the processes that will produce these results and the requisite inputs for these processes.

- 5) More effective organisational development, since in order to employ the strategies to achieve this (strategic planning, team building, management development, performance management, etc.) the leader would have to have a good understanding of the overall systems in their organisations (i.e. a systems view).

Systems thinking provides a tool with which organisations can better cope with the constant complex changes that are being experienced continuously. It provides a means of viewing the consequences of the decisions that are taken within situations and of learning from these experiences (Cooper, 1998). Individuals are able to see the processes over time and to break away from assumptions that have previously prevented lasting results. Stacey (1993) argues that the main approaches to strategic management are based on systems thinking.

2.2.6 Systems Thinking and Organisational Culture

An important aspect that needs to be considered when using systems thinking in an organisation is the culture, which includes power, behaviour and politics.

Although organisations spend vast amounts of effort in developing formal goals, Perrow (cited by Farmer and Martin, 2000) argues that a vast web of less visible goals will also co-exist. Perrow discusses three types of goals that exist in organisations:

- Official goals that are purposefully vague and general and which reflect the general purpose of the organisation;
- Official operative goals comprised the operating policies that are used to achieve the official goals and influence the organisational behaviour;
- Unofficial operative goals that are tied to group interests. They may support, subvert or be irrelevant to the official goals of the organisation.

Perrow points out that the official operative goals can easily become ends in themselves leading to goal displacement. Rational practices intended by these official goals often lead to unintended consequences because management do not think of the organisation as a pluralistic entity, i.e. containing a rich diversity of individuals with diverse attitudes, interests and concerns.

The culture of an organisation refers to the beliefs, customs, practices and ways of thinking that are shared by virtue of the people being and working together. Handy (cited in Farmer & Martin, 2000) classifies cultures within organisations into four categories:

- Power culture would frequently be found in small enterprises controlled by powerful figures. People working within this culture believe in individuality and taking risks, while the management style would be informal with few rules and procedures.
- Role culture is found in bureaucracies. Here people's functions are formally defined. Security and predictability are important aspects within this culture.
- Task culture exists where the focus is on the job (or a project). Teamwork, adaptability and expertise are values that are important.
- Person culture is found where there is a belief that the organisation exists so that the personal interests of the individuals can be served.

A company that has an overemphasis on blaming employees for human errors at the expense of correcting the defective systems are said to have a blaming culture (Whittingham, 2004). In such a culture, there is a lack of openness that leads to errors being hidden. Such organisations have a defensive climate which is characterised by instituting controls while not sharing information with others, refusing to see the whole picture, and protecting oneself and others as explained by Argyris & Schon (1978).

Stacey (1993) states that, since organisations are complex systems, attempts to plan changes to their culture and behaviour patterns will prompt counter-forces and lead to little or unexpected/unintended changes. One cannot hope to make significant deep changes in an organisation by merely changing its structure (Senge, 1996). Changes cannot be decreed from the top structure of an organisation. Senge says that trying to "drive" a human system to change may do more harm than good.

In an organisation where there is a basic lack of trust, building a culture of trust is not a simple or rapid process, but rather one that requires a commitment to create and sustain a culture that is customer focussed and respectful of employees (Baird & St-Armand, 1998). For employees to trust management, Maccoby (2003b) maintains that there needs to be an understanding of the reasons why decisions were made and participation by employees in

the making of decisions that affect them. Urquhart (2002) lists a number of benefits that may be gained by an organisation with a trusting culture. These include:

- i) Employees are more willing to contribute and share their ideas;
- ii) Savings in resources (including time and money);
- iii) Promotes creativity, innovation and productivity; and
- iv) Stimulates motivation due to people being keen to get involved.

2.2.7 Systems Thinking as Applied to Project Management

Kerzner (1998) defines a project as any series of activities and tasks that:

- Have specific objectives that have to be completed within certain specifications
- Have defined start and completion dates
- May have funding limits, and
- Utilise resources such as money, people, equipment, etc.

The roots of project management can be traced to the scientific management theories of Taylor (cited by Sisk, undated). Taylor applied scientific reasoning to work by showing that labour can be analyzed and improved by focusing on its elementary parts. In order to improve productivity, harder and longer hours were demanded of the workers.

Management evolved into a distinct business function requiring study and discipline.

By the mid 20th century, industrial psychology and human relations began to take hold as integral parts of business management. PERT charts and the critical path method were techniques that spread to various industries in order to support managers with growth of companies in a rapidly changing and highly competitive world. Project management was very much a top-down command and control form of organisation and management. In the 1960's, Johnson, Kast & Rosensweig (cited by Sisk) described business in terms of a human organism (system).

This led to a systems view of a business where all the functional parts must work in concert in order to achieve specific goals or deliver successful projects. In the past 20 years, it has been increasingly recognized that the success of projects is dependent as much on the human aspects as on the supporting technology. As a result, traditional project management will need to change its focus more to this side of the equation.

Unfortunately, project management is today still viewed as requiring a hard systems approach to resolving problems. This approach is not adequate for many of the projects that are ill-structured and have a significant human component. Applying soft systems thinking to a project environment would be an iterative process requiring a significant amount of interpersonal skills. Unfortunately, the nature of most projects implies that there is usually pressure on the available time, while the profile of most project managers tends to be that of a task-oriented (as opposed to people-oriented) person.

Kerzner (1998) states that it is an error for project managers to solely base their decisions on subjective experience, judgment and intuition and ignore the alternatives that would be available if objective thinking were applied. He feels that systems thinking is vital for the success of any project. The ability to analyze the total project rather than the individual parts would be the first prerequisite for successful project management.

In chapter 3 it will be shown that, since a project has all the essential elements, it can be considered as a system. Thus, by considering the project as a system, it is important for the project manager to be aware of how positive feedback and mutual causation can lead to change and how emergent change can develop within the project. Consequently, the project organisation may change as a result of positive feedback or be held together by means of negative feedback. The project organisation will generally be an equilibrium maintaining system (due to negative feedback), but positive feedback and mutual causation will result in some adaptive transformation to its structure and other organisational components. These changes will be dependent on the strength of the various causal loops that exist. The project can therefore be viewed as a complex adaptive system with periods of stability and periods of change. Such an understanding of the project system (and the higher-level hierarchical structures) is important if the complex problem situations that occur on large projects are to be faced and overcome by the project management team.

Traditional managers (including project managers) tend to see an organization as made up of parts (Seddon, 2002). The assumption is made that if each part is operating as specified, then the organization should perform as expected. However, Seddon feels that this guarantees that the system will under perform, as the managers put constraints that control the people's behaviour in place. This leads to demoralization due to the perception

of disempowerment that is created amongst the people in the organization. To solve the problem, the system must be changed. This means that managers must adopt a holistic view of the organization. It will be necessary for managers to remove the constraints in order to obtain the improvements that will be required to benefit the organization.

Within an organisation, there can be two types of goals: official goals and operative goals. These are associated with the theories in action that exist within an organisation and again there are two: espoused theory (what people say they) do and theory-in-use (what people actually do). In understanding how an organisation works, it is important to appreciate how the choice of actions and assumptions of the people contribute to their repertoire of actions to bring about change. The espoused theory and official goals are similar to statements of intent that people declare publicly. However, their theory-in-use and operative goals may be quite different and are usually attributed to those concerned by others (Martin, 2000). In some situations different players may go along with decisions and plans as long as there is sufficient trust and belief that benefits will emerge for them eventually.

It is often heard during post-project evaluations of projects that encountered severe problems that these projects should have been stopped in order to allow the project team to take stock of the situation and then plan a way forward (Eden *et al.*, 2000).

This suggestion, however, does not take into account the enormous pressure that management places on the project managers to avoid further delays to the project. This pressure, unfortunately, drives decision-making. Hence the luxury of being able to stop a project midstream becomes impractical. By using a systems thinking approach and the tools that are available, the project manager and key role players will have a better overall view of the various aspects of the project throughout the project lifecycle.

2.2.8 Tools of Systems Thinking

There are numerous tools that are available to the systems practitioner for the examination of situations that require further analysis or decisions. These tools are used for handling complexity more adequately and helping deepen understanding, particularly regarding interactions between components within the systems or in the environment. The precise choice of tools depends on the sorts of problem that have been encountered and the

experience that the practitioner has with the tools. Systems practitioners use various tools for connecting unconscious thoughts and feelings.

A summary of the various tools that practitioners can use is provided in table 2.1 where the various tools are listed together with their main purpose and their applicability to this study (if any).

Tool	Purpose	Relevance to this study
Diagramming	Representing complex situations; share understanding; communicating ideas; identifying connectivity; diagnosing situations; planning and implementation.	Diagrams are used in this study for both the systems thinking and the action research chapters.
Control theory	Understanding feedback loops and appropriate control loops based on selected indicators.	Reference is made to balancing and reinforcing loops, and their contribution to stability, vicious and virtuous cycles.
Hard/soft systems thinking	Provides insights to the different types of problems and the understanding of this is useful for the selection of appropriate tools for problem solving.	Identification of the type of problem as a messy situation indicated the use of appropriate systems thinking techniques.
Modelling	Helps make one's implicit view of reality more explicit in order to share with other.	Diagrams that are used are forms of models. Contextual models are used when doing Soft Systems Methodology.
Systems dynamics	Provides a method for describing, modelling and simulating dynamical systems.	Not used.
Decision making	Used to develop a strategy for managing uncertainty and deciding on appropriate interventions.	Stakeholder identification is an essential component of both systems thinking and action research.
Archetypes	Used to identify and compare patterns of behaviour with those that have been classified so that particular archetype strategies may be applied.	Not used.

Table 2.1: Summary of systems thinking tools and their applicability to this study.

2.2.8.1 Diagrams

Systems diagramming tools (Lane, 1999) may be particularly appropriate for managing projects if used for the correct reasons. The following are types of diagramming tools together with their key application area that may be used when depicting a situation:

- Rich pictures could be useful to diagrammatically present different perspectives, ambiguities and other aspects of difficult situations that are characteristic of messy problems that are frequently omitted by using other techniques.
- Relationship diagrams are useful for displaying connections between related concepts or components.
- The system map may be used for different purposes. It can be used to: illustrate the organisation (e.g. the project) itself as a system; present the stakeholders who have some involvement (directly or indirectly) with the system; illustrate a particular technical issue that needs to be considered; etc. One can draw the system map at different levels of abstraction depending on the audience and its purpose, each with its own interconnected components and emergent properties.
- The influence diagram can be used to represent the primary structural elements of the system being considered and the relationships that exist between them.
- The multiple cause diagram is useful for understanding why a certain event occurs or re-occurs.
- The sign graph is used to look at the relationships between variables and identify the positive and negative feedback loops that make the system perform in a specific way. A reinforcing loop may lead to exponential growth (termed virtuous cycle) or decline (termed vicious cycle) (Senge *et al*, 1994). Sign graphs are also useful to identify where interventions could be made in the system of interest and what the likely result of the interventions could be.
- The causal loop diagram is similar to the previously mentioned two diagrams and is used to see how system components separated by location or time may interact to generate problems.
- Activity sequence diagrams, network drawings, Gantt charts and critical path diagrams are useful for doing project scheduling.
- Flowcharting is frequently used to depict process flows or as a design aid for software development.
- The decision tree and decision network techniques are useful diagrammatic tools for decision-making.
- The fishbone diagram (Ishikawa diagram) and the force field diagram can be usefully applied in project management. The former can be used in risk identification and identifying associated mitigation steps or for problem solving (Baguley, 2003). The force field diagram can be used to represent the magnitude

of the driving and restraining forces for change in a given situation and hence allows one to evaluate the impact of a proposed solution if implemented.

2.2.8.2 Systems Control Theory

More recently traditional systems control theory and diagramming have been adopted by systems thinkers for applications outside of the control systems in the industrial domain and used in more “social” or non-engineering systems. Monitoring and control are typical activities of a control system that involves feedback loops. The project management process involves planning, monitoring, control and management. A major source of behaviour difficulties is in the multiple feedback loops that are found within complex systems. A project manager applying systems thinking would need to see how these feedback loops contribute to the project dynamics and determine how best to monitor and control them in order to obtain the required results from the project.

2.2.8.3 Hard and Soft Systems Thinking

The two kinds of complexity that will be considered are hard complexity and soft complexity. Hard complexity (or difficulty) occurs where there is a well-defined goal that must be achieved by making decisions based on many combinations of a large amount of different factors. A feasible solution for achieving the goal is thus the result of choices made between these many possibilities. A soft complexity (often termed a “mess”) arises when there is human involvement in a situation and no obvious or clearly defined objective. In this case, the order of complexity is greater due to the larger number of factors and possible combinations of feasible decisions to be considered. It is also more complex due to the different interpretations of these factors, decisions and even of the goals to be reached that are held by the role players.

Table 2.2 below provides a summary of the key difference between the aims of hard and soft systems thinking (Lockett & Lockett, 1999).

Type of systems thinking	Aim
Hard systems thinking	Improve knowledge about the problem area by building representative models
Soft systems thinking	Improve a situation through the facilitation of an enquiry process involving reflection and debate.

Table 2.2: Aims of hard and soft systems thinking

Methodologies that could be used by hard systems thinking practitioners include systems engineering, systems analysis, systems dynamics and operational research. These methodologies tend to emphasise measurable and objective criteria; isolation and control over variables; and a top down composition of systems into subsystems.

The distinction between difficulties (which are relatively well defined and limited in scope) and messes (unbounded, having emotional elements) has led to the HSA and Soft Systems Methodology (SSM) described by Checkland (1981) as ways of looking at situations. SSM was Checkland's response to the difficulty experienced in applying hard systems thinking to business (human activity system) problems. In the soft systems paradigm, the aspects of a situation that cause the problem are not easily identified. There will often be many different solutions to the problem, each of which would be valued differently by the stakeholders involved. SSM views a manager as being immersed in an ever-changing series of complex interactions of activities and ideas which need to be evaluated and acted upon after due reflection (Checkland, 1989). The cycle is perpetuated by the actions that are taken and which lead to further changes that need to be evaluated.

There are criticisms of SSM. These include:

- It is not a guidebook and is heuristic, not algorithmic.
- It is not a prescriptive methodology and therefore difficult to manage due to its open-endedness.
- Environmental and structural determinants can be easily overlooked.
- SSM assumes all members have equal choice. Openness and togetherness are implicit and explicit values of SSM and as such are not really applicable to power-centred organisations.
- It is not suitable for high-achievers, as goals are never reached, only approached.
- SSM can be manipulated by consultants in order to achieve their hidden agendas.

As stated earlier, systems thinking assists the project manager in viewing the world from a broad perspective including structures, patterns and events instead of just at the events themselves. Applying soft systems thinking to practice is an iterative process that requires a high level of interpersonal skills that need to be developed at the project team level.

Tools that could be used by soft systems thinking practitioners in order to establish an appropriate intervention point in order to improve a problem situation include: Strategic Assumption Surfacing and Testing (SAST); interactive planning, brainstorming; affinity diagrams; interrelationship diagrams; multi-criteria mapping; SSM; etc.

2.2.8.4 Modelling

A model is a simplified depiction of certain aspects of a real situation that is constructed for some defined purpose (Lane, 2000). Modelling is a process used by systems thinking practitioners to identify patterns and regularities in systems and to summarise their understanding of a situation in order to improve it. Models help to make one's implicit view of reality more explicit so that it may be shared and possibly debated with other role-players. Of interest in this study is the construction of conceptual models based on root definition that is relevant to a problem situation. This is a central activity of soft systems methodology. The conceptual model describes the fundamental activities that are required to achieve whatever it is that the system should do without consideration of any specific realization of the system.

2.2.8.5 Systems Dynamics

The field of systems dynamics makes extensive use of modelling in order to predict outcomes. This modelling provides a methodology and toolset to allow managers to obtain and share an understanding of the dynamics of complex causal relationships (which includes the relationships between people, product and process) (Sterman, 1992). An advantage of using systems dynamics is that it allows the modeller to capture both the hard quantifiable systemic effects as well as the softer human effects that are usually more difficult to quantify. A further advantage of systems dynamics is that it allows people's mental models to be exposed and examined for robustness by others. Double loop learning (see later) is achieved, since people begin to question their own mental models and thereby become engaged in deeper learning.

2.2.8.6 Decision Making Tools

In order to do problem solving or assist in decision-making, there are also a number of systems tools available. One such tool is multiple criteria analysis that facilitates the understanding of various perspectives of a problem and provides possible options for a

solution. Another technique for deciding on change would be to derive affinity diagrams in order to identify the main causes of a problem. Strategic Assumption Surfacing and Testing (SAST) (Flood & Jackson, 1991) can be used to decide on a strategy or solution to a problem.

There are a number of tools available to project managers that are useful to help unpack aspects of the environment. These include: SWOT, STEPS, 5Ws and H, and Stakeholder identification (Martin, 2002). These decision making tools can be used to widen one's perception of various aspects of an organisational environment and also to develop a strategy for managing uncertainty (Spear & Martin, 2001).

2.2.8.7 Archetypes

Archetypes are diagrams that show typical combinations of balancing and feedback loops that often occur in organisations. They are qualitative maps that are essentially simplified casual loop diagrams from the field of system dynamic (Senge, 1990). They explain common patterns of behaviour that allow organisation to compare their own situations to those that have been classified in order to apply some solutions that are appropriate to it. One particular archetype particularly relevant to this study is that of the Shifting the Burden where the capability to solve problems is shifted from where it belongs to a different place.

2.2.9 Choice of Systems Method

Prior to the 1950's, interventions into problem situations within organisations were dominated by hard, pseudo-scientific methods with minimal attention paid to human relations (Clarke, 2001). During the 1960's and 1970's, 'soft' methods were advanced where cognizance was taken of human viewpoints and activities. A criticism of the soft methodologies is that none of them take account of the social and political structures embedded in organisations and society as a whole (Brocklesby, 1993). In using the soft methodologies, Brocklesby sees that the existing structures of domination are maintained and strengthened, while solutions are "bounded by the structural limits of possibility imposed by the status quo". Those with power dominate the proceedings and hence the outcome.

From the 1980's, there was a concentration on ways of combining these methods in order to address all aspects of a problem situation with a single overarching approach (Clarke, 2001). This led to the development of mixed mode methodologies including:

- The Systems Of Systems Methodologies (SOSM)
- A Pragmatic Approach
- Total Systems Intervention (TSI)
- The Creative Design Of Methods
- Diversity Management
- Critical Systems Practice
- Critical Pluralism, and
- Pragmatic Pluralism.

The above methods have the aim of addressing diverse (or 'pluralistic') problem contexts with a diversity of methods in common.

Critical Systems Heuristics (CSH) (Ulrich, cited in Brocklesby) extends SSM by considering the perspective of those who are normally excluded, but who are affected by the outcome of the problem resolution and prohibits the will of those stakeholders with power being imposed upon the weak. CSH cannot be considered a truly critical methodology. However, it proposed the System of Systems Methodologies (SOSM) where there is a commitment to an integration of the various hard, soft, and critical methodologies and to provide guidance for deploying these in appropriate situations. SOSM is now seen as an instrument of Critical Systems Thinking and a central component of Total Systems Intervention.

Critical systems thinking (CST) based on work by Jackson and others (cited in Daellenbach, undated) resulted in an awareness of the deficiencies of various hard and soft systems approaches, and emerged as a new integrative systems perspective in the late 1980s and early 1990s. CST is in itself not a methodology. Its intention is to foster systemic debate on power relationships and on the relationships and complementarity between various systems approaches thereby assessing their applicability for various problem situations and guide their use. This has led to the recognition of methodological

pluralism (a critical awareness of the strengths and weaknesses of different methods and methodologies so that the most appropriate ones can be selected to address a wider range of problem situations than a single method can. Pluralism is defined by Jackson (1999) as “the use of different methodologies in combination.” Characteristics of plurism are that there is a respect the differences of the approaches and a development of a meta-methodology to guide practitioners to the best approaches. Similarly, multimethodology allows for various methods and methodologies to be used in combination for different aspects of an intervention for more effective results. In an attempt to operationalise the main principles of CST, Flood and Jackson (1991) developed TSI, representing a new approach to planning, designing, problem solving and evaluation.

Daellenbach (undated) cites Jackson and Keys as classifying problem situations along two dimensions: complexity and divergence of values and interests. A third dimension related to human complexity is added by Daellenbach. This is indicated in figure 2.1 below and can be used as a guide to selecting appropriate methodologies.

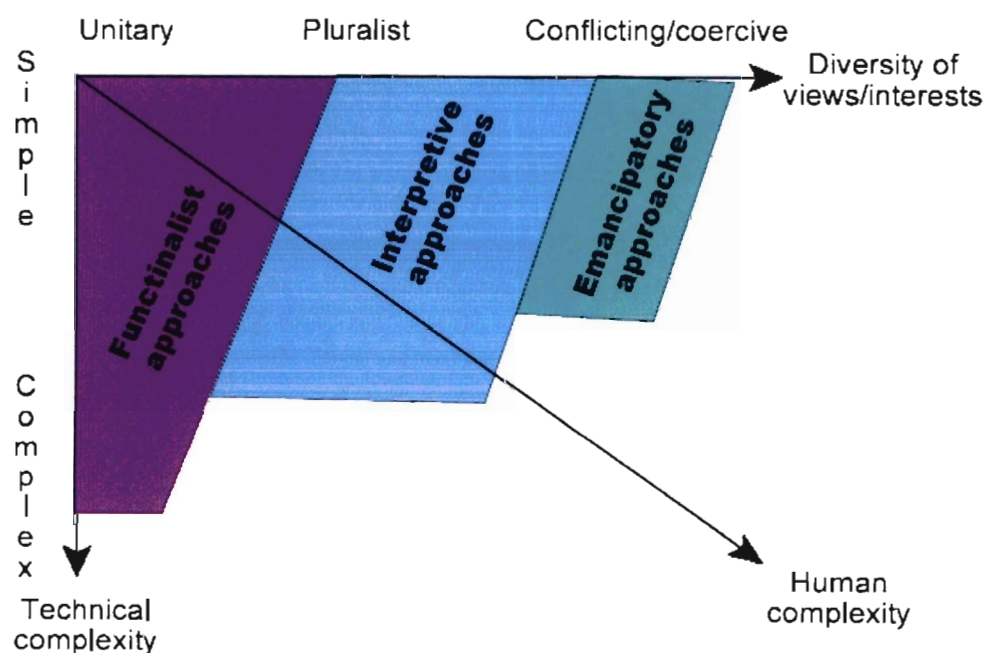


Figure 2.1: Problem situation classification and systems approaches

Table 2.3 provides more detail of the three approaches together with their areas of application and associated methodologies.

Approach	Characteristic	Applicable area	Methodologies
Functionalist systems approaches	Assume that systems are 'objective' aspects of reality, largely independent of the observer.	Problem situations that have technical complexity, but can only cope with low human complexity and low to medium divergence of interests.	<ul style="list-style-type: none"> • Traditional Management Science or Operations Research, • RAND type systems analysis, • Systems engineering, • System dynamics, • Organizational cybernetics (e.g. Viable Systems Model), • Complexity theory
Interpretive systems approaches	Adopt a subjectivist approach to systems thinking.	Problem situations with human complexity and diversity of interests and values, but not much technical complexity.	<ul style="list-style-type: none"> • Hypergame analysis, • Metagame analysis, • Interactive management, • Operational gaming, • Robustness analysis, • Soft systems methodology, • Strategic assumption surfacing and testing, strategic choice approach, • Strategic options development and analysis, drama theory, • Theory of constraints.
Emancipatory systems approaches	Adopt a subjectivist approach to systems thinking.	Problem situations where stakeholders see radically different relevant systems with different values and <i>boundary judgments</i> . Identifies inequalities and neglect and promotes radical change to emancipate and liberate the deprived majority and create a civil society.	<ul style="list-style-type: none"> • Methodologies such as Total Systems Integration and SOSM (emanating from Critical Systems Heuristics / Critical Systems Thinking)

Table 2.3: Three primary systems approaches

2.2.10 The Learning Organisation / Experiential Learning

Organisational learning is a field that explores ways for organisations to be designed in order to fulfil their function effectively and encourage its people to reach their full potential. According to Senge (1990) an organisation excels when it can tap the commitment and capacity of its people to learn. Organisational learning takes place when a group within an organisation reflects collectively on something that has been done and allows this reflection to influence the following actions. This cycle is repeated continuously (Shibley, 2001). No learning takes place without action. It is vital that in companies where there is management by projects, the management recognise the project as a form of learning organisation. Seely and Quang (cited by Cooke-Davies, undated) observe that 90% of the projects that they studied in the private and public sectors failed. They interpret this as evidence that project management tools and techniques have not been effectively applied. They further suggest that much of this failure could have been avoided if learning, experience, skills and hence management approach had been correctly matched to the complexity of the project. In other words, the project management tools and techniques need to be tailored to match the projects to which they are to be applied, with learnings from previous projects playing an important role.

As a learning organisation, the project can be compared to a closed loop system with positive feedback. In reality, the project manager needs to continuously apply the systemic action learning cycle (TXR248 course guide, 2002). This cycle comprises:

- Doing or experiencing something,
- Reflecting on what has happened or been experienced,
- Considering what to do based on existing theories, and
- Deciding what to do the next time.

In order to avoid the wrong learnings, they must be based on a systemic approach. With complex long projects involving many people, it is very difficult to identify the (intended or unintended) consequences of decisions made and to learn from these experiences.

Two types of learning are of interest here: single loop learning which is linear and aims to find a better way of doing something (continuous quality improvement); and double loop learning where the primary goals and beliefs themselves (mental models) are challenged and possibly changed.

There are five disciplines that are required to build learning organisations (Senge, 1990).

These are:

- i. Personal mastery relates to individual learning. The two components of personal mastery are i) defining the goal and ii) a measure of how close one is to the goal.
- ii. Mental Models is the way one looks at the world that determines the way we think and act. Everyone has a set of rules that determine our behaviours and are used to understand the behaviours of others ('theories in action'). However people don't usually follow these rules. Instead they follow their 'theory-in-use' (Argyris and Schon cited by Larsen *et al*, 1996) which allows them to remain in control; maximise winning and minimise losing; suppress negative emotions and to be as rational as possible.
- iii. Team learning occurs when dialogue is present. This requires participants place their assumptions on hold; participants should regard all other participants as colleagues; and having a facilitator until the team is able to function without one. A further essential ingredient required for team learning to occur is that the team itself must be a team (i.e. having gone through the 4 stages required for a team to operate successfully: forming, storming, norming and performing (Tuckman cited by Larsen *et al*, 1996)).
- iv. Shared vision stems from the individual who holds in this vision a truth and is often a (long term) goal that the individual wants to reach. For an organisation, the shared vision is built from the individual visions of its members and is created through interaction with the individuals in the organisation and not by the leader (Larsen *et al*, 1996).
- v. Systems thinking (as explained elsewhere in this chapter) is a way of thinking where the superiority of the whole is accepted.

Exactly what the definition is of a learning organisation is still unclear (Kerka, 1995).

Even Senge (cited by Woonacott, 2000) stated that "no one understands what a learning organization is, least of all me...anyone's description of a learning organization is, at best, a limited approximation". However, according to Kerka, learning organizations do have the following characteristics:

- They provide continuous learning opportunities.
- They use learning to reach their objectives.
- They link individual performance with organizational performance.
- They foster inquiry and dialogue, making it safe for people to share openly and take risks.
- They embrace creative tension as a source of energy and renewal.
- They are continuously aware of and interact with their environment.

The learning aspect that is inherent in action research is not dissimilar from the learning cycle described by Kolb (1984). Kolb stated that there are four distinctive kinds of knowledge and each is associated with a distinctive kind of learning. The ideal learning experience was gained by integrating all four of these by progressing cyclically through them. The four adaptive abilities required for effective learning are:

- Concrete experiencing, (diverging phase)
- Reflective observation, (assimilating phase)
- Abstract analysis, (converging phase)
- Active experimentation, (accommodating phase).

This is depicted graphically in fig. 2.1 below.

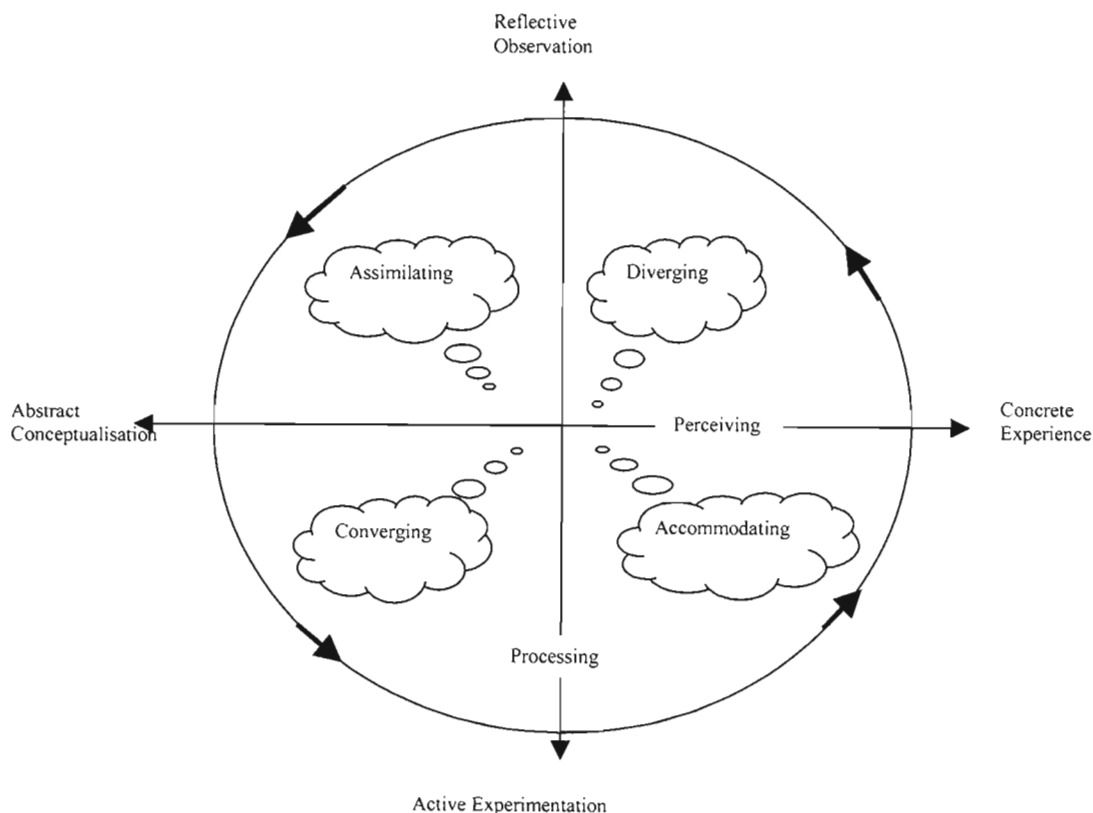


Fig. 2.2: Kolb's learning cycle (from Kolb, 1984)

The use of action research (to be discussed later in this chapter) adds enormous value to learning organisations (Seerane, undated). Through the use of action research, not only are the cause and effect of the existing situation better understood, but there is also the appreciation that sustainable improvements can be made through change. It promotes the capacity to develop critical thinking and analysing skills by encouraging the asking of questions, looking for more clarity about a situation and allowing for the reflection on possible solutions.

SSM is a learning system where the learning is about a complex problematical situation involving people and which leads to taking purposeful action in the situation in order to improve it (Checkland, 1981).

2.2.11 Insights from Complexity Theory

Using a complexity approach to look at situations offers one a new perspective that can lead to a radically different way of approaching organisational change. From both a systems thinking and an action research perspective the understanding of organisational culture is essential if any changes are to be effectively implemented. Adopting a complexity perspective allows one to view the organisational culture and change in completely different ways (Seel, 2000) and a systems thinking practitioner should be aware of this alternative concept. To change the culture of an organisation, one must change the paradigm at the heart of the culture (Seel, 2004). Seel (2000) is of the opinion that when there is enough connectivity between change agents in an organisation then complexity theory suggests that this is sufficient for emergence to occur spontaneously.

One can apply the notion of complexity theory and complex adaptive systems in developing 'self-organizing' systems as solutions for business problems. Stacey (1993) suggests that new forms emerge unpredictably in a complex system through a process of self-organisation by virtue of the people interacting and participating at a local level within the organisation. Thus, according to the concepts of complex adaptive systems, the structures of an organisation frequently result out of an evolutionary process instead of something that is imposed on it (Farmer & Martin, 2000). Over time, these structural changes are reinforced and in turn precipitate further changes. The new structure gains its own self-maintaining (self-sealing) mechanisms. The organisation may transform due to positive feedback loops or be held stable as a result of the negative feedback loops. If

change is desired, then any initiative to promote this must have a positive feedback component and negative feedback should be suppressed.

When looking at systems with the perspective of complexity theory, the behaviour of a system falls into two zones plus the boundary that exists between them: i.e. the stable zone in which there is negative feedback causing the system to return to its initial state; and the zone of instability where a small disturbance causes the system to move away from its initial state (positive feedback) thereby generating further divergence. The laws governing the behaviour of the system as well as the relative strengths of the negative and positive feedback mechanisms will dictate which type of behaviour will be exhibited. The system may sometime operate within the boundary between these two zones under certain conditions: this transition phase is referred to as being at the 'edge of chaos' and the system will exhibit bounded instability where there is unpredictable specific behaviour within a predictable general structure of behaviour (Rosenhead, 1998). Probability is used to explain the outcome, where cause/effect explanations do not suffice.

Lessons that management need to learn from complexity theory include how learning may be encouraged within organisations, how instability should be viewed and the negative consequences of a common internal culture (Rosenhead, 1998). Managers should accept that they have no idea of the future environment, which then makes long term planning irrelevant and hence increases the importance of double-loop learning within the organisation in order to question their mental models that were used to set up actions and target. Organisations that strive to maintain a common culture (emphasised by "group-think") will have great difficulty in implementing a culture of double loop learning.

Stacey (1993) divides management of an organisation into two: ordinary management who are responsible for the execution of day to day problem solving to achieve the organisation's established objectives; and extraordinary management if the organisation is to be able to transform itself where situations of open-ended change exists. This latter management needs to activate the tacit knowledge and creativity that exist in the organisation by encouraging informal structures that are self-organising and capable of redefining or extending their sphere of activities and not be bound by fixed terms of reference. This will facilitate group learning which will in turn act as inputs to the broader management process. Both management types are needed in an organisation.

2.3 Action Research

2.3.1 An Introduction to Action Research

Traditionally, research has been achieved through scientific method that is characterised by three fundamental principles: Reductionism, repeatability and refutation (Checkland, cited in Checkland & Holwell, 1997). Action research evolved as a consequence of the academic movement in social sciences breaking out of the established modes of inquiry and the increasing demand for a more useful type of research that would lead to an improvement in practical affairs (Dash, 1999). Its primary application areas include the study of human relations, the study of society and organisations, the study of educational change, etc.

Action research in its present form dates back to 1946 when it was first coined by Lewin (cited by Smith, 2002). Lewin stated that a form of comparative research on the conditions and effects of various forms of social action was needed that would lead to social action. Action research gained favour in the post second world war period, but its popularity declined in the 1960's. This was due to the recognition of the fact that people are constrained in their ability to change due to their cultural and social perceptions and the systems to which they belong.

Studies into people and their environment must take into account that the human being is both the subject and object of the study. There are two views that emerge in such studies; i.e. that people respond mechanically to their environments or that people are the initiators of their own actions.

Argyris *et al* (cited by Checkland & Holwell, 1998) propose a different kind of research to traditional scientific methods be used in social situations. Since, in a social process, social reality is being continuously created and recreated, the fundamental elements in social research should comprise:

- The researcher and participants collaborating
- Critical inquiry
- Focus on social practice, and
- Deliberate reflection.

2.3.2 Definition of Action Research

Action research may be considered as a family of research methodologies that is aimed at improving the quality of a system and its performance by pursuing action and research simultaneously. It uses a cyclical process that alternates between action and critical reflection. It is an emergent process, since, in the later cycles, methods, data and its interpretation are refined based on the understanding gained in the previous cycles. Action research is used by practitioners in order to improve their own practice and can be performed by individuals or teams. It is used to produce valid and sustained improvements to the system in which it is applied.

The following are some of the definitions of action research:

- Action Research is a three-step spiral process of (1) planning which involves reconnaissance; (2) taking actions; and (3) fact-finding about the results of the action. (Lewin, 1947)
- Action Research is “an informal, qualitative, formative, subjective, interpretive, reflective and experiential model of inquiry in which all individuals involved in the study are knowing and contributing participants” (Hopkins cited by MacIsaac, 1996).
- Action research is: “...a form of collective self-reflective enquiry undertaken by participants in social situations in order to improve the rationality and justice of their own social or educational practices, as well as their understanding of these practices and the situations in which the practices are carried out” (Kemmis & McTaggart, 1988).

2.3.3 Distinguishing characteristics of action research

Post positivism developed due to the inability of the positive approach to deal with the complexity in large cybernetic, self-changing human systems (Wadsworth, 1998). An anti-positivist approach to research acknowledges that individuals' behaviour can only be understood if the researcher is able to share their frame of reference and their interpretation of the world around them (Cohen & Manion, 1994). This understanding must come from the inside. The authors cite Beck who states that social science must work with mans' definitions of reality and the rules that have been devised to cope with that reality. This reality (mental model) is different for each individual. Social laws are

not discovered and codified by action research in the same way that physical laws are (Checkland & Holwell, 1998). Whilst in the positivist approach research starts with a hypothesis, in action research a theme replaces this hypothesis. While in natural science repeatability is crucial to the research, in action research the previously identified methodology that described the process used must be recoverable by others who wish to scrutinise the research results, since repeatability cannot be achieved. The action researcher can thus only strive for plausibility.

A feature of action research is that it promotes early action (Dick, 2000). Action research is systematic and reflective, and comprises iterations of four phases, i.e. planning, acting, observing and reflecting. Each iteration is repeated as new knowledge is obtained from the previous phase of the earlier cycle (i.e. the reflection) until the desired state is reached. The participants in action research need to appreciate that there are a number of other people involved in the problem situation and that these people can thwart the outcome of the research prediction or make their own changes to get the outcomes they desire. Thus the researcher must acknowledge that neither the outcome of the research nor the new state of the social system can be predicted in advance (Wadsworth, 1998).

Action research focuses on an existing situation in a local context. In order to be relevant to the situation under study, generalisation (or global relevance) is often sacrificed (Dick, 2000). Hence the interpretive paradigm is emergent and arises from particular situations (Cohen & Manion, 1994). Results of action research cannot be guaranteed to apply to similar situations elsewhere (Checkland & Holwell, 1998). The description of the epistemology is thus crucial in writing up the action research in order to evaluate the portability of the research to other situations.

Having considered some of the important distinguishing characteristics of action research, one needs to also consider the various action research methodologies that exist and which may be used in appropriate situations.

2.3.4 Variations of action research

There are number of different methodologies or approaches that one can apply when doing action research. These include Participatory action research and Soft systems methodology (SSM) amongst others.

2.3.5 Designing an action research project

In principle there are 4 stages in each cycle of an action research intervention (Kemmis and McTaggart, 1988). These are:

- i) Develop an understanding of the problem and plan an intervention (planning)
- ii) Carry out the intervention (acting)
- iii) Make and collect observations from this intervention (observing)
- iv) Reflect on the outcome and plan the next cycle of intervention and continue until either there is a sufficient understanding of the problem or an acceptable solution emerges (reflecting).

The action research is thus seen as an iterative process that is intended to promote a deeper understanding of a given situation. It starts with the conceptualisation and progresses through a number of cycles of interventions and evaluations (MacIsaac, 1996). Knowing when to stop the research is a capricious act (Checkland and Holwell, 1998) that will be confirmed or otherwise when writing up the results.

2.4 Conclusion

This chapter introduced the reader to the principle concepts that will be used in the dissertation. Systems thinking is a paradigm that will be used in the following chapter to gain a clearer understanding of the problem situation and, in particular, within the organisational context in which the problem exists. Appropriate systems thinking tools and methodologies will be used for this purpose. Action research will be used later to plan and intervene in order to improve the problem situation.

CHAPTER 3.

SYSTEMS THINKING: GAINING AN UNDERSTANDING OF THE PROBLEM SITUATION

3.1 Introduction

“Today’s problems often arise as unintended consequences of yesterday’s solutions” (Sterman, 2001). The previous chapter provided the relevant theory of the systems thinking paradigm and identified a number of tools that could be relevant in the study of a problem situation. This chapter looks at the project as a system and uses a systems thinking approach to contextualize the particular difficulty that was encountered prior to seeking resolution by means of action research.

This chapter may be viewed as the preliminary analysis phase for the action research that is to follow. The patterns of behaviour of some of the role players are considered, taking into account the power structure within the organisation. The multi-loop structure is seen to be a powerful reason for the lack of understanding and handling of the complex system.

The starting point of the analysis of the problem situation is to gain an understanding of the existing circumstances and state of the project. Coupled with this, there must be an examination of the environmental factors that have an impact on the situation. The culture of the organisation, the imposed bureaucracy and the influence that this has on the trust relationships of the people in the organisation need to be considered.

Before considering the project as a system, it is necessary to establish whether a project may indeed be considered a system. Once this has been proven, aspects of the project system are considered. Various systems diagrams that were discussed in the earlier chapters are used to assist the reader to obtain a clearer view of the system and to indicate the influences and causes of the problem situation. Those that will be used in this chapter are summarised in table 3.1 below.

Diagram name	Primary Purpose
Rich Picture	Used to gather information about complex situations and to suggest and document insights such as interactions and relationships.
Systems Map	Provides a model of the structure of the system's components and environment at a particular point in time to further the understanding of a situation and to communicate it to others. It assists in identifying the system boundary and the major factors in the environment.
Influence Diagram	Developed from systems maps and used to indicate the main influences that system components have on others. It models the main structural features of a situation together with the important relationships that exist among them.
Multiple Cause Diagram	Used to explore the reason for specific events occurring or why a class of events tends to occur. Also used to establish why something goes wrong or keeps recurring.
Sign Graph	Created from a multiple cause diagram and used to indicate whether the cause has a positive or a negative effect by allowing one to identify the positive and negative feedback loops driving the system's behaviour. This in turn allows one to consider the likely effects of changes and of possible interventions in systems.

Table 3.1: Systems thinking tools used in this chapter.

3.2 Description of Current Situation

Each project undertaken within the company programme is divided into a number of phases. There is often a slight overlap in these phase as indicated in fig. 3.1 below.

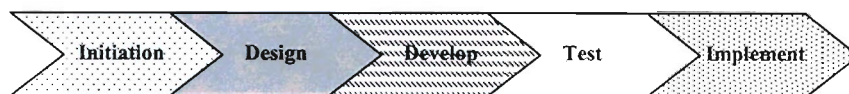


Fig 3.1: Project life cycle phases

3.2.1 Need for Changes on the Project

At the point at which this study was started, the project under discussion was already close to the end of the design phase. Some teams were already starting with development activities such as writing programs, developing training material for the users and writing business procedures to cater for the new system. The business requirements of the new system had not been properly finalised which was a normally a stringent prerequisite to move from the initiation phase to the design phase. However, due to pressure from senior management and an understanding that finalising these business requirements would have little impact on the initial design effort, the team had commenced with their designs. Unfortunately, the effort to complete the requirements took longer than expected, mainly

due to misunderstandings that had arisen during the very early stages of the project between the overseas vendor and the business representatives. Changes to the business requirements were also more complex than had been anticipated. While the discussions were in progress to finalise the business requirements, the designers made numerous assumptions in order that they may continue their work. However, when the impact of these changes became known, the project management team realised that there was a very real possibility of the project missing its target date by many months. This in turn would delay the implementation of other projects in the programme that were dependent on this one. The cost to the company of this would be enormous. A factor inhibiting the project management team from making up lost time was the bureaucracy involved in making changes to completed designs.

Due to the nature of the business conducted by the organisation, changes to the existing systems are part of the daily operations. Anyone within the company may request that a change be made to an operational system or to one that is still in development. There are many systems currently in operation and also a large number of new systems in the pipeline as projects at various stages of development. It is thus imperative to ensure that any change being requested is not only feasible, but that the impact of the change on other systems (both to the software and /or its operation) needs to be carefully considered. Since any change can have very serious consequences if not thought through properly, it is essential that a defined process be followed prior to the requested change being given the go-ahead to be implemented.

There are many forums within the organisation that have been established to consider, evaluate and decide on whether these changes can be allowed to proceed. These comprise the highest-level change request governance forum and three hierarchical forums beneath it that coordinate changes at the various operational levels in the organisation. In order for a change request to be approved, it needs to progress through each of these forums until final approval is obtained.

There are various stages through which a change request must proceed. These include obtaining permission to investigate, permission to make the change, and permission to implement the change. Within each of these stages, there are a number of steps that have to be monitored and reported on. A simplified process flow of the change management

process is provided in Appendix A. There are also a number of different types of changes that need to be considered. These include:

- Changing the way an existing system or system in development will operate (e.g. changing the scoped functionality of a system or improving its performance);
- Making a change to a system that will have no impact on the user, but is required by another system (e.g. to provide information which another system needs through a software interface);
- Changing the baseline budget of a project (e.g. due to changes in the required functionality, changes to timelines, additional hardware required that was previously not catered for, etc.);
- Changing the timeline of a project (due to a change of scope or an incorrect estimate earlier); and
- Changing the way a system will be built (i.e. the internal design) without impacting on the functionality of the system;

As explained earlier, a project life cycle comprises the following phases (see fig. 3.1 above): initiation, design, develop, test and implementation. Before moving from one phase to the next, the process requires that all documents planned for the current phase must be signed off and stored in the project document repository. These documents are considered as baselined or “active”. Any subsequent changes to these documents will need to follow the prescribed change request process. This is in order to ensure that everyone who may be affected by the change consider the impact of the change. Thus, for example, if there is a request to change the screen layout in order to optimise the operation of the new system, this information needs to be communicated and agreed by other parties, such as the team responsible for user training (since it will impact on the training manuals that they are writing as well as the training material); the team responsible for testing the system (as their test cases will need to take account of this change); etc.

While still in development, it is not unusual for numerous (between 100 and 200) requests to be submitted for changes to the software design of a system. The design documents will already have been baselined, hence the requirement to follow the change request process. These changes generally have no impact on the functioning of the overall system although in some cases there could be an impact on the user (for example, a computer screen layout

may change from one previously agreed with the user community). The reasons for the large number of these types of changes that are logged during the life of a project include:

- The user requirements are ambiguous, unclear or sometimes incorrect, resulting in the design (and even the development) being incorrect;
- Ambiguous, incorrect or unclear specifications relating to an interface between two or more systems.
- Insufficient time allowed for design (usually due to unrealistic timelines imposed by top management on the project) resulting in (incorrect) assumptions being made by the designers. Only at a later stage (development or testing) is it established that the design needs to be changed;
- The users are not fully consulted during the design resulting again in incorrect assumptions being made by the designers;

Note that although most of the above relate to the software, some could be changes to the manual procedures that need to be designed for the users.

As can be imagined, there are often conflicting interests at play when a change request is tabled. The project manager needs to protect the scope of the project in order to remain within the agreed timelines and costs; IT project managers try to reduce the scope in order to minimise their workload which tends to always have been underestimated; and the business representatives tend to want additional functionality in order to improve the efficiencies in the business. The role of the change initiator is very important in the change management system. So too is the manner in which the change is introduced to the project. If the prescribed process is followed, most changes will be rejected unless an extremely good motivation is provided. This is as a result of management protecting the scope of the project and the timelines. The power base of the person initiating the change must therefore be considered. For example, the higher the change initiator is in the organisation hierarchy, the better the chance of having the change request approved. The expertise power of the some people (e.g. the software developers or users) also plays a role, as it becomes difficult to counter their arguments without sufficient knowledge.

3.2.2 Decision Considerations Regarding Change Requests

Decisions taken on projects (especially as to whether or not to proceed with a change request) need to be carefully considered. The decision to proceed with a change, for

example, can have serious unexpected consequences to both the project and the organisation. This is a reason to use systems thinking when considering such requests, as there is a better chance that unintended consequences will be identified and weighed up prior to a decision being taken (Bellinger, undated). Although an argument has been made (Autry, 2002; Deering, Dilts & Russell, 2003) that learning takes place in organisations as a result of mistakes being made, the consequences and associated costs of implementing ill-considered changes into the project can be disastrous not only for the project, but for the entire organisation. Such decisions need to be made systemically and expeditiously in order to be effective.

Not only does the taking of wrong decisions put the project and organisation at risk due to the consequences of such decisions, but the time and effort expended in rectifying the situation and the political ramifications (especially within a highly politicised organisation with a strong culture of blame and mistrust as the one under discussion) can in itself have long term negative effects on the people involved.

Learnings that take place under such circumstances also have self-sealing and self-fulfilling patterns on the relationship dynamics with others in the organisation (Chapman, 2000). It should be noted that the unintended consequences that result out of the taking of wrong decisions might only be felt much later, sometimes when the new system is in the process of being implemented. From personal experience, the longer it takes for these unexpected consequences to become visible, the more costly it usually is to remedy. In many cases, these unintended consequences relate to software “defects” where there is an exponential increase in the cost to time curve (Pressman, 2001). In other non-software cases, similar factors apply that lead to similar cost escalations over time.

On the other hand, there are some people in the organisation who become paralysed when asked to take a decision or otherwise commit themselves to a particular strategic direction. This, too, can have serious consequences in that it causes unnecessary delays to the project. Due to the existing culture in the organisation, possibly as a result of lessons learnt from what happened to others who took ill-considered decisions, many people delay taking decisions and a form of “learned helplessness” prevails (Bates, cited in Farmer and Martin, 2000). The importance of having a suitable change management process in order to minimise the effect ill-considered decisions is thus evident.

3.2.3 Leadership within the organisation

Innovation is a form of change (de Pree, 2001). In order to bring about changes to the organisation requires innovation that is introduced in the manner of servant-leaders (Spears, 2000). Visionary leadership portrays an inspiring picture of what the organisation can become and points to a change in direction towards a new future. Although change is often welcomed, those trying to introduce the change often run into obstacles.

The leadership style within the organisation is not conducive to bringing about a change in culture. The size and history of the organisation has led to the development of strict management style (comprising the activities of planning, organizing, directing, and controlling) and the concept of servant-leadership as put forward by Robert Greenleaf (cited by Spears, 2000) is largely unknown and unrecognised. The existing management style involves the balancing of structures, whereas leadership represents the enabling of reinforcing structures, i.e. to design and implement the structure in such away as to minimise the barrier that prevent the workers from achieving their goals before they have a negative impact. The organisation tends to operate as a strict balancing loop where stability is of prime importance.

A key function of a leader is to create trust in the organisation (Maccoby, 2003b). Leaders can build trust by practicing transparency and increasing participation of staff in the decision making process. Urquhart (2002) mentions a number of factors that kill trust including the avoidance of conflict, selective knowledge sharing, inhibiting employees from using their own judgement and continually monitoring everything.

3.2.4 The Existing Change Management Process

The company's Strategic Governance Council has prescribed the manner in which any change request will be processed. Due to the complexities involved and the possible serious impact that an ill-considered change could have on the company's operation and customers, the process has been enforced on all projects. Over the years that this process has been in operation, it has been expanded to cater for instances where there were unexpected negative consequences of a change. Thus, at the beginning of the Work Allocation Project the template of the change request form that a change initiator had to complete was more than ten pages long. The template was split into different sections in

order to accommodate the type of change (e.g. functionality, cost, timeline, etc.), the possible cost of the change, the possible impact on other system(s) that may be affected, etc. Added to this and depending on the type of change request that was being submitted, additional forms had to be completed which were used as supporting documents to the main change request form. Thus the change initiator had to spend many hours trying to understand which parts of the form had to be completed prior to submission. As any person in the organisation may initiate a change, most change initiators were not familiar with the process and hence the completed forms would frequently be returned to the initiator due to the form being incorrectly completed, resulting in additional lost time and frustrations.

Since the project under discussion was already slipping behind schedule, the senior management ruled that they would have to sign all change requests in order to ensure that they were absolutely essential to meeting the scope and timelines of the project. Not only did this require more than the usual amount of signatories on a change request forms, but caused additional delays due to the managers not readily available. The initiator also had to motivate the (often very technical) change to the managers who did not have an in-depth technical background in the technology that was being used. The decision by senior management that they would have to sign all future change requests thus had an unintended outcome of creating further delays to the project, increasing pressure on the resources and creating additional stress and demotivation in an already highly stressed environment. This is a prime example of management, through their actions, contributing to a possible project failure, as explained by Steyn (undated).

To make matters worse, the process and the change control template was itself changing at an unprecedented rate. Thus, in the past 4 months, it had changed 6 times. On many occasions, the change initiator found that by the time they had submitted a change request, the required template had changed and form was returned to the initiator to resubmit on a new template.

Once senior management approves the change request (which can take up to 2 weeks), it gets submitted to the project change control board. If approved, it then gets submitted to the programme change board for approval to investigate. If approved there, it gets sent for approval to the company's change control board. Each of these change control boards

meets once a week, so should any uncertainties arise at a particular board meeting requiring that the change request be returned to the initiator or owner for clarification, further delays are encountered. Submitting a change request for the first time to the relevant council for consideration could take anywhere between 2 weeks and 6 weeks depending on the complexity of the change required and the amount of pre-approvals that were necessary prior to submission. Appendix C provides an example of the steps to be taken for a typical change request.

A further source of frustration was the fact that the change initiators (usually technical people) do not enjoy administration and bureaucracy, wanting only to “get the job done”. They view the paperwork as an unnecessary formality and adding little if any value, especially since in most cases there is little option but to approve the change request. In fact, the situation was being viewed by the team as being a classic case of goal displacement where the operative goals had become ends in themselves. Added to this is the fact that the technical people are generally in short supply and are thus under constant pressure, having to work a significant amount of overtime, sometimes for years on end. In fact, the onerous amount of bureaucracy within the organisation has a demotivating affect on the entire project team. Stacey (1993) indicates that bureaucratic control is neither rational nor efficient outside of certain limited conditions. It has a number of negative behavioural consequences that undermine its effectiveness. Two reasons that the failure of bureaucracy to achieve its purpose are:

- a) The alienating impact that it has on people that leads to a sense of powerlessness, isolation, frustration dissatisfaction and aggression and the deskilling people leading to trained incapacity (Blauner and Merton, cited by Stacey, 1993); and
- b) The inability of bureaucracies to handle ambiguity and uncertainty and to cope with complex, unstable and unpredictable working conditions and environments (Burns and Stalker, cited by Stacy, 1993).

The feelings expressed in a) above are evident within the project team. The result of the resistance to bureaucracy is the tacit agreement by the people not to abide by the rules, thereby giving an appearance of rationality and order. Stacey suggests that leaders need to adopt leadership styles and motivational factors that fit the situation appropriately. To do

this, appropriate feedback loops need to be installed in the organisation to make it operate like a cybernetic system.

Once all the necessary approvals have been obtained, the change request is allocated to an owner who will be responsible for obtaining the impact analysis (investigation) from the impacted parties. The impact must be documented on a prescribed impact template.

This impact study must then again get submitted to the various change control boards as described above in order to get approval to proceed with development. Once the approval is received, this information is communicated to all the relevant project stakeholders so that they can proceed with making the required change. The project change control board then monitors the progress of the change through its development and testing phases. Once it is ready to be put into the main stream of the project, the project change control board must give approval so that it is properly coordinated.

All throughout this process, project logs need to be kept up to date and all the related documentation need to be saved in the project repository for audit purposes. The quality assurance representative assigned to the project to ensure conformance to the project management processes monitors the process closely. See appendix C for a detailed list of steps involved in the change management process for a typical change request.

3.3 The Need for Process Change

As discussed previously, a project has specific time lines, by definition. Thus, in the vast majority of cases a change will require additional (unplanned) work to be done. Even though some contingencies may have been built into the planning to do some changes during the course of the project, the time taken to get the approval to investigate and do the impact study was seriously affecting the project. Not only did scarce resources have to spend many additional hours filling out forms and chasing signatures, but, by the time the change was eventually approved for development, the project had progressed significantly. It is common knowledge that the earlier a change is initiated on a project, the less and costly it is to the project (Amber, 2004 and Pressman, 2001). Thus, the earlier an identified change is given approval to proceed, the less the cost and impact to the project.

3.4 The Role of the Project Manager in Clearing Obstacles

It is the project manager's responsibility to ensure that the change control process is strictly adhered to. Should anything go wrong during the course of the project and it was found to be as a result of people having taken a short cut in a prescribed project management procedure, the blame is put on the project manager. The project manager is therefore placed in a conflicting situation: to meet the existing project objectives (including cost, quality, scope and timelines) on the one hand; and to ensure that the prescribed processes are followed on the other. Coupled to this is the need for the project manager to provide the necessary support to the project team by clearing obstacles from their path so that they can deliver as expected under very high pressure and stress levels for long periods at a time. By ensuring the correct processes are followed, the morale and motivation of the project team is reduced due to the heavy administrative burden this places on them as well as the perceived lack of trust that they feel due to all the approvals and controls that are required. The process also puts a severe risk on the project timelines and cost. By not following the change management process correctly there is a real possibility that a change is allowed through which will have unknown and potentially serious negative consequences at a later stage.

In discussions with the project team, the most frequent perception that was mentioned was the lack of trust that they felt. This was especially evident when considering the number of senior managers and executives who were required to verify that the project scope was not being changed for each change request, where this was in the vast majority of cases quite obvious. The feeling of the team was that the project change control board should be entrusted with making this decision and that only when there was a change of project scope should these senior managers and executives need to give their approval. Dahlke (2004) lists a number of factors that erode trust in an organisation. There include:

- People not feeling good about what they are doing;
- People do not feel a sense of mutual respect with others;
- People are micromanaged by managers and supervisors; and
- People do not feel that they are fully informed.

As project manager, the author realised that the current situation was untenable and that something had to be done to alleviate it. The decision was made to use systems thinking

and action research paradigms to seek an acceptable solution. Kerzner (1998) states that systems thinking is vital for the success of a project.

The rest of this chapter looks at the organisation from a systems thinking viewpoint.

3.5 Can Systems Thinking be Applied to Project Management?

In order to establish whether a systems thinking approach is relevant to project management, one would need to firstly look at the definition of a system in order to decide whether or not a project could be deemed a system. A definition of a system was provided in chapter 2. A similar definition of a system used by business practitioners is: “A group of elements, either human or nonhuman, that is organised and arranged in such a way that the elements can act as a whole towards achieving some common goal, objective, or end” (Kerzner, 1998). Although the actions of the elements within the system define the emergent properties of the system, the system is characterised by its boundaries. The impact of the environment on the system is also critical to the functioning of the system. A system that is completely isolated from its environment is considered a closed system. Where there is interaction with the environment, the system is considered an open system (as is the case with all social systems).

The definition of a project can be taken as “a sequence of connected events that are conducted over a defined and limited period of time and are targeted towards generating a unique but well defined outcome” (Baguley, 2003). A project usually has a lifecycle through which it achieves its purpose. A lifecycle typically comprises the following phases as illustrated in fig 3.1 above.

In order to meet the goal of a project, a number of elements are required. These include (but are not limited to):

- i) Human resources to work on the project (including management and other technically skilled personnel)
- ii) Facilities (buildings, furniture, tools and equipment, etc.)
- iii) Objective (including desired output, quality requirements, timetable, etc.)
- iv) Methodology
- v) Stakeholders

To test whether a project can be considered a system, the definition provided in the earlier chapter to test this assertion will be used.

1. *A system is an assembly of components connected together in an organised way:*

Certainly all of the above components are assembled with a unity of purpose with respect to the project activities. In applying virtually any project management methodology, the interaction of these components will be connected in a way organised and controlled by the project manager. All the components are vital to the smooth operation of the project and if any component is removed or changed, the project system will have a different outcome.

2. *The components are affected by being in the system and the behaviour of the system is changed if they leave it:*

Each of the above components will be directly affected by having an involvement in the system. By removing any of the components, the outcome of the project will again be different.

3. *This organised assembly of components does something:*

All of the components within the project system are used to achieve the goal of delivering the defined outcome of the project.

4. *This assembly as a whole has been identified by someone who is interested in it:*

Usually a sponsor or senior management of an organisation will be desirous of having a project team together with all the requisite components in order to achieve the project goal. The user community would also have some interested in the project system.

Based on the above, it is evident that a project complies with the requirements to be considered a system. Furthermore, the system is bounded, although the boundary can be moved depending on the perspective of the person looking at it.

It was stated in an earlier chapter that one of the boundaries of a project is time, or more significantly, the end date. On the basis of this, it is asserted that another boundary of a project would be the scope (or objective). The scope defines the output of the project system that, once achieved, largely determines the demise of the project system. Another key bounding factor of a project is the available funds. For a project to be deemed

successful, the boundary conditions of finish date, scope, quality and cost should merge at a predefined point as illustrated in fig. 3.2 below.

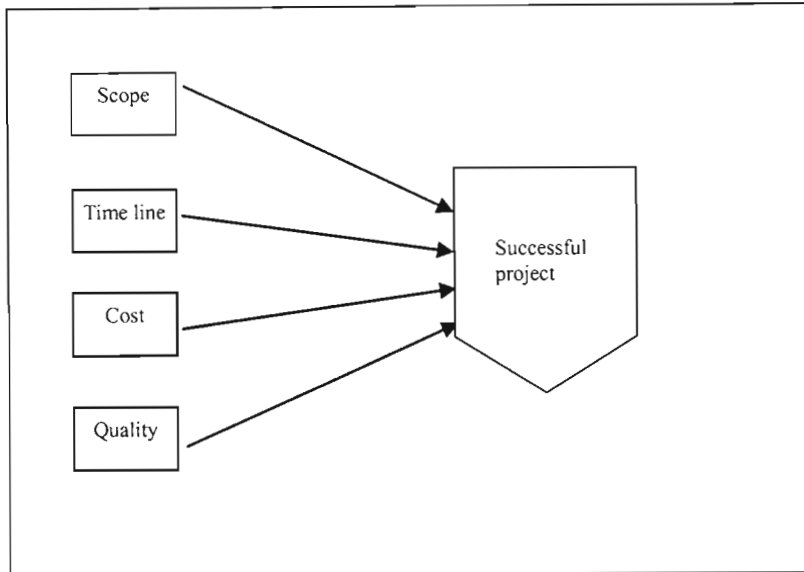


Fig. 3.2: Key project boundary conditions

Outside of the project boundary is the environment in which the project system operates. Environmental factors exert influences on the system and can significantly influence the emergent properties of the system. Within the environment of a project would be the project management governance that dictates how projects must be run. It defines the organisation's project management methodologies and also dictates which project management tools may be used. The organisation's management lie within the environment and can influence the outcome of any project positively or negatively. Current projects being undertaken by the organisation often affect other projects (by requiring the use of allocated resources, for example). Similarly, extraneous events elsewhere within an organisation can dramatically affect a project (e.g. the decision to restructure the organisation, or changing the priority of projects, etc.).

Having looked at the problem within the context of the organisation and the impact it was having on the project, and also establishing that a project may be considered to be a system, systems thinking as described in chapter 2 will be applied in order to obtain an improved understanding of the situation. This will be used as input to the action research activities that will be described in chapter 4.

3.6 Applying a Systems Thinking Approach to the Problem Situation

Systems thinking makes use of a broad array of diagramming tools in order to get a better understanding of a situation. This section will apply some of the tools that were discussed in chapter 2.

3.6.1 Rich Picture

In this research report, one of the first steps in using a system thinking approach to a problem situation will be to draw a rich picture. A systems approach requires the practitioner look systemically at the system under consideration in order to obtain as many perspectives as possible. This will mean not only understanding the culture of the organisation, but also understanding the mental models of the people providing input. In order to achieve maximum benefit, people who are affected by the situation should therefore contribute to this picture. In discussions with the people who were most vocal about the change management process, it was decided to draw a rich picture while the problem was being explained. The rich picture is illustrated in fig. 3.3. (A more detailed rich picture is also provided in chapter 4 when the soft systems methodology was undertaken).

The rich picture indicates the people (change initiators and owners) were not sure of the process that needed to be followed and which sections of the change request template to complete. The burden of an inordinate amount of paperwork is illustrated, as is the escalating cost of the project due to the administrative delays. The change initiators found it an uphill battle to comply with the process and became very frustrated. The various change control boards are indicated along the way, while the clock shows that much time was wasted complying with the process.

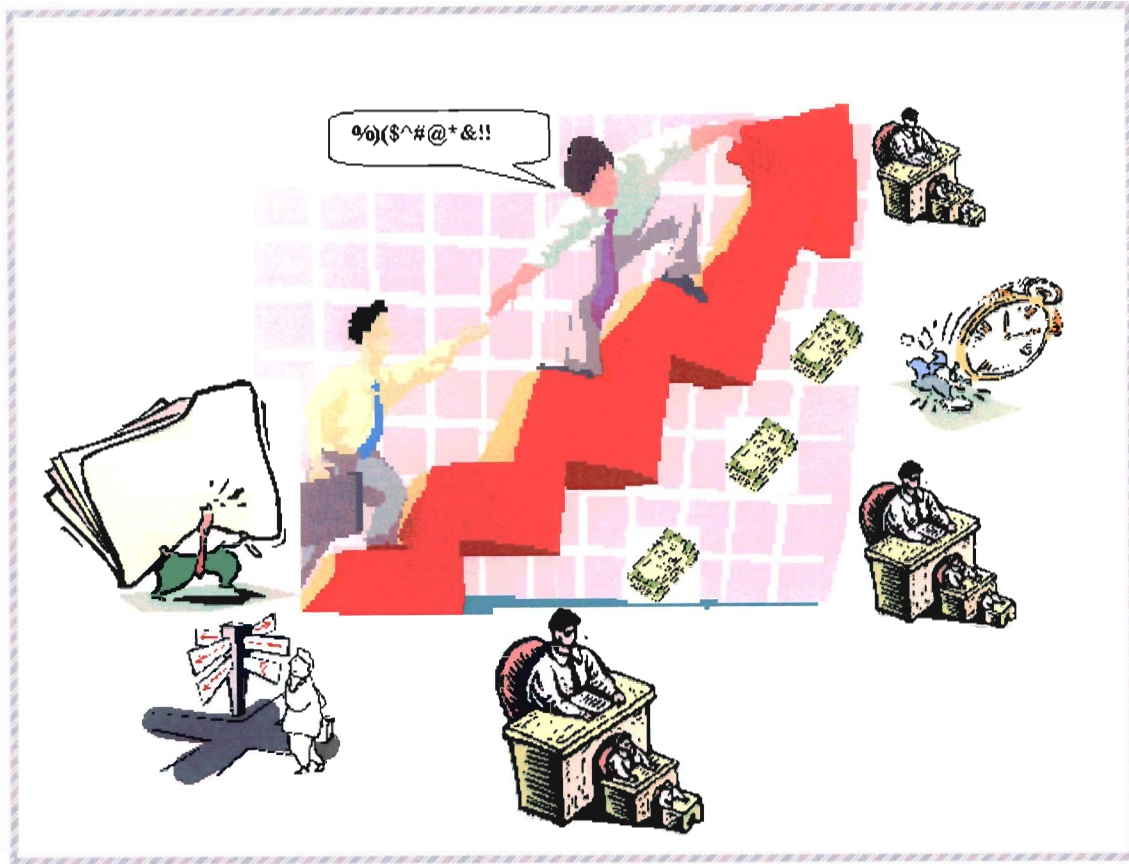


Fig. 3.3: Rich picture of the problem situation

3.6.2 Systems Map

In order to put the project and the problem into perspective it is appropriate to provide a systems map showing the project as a system. Depending on the audience and the purpose of the system map, one can draw it at different levels of abstraction, each with its own interconnected components and emergent properties.

A system map of the project from the perspective of a project manager is given in fig. 3.4. The boundary is placed around those components that directly contribute to the project, whereas components in the environment include the users within the BO, the organisation management, the governance council which sets the project management procedures, the computer and procedural systems within the organisation which will be impacted by the new system, etc. Key components of the project include all the project deliverables, the software that must be modified by the various IT teams, the project requirements, and the project scope, finances, project management procedures, etc.

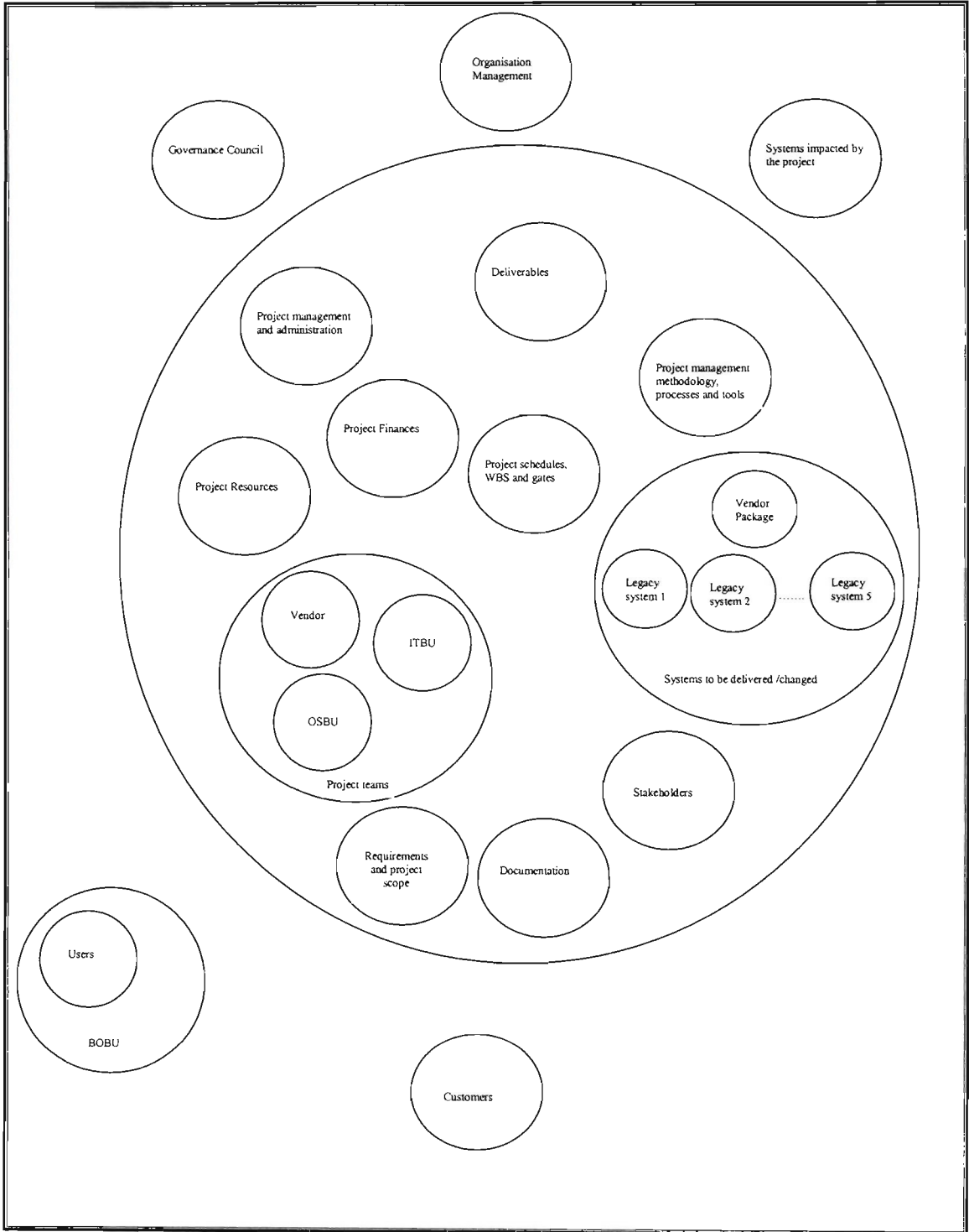


Fig. 3.4: Systems map of a project

With the above in mind, a second system map is provided in fig. 3.5 that illustrates the change request management system. The level of abstraction is lower than the project system map provided above. The system map shows the main elements which includes: the existing change control process, the company and the programme change control boards, the change control administration section and the change request template that plays a very important role in the process. The project system lies in the environment, but the project control board overlaps with the change management system, as do the initiators of change requests. Also in the environment of the change request management system are the quality assurance representatives, the company management and strategic governance council (which will influence the acceptance or rejection of certain change requests that may impact on future company strategy), as well as other projects and systems that are already in operation in the company. Also included in the environment, but which plays an important role in the change request management system, are the lessons that have been learnt from changes that have been made previously. As unintended consequences occur, they result in lessons that a learning organisation takes on board by changing the process to ensure these are catered for should a similar situation present itself in the future.

3.6.3 Influence Diagram

An influence diagram reflecting the system of the change management request system is shown in fig. 3.6. The diagram has been reconfigured from the system map in fig. 3.5 for the sake of clarity. The thicker lines on the diagram indicate a higher level of influence. Thus, for example, the quality assurance representative has a large degree of influence on the way the project is run. Similarly, the strategic governance council exerts a large influence on the higher-level change control boards (i.e. company and programme), since the company strategy will influence which change requests should be permitted. The change control administration also has an influence on the project as the administrators verify whether or not the correct process has been followed before allowing change requests to be processed.

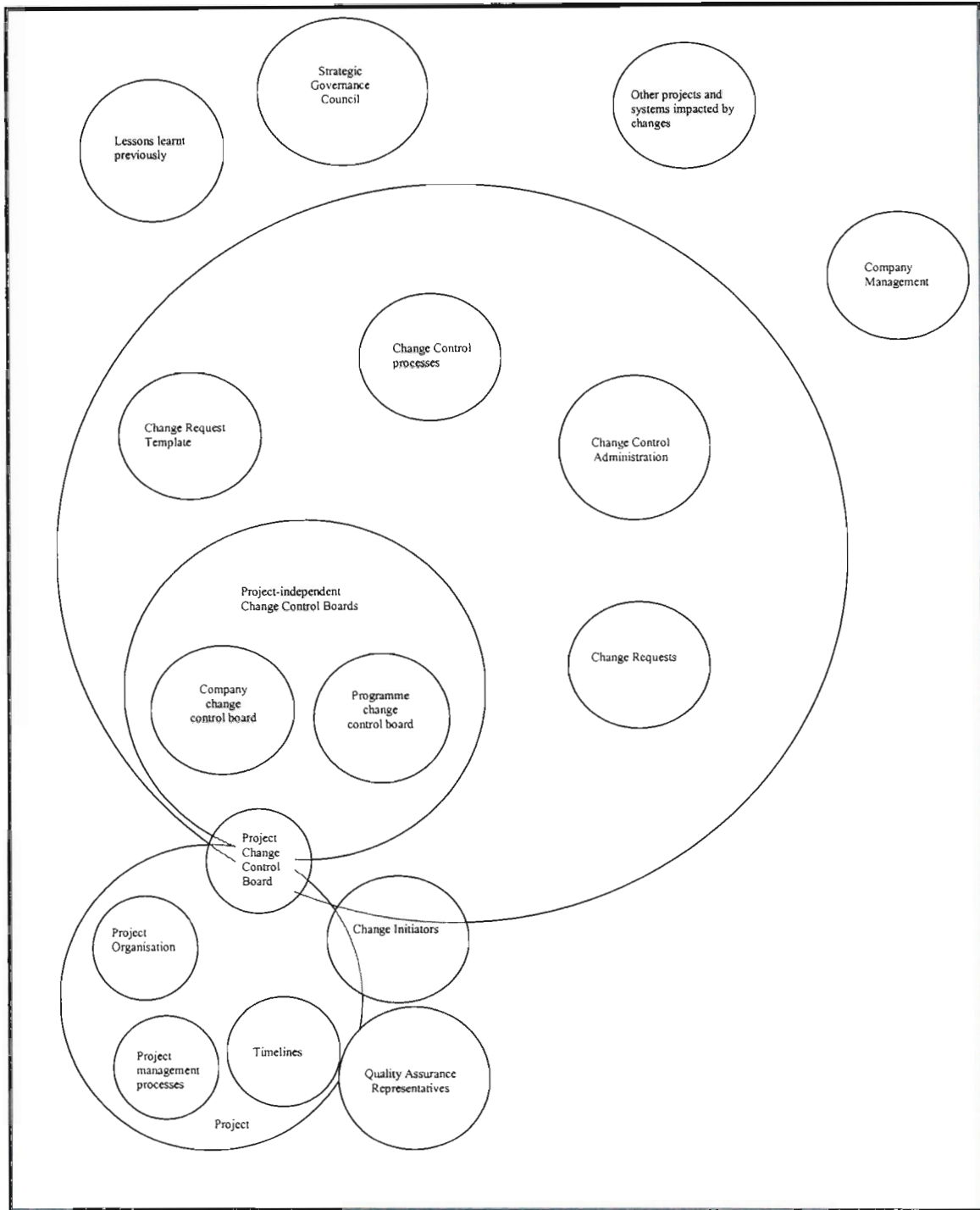


Fig. 3.5: Systems map of the change request management as a system

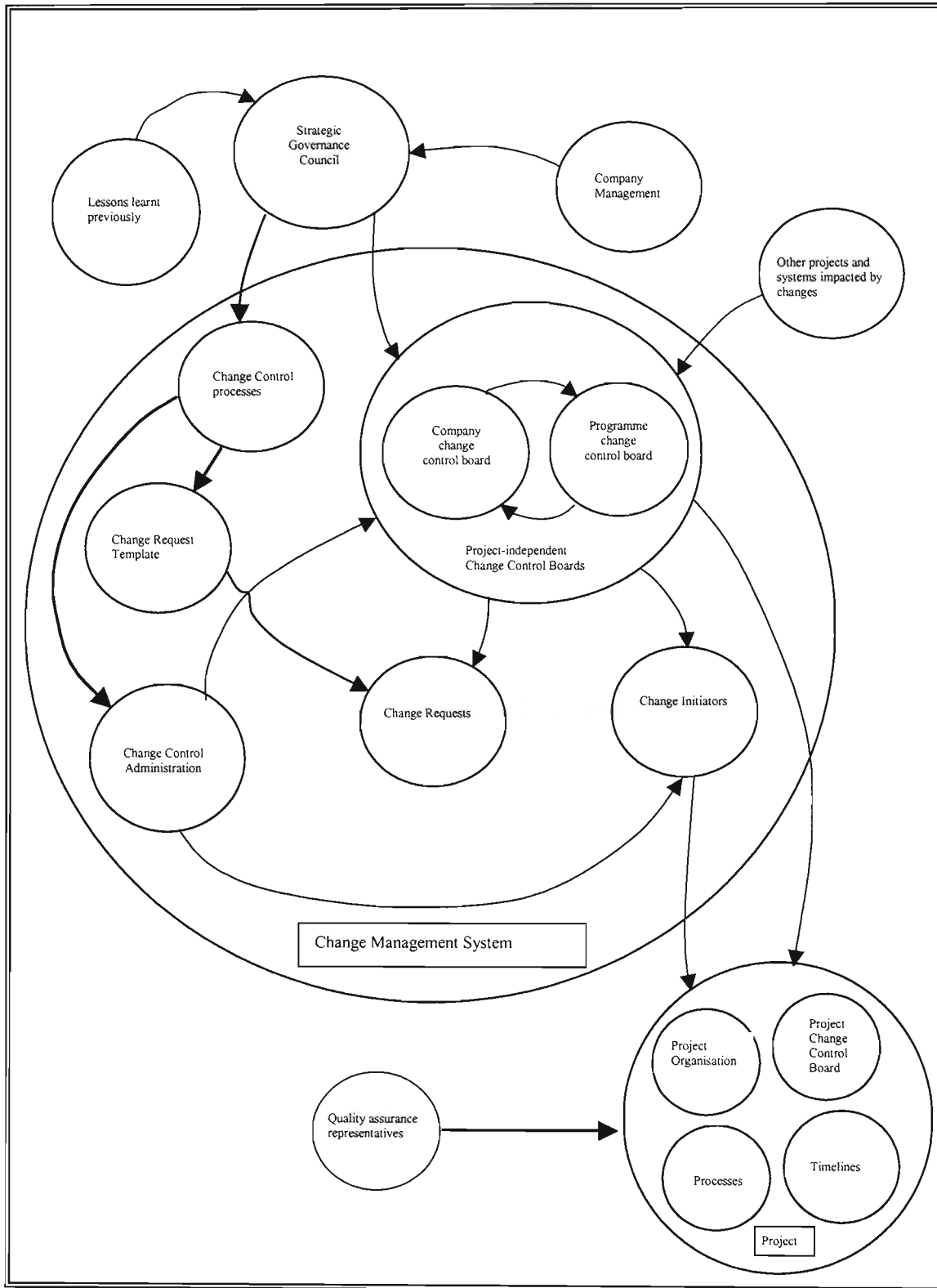


Fig. 3.6: Influence diagram of change request management system

3.6.4 Multiple Cause Diagram

In trying to understand the problem situation, a multiple cause diagram was produced in conjunction with stakeholders, comprising people who were being frustrated by the existing process as well as other project managers working on the project. The final version of the multiple cause diagram that was produced is shown in fig. 3.7. A boundary has been drawn to indicate the “project administration” system. In the environment of the system are the factors that relate to the initial setting of the project timeline. This is largely related to the need to obtain business (financial) benefits for the company as well as to what extent technical resources were consulted when the original project timelines were set. In the case of the project under discussion, the timelines were not realistic, as no consultation was held with the technical teams that were to be responsible for the design and development. This resulted in work having to be done in parallel (i.e. the business requirements and the designs), which led to the need for regular updating of documents, the need for people to “protect” themselves in the (likely) case of searching for people to blame, frustration due to administrative burden imposed when having to complete long forms so that documents could be updated, and the continuous and lengthy battle to obtain sign-off on any document. As time went on, the pressure to meet the rigid timeline also caused frustration for the resources working on the project.

In discussing what he calls the theory of business, Drucker (1994) argues that organisations frequently do the right things, but that these are ineffective as the assumptions on which the organisation has been built and is being run no longer fit the reality in which it is operating. This is relevant because it is these assumptions that shape the behaviour of the organisation, dictate the decisions as to what should and shouldn't be done and defines what the organisation considers meaningful results. The theory of business of an organisation that encompasses these assumptions does not change to keep pace with reality. Drucker suggests that the first reaction of any organisation whose theory of business is becoming obsolete is frequently a defensive one.

The feedback loops are used to explain the patterns of behaviour that is seen in large organisations (Cooper, 1998). Cooper, citing Jay Forrester, says that a complex system is a high-order multiple-loop, non-linear feedback structure where the feedback loops are seen as a major source of behaviour and policy difficulties.

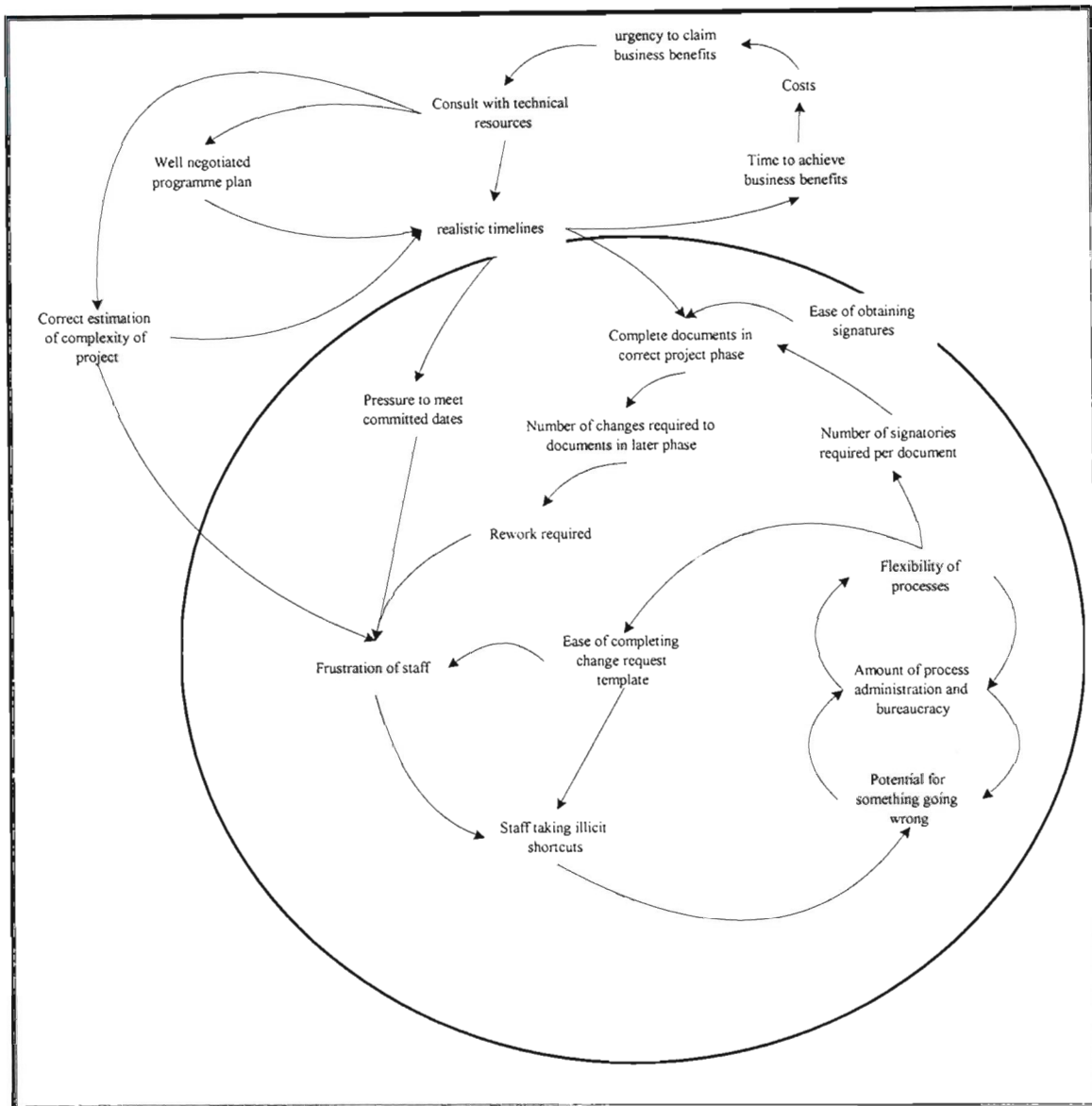


Fig. 3.7: Multiple cause diagram illustrating the negative influence of the administration on the project.

3.6.5 Sign graph

From the multiple cause diagram, a sign graph was generated and this is provided in figure 3.7. There are four characteristics to systems thinking (Ossimitz, undated). One of these relates to thinking in loops by taking into account interrelated systemic structures and recognising causal loops. This is in contrast to thinking in terms of simple cause and effect relationships that is considered linear thinking. In systems thinking, every influence is both cause and effect and the key to seeing reality systemically is to see circles of influence (dynamic thinking) instead of straight lines (linear thinking). In order to obtain

a proper understanding of feedback loops, one needs to apply a dynamic perspective to see how outcomes emerge over time. A number of these loops (some balancing, some reinforcing - mainly vicious cycles) can be seen in fig. 3.7.

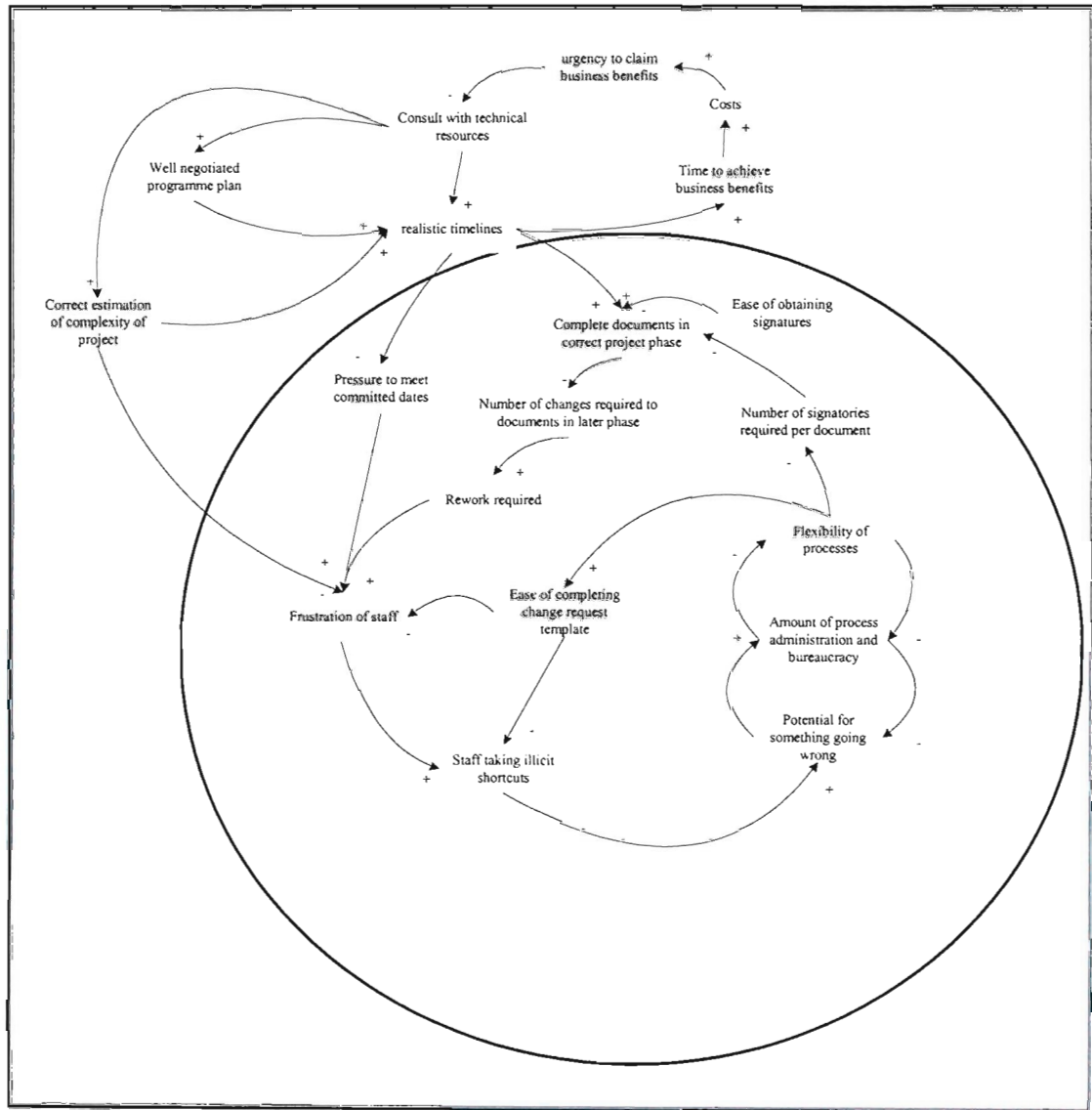


Fig. 3.8: Sign diagram illustrating the various reinforcing and balancing loops in the project documentation system.

In an earlier chapter it was stated that one of the first steps that was essential to managing a project successfully was to identify all the stakeholders. A stakeholder is anyone who will have an interest in the outcome of a particular situation or a project. In a project, a stakeholder will have something to gain or lose depending on the project outcome, or have some direct or indirect interest in the project's success or failure (Baguley, 2003). Some stakeholders' interests could be in opposition to others. A stakeholder could also be someone who has an impact on the outcome, or who is impacted by the outcome. In order to gain an understanding of a situation, it is imperative to identify the stakeholders before considering where and how to intervene in the problem situation. One needs to be aware of the different interests of the stakeholders. To apply systems thinking to the problem situation, an influence diagram should be produced such as the one in figure 3.9.

The senior management of the business units can be seen to have the most influence on the project and can be deemed the project owners. The company executive management have an influence on the business unit management. The project manager wields the most influence within the project system. Quality assurance also has an influence on the project, especially on the project administration. There is a strong mutual influence between the users (who influence the scope of the project) and the project itself (which will affect the way the users work in the future). The influence between the projects being undertaken within the programme is also shown.

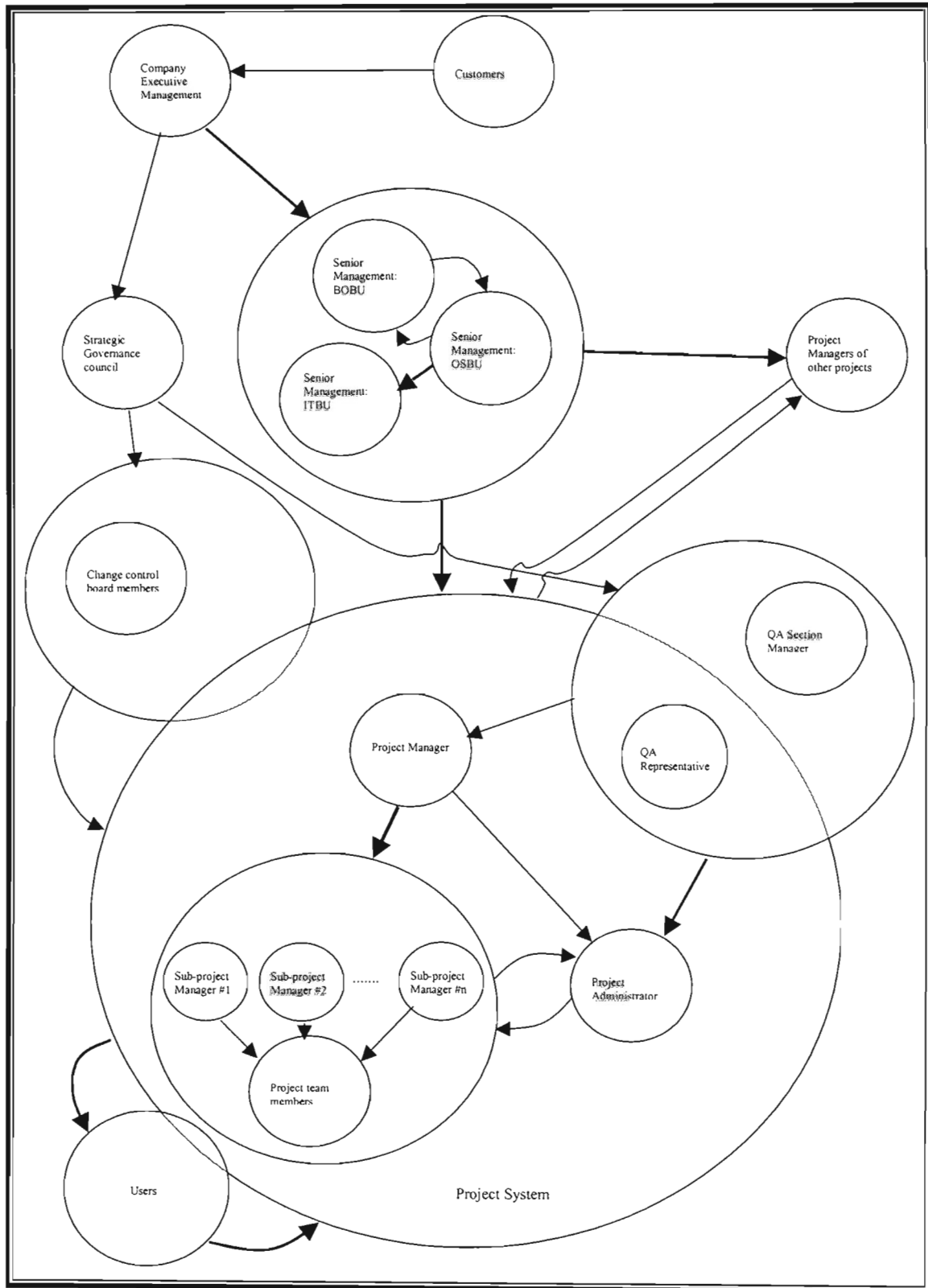


Fig. 3.9: Influence diagram of the stakeholders

3.7 Using Systems Thinking to Identify Points of Intervention

Systems thinking has the advantage in that it allows the practitioner to see the organisation as a system so that one may learn about the “what and the why” of the current situation (Seddon, 2001). This allows for more effective identification of what needs to be changed in order to derive the required benefits. The systems thinking practitioner should see him/herself as a facilitator and not as an expert, thereby assisting people to see their difficulties in new ways so that change becomes possible (Lockett, 2004).

Systems thinking is also about the relationship between events, patterns of behaviour and structure. A structure will determine the behaviour of a system and the events are snapshots of that behaviour. Thus events are a product of behaviour that is caused by systemic structure (Senge, 1990). Structure, in this context, refers not necessarily to the (hierarchical) structure within the organisation, but more to the structure of the relationships of the components that make up the system and their influences on each other.

In order to implement successful policies and interventions one needs to make changes to structure so that emergent behaviour of the system is improved and bad events occur less often. In the issue under consideration the events occurred when people were found to be trying to take short cuts in order to reduce the bureaucracy and ended up causing problems or unexpected consequences (such as important stakeholders not being aware of changes that were made, resulting in further lost time and rework). When this occurred more and more frequently, a pattern was seen to be emerging. Hence the structure of the system had to be changed in order to reduce these bad events. By tracing these flows of influence, patterns that repeat themselves may be observed which make the situations better or worse. By observing the patterns stemming from events that occur, the structure can be analysed to see where interventions may be required to bring about requisite changes.

In order to achieve the correct intervention, it would be necessary to avoid the usual approach of concentrating on the events (attacking the symptoms) which results in a

reactive approach to change, but rather to adopt the approach of learning organisations and focus on the systemic structure that leads to this undesirable behaviour.

3.7.1 System Culture and the Role Of Politics

To approach a problem situation using systems thinking, it is important to consider the prevalent culture within the system itself as well as the culture in the environment. The culture of the organisation (especially the Operations Systems business unit (OS) which is largely responsible for ensuring the processes are adhered to) is one of a “roles culture” described by Handy (cited in Farmer & Martin, 2000). This culture is most frequently found in bureaucratic organisations and is characterised by conformity to rules and respect for the “system”. The organisation is very hierarchical and the person’s position in the organisation hierarchy plays an important role with respect to the power that the person has. Information gained as a result of a person’s position provides an important power base that is used by the individual to share or not share information depending on the agenda. The relationships are more professional and emotions play a very small role in this environment. Within the OS there is also a culture of power where a few individuals who occupy senior positions and who dominate the organisation form a powerful central group. To illustrate this, during particular problematic periods on the project where it is difficult to get the cooperation of particular resources despite the best efforts of the project management team, the involvement by one of the members of this power group will have the immediate effect of getting total focus on the problem situation by all of the role-players. Within the project itself, there is a task-centred culture where the team members are adaptable, cooperative and supportive. Unfortunately, there is virtually no form of people-centred culture within the organisation. The climate within the organisation is thus distinctly defensive and the unwritten rules as identified for such a climate by Argyris and Schon (cited in Farmer & Martin, 2000) apply almost totally. In particular, people within the organisation tend to protect themselves at all time by avoiding direct interpersonal confrontation and discussion of sensitive issues publicly that might expose them to blame. This culture is a barrier to the organization becoming a learning organization and causes teamwork to be inhibited.

Within this climate, important issues are often deemed as not being open for discussion, thereby ruling out the open inquiry required for double-loop learning. Single loop solutions are sought for what are essentially double loop problems. The result is that failures are attributed to other internal or external factors that result in the theory-in-use being modified in order to account for the failure. The theory-in-use therefore becomes self-sealing, since the actual cause of the problem will not have been addressed. An important factor in this is that project managers tend to be very task-oriented and focused on delivering results within the constraints of the project.

Bate (cited in Farmer & Martin, 2000) identified six basic organizational issues and these are presented as five bipolar scales in table 3.2 below. These represent the cultural factors that can exist in an organization. The table is populated by the view of the organization of the project manager.

Basic organization issues	Negative pole	--	-	?	+	++	Positive pole
Affective orientation	People avoid showing/sharing feelings/emotions.	✓					People readily show and share feelings and emotions.
Animate–inanimate orientation to causality	No one ever points a finger at anyone in particular.		✓				Personal criticism and praise are fully accepted.
Hierarchical orientation	Superiors solve your problems for you. No one challenges them.	✓					People take responsibility for solving their own problems. Inappropriate instructions queried.
Change orientation	Better the devil you know. Change regarded as impossible or for the worse.	✓					Change welcomed for the opportunities it brings. Associated risks accepted.
Individualist–collectivist orientation	Do your thing in your patch; keep out of my patch. Many small sections, units, etc.	✓					Everyone talks to everyone. Often cross boundaries to visit other areas/project.
Unitary–pluralistic orientation	People tend to be belligerent, distant, untrusting. Problem solving by confrontation.		✓				A high level of trust. People very ready to help one another solve problems cooperatively.

Table 3.2: Bate’s 6 dimensions of organizational culture.

Following on from the culture of the organization, a systems thinking practitioner also needs to look at the different stakeholders and the different sources of power that they

have. Stacey (1993) states that power flows from relationships that have been established over time between individuals and groups. Power is used to persuade others to do things that they either do not want to do or that they would not thought of doing. Paton (cited in Farmer & Martin, 2000) discusses visible and invisible power that exists. Regarding visible power, many of the senior managers use positional power in order to drive the people within the organisation. The technical resources have expert power and due to the scarcity of the relevant expertise required by the organisation, this power can be used quite effectively. There are also a few individuals in the organisation that have personal power by virtue of their natural leadership qualities and this is used to good effect at times. Dependence power plays an important role for those managers who need to rely on their contacts within the organisation to get things done. Managers often resort to this due to the matrix structure of the organisation in order to get people to cooperate.

A senior manager or an executive will have a very different view of the problem situation than would a technical person who is confronted with the problem. In discussions with management regarding the problems being experienced, their attitude was that the process in place had to be followed and they did not seem to appreciate the length of time that it took to have a change approved or what the cost to the project ultimately was due to these delays. They especially did not seem to appreciate the negative knock-on effect that was caused to a project due to the time delay in getting approval to implement, or the effect on morale and motivation that burdening the technical resources with seemingly unnecessary administration was having. On the other hand, the people who initiated the changes found it hard to conceive of the negative impacts to the company should a change be made without following the prescribed process. They seemed to feel that they had already “thought of everything” before implementing the change and hence there would be no unforeseen consequences.

3.8 Conclusion

In this chapter, the problem situation that was experienced on the project has been placed in the context of the organisation, the various systems at play, the different organisational structures involved and the affected role-players. The role that the administrative burden had on the individuals who needed to process change requests was discussed.

From the above analysis it is evident that the project may be considered as a system. In order to identify an intervention that will lead to sustainable outcomes and be acceptable to all the stakeholders, a systemic approach to the problem situation is required. Various views of the project are provided using diagrammatic tools, and the influences and causes of the problem situation are indicated.

In the following chapter it will be shown to be necessary to move away from the present culture that exists in the organisation of blame, mistrust and linear thinking by looking only at the events. The systemic structure of the system will have to be understood and changed. Stakeholders will need to be involved in producing the changes that will lead to an improvement of the problem. This will be done by using an action research paradigm and specifically participative action research and soft systems methodologies.

CHAPTER 4.

ACTION RESEARCH: A MEANS OF IMPROVING THE PROBLEM SITUATION.

4.1 Introduction

The relevant theory behind action research was examined in chapter 2. In chapter 3 the problem situation was analysed using systems thinking within a framework of the project and the organisation. This was done using appropriate diagramming tools and also by looking at aspects of the organisational culture and politics. Relevant concepts of leadership and innovation required to introduce change were considered. Bureaucracy that exists and the resultant frustrations were also covered.

Having gained an understanding of the problem using systems thinking in the previous chapter, action research will be used in order to find a means of identifying one or more points of intervention. It will also be used to look for acceptable and viable actions that will lead to improvements that will not only be useable on this project, but where the methodology can be considered on future projects within the organisation. An explanation of why action research will be a useful approach in the particular project context will be discussed.

Two action research methodologies are applied. Initially participatory action research will be used to analyse the problem situation and institute some initial changes. During this cycle, a clearer understanding of the systems and their constituent interacting components will be obtained. The second iteration will involve soft systems methodology and will be used to look at the outcomes of the first intervention and identify further changes to the situation.

4.2 Use of Action Research in the Context of the Project

Very little appears to have been published regarding the application of action research with the aim of improving project management processes. It is assumed that the reason for this is that there is a lack of awareness of this paradigm as a means of engaging with role

players with the intention of optimising project management processes by the project management fraternity who are involved in technical projects (as opposed to social projects, where action research has been used for many years). There is no apparent reason why action research cannot be used in the project management context to bring about improvements to the processes used on the projects.

Action research has dual aims (Dick, 2000). These are to simultaneously bring about the best opportunities for change in the organisation (or community) by means of action; and to increase the understanding of the social system by the researcher and/or the client. Thus the action enhances the understanding of a situation and the understanding supports the action. Soft systems methodology is particularly useful when an organisational process may need to be changed. This is because it provides a structure for making sense of complex problem situations. In a project management context action research provides opportunities for the practitioner to reflect on and assess how effective the new processes are and to share the experiences with colleagues so that learning can take place within the organisation.

Action research is democratic in that it encourages participants to interact with each other as well as promoting collaboration in a joint effort to improve a given situation, thereby making them equal owners in the process (MacIsaac, 1996). The effectiveness of the action and the research is dependent on the level of participation that occurs with the stakeholders as well as the means to achieve this participation. Schurink (cited by Seerane, undated) suggests that despite there being differing views within the participant group at the outset, the participatory character of action research will lead the group towards feasible decisions regarding their goals and actions.

4.3 Approach to action research in the given situation

In participatory action research (Wadsworth, 1998), there are 4 parties involved:

1. The researcher,
2. The researched,
3. The people (the critical reference group) who have the problem that needs to be resolved, and
4. Those that will benefit from having better information about the problem.

Since the attempt to improve the problem situation was going to form the basis of a study and the results published in a dissertation, it was essential to inform those people who were going to actively participate in the process of the methodology that was to be used. The action research team was thus established comprising 4 other members of the project management team who were managing key sub-projects within this project and myself. They were given relevant background on the approach that was to be taken. All the “researchers” were very happy to follow the action research approach. It was pointed out to the participants that in order to achieve the goal of consensual action, it would be necessary to be open to other people’s views and varying perceptions and encourage these to be expressed openly without fear of repercussions. This was somewhat against the prevailing culture of the organisation as explained in the chapter on systems thinking.

4.4 Steps taken – First Iteration using Participatory Action Research

4.4.1 Participatory action research

Participatory action research is research involving all relevant parties in actively exploring together a situation that is experienced as problematic in order to formulate some action to change and improve it. This is done by critically reflecting on the historical, political, cultural, economic, geographic and other contexts that make sense of it (Wadsworth, 1998).

The first cycle of action research would be to obtain a better understanding of the problem situation and make some change(s) that would be evaluated. A participatory action research methodology would be used for this initial cycle. As stated in an earlier chapter, there are specific steps that need to be taken in order for a successful action research intervention to take place. These steps include:

- a) Stop current actions
- b) Develop an understanding of the problem
- c) Decide on questions that need to be answered
- d) Plan the intervention
- e) Carry out the intervention
- f) Observe and analyse the outcome of the intervention
- g) Reflect on the outcome in order to identify what needs to change or improve,

- h) Apply changes, and
- i) Plan the next cycle of intervention.

As part of step b) above it is important to also decide how the questions will be posed and who need to provide answers to the questions.

4.4.2 Current Problem Situation Description

The problem situation was identified soon after the project moved into the design phase of the project life cycle. This was as a result of some crucial deliverables that should have been completed in the planning phase but were still incomplete. Senior management, in keeping with the culture of driving milestones and key project deliverables, instructed the project manager to proceed with the sign-off of both the planning phase and these documents in their current incomplete state and to deviate¹ a later version of these documents to the next phase. This would imply that the design phase could be said to have commenced on schedule. (This would show them in a good light to their management by meeting committed targets). The documents were therefore signed-off (approved) with many incomplete sections. The result was that as these documents kept changing, the designs had to change as well, since they were based on these documents. In order to ensure that the prescribed process was correctly followed, each change to the documents necessitated that a change request be submitted as required by the project management process.

4.4.3 Action Research Steps.

It was mentioned in the paragraph on participatory action research that there are specific steps required when doing action research. Each of these steps will now be discussed.

4.4.3.1 Stop current actions.

Although it is suggested by Wadsworth (1998) that current actions be stopped, this was not feasible due to the tight project time constraints. Once the problem was identified, it was agreed that the project manager (who would also be the action researcher) would move towards finding an acceptable resolution as soon as possible. This implied the problem situation was also dynamic, because elements related to the problem were changing on a daily basis.

¹ A deviation is a project management process used in the organisation to allow a deliverable to be completed in a later phase to the one in which it should be completed.

4.4.3.2 Develop an understanding of the problem.

Much of the understanding of the problem situation was done using a systems thinking paradigm as described in the previous chapter. The problem first came to light in the early design phase when the designers complained that some of the documents on which they had to base their designs had not yet been approved (signed-off), while other key documents were approved provisionally with numerous sections that were incomplete. Although the project management process that was being used stated clearly that one should not move from one project phase to the next until all deliverables required in the previous phase had been completed (the espoused theory), the project management team was instructed to continue to do the design in parallel with the completing of these documents. It was felt that by doing this, time could be made up, even though there was a risk of having to redo some of the work already completed. The designers were not happy with this decision and made this clear to their management. Their managers raised this issue with the project manager.

4.4.3.3 Decide on the questions that need to be answered

This aspect of the research is crucial in order to ascertain what the important issues were for each of the stakeholders. The first step was to identify the stakeholders who needed to be consulted. These were:

- The project management team
- The designers
- The managers of the designers
- The quality assurance representative
- The business analysts
- The manager of the business analyst team.

To get a clearer understanding of the problem and possible solutions, it was considered necessary and vital to get an understanding from the stakeholders' perspective. Questions that needed to be asked would have to relate to:

- Why there was a resistance by the designers to doing the work in parallel (and especially to see if there were any reasons that were not being openly communicated);
- What measures could be put in place to minimise the foreseen risks;

- Establish the reason why the documents that should have been completed by the end of the planning phase were not completed. This was not to apportion blame, but rather to identify the problems that were being experienced in order to estimate the effort required to complete the task;
- Find out whether any of the project managers had been in similar situations previously and what positive or negative lessons had been learnt;
- Obtain proposals on how to reduce the negative impact of the situation and what steps could be taken to make up lost time.

By asking the above questions and discussing the responses in an open and frank manner with the respondents, the researchers were in a better position to understand the implications of any actions taken. The fact that there was an interest shown by managers on the project team also seemed to placate the other team members and demonstrate that there was a serious action in place to ease their plight.

4.4.3.4 Plan the intervention

At the next project meeting, the project team was told of the decision to continue with the design. The team was also advised that there would be continuing discussions with a number of affected parties in order to minimise the risk to the project of this decision. The team was further assured that the project management structure was doing everything in their power to normalise the situation as soon as possible. It was also stressed that it was not the intention of the project management team to use this exercise to look for a scapegoat, but rather to try to get the project back on track as soon as possible and also to capture learnings from this for future projects.

4.4.3.5 Execute the intervention

In the subsequent discussions with the designers, it was discovered that a similar situation had occurred on other projects. The designers were therefore concerned that if the designs were completed later than scheduled, they would be held to blame for further project delays as had happened on the previous occasions. In order to mitigate the risk of rework and the delay that this would have on the overall project time lines, it was proposed that all subsequent changes to designs would have to be made following the prescribed change control process. In doing this, it would be possible to track the number of changes that were made as well as establish the impact of each change. This proposal was supported by the managers of the IT design teams.

A further suggestion by some members of the design teams was that a lot of time could be saved if they were included in the ongoing sessions that the business analysts were having with the business representatives.

The manager of the business analysts felt that they were being blamed for the problem that the project was facing and spent much effort and energy in trying to motivate why they were unable to complete their activities in the planning phase. There was no proposal forthcoming from this manager other than to continue trying to get the relevant documents completed. According to the business analysts, most of the problems that they were experiencing related to the fact that the required representatives from the Business were not always available when required (as they had their normal duties to perform and this project was not high on their list of priorities).

The reaction of each team without exception and as expected was in keeping with the culture of the organisation. The various teams realised that the project was headed for major slippage and were becoming defensive so that when the anticipated blame was apportioned, they could have adequate responses in order to protect themselves. The highly politicised nature of the organisation must again be stressed, especially in situations where projects start going wrong. Each business unit and team begins demonstrating defensive behaviour. As stated by Chapman (2000), blame is particularly destructive of all sorts of work or task based relationship, because in an organization with a blaming culture, people will act to steer clear of the blame rather than do their activities in a positive sense. The culture also inhibits the free flow of information due to the defensive behaviour, as the people do not want to be seen as the bearer of bad news, since this often results in them getting the blame. Furthermore, in such cultures the blame is frequently passed down the chain of command until someone ends up carrying the brunt of what was actually a complex problem situation with many causes. A consequence of being in a blaming organisation is that no learning takes place on how to avoid similar situations in future, as once the blame has been apportioned, it is assumed that the “responsible” party will be punished in some way.

4.4.3.6 Analyse the Outcome of the Intervention

A report was produced that summarised the finding of the discussions that were held. The project management team considered the proposals and decided that with immediate

effect any change to work already done by the designers as a result of new information being provided in revised documents would only be allowed to proceed on the basis of a change request.

At this time it was noticed that the morale of the team did not seem to be lifted by the discussions and attention that management were giving to the situation. In fact, if anything, the morale seemed to deteriorate.

4.4.3.7 Applying the Change

The final step of the participative action research was to implement the change. The project manager issued a directive to all staff explaining the situation and requesting full compliance to the request for all rework to be managed by means of the change request process. Within the first week, 6 change requests were logged.

The team comprising the action researchers met in order to discuss the results of this first intervention. A further intervention was planned in order to establish why the progress of the designs was falling further behind schedule. It was decided that the second intervention would make use of the soft systems methodology.

4.5 Second Iteration of the Action Research: Using Soft Systems Methodology (SSM)

4.5.1 Application of Soft Systems Methodology (SSM)

Having used participatory action research during the first iteration to obtain a general understanding of the issues affecting the project and to make some initial changes, it was felt that in order to hone in on a possible resolution to the problem SSM would provide a more suitable methodology. SSM is defined by Checkland and Scholes (1990) as “a methodology that aims to bring about improvement in areas of social concern by activating in the people involved in the situation a learning cycle which is ideally never-ending. The learning takes place through the iterative process of using systems concepts to reflect upon and debate perceptions of the real world, and again reflecting on the happenings using systems concepts”.

A reason for the choice of SSM was the fact that there was a link between the existing problems and the organisational culture and hence a soft methodology was appropriate.

Also, it was felt that an incremental action research process that provided for participatory learning would be logical and hence beneficial to the stakeholders. The outcome had to be an improvement in the situation. SSM would provide the participants the opportunity to debate and develop their ideas. Schroff (2000) suggests that the main characteristics of SSM includes (amongst others):

- It is a goal driven approach
- It focuses on improvements to the organisation
- The people involved with the problem are its primary focus

In applying SSM, the researcher needs to look at both structure and process and the ways that these interact. Although action research cannot guarantee a successful outcome, the methodology does provide a structure to the problem situation so that it can be dealt with in a structured way. The methodology has been found to be suitable for the improvement of software processes and in determining business process improvement strategies (Shroff, 2000). The steps that will be taken are the 7 stages that were proposed by Checkland (1981). These are:

- 1) Examine the problem situation. This includes identifying who the key players are, how the process currently works, etc.
- 2) Express the problem situation (using a rich picture).
- 3) Produce a root definition of significant facets of the system(s) of interest.
- 4) Building conceptual models of what the system(s) named in the root definition must do.
- 5) Compare the conceptual models with the real world situation to see where they differ and where they are similar.
- 6) Identify feasible and desirable options for changes that would improve the situation.
- 7) Suggest recommendations for action to be taken that would improve the problem situation. Also included here is taking the suggested action.

The first two activities relate to the real world and finding out about the problem. The next three relate to a systems thinking approach to the real world, while the last two relate to taking action in the real world again. In later versions of SSM, Checkland (1999) identified two strands, one being the cultural view of the social systems, roles, norms, values, politics and sources of power, and the other being the logical analysis.

Checkland (1999) proposes doing a cultural analysis (discussed later in this chapter) where analyses are done on:

- The intervention (which relates to the structure of the system);
- The social and culture (which is associated with the procedures and policies); and
- The political system (which affects the organization's attitudes).

Another important aspect of SSM is the building of models. Models are a simplification of reality and need to present low complexity but high accuracy. A common problem that is experienced, especially in larger more formal organisations where the people feel that they are less empowered, is that decisions take longer to make in groups that are striving for consensus. In a power-based culture, decisions are often taken by people occupying senior positions in the organisation with little or no consultation being done with the role-players. Although there are serious disadvantages of this approach, one of the advantages is that the decisions are taken relatively quickly. However, if there is an intention to create a learning organisation, it is essential to include more people in the decision making process. Any process that involves negotiation and consensus building will require time. A criticism of SSM is that it is based on consensus amongst the role-players that is time consuming. People (especially in project environments) want to see results quickly. A trade-off is thus required.

In a large complex project environment where time is usually a severe constraint, adopting an approach that will encroach further on the already stretched time of the participants poses a serious challenge. However, this study will show that the sacrifice of time in order to involve the stakeholders is well worth the effort, as the participants then feel that they effectively own the result of the process. Since the consensus will result from a systematic methodological approach, the actual solution to the problem situation is considered as being less important than the benefits gained from the systemic learning process occurs.

4.5.2 Problem Situation Unstructured: Examine the Problem Situation (after the initial change)

This first stage of SSM is to obtain a general and wider understanding of the problem situation in an unstructured form. It is usually triggered by managers and/or other role-players realising that a process or task is not performing optimally; there is a perception

that there may be a problem or room for improvement. It is used to gather information about who is involved, what their perceptions of the situation are, what are the related structures of the organisations, and what processes are used. Much of this had already been done in the first iteration described above. An understanding of the organization's culture, politics and internal policies is also obtained in this stage. These have been largely addressed in the chapter on systems thinking.

It became evident fairly soon after the directive was announced to enforce the use of the change management process that the frustration levels of the designers were increasing and that their morale was dropping. The secretary of the project change control board reported that many changes that were being registered had to be returned because the templates were not being completed properly; out of date templates were being used; the approvals from the wrong managers had been obtained; or supporting documentation was missing or incomplete. The result of this was that the project change control board was approving very few changes.

Although the documents being produced by the business analysts were progressing well, the progress of the design documents was somewhat slower than expected. Discussions were held with the designers together with their managers to establish the reason for this. Two main reasons were given: the first was that the information in the existing documentation on which they had to base their work was still incomplete and ambiguous requiring meetings with the business analysts and business representatives. The second reason related to the amount of time it took to follow the change request process. This latter reason may be considered an unintended consequence of the action taken during the participative action research exercise. The changing templates, complicated nature of the forms, as well as having to chase managers for signatures were the major sources of frustration. Appendix C provides an indication of the steps that needed to be taken in order to follow the change management process for a typical change to some software that had already been developed.

Any attempt to change the process would require the consent of the relevant authorities. Experience had shown that any proposal for a change in a project management process would take many months to realise. Furthermore, whatever was to be done had to be effected quickly in order to reverse the slow rate of progress that was being achieved.

Discussions were thus planned with the senior manager within the OS responsible for the development of all projects as well as being the quality assurance manager. The approach taken at this meeting was that, unless something drastic was done, not only would the project slip, but this would in turn cause most other projects within the programme to slip due to their dependence on this project being successfully implemented.

4.5.3 Problem Situation Structured: Cultural analysis

Checkland (1999) suggests that, in order to obtain a good understanding of the human activity system, the practitioner should apply a cultural analysis. This will assist in structuring and expressing the available information and also in the understanding of the problem situation. It will also enable and facilitate the analysis that will follow in the next stages of the application of SSM. In this stage, SSM recommends using cultural analysis comprising three tools:

- Analysis One - Analysis of Intervention: This looks at the stakeholders involved and in particular the client (the individual who causes the intervention to take place), the 'would-be problem solvers' (those people responsible for conducting the study) and the problem owners (the beneficiaries or victims who are affected by the problem);
- Analysis Two -Social and Cultural System Analysis: This is used to gain an understanding of the internal policies and to establish possible motives and other factors that influence peoples' perspectives. In order to do this, one must look at three interlinked and mutually dependent entities: roles (defined as the social position of the role-players within the organisation with respect to others), norms (the expected behaviour of each of the roles) and values (standards by which performance in a role will be judged) of the organisation;
- Analysis Three -Political System Analysis: A study of the structure of overt and covert power relationships within the organisation. An understanding is required as to what makes individuals powerful within the organisation and what the symbols of power are.

Since much time was spent in applying systems thinking as described in chapter 3 and this covered the above topics, it was felt that sufficient related information was available to the researchers and that spending more time on the above was not required.

4.5.4 Problem Situation Structured: The Problem Situation Expressed as a Rich Picture

When formally expressing the problem situation, the following factors need to be considered (Couprie *et al*, undated):

- The organisation structure which includes the components that are not easy to change;
- The processes that are performed within the system;
- The softer issues that are expressed by members of the organisation.

From the information gathered in the previous stage, a rich picture was produced together with some of the affected parties. In particular, the various stakeholders were observed in their work environment and semi-structured interviews were held with many of the affected parties. The resultant rich picture is provided in fig. 4.1 and contains more details than the one used in chapter 3. The rich picture assists with structuring the information and the understanding of the problem situation. It is used to enable and facilitate the analysis that follows.

The rich picture shows the various change control boards and indicates that the change request process can take up to 6 weeks to complete. The change initiator is seen carrying a pile of documents and being very frustrated by being sent from pillar to post. The change management administrator is seen rejecting changes by telling the initiators to complete the forms again properly, while the quality representative is viewed as cracking the whip, with the lengthy process (at version 8) next to him. The doors of the managers' offices are seen to be closed, while the paperwork piles up outside their offices. The project manager is torn between the customer (Business) who needs the new system as soon as possible and trying to get the work done faster. The business analyst is very busy (generating documents that will result in changes to some designs which have already been completed) while the designers are waiting for work to come in via change requests. All this time, sheets are falling off the calendar indicating the passing of time. The researcher is also shown looking into the system and taking notes. An additional point from the rich picture is that the people are all frustrated and unmotivated (as seen by their sour faces).

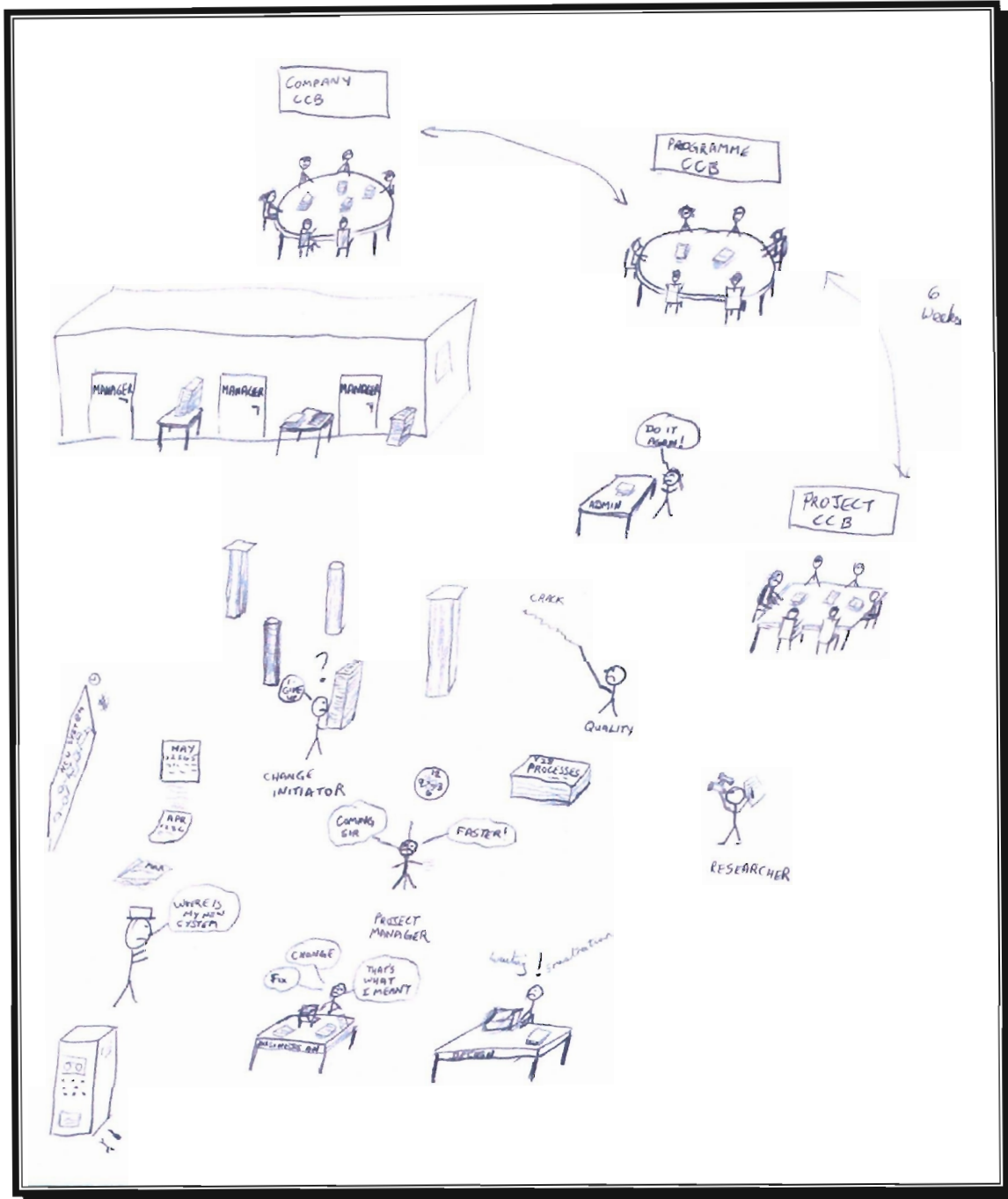


Fig. 4.1: Rich picture depicting the problem situation

In analysing the problem situation depicted in the rich picture (which concentrates more on the process view), it is necessary to consider the people who are involved in the situation (the problem owners, clients and problem solver) in their cultural context; the social aspects where the roles of the stakeholders are analysed together with the norms of behaviour that these people display and the values by which their behaviour is judged; and the different power bases that the people in the organisation have (Couprie *et al*, undated).

These are difficult to indicate in a rich picture, but need to be considered as part of the problem analysis. Once again, these were dealt with in the chapter on systems thinking.

At the end of this stage, there was a good understanding of the problem situation. A list had been made of all of the problems relevant to the situation with the identified problem owners. There was also an appreciation of the social, political and cultural aspects of the organisation influencing the problem situation.

4.5.5 The Root Definition of the System of Interest

The root definition is a way of describing what the system is, how it will work (not the means of implementation), and why it is required. A root definition is expressed as a transformation process that takes some entity as input, transforms it and produces a new form of the entity as an output. Before identifying the root definition, the SSM practitioner needs to identify problem themes from the analysis done in the real world. In the case under consideration, the following themes emerged from the rich picture and associated analysis of the problem situation:

- New requirements coming from the business analysts (mostly stemming from the business representatives)
- The lack of morale due to the immovable time constraints and the unsupportive culture in the organisation
- The project management process that are imposed on all projects and which largely disempower the project managers
- The change management process that slows activities down causing the project to slip its target dates.

In order to proceed, the problem theme that was deemed to be the one most likely to lead to an improvement in the situation was selected and a root definition drawn up. The other themes may be used in the process at a later stage should further improvements be required.

After a number of attempts, the root definition that the research team eventually agreed with was the following:

“A project-managed system that will allow change initiators to accurately and expeditiously submit change requests and which will be rapidly processed for a

decision. This is to be achieved by simplifying the existing process in a manner that is acceptable to and within the constraints imposed by the change management and company governance councils in order to allow the project timelines to be met and in a way that can be monitored and reported on.”

A CATWOE analysis needs to be performed on the root definition in order to evaluate the accuracy of its representation of the real system. The mnemonic CATWOE was used by Checkland to describe the human activity and situation. Table 4.1 provides this analysis:

Label	Description	Current situation
Clients	Customers - the victims or beneficiaries of the transformation	Designers, project manager,
Actors	The people who participate in the transformation	Change initiators (business analysts, business representatives, designers), project change control board
Transformations	The conversion of input to output	Unprocessed change request to a processed change request in an expedient and expeditious manner
Weltanschauung or world-view	The world view which makes the transformation meaningful in context	Handling change requests quicker will be of benefit to the organisation
Owners	The people who could stop the transformation from taking place	Quality management, project manager
Environment	Elements outside the system which it takes as given	Company governance council, auditors, senior management, contract with the vendor.

Table 4.1: CATWOE description and identification with respect to the root definition

4.5.6 The Conceptual Model

A conceptual model is a human activity model that is used to show each operational activity that is necessary to carry out the process that is described in the root definition. It needs to include some measure of performance. It should strictly conform to the root definition and use a minimum set of activities.

In order to evaluate the operational system there are three activities that need to be performed. These are to:

1. Define the measure of performance of the system by evaluating whether it will work (its efficacy), whether it will operate with minimum resources (efficiency), whether its goals are being met (its effectiveness), whether the change is ethically acceptable and represents elegant transformation (Checkland & Scholes, 1990);
2. Monitor the activities in the operational system based on the metrics identified in the first step;
3. Take remedial action should the monitoring of the metrics indicate the system is not operating as planned.

The conceptual model that was derived from the root definition provided above is given in fig. 4.2.

4.5.7 Comparison of the Conceptual Model with the Real World Situation

One purpose of the comparison stage is to generate debate about possible changes that might be made to the problem situation with the view towards defining desirable and feasible changes to the real world situation. Several approaches exist when comparing the real world with the models derived from the root definition.

The approach adopted on this project was to use the conceptual model as a basis for ordered questioning, as it was felt by the participants in the process that the relevant actors would feel included in the proposed process and would therefore want to make it work if the proposal was accepted. This approach has also been recommended when the real world situation is very different from the conceptual model, since the technique only requires questions to be asked about the existing system.

In comparing the current situation with the ideal situation, the comments were very positive from all parties consulted. This was especially the case when considering those features in the conceptual model that were seen to be a technical improvement over those in the real world situation and which were felt to be acceptable within the culture of the organisation. In particular, the proposed simplicity of the new template evoked very positive comment, especially the fact that the supporting documentation fell away and

only the relevant sections of those documents were to be incorporated in the single change request template. Another proposed change to the process that was positively received was the reduced number of approvals required. The people were also very enthusiastic about the proposal that change requests could be approved electronically (via the e-mail system).

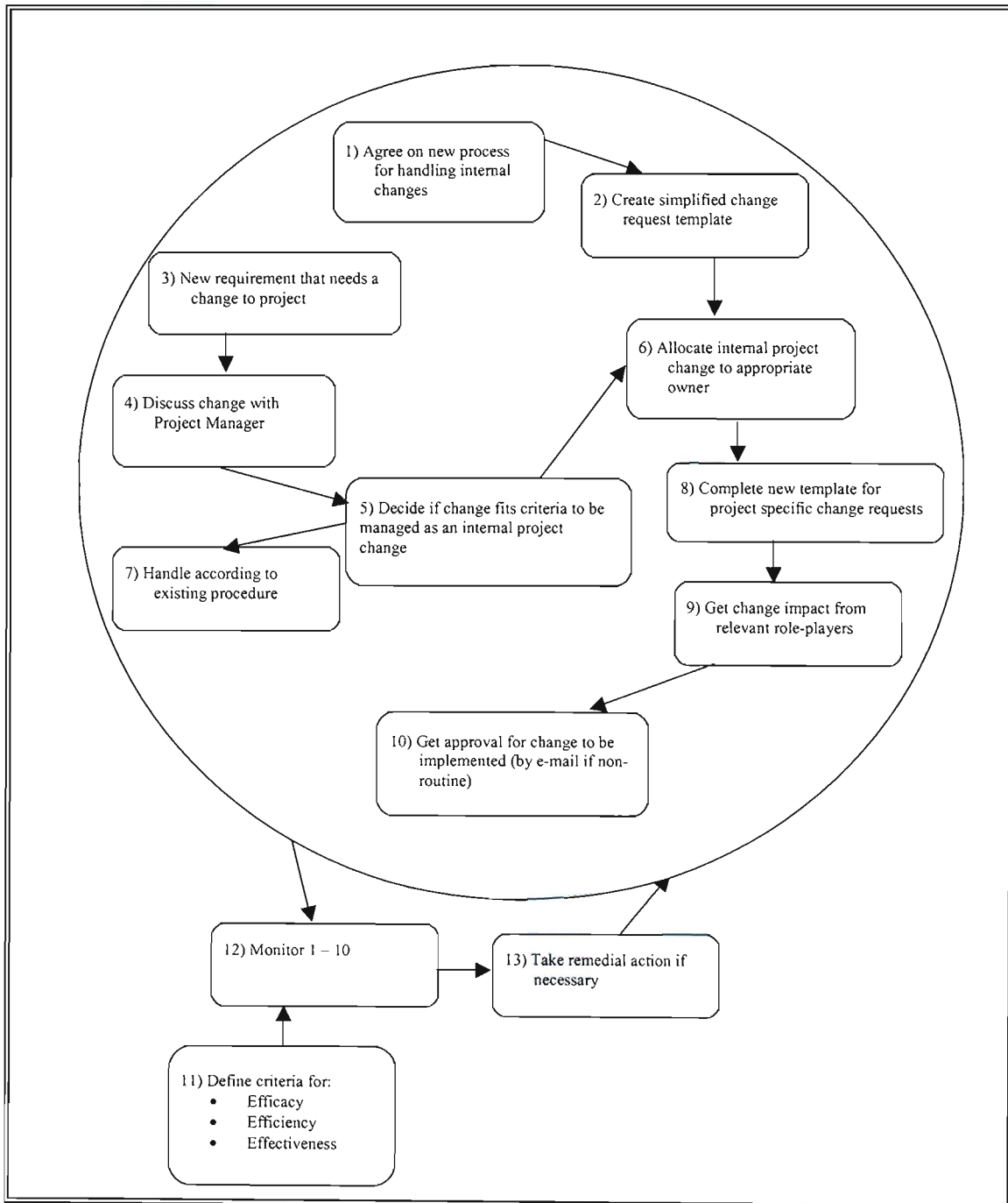


Fig. 4.2: Conceptual model

4.5.8 Definition of desirable and feasible changes

This stage defines those changes proposed in the conceptual model that are most feasible (fit the culture of the organisation) and desirable (a technical improvement). The changes identified in the previous stage are considered according to various criteria including the cost and benefits of the changes, as well as their feasibility from an organisation cultural perspective. Problems that might occur as a result of the changes need to be considered. As an outcome of this stage, the changes that will probably have a positive outcome, if implemented, are recommended.

For each proposed change, the following were considered:

- 1) The reason for change,
- 2) The nature of change,
- 3) The means to bring about change, and
- 4) The potential long-term effects of change.

Based on the above, much of the existing change management process as applied on the project was to be overhauled and a new one proposed. The major changes were:

- a. A new template would be drawn up which was very much simpler than the existing one and would incorporate the information that previously had to be supplied on supporting documents
- b. The change request would be managed by the project change control board only (i.e. it would not have to go to the other two change request boards)
- c. The number of signatories would be reduced and the authority to ensure that scope was not changed was delegated to the project control board
- d. Instead of having to obtain physical signatures, a system of electronic approval by e-mail was to be proposed
- e. For change requests that were urgent, it would not be necessary to wait for the regular weekly meetings of the project change control board or to call an ad-hoc meeting of the board – the administrator of the board would administer the entire process by means of e-mail and telephone calls, where necessary
- f. A single stage approval would be provided for (instead of having to go through the usual 2 stage process of first having to obtain approval to investigate and only after establishing the impact, obtain approval to implement the change)
- g. Each change would be allocated a logical owner who would drive the process.

The above list represented the ideal situation and needed to be presented to the authorities for comment and approval. It was appreciated that this would not be easily forthcoming and that numerous conditions, provisos and amendments to these proposals were anticipated.

4.5.9 Action to be taken to improve the problem situation

The conceptual model was used as a guideline for the actions to be followed. The change request template was amended in order to simplify it and incorporate the relevant information from the supporting documentation. The new template contained fewer than 2 pages. The action research team considered how the approach was to be made to the decision makers, as it was anticipated that some resistance would be encountered. Before embarking on this exercise, a discussion was held with some of the key senior managers within the OS and IT to get their feelings as to whether such a radical proposal would get their support, and if so, under what conditions. The outcome of these discussions was that the senior managers would support any suggestions that were made as long as the quality assurance manager agreed to the proposals.

A meeting was thus arranged with the quality assurance (QA) management team where background to the problem faced by the project was explained and a presentation made based on the proposals outlined above. It was also explained that if the project was to have any hope of meeting its schedule, a decision had to be made very quickly. Fortunately the quality assurance representatives who also worked on other projects had been reporting similar frustrations by those project teams, so there was a realisation that something fairly radical (for the organisation) had to be done. One serious concern that was raised by the QA manager was that the project team (or some members of the team, specifically those representing the interests of the Business Operations business unit) might try to introduce scope changes that could seriously impact the target date of the project. Also there were certain changes that could impact on other projects in the programme, and if not considered by the other change control boards, could have severe consequences to the organisation. This was countered by giving the assurance that if any member of the project change control board were in any doubt, the change would follow the existing process. This was further supported by the IT representative on the project change control board who stated that the IT resources were under extreme pressure to

deliver against almost impossible time scales, so they would be very vigilant against such scope changes being allowed through.

The proposal was thus amended to differentiate change requests into two categories. The first were those that would cater for what was termed “project specific” change requests that would have no impact outside of the project (and were usually of a technical nature). The others were those change requests that were felt would need to continue following the existing process. These latter change requests included those where:

- The scope of the project was to be changed;
- The project timeline or budget were being changed; or
- The vendor supplied software and/or the contract with the vendor would be impacted.

In all of these cases, there were impacts outside of the boundary of the project. Thus an additional step would be included whereby the change initiator would motivate the change to the project change request board even before starting the process of completing the template. At that stage the decision would be made as to whether the change request would be treated as per the existing process, or according to the new process as a “project-specific” change request. Appendix B indicates the process flow for the new process for project-specific change requests. It can be seen that this is much simpler and less time consuming than the process described in appendix A that is required for non-project specific change requests.

A further request from the QA manager was that, once the change had been approved for implementation by the project change control board, the change request form be submitted to the Change Management administration section for filing in their document repository.

After some further discussion and clarification, it was agreed that this project would be allowed to proceed with this proposal. The application of the new process would be monitored very closely and should it be found at any time not to be working correctly, it would be stopped and the existing process re-imposed. The chairman of the project change control board would report initially on a weekly basis and after six weeks on a monthly basis as to the effectiveness of the process. It was further stated that if this were

found to be beneficial to the project without putting the programme or organisation at risk, it would be implemented on the other projects.

Since the change was being made in a system that is also highly politicised, it needed to be stressed to the team that the outcomes might not be predictable. There was a good chance that the final outcome would not be what was planned. However, it was also to be appreciated that SSM never really finishes and that further iterations of the process would continue to take place as the system changed and as the consequences of these changes were evaluated. Besides enhancing the new process as anomalies became evident, the other themes derived from the rich picture could also form the basis of later interventions to further improve the situation.

4.5.10 Implementation of New Process

The new process for “project-specific” changes was documented and communicated to the entire project team. The communication included the invitation for anyone who experienced difficulties with the new process or found that it was not working satisfactorily to immediately bring this to the attention of project change control forum where it would be analysed with respect to the problem and amended accordingly.

Indicators were identified in order to establish the effectiveness of the new process. The most important of these were the number of times that the change request template was referred back to the initiator due to it not being completed correctly and, more importantly, the time it took to process the change request from initiation to obtaining approval to implement using the “project-specific” change request process.

4.5.11 Observations and Analysis of the Intervention

Due to the relative simplicity of the new process (as indicated in appendix B) and the new template, it was found that there were no submissions that were rejected due to incorrectly completed forms or important information that was inadvertently omitted. It was also found that the average time to get approval to implement had dropped from 5 weeks using the normal process to less than 1 day with the new process. This was mainly as a result of two factors: using the single stage approval process and allowing approvals to be done electronically via e-mail.

As a result of this intervention, it was found that the team were more willing to follow the process and did not view the process as being a significant burden on their workload. In most cases, the change requests had to be authorised by the same group of people as before and they were made aware of the fact that the success of the new process was dependent on their cooperation and quick analysis of the change requests that they received and their turn-around time.

Users of the new process were made aware from the outset that this was a trial and that, if the process was abused, it would be stopped. They were also encouraged to provide inputs on improvements or areas that were not working well.

4.5.12 Reflections on the Outcome with the View to Identifying Further Improvements

The process was allowed to run for a period of three weeks before a formal assessment was made. In the interim the action researchers monitored the process to see that it flowed smoothly. At the review meeting that was held with all the action researchers, it was found that the process was working exactly as anticipated. The administrative formalities of most project change requests took less than a day to process. In some case this period was two hours. Most of the time was now spent in obtaining the impact analyses from the impacted parties, but as this was technical and these resources were often very busy on other priority activities on the project, there was little that could be done to expedite this activity. Since the process was now driven by e-mail, it was found that less meetings were necessary. Where two or more parties were dependent on the others to finalise impacts, it was found that in almost half the cases the technical issues were resolved by e-mail or telephone as opposed to previously where meetings had to be arranged with commensurate delays in getting all the role players together.

Feedback received from the designers was very positive. Some suggestions for improvement included:

- Making the change requests more visible to all project team members
- A request that the project manager be briefed prior to an initiator distributing the change request form to anyone else (in order to avoid raising expectations of the business representatives on changes that were clearly out of scope for the project and which would not be permitted to proceed),

- The inclusion of some additional information on the template (such as when the change needed to be ready for implementation); and
- Sending a short message service (SMS) from a cell phone to alert relevant people that there was an urgent e-mail waiting for them for approval. Alternatively having the change control administrator phone those people whose response to the e-mails were outstanding for more than a predefined period.

These suggestions will be considered in the near future.

Although the project was still behind schedule after a period of 6 weeks from time the new change management process was implemented, it was found that significant progress was made in catching up lost time.

After the agreed period of six weeks a formal presentation was made to the quality assurance section. In the light of the findings it was agreed that the process be continued for the duration of the project. The QA representatives were also encouraged to discuss this new process with other project managers with the view to applying it on their projects.

Over a period of time, some minor enhancements were made to the process and the template in order to cater for some unusual situations that had not been previously considered. It was found that more than 90% of all change requests followed the “project-specific” change control process.

4.6 Conclusions

This chapter described two iterations of action research. In the first iteration, participatory action research was used in conjunction with the information that was available from the use of systems thinking as described in chapter 3. This was in order to understand the underlying cause of the problem facing the project and the action that was subsequently put in place. The second iteration was necessary since the change management process that was prescribed by the organisation added a significant administrative burden to the project team. SSM was used as a means to suggest a change to the existing change management process within the context of the culture of the organisation, something that would normally take many months to achieve. A new process was devised and adopted for changes that project-specific.

The objective of using action research was to show how it could be used effectively to understand a problematic situation and propose changes that would bring about improvements. The intervention into the project by means of action research was found to be extremely effective. By applying a systems thinking approach in order to analyse the problem situation and then using action research methodologies to understand the underlying issues and identify the appropriate interventions by including a representative group of role-players, the changes could be effected with great success. A potential barrier relating to the organisation's culture could have stopped this initiative had it not been for the fact that the issues were properly analysed by so many key participants and the relevant stakeholders consulted prior to presenting a possible solution.

The people acting as action researchers and the QA department had treated the entire exercise as a learning experience. Everyone involved had a good appreciation of the situation and all felt that something needed to be done for the sake of the entire programme. By monitoring the process of problem analysis and the approach taken to introducing a change within the very conservative culture of an organisation was a learning experience for all those involved, even at a distance.

The next chapter (the final chapter in this document) will summarise the findings with respect to the use of systems thinking and action research in the context of a project environment and in a conservative organisational culture. In particular, the advantage of using the two methodologies together will be discussed. There will also be a summary of how the findings relate to some of the theories that have been previously considered. The importance of the findings and how these contribute to a learning organisation will be discussed. Some recommendations will be made for anyone in a comparable situation wishing to adopt a similar technique for approaching problem situations. Finally, the learnings that were experienced by the organisation and the participants as well as the learnings that the author gained will be mentioned.

CHAPTER 5.

OBSERVATIONS AND STUDY CONCLUSION

5.1 Introduction

In chapter 3, the problem situation was analysed using systems thinking techniques, while in chapter 4 two action research methodologies were used to gain further insights into the problem and implement some changes. In this chapter, the findings of this study will be summarised based on the theory outlined in chapter 2 and the work done in chapters 3 and 4. The use of systems thinking and action research and, in particular, the systemic reflection that resulted from these were found to be advantageous at various levels. These translated into three levels of learnings. These are the learnings that took place by the organisation and the participants in the study, as well as the authors own learnings gained as a result of this study and the MCom course of which this study is part. Some theory will be provided that will put the findings of this study into perspective.

5.2 Using Systems Thinking in a Project Environment

This study has helped the author to put systems thinking into perspective with respect to the field of project management. As a project manager who has spent many years solving problems by taking things apart and dealing with the pieces, taking an integrative or holistic perspective has been a difficult paradigm shift for him to make. Having taken a real problem situation that involved human interaction and used a soft systems thinking approach to introduce improvements, the author now firmly believes that systems thinking can have significant benefits for project management. However, it is important that the project manager is trained to look for the patterns in behaviour so that appropriate changes to the structure of the system may be made. The understanding of the importance of double loop learning and causal relationships is critical if sustained changes in system behaviour are to be achieved.

The problems that one faces on large complex projects where the boundaries are changing frequently and continuously, requires not a reductionist view, but a systemic perspective to see how everything fits together and how changes in one part of the system affects others. When applied to projects that have a large IT component, the traditional project

management methods and procedures still play an important role, but the author now understands the importance of getting the involvement of a wide variety of stakeholders at the early stage of the project. The application of systems tools to assist in hard and soft issues can be a very valuable weapon in the armoury of the project manager. However, it is felt that one must get more experience with the methodologies and tools, as there is such a vast array of them. Knowing which to use in order to obtain the most benefits is still quite confusing and the author feels that it would be very beneficial to work with an experienced practitioner in order to see these applied to different real life situations. This study certainly provided the means of getting more experience with the choice of tools in one such real life problem situation.

A further reflection that the author has is how one would actually apply these tools in an organisation that is not familiar with systems thinking. In many large conservative organisations, executive management still have an authoritarian and autocratic approach to introducing changes to the way things are to be done. They seem to lack the understanding of how this disempowers the majority of people within organisation and how by treating people as an unthinking component within the system, they are in fact causing the organisation to under perform. The culture of mistrust is perpetuated. Systems thinking provides the project manager with an awareness of this and gives some ideas on how to deal with it. Although the author concedes that this is still very early days in his career as a systems thinking practitioner, he agrees with Cooper (1998) who states that a criticism of systems thinking is that “many of the tools and approaches are so esoteric that most people can not begin to apply them in job situations”. It is clear that one would derive much more benefits from this approach if others involved were also schooled in systems thinking so that they can better understand the process as it unfolds.

Although systems thinking advocates that one approaches the system as a whole, translating this into an effective methodology is very challenging, especially for someone who is used to following fairly standard methods and procedures. One of the downfalls that the author believes exists with the application of systems thinking is the amount of time it takes to get to the required outcome. Bearing in mind that projects have a time constraint (by definition) and that in almost all projects there is hardly sufficient time to just deliver the product, spending time bringing more stakeholders (many of whom may have different or opposing viewpoints) on board will be seen by management as inviting

trouble and delays. The core of the systemic approach is that one needs to gain insight into the perspectives of others. It forces one to look much wider and deeper than the boundary of the project. Applying this in most organisations that use scientific management and reductionist principles for projects and problem solving is not an insignificant hurdle that will need to be overcome. However, one should weigh up the cost of not using systems thinking where, although the product may be delivered on time, the actual success of the project will be questionable. This can be attested to by the many failed or partially failed projects worldwide. In such cases the product may be delivered on time, in budget and according to specification; however if the users were not properly consulted at the outset regarding their needs, or if they weren't briefed about it prior to its implementation, they are just as likely to reject the new system.

Stacey (2002) is of the opinion that we have become conquered by systems thinking by thinking of ourselves and our interactions with each other as if we are systems.

Although the above has dealt with project management in particular, the author feels that as much if not more benefit can be obtained by applying a systems thinking approach to large complex programmes. Here, many projects integrate together over a period of time and the consequences (expected or otherwise) need to be considered very carefully throughout the entire life cycle of the programme. Effective programme management requires a big picture view, a long-term orientation, and the ability to make trade-offs and to deal with complexity and ambiguity. These are conceptual and strategic tasks. Also, typically in a programme, the stakeholders come from diverse backgrounds and have even more widely held expectations and perspectives. As suggested by Ayers (undated), only by drawing all these people together using a systems approach will the programme have a hope of being successful.

An advantage of applying systems thinking to the study prior to embarking on action research is that it allowed for a thorough study to be done on the politics and culture within the organisation. Although SSM also requires that this view of the system be considered (see discussion elsewhere in this chapter), looking at the problem situation from a systemic view point and within the different boundaries brought these issues out earlier in the process and ensured that it was always a consideration in all aspects of the later action research. Furthermore, when the final stages of the research were reached in

the two cycles and action was about to be taken, the understanding of what to look out for and especially the importance of ensuring that any change was culturally acceptable remained prominent in the minds of the people making the changes.

Continuous learning is an essential part of any project as it increases the ability of the team to perform better. It demands a high standard of attention, inquiring action and truth seeking. For this reason every project should be considered a learning organization.

5.3 Moving Towards a Learning Organisation

People, like all life forms, learn and create knowledge for their survival (Wheatley, 2001). In organisations such as the one discussed in this study, this autonomy creates problems for management who expect people to carry out instructions without making any changes to these instructions (for example, improvements to optimise a result). Managers are not able to view changes that people make as creativity and are prone to label this as disobedience or resistance instead of seeing it as new knowledge. They are unable to appreciate where someone has looked at the instruction, found an improved way of performing the task in the given context, thereby creating a new way of achieving the end result in a way that stands a better chance of success. Unfortunately, workers frequently do not report this improvement to their management for fear of being disciplined or in the belief that their management do not care. In an organisation in which true leadership occurs, such behaviour will be encourage, even if it does lead to the occasional mistakes where learning can take place. Snowden, in his keynote address to the Knowledge Management in Europe conference claims: “best practice is useless. We only learn from worse practice”. Thus, until people are allowed to accumulate this experience, the amount of learning in the organisation will be very limited (Zijlstra, 2003).

Instead of applying double-loop learnings with the view to changing their mental models of the project management process, the custodians of the project management processes are stuck in the trap of being reactive to events that occur on the projects and imposing new processes in an attempt to ensure these do not re-occur on other projects. There is no attempt to look beyond these events for the patterns so that the structure of the system may be changed in order to produce improved outcomes and behaviour.

Snowden maintains that when moving into a new domain, it is preferable to be equipped with some stories of failure from which one has learnt, than to have a formula of best practices where the circumstances of success are very rarely repeated, while those of failures recur with ever increasing frequency. The author is firmly of the opinion that by writing down one's experiences (good and bad) at the end of a project and placing it on a repository for others to read is a very poor substitute to allowing those involved to tell their stories to new project teams. By doing this, it would help to change the culture of the organisation. However, the climate and culture within the organisation is often not conducive to converting knowledge into action due to the 'games' that are played, thereby inhibiting the ability to learn from experience, as explained by Argyris (1991). This is one of the barriers that inhibit learning organisations.

“SSM is a methodology that aims to bring about improvement of social concern by activating in the people involved in the situation a learning cycle which is really never-ending. The learning takes place through the iterative process of using systems concepts to reflect upon and debate perceptions of the real world, and again reflecting on the happenings using systems concept” (Checkland and Scholes, 1990).

Almost all sources that were used for reference on the soft systems methodology stated that a key output of this was the learning that was as important as the actual intervention itself. At first the author found this hard to comprehend, as he saw the key outcomes of SSM (which is an action research methodology) being the research into the problem situation and the subsequent intervention to improve the situation. Besides some learning about the problem situation by the researcher, the author did not realise how other role-players learnt from the exercise. This changed at the point at which the conceptual model was presented to the stakeholders for debate. It was at this time that it became clear to the author that the participants were exposing their mental models of how they saw the current system operating and identify their expectations of this system. As the debate progressed it became clear that this exercise was extremely valuable in allowing the participants to understand where each person's needs lay and what they wanted from any new system. At the end of the debate, it was apparent that consensus could be reached on the new system, even though there were some areas where participants agreed to disagree. Learning by all participants thus took place as a result of the debates that occurred when they compared models at which time their differing viewpoints surfaced. This allowed

these viewpoints to be appreciated more fully by others in order to reach some kind of consensus or accommodation that would be the basis for the required process change.

In this study, the use of SSM changed the problem situation and the author believes it also changed the opinions of what the problem owners were really trying to achieve.

Ostensibly the intention was to bring the project on track by finalising the requirements and doing the design in parallel. Lack of trust of the designers in management due to previous experiences and fear of being blamed for slippages in the project schedule meant that designers insisted on following the formal change management process. On the other hand, the perceived lack of trust by the organisation's senior management in the project management team forced an onerous level of bureaucracy which would cause a vicious cycle and cause the project to slip its scheduled delivery dates even further. Cooke-Davies (2003) states that project management too easily descends into a value destroying bureaucracy. Thus, instead of each grouping trying to find ways to apportion blame to others for the current predicament and spending time and energy looking for ways not to be blamed themselves, the action research interventions showed that there was another way to sidestep the prevailing politics and culture.

Thus the process could be considered more important than the outcome. It was stressed a number of times during the action research activities that a clear, absolute goal is never reached with SSM (Underwood, 1997). Checkland (1999) says that the end to the learning cycle is brought about when there is agreement amongst the involved people that a certain course of action is desirable in terms of the analysis and feasible in the light of their history, relationships, culture and aspirations. This was the status at the end of this study, although it is anticipated that should the change management process be implemented on other projects within the organisation, some further enhancements may be made to the new process in order to accommodate project-specific requirements.

5.4 Using Action Research for Learning and Implementing Improvements

Action research, and SSM in particular, encourages an understanding of complex and highly interconnected systems. Unstructured problems are viewed as conditions to be alleviated rather than problems to be solved. SSM is therefore useful in solving unstructured and poorly delineated systems where goals are debatable or not properly

defined (Shroff, 2000). In this study, SSM provided a structured approach that assisted in clarifying objectives in a complex and dynamic situation that involved human activity. It encouraged commitment and provided a forum for bringing diverse interests together.

Some of the proponents of SSM seem to underestimate the application of action research and SSM within a highly politicised and dynamically complex environment such as the organisation discussed in this study. In the view of MacIsaac (1996), all participants are empowered and all participants are involved in the analysis of the data and the selection of the interventions. The author feels that it is naïve to think that everyone will openly discuss problems, perceptions and needs, especially when working in a highly politicised and hierarchical culture such as the one described here. However, if facilitated correctly, open, willing and supported discussions are more likely to open up the organisational culture and encourage learning and joint problem solving. This is a necessity when applying action research, as the final outcome is unlikely to match the agreed changes exactly, thereby necessitating new compromises along the way.

One continuously needs to be reminded of the root cause of the problem that was faced by the project. It becomes too easy to look for a solution, implement it and continue. However this approach only addresses the symptom and the same problem can be expected to appear on other projects. The author believes that the culture of the organisation needs to be addressed so that everything is not driven by the anticipated outcome of the performance evaluations of executives and senior managers. Senior management provide project target dates after limited (if any) consultation with project team members and these dates become the indicators against which they are measured and their performance bonuses are calculated. These timelines are inevitably unrealistic and trying to change them once more information becomes available requires extremely good motivations and usually having to blame some one or some group. This culture of blame relates to the feelings of distrust that exists throughout the organisation. Similarly, the pressure placed on the team to meet these unrealistic timelines inevitably requires short cuts be taken which, in turn, frequently results in incorrect assumptions being made or mistakes occurring, both of which cause further delays and costs to the project. More blame gets apportioned and the political climate on the project becomes very tense. In order to address this culture of mistrust and blame goes beyond the scope of this dissertation. However, the fact that this surfaced during discussions around the contextual

model was, to the participants and the author, a very valuable learning experience that helped all concerned understand the environment in which they were working.

Lewin and Regine (2000) make the distinction between people who make caring and participative choices that contribute to the health of the organisation, and those who make selfish choices that make the organisation an unhealthy place to work. They make the point that human creativity is unleashed when leaders set a few simple rules and leave the rest to self-organisation. Such leaders need to learn to let go of the illusion of control, which the authors acknowledge is a painful process.

The implicit and explicit values of SSM for openness and togetherness are not easy to apply in power-centred, confused, conflict and contradiction oriented organisations. In fact, many authors (Mingers, Jackson both cited in Lockett, Ngubane & Memela, 2001) argue that Checkland's SSM ignores issues of power. However, the author does not agree with this, as Checkland (1999) frequently mentions that culture and power need to be considered throughout the SSM process. The "two streams" methodology in particular highlights this. Checkland (cited by Couprie *et al*, undated) suggests that 'root constraints' may need to be applied to suggested changes in order to account for power influences that may exist in the system.

Wadsworth (1998) also states that the researcher is constrained to appear impartial or at least vaguely on everyone's side. A criticism of SSM mentioned in chapter 2 refers to the fact that the methodology is open to manipulation by the consultant in order to achieve a hidden agenda. MacIsaac (1996) suggests that the researcher has neither hidden agendas nor a wish to control the outcome of an SSM intervention. It may also be argued that if the hidden agenda is to the ultimate benefit of the organisation and system under consideration, then it is a means to an end that should be welcomed as long as there is no malicious intent.

The SSM model that is referred to in this study is the 'seven-stage model' that Checkland originally proposed (Checkland, 1981). However, in later writings, Checkland (1999) comments that it has a "mechanistic flavour" and is used more for teaching purposes while a less structured and broader methodology has become more favoured by

practitioners. The more flexible model favoured by practitioners today is the four-activities model which comprises the following:

- i) Finding out about the problem including culturally and politically;
- ii) Formulating some relevant activity;
- iii) Debating the situation using models and seeking debate involving changes to improve the situation in a way that is (culturally) feasible and (systemically) desirable and also accommodates the conflicting interests so that action to improve the situation may be taken; and
- iv) Taking action in order to bring about an improvement in the situation.

The above 4 activities may be mapped back to the Kolb learning cycle and coincide with the Diverging / Assimilating / Converging / Accommodating phases as indicated in fig.

2.1. In this study, the author chose to use the original seven-stage model as a guideline. The main reason for this was that he found it very logical and systematic, which, given his background, gave him some feeling of comfort. There were also numerous examples of this in the references that were used. Had he started with the four-activities model, the author feels sure that, as a novice SSM practitioner, he would have ended up expanding these steps back to the original seven steps in order to ensure that it was done systematically.

5.5 Complexity, Chaos and Knowledge Management

At present the organisation is a monopoly, being the only company offering the particular services to the public. However, it is in a state of transition due to a new future (i.e. competition) that will be arriving within the next year or two. The organisation can be considered to be part of the new economy, where knowledge is a significant although intangible asset of the company. The tacit knowledge (i.e. that which is in the minds of the people) cannot easily or effectively be codified into explicit knowledge. According to Stacey (2002) such an organisation needs to focus on selecting, developing and re-training those people who have this knowledge.

At a recent project meeting, the following was stated by a trained psychologist assigned to the project to facilitate good team functioning: “We are working in irrational times. We design for business units that don’t exist when we are ready to implement. We design for

Business that is changing so fast that, when it is time to implement the new system, it doesn't resemble the structure that we designed for and for which the system was scoped. Thus when we deliver, the Business is unable to use the system. However, we are still obliged to produce the required deliverables as per the project schedule as originally agreed." This is a good reflection of the situation on the project at the present time. It is thus clear that the organisation is undergoing some very chaotic times and should have the right leadership to help the people survive in such a complex dynamic environment.

It should be evident to anyone who understands the concept of learning organisations and knowledge management that the way bureaucracy has become a driving force in the organisation has led to many people becoming deskilled and trained incapacity is apparent when it comes to dealing with even the most basic project management activities. Wheatley (2001) says that the outdated belief that organisations are like machines where tasks, roles and functions are engineered to achieve predetermined performance levels is a factor that prevents effective knowledge management.

It must however be acknowledged that there is a role for bureaucracy in organisations today. Sycamnias (undated) points out that the success of bureaucracy lies in its ability to succeed at obtaining objectives by maintaining control in large organisations. The structural features of a bureaucracy are the ones that are selectively retained, because they achieve reinforcing consequences, while non-bureaucratic features are eliminated. However, he cites Merton as arguing that there is an inclination for the rules to become more important than the ends they were designed to serve, resulting in goal displacement and loss of organisational effectiveness as has been experienced in the organisation under discussion. Maccoby (2000) argues that bureaucracies tend to be over-managed and under-led which results in bored and unmotivated staff. The author believes that a balance needs to be found for amount of bureaucracy that an organisation imposes.

One of the causes of the problem situation covered in this study relates to the application of a process that was clearly inappropriate to the situation. The Strategic Governance Council has attempted to establish a standard set of processes to be applied on all projects undertaken by the organisation. The council seems to ignore the fact that each project will have its own dynamic which needs to be handled within the given context of the environmental forces and project situation that exist at a given time. A standard set of

rules cannot be used to resolve the complex and varied problems that occur on different projects. The project manager and team need to be given adequate responsibility and authority to look for specific solutions to their own particular problems. Senior management should sufficiently trust the project managers to escalate issues for assistance and support before they become unmanageable. Sharing these specific solutions (where successful or not) with other project managers would be a step towards the creation of a learning culture in the organisation. Merton (cited by Sycamnias, undated) argues that a reason for bureaucracy not working in some situations is due to the undesirable effect of having formalised rules and procedures applied in inappropriate situations; that is, responding to a unique situation as if it were routine, resulting in dysfunctional consequences. This is closely related to the problems of goal displacement mentioned above.

Urquhart (2002) defines a trusting workplace as one that has the following qualities:

- Open communications;
- Empowered employees;
- Rules that are to be treated as guidelines, not a solution; and
- Making everyone in the organisation accountable.

Urquhart argues that, in order to build a trusting workplace, three elements are required.

These are:

- i) Dialogue;
- ii) Acknowledging the undiscussable; and
- iii) Encouragement of criticism.

Dahlke (2004) argues that a climate of trust is the most important attribute of a successful and smoothly functioning organisation. He uses a three-pronged strategy to build a climate of trust in organisations. These are indicated in fig. 5.1 below.

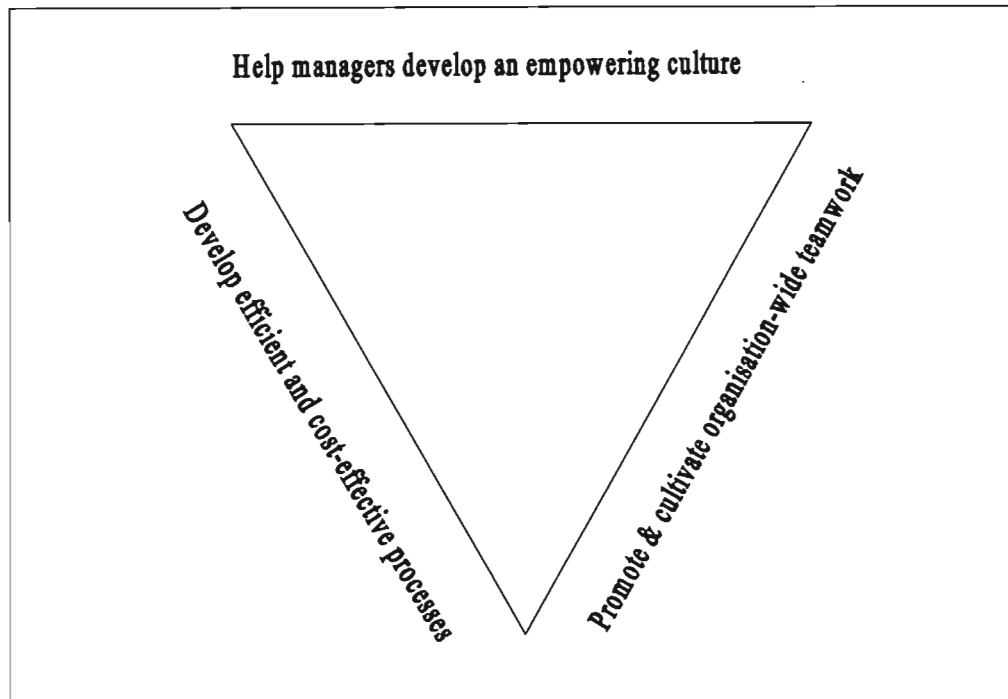


Fig. 5.1: Building a climate of trust within an organisation

Until now, management has focused almost exclusively on creating order. However, in the complex and rapidly changing environments that now exist, it is necessary to open up the unordered complex space in order to allow innovation to occur. According to Wheatley (2001) it is in chaotic times experienced by organisations that knowledge is born. In order to be open to this, organisations need to have a tolerance for messy non-linear processes and be prepared to devote some time to knowledge creation activities. Creativity only becomes available when people are confused, overwhelmed and frustrated by not knowing. At such a point, according to Wheatley, a perfect insight miraculously appears. New solutions are born in messy processes that take time, and not by applying a series of incremental planned steps.

Most change in complex systems is emergent. Complexity theory suggests that a) emergence is likely to occur spontaneously when there is sufficient connectivity between the components (or agents); and b) it may take the same effort to create large emergence as a small one.

The need for organisational change as a result of increased complexity within the workplace, the increase in global competition, advancing technology and the continuous

need to improve performance has necessitated a new way of thinking about the way things are considered, viewed and get done in the organisation (Cooper, 1998). Deming and Juran (cited by Seddon, 2002) have demonstrated that people's behaviour is governed by the system in which they work, which goes against traditional management thinking. Change is related to the patterns of behaviour of the people in the organisation: i.e. no change will occur if the people's behaviour remains the same. To change the performance requires a change to the system. The authors claim that the lack of a systemic approach to change is the single most common cause of failure of change programmes within organisations. Systems thinking as a new paradigm is thus crucial for all employees.

5.6 Understanding the Impact of Culture using Systems Thinking

In dealing with complex and messy problems in an organisation, the author agrees with Cooper (1998) who feels that the need for systems thinking is essential and the tools and methodologies are now available to place this knowledge within the reach of all employees within an organisation. New mental models and a shared vision to take organizations into the future will come with the use of systems thinking.

In looking back at the power structures in this study, it was clear that the area of primary influence was the quality assurance section that did not have formal power, but were able to influence the management to accept the proposal for a new change management process. When deciding to implement a change to the way an organisation operates and which impacts on the shared beliefs of the people in the organisation, it is important to take cognisance of the existing culture and power structure. By analysing the organisational culture, it is possible to determine whether options for change would fall within the bounds of the existing culture or would necessitate major cultural change. Stacey (1993) says that in order to effect any major change to the organisation's culture would require specific plans to be formulated to facilitate this change. Furthermore, it would be necessary to analyse the power structures within the organisation in order to determine whether plans for such a change will be acceptable. To do this, a systems practitioner would have to analyse the source, form and location of power by identifying the dominant coalitions within the organisation. This is not always easy, according to Stacey, due to the fact that the power structure may not be as dictated by the formal hierarchy, but may instead lie in specific areas of influence that may have less authority.

Snowden (cited by Pollard, 2004) argues that management is never in charge of the culture of an organisation, but that the employees behave as they do partly because that is what they have learned is the most effective way to do their particular job, and partly because it is in their own self-interest, and not because it is in the procedure manual.

To change the culture of an organisation, one must change the paradigm at the heart of the culture (Seel, 2004). A paradigm in the context of organisational culture is like a self-fulfilling prophecy. It emerges from the multiplicity of interactions between the individuals in the organisation according to Seel, and he cites Capra in defining a paradigm as “a constellation of concepts, values, perceptions and practices shared by a community, which forms a particular vision of reality that is the basis of the way a community organises itself.” A paradigm in human and social sciences helps one to understand phenomena and encompasses both theory and methods. Thus, to change the culture of this organisation would be require very strong leadership that would need to alter the current bureaucratic management paradigm and instil the elements of trust and cooperation in a top down approach through the entire organisation. Maccoby (2003b) says leaders need to have a high level of strategic intelligence in order to create learning cultures where people are not afraid to make mistakes.

The main feature of double loop learning is that it brings about organisational change that will very likely alter power relations between people (Stacey, 1993). However, this threatens the vested interests that exist and hence people who may lose power will inevitably try to block the change, thereby blocking the double loop learning process itself. If necessary, leaders should provoke conflict through ambiguity, intentionally escalate small change and rather amplify the effects of chance events, instead of dampening these down. Such an approach is indicated where an organisation is operating in a very stable environment. However, the author believes that in times that are already stressful within an organisation, this is not a wise approach, as from experience, the operational staff need some shelter from the turbulence that exists around them in order to achieve their goals. Too much instability and change can have a serious demotivating effect and can be detrimental in allowing the organisation to reach certain predefined goals.

5.7 Organisational benefits resulting from this study

The extent to which the organisation benefited from this study and the resultant intervention can be discussed at two levels. From the point of view of the actual process change that took place, the project and organisation gained significantly from the faster turn around times to have change requests approved. This not only resulted in much of the lost time being caught up in the design phase over the succeeding months, but also improved the morale of the team by contributing to reduced stress levels. This began a positive virtuous feedback cycle where people's productivity improved, project goals were again seen to be attainable, people were prepared to work harder, further ideas for process improvements were tabled for consideration, etc.

At the level of organisational learning, the benefits are less tangible. The culture of the organisation has not changed. However there is an acknowledgement that the structures that are in place (for example, the seemingly inflexible project management processes) are not cast in concrete and by following a process similar to the one described in this study, improvements may be suggested and implemented without the fear of being regarded as a rebel by senior management. Over time it is hoped that the results of this study will be assimilated by a wider audience within the organisational structure so that learnings (and associated knowledge) from the participants may be shared. Should others decide to do similar exercises, it is feasible that a community of practice may be established amongst interested staff and thereby inculcate a spirit of cooperation and collaborative learning within the organisation for those interested in applying systems thinking and/or action research to complex human activity problems. Unfortunately, given the existing culture and politics within the organisation, it is uncertain whether this will actually happen unless someone in a relatively powerful position sees and understands the benefits of what occurred with this study and takes positive and active steps to use it for future benefit.

The people involved in the action research aspects of this study experienced learnings that will hopefully be able to be applied in the future should they get involved in situations where interventions are required to make changes to the organisational structures. A key learning that the author believes occurred was that both the participative action research activity and the SSM activity were embarked upon as an open-ended exercise without any specific goal in mind. This is quite unusual in a project environment where firm

objectives are set at the outset and progress measured along the way. Working towards a largely undefined objective was thus something new to the entire team and made everyone quite uncomfortable at the beginning. However, as time progressed and the participants got to understand the process that was being followed, they were more prepared to give it time and were eventually very keen to see how the outcome would unfold. In this case, there was some trust placed in the researcher and a belief that an improvement would be made to the problem situation that was being experienced. The author believes that the team learnt to work together in order to reach consensus in a positive manner, which contrasted with the way they had worked up to the point that the exercise began – which could be described as mistrust and blaming.

The paradigm of systems thinking and especially ensuring sufficient time was spent on the associated concept of gaining an understanding of the others' perspectives resulted in a number of people acquiring insights that would otherwise not have been achieved and agreements on actions steps being reached which would not have been possible using traditional methods. An appreciation of the process grew amongst the stakeholders that allowed them to deal with the group dynamics and changes that were taking place around them. The exercise gave the participants the opportunity and environment to share their learnings with each other in an environment that is not normally conducive to this. In retrospect, the author feels that by giving more information on systems thinking to the participants involved in this process before the start of this exercise, it may have gone smoother at the beginning and results may have been achieved in a shorter timeframe. This supports the contention made by Cooper (1998) that all employees in a company should be equipped with the skills necessary for systems thinking.

5.8 Problem situation revisited

The problem situation that was dealt with in this study relates to the manner in which the change management process implemented within the organisation presented a bottleneck to the progress of the project. The affect of this process was that there were serious delays in the completion of critical activities leading to stress and frustration of the project team. If nothing were done to alleviate the situation, the project would not have been delivered on time, which would have had severe ramifications for the company. Identifying the change management process as being the constraint and looking for acceptable ways of

dealing with it alleviated the situation. Appropriate interventions were made in order to expedite the change management process while still conforming to the requirements of the change Governance Board. This resulted in visible improvements to the work progress as well as the softer issues such as staff morale.

5.9 Recommendations

Two types of recommendations are discussed here. Firstly recommendation based on the actual change control process that was implemented as a result of the SSM exercise. Secondly, there will be recommendations for anyone wishing to embark upon a similar exercise of applying systems thinking together with action research in a large conservative organisation.

Based on the implementation of the new change management process, the following are recommendations that should be considered within the project system discussed in this dissertation:

- All change requests handled using the internal change management process would be communicated to all sub-project managers on the team once it was approved for implementation;
- The new change request template should be enhanced to include certain information that some team members felt was important (such as the required delivery date for the change);
- The secretary of the project change control board should send an SMS (short message service) from her cell phone if no response is received from a person required to approve a change request should such approval not be received within a certain time;
- The new process should be disseminated to all other projects within the OS and IT for use on change requests that comply with the criteria of a project- specific change.

In the light of the success of this exercise to improve a problematic situation within an environment that is normally intolerant towards change, the following recommendations are made for others who may wish to emulate the methods described here.

- It is important that all participants are given a solid background to systems thinking. Some of the outcomes of systems thinking need to be emphasised, such as sharing of perspectives; use of tools to obtain further clarity; the causal relationships within the system structure; and the learnings that will be obtained.
- There is a benefit to using systems thinking techniques as a precursor to the use of an action research methodology in order to gain deeper insights into the problem situation. This will provide, in particular, an understanding of the cultural, behavioural and political aspects that exist in the social system in which the problem is situated.
- It is important to identify the key decision makers before embarking on such an exercise and explain the process to them. One needs to be honest with respect to the possible outcomes and in particular to mention the fact that there may well be unintended consequences as a result of any intervention and how these will be dealt with. In a project environment, the timing and resource utilisation may be an issue that needs to be discussed and agreed on.
- One needs to consider fallback options should the intervention not produce the desired results. These should be discussed, agreed and, if necessary, documented.
- A community of practice should be considered within any organisation that is serious about using these methodologies to improve problem situations. This would allow people to share experiences and knowledge and thereby become more proficient in the application of systems thinking and action research.

5.10 Recommendations for further research

The scope of this study was very limited in that it dealt with a particular situation within a specific organisation. There are thus a number of areas in which further research may be conducted in order to further refine the subject matter. The following are some suggestions on further research that may be undertaken.

- There was no attempt to try to change the culture of the organisation. Extensive discussion around the inhibiting affect that the culture has on the ability to manage projects has been included throughout this study. Some research should

be undertaken in order to see whether it would be viable to instil a different and more accommodating management style into the organisation. This would have to be done with great sensitivity.

- Linked to the above, there is scope for research into how a style of servant-leadership may be introduced into the organisation in order to move away from the hierarchical and autocratic style of management that is currently so pervasive.
- Although a number of methodologies were used in this study, there was no analysis of the most appropriate mix of methodologies. As an enhancement of this study, or in the event of using a systems approach to make further changes to the processes within this organisation, a critical systems thinking approach (as discussed by Jackson and others (cited in Daellenbach, undated) using System of Systems Methodologies or Total Systems Intervention could be considered in order to identify the appropriate multimethodology for this situation. This could be further refined in an iterative manner.
- The wider application of systems thinking to project management in the organisation is an area that the author believes is worthy of further research. At present, project management is instilled in a very rigid and highly process-driven manner. The project manager has virtually no authority to make any changes to this methodology which places a significant administrative burden on the entire project team and adds very little value to the overall success of the project. In fact, these project management processes are frequently cited as a factor that causes delays to the projects. Research could be done based on the success of this study in order to see how other processes may be optimised and thereby remove much of the frustration experienced by the project teams.

5.11 Conclusions

The study described here illustrates how SSM may be used improve project management processes in an environment that is rigid, bureaucratic, politicised and conservative. The author believes that the methods used may well be applicable to bringing about changes in organisations with a similar culture. This would include changes that are not project related. Organisations that could also benefit from this would also include parastatals and government agencies where the current level of bureaucracy is stifling productivity in

South Africa. If the country is serious about improving the efficiencies within the civil service, then this approach should be given serious consideration.

The objective of this particular study was to see whether applying a systems thinking approach and action research paradigm to a complex problem situation in a large project environment within a highly politicised and conservative organisation would lead to any significant improvements. The systems thinking process that was described in chapter 3 and the application of participative action research and SSM discussed in chapter 4 led to the identification of appropriate intervention points and the implementation of a new process for change management on the project. Subsequent to this, the problem owners acknowledged that the situation had improved significantly and that good progress was being made to catch up time lost on the project due to the unnecessary bureaucracy that was in place prior to this situation.

In a broader context, the methodology adopted and described in this study indicates that the soft systems approach in dealing with what is largely a human activity system is able to produce results in large organisations where it would be more usual to apply hard systems approaches to problems. By using SSM it was possible to facilitate a better understanding of the problem situation, define the system's purpose; check connectivity between activities, establish indicators so that improvements in performance can be measured, and ensure sustainability.

In the organisation under discussion, the project management methodologies and processes are continuously changing due to problems experienced in particular situations. However, similar situations occur in many other large bureaucratic organisations that have a similar culture. The use of SSM is advantageous not only because it results in systemic improvements to the situation, but because the stakeholders' knowledge of the overall system is enhanced which can lead to further system improvements due to their having a better understanding of the viewpoints of the other role-players.

From a personal perspective, the research question that was raised at the beginning of the study was whether one could effectively use systems thinking to better understand a very messy situation and whether action research was an effective methodology that could bring beneficial changes within an organisational climate that would not normally be

conducive to this type of intervention. There was certainly an increased amount of conscious learning that took place from the experiences gained by doing this study. This individual learning could not have been achieved by studying the theory alone. The author also derived a better understanding of the collaborative approach that took place amongst the stakeholders, particularly during the action research period of the study, but also whilst applying systems thinking at the early phase of the endeavour. The understanding of the application of systems thinking in a real situation was enhanced significantly and a number of concerns that the author had prior to the study were clarified. In particular, the choice of systems thinking tools and the actual outcomes derived by using these tools provided some important insights for the time that the author may need to do a similar exercise again in future.

The authors understanding of action research as applied to real day-to-day situations was enhanced during the course of this study. His own capacity for critical thinking and analysis was enhanced significantly by constantly requesting information to clarify issues and then reflecting on the possible solutions to these. The successful application of action research within what is usually considered a hard systems environment provides an indication of the fact that the action research paradigm should be considered when faced with similar situations by this and other comparable organisations.

As a result of this study, the author believes that he has met the objectives set at the beginning. He improved his own understanding of systems thinking and how it can be used to create learning organisations, how complexity theory can be used to drive change within organisations, and the use of action research to learn about a particular problem situation and introduce change in order to bring about improvements. These improvements also had a positive effect on the project in that lost time was being caught up and the morale and productivity of the project team had greatly improved. Finally, there is a better relationship that exists between the various role players who participated in this exercise due to a better understanding of each other's perspectives. The author would thus have no hesitation to recommending this approach to others which to emulate it.

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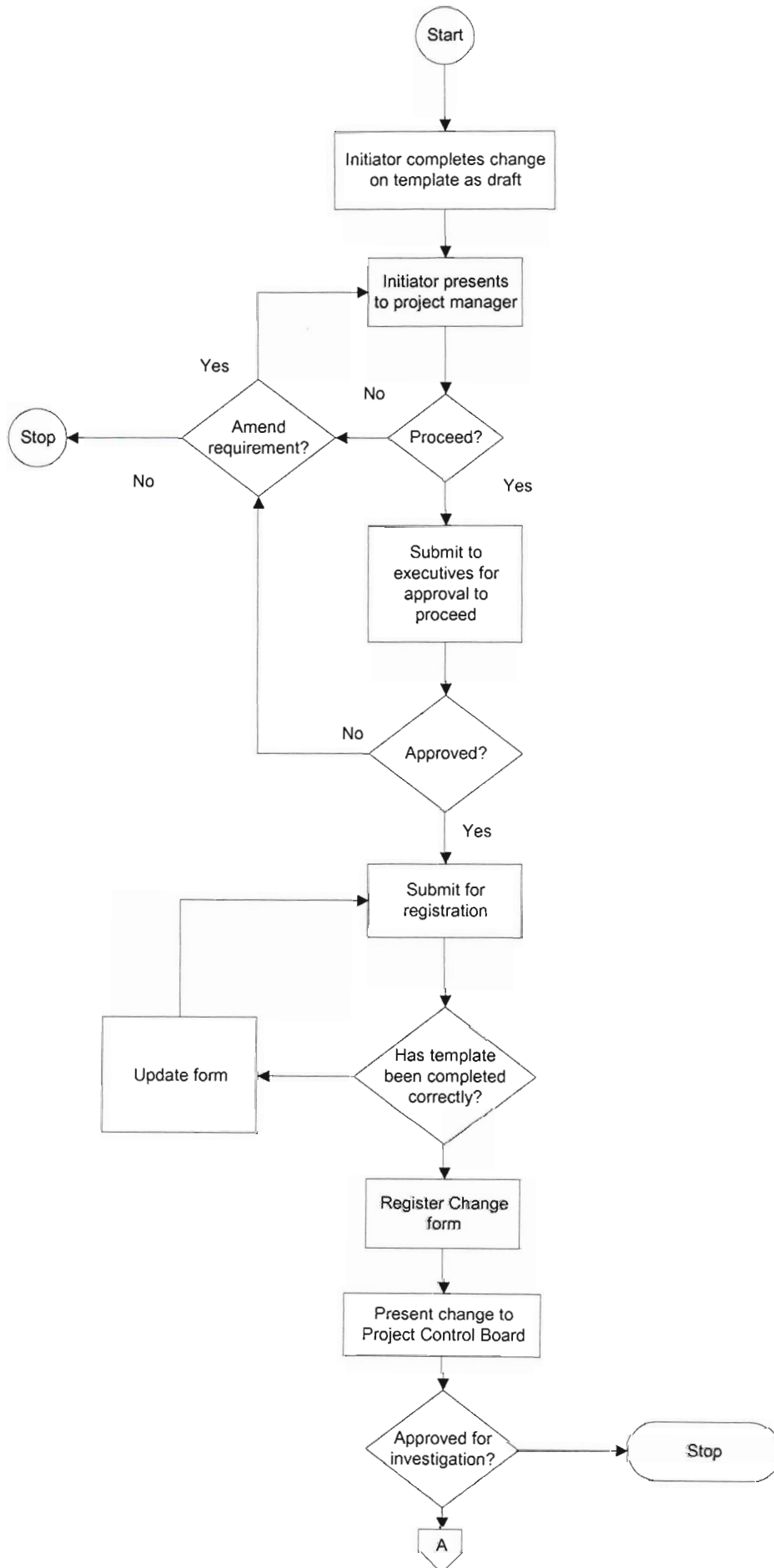
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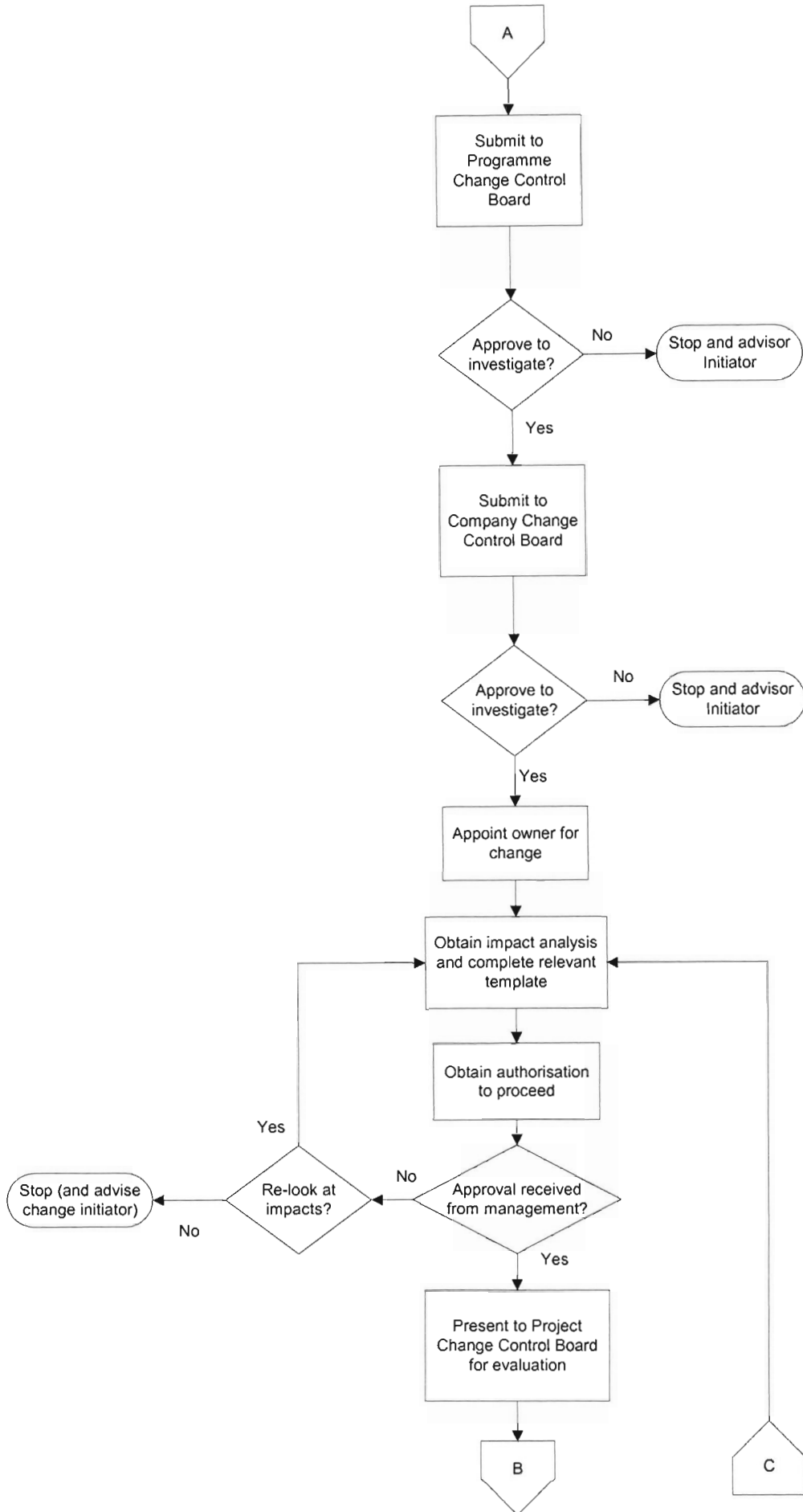
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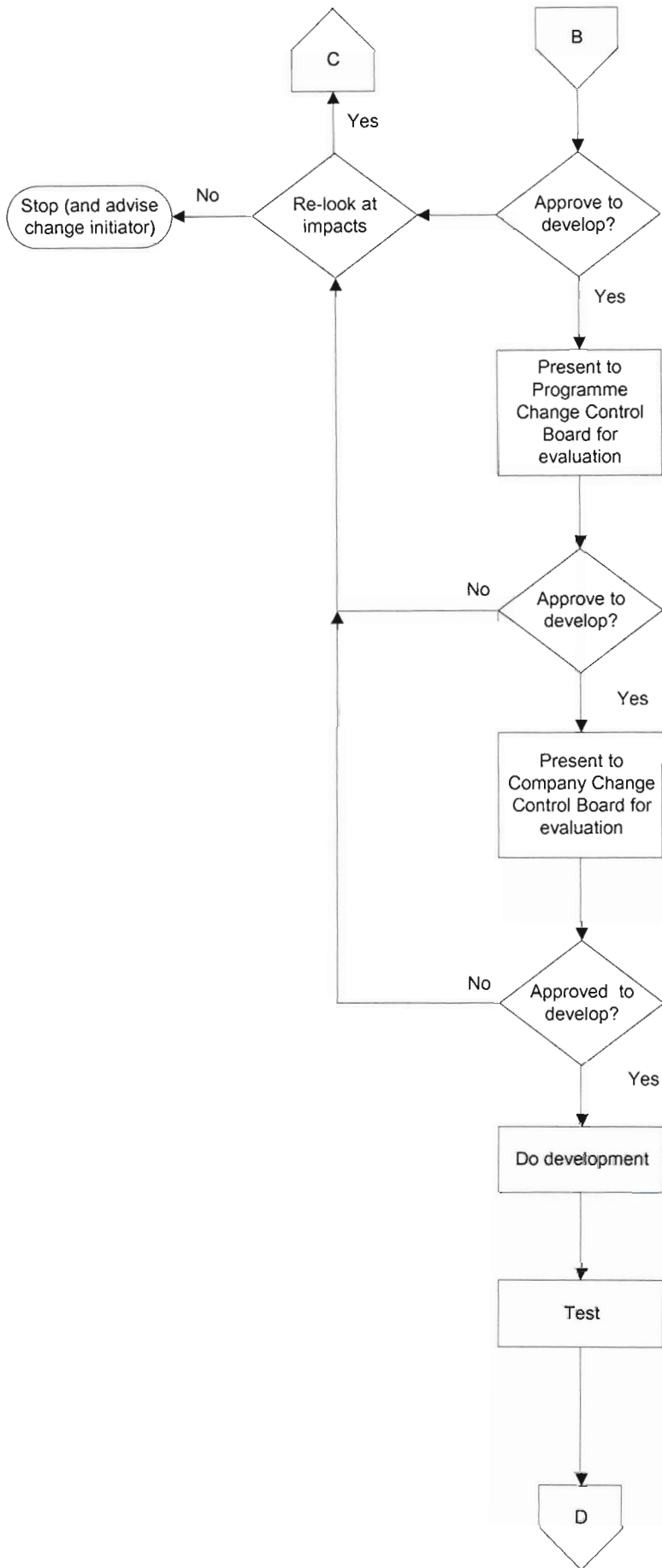
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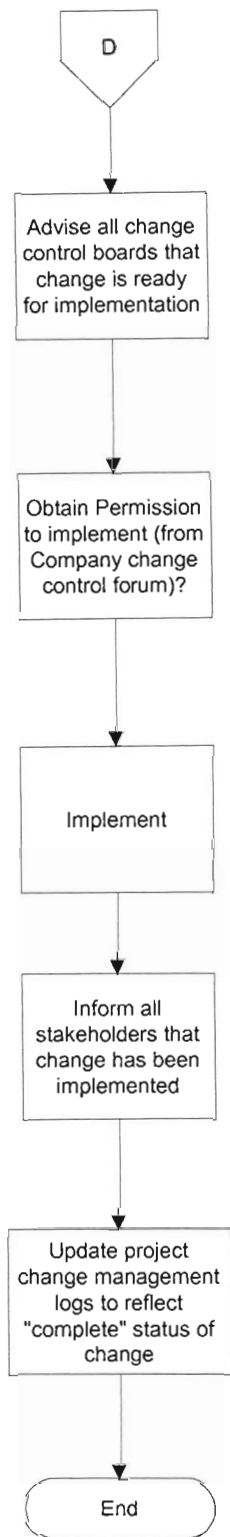
APPENDIX A

Appendix A: Existing change control process (simplified)



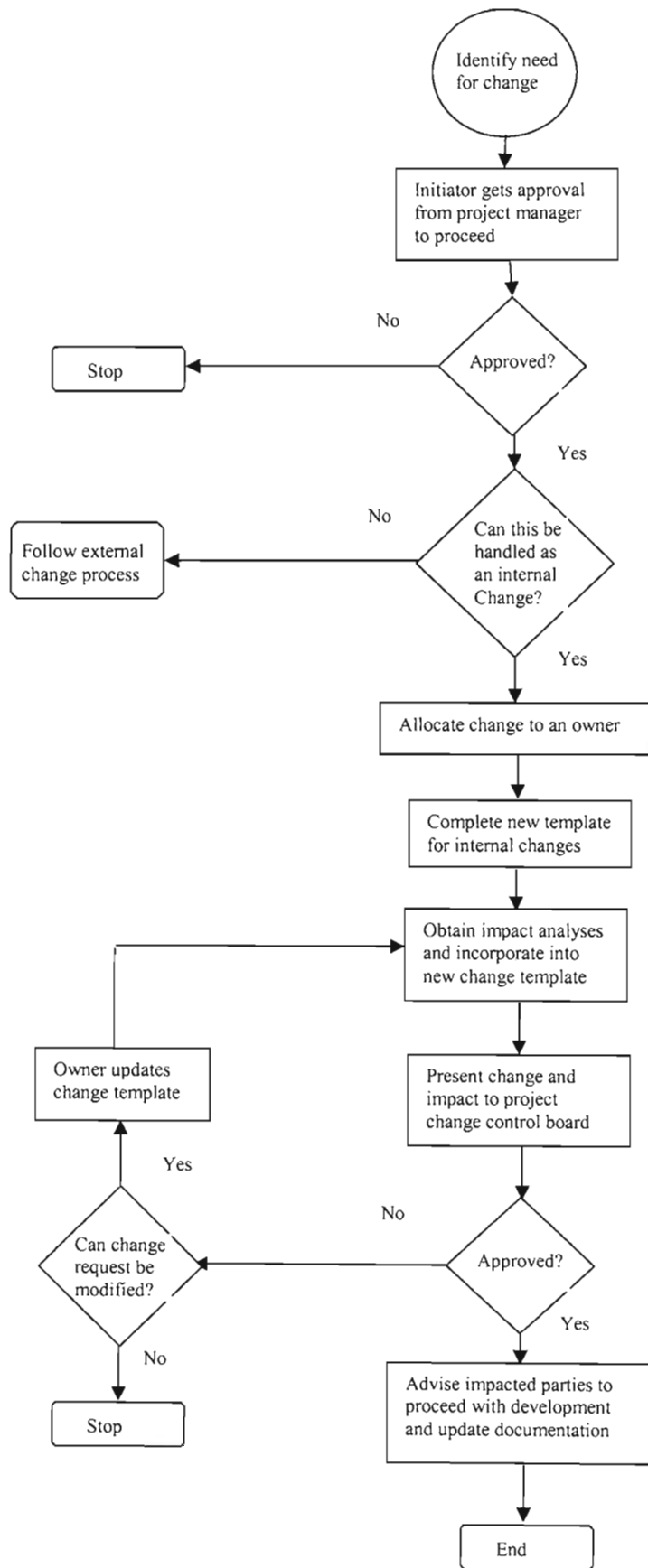






APPENDIX B

Appendix B: Proposed change request process flow for project-specific changes



APPENDIX C

Steps to be taken using current change management process for implementing a change to the software (as an example).

Action	Key responsible person
1. Initiator realises something needs to change.	Change Initiator
2. Obtain latest version of change template.	Change Initiator (from intranet web site)
3. Complete first part of template for specific type of change (e.g. timeline change, functionality change, design change).	Change Initiator
4. Get approval from executives and senior managers to proceed.	Identified executives & senior managers
5. Check correct version of the template is being used.	Change Control Administration
6. Check template has been filled in correctly.	Change Control Administration
7. Register change on project logs.	Change Control Administration
8. Motivate to project change control board.	Initiator
9. Get approvals to proceed.	Project change control board
10. Verify correct approvals have been obtained for this change type.	Change Control Administration
11. Assign owner.	Project change control board
12. Complete balance of the change request template.	Change owner
13. Submit to Change Management Administration to file.	Change owner
14. Check template has been filled in correctly.	Change Control Administration
15. Motivate to programme change control board.	Change owner
16. Approval to proceed to investigate impact of change.	Programme change control board
17. Motivate to company change control board.	Change owner
18. Approval to proceed to investigate impact of change.	Company change control board
19. Update status of this change request on project logs.	Change Control Administration
20. Identify stakeholders.	Change owner
21. Obtain impact (workshop if necessary).	Change owner, directly impacted people
22. Complete Change impact template.	Change owner

23. Submit change impact form for filing.	Change owner
24. Verify impact template has been correctly filled in.	Change Control Administration
25. Present to project change control board to get approval to develop the change.	Change owner
26. Present to programme change control board to get approval to develop the change.	Change owner
27. Present to company change control board to get approval to develop the change.	Change owner
28. Update status of this change request on project logs.	Change Control Administration
29. Notify the people who need to make changes that approval has been granted to proceed with the development.	Change owner (e.g. designers, developers)
30. Notify other impacted parties so that they are aware that the change has been approved.	Change owner (e.g. testers, trainers)
31. Make necessary changes.	Directly impacted people
32. Monitor progress of development.	Change owner
33. Negotiate with Configuration Manager as to when this change may be implemented into the main stream of the project.	Change owner, Configuration Manager
34. Implement change into the main stream of the project.	Configuration Manager
35. Update status of this change request on project logs to indicate that this change is complete.	Change Control Administration
36. Notify change initiator.	Change owner