Modeling Change in a Manufacturing Facility in a Continuously Changing Environment

By

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(MInd Admin)

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At the request of SA Breweries (Pty) Ltd, the contents of this Thesis are to remain outside of public scrutiny for a period of 3 years.

Plagiarism Declaration

I know the meaning of plagiarism and declare that all the work in the document, save for that which is properly acknowledged, is my own.

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List of Abbreviations

FMCG	Fast Moving Consumer Goods
SAB	Sourh African Breweries Pty Ltd
FAB	Falvoured Alcoholic Beverages
hl's	hectolitres
NPD	New Product Development
QA	Quality Assurance
HR	Human Resources
MDev	Manufacturing Development
CSMT	Chamdor Senoir Management Team
BOT's	Behavoiur of Time Graph's
CLD's	Causal Loop Diagrams
IRD	Interrelationship Diagraph
PV	Process Variable
PD	Process Demand
SP	Set-point
MGD	Miller Genuine Draft

Abstract

In a global manufacturing environment, South African manufacturers are facing increasing challenges both at home and abroad. These challenges result in a process of ongoing change and redefinition - a process which needs to be understood and properly managed.

This qualitative action research study was conducted within the senior management team at a production facility of one of South Africa's largest fast moving consumer goods (FMCG) companies. This particular unit has been grappling with change management in an environment of rapid change, driven by the need to simultaneously upgrade the facility, introduce new capability and products, and to increase flexibility and responsiveness.

All of these interventions have come together at the same time, and change has been synchronous and non sequential. This in turn has put huge stress on the system. Therefore the need for the system to adapt to rapid change, to be flexible and innovative is vital to the smooth operation of the business.

The aim of the study was to examine (using both ethnographic research and the action research methodologies) the issues and processes that were both experienced and observed as a member of this leadership team. The focus of inquiry was to understand how all the sub systems involved interacted upon each other, and how they impacted on the total system. A further reason was to understand the drivers for change, and then be able to use them in a positive way to manage the ongoing complexity that characterizes this facility.

The results of this study suggested several areas for improvement, but the two key areas appeared to relate to leadership team dynamics and change management. From the learning's of this study, a model for Managing Change in a Changing Environment is proposed. In this work, the model is then tested and validated.

For the structure of the thesis, four parts and ten chapters have been created.

Part 1 is titled Developing the Problem Statement, and the two chapters within this section introduce the system in focus and develop the problem statement respectively.

Part 2 is titled Theoretical Content and develops the framework for the thesis. This part consists of three chapters. Chapter 3 is a literature review of key aspects of the change management process. Chapter 4 provides the philosophical framework, while chapter 5 reviews the available research methodologies, and include my reasons for choosing action research as my research paradigm of choice.

Part 3 is titled Application of the Theory in Context and consists of two chapters. Chapter 6 presents the key learning's from the ethnographic action research study conducted at Chamdor brewery, while chapter 7 develops a model for understanding how to manage change in a changing environment.

Part 4 is titled Evaluation and consists of the last two chapters of the thesis.
Chapter 8 reflects on the model proposed in chapter 7, and by answering certain questions, demonstrate its validity and rigour.

Chapter 9 identifies and evaluates the perceived value of this study, by utilising SCQARE as a framework for sense making. The chapter ends off with a summary of conclusions and the benefits attained on a personal level from doing this thesis.

The structure of the parts and the chapters of thesis can be represented diagrammatically as follows:

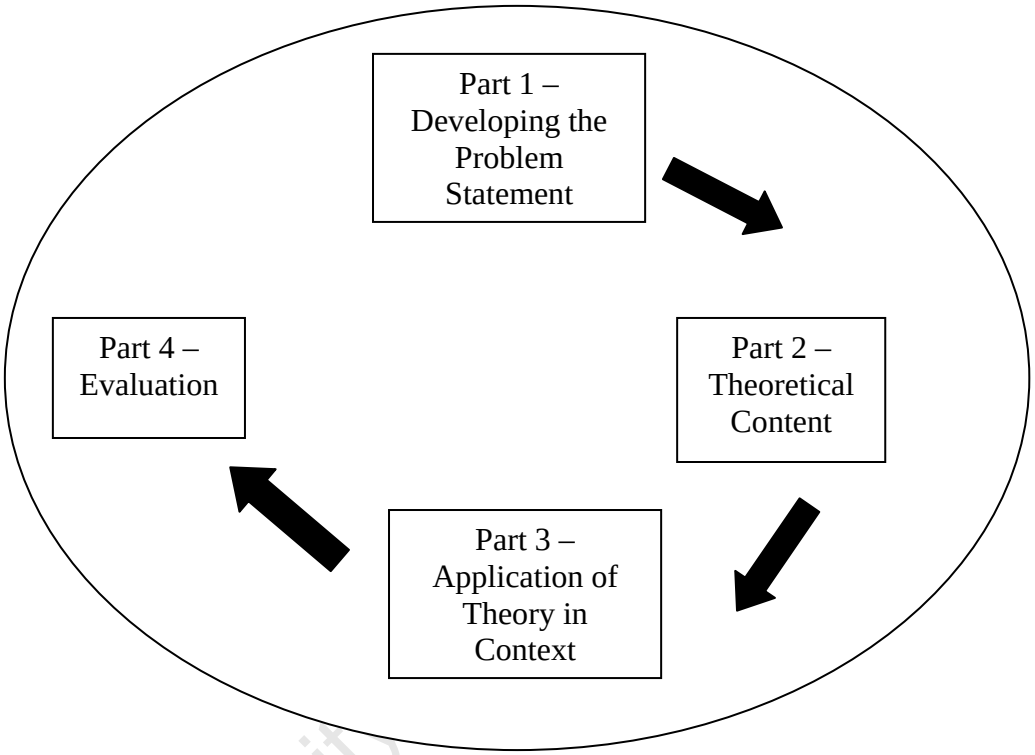


Fig a: The Structure of the Thesis

Part 1 – Developing the Problem Statement

The aim of Part 1 is to describe the context within which this research project was carried out.

Chapter 1 briefly presents the background to the company and its operation, and describes the role that it plays within the South African Breweries production grid.

In chapter 2 the problem statement is developed that was used to initiate this research. A hypothesis is developed which will be tested later in chapter 7.

Chapter 1 – Introduction to the System in Focus

The aim of this chapter is to briefly present the company's history, as well as describe the current context within which it operates. A systems view of the organisation is presented.

1.1 An introduction to SA Breweries

First established in 1895, South African Breweries Ltd (SAB) is the South African subsidiary of SABMiller plc. SABMiller is today ranked among the top three brewing companies in the world in terms of volume. The company operates breweries in forty countries in Africa, Europe, the United States of America, Central and South America and Asia. SABMiller is listed on both the London and Johannesburg stock exchanges.

While SABMiller is a global player, its roots are still firmly entrenched in South Africa, where its influence touches almost every aspect of society. More than four hundred thousand people are employed in the beer value chain in South Africa alone (from growing of natural resources such as barley through to retailing), and more than R 5-billion in tax and excise is generated for the fiscus every year (which is more than all the gold mining houses combined).

SAB currently operates seven breweries in South Africa. Each of these plants brews and packages either beer or Flavoured Alcoholic Beverages (FAB's), from where the finished product is transferred to a distribution warehouse located next to each brewery. Finished product is then transported from the distribution warehouses to some forty depots around the country, from where it is dispatched to customers and consumers via various distribution channels.

Each of the breweries falls under the jurisdiction of the Manufacturing Division, while the distribution of finished product is under the control of the Sales and Distribution Division. While SAB has an annual brewing capacity of almost thirty-one million hectoliters (hl's), approximately twenty-five million hectoliters of finished product is consumed every year in South Africa. This is derived from nine beer types, and six FAB variants.

In order to define the system, its demarcating boundaries need to be established. This was done by considering recursion, as well as looking at the system in focus and its sub-systems. As a result, the following shall be detailed:

- The Manufacturing Division
- Departments
- The Containing Environment
- The Purpose
- Constraints – External and Internal
- The Dynamics of the Parts
- The Organisation

1.2 The Manufacturing Division

For the purpose of this thesis, the system under review is the Chamdor brewery.

The Chamdor brewery is located west of Johannesburg in the industrial area of Chamdor, Krugersdorp. The brewery was originally opened in 1970 as part of the Whitbread Brewing Company, and subsequently taken over by Louis Luyt in 1972. In 1976 the ownership of the brewery reverted to SAB.

Chamdor brewery is one of seven breweries operated by SAB in South Africa. Each of these breweries has a distinct role within the national production grid. Chamdor occupies the role of lead flexible brewery. The aim is to develop the brewery into a flexible production facility that supports new product development (NPD), as well as tests new technology. While Chamdor is small by volume standards compared to the remaining breweries (approximately two million hl's per annum out of a total of approximately twenty-five million hl's per annum country wide), it makes up for this with huge complexity in terms of the number of brands and pack sizes that it produces. For example, it is the only brewery making the Brutal Fruit product range, as well as Miller Genuine Draft. The brewery employs over three hundred and ten people.

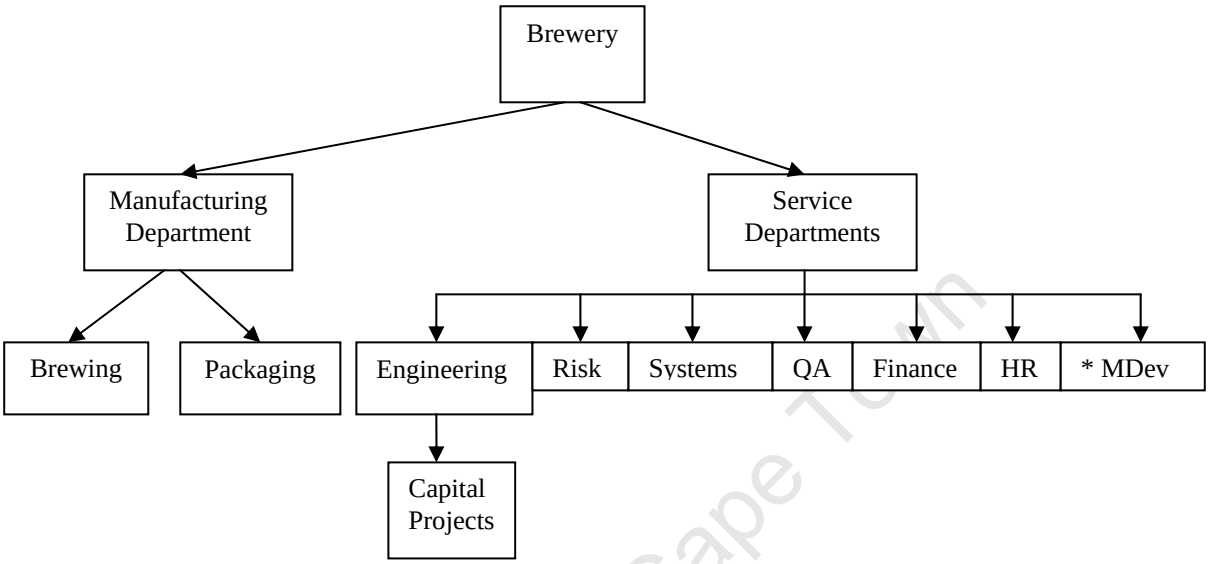
The brewery also does all NPD on behalf of the rest of the group. New brands and products are first developed at Chamdor, and once they reach a sustainable volume, are relocated to other breweries. With consumers demanding greater product ranges and innovative products, a significant amount of capex (over R 350 million) has being spent on the brewery to support the NPD drive. Chamdor has not always held this status. In the year 2000, the brewery was threatened with closure because of low volumes and outdated, inflexible technology. Maintenance of the production facility was also allowed to run down. The introduction of a new category of brands called FAB's reversed the low volume trend, and the decision was taken not to close the facility. Over and above the NPD work, the plant is therefore being upgraded to address various maintenance, reliability and flexibility issues.

Chamdor could be described as a brown field site as opposed to a green field site. A brown field site is a facility that already exists, versus a green field site where everything is brand new. Building on a brown field site is more difficult, as any new equipment or processes need to be integrated into existing infrastructure and processes. From this point of view, a green field installation is much easier to manage.

All of the above interventions have come together at the same time, and change is synchronous and non sequential. This puts different stresses on people and the system, and the need to adapt to rapid change, to be flexible and innovative is vital to the smooth running of the business. A significant portion of the workforce has worked at Chamdor for more than five years, some of whom occupy positions within the Chamdor senior management team (CSMT). It is this very group who are grappling with both change itself, and the effective management of change. Given its strategic importance within the production grid, the future of Chamdor is guaranteed. At the moment, it's the most exciting brewery to be within the group.

1.2.1 Departments

There are essentially two sub-sections within the brewery, two manufacturing departments and seven service departments (refer Fig 1.1 below). The manufacturing departments are made up of the Brewing and Packaging departments, while the service departments constitute Engineering, Finance/Planning, Systems, Manufacturing Development, Quality Assurance, Risk and Projects.



* MDev = Manufacturing Development

Fig 1.1: The Brewery Systems Parts

The primary role of each department is as follows:

Brewing: takes brewing raw materials and transforms them into filtered beer or FAB's via a fermentation process that utilizes yeast.

Packaging: package the filtered beer or FAB's into the correct pack size, and add a closure and labels on to the bottles. Product is then packaged into various forms of secondary and tertiary packaging.

Engineering: provide utilities such as water, steam and air for use by the two production departments, also collect by-products such as impure carbon dioxide from the brewing process and turns this into usable utilities (pure carbon dioxide).

Capital Projects: a sub department of the Engineering department responsible for the design and execution of all capital projects on site.

Risk: responsible for all safety, health and environmental issues.

Systems: provide support for all electronic management systems, as well as service all automation platforms on site.

Quality Assurance (QA): responsible for quality measurement on site, as well as the integrity of systems and reports relating to quality.

Finance/Planning: order brewing & packaging raw materials according to a forecast based on actual and projected sales; schedule production; provide the financial audit trial for stock control and costing purposes.

Human Resources (HR): responsible for recruitment of personnel on site, handle all HR issues on site.

Manufacturing Development: primary role is to look for process optimization opportunities based on the Theory of Constraints; also responsible for knowledge management on site.

1.3 The Containing Environment – setting the scene for the internal and external environment

Internal Environment

The people - over three hundred and ten people are employed at the brewery. The qualification set ranges from grade ten to PhD level. The age set is also a mixture, with increasing numbers of younger people being in the business versus the more experienced people with corporate memory.

The plant/technology - the plant is a mix of old and new technology, although some sections have been totally overhauled. Some of the new technology is unique to this site (and maybe even unique in the brewing world). With increasingly new technology, a new mindset for maintaining and optimizing equipment has had to be introduced.

The systems - from a systems perspective, many areas of the plant are now fully automated. Increasing automation has meant that new skills (programming, etc) have had to be sourced and introduced.

External Environment

The market - SAB dominates the clear beer market (as opposed to sorghum beer which is cloudy beer) in South Africa via its status as being the preferred beer supplier. On the FAB front, SAB currently enjoys a 64% market share, with volumes growing in this category.

The competitors - The competitors in the clear beer market are all small microbreweries, with imported beer from overseas and some neighbouring countries. In the FAB category, the main competitors are Brandhouse and Distell.

The suppliers - There are a large number of raw material suppliers involved in the beer production chain, ranging from brewing through to packaging. It is estimated that thanks to SAB, five additional jobs for every SAB job are supported by the beer industry.

Macro-economic influences - There are a number of influences at play here, ranging from socio economic through to political and environmental issues that impact on the economy of South Africa. Spending patterns change as a result and this in turn impacts on beer sales. The reasons for changing spending patterns are both numerous and complex, and are beyond the scope of this thesis. Suffice to say that macro-economic influences are felt throughout the SAB value chain, as they do impact on sales and ultimately on brewery performance.

1.4 The Purpose

A system has a purpose or does something. In defining this purpose the worldviews of key individuals who affect or whom form part of the system need to be considered as they are important in understanding how the system behaves (Waring, 1996). In the case of Chamdor manufacturing, there are two sets of stakeholders, namely employees and management. Each of these stakeholders sees Chamdor from a different perspective.

Employees – a large percentage of the employees on site are in shift based teams that work for twenty-four hours a day, seven days a week throughout the year. These people are responsible for production of product according to laid down recipes and procedures. Employees see the purpose of the system to ensure a consistent supply of beer and FAB's according to plans and quality standards set out by management.

Management - the role of the management team is to provide leadership and strategic direction to the various sub-departments and teams within the brewery. A further role is to provide the tools for these teams to perform their jobs correctly. Management sees the purpose of the system to ensure the maximizing of profit to the greater business, by driving efficiencies and costs. In return, management rewards employees for their services.

1.5 Constraints – External and Internal

There are a number of constraints that inhibit the system from operating effectively. These can be broadly broken down into two sub-sections, namely external and internal constraints.

External constraints are those things that are beyond the control or influence of the brewery and its personnel. Examples are macro economic factors**,** weather, legislation e.g. safety, environmental, etc and changing market trends. In the case of Chamdor brewery, these could be factors such as environmental legislation (e.g. water usage, pollution, etc), safety standards or government legislation (e.g. an increase in excise).

Internal constraints are those things that brewery personnel, be they management or employees, can control and influence. Examples are people skills, organizational structure and systems.

1.6 The dynamics of the parts

The basic processing steps are shown in Fig 1.2 below. Each of these steps has a number of sub-process steps, and once again it is beyond the scope of this thesis to show and define them all, as there are hundreds if not thousands of processes involved. The intention is only to map the very highest level of the total process.

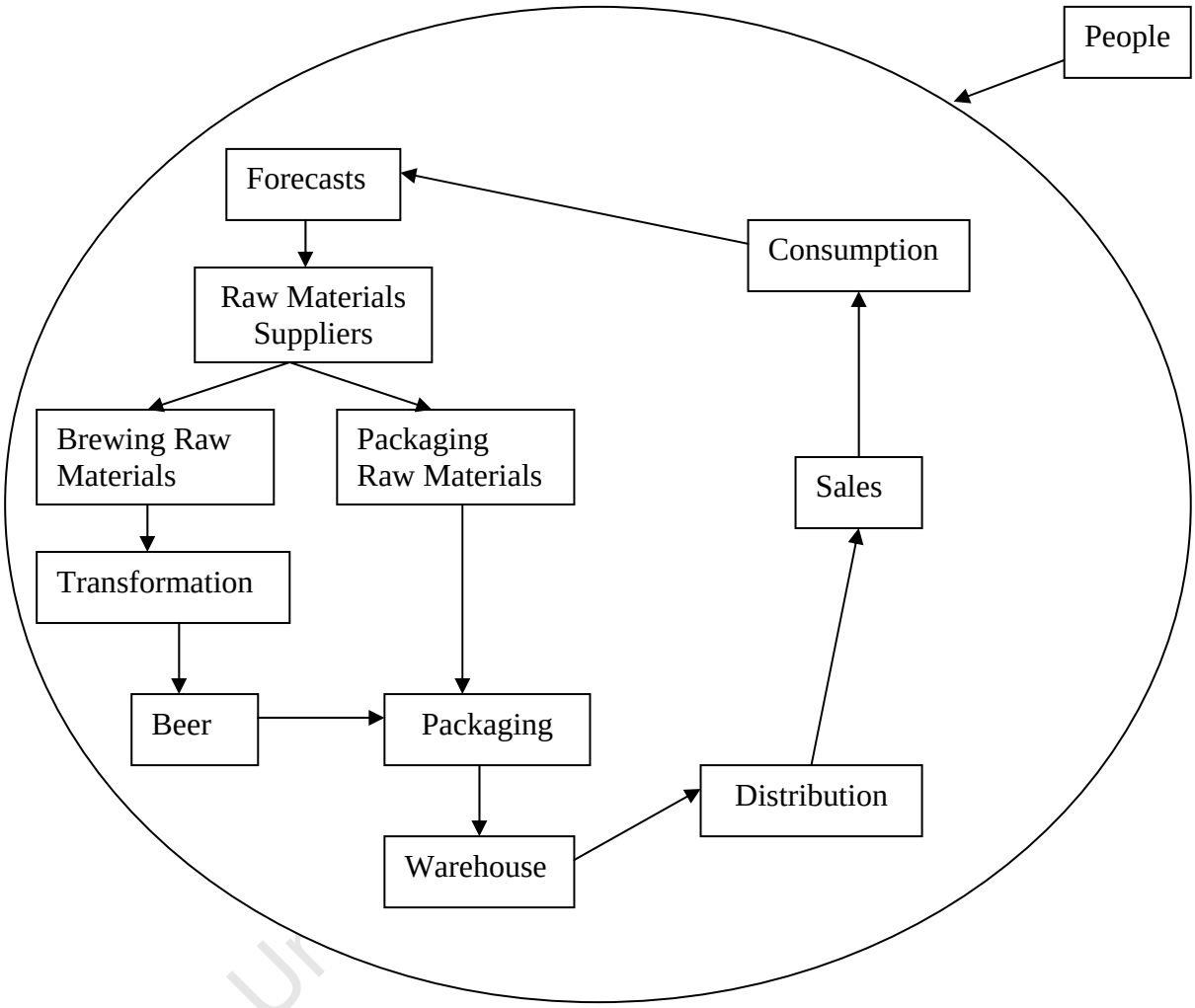


Fig 1.2: High Level Process Map of the Manufacturing Process Steps

Raw material suppliers supply brewing and packaging raw materials based on forecasts provided by the planning department. Brewing raw materials undergo a transformation process which results in beer or FAB's as a finished product. This process takes a minimum of eighteen days to perform and is carried out by the brewing department. The packaging department takes the filtered beer or FAB and packages it into the correct pack size and configuration. The packaged product is then transferred to the warehouse.

From the warehouse the product is transported by either road or rail to a series of depots around the country. The depots in turn distribute the product to the point of sale (either a customer or a consumer). The product is then consumed. Based on the actual

consumption rates and projected forecasts of sales, the planning department updates forecasting and procurement of raw materials to support the brewing and packaging departments, at which point the loop is closed.

1.7 Organization

Under the section on system parts (section 1.2.1), ten departments were described. Each of these departments has a departmental manager e.g. the Engineering Manager is the head of the Engineering department, the Brewing Manager heads the Brewing department, etc. The heads of department report to the General Manager, who in turn reports to the Manufacturing Director, who is based off site at the SAB central office in Sandton, Johannesburg.

The CSMT organizational structure can be represented as follows:

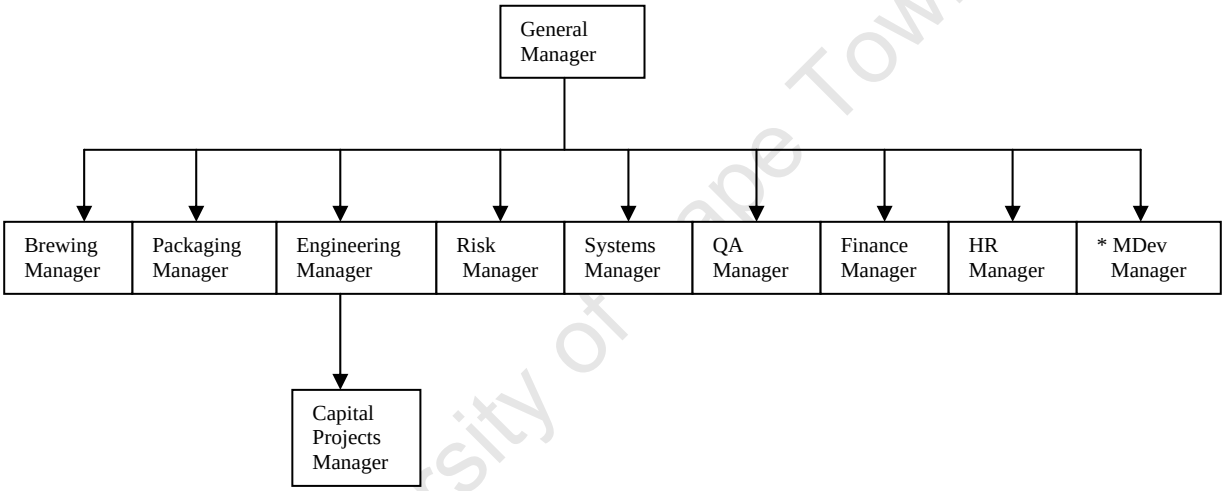


Fig 1.3: Chamdor Organizational Structure

* MDev = Manufacturing Development

1.8 Summary

This chapter started off with an introduction to SABMiller and proceeded to present the various systems and sub-systems that make up Chamdor brewery. The aim of this chapter was to present the context within which the research study was conducted.

Chapter 2 – Developing the Problem Statement

In this chapter, a brief problem statement is stated and then developed in order to focus the research inquiry.

2.1 Problem Statement and Focus of Inquiry

What is a problem and what is a problem statement? The Chambers 21st Century dictionary (2002) defines the terms problem and statement as follows:

- Problem - a matter difficult of settlement or solution, a proposition in which something is required to be constructed, not merely as in a theorem.
- Statement - the act of stating, a formal account, declaration of facts

A problem is an obstacle which makes it difficult to achieve a desired goal, objective or purpose. It refers to a situation, condition, or issue that is yet unresolved. In a broad sense, a problem exists when an individual becomes aware of a significant difference between what actually is and what is desired.

Since problems are difficult to resolve, they get in the way of achievement of goals and objectives. Problems are obstacles that prevent the transition between the actual "as-is" state and the desired "to-be" state. Problem resolution therefore focuses on understanding and removing the obstacles, so that the desired end state is achieved. In defining a problem, a clear problem statement is required, as this will define the limits or boundaries of the problem and will provide clear focus on what the problem is. The challenge is often to separate the causes of the problem from the symptoms. Very often when defining problems, the tendency is to describe the symptoms instead of really getting to the heart of the matter of what is causing the problem in the first place.

Over the last five years (2000 to 2005) the author has worked at the Chamdor brewery through some of its greatest change, in two senior positions as the Brewmaster and then as the Technical Manager. The first was in a line department, and the second in the projects department. Both positions were part of the CSMT, operating at a strategic level within these two different departments. The author's primary focus in the first two years was product quality, with a secondary focus on new technology. For the last three years the author's focus has been on technology, conceptual and detailed design of the plant, and the ultimate development of the production site.

During this time of rapid change, the author has been able to witness major change first hand at all levels of the plant. This included changes in the CSMT, as well as changes in systems and structures. Over the period under review, the CSMT has been successful in a number of areas, failing in others. Managing and leading change in this environment has been no easy task.

The aim of this study is therefore to understand the complex interactions that are at play at Chamdor, from the perspective of the senior management team on site with the view to proposing a model for managing change in a complex environment. As the environment is complex with a number of interacting variables and perspectives, taking

a systems view as opposed to a mechanistic view provides a framework for getting to a problem definition. Senge defines a system as “anything that takes its integrity and form from the ongoing interactions of its parts. Systems are therefore defined by the fact that their elements have a common purpose and behave in common ways, precisely because they are interrelated toward that purpose.” (Senge 1999 , p.137).

The primary focus of inquiry was to understand how all the sub systems involved at Chamdor interacted upon each other, and how they impacted on the total system. A further reason was to understand the drivers for change, and then be able to use them in a positive way to manage the ongoing complexity that will be at Chamdor for the next few years.

The situation described above is illustrated in Fig 2.1 below:

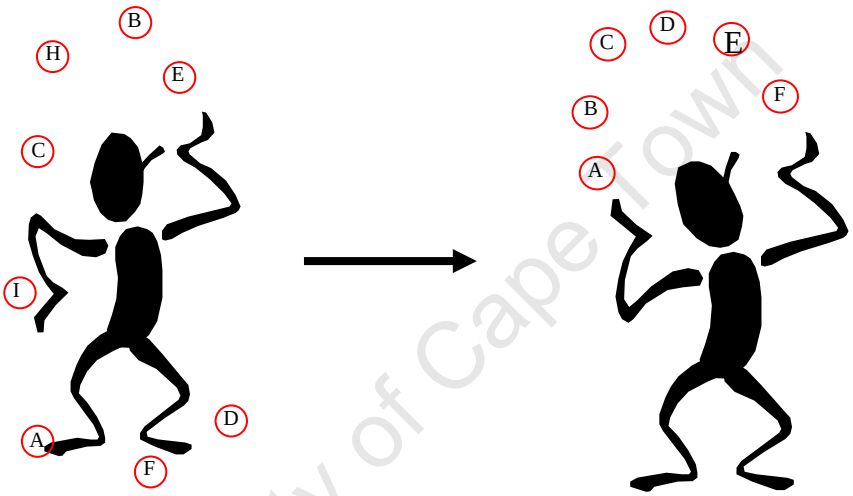


Fig 2.1: The Jugglers of Change

The choice of the depiction of two jugglers on the cover page of annexure 1 at the end of this thesis is deliberate. In this case, each ball represents an unique initiative.

The first juggler represents the pre-change state in which everything is disorderly and chaotic. In this scenario, the juggler manages to juggle certain balls, but in random sequence. Some balls are dropped. The second juggler represents the post-change state in which the balls are juggled in an orderly manner. The number of balls is reduced and as a result, no balls are dropped. This means that the total system is in a state of harmony.

Why is this important?

Every dropped ball in this scenario is a missed opportunity. This translates into delays in implementation of projects, incomplete implementation of projects, not realising project benefits, etc.

What is the desired end state?

The desired end state is a system which is adaptive, flexible and innovative and that can deal with the volume and complexity of change being thrown at it.

On the assumption that the number of projects/initiatives at Chamdor will not slow down, how to achieve the desired end state is at the heart of this thesis and of the problem statement. With this guiding intention, the issue of how to describe the problem is one that deserves attention. This problem involves a number of participants or stakeholders, is complex and embedded in multiple systems. With a defined end state and with the desire to get to the root cause of problems rather that solving symptoms, the working problem statement is:

How to manage change in a continuously changing (and complex) manufacturing environment.

Why is it important to understand this problem statement?

Chamdor is the sole supplier of many of SAB's products and as such occupies a unique niche in the SAB production grid. More than R 350 million has been spent to build this production platform and capability, and the investment now needs to be leveraged to it's maximum potential. This means it must be able to accommodate many new projects and initiatives. It needs to become the leader in the organisation with dealing with change.

2.2 Research Scope

The scope of this enquiry was limited to one location within the SABMiller group, namely, Chamdor brewery.

However, this location is not the only site within the group that is undergoing change, and it is hoped that the outcome of this study can be applied at our other breweries, as well as in the broader industry – in fact, any organization that is undergoing major change.

2.3 Research Design

The research design was based on a number of research methods as is appropriate in management research. The perceived research needs were matched with the appropriate research methods, taking the following factors into account:

- As a manager who wishes to understand and improve a complex situation that is grounded in the reality of their job, observations are made from within the system of which the researcher is a part. The researcher therefore influences the situation being researched.
- In order to improve the situation, the reality of the situation needs to be understood.
- Changes can only be decided upon once the situation and the key leverage points have been identified and understood. Only then will a theory be formulated in the form of an intended change that will be tested by implementation. Depending on whether the change is in the right direction or not, further theories will develop and further changes made.

- A key outcome is not only to effect change but to understand what leads to change success or failure.
- The overall purpose of the study was not to prove any particular theory but rather to develop an understanding that would lead to an improvement in the situation, improve the author's understanding of change management so that the learning's could be shared with other managers in similar situations and from the learning derived improve the author's management practise in the future.

A qualitative research approach was taken to enquire into the problem. This is expended upon in chapter 4. Qualitative research is concerned with understanding social phenomena from the participant's perspective. Ethnographic research in particular was the preferred methodology. Ethnographic research is a naturalistic-interactive approach to enquiry that entails entering the participant's environment in order to discover how participants interpret and react to the occurrence of events and processes.

The period of this study was August 2001 to March 2004. The aim of the study was to examine (using the ethnographic research methodology and the action research paradigm) the issues and processes that the author both experienced and observed during this time. In order to explain these phenomena within a systems thinking framework, causal relationships and a model have been proposed. The aim throughout has been to understand the changes happening, in order that future management practice involving change will be improved.

2.4 Summary

This chapter builds on the system in focus introduced in chapter 1. The focus of inquiry and the problem statement were presented, as well as the research scope and design. The next section of this thesis develops the theoretical framework for understanding and resolving the problem statement.

Part 2 – Theoretical Content

Part 2 of this thesis aims to develop the theoretical framework for understanding and resolving the problem statement presented in part 1. Part 2 therefore consists of three chapters.

Chapter 3 is a literature review of the material relating to change management. In the context of this thesis, the factors that are involved in the broader field of change management need to be understood, in order to build up a sound platform on which to build any proposed models of change.

Chapter 4 provides the philosophical framework for the thesis. In this chapter the available research philosophies are introduced, including a discussion on the differences between quantitative and qualitative research data. The four paradigms of research are also evaluated.

Chapter 5 provides the methodological framework for the thesis. The chapter reviews the available research methodologies, and includes the author's reasons for choosing action research as being the research paradigm of choice.

Chapter 3 – Change, Change Management and Models of Change

This chapter is a literature review of matters relating to change. The aim of this chapter is to familiarise the reader with the issues relating to change, with a view to setting a context for later chapters of this study if required.

In this chapter four broad categories of change are reviewed. Section 3.1 is an introduction to change itself, the reasons for change and discusses types of change in order to answer the following two questions – what does change mean and what are the various types of change?

Resistance to change is discussed in section 3.2. This section attempts to answer the following questions, namely what resistance to change means, why people resist change and what mechanisms people use when faced with change.

Section 3.3 discusses the definition of change management, the skills required of an effective change agent, various change management strategies and looks at how change impacts on performance.

Chaos management is discussed in section 3.4, which briefly reviews how chaos management relates to change management.

In section 3.5, three widely used change models are reviewed. These are the change models of Lewin, Conner and Kotter. To end off this chapter, the key elements between these three models are surfaced via a CATWOE checklist in section 3.5. CATWOE is a mnemonic which stands for the various aspects of the definition of the system that should be checked as is discussed in greater detail in section 3.5.4.

Fig 3.1 shows diagrammatically how the literature survey has been constructed:

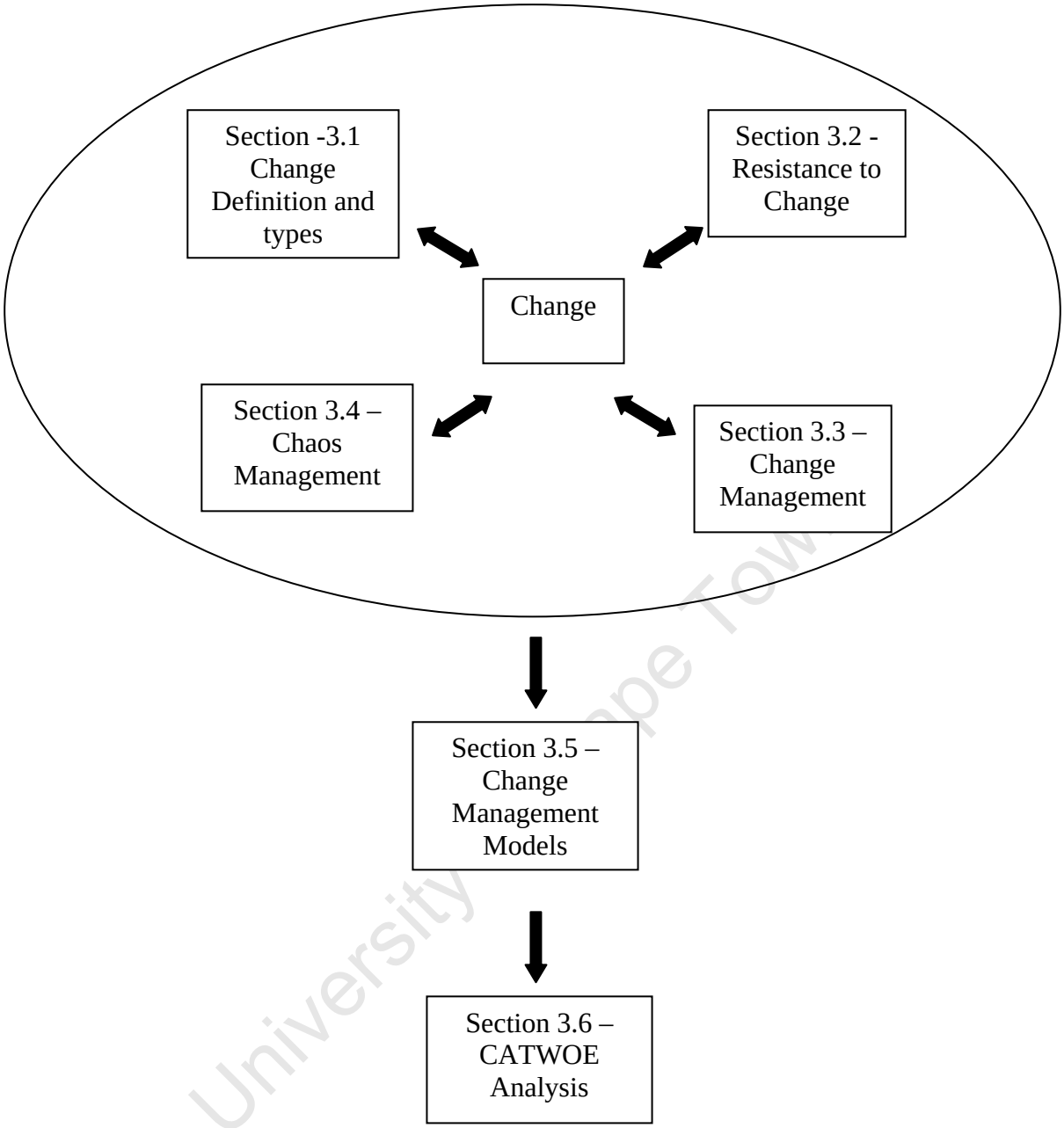


Fig. 3.1: Diagrammatic Representation of the Literature Review

3.1 An Introduction to Change, Reasons for Change and Types of Change

What does change mean? The original meaning of the word is derived from the old French word changer which was a term for "to bend or turn" – very much like a tree or a vine does when searching for the sun. The idea that the only constant is change has been a truism of life since at least the time of Heracleitus, circa 500 B.C. (Senge 1999, p.14). According to Chambers 21st Century Dictionary, change is defined as to alter or to make different.

For change to occur there must be a reason for doing so. This applies especially in the business environment, where companies have to adapt to changing circumstances in order to survive. Nadler (1998, p.3) states that the most typical reasons for change are "technical and technological development; increasingly competitive business marketplaces; market situations where supply exceeds demand; globalisation; increasing customer demands (e.g. price, quality, services); government interventions and changes in ownership relations".

What are the types of change? Change is characterised by two basic categories, namely continuous and discontinuous change (Nadler, 1998). Continuous change is also referred to as incremental change and goes on constantly via small but continuous steps. The objective of this change type is improvements in products, in performance or in processes, and can involve large commitments of resources such as time, people and money. Continuous change is the category of change most often referred to, and is explained by the Lewin change model (Senge, 1999).

Discontinuous (or radical change) by contrast is driven by external forces such as globalisation, new and improved technologies, as well as an increase in the number of products and competitors. Discontinuous change therefore equates to large-scale change and is chaos-like, which implies that day to day events are random and unpredictable. The old management mindset was that managers could predict and control events, but this has changed to the point where organisations must be more flexible and adaptable to react more quickly to change by being customer focused. The management focus in such an environment has there moved from planning and controlling, to teamwork and analysis and understanding of trends and patterns.

According to Weick and Quinn (1999), continuous change has a number of advantages over discontinuous change. Since small incremental change steps are easier to manage and are less disruptive, they have a greater probability of success. In an environment where continuous change is prevalent, people remain in a constant state of readiness for change. This in turn gives an organization the ability to continuously fine tune its state of readiness, which implies that change is less costly and damaging than large scale, crisis related change.

3.2 Resistance to Change

Senge (1999, p.32) asserts that creating mental models is "the discipline of reflection and inquiry which is focused around developing awareness of the attitudes and perceptions that influence thought and interaction". Most mental models are so deeply imbedded that people do not even realize they are simply models - people believe they are reality.

Resistance to change is an example of such a mental model, and can interfere with successful implementation of change initiatives. The mental model most commonly used to illustrate this is Lewin's Force Field Analysis (Peltier, 2001; Hersey, Blanchard and Johnson, 1996):

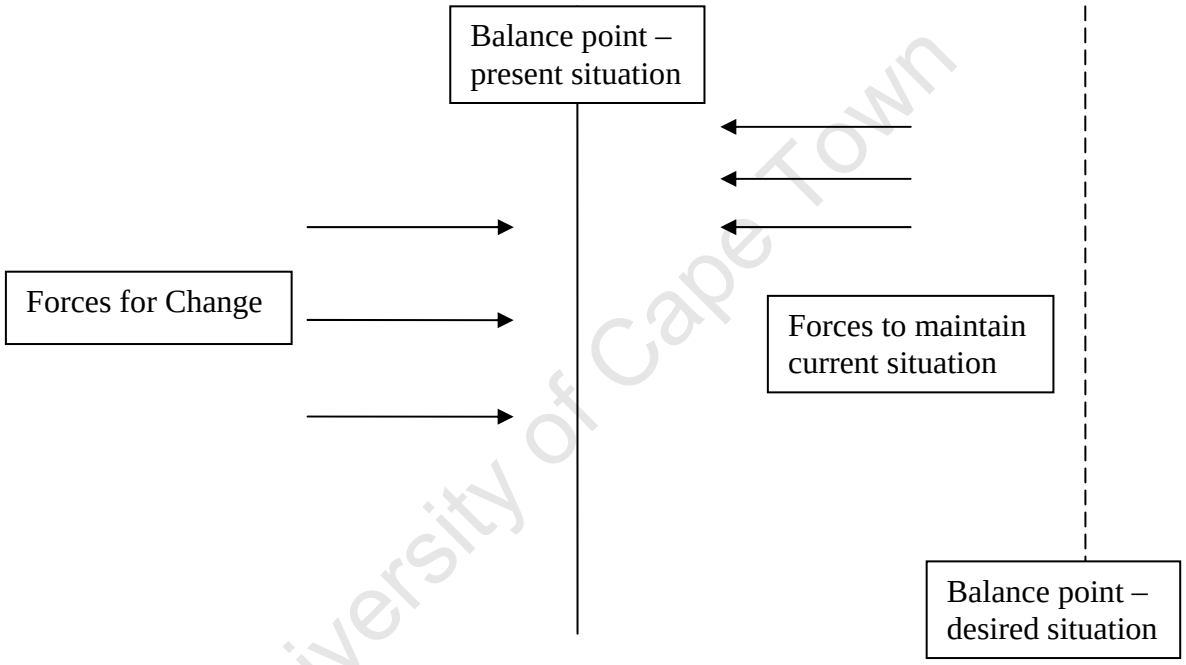


Fig 3.2: Lewin's Force Field Analysis (adapted from Peltier,2001)

In this figure the vertical line represents the balance point or present situation. The arrows on the left of this line are the forces for change or driving forces. On the right of the vertical line are the forces to maintain the present situation or the restraining forces. If the driving forces equal the restraining forces, then the system is in equilibrium.

In order to drive change (say to the dotted vertical line towards the right), there are essentially two options. The first is to increase the driving forces, which often leads to an increase in tension. The other option is to reduce the restraining forces, which often reduces the tension in the system.

Lewin observed (Peltier, 2001, p. 139) that "it is often easier to decrease the restraining forces than to strengthen the facilitating forces, and the process of weakening the restraining forces is more likely to reduce tension, while a strengthening of enabling forces can increase tension."

The above model can be used to conceptually explain why people resist change. In the situation depicted by Figure 3.2 and assuming that change needs to be driven to the right, individuals are faced with two choices, either resist the change or embrace the change. From a change agent's perspective, by resisting the change, the change will take longer to implement. By embracing change, the tension is removed and the resistors become part of the new solution.

If people resist change, why do they do so? In Organizational Behaviour (2001, p. 673), Kreitner and Kinicki note that Coch & French were the first to record resistance to change in organisations. This study, conducted in 1948 at a pyjama factory , posed two research questions - *"Why do people resist change so strongly?"* and *"What can be done to overcome this resistance?"* The main conclusion was that there is less resistance to change when people are allowed to take part in the design and development of the intended change.

Dubrin and Ireland (1993) attribute resistance to change to three factors. The first is the fear of poor outcomes (for example, earning less, working more), the second the fear of the unknown and lastly the fact that there may be errors in the proposed changes to be implemented that have been overlooked by the change management team, which can lead to problems later during implementation. In contrast, Dent and Galloway Goldberg (1999) assert that the best way to confront the traditional view is to advocate that people do not resist change per se, but that they resist the loss of status, pay or lifestyle.

Jones (2003, p.7) adapted Kanter's ten major reasons for resistance as depicted in Table 3.1:

Table 3.1: The Ten Major Reasons for Resistance (adapted by Jones, 2003)

No.	Reason	Description
1	Perceived loss of control	Usually too much is done to people and not enough by them
2	Excess uncertainty	Is a consequence when information about the change is not available to those who are most affected by it
3	Surprise	Occurs when decisions are sprung on people without adequate consultation or articulation of the vision
4	Difference effect	Change means becoming conscious and questioning of familiar routines or habits, which is extremely unsettling for most people
5	Loss of Face	Saying that something needs to be changed makes people anxious that the previous approach is not valued
6	Concerns about future competence	People wonder about their ability to be effective after the change, and whether they will be able to do the new work that is required
7	Ripple effect	Each change has potential flow-on effects which can disrupt seemingly unrelated areas
8	More work	Doing something differently requires more work e.g. more effort, concentration, etc
9	Past resentments	Cynicism and distrust evolved from a history of broken promises, or unaddressed grievances influence acceptance of change
10	A real threat	There may well be winners and losers, genuine pain and loss as a result of the change.

What mechanisms do people use in response to change? Jones (2003, pp. 6-7) states that there are a wide range of responses to any change initiative , and categorizes these responses into four groups, namely pioneers, early adopters, followers and resistors. Pioneers are the group at the front of change – they react by taking action. This group has the most positive view of what the changed situation could be. While early adoptors favour change, they are more cautious in their approach and do not immediately take action. In any change initiative, the greater majority of people are followers. This is the group that supports change once the greater majority of people have bought into the change process. The last group is resistors - this is the group that opposes change.

3.3 The Change Management Process

For change initiatives to be successful, a change management process needs to be followed. There is no single way of doing this, as every change initiative has its own challenges and its own desired output. However, there are authors who note generic sets of skills and strategies that can be used in change initiatives. This section considers definitions of change management, and describes generic skills and strategies for the change management process. The impact of the process on organisations is considered briefly.

Any discussion on change management therefore needs to start with a basic definition of what is meant by change management.

According to Nickols (2004, p.1), who draws on consulting experience, at least three basic definitions are utilised to define the change management process. These include the task of managing change, an area of professional practice and a body of knowledge. For the task of managing change, there are two meanings. The first (Nickols, 2004, p.1) refers to the "making of changes in a planned, managed and systematic fashion, the aim is to more effectively implement new methods and systems in an ongoing organisation". The second meaning relates to "the response to changes over which the organization exercises little or no control (e.g. legislation, social and political upheaval, competitor activity, shifting economic tides and currents, etc)".

The second is an area of professional practice which refers to independent consultants, change agents and consulting firms who engage in change management initiatives on behalf of companies. The third (Nickols, 2004, p.2) is a body of knowledge, which refers to "the content or subject matter of change management and consists chiefly of models, methods and techniques, tools and skills". Nickols (2004, p.4) further states that "at the heart of any change management process lies the change problem, that is, some future state to be realized, some current state to be left behind, and some structured, organized process for getting from the one to the other".

The management of the change process, or being a change agent, requires according to Carnall (1995, p.113) the following three skill areas:

- Managing transitions – having an open attitude to change, by sharing the problems being faced, and with top management support, an environment of learning can be created in which experimentation is encouraged.
- Dealing with organisational cultures – empathy and sensitivity are required when dealing with cross-cultural issues.
- The politics of organisational change – understanding how a given order works or is changed is critical here.

Nickols (2004, p. 7-8) builds upon this with a set of five skills for a change agent, these being political skills, analytical skills, people skills, systems skills and business skills.

- Political skills - as social systems, organisations are very political. Change agents need to understand this, and most importantly, avoid getting involved in the politics, as your judgement can be skewed.
- Analytical skills – this includes systems and financial analysis, and the ability to breakdown and re-build systems is vital.
- People skills – this includes communication or interpersonal skills. The ability to actively listen and view things from the mindset of those undergoing the change is important here.
- System skills are divided into two sets, namely systems analysis and General Systems Theory. In systems analysis, the system is assumed to be closed and cannot learn or change on it's own. In General Systems Theory the system is assumed to be open, and change happens as a result of interactions between the systems sub-parts for mutual survival and benefit.
- Business skills – the skill of understanding business and money, especially how financial markets work

The entire package of skills required by a change agent is represented diagrammatically in Fig 3.3:

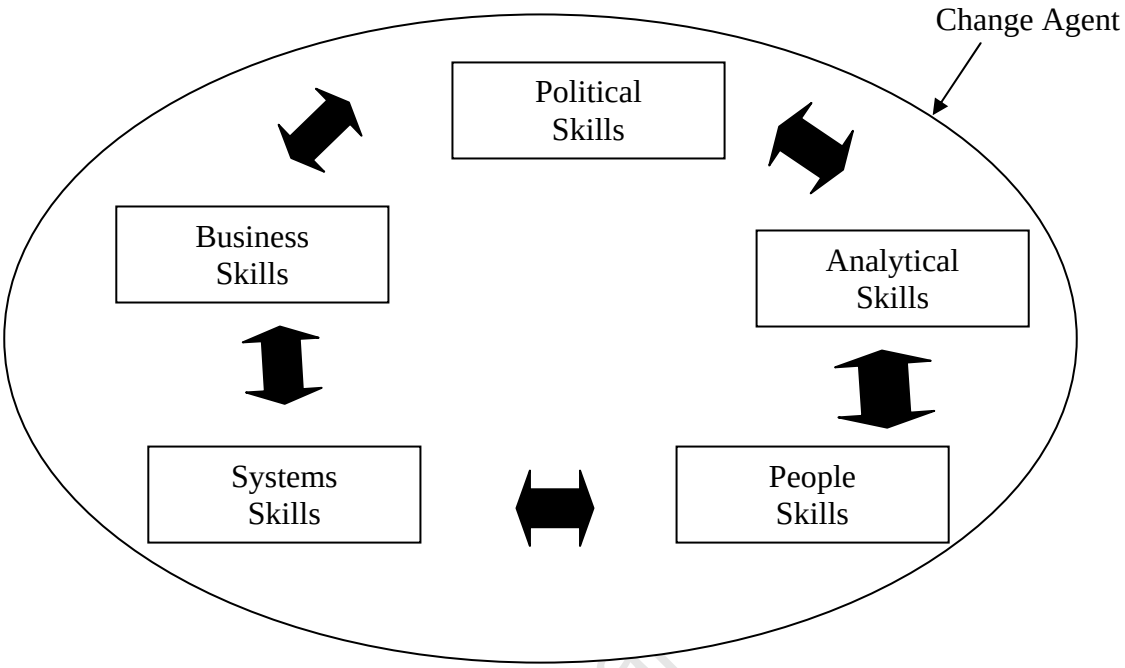


Fig 3.3: The Change Agents Skills Requirements (adapted from Nickols, 2004)

Managing change requires a change management strategy, and how to select the best strategy requires careful consideration. Bennis, Benne and Chin (1969, p. 23) postulated three change management strategies, namely empirical-rational, normative-re educative and power-coercive. Nickols (2004, p. 8-9) further adapted the three change management strategies of Bennis, Benne and Chin to incorporate a fourth, new category called environmental-adaptive. These change management strategies are best represented in table 3.2:

Table 3.2: The Four Basic Change Management Strategies (Nickols 2004 adapted from Bennis, Benne and Chin, 1969).

No.	Strategy	Description
1	Empirical-rational	People are rational and will follow their self-interest — once it is revealed to them. Change is based on the communication of information and the proffering of incentives.
2	Normative-re educative	People are social beings and will adhere to cultural norms and values. Change is based on redefining and reinterpreting existing norms and values, and developing commitments to new ones.
3	Power-coercive	People are basically compliant and will generally do what they are told or can be made to do. Change is based on the exercise of authority and the imposition of sanctions.
4	Environmental-adaptive	People oppose loss and disruption but they adapt readily to new circumstances. Change is based on building a new organization and gradually transferring people from the old one to the new one.

The power-coercive approach is based on political, economic, and/or moral sanctions as sources of influence, is widespread in organizations but not particularly valued by change agents. The power-coercive approach is influenced by a number of different sources (for example, economic and political) and is widely found in organisations. This approach is not widely favoured by change agents. By contrast, the source of influence in the empirical-rational approach is knowledge.

The normative-re-educative approach is the approach most favoured by change agents, as the idea is learning to learn, which obtains greater buy-in from those undergoing the change. Which strategy to use is often the difficult choice – according to Nickols (2004, p.9) a blend of strategies is often the best route to follow. This decision is affected by a number of factors, which include the degree of resistance, the target population, the stakes, the time frame, the expertise and the dependency. The relationship between the four change management strategies and when to use them is represented in table 3.3:

Table 3.3: The link between Strategy Type and Factors (adapted from Nickols 2004,p.9).

Factor	Type of Strategy
Resistance - strong	Coupling of power-coercive and environmental-adaptive strategies
Resistance - weak	Combination of Empirical-Rational and normative-reeducative strategies
Target populations - large	A mix of all four strategies
Stakes - high	A mix of all four strategies
Time frame - short	Power-coercive strategy
Time Frame - long	Mix of empirical-rational, normative-reeducative, and environmental-adaptive strategies
Expertise - Adequate available	Mix of all four strategies
Expertise - Non availability	Power-coercive strategy
Dependency - organisation on it's people	Ability to command or demand is limited, therefore a mix of empirical-rational and normative-reeducative
Dependency - people on the organisation	Ability to oppose or resist is limited, therefore power-coercive
Mutual Dependency	Requires some level of negotiation i.e. a mix of all four strategies

3.4 Chaos Management and how it relates to Change Management

Chaos management is a relatively new field of study. The opposite of order is chaos. Chaos does not reveal a clear system or organisation, and hence is difficult to manage. The first step in dealing with chaos is to understand that there are different types of chaos. Therefore when dealing with chaos it is important to understand that there are different types of chaos. These are personality chaos, communication chaos or development chaos.

Kerner (2003, p.1) asserts that "not all chaos is necessarily bad, and not all of it is necessarily unmanageable". Personality chaos relates to individual's personalities and the influence the can have in the workplace. Examples are non-conformists, those unable to work in teams, etc. Communication chaos relates to the lack of accurate and timeous communication. Development chaos relates to the lack of systems rigour – the negative impact that improper version control of documents, lack of change control requests, etc have on a working environment. Kerner further states that individuals must be willing to embrace change if they are to capture the benefits of good chaos.

With chaos comes complexity - the management of complexity is therefore not a straight forward matter. The traditional way of management is based on the assumption of cause and effect (Beckham 2001). Therefore, if "A" is completed, then "B" will be the result. Additionally, having achieved "B", by undertaking "C" the result will be "D". Beckham (2001, p.41) asserts that "management has largely been a discipline dedicated to the pursuit of cause and effect". Examples of cause and effect management are systems like forecasting, goals and budgets.

In today's age, the issue of complexity has made this traditional way of doing things even harder. Therefore in a complex world, doing "A" to achieve "B" will often result in "Z". According to Beckham (2001, p.41), one way of envisaging complexity is "to consider the minimum number of words to describe something. The more complex something is, the more words it takes to describe it. Another way to think of it is in terms of the number of connections it has to other things. The more connected something is the more complex it will be". We live in a world where things have become more connected than they were only ten years ago. The internet, cell phones and the mass media are examples of this.

3.5 Models of Change

In this section, three widely referenced models of change are examined and used as a starting point from which the author's own model of managing change can be positioned in chapter 7.

There is a proliferation of work on how to manage change through various action steps and how to implement the change viewed from various paradigms, many in the area of problem solving. The change models are discussed in sections 3.5.1 to 3.5.3, with Connor and Kotter being the two most commonly used models to describe organisational change.

3.5.1 Lewin's Change Model

Kurt Lewin was a social psychologist whose landmark work in the 1930's and 40's led to a three-stage change model which to this day still underpins most theories of organizational change. Lewin's model consists of three basic stages: an unfreezing stage, followed by a change (or reframing) stage and a refreezing stage (Hersey, Blanchard and Johnson, 1996).

According to these authors, there are a number of underlying assumptions which underpin this model. Firstly, the process involves learning something new and involves a move away from an existing attitude or behavior. Secondly, there needs to be a motivation for change. The third assumption is that people are at the core of the change. Fourthly, resistance to change occurs even when the desired end state is highly desirable. Lastly, for change to be effective, it must be re-enforced.

The three stages can be represented diagrammatically as follows where A represents the unfreezing stage, B represents the changing (or reframing) stage and C represents the refreezing stage:

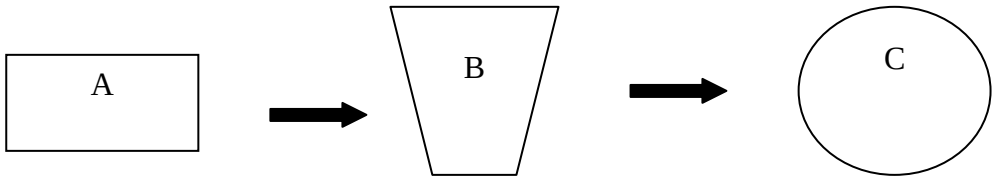


Fig 3.4: Lewin's Model of Change (Hersey, Blanchard and Johnson, 1996, p.482)

In the unfreezing stage, the impetus for change is created. In this stage individuals must be encouraged to move away from their old behaviours and attitudes, and to embrace the change that is being proposed. The technique of benchmarking is often used to unfreeze an organization and demonstrate what can be achieved. When employees see and understand this, the change is so much easier to implement.

The changing (or re-framing) phase is a learning phase, the purpose being to assist employees to learn new concepts or points of view, as well as alternative thinking. Hersey, Blanchard and Johnson (1996, p. 481) identify this as most likely to occur via one of two mechanisms - identification or internalization. Identification is when a few models are provided that can be used as leaning tools for new behaviours, etc. Internalization happens when individuals are placed in a situation which demands new behaviours of them.

The re-freezing stage is a stabilization or consolidation phase in which the desired change is integrated into the fabric and routine way of doing things. People start living the new changes. This phase requires positive re-enforcement and coaching to support the change being introduced, as it is easy for people to revert to their pre-change attitudes and behaviours.

Over the past twenty years, Lewin's model has drawn criticism from a number or quarters. Burnes (2004, p. 977) identified that the key criticism's of Lewin's model was that it "assumed organizations operate in a stable state, is only suitable for small-scale change projects, ignored organizational power and politics, and was top-down and management-driven". Burnes concludes that much of this criticism is unfounded, to the point where the work of Lewin is being re-examined and built upon by others. Weick and Quinn (1999, p.362) concur with this view and state that the Lewin model "continues to be a generic recipe for organizational development".

3.5.2 Conner's Change Model

In *Managing at the Speed of Change*, Connor (1993, p.38) identifies three stages in the change process - the present state, the transition state and the desired state.

Conner's change model is depicted in Fig 3.5:

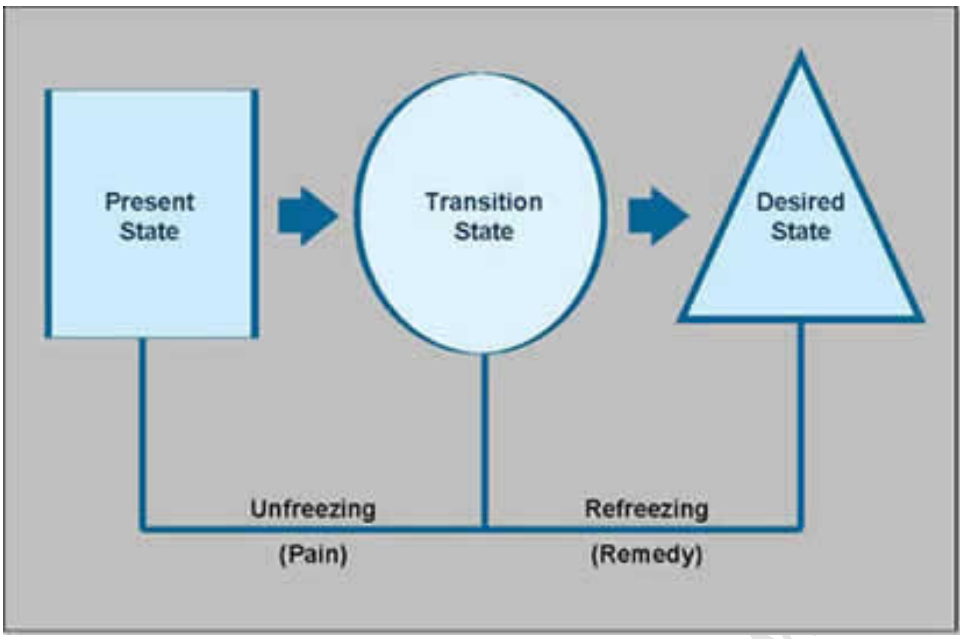


Fig 3.5: Conner's Model of Change (Conner, 1993, p.38)

The first stage of the Connor model is the present state. Movement from the present state to the desired end state will only happen when the end state is perceived to have greater benefits. It is therefore vital that the end state is well defined, as this will ensure acceptance from those undergoing the change.

In order to each the desired end state, the transition state has to be completed. According to Connor, some companies experience this stage as the "journey through hell" (Connor, 1993, pg 23). This stage must therefore be quickly transcended. In order to initiate the change process and move towards the desired state, an unfreezing must occur which can lead to pain.

Pain creates discomfort and provides the trigger that starts the move from the present state to the desired state. Once the transition state has been completed, an anchoring step is required to ensure that changes are entrenched. This is similar to the Lewin model where change, if not properly anchored, can lead to regression to old practices and mindsets.

In the author's own experience, this is often where any change management processes goes wrong. It is often tempting to move to new and exciting projects or initiatives without properly anchoring the initial changes made.

An example of the Connor model in practice is the change in technology from typewriters to personal computers. Typists benchmarked their skills in the number of words per minute that they could type, while computer operators benchmarked their skills in the number of software packages they could operate. The typists felt threatened and could either embrace the change or be compelled to change. By changing the reporting requirements (corrections are easier to complete on a computer than a typewriter), companies enforced a subtle change. Changes in reporting requirements are an example of the introduction of pain which led the typists to unfreeze from the present state to the desired end state.

An example from the author's experience is the move to highly automated manufacturing plants that use in-line instruments for process control. In the past, operators manually recorded results from field instruments and then transcribed this data into process reports. With the introduction of new technology, in-line instruments automatically completed these functions. Operators viewed this as a threat to their jobs, and resisted the introduction of this new technology. Once they had been trained and understood the instruments functioning, they saw how this would make their jobs easier and embraced the change.

3.5.3 Kotter's Change Model

John Kotter of the Harvard Business School is a world renowned expert on leadership. The Kotter model has been used extensively and successfully throughout SABMiller. Various modifications have been made based on experiential learning and roll out of change initiatives, but the basic framework has been retained.

In Leading Change (1996), Kotter describes an eight step process for leading large-scale change efforts that has three distinct phases. Steps one to four can be grouped as a phase which is very similar to the unfreeze stage of the Lewin model. Steps five to seven are the action steps of Kotter's model, and are similar to the re-framing stage of Lewin's model. Step eight, in which change is anchored, is similar to the re-freezing stage of the Lewin model. Kotter also suggests that the eight step process is a framework and that "some overlap in stages is normal" (Kotter and Cohen 2002, p.58).

Kotter's eight step process is depicted in table 3.4:

Table 3.4: The Three Phases and Eight Steps of Kotter's Change Model (adapted from Kotter 1996)

Phase No.	Phase	Step No.	Action
1	Creating an Environment for Change	1	Establishing a Sense of Urgency
		2	Creating a Guiding Coalition
		3	Developing a Vision and Strategy
		4	Communicate the Change Vision
2	Implementing the Change	5	Empowering Employees for Broad- Based Action
		6	Generating Short -term Wins
		7	Consolidating Gains and Producing More Change
3	Changing the Culture to Support the Change	8	Anchoring New Approaches in the Culture

The first phase of Kotter's model refers to creating an environment for change; the aim in this phase is to establish a sound and solid basis for implementation of a particular change. This phase consists of four steps, the first being for the change leaders to establish a sense of urgency. To do this, there must be a convincing reason for doing so. One of the roles of a change leader is to identify the urgent reason, which may be due to a crisis, a change in technology or a new business opportunity, amongst others.

Kotter and Cohen (2002, p.27) refer to "burning platforms that force people to jump away from their comfortable positions". The aim of this step is therefore to jolt people

out of their complacency and get them ready to seize the identified opportunity. This first step is crucial and in Kotter's experience, 50 percent of change efforts fail at this point. Kotter's also suggested that close to 75 percent of the work force must accept the urgency if the overall effort is to succeed.

Step two of the model is creating a guiding coalition, "with the credibility, skills, connections, reputations and formal authority to provide change leadership" (Kotter and Cohen 2002, p.4). The aim is to maintain the urgency started in step one, and to facilitate the change process, thereby leading to a shared understanding of the problems, as well as a view on the possible solutions.

To develop a compelling vision in step three, the guiding team needs to create "sensible, clear, uplifting visions and sets of strategies" (Kotter and Cohen 2002, p.4). Kotter refers to six characteristics of an effective vision, namely that it is future orientated, is compelling, realistic, focused, flexible and easy to communicate (Kotter, 1996).

Step four is called communicating the vision and "the goal is to induce understanding, develop a gut level commitment and to liberate more energy from a critical mass of people" (Kotter and Cohen 2002, p.4).

During this step the idea is to keep people involved and energized for change, and this involves constant and widespread communication using every communication media and tool available. Even more important is that the actions of the change leaders must embody the vision. Change leaders must be seen to be committed as nothing will discredit the process more than a change leader who does not subscribe to the process.

Kotter cautions against skipping any steps in phase 1, as the foundation for effective change is set during this phase. The temptation in today's fast moving world may be to skip steps and move to the action phase before grounding the reason for change. This can compromise the change effort, leaving the change unlikely to survive in the long term.

The second phase of the Kotter model is called implementing the change, and is aimed at developing, trialling and implementing new practices.

This phase includes three steps and is the action element of the change model. The first action step (step five) in this phase is to empower others to act on the vision. To do this, "key obstacles that stop people from acting on the vision are removed" (Kotter and Cohen 2002, p.5). This can be done by coaching managers to empower employees, by providing adequate information and increasing people's confidence and ability to accept change.

Step six is called generating short term wins. These are important "to provide credibility, resources and momentum to the overall effort" (Kotter and Cohen 2002, p.5). It is important to celebrate early wins, even if they are small. By rewarding people for their efforts, the drive towards the end state is maintained.

During step seven, gains are consolidated and more change is produced, requiring change leaders to continue driving the change process. At this point it may be tempting not to follow through with step eight, but Kotter cautions against this.

In the author's own experience, this is often where a change management process goes wrong. The change agent may be moved to head up another project, leaving the remaining team members to anchor the changes in step eight. The team loses momentum as a result of a lack of leadership from the change agent having moved on.

The single step in third phase deals with entrenching the change and changing the organizational culture to support the change. In this step, change leaders anchor the change by "nurturing a new culture. A new culture, group norms of behaviour and shared values develops through consistency of successful action over a sufficient period of time" (Kotter and Cohen, 2002, p.6).

3.5.4 Surfacing the Key Elements of the Three Change Models

In sections 3.5.1 to 3.5.3, three widely used models of change have been presented from the literature. The aim of this section is to filter each of these models through the CATWOE checklist, in order to extract the essence of each model, and to see how closely they approximate the writer's experience of change.

In his description of Soft Systems Analysis (which is a methodological approach to understand the various systems at work in a complex social environment), Checkland (1991) uses a CATWOE checklist to confirm that the definition of the system is complete. CATWOE is a mnemonic which stands for the various aspects of the definition of the system that should be checked.

C stands for "customer of the system" and in this context it means those who are on the receiving end of whatever it is that the system does, be they beneficiaries or victims.
A stands for "actors", meaning those who carry out the activities envisaged in the system being referred to.
T is the "transformation process", or what the system does to the inputs to the system to change them into outputs.
W stands for "*Weltanschauung"* or "Worldview". This forces one to be explicit about the way in which the system is viewed.
O stands for "owner" of the system, and identifies those who have sufficient power over the system to cause it to cease to exist.
E stands for "environmental constraints", or those elements that constrain a system that you have taken as a given.

In Table 3.5 the reader will find a tabulated comparison of the three change models vs. the CATWOE checklist:

Table 3.5: CATWOE checklist of the three change models

CATWOE Checklist	Lewin	Conner	Kotter
Customer	In this case it could be the owner of the system (such as a manager or a team that wants to introduce change in order to achieve a set objective), or an individual who initiates change so that they will be the beneficiary.	In the people within an organization that is undergoing change. The people within the organization are the beneficiaries of the process.	Is a team undergoing change?
Actors	This could be the individual directly involved in the change process, or could be those people who are recipients of the change process.	The people within the organisation, with a requirement that everyone goes through the transition state to reach the desired end state.	Are the people undergoing the change itself?
Transformation	The transformation is from one steady state to another. And is made possible by the "unfreezing" of a situation, a "reframing" and a "refreezing" to form a new steady state.	The transformation is from a "present state" via a "transition state" to a "desired state". The unfreezing process from "present state" to "transition state" involves "pain", while the refreezing process locks the new behaviours in place.	In order to implement change, an environment first needs to be created for change. Implementing the change is the transformation process in this model.

CATWOE Checklist	Lewin	Conner	Kotter
Worldview	Change will be initiated if there is sufficient motivation to do so, with the motivation aspect being a construct of the person initiating the change. The same degree of motivation for change will not be received by everyone for the same data inputs.	Dissatisfaction with the current conditions creates the need for change.	People must have a very good reason for doing something different
Owner	This is also the customer of the process (in most cases).	The people who are undergoing the change itself.	The owner is the leadership that is affecting the change
Environment	Resistance to change is the major concern, and individuals and groups need to be closely involved in the process of making their own decisions and carrying those decisions through to implementation.	This is the ability of people to accept change and to "freeze" the new behaviours into practice.	A sense of urgency must be created for change to be effective, as the people undergoing the change are the most likely to oppose any change initiatives

These three models represent different perspectives of the change process. However, one thing they all have in common is that change is a disruption to a system, and that the process that emerges from this is one that restores a sense of stability.

While the above models have some features in common with the research outcomes described in chapter 6, the author believes that they do not adequately explain some of the systemic issues of change that have experienced. Chapter 7 therefore deals with how the author has constructed his own model of change for Managing Change in a Changing Environment.

3.6 Summary

Change and the management of change is a varied and complex subject, and there is a vast body of knowledge on the matter. The aim of this literature survey was to review the critical points of current knowledge on the subject, with a view to using this knowledge in later chapters of this study.

Four broad categories of change were reviewed in this chapter. Section 3.1 concerned change itself, and included a definition of change and also discussed the differences between continuous and discontinuous change.

Section 3.2 focused on resistance to change and answered the following questions - what resistance to change means, why people resist change and what mechanisms people use when faced with change.

Change management was reviewed in section 3.3. This section focused on a definition of change management, the skills required of an effective change agent, a discussion on change management strategies and factors for selecting a particular strategy. This section ended off with a discussion of the impact of change on performance.

Chaos management and its links to complexity and change management were introduced in section 3.4.

Three widely referenced models of change were examined in section 3.5. These were the change models of Lewin, Connor and Kotter. The literature survey ended by surfacing the key elements between the Lewin, Connor and Kotter change models via a CATWOE checklist in section 3.5

Chapter 4 – The Philosophical Framework for Research

In this chapter the philosophical assumptions guiding the research design and informing the choice of the methodology, methods and data collection and analysis is outlined. The chapter starts with definitions of terms, followed by a review of the underlying philosophies which underpin Lewis's theory of pragmatic knowledge. Four paradigms of research are introduced.The merits of quantitative and qualitative research data are also considered. The different methods of reasoning are introduced and the role of systems thinking and cybernetics in relations to this research study is outlined.

According to the Chambers 21st Century dictionary (2002), research is defined as a "careful search or investigation - a systematic investigation towards increasing the sum of knowledge" while the word study is defined as "the application of the mind to the acquisition of knowledge". Therefore the main aim of conducting a research study is the generation of knowledge. However, for knowledge claims to be declared valid, they must be subjected to validation. Therefore the method of collecting data and making inferences from this has to satisfy this requirement. Coupled to this the research approach adopted must satisfy an underlying philosophy of knowledge creation and verification. The particular philosophy adopted informs one's worldview and is itself reframed over time as one changes one's worldview.

What do the terms methodology, paradigm and worldview mean? A methodology is a system of methods and rules applicable to research or work in a given science or art (Heyligen 1996). Methodology is also more than a set of methods – it includes both the rationale and the philosophical assumptions that form the basis for a particular study. The common idea here is the collection, the comparative study, and the critique of the individual methods that are used in a given discipline or field of inquiry. The central idea is that methodology refers to the collection, the study and the critique of individual methods that are specific to a specific discipline or field of inquiry.

Paradigm is a pattern a pattern or model, an exemplar (Heyligen 1996). The word *paradigm* comes from the Greek word *paradeigma* which means pattern or example. A paradigm is basically a worldview or a "set of propositions that explain how the world is perceived", and a paradigm of inquiry informs a researcher as to "what is important, what is legitimate and what is reasonable" concerning systemic inquiry (Sarantakos 1993, p.30). Therefore the paradigm is the pattern or model used to construct a thought pattern relating to organizing and understanding reality. The operating paradigm therefore often represents a more specific way of viewing reality, than the much more general scientific method.

What is a worldview? The term is taken from the German word *Weltanschauung* which means a look onto the world, and relates to the process by which we interpret the world and interact with it. It can be described as a conceptual reference for understanding the complexity of the world we live in. This allows us to make sense of our experiences, our thoughts, our feelings and social contacts. Heylighen (1996, p.61) describes a worldview as a framework that will "… synthesise the wisdom gathered in the different scientific disciplines, philosophies and religions. Rather than focusing on small sections of reality, it would provide us with a picture of the whole." As such a worldview is our personalised set of theories about our world for decision and action.

A hierarchy of thought levels, where each level informs the next, can be depicted as follows:

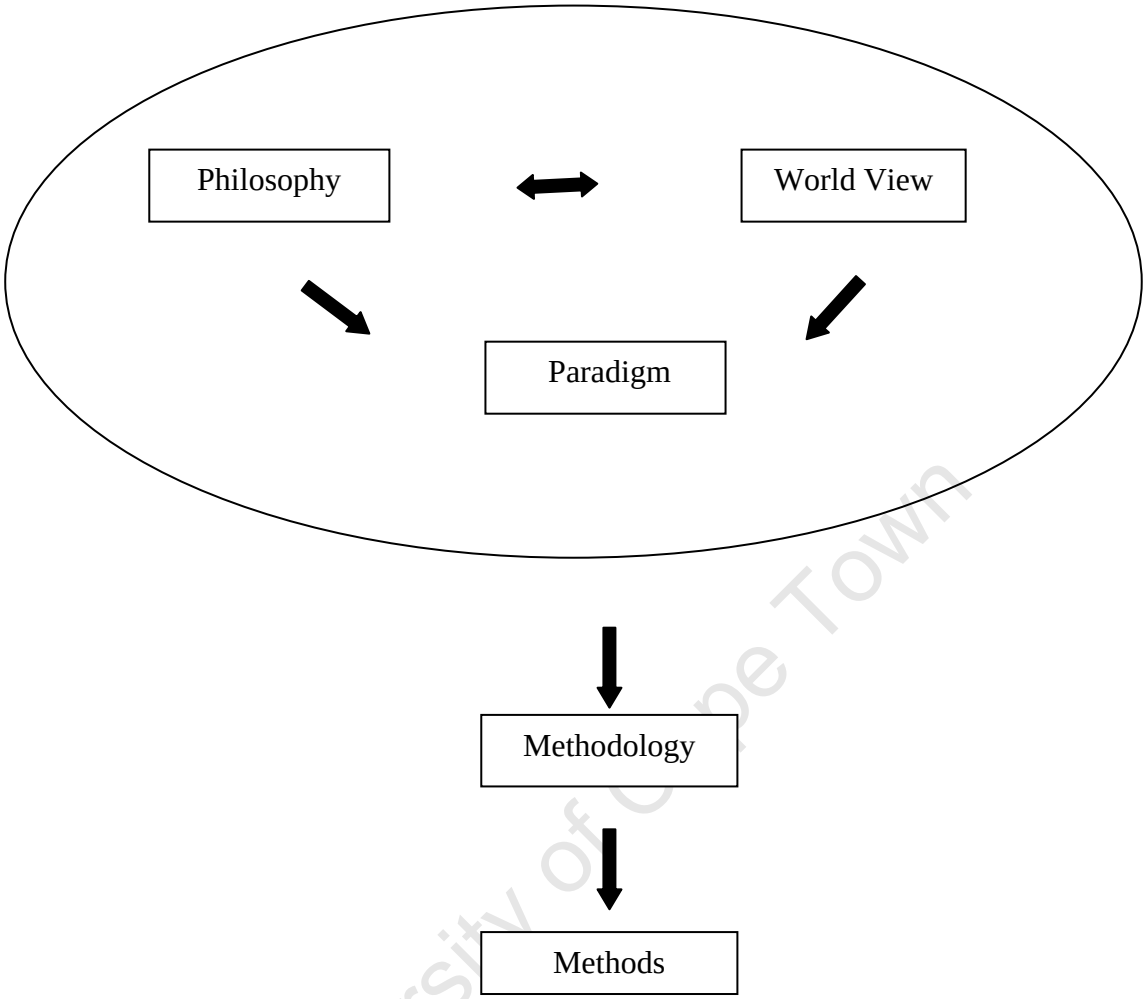


Fig 4.1: Logical Levels of Thought and Action

This diagram shows that the choice of research method and methodology is dependent on the paradigm, which in turn contextualises the research situation (Heyligen, 1996).

4.1 Underlying Philosophy

All types of research are based upon certain underlying assumptions about what makes the research valid, as well as which research methodologies are appropriate. Ostwald (cited by Peterson 1998, p.98), wrote that "all realities influence our practice and this influence is their meaning for us". Lewis (1929) built upon Ostwald's thinking and marked a distinct shift from theoretical absolutes, closed systems and fixed principles towards concreteness and adequacy, actions and facts. Lewis espoused a theory of pragmatic knowledge and used three building blocks to construct this theory. These building blocks are represented in Table 4.1:

Table 4.1: The Building Blocks of Lewis's Theory of Pragmatic Knowledge (Lewis 1929, p.98)

Building Block	Description
Content of Awareness	Our initial perceptions of the world are through our five senses, our dreams and our imagination, which become the raw data for our immediate experience. This information is then assessed on its intrinsic value, in order to allow us to act or respond to the experience. However, we cannot assume that each individual sense is a given representation in exactly the same way.
Conceptual Knowledge	In order to avoid sensory overload, order needs to be imposed from chaos. This is achieved by classifying data into general concepts concerning expected relationships and properties. While these general concepts must be consistent and rational, they do not have to match reality. Useful concepts are built with unambiguous operational definitions which then allow us to create hypothesis that are testable. While we can be certain about our definitions and concepts, we can be mistaken about how we can apply them.
Empirical Knowledge	As described by Lewis, empirical knowledge gives us the opportunity to develop and modify a set of rules and/or relationships, thus allowing us to predict future or "post-change" outcomes.

Using these building blocks, Lewis framed a theory of pragmatic knowledge that says "a statement, conveys knowledge if it predicts future outcome, with the risk of being wrong, and that it fits (without failure) observations of the past" (Lewis, 1929, p.47). Similarly, Lewis defined rational prediction as "requiring theory to build knowledge through system revision and extension of theory based on comparison of prediction with observation." Lewis's Theory of Pragmatic Knowledge can be represented diagrammatically in Fig 4.2:

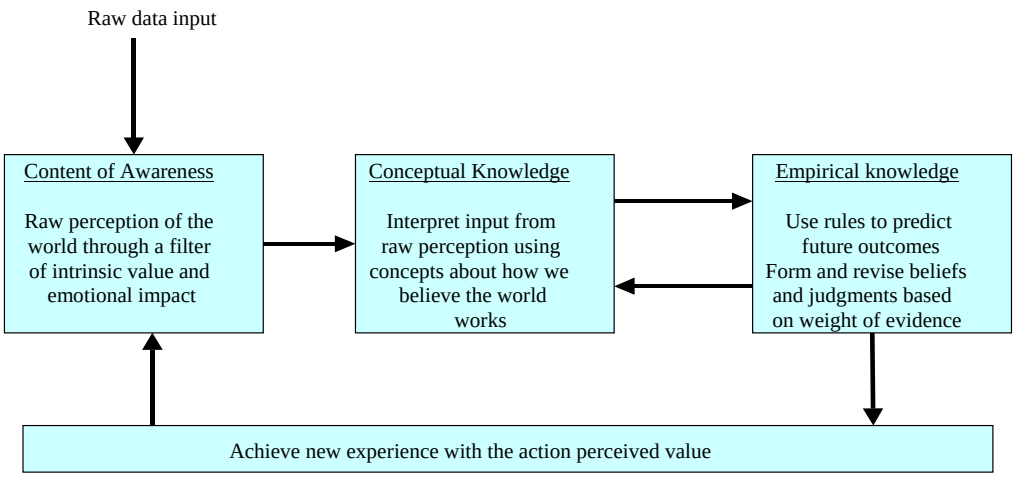


Fig 4.2: An adapted view of Lewis's Theory of Pragmatic Knowledge (Lewis, 1929, p. 57)

Many of our beliefs and judgements (or mental models) are based on past experiences and probable outcomes. We believe a current set of inputs if they are consistent with concepts developed based on past experience. Should the new results support our predictions, our confidence in that belief increases. In some cases, however, a single test can invalidate our beliefs. We can therefore never be completely certain of our beliefs since confirmation occurs in a finite number of trials.

4.2 Paradigms in Research

A paradigm is in essence a worldview or a "set of propositions that explain how the world is perceived," and a paradigm of inquiry informs a researcher as to "what is important, what is legitimate and what is reasonable" concerning systematic inquiry (Sarantakos 1993, p.56). Although varying opinions exist as to what are the present paradigms of inquiry, the most frequently cited and discussed classification is that offered by Guba and Lincoln (1994), who considered that in this present era, the four basic inquiry paradigms are:

Table 4.2: The Four Basic Inquiry Paradigms (Guba and Lincoln 1994, p.89)

Inquiry Paradigm	Explanation
Positivism	Holds that reality, as a true state of affairs, can be ascertained by research and that the researched object is independent from the researcher.
Post positivism	Claims that reality exists and can be probabilistically, but not fully, apprehended.
Interpretivism and Constructivism	In order to perceive the nature of reality as a local and specific mental construction formed by a person and multiple mental constructions collectively exist regarding reality (relativism)
Critical Postmodernism	It is believed that a virtual reality shaped by numerous values over time can be apprehended, but then only for practical purposes.

Each of the paradigms is discussed in more detail below:

4.2.1 Positivism

The central assumption of positivism is that we live in an objective world, and hence this paradigm "often searches for facts conceived in terms of specified correlations and associations among variables" (Gephart 1999, p.35).Traditionally positivism relied on experimental and quantitative methods for testing and verifying of hypotheses. In recent times this has been replaced and complemented with qualitative methods, so that a broader range of information is collected outside of a set of variables. This new trend implies that there is an increasing focus on falsification (as opposed to verification). Therefore one contradictory case or attribute can falsify an anticipated relationship.

4.2.2 Post Positivism

Post positivism is consistent with positivism in that it "assumes that an objective world exists; however, it does assume that the world might not be readily apprehended and that variable relations or facts might be only probabilistic and not deterministic" (Gephart 1999, p.37). According to Miles and Huberman (1993), post positivism currently centres around qualitative methods that are closely modelled on positivism and experimental designs. This in turn mirrors post positivists attempts to address shortcomings in the methodologies employed by quantitative method . Grounded theory is a methodology used in post positivism to investigate and test variables and the way they interact in situations where it is impossible to conduct quantitative and statistical measurement.

4.2.3 Interpretivism and Constructivism

Schwandt (1994, p.118) states that "interpretive research is fundamentally concerned with meaning and that it seeks to understand the definition of a situation". Schutz (cited by Gephart, 1999) believed that interpretive theory entailed constructing a second order theory or theory of members theories. This is distinct from positivism, where impartial realism and its significance are deemed to be autonomous of people. Interpretivists believe that knowledge and its significance are acts of interpretation. Therefore there can be no purposeful knowledge independent of thought and reason. The main features of shared meaning and understanding are often addressed by interpretivism. On the other hand, constructionists reason that knowledge and truth are the result of perspective (Schwandt 1994, p.125) . Therefore these truths are measured relative to some meaning, situation of viewpoint.

Interpretivist and constructionist therefore share a concern with subjective meanings. Data collection and representation have been achieved via informant interviewing (Spradley, 1979), ethnography, or the accounts of how cultures interact and function based on personal involvement with the culture (Van Maanen, 1988). Other methods that have been used are ethnographically linked textual analyses (Gephart, 1999), as well as grounded theory.

4.2.4 Critical Postmodernism

Critical postmodernism is a combination of two worldviews, namely critical theory and postmodern scholarship. Critical theory was developed by the Frankfurt School in Germany and is based upon the German tradition of philosophical and political thought stemming from Marx, Kant, Hegal and Max Weber (Kincheloe and McLaren, 1994 cited by Gephart, 1999). While critical theorists differed on many issues with Marxist orthodoxy, they still focussed on the impact of capitalism and the perceived negatives that capitalism produced such as power, suppression and prejudice.

A central assumption of the critical practice is that capitalist modes of production produce the material world that we live in. However, this contains a contradiction which acts as both a social value and a structure. The contradiction is this – the business owner (i.e. the capitalist) can take advantage of workers by remunerating them less than the value of the products they make. A further contradiction is that the capitalist has the right to keep the profits earned.

Gephart (1999) noted that critical postmodern research has often focused on discussions at the micro level, which is in contrast to the macro level focus typically found in critical theory research. Critical postmodern research often discusses the differences between power. Therefore the objective in critical postmodernism is to break down these differences so that structures of power, suppression and prejudice are revealed. This enables reconstruction or offers alternative, less exploitative solutions.

4.3 Quantitative and Qualitative Research

Quantitative and qualitative research are considered as two forms of research. Quantitative research is extensively utilised in the area's of natural and social sciences (Guba and Lincoln, 1994). The overriding objective with quantitative research is to use models, theories and hypotheses to understand and explain natural phenomena. Accurate measurement is a vital constituent of this form of research – it connects empirical observation with measurement, thus conveying the relationship between the two. As a result, quantitative research is frequently iterative by nature.

By contrast, qualitative research focuses on individuals and groups and how they analyse, understand and interact with their surroundings, and how they then use this to learn and construct meaning. Qualitative research however places little emphasis on the use of statistics to validate a particular hypothesis. Qualitative data typically involves words and quantitative data involves numbers. Another major difference between the two is that qualitative research is inductive, while quantitative research is deductive. In qualitative research, a hypothesis is not needed to begin research. However, all quantitative research requires a hypothesis before research can begin.

A further difference between qualitative and quantitative research is the underlying assumptions about the role of the researcher. In quantitative research, the researcher is ideally an objective observer that neither participates in nor influences what is being studied. In qualitative research, however, it is thought that the researcher can learn the most about a situation by participating and/or being immersed in it. These basic underlying assumptions of both methodologies guide and sequence the types of data collection methods employed.

Each of these approaches has its drawbacks. A criticism of quantitative research is that it often forces responses or people into categories that might not fit in order to make meaning. Qualitative research, on the other hand, sometimes focuses too closely on individual results and fails to make connections to larger situations or possible causes of the results. The two methods are sometimes used together in order to gain a deeper understanding of causes of social phenomena, or to assist with the creation of new questions for examination. The methods can best be summarised as follows:

Table 4.3: Quantitative vs. Qualitative Methods (adapted from Guba and Lincoln, 1994, p.67)

Area	Quantitative	Qualitative
Method	Test hypothesis that the researcher begins with.	Capture and discover meaning once the researcher becomes immersed in the data.
Concepts	In the form of distinct variables.	In the form of themes, motifs, generalisations, taxonomies.
Measures	Systematically created before data collection and are standardised.	Created in an ad hoc manner and are often specific to the individual setting or researcher.
Data	In the form of numbers from precise measurement.	In three form of words from documents, observations or transcripts
Reasoning	Deductive	Inductive
Theory	Largely causal and deductive.	Can be casual or non-causal and is often inductive.
Research Procedures	Procedures are standard, and replication is assumed.	Procedures are particular, and replication is very rare.
Analysis Process	Uses statistics, tables, or charts and discusses how what they show relates to hypotheses.	Extracting themes or generalisations from evidence and organising data to present a coherent, consistent picture.

4.4 Systems Thinking and the Cybernetics Paradigm

Systems theory is concerned with the organised complexity of purposeful systems and by definition, a system has no existence without a purpose (Ackoff, 1984).

Cybernetic theory is concerned with how to effectively regulate the complexity within a system. Norbert Weiner, accredited the title of father of cybernetics, defined it from the Greek word steersman or governor, to be the "science of effective communication and control in man and the machine" (Clemson 1984, p.51).

Stafford Beer took this definition beyond engineering into social systems by defining cybernetics as the "science of effective organisation" (Clemson 1984, p.76). The word organisation here is meant as a verb not as the noun describing a concern or company. Cybernetics therefore has to do with how systems organise themselves. Stafford Beer (as cited by Clemson, 1984, p.67) defined systems as having the following main characteristics:

- Complex – having more relevant detail that any given observer can deal with
- Dynamic – constantly changing in behaviour or structure or both
- Probabilistic – exhibiting behaviour that is at least partly random
- Integral – they act is some way as a unity
- Open – they are embedded in an environment which affects the system but which is also affected by it.

Cybernetics therefore studies the differences between effective and ineffective modes, structures or methods of organisation in certain classes of systems. Another way of expressing this is to say that cybernetics relates to general patterns, laws and principles of behaviour that characterise complex, dynamic, probabilistic, integral and open systems. Ashby (1970) wrote three basic cybernetic laws of complex systems:

Table 4.4: Ashby's Cybernetic Laws (Ashby 1970, p.67)

Law No	Law Name	Description
1	Self-Organising Systems Law	Complex systems organise themselves. The characteristic structural and behavioural patterns in a complex system are primarily the result of the interactions of the system parts. The corollary to this law is that complex systems have basins of stability separated by thresholds of instability.
2	Feedback Law	The output of a complex system is dominated by the feedback and within wide limits, the input is irrelevant. The corollary to this law is that all outputs that are important to the system will have associated feedback loops. Feedback loops can be conveniently divided into two classes depending on their effect upon the system behaviour. The first are negative or error correcting or goal seeking. The second are positive or vicious or deviation amplifying.
3	Law of Requisite Variety	Given a system and some regulator of that system, the amount of regulation attainable is absolutely limited by the variety of the regulator. This law means that the more complex a system compared with its regulator, the lower the degree of (external) regulation achievable, thus the self-organising law holds

These three laws therefore provide a context for thinking about complex social systems such as organisations. Application of systems thinking concepts and cybernetics enables understanding of complex social phenomena.

Systems thinking is a useful way of thinking about the world in which we live, and how we behave more effectively in it. The more we build our understanding of system behaviour, the more we can anticipate that behaviour and work with the system to shape the quality of our lives. Systems have several essential characteristics, which include the following:

- A system's parts must all be present for the system to carry out its purpose optimally.
- A system's parts must be arranged in a specific way for the system to carry out its purpose.
- Systems have specific purposes within larger systems.
- Systems maintain their stability through fluctuations and adjustments – left to themselves, they seek to maintain their stability.

- Systems have feedback, which is the transmission and return of information. This can be feedback within itself, or between itself and external systems.

As a language, systems thinking has unique qualities that make it a valuable tool for discussing complex systemic issues. Systems thinking emphasizes looking at wholes rather than parts, and stresses the role of interconnections. It is a circular rather than a linear language that has a precise set of rules. It offers visual tools such as causal loop diagrams and behaviour over time graphs, which are rich in implications and insights, and which open a window on our mental models. A number of different systems tools have been utilized in the writing of this thesis. These systems tools have purposely not been discussed in any detail in this chapter, as the author believes that they contribute to greater continuity in the writing of this thesis as discussed in chapter 6 at the point at which each of the tools is utilized.

4.5 Types of Reasoning

In logic, there are three broad methods of reasoning, namely deductive, inductive and abductive approaches.

Deductive reasoning (Fig. 4.3) works from the more general to the more specific, sometimes called a top down approach.

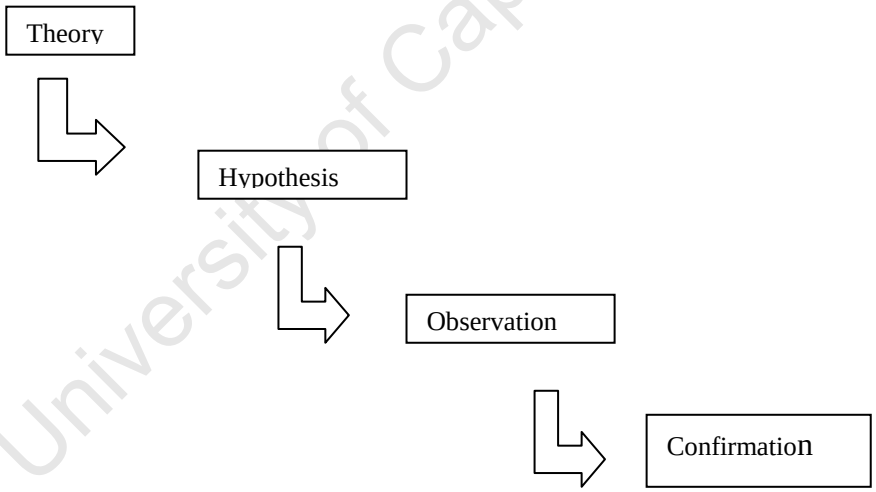


Fig 4.3: Deductive Reasoning

In deductive reasoning, a theory about the topic of interest is thought up. The theory is then narrowed down via a detailed hypothesis, which can be tested. Once observations are collected, the theory can be further narrowed down. Ultimately this leads to a test and verification of the original hypothesis with data.

Inductive reasoning (Fig. 4.4) works the opposite way around from inductive reasoning. In this case the process moves from observations and measures through to analysis of patterns and trends. These then inform a tentative hypothesis which can then be tested and validated. Inductive reasoning is often referred to as a bottom up approach.

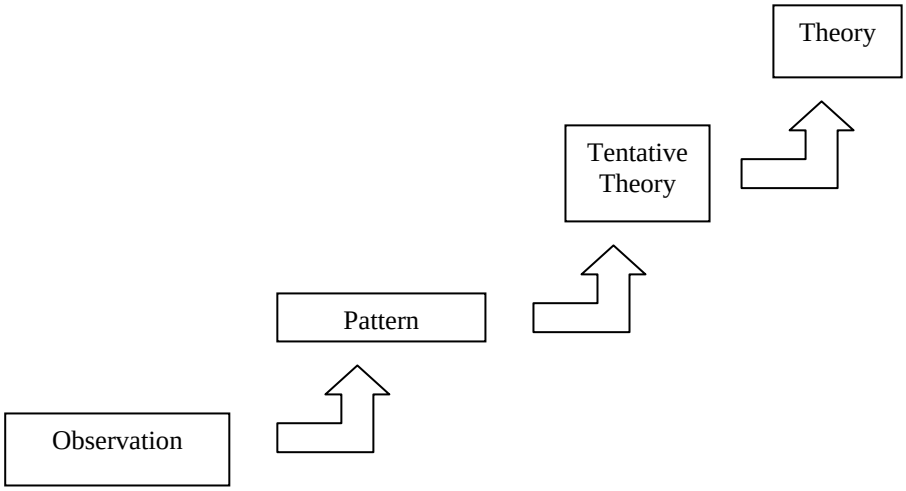


Fig 4.4: Inductive Reasoning

The third type of reasoning is abductive reasoning. This process starts from a set of facts and /or figures and works towards the most logical explanation of this data. Charles Pierce (Stanford Encylopedia of Philosophy, 2001) was the philosopher who first introduced the concept of abduction into modern logic in the late 1900's. Despite this long history, abduction is still not favoured amongst texts that focus on formal logic. Logic is divided into two types of reasoning, namely formal and informal reasoning. Symbolic logic is an example of formal reasoning, while critical thinking is a form of informal reasoning. Abduction is a type of informal, critical thinking which contrasts with deduction and induction, which are forms of formal, symbolic logic.

4.6 Determining a Methodology

Guba and Lincoln (1994) suggested that the four philosophical paradigms described in section 4.2 could be distinguished by answering the following basic ontological, epistemological and methodological questions.

Ontological questions are concerned with a specific view of a reality, and two positions are normally taken. The first position is that there is one reality that is observed by an inquirer, who has little or no impact on the object being observed. The second position is that reality is constructed of individuals' mental models of the objects with which they engage, and that this engagement in some way impacts on both the observer and the situation being observed. The typical questions being probed are: *What is the form and nature of reality? What can be known about reality? How the reality exists, is organised and works?*

Epistemological questions examine the nature of knowledge and the relationship assumed to be present between the knower and what is known or being sought to be known. It therefore deals with the assumptions about truth and non-truth. The typical questions being probed are: *What is the nature of the relationship between the knower (the inquirer) and the would-be knower and what can be known? How do we know? How is knowledge derived? How is this knowledge to be validated and tested? What are the limits of understanding?*

Methodological questions are concerned with the techniques for acquiring knowledge. Typically then, the following question would be asked: *How the inquirer should go about finding whatever he or she believes can be known?*

Most philosophers and students of science agree that ontological and epistemological assumptions underpin which methodology a researcher believes to be better than another and dictate which techniques are more appropriate in the study of a problem. Bearing these comments in mind, the following assumptions have been made in setting the foundation for the author's methodological choice.

The study takes place in a naturalistic setting, namely the workplace, where the author participated and observed the day-to-day experiences of a particular group in their work environment. The author did not seek to validate and test the truths and non truths of what is happening in this environment and is aware that by participating he has an impact on these changes. Ontologically and epistemologically, an objective reality is not assumed as the perspectives of the author and participants are considered to have validity.

On the basis of these assumptions, the author was able to identify the features of a methodology that suited the line of inquiry;

- It had to allow the author to deal with a social situation where the meaning of the experiences could be interpreted.
- It had to allow for the fact that these interpretations would be emerging while more experience accumulated.
- It needed to provide ways of understanding how the author interpreted and responded to these experiences.
- It needed to provide ways of modifying the world or taking action.

The author therefore selected action research as the research approach for this study.. This is further expanded upon in chapter 5.

4.7 Summary

In this chapter, various philosophical issues were discussed as a backdrop to justifying the research approaches of ethnography and action research. These are detailed in the next chapter.

Chapter 5 – The Methodological Framework of Research

Building on from chapter 4, this chapter seeks to review the methodologies of action research in order to validate this choice of inquiry into the problem statement. The chapter starts with an overview of action research from the time it was first conceptualised by Kurt Lewin until its present day usage. Various definitions of action research are explored, as well as links to and comparisons with action learning. Winter's six action research principles are also discussed.

A discussion of the ethical considerations that need to be borne in mind when carrying out action research is discussed, as well as criticisms of the action research method from various sources. The chapter ends off with a review of ethnography as a data collection methodology.

5.1 Action Research – a Methodological Overview

Kurt Lewin is generally considered the originator of action research and is credited with the use of the term action research as early as 1946. Lewin specialised in the area of social problems, focusing his efforts to address conflicts and change within organizations, using participative group processes.

In this treatise, action research was characterised (Dick 1993, p.12) as "a comparative research on the conditions and effects of various forms of social action and research leading to social action," using a process of "a spiral of steps, each of which is composed of a circle of planning, action and fact-finding about the result of the action". The basic cycle involves the following:

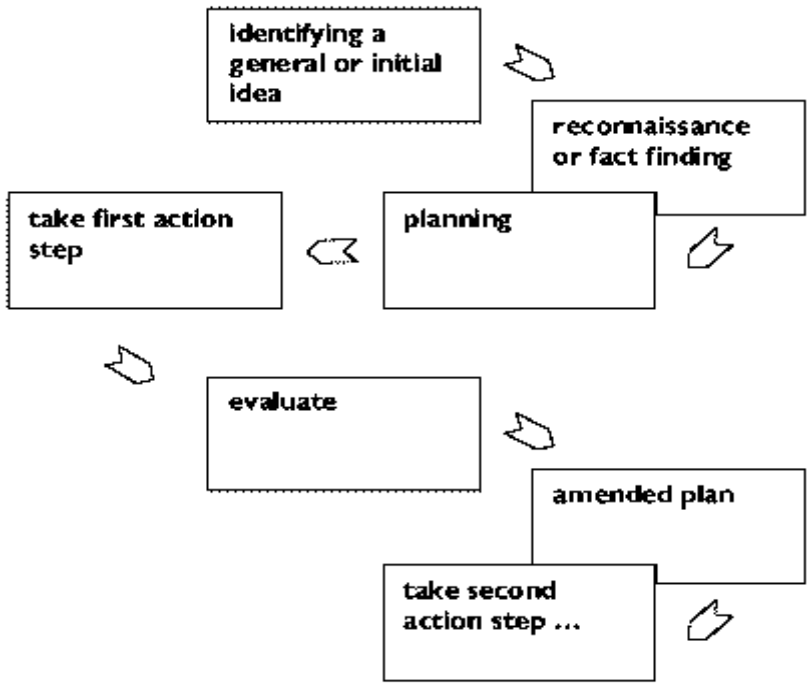


Fig 5.1: Lewin's Action Research Model (Lewin, 1946 as cited by Dick 1993, p.14)

Another major contributor to the field of action research was Eric Trist. Over time, his main focus was on large, multi-organizational problems. The common theme between the research of Lewin and Trist was that they both applied it to systemic change within and between organizations. They also both ardent supporters of the principle that decisions are best implemented and solved by those who make them.

By the mid-1970s, the field of action research had further evolved, revealing four main directions, namely traditional, contextual (action learning), radical, and educational action research.

5.2 A Definition of Action Research

The methodology of action research has two main aims, namely action and research. Action is required to bring about change, while research is required to increase understanding. Another definition of action research is learning by doing - a problem is identified by a group of people who then resolve to do something about the problem. This group then reviews how successful their efforts were, and if unsuccessful, they try again. In this way the learning is cyclical. A more succinct definition from MacIsaac (1995, p.29) is, "Action research aims to contribute both to the practical concerns of people in an immediate problematic situation and to further the goals of social science simultaneously. Thus, there is a dual commitment in action research to study a system and concurrently to collaborate with members of the system in changing it in what is together regarded as a desirable direction. Accomplishing this twin goal requires the active collaboration of researcher and client, and thus it stresses the importance of co-learning as a primary aspect of the research process."

Action research is made up of a group of research methodologies that practices both action and research simultaneously. It therefore has parts that are similar to consultancy or change agency, and some which are similar to field research. In order to guide its conduct, a set of guiding principles has been established that govern the use of this methodology.

Action research, according to Dick (1993) is inclined to be cyclic (similar steps tend to recur, in a similar sequence), participative (both users and informants are involved as partners, or at least active participants, in the research process), qualitative (language is more often dealt with than numbers) and reflective (critical reflection is carried out on the process and its outcomes).

Action research must also be responsive and able to change as the situation changes. This implies it must be flexible. Action research is also emergent, meaning that the process unfolds gradually. Thanks to the cyclic nature of action research, the responsiveness and rigour of the process is supported. Critical reflection is a vital step in each action research cycle. This step involves recollection of data and then critique of the data also that understanding is increased or improved. This in turn informs the next cycle.

This cycle or spiral nature of the action research cycle is illustrated in Fig. 5.2 below:

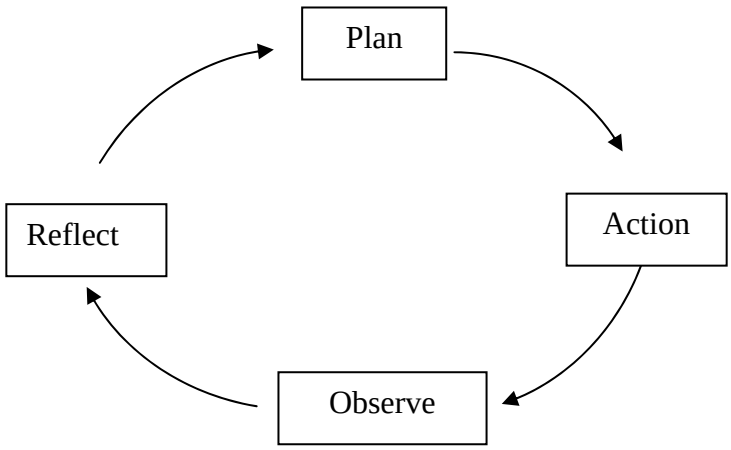


Fig 5.2: The Action Research Cycle (Kemmis 1988, p.66)

In this cycle, an observation leads to reflection, which in turn leads to the next stage of planning. Planning then leads to action, following which the cycle starts again at observation. Multiple cycles of this loop allows for greater rigour to be established.

Susman (1983) distinguishes five phases to be conducted within each action research cycle, which is represented diagrammatically below:

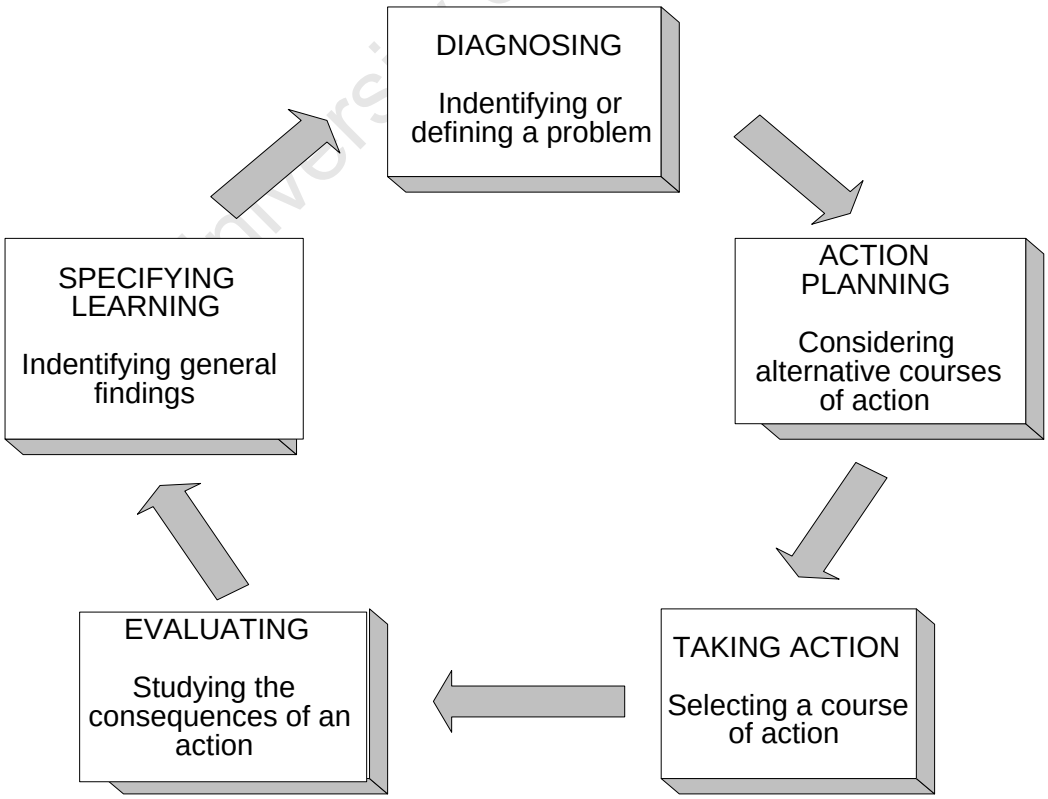


Fig 5.3: The 5 Phases of Action Research (Susman 1983, p.75)

The identification of a problem initiates the collection of data to allow for analysis thereof. The next step is identification of the possible solutions, following which an action plan is drawn up. The action plan is then implemented. Data is then collected and re-analysed, so that the effectiveness of the action plan can be measured. The problem is then re-evaluated, and the cycle is repeated until the original problem is resolved.

5.3 Action Learning

According to Dick (1993), action learning is a process where groups of people get together, share their experiences and then use this as the basis for improved learning. Action learning was originally pioneered by Revans (1982) and is a process of learning new ideas, skills and attitudes by studying work or other behavioural situations. Action learning is about learning by doing, by taking action. As the father of action learning, Revans coined the following expression:

$$\mathbf{L = P+Q}$$

where L equaled learning, P was programmed (or taught) knowledge and Q was questioning insight. For Revans, the ability to ask the right questions at the right time and take action accordingly was at the heart of action learning.

In its original guise, action learning was typically used across different organisations. This meant that participants in action learning came from different organisational backgrounds, where they each faced different problems. The participants then used their experiences to arrive at common learning's that could be shared between their organisations. More recently action learning programmes were set up within one organisation, where individuals are faced with a common problem or a task (Dick, 1997). Facilitators are often used in this process. The action learning team then comes up with recommendations for improvement of the said task or problem, which are then implemented by the business.

5.4 A comparison of Action Research and Action Learning

What are the similarities or distinctions that can be drawn between action research and action learning? While advocates of action research and learning do not necessarily agree on the basis of a distinction between the terms, Dick (1997) makes a useful distinction based on the manner of learning. In action learning, team members have different learning's based on different experiences of the same given situation. By contrast, in action research, collective learning is gleaned by a team of people based on collective experiences. Recently this distinction has begun to blur, thanks to action learning programmes within companies. In these programmes, teams are faced with a common problem or objective. This has led to action learning programmes which operate very similarly to action research.

A further distinction between the two techniques can be made on the basis of field of application. Action learning is often used in business and organisational fields, while action research tends to be used in the sphere of education and communities.

There are also some similarities between the two approaches, the first being that both can be compared to experiential learning. Experiential learning is the process for

extracting learning from experience. This experience is something that is either happening, but is more frequently the resulted of a facilitated process. The second similarity is that all the methods are cyclic in nature, involving action and reflection.

In Handy's theory of learning (1989), the main features of experiential learning, action research, and action learning is captured. In its simplest form, this theory of learning is a two stage process consisting of action and reflection, which continue in a series of cycles. Reflection in turn leads to increased learning, and ultimately to changed future behaviour. An ongoing cycle of action, reflection and more action results. If the reflection component of this cycle is expanded, a critical review of the last action implemented can be considered. This leads to a cycle of action-review-planning-action.

Building our understanding as theories can then be added to the learning cycle, effectively making sense of the problem by building on our previous understanding of the problem. Through enhancing our understanding, we are thus better able to act on the original problem. Very often when we are acting we do not take the time to be deliberate about what we are doing. This can lead to a situation where the theories we draw upon are intuitive, and only through proper planning and review do these theories become clearer.

The implication is that since these theories have been gleaned from recent experience, they are used to plan the way forward for the next experience. This implies that experiential learning functions in two modes which alternate between action and reflection on the one hand, and between unconscious or intuitive and conscious theories on the other. Through the use of cyclical processes the two modes become integrated such that action informs reflection and is informed by it. In this way, reflection produces learning (in action learning) or research (in action research).

The idea of learning was further refined by Kolb (1984) whereby knowledge is created through the transformation of experience. Kolb described experiential learning as a process involving four adaptive learning modes, namely concrete experience, reflective observation, abstract conceptualisation and active experimentation. Kolb's learning model is shown in Fig 5.4:

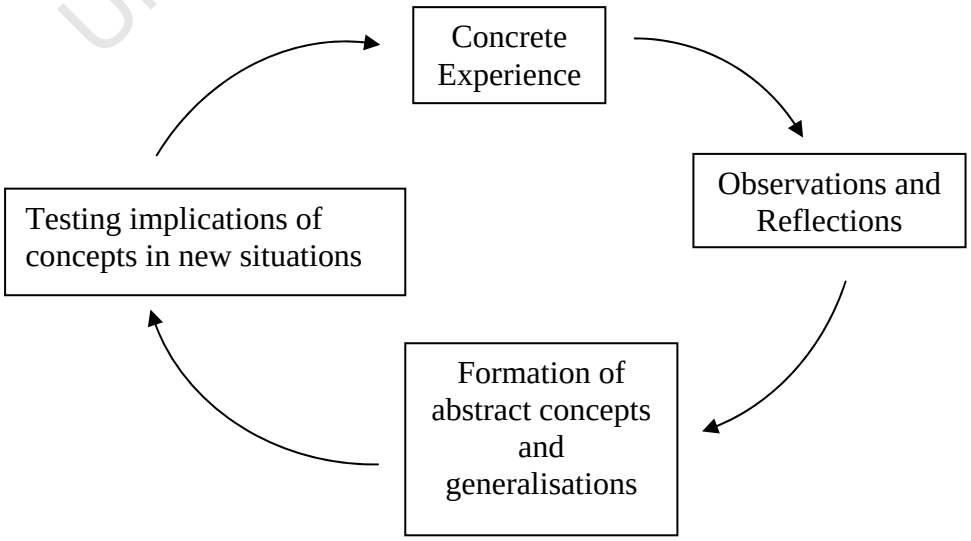


Fig 5.4: Kolb's Experiential Learning Model (Kolb 1984, p.32)

In this model the four modes occupy two dimensions which are dialectically opposed orientations, from which learning emerges as a result of trying to resolve the dialectic tensions. The dialectically opposed orientations are concrete experience (or apprehension) and abstract conceptualisation (or comprehension), and reflective observation (or intention) and active experimentation (or extension).

5.5 Critiques that guide Action Research

Dick (1997) cautions that in order to learn from experience, action researchers need to critique what they do and how they do it. Winter (1996) provides a comprehensive overview of six key critiques that guide the use of action research. Each of these is discussed below.

5.5.1 Reflexive critique

Reflexive critique refers to "the process of becoming aware of our own perceptual biases" (Winter, 1996, p.13). This requires that people reflect on issues and processes and make explicit their assumptions and interpretation on which judgement is made.

5.5.2 Dialectical critique

Winter (1996, p.13) refers to dialectical critique as "a way of understanding the relationships between the elements that make up various phenomena in our context." For a shared reality to exist, a common language needs to be used, on the understanding that the most likely elements to create change are those that are in opposition or are unstable.

5.5.3 Collaborative Resource

By collaboration, Winter (1996, p.22) means that "everyone's point of view will be taken as a contribution to resources for understanding the situation, and no-ones point of view will be taken as the final understanding of what all the other points of view really mean." This therefore assumes that each person's point of view is equally important, and strives to avoid bias or skewing based upon the status of an idea creator.

5.5.4 Risk

Risk disturbance is an "understanding of our own taken-for-granted processes and willingness to submit them to critique" (Winter, 1996, p.14). This implies that all participants in the change process, including the change agent, must be open to ideas from others. The basic premise is that whatever the outcome of the action research process, learning will take place.

5.5.5 Plural Structure

Building on the above four principles will "create a plural structure consisting of various accounts and various critiques of those accounts and ending, not with conclusions intended to be convincing, but with questions and possibilities intended to be relevant in various ways for different readers." (Winter, 1996, p.23). This implies

that due to the nature of action research there may be multiple views or interpretations of a situation, which can lead to multiple possible actions.

5.5.6 Theory, Practice, Transformation

Theory and practice internalised "is seeing theory and practice as two interdependent yet complementary phases of the change process" (Winter, 1996, p.14). This implies that for those that undertake action research, theory informs practice, and practice in turn informs theory through a cycle of transformation. It is the job of the researcher to make explicit the theoretical justifications for a particular action, and to always question the bases for which those justifications are made.

5.6 Ethical Considerations

The consideration of ethical issues is very important to consider when using action research. As action research is carried out in real-world circumstances and in many cases in organisations where the researchers and participants share sensitive information, those carrying out the research work must pay close attention to the ethical considerations.

Winter (1996) lists a number of key ethical principles that must be adhered to using this research methodology. The first principle is that all those who have been consulted or participate in the process accept the guiding principles of the work. All participants must be able to influence the work and the rights of those who choose not to participate must be respected. The work must be visible and transparent, and others must be able to make suggestions regarding it. Throughout the research process, confidentiality must be maintained and finally, reference to other people's work must be acknowledged.

5.7 Criticism of Action Research

As different research methodologies are informed by different assumptions, any research methodology can have its critic's, and action research is no exception. Drawing upon a literature review, Dickens and Watkins (1999) state that since action research lacks what is perceived as the rigour of scientific research, it gets criticized for making a limited contribution to the body of knowledge. The authors argue, however, that this is more of an academic concern for researchers than a practical one, and claim further that action research does not necessarily have to result in the resolution of a problem in order for it to be valid, instead validity is judged by other criteria.

An important element of the positivistic research approach is replicability, as it gives power to its findings by securing homogeneity through time. According to Checkland and Howell (1998), this is especially problematic in social settings, as homogeneity through time is impossible to achieve. Checkland (1991) further documents his concern around the impartiality of the researcher, where what enters the research method is subject to judgment, negotiation and personal interpretation. Dash (1997) documents a number of concerns with action research, especially with the autonomy of research. His view (Dash 1997, p. 3) is that "the fundamental aim of action research is to improve practice rather than to add to knowledge."

5.8 Ethnography as a Methodology

This section explains what constitutes ethnographic research and what the characteristics of ethnographic research are.

The word ethnography is derived from the Greek words ethnos, meaning people and graphein, meaning writing. According to LeCompte and Scensul (1999, p.1), ethnography is "an approach to learning about the social and cultural life of communities and institutions." According to these authors, ethnography has the following additional properties – " it is scientific, investigative, uses the researcher as the primary tool for data collection, uses rigorous research methods and data collection techniques in order to avoid bias and ensure accuracy of data, emphasises and builds upon the perspectives of people in the research setting and lastly is inductive, building local theories for testing and adapting them for use."

As a scientific method, how is ethnography different from other research methodologies? The first difference and a central assumption of ethnography is that we can only review and draw conclusions once we have discovered what people actually do and why they do it. The researcher's eyes and ears are the main tools used for data collection. The second difference is that ethnographers cannot manage what happens. In fact, one of the criticisms of ethnographic research is the "lack of control over the field setting to those who consider ethnography to be more of an art than a science" (LeCompte and Scensul 1999, p.3).

What are the characteristic's of ethnography? LeCompte and Scensul (1999, p.9) state that there are seven characteristic's that mark a study as being ethnographic. The first of these is that the "work is carried out in a natural setting". Secondly, interaction with participants is done "intimately and face-to-face". Thirdly, the participant's feedback and views are "an accurate reflection of their perspectives and behaviours". Fourthly, data collection is "inductive, interactive and recursive", with "multiple data sources being used, including both quantitative and qualitative data". Next, the context within which the research occurs is framed i.e. all elements under review exist in a particular context. Lastly, it utilises the "concept of culture as a lens through which to view and interpret results".

What conditions call for ethnographic research to be used? According to LeCompte and Scensul (1999, p.29), ethnography can be used "to define the problem when the problem is not clear, or when it is complex and embedded in multiple systems or sectors." Additionally, ethnography can be used to "identify participants when the participants, sectors or stakeholders are not yet known or identified" as well as to "clarify the range of settings where the problem or situation is occurring at times when the settings are not fully identified, known or understood." The factors aligned to the problem can be explored in "order to understand and address them or to identify them when they are not known". Ethnography can be used to document a process, and to "describe unexpected or unanticipated outcomes." Lastly, ethnography can be used to "ease the access of clients to the research process and products".

Ethnography essentially has two process steps, namely data collection and data analysis. Data collection is a discovery stage, in which information relating to a problem is extracted from various sources, using differing data extraction techniques

such as participant observation, artefact collection or interviews. Data analysis is the second stage and allows researchers to understand what they have learned. Various techniques (expanded upon in subsequent chapters of this thesis) are used to analyses the data collected into events, patterns and structures. In the case of ethnographic research, the analysis of data starts before data collection is complete. This is in contrast to other experimental techniques where data analysis occurs after all the data has been collected.

Ethnographers need to go through several stages of analysis as their research unfolds. By doing this, it assists in making sense of what they have been observing. The whole picture does not become clear at once, but slowly emerges from all the observations, interviews, etc. As they proceed through this analysis step, ethnographers have to surface issues at three levels, namely the event, pattern and structural level (refer Fig 6.1 for the systems iceberg model that reflects this).

The two stages of ethnographic research are reflected in Fig 5.5.

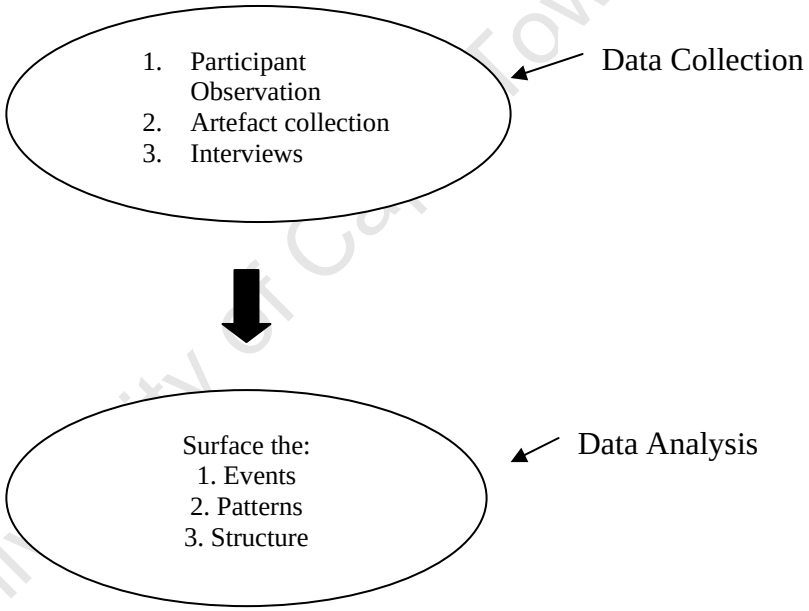


Fig 5.5 The two stages of Ethnographic Research

An ethnographic research journal is written from the researcher's perspective and is essentially a diary of the researcher's experiences throughout the process. In other words, ethnographic methods rely chiefly on participant observation, which means that the ethnographic journal is an example of inductive analysis.

For this thesis, the author has chosen the methodology of participant observation, where the researcher is purposefully acknowledging their role as a participant in the unfolding sequence of events and actions. In this methodology, the ethnographer systematically works at deriving meanings of events, by understanding their thoughts and meaning's, feelings beliefs and actions.

The use of an ethnographic journal is recommended by a number of researchers in qualitative research design. Maxwell (1996) advocates the use of memos to include reflection on ideas and courses of action. Miles and Huberman (1993) regard this form of data capture as an essential technique for qualitative analysis, as they do not just report data but in fact tie together different pieces of data into a recognizable form, thus becoming an important sense making tool. In the case of this thesis, the author kept a journal for a period of just over two years.

5.9 Methods and Techniques

The aim of this section is to give the theoretical background and building blocks for the process presented in chapters 6 and 7. In order to explain the underlying systemic structures that generate patterns of behaviour, the nature of this structure needs to be explained. By uncovering the nature of this structure, the roots of the problem can be explained. The process starts by formulating the problem, and then identifying the key variables in the situation.

Following the identification of the key variables, the next stage is to graph these variables over time. Therefore the purpose of behaviour over time graphs (BOT's) is to think in terms of the big picture and to consider both short term and long term perspectives of a problem; to learn to see patterns and trends in a problem and to identify root causes of current problems. The outcome is a timeline that shows a history of a current problem and provides insights about recurring patterns of problems in an organization.

BOT's are then used to hypothesize about relationships between these variables, and to generate graphs that lead to an understanding of the problem. An important decision is choosing the time horizon of the graph, as this affects the amount of information that the graph will represent. For any BOT, there are essentially three horizons that are plotted. *Now* is the present moment in which the problem is being investigated. *Earlier* is a point earlier in time where the bahaviour can be traced to. *Earliest* is a point even earlier than this, where something may have occurred to start the original problem. BOT's are more free form than other graphs, with the lines intended to indicate qualitative patterns or trends over time rather than absolute values. Once the patterns of behaviour over time have been graphed, the next challenge is to draw a representation of the systemic structure itself.

Causal Loop Diagrams or CLD's (Goodman, 1997) have been extensively used to analyse qualitative data, and are particularly useful in examining and explaining phenomena that are inter-related and happening at the same time. CLD's are therefore a useful systems thinking technique for understanding and exposing the workings of the system under review. Shibley (2003) provides a useful template for constructing CLD's: firstly, the data is gathered (in this case by ethnographic research) and assumptions are surfaced and acted upon (the action research methodology). A story is then constructed using the key variables and these are then linked and looped together as necessary where relationships are seen to occur. By considering the various relationships and loops, reasons for why the system behaves as it does can be revealed.

For a CLD, two or more variables are connected via arrows, with a closed circle of variables and links making up a complete feedback loop. In a CLD at least two kinds of relationships between variables can be seen:

1) Same direction – when variable A changes, variable B changes in the same direction
2) Opposite direction - when A changes, B changes in the opposite direction

There are essentially three ways to draw a CLD. The first method is to draw the CLD by beginning at the start of the story. With the second method, you start with the problem symptom and work backwards to assemble the loop diagram. The third method uses a back and forth approach in which you move back and forth through the sequence of the story, using bits and pieces from methods one and two to piece together the CLD. This method is particularly useful when diagramming complex stories that have many variables and loops. These relationships are shown on the loop diagram as either an "s" for "same direction change", or an "o" for an "opposite direction change". Every feedback loop depicts either a reinforcing process or a balancing process.

Reinforcing loops can be seen as the drivers of development or disintegration of growth and collapse since they drive change in one direction with even more change in the same direction. These loops are often refereed to as virtuous or vicious cycles for this very reason. Reinforcing loops are designated with an "R". A visual way to spot an R loop is to count the number of o's in a CLD. If there is an even number of o's (or no o's), then the loop is reinforcing.

Balancing processes, by contrast, are generally stabilizing or goal seeking. Balancing loops try to bring things to a desired state and hold them in this state. Change in one direction is resisted by producing change in the opposite direction. In CLD's, balancing loops are designated with a "B".

The above two systems tools are utilised in chapters 6 and 7 to further expand the analysis of the key variables.

5.10 Summary

In this chapter the ontological, epistemological and human nature assumptions that led to the author's choice of action research as the preferred research methodology have been outlined. The links between the features sought and action research as the chosen methodology have also been explored.

The action research methodology was reviewed, including guiding principles and criticisms of the methodology. The chapter ends off with a review of ethnography as a data collection methodology. An ethnographic journal was kept for a period of just over two years (refer appendix 1), and this formed the basis of the data collection methodology. In chapter 6 the ethnographic journal is systematically evaluated.

Part 3 – Application of the Theory in Context

The aim of part 3 of this thesis is to apply the theory from part 2 in order to address the concern raised in part 1, when the problem statement was first developed. The working problem statement is:

How to manage change in a continuously changing (and complex) manufacturing environment.

Chapter 6 presents the analysis of the data emerging from the ethnographic action research study conducted at Chamdor brewery. The ethnographic journal is systematically analysed, using qualitative analysis techniques and systems thinking tools. The aim of this chapter is to surface the underlying structure from the events and emerging patterns.

Chapter 7 builds on the findings of chapter 6 (the ethnographic journal, which largely reflects events and the author's interpretation of the emergent patterns in an attempt to understand the underlying structure). The aim of this chapter is therefore to consolidate the results from chapter 6, and to relate these back to the models of change described in chapter 3. The chapter concludes with a model being proposed for Managing Change in a Changing Environment.

Chapter 6 – Research Outcomes

This chapter presents the key learning's from the ethnographic action research study conducted at Chamdor brewery.

In this chapter the ethnographic journal is systematically analysed, using systems thinking tools and qualitative analysis techniques to inductively derive theory. The aim of this chapter is to surface the underlying structure from the events and emerging patterns. From a systems thinking point of view, the understanding of the structure will provide the real benefit in improving practise.

6.1 Analysing the Data

During the course of this project, two main sources of data collection were utilised. The first was an ethnographic journal (in this case from a participant observation point of view) which was kept over a period of two years, in which time both the brewery and the author's job underwent tremendous change. The second source of data was individual interviews which formed part of a process undertaken in the company (by the author) called a career stock take. This document is a record of reflections on career opportunities within the organisation, and individual interviews seven different senior people within the organisation were held to contribute to this. The career stock take is a condensation of the input from these seven individuals, as well as personal reflection from the author. These two documents are attached as appendices 1 and 2. The immediate problem that was faced was how to make sense of this huge body of information - how to integrate all these events into meaningful patterns and structures?

In order to obtain answers to these questions, the systems iceberg model was used as a framework. Themes were identified by reviewing the data i.e. the events or data chunks, these were coded into categories i.e. identifying the underlying patterns and through the techniques of contrast and comparison the relationships between the categories were established, this effectively was used to identify the structure or core variables.

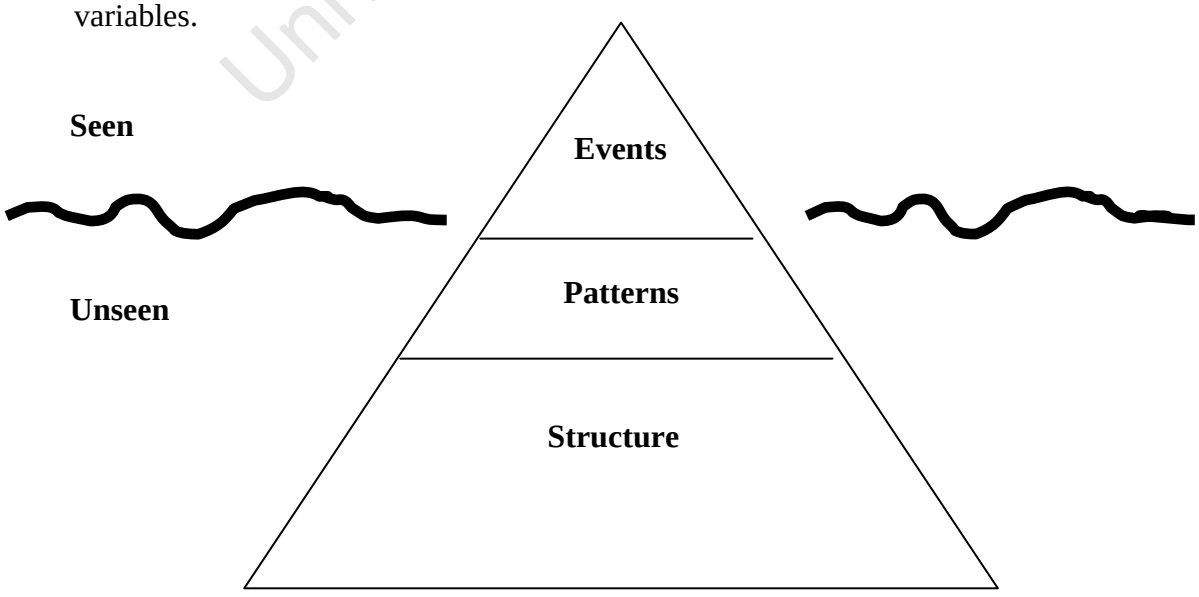


Fig 6.1: Systems Iceberg Model (Senge et al 1994, p.94)

Just as in the case of an iceberg at sea, the part above the water level is seen - these are called events. The submerged part of the iceberg is below the water level and is unseen – these are patterns and the structure in the systems iceberg model.

The ethnographic journal and the career stock take represent the events in this system under study. Therefore the first stage was to document these events. However, focusing on events is like wearing blinkers – you can only react to each new event rather than anticipate and shape them. What's more, solutions designed at the event level tend to be short lived. Most importantly, they do nothing to alter the fundamental structure that caused the event. By uncovering the elusive systemic structure that drives events, you can begin to identifying higher leverage actions. Table 6.1 (Senge et al 1994, p.89) depicts the richness of these three levels of understanding:

Table 6.1- Levels of Understanding (Senge et al 1994, p.89)

	Action Mode	Time Orientation	Way of perceiving	Questions to ask
Events	React	Present	Witness event	What is the fastest way to react to this event now?
Patterns	Adapt		Measure or track patterns of events	What type of trends or patterns of events seem to be recurring?
Structure	Create change	Future	Casual Loop Diagrams	What structures are in places that are causing these patterns?

The next stage in comprehending systemic structure is to move from thinking at the event level to thinking at the pattern level. For example, to look for patterns that explain why things happened the way they did. The goal of pattern identification is therefore to identify cause and affect relationships, and to see relationships. In this exercise, the aim is to bring out and elaborate on patterns that occur across multiple logged incidents. The third and last stage concerns structure – how the events and patterns fit into a meaningful structure which explains the observations?

The first priority was to divide the ethnographic journal into four distinct periods as follows (which are attached as appendix 3.0):

- Period 1 - The last six months as Brewmaster
- Period 2 - The first year of the new role in the projects department
- Period 3 - The next six months in the project department
- Period 4 - Towards understanding career opportunities

These four periods were aligned to major personal changes in the author's job, and the interaction with different teams of people. For each of these periods a list of themes was compiled from the information gleaned from both data sources. On reflection, it was soon found that every time the author read the journal, more and more themes would surface. After three iterations, the final list of themes was settled upon, and this is documented in appendix 3.0. Appendix 4.0 represents the action research cycles for each period.

The next step was to turn each of these themes into categories which clusters the themes. The aim of a coding process is to organise and summarise natural groupings among a large number of ideas/issues, in order to understand the essence of a problem. Fig 6.2 outlines the methodology followed for this chapter and the next:

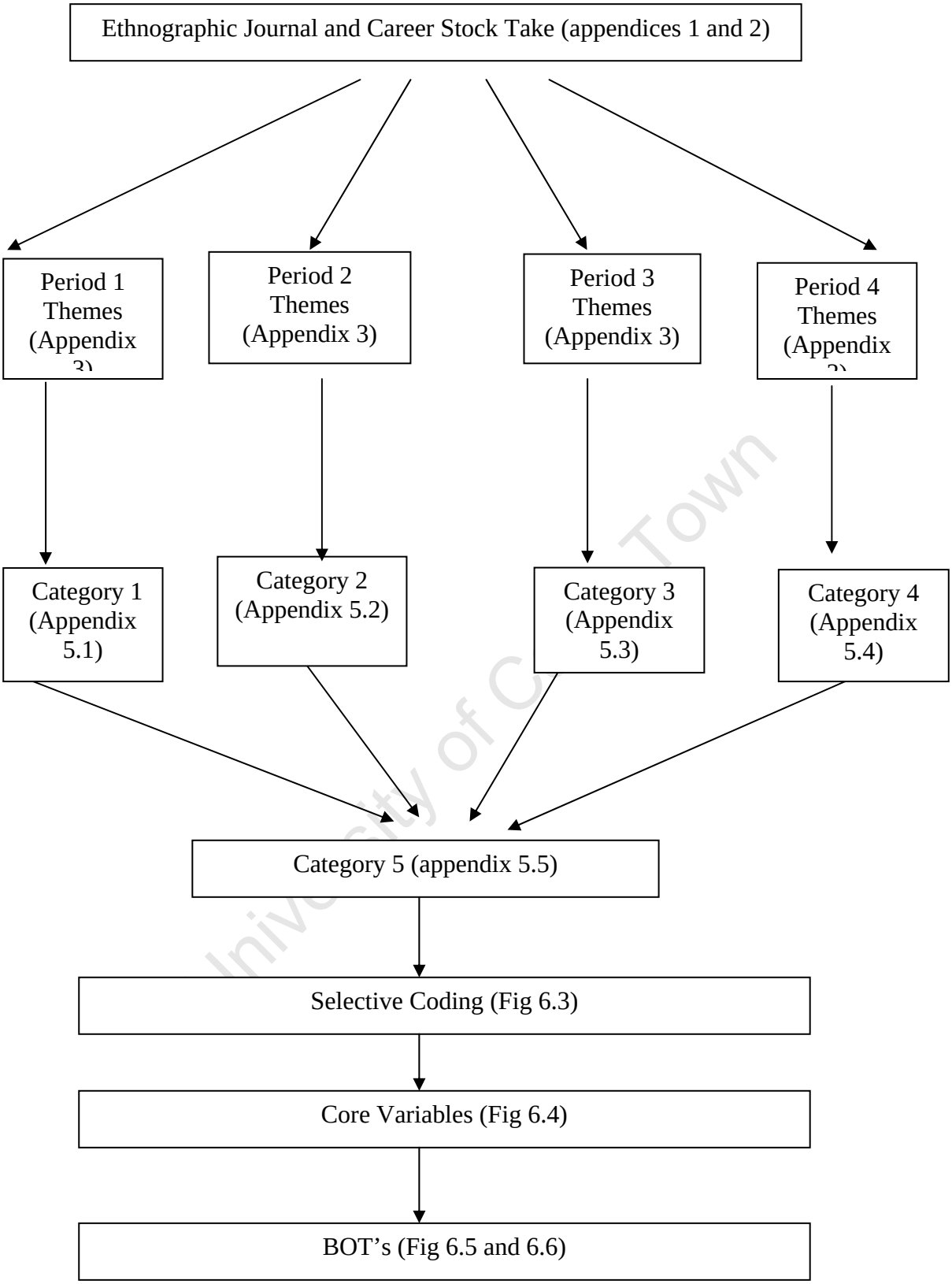


Fig 6.2: Process followed in chapter 6

Each event of a particular theme was written down on post it stickers, and the themes were collated into four categories (which are attached as appendices 5.1 to 5.4), one category for each period. It became apparent that a number of themes re-occurred throughout each period, and in reviewing the data in relation to the categories these themes were refined (appendix 5.5)

The initial categories emerging from this coding process yielded the following twelve headings or key variables:

1. Lack of structures and role clarity
2. Effectiveness of decision making
3. Lack of career opportunities
4. Impact of a lack of systems
5. Effectiveness of CSMT
6. Degree of innovation
7. Effectiveness of level four teamwork
8. Impact of leadership style
9. Impact of continuous projects
10. Development of effective strategy
11. Effectiveness of planning and reliability
12. Impact of critical reflection

Following this exercise it became possible to move from a meta view to a micro view, and then back to a meta view, using a rigorous process.

The next step was to reduce the number of categories by considering the relationships between them. This was achieved by asking about causes and consequences, conditions and interactions and strategies and processes (Neuman, 2000). This process was logically represented using a systems tool i.e. an interrelationship diagraph to systematically identify, analyse and classify the cause and effect relationships that exists among all the categories so that key drives or outcomes can emerge.

The question asked at this stage was “What are the factors impacting on the effectiveness of the Chamdor Senior Management Team?” The twelve key variables from (Fig 6.3) were arranged in boxes, and the cause/influence relationship was determined between each. If there was a relationship, the stronger direction of cause/influence was determined. This resulted in the outcomes and drivers shown in Fig. 6.4.

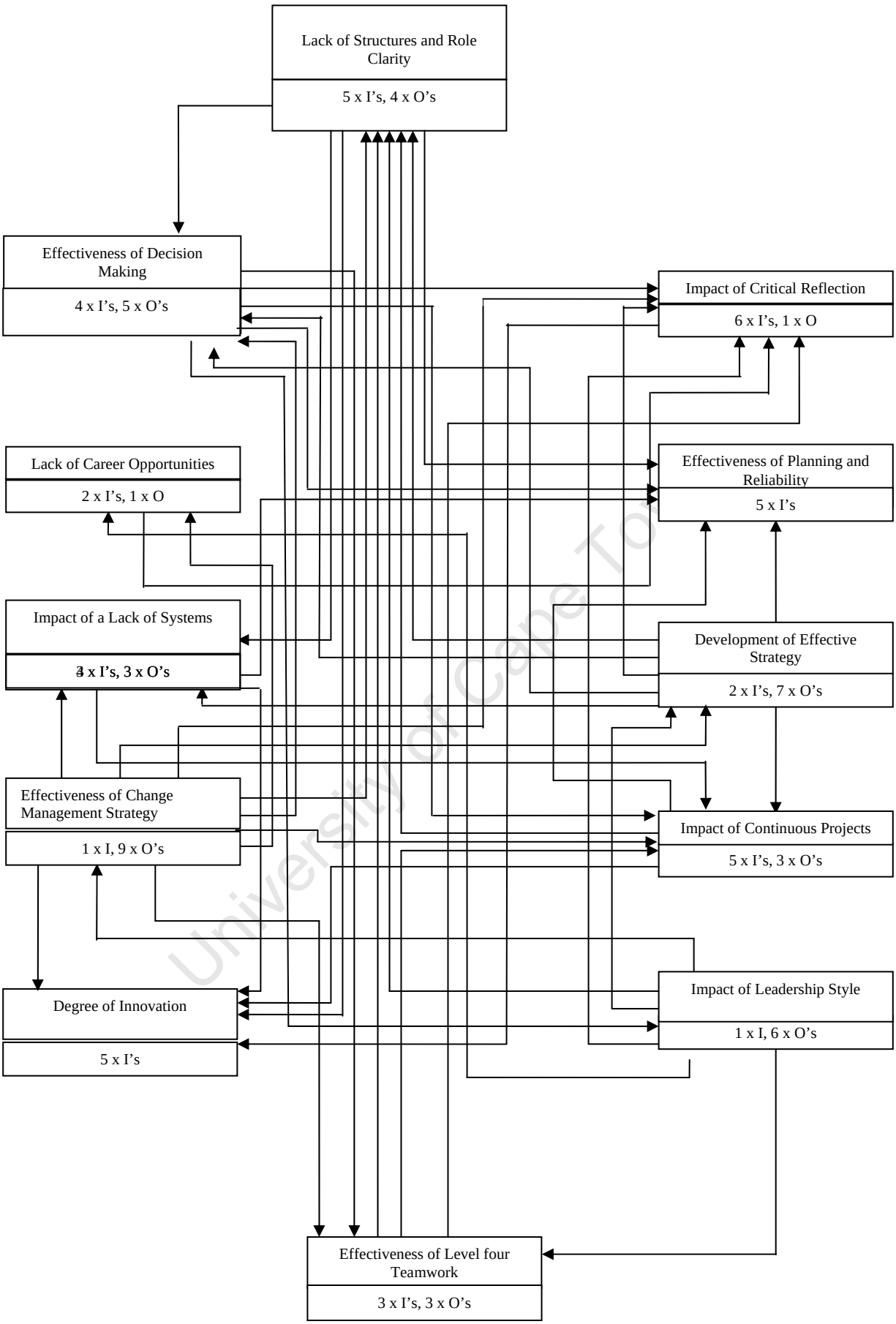


Fig 6.3: Selective Coding – What are the factors impacting on the effectiveness of the Chamdor Senior Management Team?

These were identified as follows:

- **Key drivers or root cause** (these are generally the issues to be tackled first):
    - Effectiveness of decision making.
    - Development of effective strategy.
    - Impact of leadership style.
    - Effectiveness of change management strategy.

- **Key outcomes** (these become a focus for planning as a measure of overall success):
    - Impact of critical reflection.
    - Degree of innovation.
    - Effectiveness of planning and reliability.
    - Lack of structures and role clarity.
    - Impact of continuous projects.

In addition, a number of potential bottlenecks were identified (these issues are taken into account when developing implementation plans to address the drivers and achieve the outcome):

- Impact of a lack of systems.
- Effectiveness of the CSMT.
- Lack of career opportunities.

The outcomes and drivers are depicted in Fig 6.4:

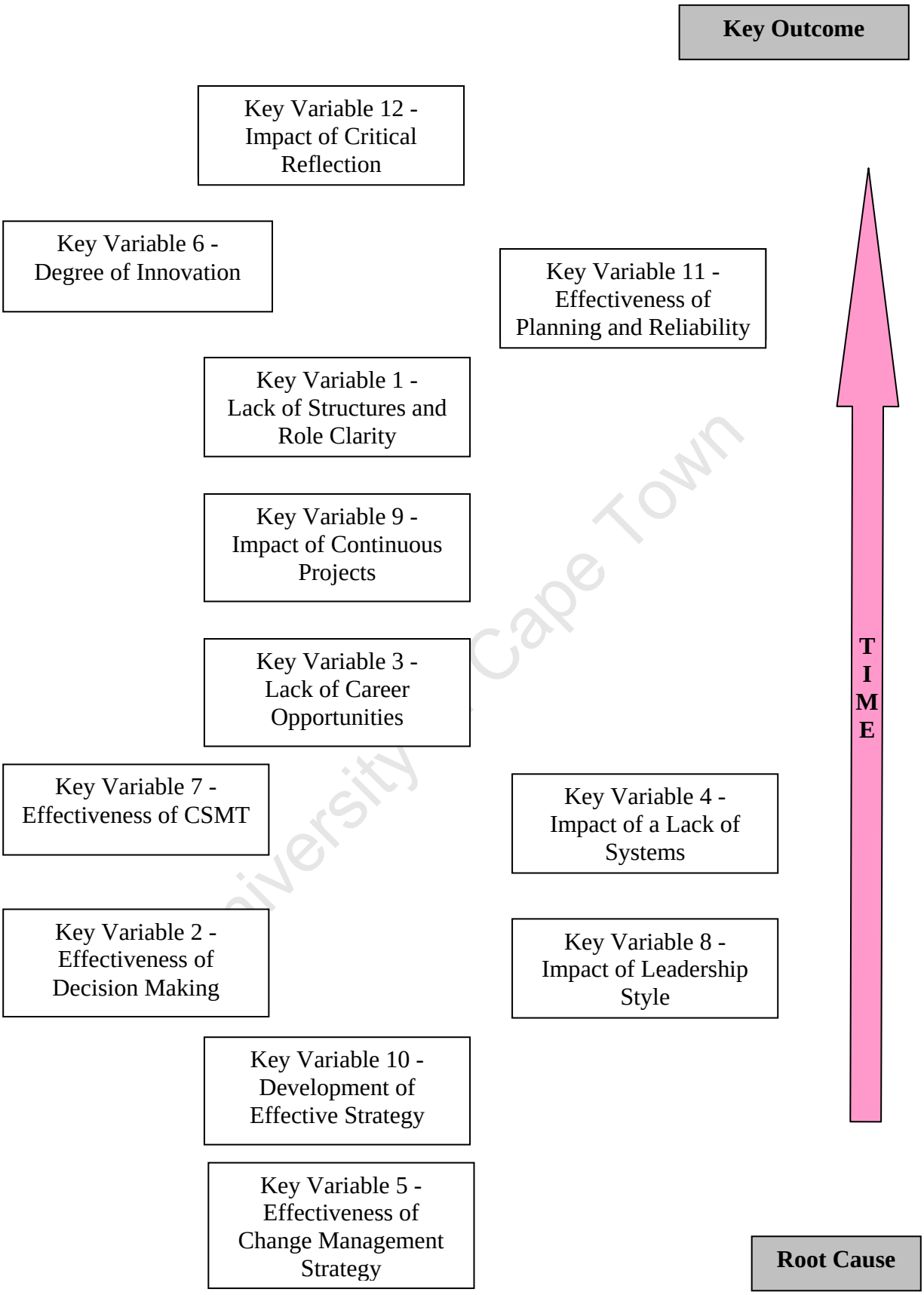


Fig 6.4: Core Variables

All problems have systemic origins – the key is to choose one that is appropriate and significant to the situation. There are three steps in defining a problem:

1) Formulating the problem.
2) Identifying the key variables in the situation.
3) Graphing these behaviours over time.

Once a problem has been targeted for a systemic approach, a clear and succinct statement of the problem should be developed, which is often the toughest part of systems thinking. The more clearly and specifically the issue is stated, the more focused the systemic analysis will be. In the case of this action research project, the following problem statement was formulated:

How to Model Change in a Manufacturing Facility in a Continuously Changing Environment

6.2 Expansion of the Twelve Key Variables

Twelve key variables have been identified from the ethnographic journal. In the section below, the author attempts to outline what each variable means and comments on its level of variation.

Key Variable 1 - Lack of structures and role clarity

Clearly defined roles and responsibilities are required essentially for two reasons. The first is to avoid confusion between individuals within a team. In a team context, there are a set number of outputs or deliverables to be achieved, and some of these are often missed because one team member assumes that another team member is taking care of the said issue. The second reason is to avoid duplication of effort – simply put, working smarter and not harder. All too often, the same information is collated or generated from two or more people or systems, which is unproductive. Productivity can therefore be improved by eliminating the duplication of effort.

The levels of variation and the desired post change situation for this variable are:

- Positive variation would be *effective* structures and role clarity.
- Negative variation would be the *lack* of structures and role clarity.
- Desired post change would be *clearly* defined structures and role clarity, as this would remove confusion within the team.

Key Variable 2 - Effectiveness of decision making

In an environment of high complexity and flexibility, the speed with which decisions get made (and are then managed) is important. At times, the team is obsessed with a 100% solution when a 90% solution will do. The risks associated with a 90% solution need to be understood and mitigated via planning of mitigating actions.

Coupled to this, the availability of people in decision making forums is problematic. Everyone seems so busy that one often battles to get all stakeholders into the same meeting. This means that decision making drags on.

The levels of variation and the desired post change situation for this variable are:

- Positive variation would be *good* decision making so that the correct decisions are made based on accurate data, the whole team is involved in decision making, etc.
- Negative variation would be *poor* decision based on insufficient information, autocratic management styles, etc.
- Desired post change would be *good* decision making processes involving all stakeholders.

Key Variable 3 - Lack of career opportunities

This key variable talks to the personal frustration that the author experienced and relates in particular to the author's mental model around certain appointments in the business, and the lack of career opportunities for technical specialists.

The levels of variation and the desired post change situation for this variable are:

- Positive variation would be the provision of career paths for technical specialists within the organisation.
- Negative variation would be the lack of career opportunities.
- Desired post change would be a defined career path for technical specialists within the organisation.

On reflection by the author, this key variable does not directly impact on the problem statement, and has hence been excluded from any further analysis.

Key Variable 4 - Impact of a lack of systems

Finding information to aid problem solving and decision making on site is hugely problematic. There is a hidden factory of inaccurate data collection, duplication of the same information into different data collection systems and multiple entry points into separate spreadsheets. This causes delays in identifying problems as the data collected is inaccurate. Coupled to this, the systems are inflexible and not easily able to cater for new products and processes.

In certain cases there is a total lack of measurement. This causes delays to problem resolution, as basic information is not available for thorough investigation to be initiated. A new measurement system first needs to be installed and data collected for a time period before proper problem solving can resume.

The levels of variation and the desired post change situation for this variable are:

- Positive variation in this case is illogical, as the notion of the lack of systems having a positive impact needs to be discounted.
- Negative variation would be the *negative* impact of a lack of systems.
- Desired post change would be a *flexible, value adding* set of management systems that would enable problem resolution.

Key Variable 5 - Effectiveness of change management strategy

In the environment of rapid change that is being experienced at Chamdor brewery, any change management strategy must be inclusive for it to be effective. Change

management is something that is planned, and cannot just happen. The need for change must first be acknowledged, following which the change management plan must be developed.

This ties in very closely with the way Kotter (1996, p.45) describes management as "a set of processes that keep a complicated system of people and technology running smoothly" (refer section 3.5.3 in this document).

Over the past few years at Chamdor brewery the impact of the sheer volume of projects has been vastly underestimated. The focus has been far too biased towards rapid implementation of projects with little consideration of the impact that they will have on the people, systems and processes.

The levels of variation and the desired post change situation for this variable are:

- Positive variation would be a *well* defined change management strategy.
- Negative variation would be a *poorly* defined change strategy.
- Desired post change would be an *effective* change management strategy that the people of Chamdor brewery would buy into and support.

Key Variable 6 - Degree of innovation

In this environment of rapid change and introduction of many unique and innovative products and processes, the degree of innovation is expected to be high. Risk taking and creativity should be encouraged in order to create new ways of doing things.

There are many opportunities to share these experiences with our other plants via shared learning's, a knowledge management tool that has been running within the business for a few years now. For some reason, the people of Chamdor brewery do not communicate these learning's, or do not seem to have the time to do so, or do not see their experiences as learning experiences. They are so busy moving forward, that at times they do not step back to reflect on what has happened in their work environment. They owe it to themselves and to the brewery to do so, because if they don't, other breweries will latch onto the learning's and take them as their own. More importantly, if knowledge is not shared, growth is slow.

The levels of variation and the desired post change situation for this variable are:

- Positive variation would be a *high* degree of innovation where people embrace the change and recognize the need for all the project activity.
- Negative variation would be a *low* degree of innovation where people have almost grown tired of the rate of change, and often feel overwhelmed by it.
- Desired post change would be a *high* degree of innovation.

Key Variable 7 - Effectiveness of CSMT

The CSMT is the executive team responsible for leading the brewery. There are eleven team members led by a General Manager. The whole brewery of three hundred and ten people is led by this team. The brewery looks up to its leadership team to work together, to inspire them to greater deeds, to lead by example and to lead the brewery to a new future.

If there is no teamwork between the leadership team, the brewery senses this and follows suit. Lower level teams become ineffective, as they see and sense chaos from their leadership team.

The levels of variation and the desired post change situation for this variable are:

- Positive variation would be a highly *effective* team as this team will lead the brewery through this period of major change.
- Negative variation would be an *ineffective* team.
- Desired post change would be an *effective*ly operating CSMT that functions as a team.

Key Variable 8 - Impact of leadership style

This issue relates to the leadership style of the General Manager and the way he manages the CSMT. There are many leadership styles, but the two extremes that the author has experienced are an autocratic style vs. a participative style. People within teams react in different ways to these two extremes – some enjoy the autocratic style while others abhor it.

In the experience of the author, the autocratic style stifled thinking and creativity. The autocratic style rubs off on the lower levels within the organisation, so that people at these levels became dis-empowered and stop making decisions, as everything is challenged from the top. In an environment that cried out for inspirational leadership, the autocratic style of the team leader was so deeply ingrained that the leader could not operate in any other way.

The levels of variation and the desired post change situation for this variable are:

- Positive variation would be a *positive* impact of leadership style which would foster an environment of empowerment and creativity.
- Negative variation would be a *negative* impact of leadership style as it dis-empowers people and stifles creativity in an environment that calls for innovation and risk taking.
- Desired post change would be the *positive* impact of an inspirational leadership style on the way people were being managed, and on the way they were managing others.

Key Variable 9 - Impact of continuous projects

The author has been at Chamdor for four years, and throughout this period, a number of projects and initiatives have been in progress. The pace of these projects has accelerated from 2002 in support of new products and processes.

A significant amount of change has been introduced as a result of these projects, and people within the brewery have struggled to keep up with the rate of change and to adapt to the change. This has led to high levels of stress within the brewery. In many cases, people have more than gone the extra mile, and yet they have not been rewarded for their efforts.

The levels of variation and the desired post change situation for this variable are:

- Positive variation would be the *positive* impact of continuous projects, where people embrace the change and recognize the need for all the project related activity).
- Negative variation would be the *negative* impact of continuous projects where people have almost grown tired of the rate of change, and often feel overwhelmed by it.
- Desired post change would be for people to view the impact of continuous projects as being something *positive*, as its taking the plant, the processes and it's people to the forefront of innovation and technology within the South African beverage industry.

Key Variable 10 - Development of effective strategy

Strategy is a vision or blueprint for the way forward to achieve some desirable end state. It provides the direction in which something must be moving to achieve this end state.

The levels of variation and the desired post change situation for this variable are:

- Positive variation would be *effective* strategy, which translates to clearly define goals and objectives in order to achieve the desired end result.
- Negative variation would be *ineffective* strategy, leading to confusing direction and ultimately translating into poor plant performance.
- Desired post change would be *effective* strategy which clearly maps out the way forward for the brewery and its people.

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Key Variable 11 - Effectiveness of planning and reliability

In order to consistently deliver a wide range of products and processes, both effective planning and reliability are required. All the elements associated with reliably producing products (i.e. man, machine, materials, measurement and method) need to be in place, as well as the 6P's (i.e. proper prior planning prevents poor performance).

The levels of variation and the desired post change situation for this variable are:

- Positive variation would be *effective* planning and reliability, leading to products will be delivered on time at the correct quality
- Negative variation would be *ineffective* planning and reliability, which would ultimately lead to poor plant performance.
- Desired post change would be *effective* planning and reliability.

Key Variable 12 - Impact of critical reflection

In the frenetic pace of change at Chamdor, the ability to step back or out of a given situation is important. Reflection is a crucial step in the action research cycle that involves recollection and then critique of what has happened. The increased understanding which emerges from this critical reflection is used to better understand the situation that we find ourselves in.

In the author's experience, people at Chamdor tend to be so busy with "being busy" that they do not even acknowledge how change is impacting on their lives and the way that

they work. They therefore miss opportunities to improve their understanding of how the whole system is at work.

The levels of variation and the desired post change situation for this variable are:

- Positive variation would be a *positive* impact, with people using reflection to improve their understanding of the changes they are experiencing.
- Negative variation would be a *negative* impact where people do not reflect on the world around them.
- Desired post change would be a *positive* impact of critical reflection.

These key variables become the cornerstones of the causal loop diagrams discussed in chapter 5, where they have been grouped according to their impact on people (i.e. the leadership team dynamics) and the process (i.e. the change management systems).

6.3 Drawing Behaviour over Time Graphs (BOT's)

Fig 6.2 depicts how the eleven key variables were identified. The original source of this information was the ethnographic journal and the career stock take that the author documented over a period of two years. The aim of depicting Fig's 6.5 and 6.6 was not to show all eleven key variables, as this would clutter the graphs too much and make them difficult to explain. The aim was rather to illustrate the principles and applications of BOT's and to this end, only certain (but the same) key variables in each BOT are graphed and explained.

Fig's 6.5 and 6.6 therefore depict two BOT's for the same timeframe under review. The first figure depicts the pre change situation, in other words, what is currently happening. The second figure depicts the post change situation or the desired end state.

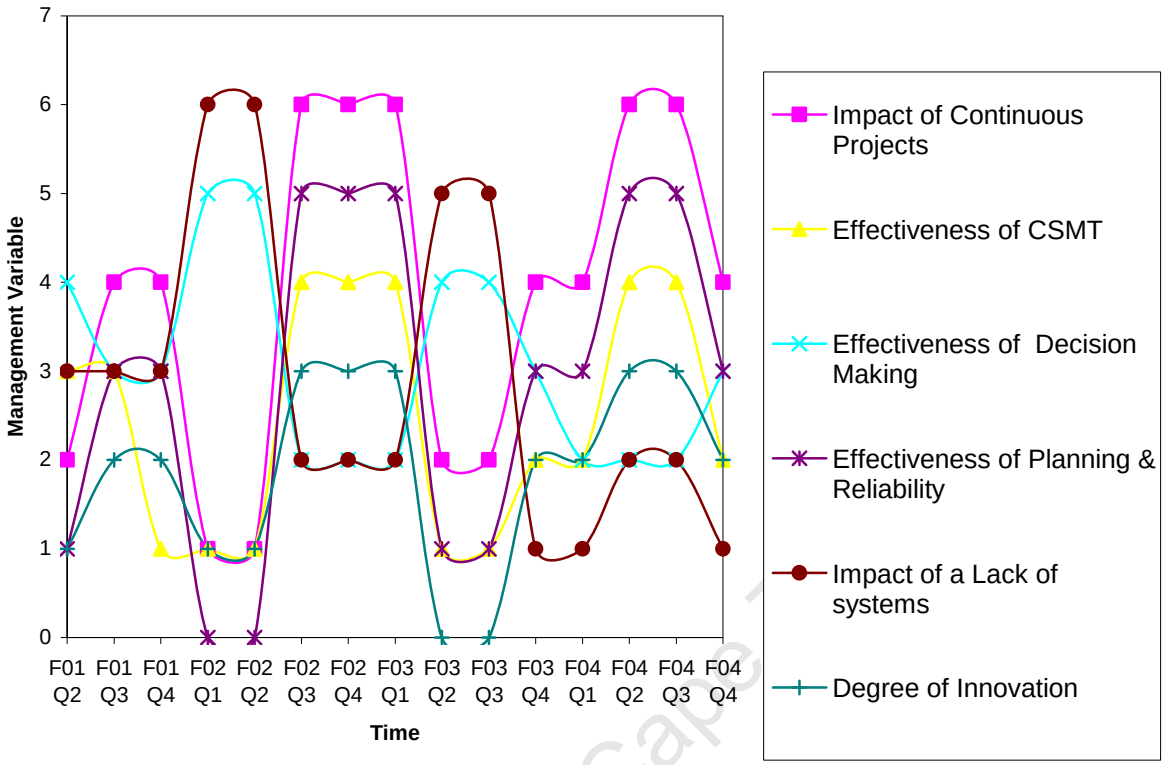

Fig 6.5: Behaviour over Time Graph 1 – pre change

The pre change graph depicts a typical boom or bust scenario, when there is wild, uncontrolled oscillation between variables over time. It reflects what has typically happened over the period under review at Chamdor. For example, when the number of projects or initiatives increases sharply, the amount of innovation tends to increase. The CSMT teamwork decreases as the impact of the continuous projects increases. As the number of projects or initiatives increases sharply, reliability and delivery decrease. The individual components of the system therefore work against each other, leading to a chaotic state. This ultimately translates into poor delivery of projects and initiatives.

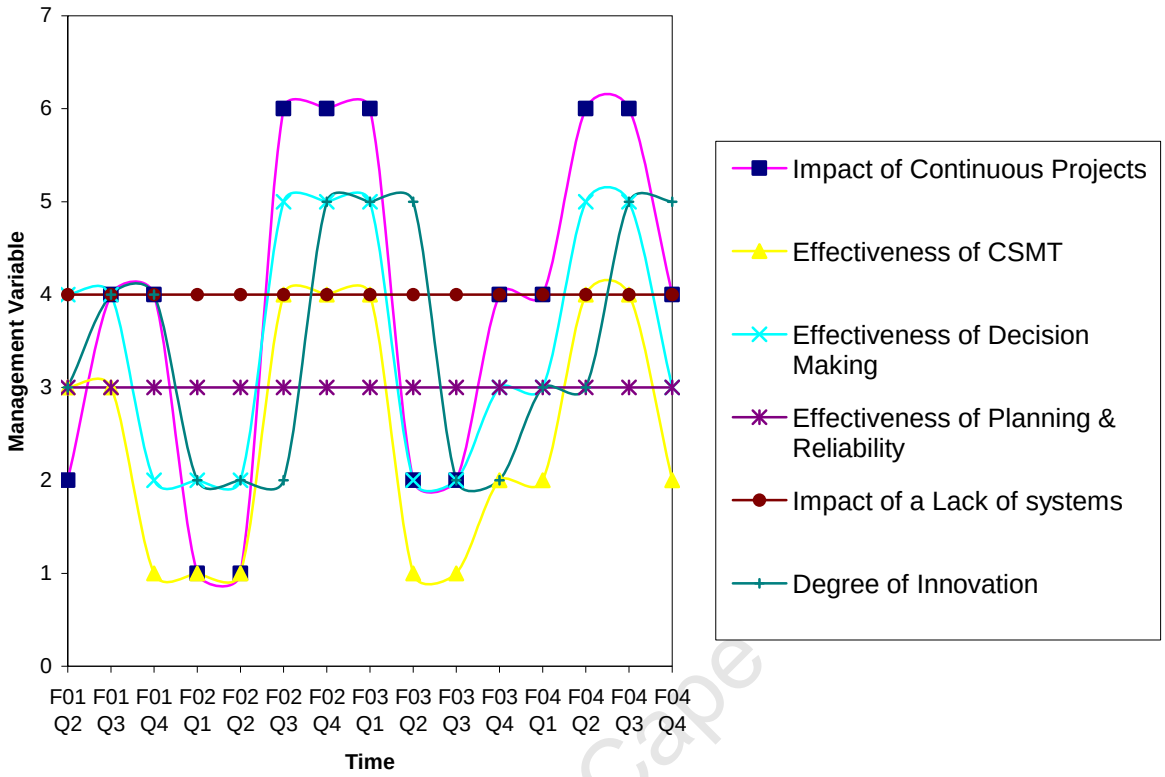

Fig 6.6: Behaviour over Time Graph 2 – post change

The post change graph depicts the desired end state, and reflects the same data collection period. There is a lot less oscillation between variables over time, where the change is managed and controlled as far as possible. For example, when the number of projects or initiatives increases sharply, decision making is effective as the CSMT is working together. Planning and reliability improves, and innovation increases. The system therefore works as a whole for a common purpose. Therefore any model the author proposes in chapter 7 needs to reflect a mechanism for achieving this post change end state.

6.4 Summary

As management research, in the form of action research, is concerned with understanding and intervention, theories inductively developed to explain problem situations need to identify core variables for leverage to improve the problem. To this end, the ethnographic journal and interviews were systematically analysed, using systems thinking tools and qualitative analysis. The consequence was to surface the underlying structure or theory from the events and emerging patterns, as the understanding of structure provides the real benefit in improving the practise

Chapter 3 examined three different models of change, and these, together with the results from this chapter, form the basis for the author's own model for Managing Change in a Changing Environment in chapter 7.

Chapter 7 – Towards a Model for Managing Change in a Changing Environment

This chapter builds on the findings of chapter 6. The aim of this chapter is therefore to consolidate the learning's from chapter 6, and to relate these back to the models of change described in chapter 3. A model for Managing Change in a Changing Environment is proposed.

7.1 Causal Loop Diagrams (CLD's) - Telling the Story

Chapter 6 ended off with the depiction of two BOT graphs, which represented the present (pre-change) and the desired (post-change) situation.

The next challenge was to represent systemic structure or theory. Causal Loop Diagrams (CLD's) was the method of choice. CLD's are a graphic representation of the structure, which allows one the opportunity to explore dynamic interrelationships among the variables that may not have been considered before. The benefit of this approach is that sometimes one can see how parts of a system that are separated by location or time nonetheless might interact to generate problems. This also allows one to hypothesize about solutions to the problem and then to test them, risk free.

The first step in telling the story is to formulate the core problem and explain "*what is going o*n?" The claim is that the core problem at Chamdor brewery is that brewery performance is being negatively impacted by the effectiveness of the CSMT.

The second step in telling the story is to outline the problem behaviour. The brewery is being swamped with too many initiatives (routine initiatives as well as major capital projects). Each of these initiatives is impacting on the change management process in some way. The CSMT is battling to manage this change, and especially how to effectively integrate the changes into the daily brewery operation.

Coupled to this, there are issues within the CSMT that are negatively impacting on the effectiveness of the team. These issues centre on the leadership style within the team, and the impact that this is having on the team itself, as well as the effect it has by filtering down to lower levels within the organisation. By his own admission, the team leader (in this case the General Manager) is a recovering autocrat, who is struggling to change his leadership style. His leadership style is not conducive to effective leadership team dynamics, to the point where his leadership style is being openly challenged by certain team members.

The problem behaviour is therefore that there are a number of systemic issues that are constraining or inhibiting performance at Chamdor. These issues fall into two broad categories or systems, the first being the leadership team dynamics, and the second being the change management process. The process followed is outlined in Fig 7.1.

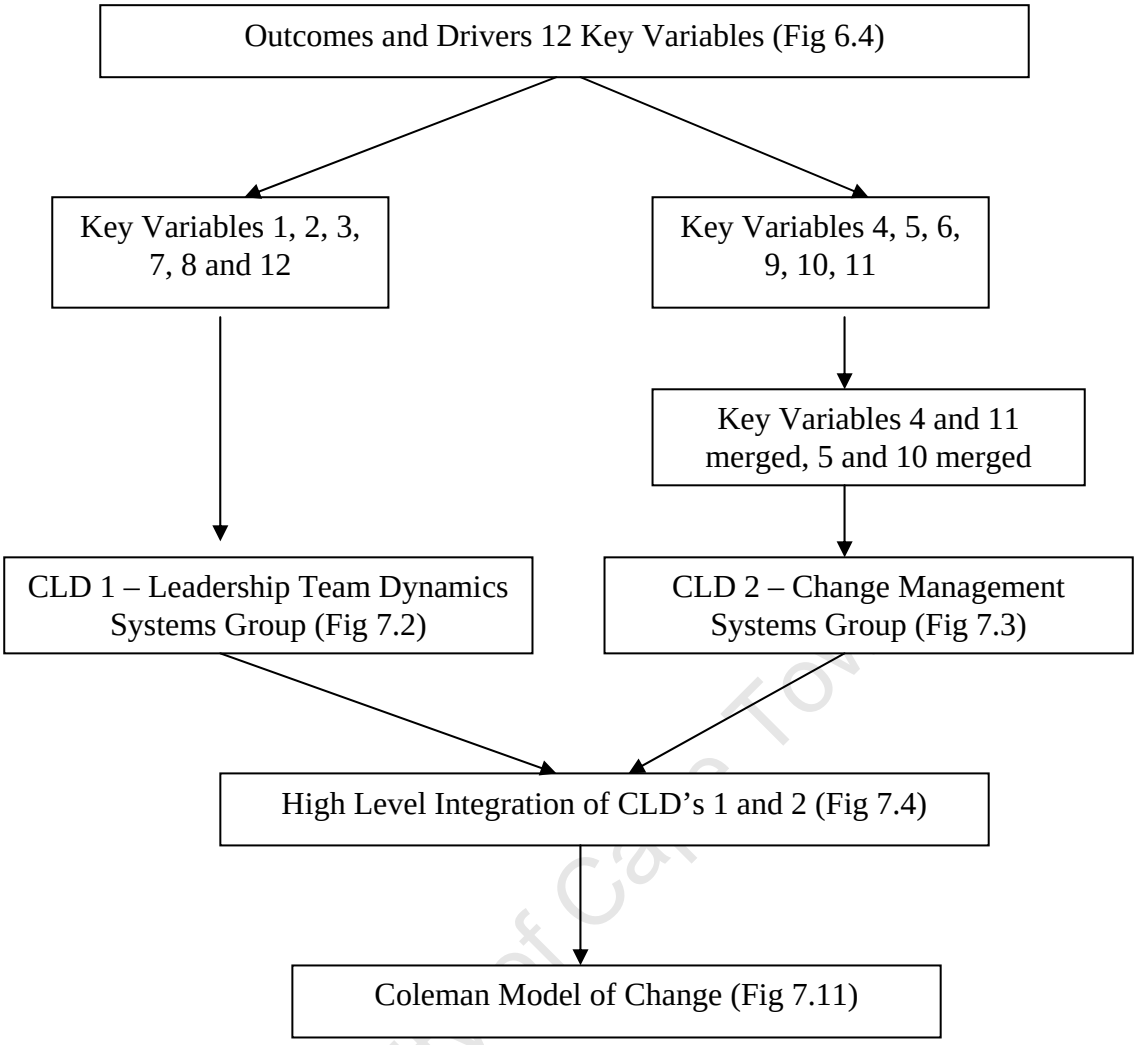

Fig 7.1: Process followed in chapter 7

The third step in telling the story is to choose the key variables that one wants to work with. Through the process outlined in chapter 6, the author has identified twelve key variables that are impacting on the system under focus.

In the case of key variables five and ten (namely effectiveness of change management strategy and development of strategy respectively), these were merged into a new variable called effectiveness of change management strategy. This was based on the premise that they are talking about a similar thing, namely the management of change.

In the case of key variables four and eleven (namely impact of a lack of systems and effectiveness of planning and reliability), these were merged into a new key variable called effectiveness of management information systems (MIS). This was done on the basis that planning and reliability are examples of systems tools used to improve planning and reliability.

With reference to the systems thinking iceberg in chapter 6, the eleven key variables are examples of underlying structural issues within the system. Each variable should have two extremes or variations, namely a high level variation and a low level variation. For

example, a positive or a negative impact, a high or a low degree of innovation, etc. These variations have been expanded upon in chapter 6.

In the sections below and building on the stories of each variable in chapter 6, these have been grouped into one of two systems groups, either leadership team dynamics or change management.

7.2 CLD 1 - Leadership Team Dynamics Systems Group

The following six variables have been grouped into the leadership team dynamics group:

Key Variable 1 - Lack of structures and role clarity
Key Variable 2 - Effectiveness of decision making
Key Variable 7 - Effectiveness of CSMT
Key Variable 8 - Impact of leadership style
Key Variable 12 - Impact of critical reflection

The problem symptom is the effectiveness of the CSMT. Using CLD method two described in chapter 5, and working backwards from the problem symptom, the story unfolds as follows in Fig 7.2:

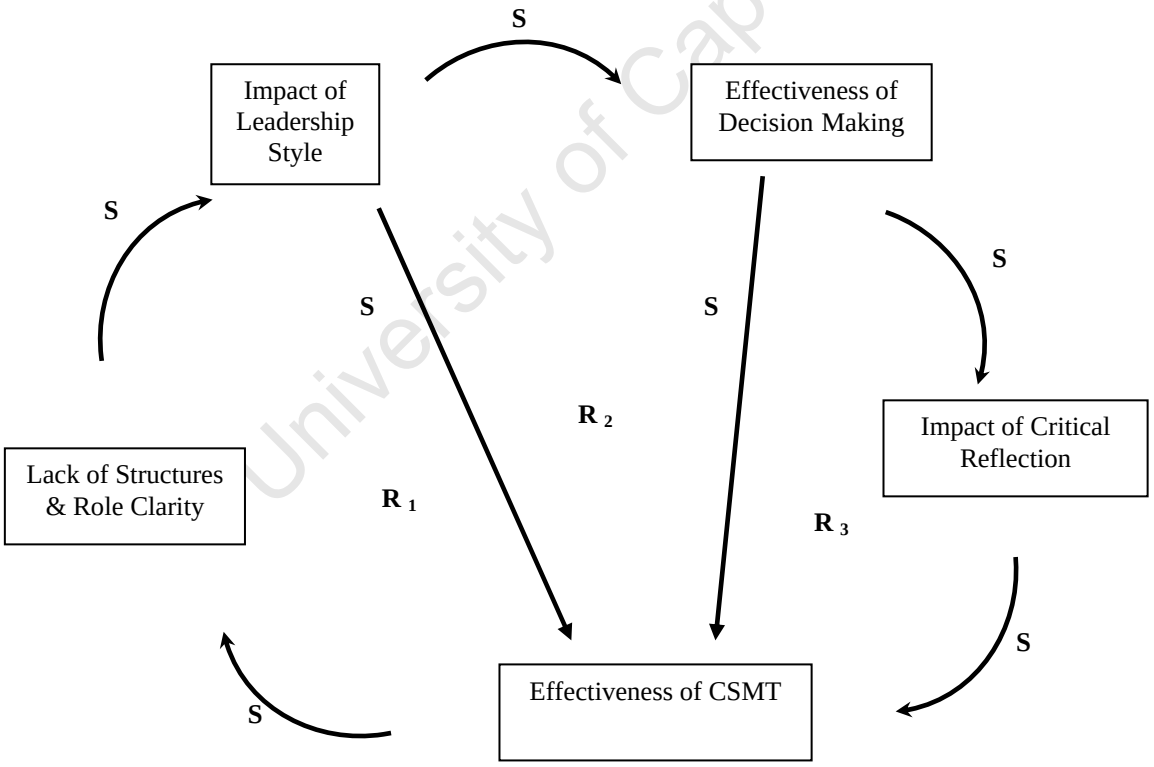

Fig 7.2: Causal Loop Diagram 1 – Leadership Team Dynamics

The systems grouping of leadership team dynamics talks to the effectiveness with which the CSMT is being led, as well as the effectiveness with which the CSMT is in turn leading the whole brewery.

Description of reinforcing loop R_1:

The first reinforcing loop starts at the effectiveness of the CSMT. As the effectiveness of this team decreases, structure and role clarity also decreases. Chamdor brewery is an environment of high complexity and change, and people and teams need to adapt to this change. In such an environment, the lack of structures and role clarity within the CSMT means that balls get dropped, and projects and initiatives are not delivered on time and to the correct standards. Since people are not clear on who is doing what, things slip through the cracks.

The lack of structures and role clarity is exacerbated when the team is bring driven by an autocratic leadership style. The autocratic leadership style means that the leader normally gets his way. This leaves the other team members feeling disempowered and isolated – why be a member of the CSMT when the autocratic leader of that team always drives his solutions into the business? If the leader makes all the decisions, the rest of the team will start questioning whether they are even needed as part of the team.

Since there are three "same direction" changes in loop R_1, this loop is an example of a negative spiral.

Description of reinforcing loop R_2:

The second reinforcing loop builds on the first loop. As the leadership style becomes more autocratic, the effectiveness of decision making drops off, as team members become scared to make decisions, as they know that their decisions will always be challenged by the leader or even overridden by the leader. Ultimately the effectiveness of the CSMT drops. This loop is another example of a negative spiral.

Description of reinforcing loop R_3:

The third reinforcing loop builds on the second loop. As the effectiveness of decision making decreases, so does the level of critical reflection. Some of the team seem able to work in this autocratic environment, while others reflect on what is happening around them, and openly challenge the leader and his leadership style. For their troubles, those who do so are labelled as being non team players and ostracised. The team is effectively split into two camps, those that support and learn how to work with the autocratic leader and his leadership style, and those who oppose his leadership. The loop is completed as this in turn leads to an ineffective team, who focus on their own performance instead of on team performance. In other words, the structure of the team is disrupted. This loop is further example of a negative spiral.

CLD 1 therefore has three reinforcing loops. Reinforcing loops can be seen as the engines of growth and collapse, that is, they compound change in one direction with even more change in that direction. Many reinforcing loops have a quality of accelerating movement in a particular direction, a sense that the more one variable changes, the more another changes. For this reason, these loops are also known as virtuous or vicious cycles.

Since CLD 1 then describes a situation that is spiraling out of control, the obvious question to ask is *Why has the system not self destructed?* While the system described above is far from ideal, it is the author's experience that it is the goodwill of the other

team members, their personal pride and their professionalism that is preventing total collapse of the system.

How can the system be improved?

The first step is to clearly identify who does what within the team, and once this is done, hold people accountable for delivering to their agreed roles. This may mean changing the reporting structures within the team, and even moving some people off the main team in order to simplify reporting lines.

The next step is to change the leadership style within the team. There are essentially three options available here, the first being for the leader to change his style to be more participative. Now this is a difficult process to achieve and tantamount to getting a leopard to change his/her spots. If this is not achievable, then those who remain on the team and cannot cope with the leadership style have two options, either to accept the status quo or to leave the team.

The last alternative is to replace the leader with someone who has a more participative management style. However the great difficulty with this option is that this change is outside the control of the team - the change needs to be initiated from a higher level within the organisation.

Assuming a more participative environment, the effectiveness of decision making will improve as people will be involved in decisions affecting themselves and the teams they represent in the brewery. This means that decision making will become more transparent. People will also not be scared to make decisions.

For those that previously supported the autocratic leadership style, the blinkers will be removed from their eyes and they will reflect on the impact that the changes have made on both themselves and the brewery. Perhaps they will even become more participative themselves. The new style of leadership will trickle down to all levels within the brewery, and teamwork will improve as a result. For those at the level immediately below the CSMT, this could prove to be aspirational (i.e. they would aspire to become part of the CSMT).

The ultimate positive spin off from this process will be that the lower levels in the brewery will see that the CSMT is operating effectively, and making sound and well-informed decisions. This will ultimately have a positive result on brewery performance and the ability to deal with rapid change.

7.3 CLD 2 - Change Management Systems Group

The following six variables have been grouped into the change management systems group:

Key Variable 4 - Impact of a lack of systems } merged into one
Key Variable 11 - Effectiveness of planning and reliability }
Key Variable 5 -Effectiveness of change management strategy } merged into one
Key Variable 10 - Development of effective strategy }
Key Variable 6 - Degree of innovation
Key Variable 9 - Impact of continuous projects

As discussed in Section 7.1, variables four and eleven have been merged (now referred to as effectiveness of management information systems), as have variables five and ten (now referred to effectiveness of change management strategy) in the CLD analysis below.

The problem symptom is the effectiveness of the change management strategy. Using CLD method two again (as described in the introduction to this chapter) and working backwards from the problem symptom, the story unfolds as follows in Fig 7.3:

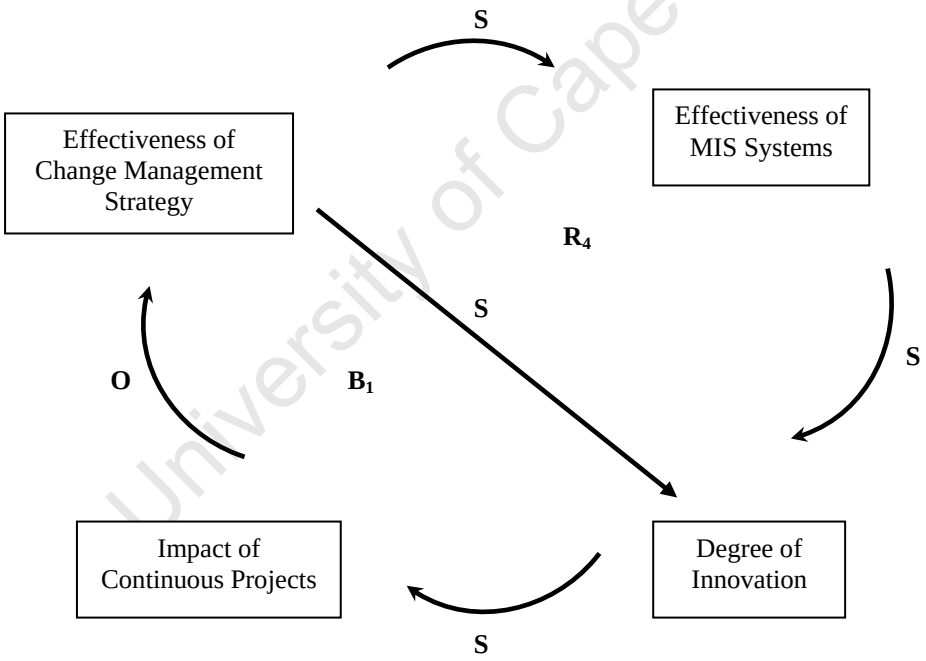

Fig 7.3: Causal Loop Diagram 2 – Elements of Change Management

Description of balancing loop B_1:

This loop starts at the impact of continuous projects. As the impact of continuous projects increases, the effectiveness of the change management strategy decreases. Over the past three years, close on two hundred and fifty discrete projects, costing approximately R 350 million have been initiated and installed at Chamdor. All of this has been into a brown fields brewery, making the integration of all these projects into an existing production facility even more difficult. With all these projects has, of course, come huge change.

All these projects have been initiated as a result of a conscious strategic decision by the business to turn Chamdor into the Lead Flexible brewery in South Africa. In 2002 the CSMT developed a strategic five year plan of the way forward for the brewery and it's people, but very little focus has been placed on the critical aspect of change management. As the brewery has changed significantly since 2002, this strategic document has not been updated to reflect all the new operational plant and systems.

In this environment, the degree of innovation is stifled. People are so busy that they don't have time to step back from a given situation and reflect on the systemic issues that underpin a specific problem. They therefore run out of time to be creative, and as a result, the degree of innovation is lower than expected. This loop is therefore a balancing loop.

Description of reinforcing loop R_4:

As a result of all the changes and the ineffective change management strategy, various management information systems (problem solving tools, data collection, planning, maintenance, etc) have not been able to keep abreast of all the changes. While a sound technological and automation platform have been created over the last few years, the investment in management information systems has not developed at the same pace. As a result, the root causes of problems are not identified and people become despondent as they cannot solve problems. Once again, the degree of innovation is stifled, as the ineffective management information systems do not support problem solving. As a result, the degree of innovation decreases. This loop is therefore a reinforcing loop.

CLD 2 is therefore made up of one balancing loop and one reinforcing loop. As a result, the total system is in balance. As mentioned in the introduction to this chapter, balancing processes are generally stabilizing or goal seeking, and balancing loops therefore try to bring things to a desired state and keep them there. In a balancing process there is always an inherent goal, whether that goal is visible of not. In fact what drives a balancing loop is a gap between the goal (the desired level) and the actual level. As the discrepancy between the levels increases, the dynamic makes corrective actions to adjust the actual level until the gap decreases. In this sense, balancing processes always try to bring conditions into equilibrium.

How can the system be improved?

In the case of CLD 2, the equilibrium can be disturbed by environmental conditions or factors, particularly in the area of the volume of continuous projects. The volume of projects needs to be managed and well controlled to a point where the number of projects being attempted is equal to the capability of the brewery and its people to deliver theses projects. To this end, the author has developed and expanded upon a model for managing the volume of projects later in this chapter - (refer Fig 7.11)

Secondly, the Chamdor strategy needs to be reviewed every year to ensure that it is aligned to the SAB business strategy. The strategy also needs to be reviewed after every major intervention (normally a new technology, product or process). The strategy needs to include an element on change management that is appropriate to the change requirements of Chamdor brewery.

Next, capital investment in systems must allow for flexible management information systems that are easily adapted to the new demands of products and processes. This will reduce the manual intervention that is currently spent on managing the brewery, and will free people up for value adding initiatives such as creativity and innovation.

7.4 Merging of CLD's 1 and 2

The situation described in CLD's 1 and 2 is of two discrete systems, the first being a system that is spiralling out of control, the second being a system in balance.

To what degree do the two systems interact?

The two systems groups defined above do have a link - they do not work mutually exclusively. At a high level, the integration of these two systems is reflected in Fig 7.4 and is linked by a new variable named brewery performance.

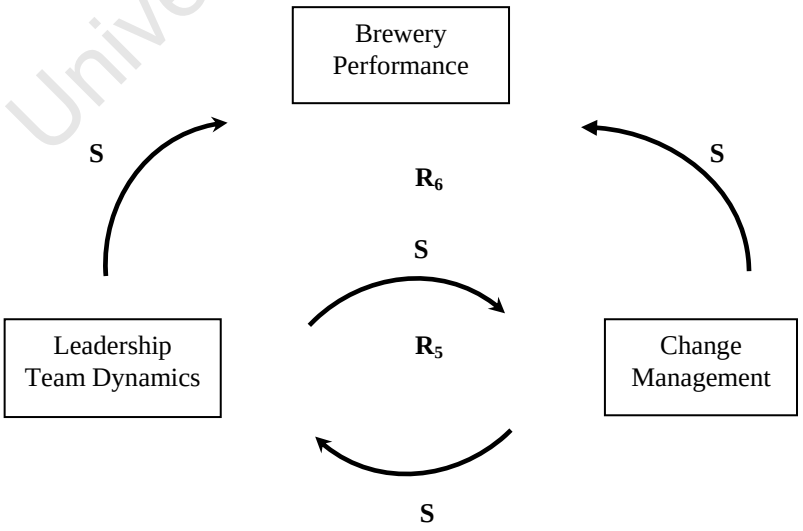

Fig 7.4: CLD 3 - High Level Integration of the CLD's 1 and 2

The system has two reinforcing loops, R_5 and R_6. In reinforcing loop R_5, as the leadership team dynamics improves, so does the effectiveness of change management. As change management improves so does the leadership team dynamics. Of course the converse also holds, that is, as leadership team dynamics decreases, so does the effectiveness of the change management. In this case, the system would continue to get worse in a negative spiral.

In reinforcing loop R_6, as the leadership team dynamic improves, so does brewery performance. As the change management strategy improves, so does brewery performance. The converse of this also holds - as change management becomes less effective, brewery performance also declines.

As a point of clarity, the author attempted to merge CLD's 1 and 2 into a single CLD. However, the resulting CLD was too complex to explain. The author also believes that the underlying systems structure has been dealt with in separate diagrams elsewhere in this thesis (refer IRD Fig 6.3 and Outcome and Drivers Fig 6.4 in chapter 6)

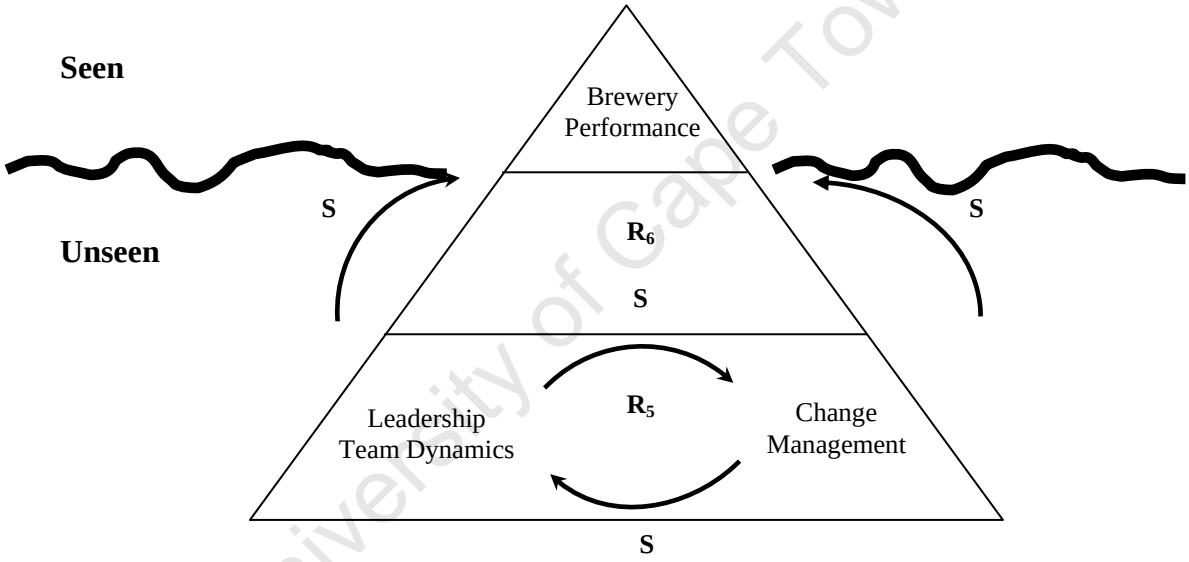

Fig 7.5: Overlaying of Systems Iceberg on CLD 3

In Fig 7.5 the system iceberg model has been overlaid over CLD 3 to demonstrate how the underlying patterns and structure that are impacting on brewery performance have surfaced. From this it can be seen that the event in the systems iceberg is the brewery performance, and that the two sub systems of leadership team dynamics and change management are the underlying patterns and structure that are occurring at Chamdor.

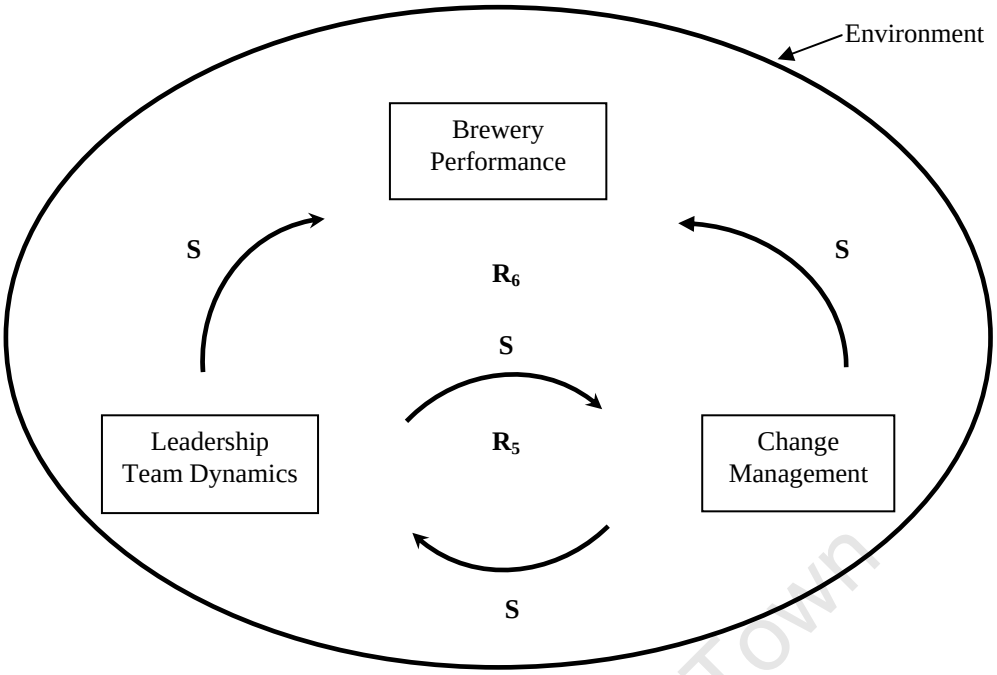

Fig 7.6: The Chamdor System in its Environment

Fig 7.6 represents the same system within its environment, with the circle being the environment. This figure depicts a stable system that is cocooned within its environment. This situation is tantamount to two systems balancing on a fulcrum (refer Fig 7.7). For the total system to be in balance, both sub-systems need to be in balance.

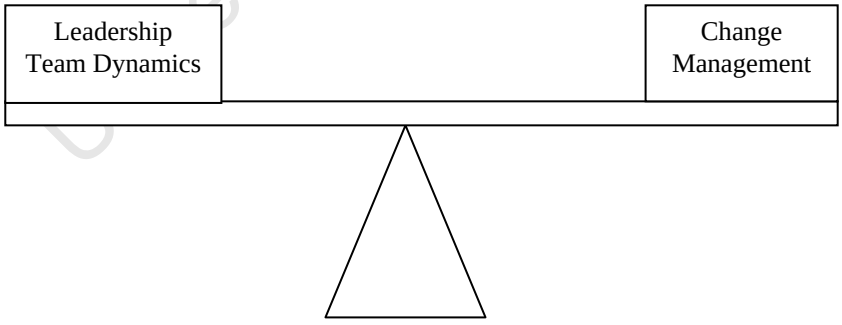

Fig 7.7: The Balance between CLD's 2 and 3

This balance forms an integral part of one of the filter layers in the change model that is proposed in Fig 7.11. However, in order for a system to remain viable, it needs to have the capacity to adapt to new situations. This capacity for adaptation is normally associated with the strategic levels within an organization, and in the case of this study, the CSMT.

Viable systems are those able to maintain a separate existence. Such systems have their own problem-solving capacity. If they are going to survive they need not only a capacity to respond to familiar disturbances, but potential to respond to unexpected, previously unknown disturbances. This latter capacity is a hallmark of viable systems - it gives them the capacity to adapt to changing environments. While a catastrophic event may at any instance fracture the coherence of a viable system, the fact of viability lessens the vulnerability of systems to chance and indeed makes them more adaptive to change.

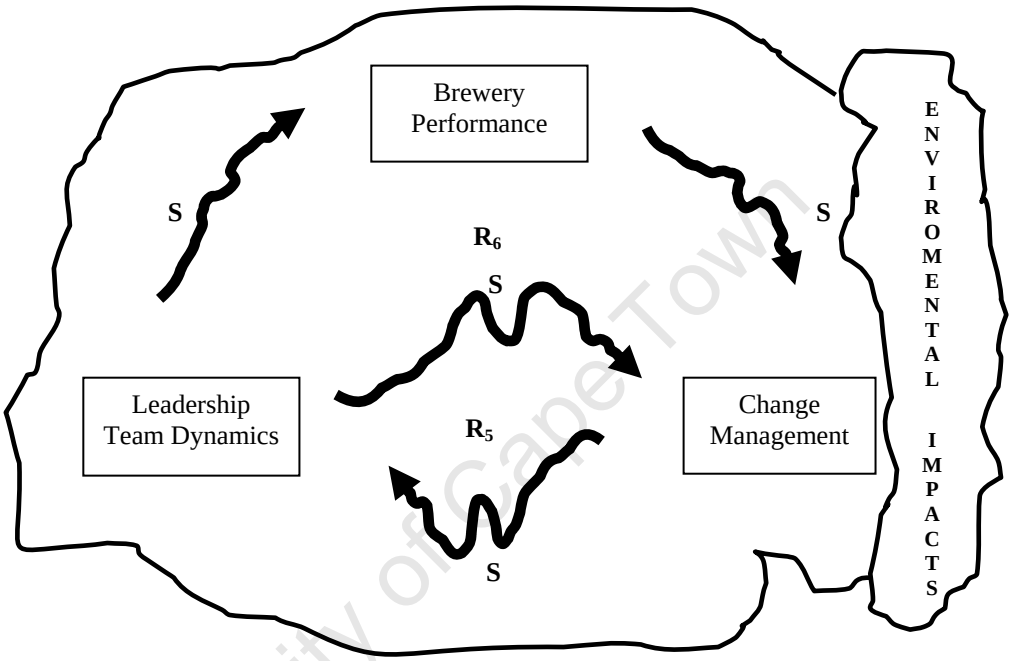

Fig 7.8: Representation of Environmental Impacts on the Chamdor System

Fig 7.8 depicts the same system as Fig 7.6, but with the influence of environmental impacts that distort the shape of the system and hence make the total system unstable.

What are the factors that impact on this environment?

Of all the factors impacting on the environment, the author has identified that the greatest impact is the volume of continuous projects. Fig 7.8 therefore represents the impact of continuous projects on this environment and shows how the environment gets distorted when overloaded by projects and initiatives.

7.5 Proposed: A Model for Managing Change in a Changing Environment

While CLD's are useful in demonstrating the relationships between the findings of action research, they do not in themselves integrate the whole experience of managing change in a changing environment.

In this section the author presents a proposal for a model to explain the necessary elements and processes underlying the management of change in a manufacturing

facility, using the three models of change presented in chapter 3 as a source of evidence to support this claim.

In arriving at this model, the author has formulated reasoning around the Toulmin argument model (Paul, 1993), and the relationship between the argument components is shown in Fig 7.9:

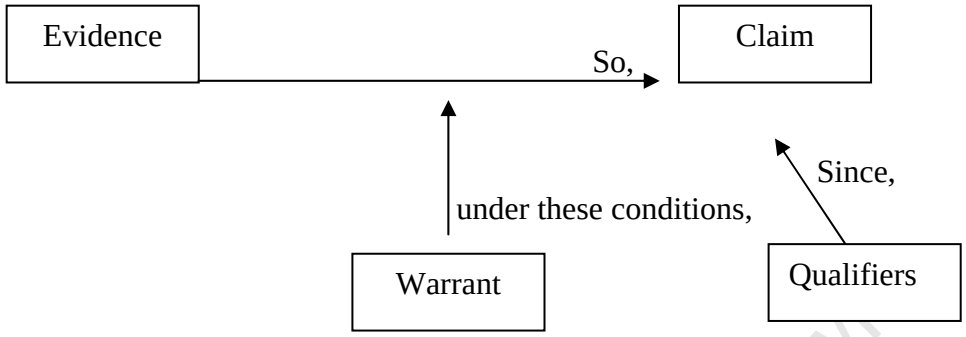

Fig 7.9: The Toulmin Argument Model (Paul 1993, p. 68)

The components of the argument are made of claims, evidence, warrants and qualifiers. Claims are disputable statements that are the focus of the argument and in this case will be a model and its components to explain a certain research phenomenon. Evidence is information and data that is offered to support the claim. These are the outcomes of the research study. Warrants are authoritative works, common knowledge or reasoning and inferences that connect the evidence to the claim. In most cases the author has used the three models of change as the base for the warrantable assertions. In some instances, however, the author has used the absence of information as a warrant i.e. disconfirming information has been sought and not found. Qualifiers are hedging statements that indicate limits to the claim and thereby enhance its validity.

The structure of this argument is that given the evidence that has been presented, and since there is warranted support, under certain qualified conditions, a claim is being made. The claim is therefore that this model is qualified in that it is not proposed as a general model for change, but rather one to promote understanding of change management in a complex environment.

In order to develop the model further, the author has drawn from two different sources. The first is a typical feedback control loop from the field of instrumentation, and the second is Ashby's second law of cybernetics.

Fig 7.10 shows a simple feedback control loop as borrowed from the field of Instrumentation:

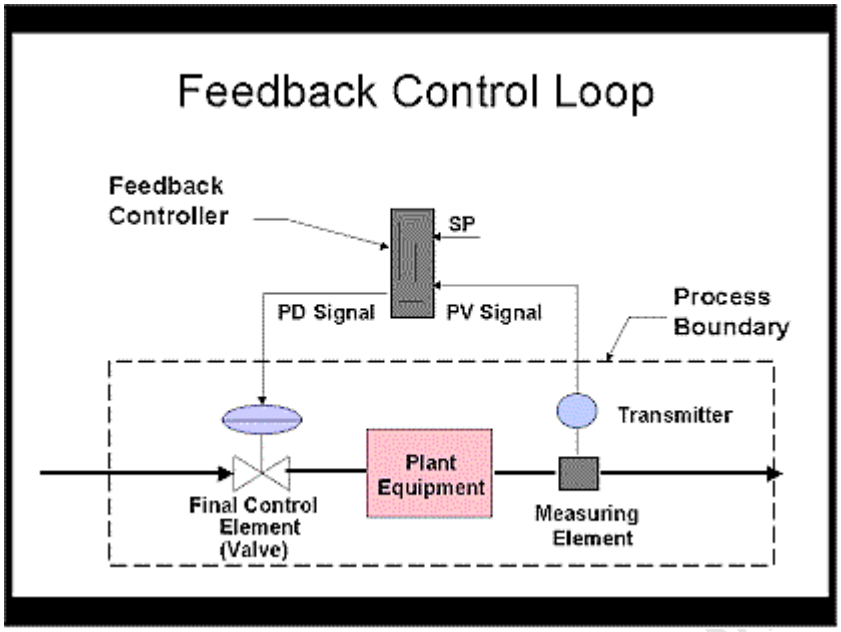

Fig 7.10: Feedback Control Loop

In its simplest form, the loop consists of a measuring device with associated transmitter, a final control element, which is often simply called the valve and a controller. The signal from the transmitter to the controller will be referred to as the process variable (PV) and the signal from the controller to the final control element as the process demand (PD). The controller itself in its simplest form has two inputs. One is called the set-point (SP), which is the value at which you would like to control the process, and the other is the PV which is the actual value of the process. If a process is on set-point, and is stable, and an error then arises, it will be because either the set-point or the PV has changed. This feedback process is a concept which systems thinking has adopted and applied to not only technical systems but social systems as well. In a system a transformation of inputs into outputs occurs.

De Rosnay (1997) notes that the result of a transformation or an action is fed back to the input of the system in the form of input data. If new data accelerates the transformation in the same direction as the preceding results, they are positive feedback i.e. resulting in growth or decline. Negative feedback would be the result of new data producing a result in the opposite direction to previous results, i.e. as De Rosnay states, there is maintenance of the equilibrium to stabilize the system. Ashby's (1970) second law of his three basic cybernetic laws of complex systems, the Feedback Law, extends this concept. In this law, the output of a complex system is dominated by the feedback and within wide limits, the input is irrelevant. The corollary to this law is that all outputs that are important to the system will have associated feedback loops. Feedback loops can be conveniently divided into two classes depending on their effect upon the system behaviour. The first are negative or error correcting or goal seeking. The second are positive or vicious or deviation amplifying.

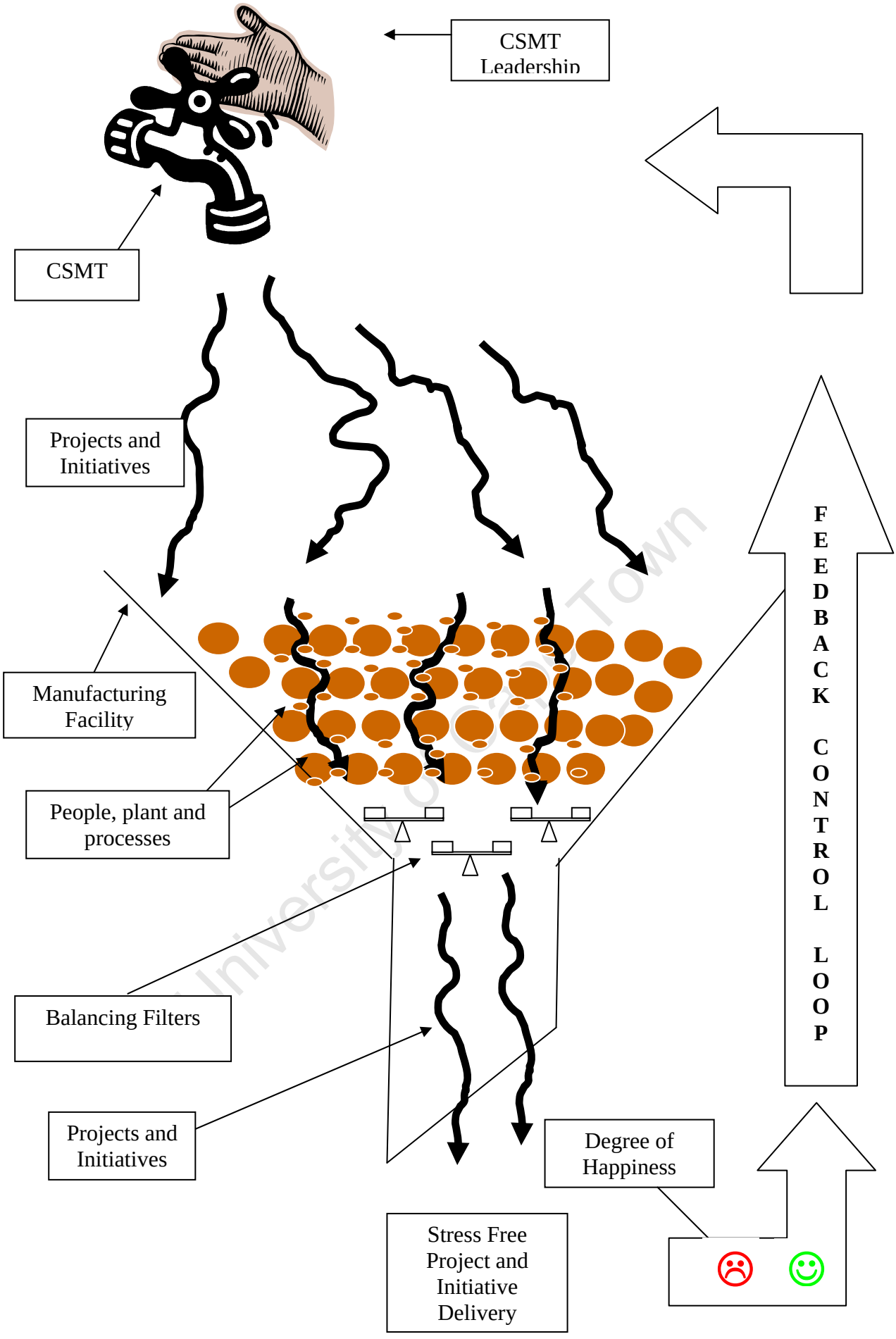

Fig 7.1: The Coleman Model of Change

The Coleman model is made up of the following elements:

The hand represents the CSMT leadership (i.e. the General Manager), while the tap represents the CSMT members. Each squiggly line entering the funnel represents a single project or initiative. In the case of the example shown, there are four projects entering the funnel. The funnel is the brewery or manufacturing facility and represents a channelling or filtering mechanism for all the incoming projects and initiatives. In effect, these are the boundaries of the process or the system in focus. The filter bed (the circles) is installed at the bottom of the funnel. Each of the circles represents the people, the plant and the processes within the brewery, and collectively the group of circles represents the brewery. The balancing filters represent an additional filter mechanism. The two squiggly lines exiting the model represent the projects or initiatives that have been filtered through the filter bed. The faces at the bottom of the funnel represent one of two scenarios. The happy face represents stress free project delivery, while the sad face represents high stress project delivery. The two bold arrows represent the feedback control loop back to the CSMT leadership and to the CSMT.

The model depicts a filtering mechanism linked to a water tap, and operates in the following way:

- Initially the tap is open and a number of new projects or initiatives are directed towards the funnel (i.e. the brewery or manufacturing facility).
- Each new project or initiative is filtered twice, firstly through the filter bed (the people, the plant and the processes) and secondly through the change pyramids. By implication, no project or initiative should exit the funnel unless it has been through this filtering mechanism.
- There are essentially two possible scenarios within the filter bed, namely that the bed becomes too porous or that the bed becomes blocked.
    - In the first scenario, should there be a weak link (either an individual process, piece of plant or certain individuals or the sum of the three together), or a tilt in the structure of the balancing filter, the funnel becomes more porous. This results in too many projects and initiatives being able to exit the funnel at the same time. Since the system sees the filter as flowing well, it is not concerned with increasing the in-flow of projects and initiatives, as it assumes the filters are doing their job.
    - In the second scenario, the system reaches a point of project/initiative overload, and the volume of projects builds up above the filter bed. Once again, this could be caused by a weak link (either an individual process, piece of plant or certain individuals or the sum of the three together), or a tilt in the balance filter. The funnel becomes blocked. In this scenario the projects and initiatives overflow the funnel, thereby by-passing the two filtering mechanisms that are in place. This means that projects and initiative delivery can still be achieved, but the filtering mechanism (which is really a system of checks and balances) is by-passed. The quality of project and initiative delivery therefore becomes worse. As a result, new plant and processes are never effectively bedded down, resulting in re-work, ineffective practices, etc. The ethnographic journal has many examples of this.
- Neither of these scenarios is ideal, as in both cases the system is overwhelmed, which leads to under delivery of projects/initiatives, thereby creating a lot of additional stress.

- The ideal scenario is one where new projects or initiatives exit the funnel in a logical and orderly manner, having been processed through the two filtering mechanisms. In this ideal scenario, everyone wins as a happy face is achieved. There is no need to revert to the feedback control loop, as the process is stable and on set-point. In fact, there may be opportunities to open the tap still further, as the system has the ability to handle more change.
- If too many new projects or initiatives exit the funnel together, everyone loses, as a sad face is achieved. This implies that the brewery is overloaded. In this situation, the feedback control loop kicks in by regulating the flow through the tap. Therefore, the tap is throttled, thereby reducing the number of initiatives and projects from entering the funnel. This is a continuous feedback loop which operates until a happy face status is achieved, following which the tap can be opened again.
- This calls for the CSMT leadership and the CSMT to have their fingers on the pulse of the brewery, to understand the amount and type of change that is happening.
- The ultimate goal is for the whole loop to reach a point of balance or equilibrium, where the ability to deliver initiatives or projects is matched by the capability of the brewery and it's people to support them.
- Given Chamdor's role as a lead flexible production facility, this is an idealistic notion. The situation will occasionally arise where a strategic project/initiative will have to enter the funnel and other projects and initiatives may have to be delayed or even sacrificed. A case in point was the Miller Genuine Draft (MGD) project.
- What barometer is used for measuring whether project or initiative delivery is indeed stress free? Many tools are routinely used within the brewery to measure this. They include organisational effectiveness surveys, staff turnover, the hours that people work, feedback in various forums, etc. Feedback via these tools is a useful gauge of the stress levels that people and systems are operating under.
- Can the system truly deliver more? Another way to accommodate even more is to widen the funnel and increase the filter bed, either by adding more (people) resources into the system or improving the plant capability to deal with change itself.

7.6 Summary

In this chapter and building on the concept of CLD's introduced in chapter 5, the key variables from chapter 6 were grouped into two systems groups, namely the leadership team dynamics systems group and the change management systems group. Separate CLD's were developed for each of these groups.

The links between these two systems groups were explored and expanded by overlaying the integrated CLD into the systems thinking iceberg. The impact of continuous projects as the major environmental factor was also explored. The role of the two systems as a balancing act was developed, and integrated as an additional filter mechanism into the proposed change model for Managing Change in a Changing Environment. In chapter 8, the validity of the proposed model is reflected upon.

Part 4 – Evaluation

The aim of part 4 of this thesis is to demonstrate validity and rigour of the total process by closing the cycle first hypothesised in part 1 and subsequently further developed in parts 2 and 3.

The aim of chapter 8 is to reflect on the model proposed in chapter 7, and by answering a number of questions, demonstrate the model's validity and rigour.

In chapter 9 a final process check of the research process followed throughout this thesis is done using the SCQARE framework in order to make sense of the author's logic. The framework consists of six parts, namely:

a. S - Situation
b. C - Concern
c. Q - Question
d. A - Answer
e. R – Rationale
f. E - Evaluation

The chapter ends off with a summary of conclusions, and the benefits that have been gained on a personal level from doing this thesis.

Chapter 8 - Reflection on the Model

The aim of this chapter is to reflect on the Coleman model proposed in chapter 7, and by answering the questions outlined below, demonstrate its validity:

- How the model is different to other change models?
- Is the proposed model useful?
- How does the proposed model compare with other models?
- Is the model applicable at other manufacturing sites?
- Can the author apply these learning's when faced with a similar situation?
- Has the model been tested or applied?
- Is the model a reasonable reflection of reality?

8.1 How is the model different to other change models?

In order to examine differences and similarities between the three change models (section 3.5) and the author's model, the Coleman model has been filtered through the **CATWOE** analysis (described in section 3.5.4) to reveal the author's underlying assumptions and to seek disconfirming information.

Customer – as with the Lewin model, the author has considered the customer in the model to be either the person directly undergoing the change process, or at another level, it could be the leader (and by further implication the CSMT) benefiting from the change model being proposed.
Actors – the author considers those people or teams that the customer (the person going through the change) influences or is influenced by the main actors.
Transformation – in agreement with Lewin, the author's model refers directly from moving from one steady state to another.
Worldview – in describing the model the author proposes that the change process is mostly driven by the person/team going through the change (as per Kotter), and that the change process is not reversible.
Owner – in most cases, this would be the person or team going through the change.
Environment – the author has assumed that the model has direct applicability in an organisational context.

The model looks at the factors that initiate a change, and by reference to the supporting causal loop diagrams, reveals underlying structures.

8.2 Is the proposed model useful?

The author proposes that this model's usefulness derives from several factors. Firstly, the model has emerged from a researched process involving empirical evidence rather than a purely theoretical approach. Secondly, it is the author's belief that the techniques employed support the validity of the information. Thirdly, it is referenced against other well known models of change. The author knows that by going through an active learning experience where learning's have been formally captured, that the next experience of managing change will be improved through use of this model. The author further proposes that the model has application in a general sense of change

management because of the systems thinking approach to examine fundamental structures.

8.3 How does the proposed model compare with other models?

This model has been developed as part of a research process conducted on one site within a single organisation and the generalisability has not been tested. In addition, unlike the other models reviewed (refer sections 3.5.1 to 3.5.3 on the change models of Lewin, Conner and Kotter), this model is specific in the area of managing change in a complex and changing environment, and it does not offer a general approach to change management (although there are several principles which have wider applicability).

8.4 Is the model applicable at other manufacturing sites?

The author would argue that this model is applicable at other manufacturing sites that are undergoing similar volumes of change. Chamdor brewery is not unique within the group in that it is not the only manufacturing facility undergoing change. Most of the other facilities are faced with the same initiatives that Chamdor are. Most, however, are not being faced with the volume of NPD work and projects that Chamdor is. This situation is rapidly changing at the other sites, and when their volume of projects increases, these facilities are going to be faced with the same issues that this brewery faces. The author therefore firmly believes that they will be able to use this model to control and manage the number of projects and initiatives that are coming their way.

8.5 Can the author apply these learning's when faced with a similar situation?

Action learning is a process of learning by intervening, with the intention of improving practice. This has been been a significant outcome of this study. The last few years at Chamdor brewery, as well as documenting the whole process via this action research project has definitely given the author greater insights into the change management process required to manage multiple interventions on a site. The author believes that these learning's can definitely be applied and transferred to other contexts, in order to prevent the repetition of the same errors as have been made at Chamdor brewery. Furthermore, the author is confident that he has grown from these experiences on a personal level.

8.6 Has the Coleman model been tested or applied?

Yes, it has. The concept is used to manage the day to day activities within the project department on site, to the point where projects are tracked not only on their timelines, but also for their impact on people and the softer issues such as morale and stress.

While the last few years have seen numerous projects and interventions on site, the years following this study will have potentially more projects and initiatives, with a significant increase in terms of capex spend and volume of projects. While the CSMT is maturing and working together better, the model is being used to prioritise and control focus in a structured, systematic way. With this has come the realisation that you cannot be all things to everybody and that all processes have defined limits and capabilities. This means there is a limit to how far you can push plant capability, and a limit to how far you can push the people who make things happen.

On a personal level and relating to the author's specific job, the model is being used (and all the learning that have been included within it), to prioritise and focus the project team. In this way the project team is better able to deliver projects without negatively impacting on the morale and stress levels within the plant. A recent example of using the model is a campus brewery project, which is being carried out on behalf of SABMiller. The project involves the installation of a particular technology, which has never been commercially tested in any of our breweries around the world. If the technology works (which is environmentally driven), it will be rolled out to SAB Miller breweries across the world, so it has a very high focus and very tight timelines.

The Coleman model was updated to include the status of all current projects, and then the new project was added into the mix. It soon became apparent that the project could not be performed in the available timeframe, and that until the funnel was free flowing, this new project would significantly slow down the delivery of existing projects through the funnel. The new project was therefore postponed by four months, in order to control the flow through the funnel. This resulted in the whole system being in balance, ultimately allowing all the projects to be delivered. So while the project is important to the broader organisation, it is more important to Chamdor that they control the flow of project initiatives in a logical manner.

8.7 Is the model a reasonable reflection of reality?

The reality to the author is that a well functioning leadership team (and hence brewery) would be dealing with multiple interventions and change. Take the example of trying to drink water from a tap (which is essentially the model being proposed) – if too much water gushes out, the natural inclination is to slow the feed. This is a very basic feedback control loop. Therefore, in the context of complex change, where you are battling to control or manage a manufacturing facility, the natural inclination is to control the amount of change – this is after all the job of a senior management team in any work environment.

8.8 Summary

In conclusion, the proposed model has worked in practice (refer the example discussed in section 8.6) and has proven to be useful and relevant in better understanding and managing the process of managing change in a complex manufacturing facility.

The next chapter concludes this thesis with an overall reflection on the research process.

Chapter 9 – Evaluation and Conclusions

The SCQARE framework is explained and applied as a framework to guide the overall evaluation of this thesis. This is followed by a reflection on the research process and outcomes.

9.1 Introduction to SCQARE

The SCQARE approach (Ryan, T. 2001) assumes that the author of a text believes that he or she has added some value to the world by producing the text. It is then the reader's task to identify and evaluate that perceived value. The SCQARE framework allows the researcher to expand and express the answer so that it supports its relevance, usefulness, validity and ethical content. This is all achieved with respect to the original concern or problem statement. The framework consists of six parts:

a. **S - Situation:** For an idea to have value, it must be relevant to a given situation.
b. **C - Concern:** An investigation is usually carried out because there is a concern about the situation. This can be brought about by either change in the situation or in the environment.
c. **Q - Question:** A question derived from the concern that if adequately answered will deal with the concern.
d. **A - Answer:** The answer to the question, which is normally generated as a number of possible answers.
e. **R - Rationale**: This step provides the logical basis for the answer. Based on the interpretation of evidence and theoretical assumptions, the researcher puts forward a point of view relevant to the given situation..
f. **E - Evaluation:** This step is the quality check for the SCQARE framework, and consists of four parts:
    - Relevance, which asks the question: "Is C relevant in S and does S adequately explain why C is a concern?"
    - Utility, which asks the question: "Will A satisfactorily deal with C?"
    - Validity, which asks the question: "Does R provide a valid argument for A, where A is a claim?"
    - Ethics, which asks the question: "Is A an ethical option given the context S?"

9.2 Situation

As a submission for this thesis, an action research project was undertaken on a work related problem. The excerpts from the author's ethnographic journal (appendix 1) describe a situation that is:

- Chaotic and unstructured.
- Seriously lacking in systems.
- Lacking leadership.
- Lacking experience.
- Resistant to change.
- Swamped by multiple interventions on site.

9.3 Concern

Following an extended period of critical reflection, plus discussions with team members in the organizational context, the author is concerned that there are a number of systemic issues that are negatively impacting on the effectiveness of the CSMT. This in turn is impacting on the ability of the brewery to deal with significant volumes of change, as well as complex change in areas outside of our traditional comfort zones. A mechanism for surfacing these issues needed to be found, as well as a way of solving these problems in a structured way.

It was also important that all members of the CSMT were involved in surfacing the issues, and that all team members were committed to the implementation of corrective action.

The system in focus was the CSMT. The problem statement was:

How to manage change in a continuously changing (and complex) manufacturing environment.

9.4 Question

There were essentially two questions that the author wanted to answer:

- What are the factors that are impacting on the effectiveness of the CSMT?
- What should be done to change the situation at Chamdor?

The author's latent hypothesis is that this study could contribute to improving the understanding of the factors that were impacting on the CSMT's performance. As a result of these efforts, a model has been proposed to manage the situation.

9.5 Answer

The answers to the questions above lie in a number of different sources. This ties up predominantly with chapter 6. The first is the ethnographic journal, from which a number of re-occurring themes have been surfaced via various IRD's and CLD's. Ultimately a model has been proposed to show how the situation can be managed and improved.

9.6 Rationale

The rationale provides the logical basis for the answer. The ethnographic journal reflected the author's ongoing concerns with the CSMT over a period of more than two years. Based on the information that was presented, there is sufficient evidence to confirm that there was definitely a problem with the effectiveness of the CSMT. The author therefore believes that he was fully justified in investigating this problem area. Having established validity of the concern, the rationale for the answer was provided in the participatory process of action research, adherence to research process in collection and analysis of data and the use of literature sources of change models.

9.7 Evaluation

This is the quality check for the SCQARE framework. The requirements for relevance are met, since the situation adequately explains why the concern exists. The CSMT within a brewery is a vital cog in the value chain throughout the plant – they are the team that decides the direction the brewery will take. Therefore, any problems, be they systemic or situational, that impact on this team's performance, are of profound importance to the effective running of the brewery. Therefore, getting the CSMT at Chamdor to operate effectively is of great relevance.

The requirement for utility is met, since the answer satisfactorily deals with the concern. The answers to the problem have been surfaced and lie within the author's ethnographic journal.

The requirement for validity is met since the rationale provides a valid argument to the claim (answer). The author's claim is that two main systemic issues are the root cause of why the CSMT is ineffective. The two are the leadership team dynamics (which describes how problematic leadership is influencing team dynamics) and the change management system (how the lack of effective change management is impacting on the CSMT). The author has demonstrated this via recoding participant observation data in the ethnographic journal, as well as a detailed breakdown and analysis of the system events, patterns and structure.

The ethics requirement is met since the answer is an ethical option given the context of the situation. By undertaking this project, the interests of a number of parties were served. These include the CSMT itself, which can utilise the information to formulate an agreed way forward. Every other team on site will benefit as well, as it is in the interests of the whole brewery that the CSMT is operating effectively, managing change and leading the brewery to a bright new future.

9.8 Conclusion

The purpose of this research study has been two-fold:

- Firstly, to manage the action which was essentially the changes that the author has experienced at both workplace and personal level, and
- Secondly, to conduct a research study in order to improve understanding of the change management process.

The author believes the systems thinking approach has added greatly to the usefulness of this study, which has contributed much learning about the overall nature and management of change, as well as behaviours and patterns that can be worked on to improve the overall effectiveness of change, both at a team and an individual level.

The learning experiences presented here reflect the process of change as experienced by the author, and no attempt has been made to validate the ideas through other investigative methods. The knowledge acquired, however, has allowed the author to construct a framework to help better understand the mechanism of change. This will allow improved management practices through increased responsiveness to change, as well as leading others through the process more effectively.

The question of validity of the research study was always at the forefront of the author's thinking during the write up of this dissertation. This is important when reflecting back on the research and presentation of findings. The author therefore proposes that the purpose of action research is not to prove anything, but to better understand a situation so that both personal as well as others practice, can be improved. The author also recognizes that this is an interpretative act.

The cybernetic laws as described by Ashby (section 4.4) proved fundamental in providing the explanatory power of the systems at play. That systems seek a level of stability, is a key factor in the operation of the author's proposed model. Similarly, the law concerning feedback is well demonstrated through the use of CLDs and the Coleman model. The law of requisite variety also plays an important part in the Coleman model through the idea of balancing filters. These filters are variety reducers which help the system to cope when there is a large increase in the inputs to the system. The usefulness of the model has been demonstrated to the point where it is recommended that the model can be used for any organisation undergoing continuous change.

In addition to the importance of this study for the author as a manager, and the organisation in which it was conducted, the relevance can be extended to other organisations as well. Generally managers are changing roles much more frequently than in the past. Pullen (1996) cites a survey that shows that in one third of companies, half of all senior managers have changed roles in the last two years. In an increasingly complex and fast changing world, this trend is likely to continue. To survive in this world, corporate and individual flexibility is essential.

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Appendices