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***A SYSTEMIC RATIONALE FOR
INTEGRATED
LOGISTICS/MATERIALS MANAGEMENT:
A CASE STUDY OF ROMAGO ENGINEERING***

***A THESIS
SUBMITTED TO
THE SCHOOL OF ENGINEERING
MANAGEMENT
BY***

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THE REQUIREMENTS
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***SUPERVISOR: ASSOCIATE PROFESSOR
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Sometimes it is amazing when one starts to think of the influence various people have had on his life. There are those we consider to have profoundly affected our lives and there are those we think they have barely touched our lives. Yet in a world where the flapping of the wings in the Amazon forest can cause a storm in Florida, the people who go unrecognised in our lives may be the very people with the greatest effect on the destinies of our lives.

In this acknowledgement I will name only those who have recently affected my life and made this thesis an adventure through pain and joy on the path to self discovery.

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Next are those dear friends, who though far, have been near through constant communication by email and letters. In this category are my dear brother Dr. Antony Madelle Mahindu, My sister Grace Otieno Tuju, and my dear friend Mimie Baligassa Mijares. Your encouragement was very useful and kept me going during those dark moments when life was on the edge. There is also that group of faithful friends who were close and made my life enjoyable and worth pursuing, these were, The Kalyegira family, The Wos family, My classmate Kalpana Ramesh Kanjee, James Tung and my housemate Peter Lekoma Tsepiso. Thanks too for the many late night rides. Special thanks to my sister and most dear friend Florence Ethel Leopold-George, our times together have indeed been challenging intellectually as well as refreshing.

To Corriene Shaw and Associate Professor, Tom, B. Ryan goes the gratitude for introducing me both to Systems Thinking, Qualitative Research and Action Research. The seed you have planted will definitely sprout and give fruit in due season.

To the Systemic leadership Development programme 2000 class, I say thank you so much for the opportunity I had in sharing with you a small portion of your life. You have proved your mettle, now try to show the world these new ideas that have been passed to us.

To all I say thank you, for your love, support, encouragement, challenge and forbearing spirit to endure such a mortal as I, on this journey to knowledge, a journey that I believe has only begun. I thank you all for your participation and humble contribution to making my life such an enriched experience.

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DEDICATION

In loving Memory of my grandmother,

Naomi Khasungu Matimu

To my Aunt,

Mary Ayako Nyawade

And to my Mother,

Alice Lime Matimu

All of whom are in my heart and thoughts every day.

ABSTRACT

While the need for integrated management of Logistics/Materials has long been recognised since the 1960's among material supply practitioners, Its adoption has been slow and only progressed during times of economic crisis and by benchmarking against those who made progress as they adopted it.

This thesis argues that this slow adoption has partially been due to an under conceptualisation of the theoretical rationale for such an adoption. Using a case study of Romago Engineering, a company that was experiencing material supply problems, the thesis develops a theoretical foundation for such management through a conceptualisation of the firm as a system, whose behaviour and characteristics are a result of the interactions of its various sub-systems. This conceptualisation is built on a systems philosophy that also leads to a pluralistic view of reality. This required that the inquiry method developed to inquire into the problematic issues at Romago engineering should incorporate multiple perspectives. Systems thinking and multiple perspective inquiry framework that synthesised the work of Minter, Ryan and Handy was developed. This framework worked within qualitative and action research paradigms, using the Soft Systems Methodology and Viable Systems Diagnostics.

The results of the application of the framework and the methodologies, indicate that if the material supply problems are to be solved in a holistic rather than a symptom treatment level then, Romago Engineering needs to adopt an integrated Logistics/Materials management, and develop policies that will attract and retain highly competent technical and managerial employees.

Thus starting from the philosophical foundations of systems thinking, qualitative research and action research, a methodology for inquiry into complex managerial problems was developed, as was a rationale for the adoption of integrated logistic/materials management.

TABLE OF CONTENTS

ACKNOWLEDGEMENTS.....	2
DEDICATION.....	4
ABSTRACT	5
TABLE OF CONTENTS	6
LIST OF FIGURES	10
LIST OF TABLES	11
PROLOGUE.....	12
CHAPTER 1: INTRODUCTION	15
1.1 BACKGROUND TO RESEARCH.....	15
1.2 RESEARCH PROBLEM AND HYPOTHESIS	16
1.3 JUSTIFICATION FOR RESEARCH	17
1.4 METHODOLOGY	19
1.5 THESIS OUTLINE	21
1.6 CONCLUSIONS	22
CHAPTER 2	23
RESEARCH ISSUES -LOGISTICS/MATERIALS MANAGEMENT.....	23
2.1 SYSTEM OF FOCUS	23
2.2 ORGANIZATIONAL MODEL	24
<i>Machine model of Organisation.....</i>	<i>25</i>
<i>Organismic Model of Organisation.....</i>	<i>25</i>
<i>Social model of Organisation.....</i>	<i>25</i>
<i>Synthesised model of organisation for Romago</i>	<i>26</i>
2.3 ORGANIZING FOR EFFECTIVE LOGISTICS	27
2.4 LITERATURE REVIEW ON LOGISTICS, AND MATERIALS MANAGEMENT	28
<i>Physical Procurement</i>	<i>29</i>
<i>Physical Distribution Management.....</i>	<i>29</i>
<i>Materials Management.....</i>	<i>30</i>
SUMMARY	33

CHAPTER 3	34
PHILOSOPHICAL FRAMEWORK FOR INQUIRY METHOD	34
3.1 PHILOSOPHIC NECESSITY.....	34
3.2 PHILOSOPHY OF SYSTEMS	35
3.2.1 Systems Ontology And Epistemology	36
3.2.2 Systems Metaphysics- On Being.....	39
3.2.3 System Metaphysics -On Wholes	40
SUMMARY	42
CHAPTER 4: THE BASIS OF THE FRAMEWORK OF INQUIRY.....	43
4.1 THE NATURE AND PROCESS OF MANAGEMENT RESEARCH.....	43
<i>Postulates of Research Paradigm</i>	<i>45</i>
4.2 QUALITATIVE RESEARCH	45
<i>Kuhn's View of the Sociology of Science.....</i>	<i>45</i>
<i>Marginalisation of Qualitative Research</i>	<i>46</i>
<i>Postulates of the two paradigms</i>	<i>48</i>
<i>A closer look at three research issues in the two paradigms.....</i>	<i>53</i>
<i>Integrating the Qualitative paradigm in Action Research</i>	<i>54</i>
SUMMARY	55
CHAPTER 5 : THE QUESTION AND THEORY; CONDUCTING QUALITATIVE RESEARCH WITHIN AN ACTION RESEARCH FRAMEWORK.....	56
5.1 HISTORY OF ACTION RESEARCH.....	56
5.2 THE PHILOSOPHY OF ACTION RESEARCH.....	57
5.3 WHAT IS ACTION RESEARCH? DEFINITION.	58
5.4 THE PROCESS OF ACTION RESEARCH.	59
5.6.DOING ACTION RESEARCH	61
<i>Data collection in natural settings</i>	<i>61</i>
<i>Building a purposive sample</i>	<i>62</i>
<i>Qualitative methods of data collection.....</i>	<i>63</i>
5.7 SWEEPING IN MULTIPLE PERSPECTIVES.....	63

5.7.1	SOFT SYSTEMS METHODOLOGY MODEL- HUMAN ACTIVITY SYSTEM.....	66
5.7.2	VIABLE SYSTEMS DIAGNOSTICS	70
	<i>Viable System Diagnosis</i>	75
	SUMMARY	77
	CHAPTER 6: IMPLEMENTATION-RESEARCH IN ACTION	78
6.1	PROBLEM SITUATION UNSTRUCTURED	78
6.2	SOFT SYSTEMS METHODOLOGY RICH PICTURE OF MATERIALS SUPPLY SYSTEM OF ROMAGO STANDARD LINE	78
6.3	CONCEPTUAL SYSTEMS.....	80
6.3.1	CONTAINER TANK MANUFACTURING SYSTEM.....	80
6.3.2	A MATERIAL PROCUREMENT SYSTEM.....	81
6.3.3	INCOME GENERATING SYSTEM FOR EMPLOYEES	82
6.3.4	INCOME GENERATING SYSTEM FOR ROMAGO SHAREHOLDERS.....	83
6.3.5	A PLANNING AND SCHEDULE PRODUCTION SYSTEM.....	84
6.3.6	COMPONENT AND TANK ACCESSORIES SUPPLY SYSTEM.....	85
6.4	COMPARISON OF CONCEPTUAL MODELS WITH RICH PICTURE.....	87
6.5	SUMMARY OF COMPARISON OF CONCEPTUAL MODELS WITH RICH PICTURE	91
6.5	VIABLE SYSTEM DIAGNOSIS OF THE VARIOUS SYSTEM'S THAT MAKE FOR VIABILITY.....	93
6.7	PROPOSED ORGANISATION	96
	SUMMARY	97
	<u>7. TEST</u>	98
7.1	ORGANISATIONAL (STRUCTURE, POLICY, COMMUNICATION AND PROCEDURE).....	98
7.2	HUMAN RESOURCES	99
	SUMMARY	101
	8.REFLECTION/EVALUATION	102
8.1	REFLECTION ON CONTEXT	102
8.2	REFLECTION ON PROCESS.....	102
8.3	REFLECTION ON CONTENT	104

8.4 REFLECTION ON PERSONAL LEARNING	105
SUMMARY	108
9.0 REFERENCES.....	109
10. APPENDICES	114
APPENDIX 1: PROBLEM SITUATION UNSTRUCTURED	114
APPENDIX 2	116

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LIST OF FIGURES

<i>FIG1: DYNAMICS OF MY POSITION AS AN ACTION RESEARCHER.....</i>	<i>13</i>
<i>FIG 2: THE INTEGRATED LEARNING CYCLE SYSNTHESED FROM THE WORK OF MINTER, PROFESSOR RYAN, HANDY AND KEMMIS.....</i>	<i>18</i>
<i>FIG 3: SYSTEMIC VIEW OF THE BUSINESS LOGISTICS SYSTEM OF FOCUS.....</i>	<i>29</i>
<i>FIG 4:ROMAGO AS A PROFIT GENERATING SYSTEM.....</i>	<i>30</i>
<i>FIG 5: CONCEPT MAP OF RESEARCH PARADIGMS.....</i>	<i>47</i>
<i>FIG 6: THE ACTION RESEARCH PROCESS.....</i>	<i>60</i>
<i>FIG 7: THE EMERGENT PROCESS OF ACTION RESEARCH.....</i>	<i>61</i>
<i>FIG 8: SOFT SYSTEMS METHODOLOGY AS A LEARNING SYSTEM.....</i>	<i>68</i>
<i>FIG 9:THE RICH PICTURE OF ROMAGO PRODUCTION LINE SUPPLY RELATIONSHIPS.</i>	<i>79</i>
<i>FIG 10: CONCEPTUAL MODEL OF TANK CONTAINER MANUFACTURING SYSTEM.....</i>	<i>81</i>
<i>FIG 11: CONCEPTUAL MODEL OF MATERIAL PROCUREMENT SYSTEM.....</i>	<i>82</i>
<i>FIG 12: CONCEPTUAL MODLE OF EMPLOYEE INCOME GENERATING SYSTEM.....</i>	<i>83</i>
<i>FIG 13: CONCEPTUAL MODEL FOR INCOME GENERATING SYSTEM FOR SHAREHOLDERS.....</i>	<i>84</i>
<i>FIG 14: CONCEPTUAL MODEL OF PLANNING AND SCHEDULE PRODUCTION SYSTEM.</i>	<i>85</i>
<i>FIG 15: CONCEPTUAL MODEL OF COMPONENT AND TANK ACCESSORY SUPPLY</i>	<i>86</i>
<i>FIG 16: INTERRELATIONSHIP DIGRAPH.....</i>	<i>93</i>

<i>FIG 17 : PROPOSED MATERIALS MANAGEMENT ORGANIZATION FOR VIABILITY.....</i>	<i>95</i>
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LIST OF TABLES

<i>TABLE1: HIEARCHY OF PROPOSED RESEARCH FRAMEWORK.....</i>	<i>20</i>
<i>TABLE 2- RESEARCH CHARACTERISTIC AND TRENDS IN HISTORIC CONTEXT.....</i>	<i>49</i>
<i>TABLE 3- PHILOSOPHICAL QUESTIONS, THEIR POSITIVIST AND PHENOMELOGICAL POSTULATES AND IMPLICATIONS FOR RESEARCH</i>	<i>52</i>
<i>TABLE 4: COMPARISON OF CONCEPTUAL MODELS WITH RICH PICTURE.....</i>	<i>87</i>

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PROLOGUE

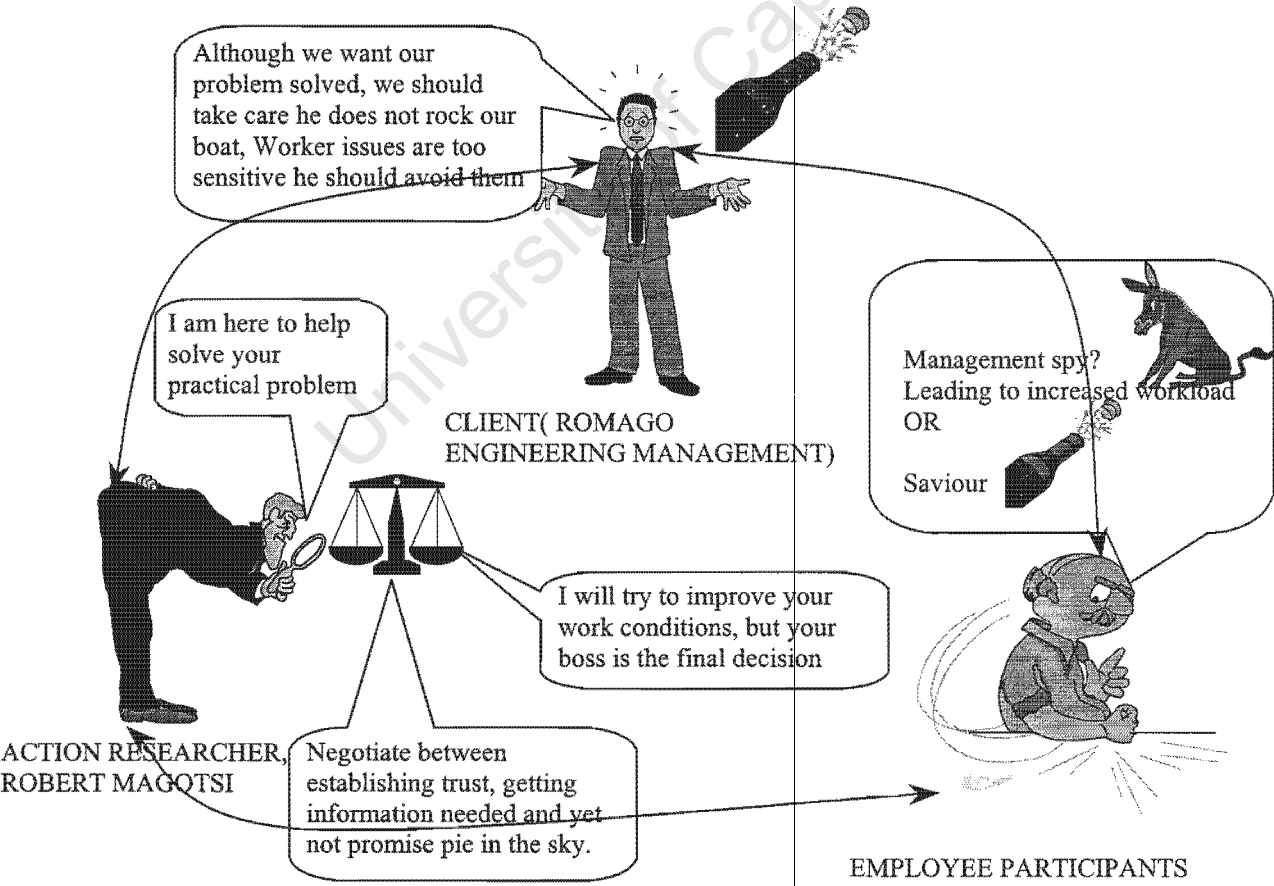
The details of this thesis describe the research participants interests, concerns and hopes as they are related to the improvement of both the operations of the company they worked in and to their own personal welfare. However given the nature of my access to the company, participation in the thesis project was viewed as a means of achieving an end objective with a predefined goal of solving managerial problems. The ability of participants in the study to contribute was limited in flexibility, being made up of representatives from among the shop floor workers and middle managers, each representative group speaking on behalf of those affected. Participant choice was also further constrained by the problem definition, which restricted those who could meaningfully contribute to the debate. Thus the definition of the problem situation as being mainly a materials management problem, limited contribution to a core group of those intimately involved in the materials management process. As an external agent, in terms of my 'consultative' state, I accepted contributions in terms of the information gleaned from the participants and their apparent agreement to the predefined goals of the study was assumed. The beneficiary of this process was geared towards the realisation of organisational goals, with participants' goals being subsumed within the boundary of the organisational goals.

Action Research is a process of self engagement, as researchers project their own identities and conflicts into the work. This study is brought to the reader through the lenses that I perceived the participants interests to be. Nonetheless Just as a filter shows certain aspects of an object, I serve as the filter that takes a beam of light and reveals only certain colours while filtering others, in an attempt to understand the intricacies of the situation at a firm like Romago engineering. How then did I as a filter come to this point and how did I influence the light that shone upon the organisation.

I am an African man from an emergent rural middle class. I was born, lived and educated in rural Kenya, a country that though peaceful has experienced a great imbalance of economic and political power since its 'independence' from Britain. I have had to fight for the right of inclusion not only in the political process, but also for the right of access to decision making in some of the firms I have worked in. This has developed in me a desire to be in control over my own destiny, which has sometimes meant seeking access to political power. This has also shaped in me a social consciousness that identifies with those within society that may be oppressed by the social political and economic set up.

Thus with this background and having determined that I shall be master of my own destiny, I journeyed southwards to the new rainbow nation, in hope of gaining skills that would make me more competitive in the international workplace and hence give more latitude over my life and also enable me to provide practical way for the emancipation of those oppressed in my environment. My attachment for the purposes of this thesis at Romago Engineering re-awakened in me the reality of the deep economic and political power imbalances that are still part of South Africa. My impression of the problem situation at Romago Engineering was therefore one in which I desired to improve the lot of the voiceless and politically emasculated (in organisational context) workers. My preliminary thesis proposal while exploring the various problematic issues that arose at Romago was heavily biased towards human resources problems (see appendix 1). As an action researcher I was also to be a mediator between my own personal growth goals and aspirations, my clients goals (to solve a practical managerial problem) and the participants goals (improving their working conditions). My position as an action researcher is captured by the dynamics expressed in Figure 1 below.

FIG 1: DYNAMICS OF MY POSITION AS AN ACTION RESEARCHER AT ROMAGO ENGINEERING



Hence even before I could involve the participants in the study I had to create an atmosphere of trust, not only so that I could get the information I needed but also for effective participation. The bulk of the participants who were drawn mainly from the shop floor, were suspicious of my intentions. While wondering whether I was a new management spy, as previously those involved in studies from outside had resulted in an increase of the workers workload, none the less they also had hopes that maybe I could actually contribute towards improving their work conditions. How such hope and suspicion could co-exist still baffles me. The client management on the other hand while desiring that I should help them in solving the practical managerial problems of their concern, were suspicious that I may develop such rapport with the workers as to promise them that which management may be reluctant to implement and hence sour the relations between the two. Management also seemed to have misgivings about implementing recommendations suggested by this young African man, who did not have experience in the kind of business that they operated.

Such an atmosphere was the beginning of this thesis project where power relations and access to decision making power were going to be crucial for the success of the whole endeavour. It is therefore through the filter of the power struggles and contestation of access to decision making power for personal development that this study was shaped in.

CHAPTER 1: INTRODUCTION

1.1 BACKGROUND TO RESEARCH

This thesis applies systems thinking principles and multiple perspectives paradigm in investigating materials supply problems at Romago engineering and provides a rationale for an integrated logistics/materials management. In a world that is becoming rapidly competitive, *'logistics/materials management can make important contributions to a company's profit margin by reducing total costs'* Magad and Amos, (1995, p. 21). The need for the integrated management of logistics/materials has long been recognised among materials supply practitioners Carter and Price, (1993). However the adoption of this management has been slow and has only progressed during times of economic crisis and by benchmarking against those who made progress as they adopted this model of management.

It is the argument of this thesis that while it is important to base one's decision on empirical studies or benchmarks, a theoretical understanding of the rationale of such a decision is a far much more robust foundation for consistent decision making. The theoretical foundation is provided here through the conceptualisation of the organisation as a system, whose behaviour and characteristics are a result of the interactions of its various sub-systems. To optimise the performance of the whole, one needs to manage the interactions of the sub-systems, instead of optimising the sub-systems. Gharajedaghi and Ackoff, (1984)

The importance of logistics to any firm involved in manufacturing has been highlighted as being a powerful competitive weapon that can make real contribution to corporate profitability. Gartonna, Trost and Kerr, (1990) asserts that logistics will play a significant role in those organisations, which gain a sustainable competitive advantage in the global marketplace. Materials management which is the focus of this thesis is a sub-system of the Logistics supra system, in the systems hierarchy. The Logistics supra system is composed of the Physical Procurement, Materials Management and Physical Distribution sub-systems. Carter and Price, (1993).

Materials management is critical in the success of manufacturing firms. Materials impact upon the competitive capability of the firm in a number of ways including cost, delivery speed, delivery reliability and flexibility. This can be seen by the outline given by Carlisle and Parker (1991) in reference to the car industry, *"With purchased components and materials representing 60-80% of the manufactured cost of automobiles, any excessive inefficiencies between United States car makers and their suppliers only serve to reduce margins all along the manufacturing chain, as they can no longer be passed along so easily to the marketplace"* p.23

Thus the importance of materials management to any industry involved in manufacturing cannot be over emphasised, either a firm neglects the effects of the inefficiencies and transfers their cost

to customers making it un-competitive or reconciles itself to having low profit margins or it works to reduce those inefficiencies. Operation issue problems and decisions exist within the broader strategic context of an organisation.

Effective materials management is therefore not just a matter of effective scheduling, but the management of the whole supply constellation¹ from procurement to final delivery on the production line in the Romago case.

This thesis aims to

1. Provide a theoretical basis of conceptualising logistics/materials management in systemic terms
2. Develop a systemic and multiple perspectives framework for inquiry into the supply problems Romago engineering has been experiencing
3. Apply the developed framework to inquiring into the problematic situation and proposing areas where intervention to solving those problems may begin.

1.2 RESEARCH PROBLEM AND HYPOTHESIS

The rapid expansion and consolidation of business around core competencies coupled with historical antecedents and the cost centre method of accounting has led to a fragmented management of materials at Romago Engineering. Fragmented materials management is experienced as the late delivery of materials on the production line, and missing parts & accessories resulting in a high re-work content that decreases productivity.

The late deliveries and missing parts & accessories has led to a concern that continued low productivity might not only lead to the erosion of the company's competitive edge but also jeopardise its long-term viability. How then does the firm strategically organise its materials management and in the process ensure its viability as an organisation? Since the analysis of isolated individual departments creates a distorted understanding, this study proposes the answer to be the managerial application of systems thinking that views the manufacturing process holistically. This recognises that it's the interaction of the various departments (subsystems) that creates emergent properties (problems) that are often treated at the symptom level.

By modelling the organisation as a socio-technical system, and applying a multiple systems inquiry of Soft Systems Methodology and Viable Systems Diagnostics, an integrated management of materials under a senior manager is proposed. The holistic management of materials should not only bring vision to it, but would also provide a holistic framework within which problems with materials can be proactively anticipated and prevented.

¹ Supply Constellation is distinguished from supply chain in that it conceptualises the firm in systemic terms. Ramirez (2000) says that it is the mixture of competencies and ability to co-ordinate and mobilise customers in creating value.

Answering of the question that arose in the company's situation provided contributions presented in chapter six.

This research made the following contributions:

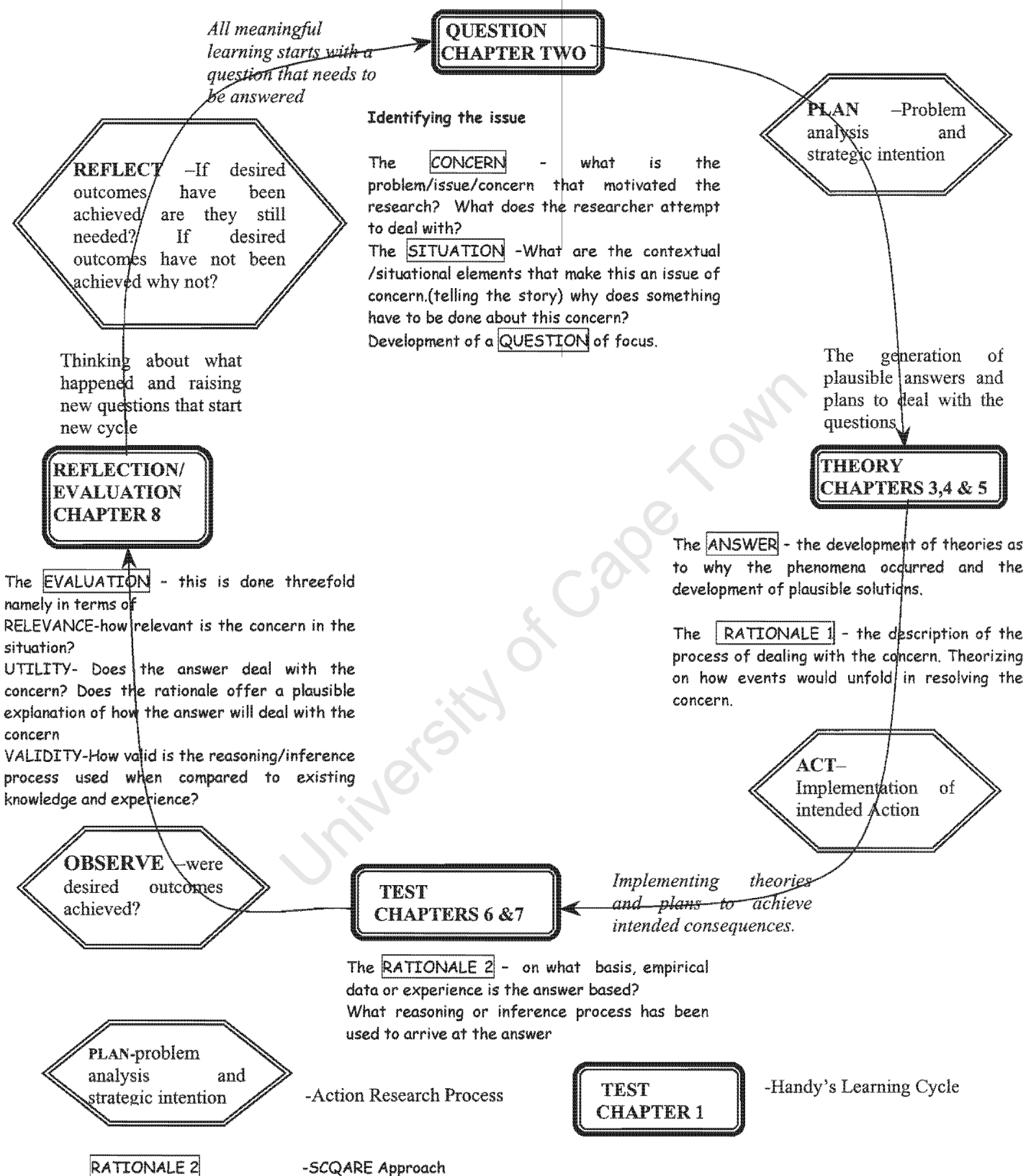
- It provided a systemic rationale for integrated logistics/materials management beyond empirical considerations.
- It developed a systemic framework of inquiry that can be used in inquiring into complex managerial problems.
- It developed my ability to apply theoretical concepts to daily management problems and reflect on my practice hence improve my management praxis.

1.3 JUSTIFICATION FOR RESEARCH

The research problem is important on the following theoretical and practical grounds:

- a) Logistics/Materials management is an important aspect of any manufacturing concern and any problems arising from it can only be ignored or incompetently handled at the risk of the viability of the firm. Solutions to problems arising require that one should holistically seek to intervene in seeking solutions rather than alleviating the immediate effects.
- b) While a lot of research has been done on the various strategies a firm should adopt for competitiveness in its material management, these investigations have mainly focused on empirical studies. There has thus been a theoretical under conceptualisation for an integrated logistics/materials management. This thesis seeks to provide the theoretical justification for an integrated logistics/materials management rooted in the philosophical foundations of systems thinking.
- c) This thesis integrates the various learning theories, within a qualitative action research paradigm in developing the methodology for inquiry into the complex management issues, that is elaborated further in section 1.3 and shown diagrammatically in figure two.
- d) This research as it was designed to solve a practical problem that the industry was facing has pragmatic implications. It identifies the leverage areas where the industry's managers can begin to intervene for maximum influence within the firm, on the road to restoring the firms' competitive edge.

FIG 2 : THE INTEGRATED LEARNING CYCLE SYNTHESISED FROM THE WORK OF MINTER, PROF. RYAN, HANDY AND KEMMIS



1.4 METHODOLOGY

The methodology used in this research is an action research methodology within a qualitative research paradigm. The qualitative research has been undergirded within the systems thinking knowledge paradigm. Within the hierarchy of knowledge inquiry systems, the systems thinking paradigm that is rooted in the notion of wholeness, is a methodological construct that addresses the inadequacies of the reductionist, analysis based scientific thinking. Qualitative research, and not quantitative nor a combination of the two, is used because the research required an interpretative understanding of how the people involved in the problematic situation, constructed and interpreted the situation. Qualitative research attempts to capture the process of interpretation, while quantitative research looks past these to their mathematical significance. Action research is used as a research methodology as it seeks to yield both understanding of the social system as well as determining the best opportunity for change. It seeks to learn from experience and apply the learning in bringing about change. Among the methods used in data gathering were, participant observations, in-depth interviews with various people involved in the supply of components/sub-assemblies, group interviews as well as the collection of relevant documents. These multiple sources of information were used to increase the accuracy of the information gathered.

The inquiry framework developed as shown above, to inquire into the issue of interest is a synthesis of three different approaches to understanding the issues. These approaches are the learning cycles as described by Handy, the **SCQARE** method that is based on the work of Barbara Minter (1990) and expanded by Associate Professor Ryan, of the university of Cape Town and the Action research cycles as advocated by Kemmis of Deakin University.

The **SCQARE** approach involves the definition of the Concern that arises in a *Situation*, which is re-framed as a *Question* that is *Answered* and the *Rationale* for the answer is given followed by the *Evaluation* of the whole process. The synthesis of the three methods for the proposed framework is represented above diagrammatically as Figure 1. While table 1 below gives a hierarchy of the proposed framework. The **SCQARE** approach offers a rigorous approach to conceptualising and articulating ideas in a viable way. It is a useful approach for inquiring into a situation, developing and conceptualising about a situation and articulating ones ideas so that they are meaningful to the stakeholders in that situation. It consists of five parts that guide inquiry, the development and articulation of ideas. The letters in the acronym reflect the names of the parts of the framework. These are

1. S-Situation, this is the context, the setting, the circumstances or conditions within which human action occurs. Any relevant idea needs to take cognisance of the facts of, the structure

of, the processes in, the functions of and the roles in or context within which a system of focus is a part of. Any description of knowledge of a particular system is from a particular perspective as systems can be seen from different perspectives.

2. C-Concern, any inquiry in a situation, is usually undertaken because there is some dissatisfaction or concern about the situation. The concern is often brought about by a change either in the situation itself or the environment. The concern may also be about the way things are managed and a feeling that if things are left that way, the situation will deteriorate.
3. Q-Question, Since the concern is many at times expressed in abstract terms, one needs to frame it into a question that will yield an answer in order to be able to deal with the concerns.
4. A-Answer, The generation of possible answers that deal with the question. The answer needs to take in cognisance, the details of the system, the nature of the concerns, the needs, perceptions and beliefs of stakeholders.
5. R-rationale, This provides the logical basis of the answer. The reasoning is based on an argument within the whole thesis consisting of the claim, the evidence, a warrant and a qualification.
6. E-Evaluation, This is a quality check for the framework and consists of the relevance, utility and validity of ones claim.

The information gathering process also involved bringing the interpreted information in the form of a rich picture to the various participants and making the necessary clarifications as to their views and to the accuracy of the capturing process of those views in the rich picture.

This feedback provided a basis for the revision of the rich picture and hence the comprehensive and accurate representation of the problematic situation from all perspectives relevant to it.

TABLE 1: HIEARCHY OF PROPOSED RESEARCH FRAMEWORK

Knowledge paradigm	Systems thinking
Research paradigm	Qualitative research
Research Methodology	Action Research Soft Systems Methodology Viable Systems Model
Research Methods	Participant observation In depth interviews Group interviews Collection of relevant documents

1.5 THESIS OUTLINE

Chapter two lays the foundation for the rest of the thesis by providing a brief history & present context as well as the material supply problems currently being experienced at Romago Engineering. It examines the literature of Logistics/materials management showing how the adoption of integrated management has been done during times of crisis and by looking to empirical success of those that adopted it. By providing a conceptual model of an organisation as a complex socio-technical system, it shows that part of the reason for the slow adoption of integrated logistics/materials management is the under conceptualisation of the rationale of this adoption.

Chapter three views philosophy as a field of inquiry and investigation toward interpretative knowledge which yields a comprehensive understanding of reality, a worldview which when applied to research lends it direction and methodology. The chapter also examines the triadic systems ontology and metaphysics, concluding with a section of systems view of reality in terms of wholes and relationships.

Chapter four explores the nature of management research, seeing it to be concerned with the inquiry of problematic management situations in order to provide the necessary knowledge for application in decision making. It considers the ways most managers currently seek to solve problems, highlighting the inadequacies in these approaches. It further provides a rationale for inquiry into the problematic managerial situations at Romago Engineering, using qualitative research within an action research paradigm.

Continuing with the argument began in chapter four, chapter five begins by laying the philosophical basis for Action Research. Deriving from the fact that different people experience and interpret reality differently (perspectives), it introduces the idea of using multiple perspectives inquiry systems in management research.

It proposes the use of the Soft Systems Methodologies and Viable Systems Diagnostics, as appropriate for inquiring into the situation at Romago Engineering.

Chapter six applies the developed inquiry framework to research in the problematic situation at Romago Engineering. Using Soft Systems Methodology, the chapter presents the rich picture of the problematic situation and develops six conceptual systems. The comparison of the conceptual systems with the rich picture identified the areas for changes that are both systemically viable and culturally feasible. The changes identified were grouped into five main categories of policy, procedures, attitudes, communication and structure. A relationship digraph between them showed the key drivers in seeking intervention are changes in organisational policies, structure and communications. The organisational structure was examined for viability using viable systems diagnostics and a new organisational structure proposed.

Chapter seven expounds on the two main areas that the organisation should begin to change, if it is to ensure success in solving its material supply problems as well as maintain viability as business enterprise. The changes are the adoption of an integrated Logistics/materials management organisational structure and the concurrent development of policies that are aimed to attract and retain professional and competent employees both at the technical and managerial level.

Chapter eight concludes the inquiry cycle by reflecting on the context, process and content of the research as well as on personal development.

Mapping these chapters onto the proposed framework of inquiry, chapter two identifies the issues for research and corresponds to the concern, situation and question. Chapter three, four and five, provide the theoretical background, that includes the answer and its rationale. Chapters six and seven test the answers provided and establish the second part of the rationale. Chapter eight reflects and evaluates the test together with the theory, providing the limitations of the answer and methodology.

1.6 CONCLUSIONS

This chapter laid the foundation of the thesis. It provided the background to the research in terms of problems faced at Romago Engineering and the progress made in the adoption of integrated logistics/materials management. It introduced the research problem and hypothesis. The research was justified, the methodology briefly described and justified and the thesis outlined. On these foundation the thesis can proceed with a detailed description of the research.

CHAPTER 2

RESEARCH ISSUES -LOGISTICS/MATERIALS MANAGEMENT

Business logistics is working its way into the strategic agendas of business boardrooms in an expanding list of industries that range from the automotive industry to fashion retailers. The arrival of business Logistics in the boardrooms is propelled by global competition as trade becomes more liberalised and economies more open. The arising competitive environment has made companies to focus on core activities and sell or outsource the rest of the functions in hope of success. Success however may depend on the company's ability to control and co-ordinate what happens in its business logistics.

Romago Engineering, a large sized South African manufacturer of Tank Containers and the single largest manufacturing business in the Western Cape has embraced the core competency idea of a company. This embrace coupled with a new political environment where the legitimate desires of workers can no longer be suppressed or ignored has forced Romago to transform its basic operations and business focus. Romago previously had three main production business divisions namely, Container tank production business unit, Petrochemical storage & transport tanks business unit and Food & Beverage business unit. Romago has already sold the petrochemical division and the sale of its food and beverage division is in the pipeline. It is also in the process of consolidating its container tank division which comprised mainly of standard tanks, special tanks and gas tanks production facilities (which previously had minimal operations). The special tank section was commissioned in October 1998. Romago also bought a gas tank production firm in Johannesburg and is currently in the process of installing production facilities to expand its gas tank production capability. Thus this rapid expansion and consolidation of business coupled with, the fragmented management of logistics/materials have combined to give rise to a number of perceived problematic issues. This thesis focuses on the problematic issues that have arisen in the supply of components and accessories to the various work centres on the standard production line.

2.1 SYSTEM OF FOCUS

The business unit of focus for this research was the standard production line. Romago manufactures the standard container tank using a production line facility that has twelve works centres where various activities are carried out in the manufacture of the tank container. The work centres are currently operating on a 1 hour 45 minutes cycle time before tanks are transferred to the next work centre. This cycle time translates into the production of twelve tanks per day. However due to various factors, the supply of components, sub-assemblies and accessories to the production line has been problematic leading to a high re-work content. High re-work also arises because once a component or accessory is not supplied within the cycle time, the unfinished tank is removed from the production line to a 'clinic' area where it is completed once the component

arrives.

However if the operation cannot be done in the rework 'clinic' the tank is removed from the production line and placed in a buffer zone, until the missing component arrives. Re-work of this nature accounted for 40% of all tanks produced during the first half of 2000.

The unsatisfactory state of affairs and the absence of a clear definition of the problem prompted my contact manager, to request that I do some research into this area. He had done some work earlier on the restructuring of the pre-production workshops for them to be able to supply components on time. Following negotiations with my supervisor, Prof. Tom Ryan, it was agreed that the problem situation was suitable for inquiry using a multiple perspective inquiry system. The problematic situation, based on my perceptions as well as the brief perception of others, was related to issues regarding, but not limited to, attitudes, relationships, organisational structure, procedures, trust, skills and communication.

2.2 ORGANIZATIONAL MODEL

The Concise Oxford dictionary (1995) defines an organisation (noun) as, '*an organised body especially a business, government, department, 'a systematic arrangement, tidiness'*'. It further defines '*to organise*' as meaning to, '*give an orderly structure to form (different elements) into an organic whole*'.

Thus *organisations* involve people in doing things together for a purpose, usually something that is useful to other people. The word organisation means different things to different people depending on their mental model. Since most organisations are creatures of man as a social being, Gharajedaghi and Ackoff, (1984), the idea of an organisation serves a pragmatic purpose for whoever holds it. It is not the aim of this paper to provide and debate the various metaphors that are made by different people for organisations. This thesis uses the following definition of an organisation: *an organisation is a network of a minimum of two persons, with each person having specific patterns of roles and interactions designed to achieve objectives shaped by underlying purpose*. Using purpose as the basis classification organisations as constructs of man are social 'creatures' that can be seen in terms of machines, organisms or social systems. Gharajedaghi and Ackoff, (1984). Each model has its implications for those who hold them and for the organisation as well, for it is the mental model that shapes ones interaction and behaviour in the organisation. The different models as explicated by Gharajedaghi and Ackoff (1984) are presented and a synthesised model to be used in the investigation of Romago engineering developed.

Machine model of Organisation

The mechanistic model of organisation views an organisation as a machine that works with regularity dictated by internal structure and the laws of nature. The organisation can be completely understood using analysis, that is, reducing a whole to its parts and determining how these parts work. This reductionist approach advocates that cause and effect explain relationships between parts. Hence the identification of causes provides complete explanation of the effects. Organisations are seen as instruments of their owners with no purpose of their own except to produce profits for owners.

Structured hierarchically and centrally controlled by external control authority, members of the organisation are deprived of information except that which is required to do the job.

This model assumes that different structures lead to different functions, therefore to understand the function of an organisation, knowledge of its structure is all that is required.

Organismic Model of Organisation

This model views organisations as living organisms, having organs, each contributing to survival and growth of the whole. Parts operate homeostatically, adjusting their behaviour to keep the proportion of the whole within certain limits.

The executive function of the organisation is thought of as the brain. There is two-way communication between the parts and the brain as well as informal communication between parts. Parts have some degree of self-control, allowing them to react rapidly to environmental changes without intervention of the brain. Parts have no purpose of their own, their role is to serve the whole. The parts are goal seeking. They can change their reaction until they produce the desired outcome. Over time the organisation learns to produce its goals more efficiently.

Beer (1984) uses control as a basis of looking at organisation and provides a cybernetic definition of an organisation based on the organisation as an organism. By drawing on how organisms effectively organise themselves for adapting in a complex dynamic environment, he models it as a viable system. Viable systems are those that are able to maintain a separate existence, and have their own problem solving capacity. Viable models, being modelled on organisms need to have not only a capacity to respond to familiar disturbances, but a potential to respond to unexpected previously unknown disturbances.

Social model of Organisation

This model views organisation as part of a larger purposeful system, as well as being a system of purposeful parts. Performance of the organisation is not the summation of independent performances of parts but the product of its interactions. The organisation is managed by managing these interactions. The parts of a social system have purposes of their own and display choice. An effective social system requires agreement between its parts and between the parts and

the whole. The purpose of an organisation as a social system is to encourage and facilitate the development of those it affects. Development is a process whereby individuals increase their ability to satisfy their own needs and legitimate desires as well as those of others. While social system cannot develop members and stakeholders, they can encourage and facilitate such development. Organisations modelled as social systems have free will and can create.

Synthesised model of organisation for Romago

While the three models provide some insight into the organisation from a different perspective, in order to gain the full advantage of each perspective, it would be prudent to model the organisation as a multiplicity of these perspectives. Thus we model our system of concern as a socio-technical system where the problems and issues deal not only with the technological aspect (machine model) but with the social (social model) and human facet (organismic model) surrounding and interacting with it.

The primary concern of organisations as socio-technical system is that problems and issues must be dealt with not only from the technological aspect but also from the social and human facets surrounding and interacting with it. Technologies being embedded in an environment of humans, who develop, alter, limit, or stop them. People as well as organisations (companies) are social beings that usually have vested interests in the problematic situation. Their individual identities may have an impact on the decisions they make as individuals on behalf of the company.

Elements of socio-technical system:

- *Technology-practical skills for the application of science.*
- *Socio-technical setting- technical and organisation elements mingle.*
- *Techno-personal setting- technology affects and is affected by individuals.*
- *Organisation actors*
- *Physical environment setting- land, sea, air and space that physically impact or are impacted on by technology*
- *Individual actors*
- *Political actors*
- *Decisions (Linstone, 1984)*

Socio-technical problems do not have a single correct solution that is recognised and accepted by all the contending parties, those who are affected by the problems or those who have a strong opinion on it. Furthermore problems, like beauty, reside in the eye of the beholder and ultimately in the mind of the beholder. Significant problems almost always involve human beings and do not have any one single definition that is accepted by all affected. Near exclusive emphasis on

technology means that those aspects of a problem that cannot be measured or are difficult to quantify are usually ignored.

The need to blend the different attitudes towards the identification and solving of problems is essential if the problematic situation is to be affected by the proposed solutions. The problems faced by the society defy simple definitions, leave alone simple solutions, therefore we need to understand the dynamics of complex problems, how to change and renew our organisations and prepare new solutions to aid problems as well as create new problems capable of revitalising our will and spirit. The concept of multiple perspectives is adopted as it is a practical way to the identification of problems and hence the first step to their solution.

2.3 ORGANIZING FOR EFFECTIVE LOGISTICS

An effective and efficient organisation is a vital part of a firm's strategic management process. With attention focussing on achieving high levels of customer satisfaction and success, the performance of materials management becomes increasingly critical. The management's ability to visualise the entire supply constellation from source of supply to the final consumer is a task that requires creative logistical performance and solutions. The primary question for managers then becomes "*how should a firm be organised to best achieve effective and efficient materials management?*"

Romago is currently organised as a command and control organisation that has encouraged the fragmented management of materials. In addition to the organisational structure it seems that this fragmented management and logistics has grown as a result of general accounting practice.

The functions of delivery (transportation) to work centres, inventory management and purchasing are organised as sub-sets of larger traditional functions, namely production, finance and procurement respectively. The management of key logistical components in such a fragmented manner makes it hard to envision or capture system wide functional trade-offs. The impact of this is that the overall company operates at efficiency levels lower than necessary, despite the fact that each of the key logistical components is being performed at the lowest possible cost.

An immersion in the problem situation revealed that though the effects of the problems were felt on the production line, the immediate people to take responsibility for these problems were the supply department. However other departments also contributed to these problems. The issues could therefore not just be viewed as procedural supply problems, but could also be conceptualised in terms of logistics/materials management. These concepts provide a holistic approach to seeking solutions to problems that manifest themselves as supply problems on the

production line. The concepts of logistics/materials management are now examined in detail in the section below.

2.4 LITERATURE REVIEW ON LOGISTICS, AND MATERIALS MANAGEMENT.

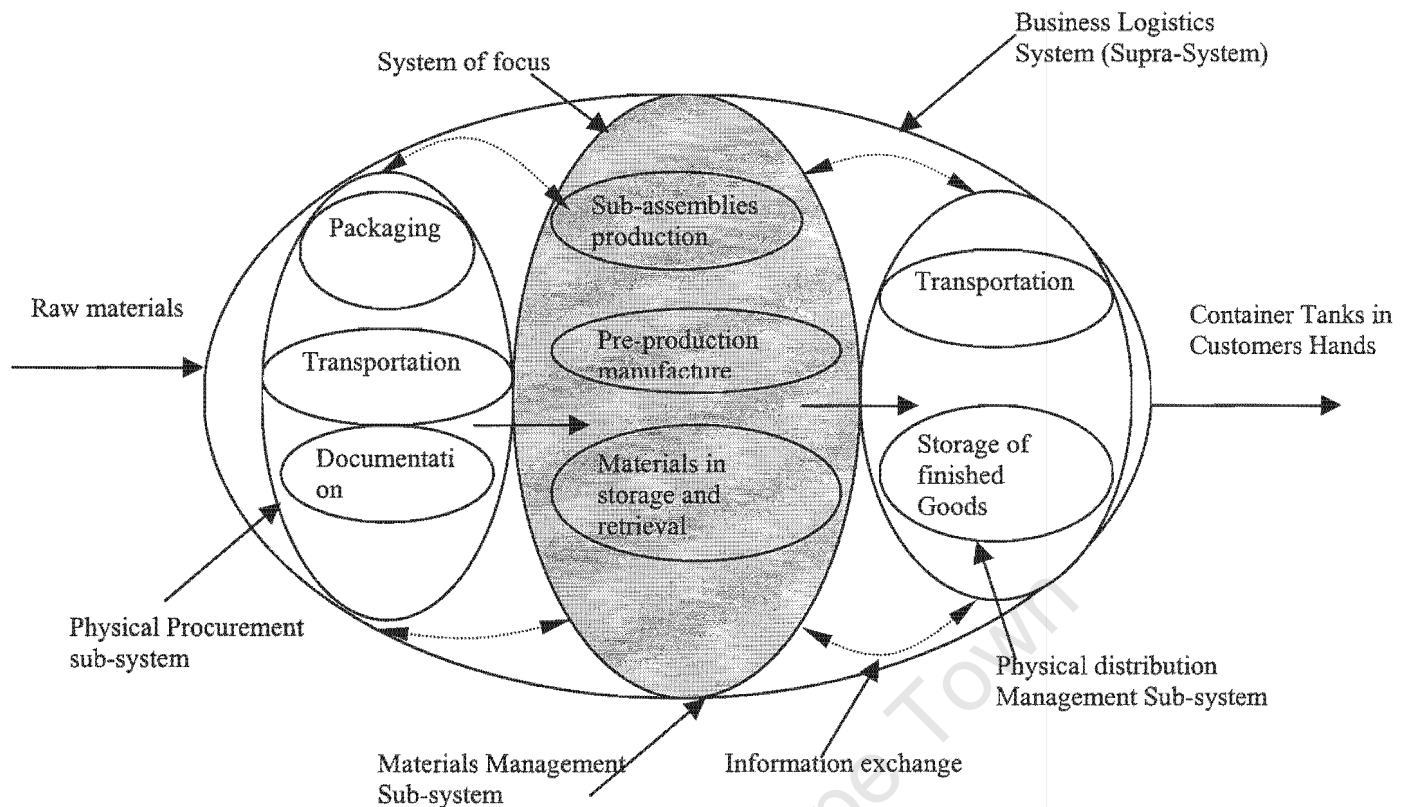
Logistics which originates from the French verb *loger* (to lodge, quarter) is of military origin meaning the art of transport, supply and quartering of troops Magee, (1968). From an industrial perspective, logistics means the management of the flow of materials and products from source to user. It is sometimes referred to as Material distribution, Physical distribution and material management. The business logistics system has also been defined by Bernard, Grabner and Robeson, (1970), as a *“total approach to the management of all materials involved in physically acquiring, moving, and storing raw materials in process inventory and finished goods inventory from the point of origin to the point of use.”* p 44. Bowersox, David and Schmitz (1989) define logistics as, *the process of planning, implementing and controlling the efficient, effective flow and storage of raw material, in process inventory, finished goods and related information from point of origin to point of consumption for the purpose of conforming to customer requirements.* Thus the logistics system is the management of physical and information exchange between production and all activities related to this exchange. The exchange of products involves the flow of raw materials from suppliers, within the firm from the points of use and the movement of finished products to the consumer. The information exchange covers all the necessary forward information for planning and execution purposes and the feedback of variations back to the various points of origin of the information. Thus the all-encompassing definition of a logistics system covers not just the physical flow of materials but also the information exchange necessary for this.

Three sub-systems of the logistics system (Fig 3 below) can be identified namely, physical procurement, materials management and physical distribution. Carter and Price (1993).

The system elements consist of :

- *Raw material acquisition and Control*-These are essential to support manufacturing capability.
- *Manufacturing and Converting capability*- These are needed to have the capacity not only to produce average requirements but also to meet fluctuations in total demand and shifts in demand products
- *Communication and Control*- Subsystem processes orders from purchaser or user to supplier as well as instructions to move or ship material and maintain status records of material either on hand or anticipated, the control sub-system makes decisions based on these communications and records, to initiate orders or movement of materials. Although it is the most difficult to identify its efficiency is critical to the good operation of the system.

FIG 3: SYSTEMIC VIEW OF THE BUSINESS LOGISTICS SYSTEM OF FOCUS



- *People* -The need for people involved in supply for training in performance of their functions and for understanding of system operating characteristics and policies must be recognised.

Physical Procurement

Physical procurement refers to the movement of requirements from suppliers to manufacturing and assembly plant stores. It fulfils the activities of purchasing by making the goods available when and where required. It usually involves :-

- The use of a firms own transport or the hiring of transport to be used,
- The selection of the most suitable transport mode,-rail, road or sea.
- The type of packaging needed, pallets /special materials,
- Documentation,
- Loading and unloading facilities
- Initial inspection

Carter and Price (1993) has noted that there has been a movement to a rapid outsourcing of this sub-system to third parties that are specialists in procurement.

Physical Distribution Management

This involves the packaging and movement of finished goods to the customer or final user. It makes the final product available when required, in the correct quantities, by the selection of

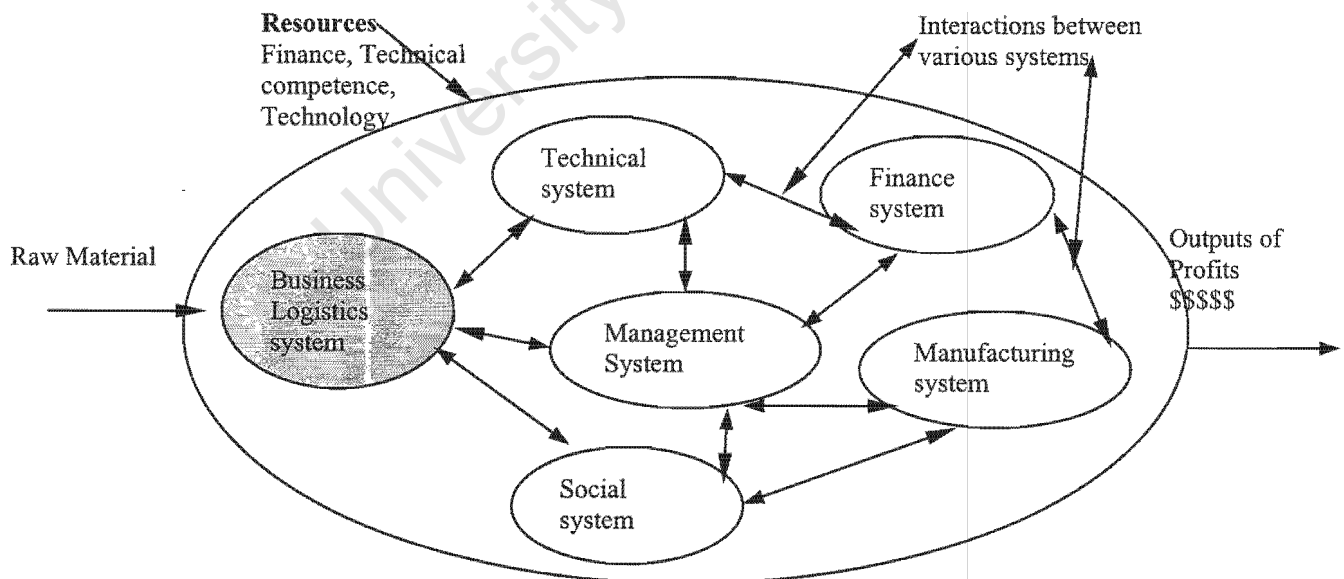
suitable channels appropriate, and supports in the provision of customer service.

Materials Management

Materials Management is defined as, 'that aspect of industrial management concerned with the activities involved in the acquisition and use of all materials employed in the production of the finished product. These activities may include production and inventory control, purchasing, and traffic materials handling and receiving' Ammer (1969, p.39). Materials management is a sub system of the business logistics system of a company Figure 4 below. Materials management is a concept, which brings under one manager the responsibility for determining the manufacturing requirements, scheduling the manufacturing process and procuring, storing and dispersing materials. Thus it is concerned with and controls activities involved in the internal flow of materials, semi-finished products and information between the different phases of manufacturing, raw material stores and despatch. The functions of materials management include:

- *Production and material planning*: ensuring the efficient use of personnel, material facilities and capacity.
- *Controlling of material cost*: organising company wide reduction programme for planning, stocks purchasing, materials handling as well as providing an effective means of monitoring the effects of programmes, where material cost increase.
- *Communications*: ensuring a well balanced and efficient communication system between various activities

FIG 4: ROMAGO AS A PROFIT GENERATING SYSTEM



NOTE: The systems represented here are conceptual models (mental constructions) to help understand the situation, in reality they are not independent systems but intertwine.

- *Materials handling* accepting, handling and physically moving materials to production. A materials handling system is a facet of materials management that is both the logical and physical manifestation of all requirements, policies and practices intended for a particular facility in the business logistics system. It is supposed to keep the manufacturing process on track and communicate information from one activity to another so that all the processes work in harmony to achieve maximum performance. The essential meaning of a system is derived from the interaction of the various parts. The challenge in the design of a material handling system is to recognise that requirements may vary over time and in many ways by products and customers. The need for a flexible response to customers needs, changing products and changing technology consequently poses challenges to any material handling system.

The aim of materials management is to satisfy the needs of all operating system such as the manufacturing production line, the needs arising from customer demand patterns, promotional activities and physical distribution channels.

Manufacturing firms use different types of materials organisation described as follows:

Manufacturing oriented: structure organised around manufacturing, which is in the middle of material flow. Manufacturing interacts with materials in two ways:

- 1) *It must respond to the demands of the physical distribution system for replenishment of products carried in stock, and equally important, it must maintain ability to respond to special or unusual customer demands, whether it be standard items, slight modifications or special items.*
- 2) *Manufacturing function depends on the physical supply system to deliver the materials, supplies, and parts needed in manufacturing, when needed and in the quantity and conditions required.* Magee, (1968, p.39)

Manufacturing concerned with the economy of manufacture, of conversion of materials, supplies, and energy into finished products and components at as low a unit as feasible.

Distribution oriented: here the distribution and traffic activities, production planning and inventory control activities are grouped together under a distribution manager.

Supply oriented: This is a partially integrated structure in which the purchasing function and production planning activities report to the same senior manager.

Integrated Materials Management: The efficient management of the physical flow of materials, sub-assembly, work in progress and finished goods from suppliers through the organisation to the final customer is a complex task that requires the integration and co-ordination of various functional activities.

The management of Logistics system is assuming major importance as focus of management attention, since the management of industrial enterprises have come to realise that the logistical system is more than a collection of disjoint specialised functions

'The effectiveness with which materials are made available to users, in the right place, at the right time, and in the right quantity has profound influence on the cost /effectiveness balance of the enterprise as a whole and the economy of which it is a part.' Magee, (1968, p39)

Management has come to see that concentration on improvement of efficiency of individual procurement, production or selling operations is a dead end road, if efficiency of the individual function throws the total system out of balance. The question that arises is, *if management has been aware of the potential benefits of an integrated materials management, how come, it has continued the management of materials in a fragmented and uncoordinated way?*

2.5 REASONS FOR THE CONTINUED INDEPENDENT AND FRAGMENTED MANAGEMENT OF LOGISTICS SUB-SYSTEMS.

Management has been lax in moving towards an integrated logistics/materials management due to various reasons that are now examined.

1. Sub-systems of purchasing, manufacturing, finance, accounting etc. often times have conflicting demands. Management tries to manage these demands independently by use of policy decisions. It tries to identify policies in terms of service levels and quality, production stability and financial policy (expected return on investment.) While this has helped management in meeting its outlined objectives this managing of conflict is based on win-lose reductionist thinking. In a competitive environment one cannot afford to seek solutions through the definition of service levels as customers expect products that are of high quality. In this new scenario of customer driven quality and service standards, the way of solving the seemingly conflicting demands of the sub-systems is to conceptualise them as a whole, noting their interactions.
2. South Africa's international isolation not only made it hard for South African managers to keep track of changes in management styles and principles world-wide. This also cushioned them from the vagaries of the international markets, hence encouraging practices that were not optimal as profits were previously guaranteed in a protected manufacturing environment.
3. The creation of an integrated logistics/materials management seems to threaten certain functional departments, which tend to resist its creation. Thus the associated departments of purchasing, stores, production, feel that their relative positions and status will be undermined by the formation of an integrated logistics/materials management system. This can however be overcome by close communication and participation and with the education of these managers to ensure that they appreciate the co-operative nature of a successful

logistics/materials management system.

4. Reluctance to adopt the integrated logistics/materials management system due to lack of understanding/adequate rationale for doing so, since the theoretical foundation for an integrated system is under-conceptualised. Megan (1995) traced the spread of materials management during the 1950's and 1960's. He noted that the need to control costs and operations, due to scarcity of money, price controls, ecological concerns, energy shortages and rapid increases in energy costs in the 1970's led to an accelerated movement towards the integrated logistics and materials management. Thus materials management has been adapted to counter periods of crisis and by looking at the firms that seems to have performed well after the implementation of integrated materials management. The basis for the expectation of improved profits, and improved customer service and satisfaction, being based on empirical cases fail to provide a satisfactory rationale for the adoption of the integrated materials management concept. This thesis seeks to provide the theoretical justification for the application of integrated materials management through the explication of materials management as a system. It sees integrated Logistics/materials management as an organisational philosophy that should evolve through the application of the systems approach to management, an approach that provides for the integration of all management functions.

SUMMARY

This chapter provided a brief history and present context for Romago Engineering as well as a conceptual model of an organisation as a complex socio-technical system, which requires a multiple perspective approach to identifying and seeking solutions to problems facing the organisation. By examining the literature on logistics and materials management, it showed how the two are interrelated. Noting the reluctance of adoption of integrated logistics/materials management, it hypothesised reasons for this reluctance, highlighting the under-conceptualisation of the rationale for integrated materials management. It further noted that materials management has grown as a reaction to solving crisis that have emerged from time to time and by copying the perceived empirical success of those who had adopted it. The chapter thus lays the foundation for the rest of the thesis in seeking to provide a conceptual rationale for the adoption of integrated logistics/materials management that is rooted in the Systems philosophy and Knowledge paradigm that is explicated in the next chapter.

CHAPTER 3

PHILOSOPHICAL FRAMEWORK FOR INQUIRY METHOD

3.1 PHILOSOPHIC NECESSITY

Philosophy is the field of inquiry and investigation towards what may be called interpretive knowledge. It is concerned with the interpretation of experience. It seeks to interpret, appreciate and enjoy the meaning aspects of life. Philosophy specialises in the field of belief, seeking to examine all beliefs and determine those foundations that are firm and secure. It is an attempt to inquire into truth with an attitude of impartiality based on the assumption that truth is discovered when the searcher is willing to subject his own predisposition to examination. Philosophy deals with the structure of human thought and experience, which in turn are the recipients and bearers of knowledge (reality). It studies human thought its categories and its various patterns of organisation (a priori) as it is human thought and experience that are receptacles as well as shapers of knowledge. Philosophy yields a comprehensive understanding of reality, a worldview which when applied to research, lend direction and methodology, which are likely to be lacking. Philosophy is thus a guide to practical research.

'The true method of philosophical construction is to frame a scheme of ideas, the best that we can, and unflinchingly explore the interpretations of experience in terms of that scheme, all constructive thought on the various topics of scientific interest, is dented by some such scheme, unacknowledged but no less influential in guiding the imagination. The importance of philosophy lies in its sustained effort to make such a scheme explicit and thereby capable of criticism and improvement' Whitehead, (1961)

The term paradigm is sometimes used to denote a particular philosophical orientation. In talking about the term paradigm Kuhn (1970) stated,

'On the one hand it stands for the constellation of beliefs, values, techniques and so on shared by members of the given community, on the other hand it denotes one sort of element in that constellation, the concrete puzzle solution, which employed as models or examples, can replace explicit rules as a basis for solution of remaining puzzles of normal science' p. 175.

Maykut and Morehouse (1994) more recently defined a paradigm, *'as a set of overarching and interconnected assumption about the nature of reality. They are made up of postulates that support it. Paradigms CANNOT be tested and they provide a basis on which we build our verifiable knowledge. Paradigms provide a worldview concerning the nature of reality'* p.4

The task of philosophy is to explore how the world must be if, the assumptions upon which particular discipline are to be valid and hence its conclusions are established by reason alone. Philosophy informs us which procedures tend towards the truth, which patterns of argument are

valid and which employment of our reasoning powers is not illusory. As philosophy reaches its results by thought alone and makes no reference to experience in doing so, it is a priori. A philosophical inquiry is settled by thinking and thinking alone. However this makes an assumption as to the thinking capacity and rational quality of man.

Part of philosophy is to understand the world as it appears to consciousness. Vivian (1960) asserted, *'facts do not speak for themselves, they must be arranged by a speculative mind. In order for us to reach an understanding of the facts we must be able to relate them to one another and see how they fit in with what we already know. We need a gift of being able to make an imaginative jump from the facts we observe to the general theory/hypothesis. A man with no imagination may collect facts, but he cannot make great discoveries.'* p.60 A philosophical framework lends some a priori coherence to otherwise ill structured, diffused, chaotic sets of phenomena.

3.2 PHILOSOPHY OF SYSTEMS

The failure of modern scientific methods which are based on the notion of reductionism analysis-synthesis when applied to management, in addressing complex management phenomena characterised by continuous flux hence uncertainty, evolution, multiple perspectives and feedback loops, calls for an alternate paradigm approach. Such an approach is found in systems thinking which is rooted in the notion of wholeness. The claim of the systems approach being rooted in wholeness implies not only a methodological ability to see things as wholes, but more importantly the presence of a foundational philosophy that undergirds systems theory. Mothibi (1999) A systems philosophy would be comprised of the metaphysical, ontological and epistemological aspects. These three branches of philosophy are explained briefly.

Metaphysics: Answers questions as to the theory of being,

- What exists/ what is existence?
- What are the basic items in the world?
- Do properties exist as well as people who possess them?

Epistemology: Answers questions as to the theory of knowledge.

- What can I know and how?
- Does perception provide knowledge?

Epistemology is concerned with the fundamental perspectives which the researcher brings to his field, which in turn determines the subject he elects to study, the methodological procedures he will employ and the character of the results he obtains.

Ontology: Answers questions as to the theory of reality.

- What is the nature of the world?
- What is real?

In trying to define a philosophy that gives rise to systems thinking, it is difficult to differentiate these areas of philosophy. If we begin with the question of how we know anything, that question will be answered not only by the nature of the seeker of knowledge but also by the nature of the object to be known. Thus we have moved to asking the questions, What is the nature of the world? What is real? As well as the question of what categories of things can be considered to exist?

The question of existence takes us back to the nature of the seeker of knowledge. This illustrates how the three branches of philosophy are intertwined.

3.2.1 Systems Ontology And Epistemology

Deriving from the premise that all human knowledge is founded on individual experience, a question that arises is how do we know anything? On the nature of our knowledge of anything, two things seem clear:

- a) Any initial experience involves an initial sense perception, ineffable presentation, the material content, *the GIVEN*, this can be taken as the first signals received by the brain from seeing, hearing, touching, tasting and smelling sensors, without our being aware of such a state of intuition, unqualified by thought. The presentation, the given element in a single experience of an object.
- b) The mind's response to the presentation, *the CONCEPT*. At an individual level the mind establishes a pattern of relationships that involve some sense data together with some idea of its application in experience. Meaning/idea for an individual mind combines concepts with the corresponding sensory data, the element of a mental model. Between minds, agreement between individuals can be established if each mind discovers within its experience, patterns that fit a common concept (what they can agree on). We learn to name objects/things by using the same substantives/adjectives to the same objects.

Analysis has to proceed at two levels. The first is phenomenological, that of direct experience, which encompasses perceptions of outside things, feelings, perceptions, decisions, etc. The second is that of conceptual constructs, the reconstruction of direct experience in systems of symbols culminating in science. It is well understood that there is no absolute gap between percept and concept, but that the two levels integrate and interact, Von Bertalanffy (1962).

The two ontological-epistemological questions, the ultimate predicates of science and knowledge, and which remain answerable only incompletely, and ambiguously are:

- 1) Can a mind's cognitive state relate to anything beyond the immediacy of its own

consciousness?

- 2) Is sense data directly relevant to the nature of reality? Where should we begin to look for truth? Where is the locus of truth?

Sutherland (1973) identifies three epistemological ontological ideal types namely, the rationalist platform, the empiricist-positivist and the phenomenological. These positions exercise a determinacy on the research enterprise, in that they restrict the legitimate domain of inquiry and restrict the nature of outputs, which result from the research process. The rationalists a priori relegate sense datum and empirical phenomena susceptible to sense capture to secondary importance or may even deny them any significance whatsoever. The rationalist constructs are functional so far as explaining some of the properties of the empirical inquiries they attempt to treat, none the less none of them can explain all the properties. Only a part of their predictions are valid and as such only parts of the theory can be correct. While the empiricist-positivist platform gives reason for some ontological significance the phenomenological platform denies such claims.

Both have adopted the nominalistic precept that the realm of the empirical is the sole residence of reality and the only admissible target of knowledge. Hume asserted,

"I shall venture to affirm, as a general proposition which admits no exception, that knowledge of any cause –effect relation is not, in any instance attained by reasoning apriori, but arises from experience, when we find that any particular objects are constantly co joined with each other. Let an object be presented to a man of ever strong natural reason and abilities: if that object be entirely new to him, he will not be able, by the most accurate examination of its sensible qualities, to discover any of its causes or effects." In Sutherland, (1973, p.72)

The phenomenologist simply moves the focus from sense data to mental configuration entities as unique, private primitive givens of experience and appeals to private intuition as the arbiter of knowledge. Knowledge thus becomes a product of experience (of sense happenings between objects and subjects) with an additional proviso that sense data becomes personally transformed in the process.

These dyadic approaches have arisen from the Cartesian dualism of matter & mind, things & consciousness, objects & subjects. There is reason to develop a triadic ontology that supercedes the dyadic ontology. Since there is no significant evidence to apriori restrict reality to either the cognitive, empirical or subjective domain. There is thus a need for an ontology that is entirely unconstrained. Such an ontology would be built on the hypothesis that any quantum of truth may be due to some interactions of cognition, empirical observation and subjectivism.

There is historical evidence to show that knowledge advances are not solely in the empirical or solely in the rationalistic or phenomenologic domains. On the advance of science, Conant,

(1952) said, *“science is a dynamic undertaking directed to lowering the degree of empiricism in solving problems, or as a process of fabricating a web of interconnected concepts and conceptual schemes arising from experiments and observations and fruitful of further experiments and observations”*, (p. 136) Historically many of the great deflection points in human achievement seem to owe their moment to casually structured interchange between imagination i.e manipulation of abstracts, experimentation and disciplined deduction. Sciences vehicle which we seem to recognise in past achievements, far from being abject empiricism, intuition or unbridled speculation is a hypothetico-deductive method, with empirical validation or invalidation of the conceptual structures being the ultimate arbiter of their scientific acceptability.

Harris (1970,) states, *“Theoretical conceptions permeate the entire process of thinking and facts always involve interpretation, so that no sharp distinction can be drawn between theory and observation, this independence of observation and theory identifies deduction from phenomena and gives the lie to any rigid separation of inductive from deductive inference”*.(p. 203) Von Bertalanffy (1962) clarion for the integration of percept and concept gives explicit recognition to the historical evidence for their constancy of association and their complementation in the real business of investigation.

A systems thinking ontology becomes distinctly and uniquely a triadic one,

- 1) The first leg of the triad is that it, explicitly recognizes the role played by disciplined deductive inference in the formulation of heuristics (enabling people to learn or discover something for themselves) which may then be used to guide or direct empirical validation
- 2) The second leg rests in the domain of empirical populated by percepts. Like concept, percept has the potential to partially determine the substance of hypothesis. For simpler phenomena, reduction and successive integration via inductive inference may exhaust the reality of phenomena at hand, making deductive postulations gratuitous. Percept also plays the role as the necessity and sufficiency for the validation or invalidation of deductively generated hypothesis.
- 3) The third assists in reality convergence of the ontology in essentially two ways namely:
 - There is necessity to postulate that sense data may not be actual representation of the empirical i.e some transformation may take place between perception and assimilation or codification.
 - The problems of leaving a role for subjectivism, revelation, abject intuition or normative model building. The first leg of the triad, the concept must be distinguished from these products, largely in the fact that the conceptual structure envisioned is a product of disciplined deductive inference or axiomatic metaphysical reasoning.

Systems ontology thus gives full scope to the range of reality postulations allowing cognitive, metaphysical constructs, empirical and hypostatisation a full reign in the business of gradually creating a posteriori order out of a priori chaos. It is least restrictive and least dogmatic. In systems theory, phenomena are highly unlikely to yield their secrets to empiricism unmediated by ordering concepts in form of broad heuristics. Any reality that knowledge is able to capture is most likely to be that found in the nexus of convergence between successively more general induction and successively more specific deductions.

3.2.2 Systems Metaphysics- On Being

In seeking to answer the question of the theory of being, this thesis concentrates on answering the question of what the basic items in the world are as well as traversing briefly in answering the ontological question as to the nature of the world. The question of being is based on phenomenology, which provides the conceptual frame in which the other parts of philosophy make their analyses and explanations. Pierce (CP 1.23)² asserted that there were only three universal categories, and which though absolutely irreducible to one another, were interdependent and directly observable in elements of whatever was at any time before the mind. Pierce described these as firstness, secondness and thirdness which roughly correspond to possibility, actuality and law respectively.

Firstness is characteristic of the mode of being which consists in an object being positively so. It captures the theory of realism, that abstract entities really exist in a world of their own, not in space and time, whether they have instances or not. The mode of being blueness, without inhering to any substance, is a firstness, for blueness has a possibility of being. Firstness hence constitutes all the qualities that have a possibility of being.

Secondness or actuality is typified by the experience of effort, of resistance, of struggle, of opposition. Actuality consists in the then and there, in relation to other existents, it's a brute fact that shock. It's a category of experience. The breaking of the night's silence by a shrieking baby, the shock and surprise of it – reveals the two-sided consciousness of ego and non- ego. This is what experience is, what the course of life compels one to think. Lieb, (1953 p. 8-9)

Thirdness characterises the mode of being, of laws governing events. It manifests itself in experience through predictions with a decided tendency to be fulfilled. Thirdness consists in that future facts of secondness will take on a determinate general character. It is characterised by its mediating role. Law governing events mediates between pure possibility (firstness and pure actuality (secondness)). Thirdness is and exclusively will be a triadic relation in logical terms.

3.2.3 System Metaphysics -On Wholes

It was stated earlier on that systems' thinking is rooted in the notion of wholeness. This section further explores the concept of "wholes".

Wholes have a phenomenal 'personality' as it were and this personality is unlikely to be a product of aggregation or simple multiplication. Wholes exhibit emergent properties that are different from those of the constituent elements. The emergent properties of wholes in Pierce's parlance thus represent the thirdness of the wholes. Von Bertallaffy (1972) argues that:-, *'The Aristotelian dictum of the whole being more than its parts which was neglected by the mechanistic conception poses innumerable problems in its elaboration. The properties and modes of action of higher levels are not explicable by the summation of the properties and modes of action of their components taken in isolation. If however we know the ensemble of the components and the relations existing between them, then the higher levels are derived from the components'*. (p. 25)

Thus different levels of any hierarchy of complex character tend to be governed by factors (laws, principles) which may themselves be different. Sutherland (1973) further concludes that, *'if wholes are not simple aggregates or products of the properties of their parts, the information gleaned about the whole from analyses of the properties of their parts would be highly unequivocal at best, downright erroneous at worst.'* (p.36). Thus we would expect to incur significant error in synthesis, where synthesis simply involved the upward integration or assemblage of lower order parts and properties. A whole thus transcends the collection of its parts. While in mechanistic scientific thinking a *system* is an aggregate of parts in which the whole is equal to the sum of its parts. In systems thinking, a *system* is a complex and highly inter-linked network of parts exhibiting synergistic properties, the whole being greater than the sum of its parts. A system consists of a number of elements and the relationships between the elements. A richly interactive group of elements can be separated from those in which few or weak interactions occur. Each element affects the behaviour of the whole, depending on the element interaction with the other elements of the system. Thus the whole is separated from its environment by the boundary that defines the rich interactions. A whole acting as a rich system of interactions can be said to be purposive if it's carrying out a transformation and it's termed as purposeful if its purpose is internally generated. The essential properties that define the system are properties of the whole and none of its constituents alone exhibits those properties. Systems' thinking embodies the idea that the interrelationships among parts relative to a common purpose of a system are what is important. Systems thinking can be thought of as a language for communicating about complexities and interdependencies of wholes. It embodies a worldview that looks at wholes rather than parts and recognises the importance of understanding how different segments of a system are interconnected. Many real life systems exhibit organised

complexity and are so effectively integrated that there is simply no part, which can be abstracted from the whole without losing significance. The integration and interaction of constituents is so intense that the constituents removed from context for analysis becomes a fiction of no ontological (real) significance. The next Chapter will look at how this philosophical basis affects and guides management research.

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SUMMARY

This chapter looked at philosophy as a field of inquiry and investigation towards interpretative knowledge, which yields a comprehensive understanding of reality, a worldview which when applied to research lends direction and methodology. Moving to the question of our knowledge of things and the relationship between percept and concept in the construction of reality, a systems ontology is distinctly and uniquely triadic. The first triad recognises the role played by disciplined deductive inference, while the second triad accepts that perception has the potential to partially determine the substance of a hypothesis. The third triad assists in the reality convergence by postulating that there maybe some transformation in sense data between perception and assimilation as well as leaving a role for subjectivism, revelation and normative model building. Thus it is an ontology that gives full scope to the range of reality postulations allowing cognitive, metaphysical constructs and empirical hypostatizations a full reign in the business of gradually creating a posteriori order out of a priori chaos.

Systems metaphysics answers the questions of the basic items in the world by referring to Pierce's conception of firstness, secondness and thirdness, which correspond to possibility, actuality and law respectively. The chapter ends by looking at the nature of wholes and seeing systems thinking as a language for communication about complexities and interdependencies of the wholes. It embodies a worldview that looks at wholes rather than parts and recognises the importance of understanding how different segments of systems are interconnected.

CHAPTER 4: THE BASIS OF THE FRAMEWORK OF INQUIRY

4.1 THE NATURE AND PROCESS OF MANAGEMENT RESEARCH

Research is a vigorous and rigorous activity aimed at developing knowledge through increasing understanding on the part of researcher, society or both. It is a process of inquiry aimed at making sense of the world and phenomena and creating new and creative ways of looking at them as well as learning how to act to bring about change effectively and efficiently.

As a process concerned with increasing understanding of the world and the phenomena that occur in it, research is faced with the task of predefining certain a priori concerning:

- The nature of reality,
- The origin, nature and construction of knowledge,
- The relationship of Knowledge with logic as concerns the principles of demonstration and verification
- The purpose of Knowledge

Research thus needs a philosophic orientation to aid in forming a framework of reference about the nature of inquiry.

Management is a method of applying existing and new knowledge to decide upon action and set standards by which the results of its action shall be judged. Management Research on the other hand is concerned with the inquiry of management situations to provide the necessary knowledge for application in decision-making. Revans (1982) argues that any system of inquiry is set in motion by human beings to fulfil human ends and the value of the processes themselves as judged by contemporary standards of morality are irrelevant. However he notes that the sequence of management processes set in motion appears to be those directing the organisation to increase the value of management's choice. He asserts that managerial actions in a capitalist society are generally limited to those decisions that in the long run make for greatest profit. Even when they do not seem to benefit the company in measurable terms. Behind every decision taken, there is a set of preferred objectives, which aim at maximising some benefit or other gain. Thus the manager has in his mind a list of preferred gains or losses, which Revans refers to as '*the declaration of preferred aims*'. Thus every action taken is evaluated against this declaration to see whether the benefits were optimised for the company or not. Thus whether conscious or not, managers are continuously going through a process of inquiry, which includes:

- The consideration of available facts,
- The declaration of preferred aims,
- The working out of various proposals to achieve these aims,

- The comparison of the alternative results with the preferred aims
- The subsequent confirmation, modification and rejection of the proposals for action.

Although the process may not be clearly delineated as elaborated here, in any one decision, most of them occur. Managers are thus constructing and continuously formulating theories about their work. Nonetheless management frequently admits that their decisions are based upon guesswork and complain of lack of facts! Managers do not know the facts because they do not know the questions they want to ask.

The failure of this lack of knowledge of the questions to ask is compounded because they deal with people who are social beings and who cannot be totally predictable like machines. They pick solutions off the shelf that were developed in different contexts and cultures which fail them and makes them despair of any management theories. What they fail to understand is that management theories are context specific and they need to develop inquiring systems that will help them understand their own contexts and hence formulate solutions to them. In many organisations, people have the perception that management is paid to think, alas management has abandoned this honoured perception and is more occupied with the daily fire-fighting, to have any time for critical thought to look into problem situations that they are faced with.

An understanding of the philosophical assumptions that guide management action is the beginning place for the development of management that is able to engage in critical self-reflection. Critical self-reflection enables management to understand that the process of management as well as their own assumptions about the situations they are involved in. This results not only in better management that seeks to solve the real problem instead of symptoms but also provides a way of continuously improving their management practice.

The philosophical assumptions in a research context thus is important because:

- Understanding the assumptions assists in dealing with questions that arise during the research process at a more fundamental level of assumptions. This is because the differences between the main paradigms of research, (quantitative and qualitative) may not be easily detected on the surface, but can be at the basic philosophical level.
- A clear understanding of the assumptions helps the researcher in making a strong case for conducting a qualitative research project in a particular situation or setting. The clearer one understands the larger picture that qualitative methods fit into the better one can conduct a research project and defend it as a rigorous and valued piece of scholarship.
- Understanding the assumptions gives the researcher the conceptual tools to think through problems and issues as they arise in a project.

Assumptions about the nature of reality are important to a researcher, because anything done by him/her to test what reality is must be based on some understanding of reality.

Postulates of Research Paradigm

Paradigm:- This is a set of overarching and interconnected assumptions about the nature of reality. They are made up of postulates that support it. Paradigms cannot be tested and they provide a basis on which we build our verifiable knowledge. Paradigms provide a worldview concerning the nature of reality. In research they provide a working worldview within which researchers work.

Postulate: These are philosophic assumptions that are positively stated and cannot be proved but may be stipulated. These stipulations are called postulates. (A stipulation is an essential condition). Thus postulates are individual assumptions that are stipulated to be true.

The postulates of a research paradigm provide answers to the questions regarding: -

- | | | |
|--|---|--|
| 1.Ontology- Questions about the nature of reality. | : | <i>What is the nature of the world? What is real? What counts as evidence?</i> |
| 2.Epistemology- interested in questions about the origins and nature of knowing as well as construction of knowledge. | : | <i>What is the relationship between the knower and the known? What role do values play in Understanding?</i> |
| 3.Logic- deals with questions about the relationship of research to logic and the principles of demonstration and verification. | : | <i>Are causal links between bits of knowledge possible?</i> |
| 4.Teleology- is concerned with questions of purpose. | : | <i>What is the purpose of research?</i> |

(Adapted from Maykut and Morehouse 1994)

4.2 QUALITATIVE RESEARCH

Kuhn's View of the Sociology of Science

Kuhn (1962) was the first to introduce the concept of paradigms in the history and sociology of science. Kuhn was concerned with the establishment and revolutions of paradigms in science. His discussion split research in science into two phases namely, normal and revolutionary phases. Research during the normal phase involves the daily cumulative building on the past, and solving of puzzles within a general pattern already accepted and outlined by the major theories of a discipline. Sometimes as more and more puzzles fit, some fail (these he calls anomalies). Thus new bits of information that are verified by the existing methods of science fail to fit in prevailing paradigms despite repeated efforts to resolve the anomalies. As more and more data fails to support existing theories, it becomes more and more difficult to support these theories. This

suggests that the basis of the prevailing paradigm among the practitioners of a particular discipline needs to change. A major shift needs to occur in the methodology of science i.e in the way knowledge is researched. However to abandon one paradigm in favour of another changes the entire basis of that particular intellectual community, that is why Kuhn refers to it as a 'scientific revolution'. Therefore there arises the need for a shift in the research paradigms and attendant methods within the history of science. Kuhn thus argues that those occasional discontinuous, yet revolutionary changes in implicitly shared points of view and presuppositions of science are an integral part of the scientific process.

Qualitative research is based on fundamentally different postulates than the positivist paradigm of research as can be seen in the concept map below, figure 5. There is therefore a need to match the research question and focus with the appropriate paradigm for collection and analysis of data.

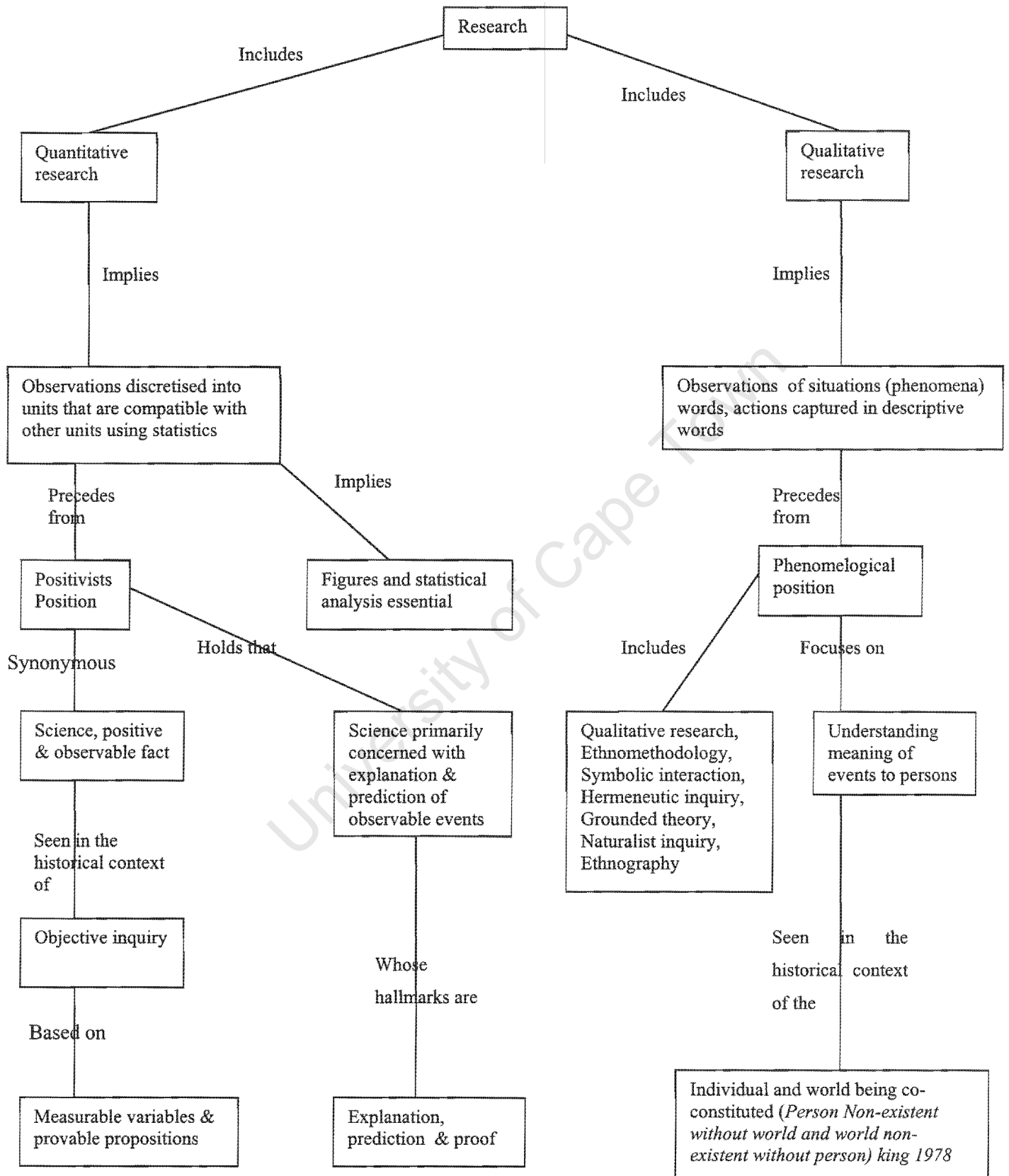
Different from the preceding paradigm, the new paradigm has to rely on its own criteria for justification, as most of the questions that arise and the answers that can be found are likely to be absent in the previous paradigm. The postulates of the new paradigm have to be different from those of the previous one to justify discontinuity. Guba and Lincoln (1985) further argue that qualitative research is based fundamentally on a different set of postulates than is the dominant approach to research (quantitative). The new postulates constitute the alternative paradigm, (which is yet to be fully developed), for conducting research.

The failure of the quantitative paradigm which is rooted in the positivists reductionism-analysis-synthesis to address the complex phenomena in management that are characterised by feedback loops, continuous flux and evolution and multiple perspectives of stakeholders, results in a paradigm crisis. The quantitative paradigm is unable to cope and yield meaningful results about the situations (phenomena) that managers are constantly faced with. An alternate paradigm capable of capturing phenomenological occurrences therefore becomes necessary.

Marginalisation of Qualitative Research

If qualitative research is able to shed more understanding on management problems, a question that arises naturally is why it has a minority status as far as research is concerned. Maykut and Morehouse (1994) argue that the reason for this is because the philosophic underpinnings of qualitative research are not widely understood and hence it is seen as a less rigorous and less valued way of doing inquiry. Historically qualitative research has been marginalised in both its participants (subjects as defined by dominant paradigm) and its methodology.

FIG 5 CONCEPT MAP OF RESEARCH PARADIGMS



The marginalisation of participants was contributed by various groups who adopted qualitative research in the beginning as follows:

- Cultural Anthropologists who were the first to practice qualitative research marginalised the 'primitive' peoples they studied. (They did an exclusive examination of the societies they studied hence marginalising them).
- Freud and Piaget studied neurotic women and children respectively-groups of people on the margins of the male patriarchal scientific culture.
- Chicago school of sociology studied street gangs and institutionalized people, other groups that are marginalised.
- Recently more studies have been done on the educational process in elementary, secondary and university setting.
- More recently William Perry (1970) examined the intellectual and moral changes in Harvard males, a group of people valued by the dominant scientific community and hence helped bring qualitative research closer to the centre of serious research

On the other hand the marginalisation of the methodology was contributed as follows :-

- Qualitative researchers presented their findings in a way that did not directly challenge traditional science.
- Anthropologists who were the first to use qualitative research did not even suggest that their method could be used by other social science disciplines.
- While writing case studies, Freud used knowledge gained from his work with patients as part of his theory building, however he placed his theories in the medical and or literary context.
- Though Carl Rogers (1942,1951) was the first to bring out his therapy transcripts for public inspection, neither he nor Piaget who conducted studies using clinical interviews provided any methodological information.
- Mary Ainsworth (1978) did her studies of mother-child using qualitative research without providing any methodological information.

In all these pioneering qualitative research studies no methodological information was provided by the researchers leaving an impression that there was no rigorous way of collecting and analysing data, and hence leading to the marginalisation of qualitative research as a research paradigm.

Postulates of the two paradigms

Postulates of research paradigms are regarded as self-evident truths in times of normal science,

however this does not hold true during periods of rapid change or shift from one paradigm to another, Kuhn (1962). Postulates are only self-evident when there is not a competing frame of reference. Postulates are given the status of acceptance in order to get on with the task ahead. They thus provide a bedrock (a plausible foundation) on which to conduct research.

There are six philosophical questions about the nature of reality and the way of conducting research. These questions are answered by a set of postulates that make a claim for ways of conducting research.

They shape:

- Researchers approach to problems
- Methods used by researchers to collect data
- The types of problem researchers choose to investigate.

The philosophical questions, the positivist and phenomenological postulates as well as the implications for these postulates for research are presented in Table 2

Paradigm Changes

Lincoln and Guba (1985) argue that research methods are also subject to paradigm changes as already noted in their extension of Kuhns work. They present an overview of changing ways the research community views the underlying assumptions upon which research is based. This is shown in Table 2 below.

TABLE 2- RESEARCH CHARACTERISTIC AND TRENDS IN HISTORIC CONTEXT

Research Characteristic	Positivist Paradigm	Phenonomelological Paradigm
World view	Simple	Complex
Organization of information	Hierarchic	Heterachic
Forms of relationships	Mechanical	Holographic
Sources of change	Determined	Indeterminate
Nature of change	Assembly	Morphogenesis
Observer perspective	Objective	Perspectival

(Maykut and Morehouse adaption of Lincoln and Guba, 1985)

These postulates undergird the different approaches to inquiry. The positivist paradigm leading to the quantitative research approach while the phenomenological paradigm leading to the qualitative research approach.

The differences between these two paradigms (i.e the positivist and phenomenological are) :

1. The positivists see the world as simple or potentially simple if it can be examined properly and broken apart correctly. The phenomenologists see the world on the other hand as complex and interconnected and thus for them research must maintain complexity if explanation is to be trustworthy.
2. Positivists see information as organized in hierarchy from bottom (sub-ordinate) to top (super-ordinate) The alternate paradigm sees information as organized in heterarchies. 'web of meaning' is a good metaphor for heterachic organisation of information.
3. Forms of relationship. Positivists see relationships as mechanical – one way flow chart. The alternate paradigm sees relationships in the metaphor of a holographic image. A holographic reproduction is three-dimensional, to change one part is to change the entire image. Interconnection of parts distinguishes holographic from mechanical.
4. Sources of change and explanation. To the positivists the source of change is determined and positively identifiable. X causes Y. The alternate paradigm sees the source of change as indeterminate and therefore not identifiable. X and Y cause each other and therefore cause is inseparable from effect and further, it is indistinguishable from it.
5. Nature of change. Positivists see change as mechanical. The replacement of parts. Individual and discrete parts are assembled one piece at a time. The alternate sees the nature of change as a morphogenesis -which is understood as the way a living organism develops from a single undifferentiated cell to a complex differentiated multi-celled being.
6. Observer perspective. To the positivist the researcher and his instruments are objective or potentially objective. The alternate sees the observer as perspectival i.e having a singular perspective of the situation. The observer interacts and influences the observed situation through his particular interpretation.

Polanyi (1958) states that *'the avowed purpose of the positivist sciences is to establish complete intellectual control over experience in terms of precise rules, further we should only have to follow the rules faithfully to understand this world'*. The alternate paradigm is characterised by close examination of people's words, actions and documents in order to discern patterns of meaning which come out of data. There are two paradigms based on two different and competing ways of understanding the world. As we observe and understand the worlds through research, these ways are reflected in the way research data is collected (words versus numbers) the perspective of the researcher (perspectival versus objective) and the difference between proof and discovery.

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TABLE 3- PHILOSOPHICAL QUESTIONS, THEIR POSITIVIST AND PHENOMENOLOGICAL POSTULATES AND IMPLICATIONS FOR RESEARCH (ADAPTED AND EXTENDED FROM MAYKUT AND MOREHOUSE 1994)

Questions	Postulates of the positivist approach (The dominant paradigm)	Postulates of the phenomenological approach (An alternate Paradigm)	Implications of the postulates for research
<i>1. How does the world work?</i>	Reality is one, By carefully dividing and studying its parts, the whole can be understood.	There are multiple realities these are socio-psychological constructions forming an interconnected whole. These realities can only be understood as such.	If knowledge can be separated in parts and examined individually it implies that the knower /researcher can stand apart from who/what she is examining. If knowledge is constructed, then the knower cannot be totally separated from what is to be known hence the world is co-constituted. Thus the two researchers will ask different questions and approach research in different ways.
<i>2. What is the relationship between the knower and the known?</i>	The knower can stand outside of what is to be known. True objectivity is possible.	The knower and the known are interdependent.	
<i>3. What role do values play in understanding the world?</i>	Values can be suspended in order to understand.	Values mediate and shape what is understood.	Values are embedded in the research, in the topic chosen for examination and in the researcher. If reality is constructed and the knower and known inseparable, values are inseparable. If world can be divided into parts and knower can stand outside what is known, then research is value free.
<i>4. Are causal linkages possible?</i>	One event comes before another event and can be said to cause that event.	Events shape each other. Multidirectional relationships can be discovered.	If reality is multiple and constructed, it follows that causal links will be mutual i.e. constructed and in terms of meaning of event of action, event is multidirectional and not unidirectional. This has implications for how one looks at data or information. Thus whilst in qualitative research, one seeks for patterns which emerge from data in quantitative research, one makes a guess or forms a hypothesis which is then used to test data. Causality is thus important to the positivist and is her prime focus.
<i>5. What is the possibility of generalization?</i>	Explanations from one time and place can be generalised to other times and places.	Only tentative explanations for one time and place are possible.	Qualitative research values context sensitivity i.e understanding of phenomena in all its complexity and within a particular situation and environment. Quantitative research works to eliminate ALL unique aspects of environment in order to apply results to the largest possible number of subjects and experiments.
<i>6. What does research contribute to knowledge?</i>	Generally the positivist seeks verification or proof of propositions.	Generally, the phenomenologist seeks to uncover salient propositions.	Discovery of salient propositions by observation and careful inspection of the patterns that emerge from data are the hallmarks of the phenomenologist. The positivist seeks to verify what has already been discovered by other methods.

A closer look at three research issues in the two paradigms

1. Qualitative research places emphasis on understanding through looking closely at people, words, actions and records. Quantitative research looks past people, words, actions and records to their mathematical significance. Thus it quantifies the results of observation. The difference is meaning given to words, behaviours or documents as interpreted through quantitative or statistical analysis as opposed to patterns of meaning which emerge from data presented in participants own words. The understanding of numbers, what they mean, how to use them, when to use one particular approach or another form statistics which provides an orientation for quantitative analysis. Philosophic writing in qualitative research provides the same type of orientation for qualitative research as that of statistics for quantitative research. The task of understanding and presenting qualitative research is as demanding as the task of understanding statistics. It is therefore important to understand the different ways words, actions and documents are used in opposing research paradigms.

Qualitative research looks to understand a situation as participants construct it. It attempts to capture what they say and do thus the product of their interpretation of the world. Qualitative research attempts to capture the process of interpretation. Its words that most people use to understand their situations. We create our world with words, as well as hide and defend ourselves with words. Qualitative research seeks to find out patterns in those words and actions and to present them for others to inspect while at the same time staying as close to the construction of the world as the participants originally experienced it.

From a qualitative approach to present a situation mathematically by use of statistics would be to strip the experience of its meaning (participants meaning). Also to present results of research to participants in a manner that they can understand is to include them in the discovery. Thus while one (qualitative) lays emphasis on words the other lays emphasis on numbers (quantitative).

2. To be objective is to be cold and distant. Being subjective in this context means to be aware of agency, of action. From the phenomenological view subjects are synonymous with agency or actors perspective. Therefore to be subjective means to tend towards the subject. Qualitative research tries to understand the speech (language), patterns and behaviour of actors or agents and the specific context in which these behaviours occur. Perceptual researchers are exposed to the same constraint in understanding the world, as are the persons they are investigating. The two paradigms also differ in terms of their attitude towards the subject of investigation. In qualitative research, the researchers perspective is an integral part of the research and therefore important

while in quantitative research, the researcher does not include his own perspective but tries to be as objective as he can.

3. The goal of qualitative analysis is to discover patterns that emerge after close observation, careful documentation and thoughtful analysis of the research topic. (It makes contextual findings and not sweeping generalisations). Discovery is understood in the relationship between subsidiary and focal. Polanyi (1958). No knowledge can be wholly focal or totally in focus.

The search for patterns in helping to understand a particular person or phenomena is an activity for qualitative research as based on the postulate that reality is multiple and constructed, hence events are simultaneously and mutually shaped and the goal is discovery. In quantitative research, a hypothesis is a hunch, which is set up in a particular manner so as to prove or verify something. However, a hypothesis can only be proved after it has been derived by observation of specific people and events.

Integrating the Qualitative paradigm in Action Research

The qualitative paradigm is a tool used in understanding and describing the world of human experience. Since we maintain our humanity throughout the research process, it is largely impossible to escape the subjective experience, even for the most seasoned of researchers. As we proceed through the research process, our humanness informs us and often directs us through such subtleties as intuition or 'aha' moments.

Kuhn, (1970) proposed the concept of specific paradigms, suggesting that there can be more than one set of basic beliefs, or 'paradigms' about what constitutes reality and counts as knowledge. Paradigms provide philosophical, theoretical, instrumental, and methodological foundations for conducting research and, in addition, provide researchers with a platform from which to interpret the world. Kemmis (1980) asserts that the true value of non-experimental research lies in its connection to the real world, its ability to describe actions in their social and historical contexts, and its ability to rationally critique these descriptions.

Central to the qualitative paradigm is the belief that people assign meaning to the objective world, that their valued experiences are situated within a historical and social context, and that there can be multiple realities (Tesch, 1990). I accept the persuasion that realities cannot be studied independently from their contexts, and I affirm the position that the qualitative methodology is legitimate and valuable, possessing distinctive characteristics that make it ideal for many types of investigations, including management practices. As noted by Mothibi (1999) systemic framework implies a methodological ability to see things as wholes with rich relationships. This implication means that the choice of a research paradigm which is congruent with the ideals of the systemic framework. For management inquiry into fussy managerial problems qualitative research

qualifies to be one.

The ultimate aim of qualitative research is to offer a perspective of a situation and provide research reports that reflect the researcher's ability to illustrate or describe the corresponding phenomenon. One of the greatest strengths of the qualitative approach is the richness and depth of explorations and descriptions. Thus the qualitative paradigm lends itself to use in the action research process as will be shown shortly in the next chapter.

SUMMARY

This Chapter explores the nature of management research, seeing it to be concerned with the inquiry of problematic management situations in order to provide the necessary knowledge for application in decision making. Building on the work of Revans (1982) it demonstrates that managers whether conscious or unconscious are going through a process of theory building as they work out various proposals for the achievement of their '*declaration of preferred aims*'. This process however lacks the rigor it deserves as managers fail to ask the right questions, instead rushing to already made shelf solutions which inevitably fail, in the new contexts they are applied.

This is further compounded by the fact that while managers' mental models tend to see people as predictable, as machines, people are social beings whose behaviour cannot easily be predicted.

This failure of management to understand the nature of its interaction with people and organisations they deal with calls for a deeper understanding of the nature and type of research necessary for management success. This type of research is premised on a different philosophical basis, as it seeks to understand people's behaviour, words and actions and the interpretations they give to the various transactions they participate in. The chapter provides a rationale for the use of qualitative research within an action research paradigm, for inquiry into problematic managerial situations at Romago engineering. This provides a means of understanding the meaning people assign to their objective world, and their valued experiences situated within a historical and social context as well as acknowledges the existence of multiple realities (perspectives) that are equally valid.

CHAPTER 5 : THE QUESTION AND THEORY; CONDUCTING QUALITATIVE RESEARCH WITHIN AN ACTION RESEARCH FRAMEWORK

5.1 HISTORY OF ACTION RESEARCH

Action research grew as an outgrowth of the traditions of John Dewey and Kurt Lewin. Dewey (1928,1933) criticised the separation of knowledge and theory of inquiry that was a model both for the scientific method and social practice.

Lewin, (1952) a pioneer in group dynamics and Action research showed how complex phenomena could be studied experimentally. Kolb (1984), Carr and Kammis (1986) and others further developed action research. The Lewinian School of action research is that of scholar practitioners in group dynamics and organizational science who sought to integrate theory and social practice. Lewin was committed to research that would improve social practice.

His concepts on Action Research included

- a) Action research involves change experienced in real problems in social systems. It focuses on a particular problem and seeks to provide assistance to a client system.*
- b) Action research involves iterative cycles of identifying a problem, planning, acting, observing and reflecting*
- c) Intended change involves a re-education, a changing of patterns of thinking and acting that are presently well established in individuals and group. The effectiveness of the re-education depends on participation by clients in diagnosis and fact finding and on free choice to engage in new kinds of action*
- d) Action Research challenges the status quo from a perspective of democratic values. Thus value orientation is congruent with the requirements of effective re-education, participation and free choice.*
- e) Action research is intended to contribute simultaneously to basic knowledge in social science and to social action in everyday life. Standards for developing theory and empirically testing propositions organized by theory are not to be sacrificed, nor is the relationship to practice to be lost.*

(Argyris, 1985, pp 8-9)

These concepts have withstood the test of time and will be examined in more detail later on in this chapter.

5.2 THE PHILOSOPHY OF ACTION RESEARCH.

Any claim to knowledge can be challenged by the question, 'How does one know what he thinks he knows'. The answer to this question lies in the domain of epistemology, concerning the theory of knowledge. As was discussed in the previous chapter on the Philosophical basis of qualitative research the two schools of thought on the questions of epistemology are those that descended from Descartes (1596-1650)³, (Scientific positivism) and those that analyse Phenomenology (i.e. analysis of ordinary knowledge) and were propounded by Popper.(1942) The alternate phenomenological paradigm arose to oppose the extension of positivist methods of natural sciences to human sciences. The new paradigm is based on the premise that the understanding of meanings, which are the essence of social action, is fundamentally different from explaining events in the natural world.

In order to explain the main differences between positivist scientific research and Action research we examine two questions namely:

What are the essential features of a positivist scientific deliberation and how does action research deliberation differ from it?

What are the problems of interpretation that may hinder rigorous testing?

Positivist scientific research is based on hard data (figures) explicit inferences, empirically disconfirmable propositions and systematic theory. Its context of discovery involves generating ideas and putting forth theories. These theories are justified by testing them using statistical significance. What is distinctive about positivist scientific research is not the process of theory proposals but systematic testing that they must survive if they are to be regarded as valid on a statistical basis. Theories are tested through Popper's idea of falsifiability. Popper (*Ibid*) proposed that scientific theory must be falsifiable, in the sense that the theory must be incompatible with certain possible results of observation. Thus genuine theories must make the risky prediction that might turn out to be false.

The science of social action needs to take a different form from the natural sciences because social phenomena is meaningful to human beings who enact them while the natural world proceeds independently of subjective meaning. The alternate paradigm sees this difference as crucial. The generation of reliable knowledge in the study of human behaviour depends on understanding meanings in their contexts and to abstract them to figures is to lose the contextual meanings. Thus while the positivist scientific stance is to abstract the meanings to figures that can be interpreted quantitatively, Action research seeks to understand the meanings of behaviour in its context.

However descriptions of action necessarily involve claims about the intentions of agents and the

meanings of their actions.

An objection that arises is how the meanings of social data can be used if beliefs and desires are subjective rather than objective, 'in the heads' of actors rather than publicly accessible? How can it be that the meanings of action can be publicly accessible? Argyris (1991) argues that:-

'The knowledge required in understanding action is embedded in the ordinary language and social practices of the community in which action occurs. The interpretation of the human sciences are second order in that they must first grasp the point of what actors do, as determined by the local context of rules and practices.'

Thus understanding action or behaviour is akin to understanding a language. It is dependent on inter-subjective meaning and shared practice and is a matter of knowledge and not feelings. Meanings are thus not private and hence are publicly accessible.

Summary

- Theory for practice guide the practitioners of Action research to grasp the pattern of focus operative in the situation at hand and yet recognise that human beings cannot take account of everything as we have a limited cognitive capacity, Simon, (1969). Theory should lend itself to testing in the action context so that the practitioner can make corrections on-line.
- Knowledge that is to be used for action cannot rest solely on the analysis of social statistics. Statistics abstracts the communicators from the instances of social action and their informed use. Statistics depends on interpretation and judgement of their relevance to the situation at hand. It is therefore necessary to get at the meanings embedded in action, at the logic of behaviour and action.
- Practice and action involves the normative dimension and should therefore be regarded as interdependent with the ways knowledge is generated.

The practice of action research involves working within a research community to create conditions in which members can engage in public reflection on substantive matters of concern to them. Since action research is concerned with increasing understanding of phenomena and bringing about change, it falls within the alternate research paradigm and hence can be carried out within a qualitative research framework.

5.3 WHAT IS ACTION RESEARCH? DEFINITION.

Action Research has been variously defined as:-

- An exercise in critical thinking to learn about events in order to change them, Merriman, (1988)
- A reflection on action, combining action and research ,Anderson (1994)

- The study of a social situation with a view to improving the quality of action taken within it. Research that creates improved social change through action that is motivated by critical self-reflection. (unknown)

From these definitions and the concepts first enunciated by Lewin it can be seen that action research describes those qualitative research methodologies that seek action and research outcomes at the same time. Thus it has the dual aims of action and research.

Action outcome implies that it seeks to bring about positive change in some community or organisation i.e it seeks to improve a situation. The research outcome seeks to increase understanding on the part of researcher or client or both, thus it is a conscious effort that seeks to formulate knowledge that adds to theories of action.

According to Zuber-Skerrit (1992) action research embodies the following five characteristics:-

- *Its Practical-Research* seeks to advance knowledge, increasing understanding towards achieving practical improvements. Its aim is to result into action.
- *Its participative and collaborative-* The research is not the work of outside experts, looking on subjects, but involves participation by all concerned with the issue to ensure greater commitment and hence assure action.
- *It is emancipatory-* The participative nature of the research allows all those involved in the study to be equal contributors to understanding the phenomena.
- *It is interpretive-* Since the research seeks to understand phenomena through qualitative means, it is open to interpretation of the participants.
- *It is critical-* Research involves self criticism, examination and reflection on the part of the participants and its upon the critical thinking /reflection that the participants seek to change their situation/environment/phenomena.

5.4 THE PROCESS OF ACTION RESEARCH.

Since the purpose of action research is both to yield an understanding of a social system and to determine the best opportunity for change, it seeks to learn from experience and apply that learning in bringing about change. It begins with an exploratory and descriptive focus of inquiry though the tools for idea generation and brainstorming. Since it is designed to discover what can be learned about a phenomenon of interest. The development of a general focus of inquiry helps guide discovery of what is known about some social phenomena. The next step is to develop a researchable question based on the topics that reflects the goals of exploration and description. The questions should seek the qualitative posture of discovery and description aimed at gaining a

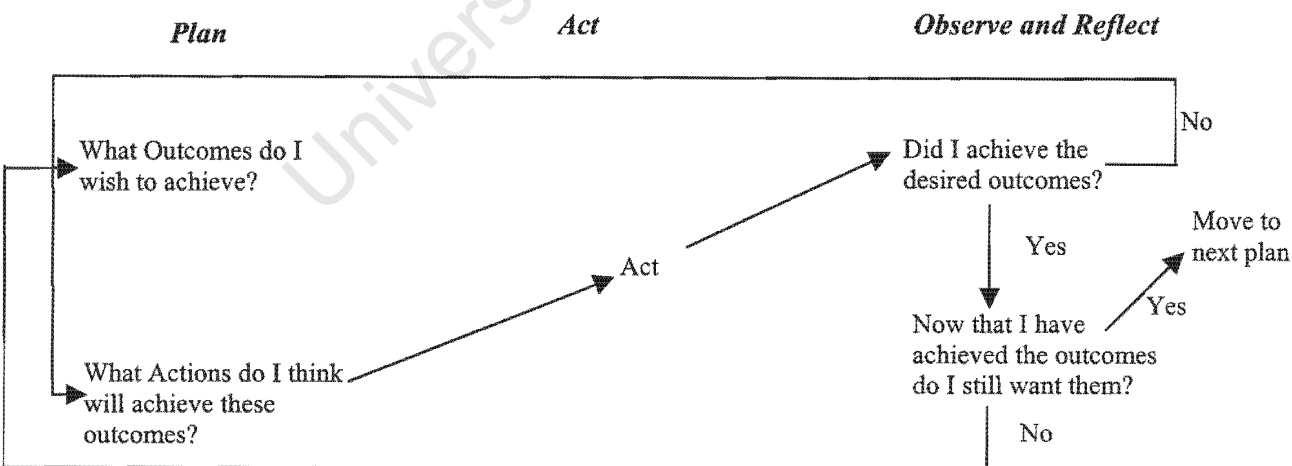
deeper understanding of personal and social phenomena.

Preliminary researchable question developed is aimed at developing an understanding about how organisations manage their logistics/materials for the efficient and effective fulfilment of their vision and how this organisation (flow of information) influences it as far as the achievement of its vision is concerned.

The alternate paradigm draws our attention to the phenomenology of human experience, noting that reality is variously constructed by each of us and we bring our multiple meanings to each act and interaction. The researchable question provides the initial boundaries of study, indicates what type of data is to be collected as well as what type of people/settings one needs to include/exclude from the study.

Action research is a repetitive cyclic process of Plan-Act-Observe-Reflect, Kemmis, (1999) as depicted in figure 6. It begins with a plan or an intention to act in a situation, so as to bring about change of phenomena. The plan involves problem analysis and strategic intention. Implementation of the action intended and observation of its effect in the situation follow this. Observation also includes evaluation of action by appropriate methods and techniques. The reflective phase or critique reviews the effects on the action implemented leading to more understanding and new plans of how to act in the situation. This leads to identification of new problems hence a new cycle.

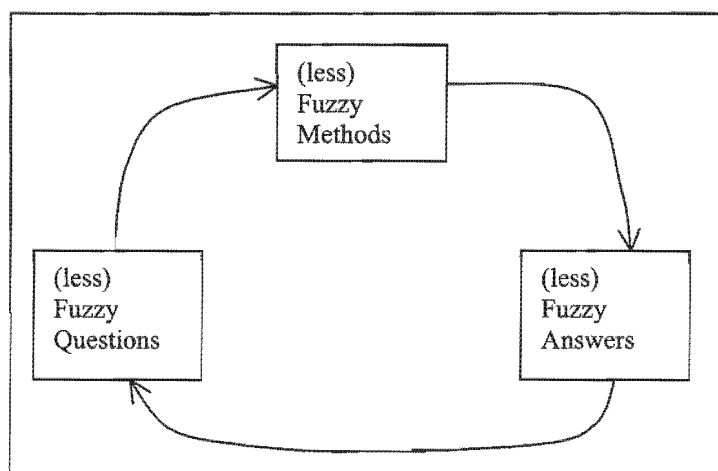
FIG 6-THE ACTION RESEARCH PROCESS, ADAPTED FROM DICK AT [HTTP://WWW.SCU.EDU.AU/SCHOOLS/GEM/AR/GUIDE.HTML](http://www.scu.edu.au/schools/gem/ar/guide.html) (ACCESSED ON 30TH APRIL 2000)



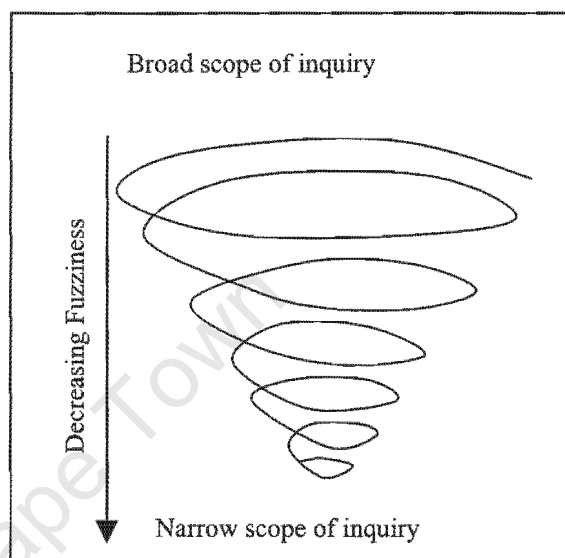
Unlike the quantitative research methods that begin with the development of a question and are followed to the end with a conclusion, action research is an emergent process. This means that it begins with fuzzy questions, using fuzzy methods and results in initial fuzzy answers, but these answers refine the initial questions and the study continues. Thus an emergent design of the

process implies that research design evolves over time.

As one carries the research important leads are identified in the early phases of data analysis and pursued by asking of new questions, observing new situations or previous situations with a slightly different lens or examining previously unimportant documents. The emergent nature of action research makes it responsive to the situation and the process takes place gradually. Thus Action research is suited well for qualitative and participative approaches to research.



*FIG 7A: ITERATION OF INQUIRY
[ADAPTED FROM, DICK, B. AND
SWEPSON, P. 1994]*



*FIG 7B: THE SPIRAL OF INCREASING
CLARITY WITH SUCCESSIVE INQUIRY
ITERATION.*

FIG 7-EMERGENT PROCESS OF ACTION RESEARCH

The assumptions behind the use of Action research is that people can learn and create Knowledge

- On the basis of their concrete experience
- By observing and reflection on that experience
- By formation of abstract concepts and generalisations
- By testing the implications of those concepts in new situations, which lead to new concrete experience and hence a new cycle.

5.6.DOING ACTION RESEARCH

Data collection in natural settings

Qualitative research is concerned with understanding people's experience in context. The natural setting is the most likely place to discover or uncover what is to be known about phenomena. This reflects the philosophic underpinning of the alternate paradigm that personal meaning is tied to context. Thus staying with people for an extended amount of time in places they inhabit is a critical feature of indwelling that fosters the development of both explicit and tacit knowledge. The methodologies suggested for this research are based on multiple perspectives and include

Viable Systems diagnostics and Soft Systems Methodology. Action research has been chosen so us to enable the researcher unearth the espoused values and unstated rules that people follow.

It will seek to understand the unstated rules of the situation and the unstated assumptions people form about each other that direct their interactions in both group and organisational settings. Since we not only experience the world but interpret this experience as well, form intentions, and decisions of action in the light of our interpretation of the situation. Thus we take purposeful action (deliberate decided, willed action) in response to our experience of the world. The words of Checkland and Scholes (1991) in their book *Soft Systems Methodology* provide the best justification for the choice of Soft Systems Methodology in understanding worker motivation. They say *"The basic shape of the approach (referring to Soft Systems Methodology) is to formulate some models which it is hoped will be relevant to the real world situation and to use them in a process of Comparison. That comparison could then initiate debate leading to a decision to take purposeful action to improve the part of real life under scrutiny."* Checkland and Scholes (1991,p.6). Thus soft systems methodology is an organised set of principles (methodology) which guide action in trying to manage real world problem situations. It is systems thinking based and is applicable to taking purposeful action to change real situations constructively.

Building a purposive sample

The type of sample for any study is usually a function of the purpose of the study. If the purpose of the study is generalisation to the larger population then random sampling is appropriate.

A random sample increases the likelihood that the sample accurately represents the population from which it was selected. However qualitative research is context sensitive and seeks to gain a deep understanding of phenomenon being experienced.

This can only be achieved through a careful selection of a group of people. This approach acknowledges the complexity that characterises human and social phenomena and the limits of generalisability. Participants are included based on the possibility that each participant will expand the variability of the sample. Purposive sampling is aimed at increasing the likelihood that variability common in any social phenomena will be represented in the data, in contrast with random sampling which tries to achieve variation through the use of random selection and large sample size. Different strategies exist for purposive sampling depending on the focus of inquiry and the researcher's judgement as to which approach will yield the clearest understanding of the phenomena.

Examples of the approaches include:-

Extreme cases-If research seeks to better understand unusual phenomena or the cases chosen are

particularly illuminating, otherwise one chooses typical cases.

Critical cases-If research seeks to understand larger phenomena subsumed by the critical cases

Maximum variation-If research seeks to understand phenomena by seeking persons /settings that represent the greatest differences in phenomena. This provides the qualitative researcher with a method by which variability characteristics of random selection can be addressed, while recognising that the goal of qualitative research is not generalisability.

In the study of factors that might affect Logistics/materials management the following areas were identified as the substantive characteristics that need to be considered in order to maximise the contrast between the study participants.

a) Type of worker	b) Work content	c) Worker Education	c) Skill level	d) Job Experience
Permanent	Mental/	Illiterate	Unskilled	0-5years
Temporary	knowledge	Barely literate	Semi-skilled	6-10years
Contract	application	Matriculant	Highly skilled	10+years
	Physical/manual	University/ Technikon		
		Graduate		
		Postgraduate		

Qualitative methods of data collection.

Qualitative data is in the form of actions and words, which require methods that capture language and behaviour.

The most useful way of gathering this data involves:-

- Participant observation*
- In-depth interviews*
- Group interviews*
- Collection of relevant documents
- Photographs, and video-taped observations.

The methods marked with an asterisk (*) involve documenting the collected data through a researchers journal, field notes and audio-taped interviews. These methods capture the situations, words and actions of those involved in it and hence provide the beginning place for the qualitative researcher to start his understanding of it.

5.7 SWEEPING IN MULTIPLE PERSPECTIVES.

Linstone (1984) classifies a multiple perspective inquiry system as a Singerian inquiry system. He argues that the Singerian analyst in seeking to inquire into the system of focus asks himself the following questions: *'have we taken a broad enough perspective of the basic assessment? To what*

extent are the questions and models of each inquirer a reflection of the unique personality of each inquirer as much as they are felt to be 'natural' characteristics or property of the 'real' world?' p.16

Churchman (1971), argues that the multiple perspectives concept Singerian inquiring system is better because :

- *'It is a meta-inquiring system; that is, it includes all other inquiring systems (data, model, dialectic).*
- *It is pragmatic; that is, the truth content is relative to the overall goals and objectives of the inquiry.*
- *It takes holistic thinking so seriously that it constantly 'sweeps in' new components, that is, it is non-terminating and explicitly concerned with the future.*
- *It postulates that the system designer is a fundamental part of the system; his psychology and sociology are inseparable from the systems physical representation.'* Linstone (1994,p. 62)

An importance of using such a pragmatic Singerian approach is the reduction in the reliance on shaky theoretical non-contextual analysis in decision making.

In order to make the best decision on a supportive mental model that aids in selecting the most appropriate systems based methodology for intervention at Romago engineering, it is necessary to determine the following :

1. Which models reflect the current thinking at Romago regarding:
 - Organisational strategies
 - Value constellation /materials management structure
 - Control systems within the organisation
 - The organisational communication systems
2. Which models might better capture what could more desirably be achieved?
3. Which models make sense of Romago's concerns, issues and problematic situation?

Romago as a socio-technical system is a complex system and the relationship between participants, workers, managers, and functional groups is pluralist. However management, workers and various functional groups generally agree upon certain issues at Romago.

In this way the relationship can be considered unitary. The problems that occur in our socio-technical system deal not only with the technological aspects but also with the social and human facets commanding and interacting with it.

Soft Systems Methodology can be used to inquire into complex-pluralist problem situations, using the underlying metaphors of organism and culture. According to Flood and Jackson (1991, p.53), The viable systems diagnostics is a systems methodology that can be used to inquire into a complex-unitary problem context, using the underlying metaphor of an organism, brain and team. They further argue that, *'these methodologies are designed to tackle contexts in which there is a lack of agreement about goals and objectives among participants concerned, but where some genuine compromise is achievable.'* Soft Systems Methodology in action ought to prevent decision-makers from rushing into poorly thought out solutions based on pre-conceived ideas about an assumed problem. Soft Systems Methodology encourages people to share their perceptions of problem situations and to explore ideas about potential changes to which they might feel some personal commitment.

Hence the methodology offer participants in a problematic situation the opportunity to have different experiences of their situations and perhaps to change their attitudes as well. It is based on the idea that changes will not happen unless those directly involved with them are persuaded of their merits. Considering the situation at Romago, Soft Systems Methodology becomes the dominant methodology for use in inquiring into the problematic situation there.

Soft Systems Methodology assumes that the nature of social and organisational reality is complex as well as cultural and can considerably help in pluralistic context by clarifying what could be done in future to realise organisational development.

Since organisations need to remain viable in terms of its structure and processes if it is to be effective and efficient. It is imperative that *'Material Management'*, as a business system meets the cybernetic criteria of viability. Viable Systems Diagnostics is designed to be able to deal with complexity because of its explicit understanding of brain related issues. Hence it is a practical means of determining organisational viability. Flood and Jackson (1991, p.118), argue that, *'viable system thinking enables an organisation to achieve customer requirement, to meet those*

requirements, to reduce waste, to manage issues, to plan management action, to help jobs add value, to involve personnel at all levels across functions, to achieve meaningful measurement, and to achieve continuous improvement. Viable systems thinking allow for participation, autonomy, motivation, responsibility and creativity to be an integral part of organisational management.'

Thus both Soft Systems Methodology and Viable System Diagnostics play complementary roles in inquiring into the problematic situation at Romago Engineering and in seeking solutions to the problems being experienced in component and accessory supplies. A brief description of these methodologies is presented.

These methodologies are applied within an Action Research paradigm. Action research according to Rappoport, as quoted by Gill & Johnson (1991), aims to contribute both to the practical concerns of people in an immediate problematic situation and to the goals of social science by joint collaboration within a mutually accepted ethical framework.

5.7.1 SOFT SYSTEMS METHODOLOGY MODEL- HUMAN ACTIVITY SYSTEM

Human activity systems are more or less ordered in wholes as a result of some underlying purpose or mission. The human activity system is differentiated from the natural system, because such systems could be very different from how they are, whereas natural systems without human intervention could not. The pursuit of system thinking, is a matter of ascertaining the properties of systems of each class and the way in which they combine and interact to form wider systems showing emergent properties. Our system of focus is the human activity system of making and delivering components to the production line on time.

The Human activity system of supply of components to the production line is partly made up of the designed physical system comprising of the pre-emptive cutting, component, and sheet metal and spinning shop. According to Checkland, (1998), Human activity systems differ from the natural systems in their study in that:

1. Study into Human Activity Systems, restricts members involved from a scientific point of view from participating in the observation of their behaviour, for that participation if allowed changes the experiment itself and renders it superfluous.
2. The irreducible freedom of human actors in human activity systems mean that there can never be accounts of human activity system similar to and having the same logical status as accounts of natural systems.

These differences justify, separating the study of natural systems from that of human activity systems in system typology. Hence therefore different kinds of investigation are appropriate for the two systems.

Our socio-technical system of focus, Romago and its value constellation system is a combination of a rational assembly of activities (human activity system-association) and a set of relationships such as occur in a natural system (community). This typological map, is a designed abstract system, in which Romago Engineering is the meta-system within which the supply sub-system exists. The activity undertaken by the supply sub-system can be viewed as a system of activities that serves, supports and contributes to the overall aims of the organisation as a purposeful whole.

Problems, which arise in an organisation, do not have an existence independent of human beings involved in them, rather 'problems' are constructs of the concerned mind, designed by the perceptions of individuals troubled or intrigued by them. The implication of this is that the answering of the question- *'what shall the situation be deemed to be?'* is a crucial stage in problem solving.

People have different '*appreciation's*' of situations because they see them in genuinely different ways. Each of us looks at and interprets the world through a prism, a worldview (*Weltanschauung*) which though complex, involves what we take to be true facts and about what we consider right or wrong values. Secondly, there are no logical grounds for deciding that one's perception is more valid than another's. If 'problems', are intellectual constructs which are determined by the perceptions of concerned actors, then its corollary is that ideas of what might constitute 'solutions' are also intellectual constructs.

Soft Systems Methodology compels practitioners to scrutinise the whole concept of what constitutes a 'problem'. A problem is a perceived discrepancy between an actual state and a perceived state. One knows what the actual state of affairs is and what the desired state is. In reality, problems do not exist in isolation- they are part of other interconnected problems. Ackoff

(1974) States:- *"We have also come to realise that no problem ever exists in complete isolation. Every problem interacts with other problems and is, therefore part of a set of interrelated problems, a system of problems... furthermore solutions to most problems produce other problems... English does not contain a suitable word for 'systems of problems'. Therefore I have to coin one. I choose to call such a system a 'mess'."*

The essence of holistic systemic thinking is that component problems are systemically interconnected. This means that the problems are linked together and what may be observed on the surface are the emergent properties of the underlying problems. They will therefore not yield

to reductionist approaches that tackle one apparent problem (symptoms) at a time. Improvements in complex problem situations are most likely brought about through the sharing of perceptions and through persuasion and the surfacing of the underlying problems through debate.

Soft Systems methodology is a useful methodology because of: -

Realisation that all real world problem situation are characterised by the fact that they reveal human beings seeking or wishing to take purposeful action.

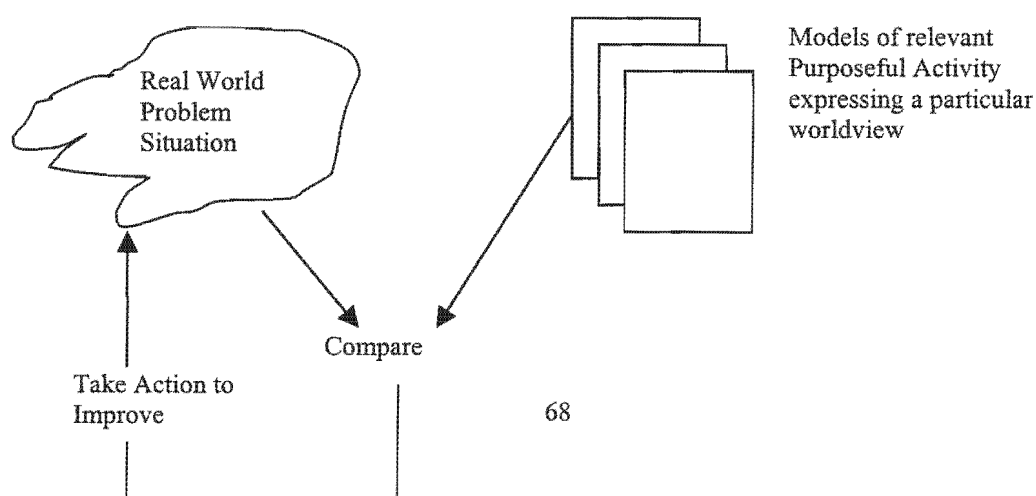
There can never be a single account of purposeful activity because one observer's terrorism is another's freedom fighting. Models of purposeful activity are built on the basis of *Weltanschauung* (perspective). Models are never of real world action. They are epistemological devices that could be used in such discourse and debate. Models structure debate about different ways of seeing the situation.

The problem solving process that emerges from Soft Systems Methodology consists of a learning cycle that can be used to structure debate about change. There are no ultimate one-fix solutions. Structure for debate is provided by carrying out an organised comparison between models and perceived real situation in which accommodation between conflicting perspectives could be sought. This enables action that is both arguably desirable (in terms of the comparison between models and perceived situation), and culturally feasible for a particular group of people in a particular situation, with its own particular history (context).

Realisation that models of Human activity systems could be used to explore issues concerning what information systems could best be created to support real world action.

In hard system thinking prevalent in management, organisations are co-ordinated functional task systems seeking to achieve declared goals and that see the task of management as decision making, in support of goal seeking. In soft systems thinking organisation are always learning and going through an iterative process as shown in figure 8 below.

FIG 8: SOFT SYSTEMS METHODOLOGY AS A LEARNING SYSTEM.
SOURCE- CHECKLAND (1998)



Soft Systems Methodology is a framework for problem solving which aims to provide solutions in unstructured and complex problem contexts with no clear definition of what exactly the problem is. SSM is a non-numerical systems approach to diagnosis and intervention. It is best used where values and beliefs of participants differ but where negotiation and compromise is possible. Hence it emphasizes plurality of viewpoints as part of the decision making and intervention process. The ends are thus not easily definable. Apart from being a process of inquiry, it is a learning cycle that also seeks to change interpretations of conflicts rooted within cultures. It consists of seven stages as articulated by Checkland (1998) as detailed below.

Stage one – The problem unstructured

This stage involves taking different views. Problem unstructured means that one looks at the problem as openly as possible without making any judgements or jumping into conclusions.

This stage takes into consideration the different views of everyone directly or indirectly involved with the issue without defining what the problem is.

Stage two-Rich pictures, Issues, Primary Task

This is a pictorial representation that summarises the situation. This involves assembling and portraying the situation in the form of a picture rich in qualitative and quantitative data.

It contains factual data e.g. organisations, individuals departments, reporting channels and graphical representation of attitudes, hostilities, friendships and information. This process is done for one to take effective action to improve it.

Stage three- Relevant Systems and their Root definitions

This stage involves forming systems, which are relevant to the problem situation to bring about a deeper understanding and an improvement of the problem situation. There are of two types of relevant systems namely issue-based or primary task. Issue based relevant systems focus on seeking to address and act upon topics of concern to people in the situation whereas primary task relevant systems capture the essence of the fundamental tasks of the organisation. The two types of systems are represented in this report.

Root definition: This is a precise description of the essences of the processes suggested by the relevant systems. It seeks to describe the relevant system as concisely and in full detail. Because of the difficulty in trying to write it out in full succinctly, the **CATWOE** mnemonic is used to help obtain the essence of the relevant system. The mnemonic meaning:

C – customers (those who affect and are affected by the system)

A – actors (those who carry out the activities in the system)

T – transformation (what inputs are converted to outputs)

W – *Weltanschauung* (Worldview, beliefs and values held by the different people)

O – owners (those who have power over the system and can terminate its existence)

E – environmental constraints

Stage four- Conceptual models

This is a graphical representation of the activities describing what the system must do if it is to be the system described in the root definition. It is finding out and tracing the logical activities that need to be carried out in the relevant system. The model is derived from the root definition by deductive logic.

Stage five - Comparison of conceptual model with rich picture

The aim of this stage is to bring about debate on possible changes that can be made to bring improvements in a situation. It seeks to highlight differences and changes that would have to be made in order that reality reflects systems thinking contained in the models.

Stage six - Defining changes

The purpose of this stage is to discuss with the stakeholders; those directly or indirectly affected by the issue about potential improvements.

The ideas suggested at this stage should be both culturally feasible and systemically desirable. Culturally feasible meaning that the change suggested must be possible and practical to achieve for the actors involved. Systemic desirable means that the change to be implemented must not contradict the systems thinking that has been applied to the formulation and construction of the root definition and conceptual model.

Stage seven – Implementation

The areas that were identified as both systemically viable and culturally desirable are implemented with the help of the participants. In this personal project the various areas identified were grouped together in similar categories and an interrelationships digraph used to determine which one would be the leverage points and the drivers of the improvement processes. These are the areas where intervention in the problematic situation can begin.

5.7.2 VIABLE SYSTEMS DIAGNOSTICS

Stafford Beer (Espejo and Harnden, 1989) uses control as a basis of looking at organisation and provides a cybernetic definition of an organisation based on the organisation as an organism. By drawing on how organisms effectively organise themselves for adapting in a complex dynamic environment, he models it as a viable system. Viable systems are those that are able to maintain a separate existence, and have their own problem solving capacity. Viable models, being modelled on organisms need to have not only a capacity to respond to familiar disturbances, but a potential

to respond to unexpected previously unknown disturbances.

Beers's (*Ibid*) definition of an organisation in terms of control, in cybernetic terms is pragmatic in that it provides, as a way of analysing three challenges facing today's organisations as well as the appropriate tools to enable managers to cope. The challenges are:

- *Complexity*:-managers encounter more relevant detail than they can possibly cope with.
- *Variety*:-the dynamism and probabilism of systems bring this about. Organisations, their elements/subsystems and the environment are in a constant flux of change of both their behaviour and structure. These changes in different elements are at least partly random, they cannot easily be predicted.
- *Self regulation*:-while organizations are embedded in an environment which affects them and which they affect, they to a large extent act as a unity, that maintains itself through feedback

In order to understand the relationships between the efficiency, effectiveness and efficacy of an organisation it is important to understand the following:

- understand the set of interpersonal relations which make up a system, as a whole, independent of particular individuals involved in these relations that make up the purposeful human activity system
- understand the mechanisms/processes, the stable form of communication or intervention between parts in an organisation that permit parts to work as a whole.
- Understand the structure of organisation as defined by the actual parts and actual communication channels in existence and NOT by the parts and lines of authority formally defined by the organisation chart.

Beer (*Ibid*) proposed in his viable systems model, that for any organisation to be viable, it needs to have the following functions as essentials:

System 1 – Implementation, this is the basic operational elements of the organisation that performs the realisation of the goal of the organisation – primary activities of organisation. This is the basic reason for the existence of the organisation.

System 2 –Co-ordination, ensures the harmonious interaction between implementation units and the leads back into the control function. It consists of information channels necessary for autonomy and problem solving. Effective co-ordination system attenuates the high variety of system 1,-implementation to the residual variety relevant to the low variety of system 3- control.

System 3 –Control, the interpretation of policy in light of data from the implementation and intelligence functions and the taking of action affecting the future of the organisation.

It controls productive resources. It is aimed at achieving coherency between the primary activities and acts as a filter to the organisation performance, capabilities and potential to policy-making. It is more concerned with the present.

System 4 –Intelligence, the exchange of information between the environment and the organisation occurs here. This is also concerned with the control and policy functions. It is concerned and sensitive to organisation changes in order to achieve viability beyond survival-more oriented toward growth and change.

System 5 –Policy, assumes the responsibility for identity and direction. It mediates between the current activities of systems 1,2,3 and the future visionary activities of system 4 to ensure there is balance and stability between them. This balances internal and external conflicts between intelligence and control functions.

Why must an organisation be viable if it is to succeed? A few statements given by people whom one would expect to know better would serve as a good beginning place for the argument of the importance of viability of any organisation if it is to succeed.

“This ‘telephone’ has too many shortcomings to be seriously considered as a means of communication. The device is inherently of no value to us” Western Union internal memo, 1876.

‘There is no reason anyone would want a computer in their house’ Ken Olson
President, chairman and founder of
Digital Equipment Corporation. 1977.

The above statements though made at different historical epochs of humanity, demonstrate that we are living in an ever-increasing complexity, rate of change and interdependency. While these statements made sense to those that made them, and may have been reasonable then, due to the changes experienced in terms of our use of the phone and the personal computer they seem utterly ridiculous to us. That people who were considered authorities in those fields made such statements indicates the continually changing and evolving nature of our environment. The fact that we have been successful for the last fifty years does not guarantee us future success unless we are willing and ready to adapt to change. In this rapidly changing environment, viability translates to the act of organising for survival. However, if complexity is understood as not being static but dynamic, then the quest for viability is not just about mere survival. It is about maintenance of identity on one hand and on the other implies substantial change or evolution of identity.

Viability is thus seen as a balance maintained along two dimensions ,Clemson, (1984) namely

- (i) *Autonomy of the organisational units verses integration of business as a whole*
- (ii) *Stability of operations, supplying accessories/components versus adaptation to changing conditions.*

An important part of Beer's model is the appropriate information flows and communication links. The information that flows around the various communication channels in the model is information about how the different parts of the organisation and the organisation as a whole are performing in relation to their respective goals. Most organisations measure achievement in terms of money, the criteria of success being the extent to which profits are maximised and costs minimised. However such measurement ignores the performance of the organisation in terms of how it is preparing for the future by investing in research and development or in terms of resources that are abstract like employee morale. Beer advocates for a more adaptive and inclusive measurement at three levels that he calls actuality, potentiality and capability.

'Actuality refers to the current achievement with existing resources and constraints, capability is the possible achievement using existing resources within existing constraints and potentiality is what could be achieved by developing resources and removing constraints.' Flood and Jackson, (1991)

LAWS THAT GUIDE CYBERNETICS

The laws that are representative of cybernetics and are of interest for management in considering the viability of an organisation are:-

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. Thus the control achievable is limited by the variety of the regulator and the channel capacity between the regulator and the system". Clemson, (1984).

The implication for an organisation is that the degree to which it can be regulated is limited by the organisations regulatory systems, including management and all the management systems and regulatory procedures utilised. Counting the number of meaningfully different responses the regulator is capable of can assess the variety of the system to be regulated. Total regulation of a situation more complex than one person is achievable only if the variety of the situation is restrained i.e. attenuated.

Successful systems usually have a mixed strategy for regulation namely: -

Amplification: - Increasing the variety of the management so as to enable it to deal with the larger

variety of the organisation and hence increase the degree of regulation.

An example of an amplifier is delegation.

Attenuation: - Reducing the variety of the system so as to be nearer the smaller variety of the management and hence increase the degree of regulation as well. An example of attenuation, also called filtration, is exception reporting systems.

Both amplification and attenuation increase or decrease variety by dealing with variety either by increasing or decreasing the information on which action may be based. Amplification and attenuation also occurs between the organisation and the environment.

Self-organising Systems law

"Self organising systems organise themselves, the characteristic structural and behavioural patterns in a complex system are primarily a result of interactions among the system parts."

Clemson, (1984)

Most structural and behavioural patterns in an organisation are a result of interactions among the parts of the organisation, they are not primarily the result of the management's deliberate decisions.

This law shows that the business largely organises itself, the manager's task being to use the systems self-organising tendencies to achieve the holistic purpose s/he is charged with.

A corollary of this law states that every self-organising system has regions of stability separated by thresholds of instability. This implies that organisations have a limited number of stable configurations. If an organisation is shifted out of a stable configuration it will seemingly by itself gravitate towards one of the stable configurations.

The Feedback Law

"The output of a complex system is dominated by the feedback for high gain amplifiers and within wide limits the input is irrelevant." Clemson, (1984)

This implies that the results produced by an organisation are determined by feedback loops, regardless of wide variations in the input. A corollary of this law is that all systems that are important to the system will have associated feedback loops. Feedback loops are one of the major elements that make self-organising systems work the way they do. A unit's operational goals (as distinct from intended goals) are determined by the actual feedback on that unit. Every operational goal should have a feedback loop otherwise it will not be consistently achieved and may probably never be achieved. That which the organisation measures and monitors is an indicator of the desired outputs that its management consider important irrespective of the stated outputs.

VIABLE SYSTEM DIAGNOSIS

Espejo (1989) and Flood and Jackson (1991) propose the following be carried out as part of a viable system diagnosis (VSD):

◆ System One of the System in Focus

- Define the environment, operations and local management for each part of system one.
- Examine the constraints placed upon system one by higher management.
- Examine the accountability of each part in system one and define the performance indicators utilized here.
- Model system one against the Viable Systems Model

◆ System Two of the System in Focus

- List the sources of oscillation or conflict between different parts of the system one and the environment. Identify the elements of the system that have a harmonizing or damping effect. These elements are part of system two. Thus identify which problems exist between the different parts and which elements (procedure or report) of system two have an affect on this problem.
- Inquire on how system two is perceived within the organisation. E.g. is system two creating excess work in terms of report requirements, does the system two assist in the process of self-organisation.

◆ System Three of the System in Focus

- List the system three components of the system in focus. Thus the operations management components of parts of the system in focus.
- Inquire on how system three exercise authority.
- Inquire on how resource bargaining between the system ones is carried out.
- Identify the responsible person for the performance of the different parts in system one.
- Clarify what are achieved by the audit inquiries into the aspects of system one and system two. Thus what is produced form these audits, what is the goal of these audits.
- Identify the relationship between system one and system three elements. Is the relationship democratic or autocratic? Identify the freedom system one elements possesses.

◆ System Four in the System in Focus

- List the system four activities of the system in focus
- Inquire about the timeline for these activities. Thus what timeline is considered in these activities, e.g. market forecast for a month or a year?

- Inquire if these activities could guarantee adaptation to the future. Thus the gathering of market information, will this assist the system in focus to change in the future?
 - Identify if system four is monitoring the environment activities and assessing these environment trends.
 - Identify if system four is open to novelty and in which way. This will assist to identify what the focus of the system four is.
 - Identify if system four contains a management operation in which the internal and external information is combined in order to provide an environment for decisions.
 - Inquire about the facility of system four to alert system five with urgent developments. Thus what mechanism/procedure exists to inform system five that policy decisions need to be made concerning an urgent development in the environment.
- ◆ System Five in the System in Focus.
- Identify the people on the Board of Directors and how the Board functions.
 - Assess if system five provides a suitable identity for the system in focus. Implementation of change in other systems can not be successful if the identity at system five level does not agree with the implemented change.
 - Inquire on the influence of system five's vision on the perception of system four. Thus how does system five perceive the function of system four.
 - Inquire on the influence of the system five's vision on the homeostat between system three and four. Which of the two systems are taken more seriously, system three (the here and now) or system four (the future).
 - Examine if system five shares an identity with system one or does system five claim to be something different.
 - Examine all the information channels in order to confirm that all the transducers and control loops are properly designed.
 - Definition of transducers. A machine, device, protocol or rule by which information is change to an appropriate form and introduced into the system.

Viable systems modelling (VSM) and Viable systems diagnostics (VSD) provide means of moving actors in a problem situation to a common platform of understanding through a common language. It provides the common language to help groups within an organisation to learn and interrelate more effectively. It creates the necessary conditions for effective action. Communication becomes not just the passing on of data and symbols to others but relating and sharing meaning. VSM is about relating and structuring the system to facilitate the healthy

growth of effective relationships. In this way it provides the framework for corporate information systems that are more closely related to the long term aims of the organization and the information needs of its members at all levels of recursion.

VSM is a tool for making change happen, by working on the control and communication processes required to implement the organisation's mission, at a new level of depth and detail, organisations can help ensure that their visions for the future are translated into practical business results.

Thus Soft systems methodology and Viable systems diagnostics are complimentary methodologies that can be used in a problematic situation and are hereby applied to the situation at Romago in the next chapter.

SUMMARY

Arising from chapter four's argument for the need of managers to understand the philosophy guiding their management theories and inquiry process, this chapter first focuses on laying the philosophical basis of Action Research. Action research seeks to understand the meanings of behaviour in its context (yielding knowledge) and to use this understanding to bring about desired change.

Deriving from the fact that different people experience and interpret reality differently (perspective), the chapter introduces the idea of using multiple perspective inquiry systems in management research. Modelling an organisation as complex socio-technical systems with relationships between workers, managers and functional groups, it is pluralistic in nature. On the other hand, since there is some agreement on various issues by the participants in the organisation, it can also be considered as unitary. By modelling the organisation as complex-pluralist, one can enquire into the problem situation being manifested using the underlying metaphors of organism and culture found in the Soft Systems Methodology as first propounded by Checkland (1981) Thus the Soft Systems Methodology allows management to address contexts in which there is lack of agreement about goals and objectives of the various stakeholders. Viable system diagnostics with its cybernetic model of organisational viability is designed to be able to deal with complexity in determining organisational viability. The fivefold systems necessary for viability are identified as Implementation, co-ordination, Control, Intelligence and Policy. The chapter expounds on the seven-step process of SSM, as well as the three cybernetic laws of requisite variety, self-organisation and feedback

CHAPTER 6: IMPLEMENTATION-RESEARCH IN ACTION

6.1 PROBLEM SITUATION UNSTRUCTURED

The issues involved in the problem unstructured were captured through participant observation and interviews. The issues fall into two broad categories namely Material management problems and Human resource problems. A detailed list of the problems is included as appendix 1.

The following stakeholders were identified as being participants in the problem situation:-

- Managers
- Individual shop floor workers
- Contracts and sales
- Procurement and external stores
- Planning and scheduling
- Pre-assembly manufacturing shops
- Spinning shop
- Components shop
- Pre-emptive cutting shop
- Metal sheet machine shop

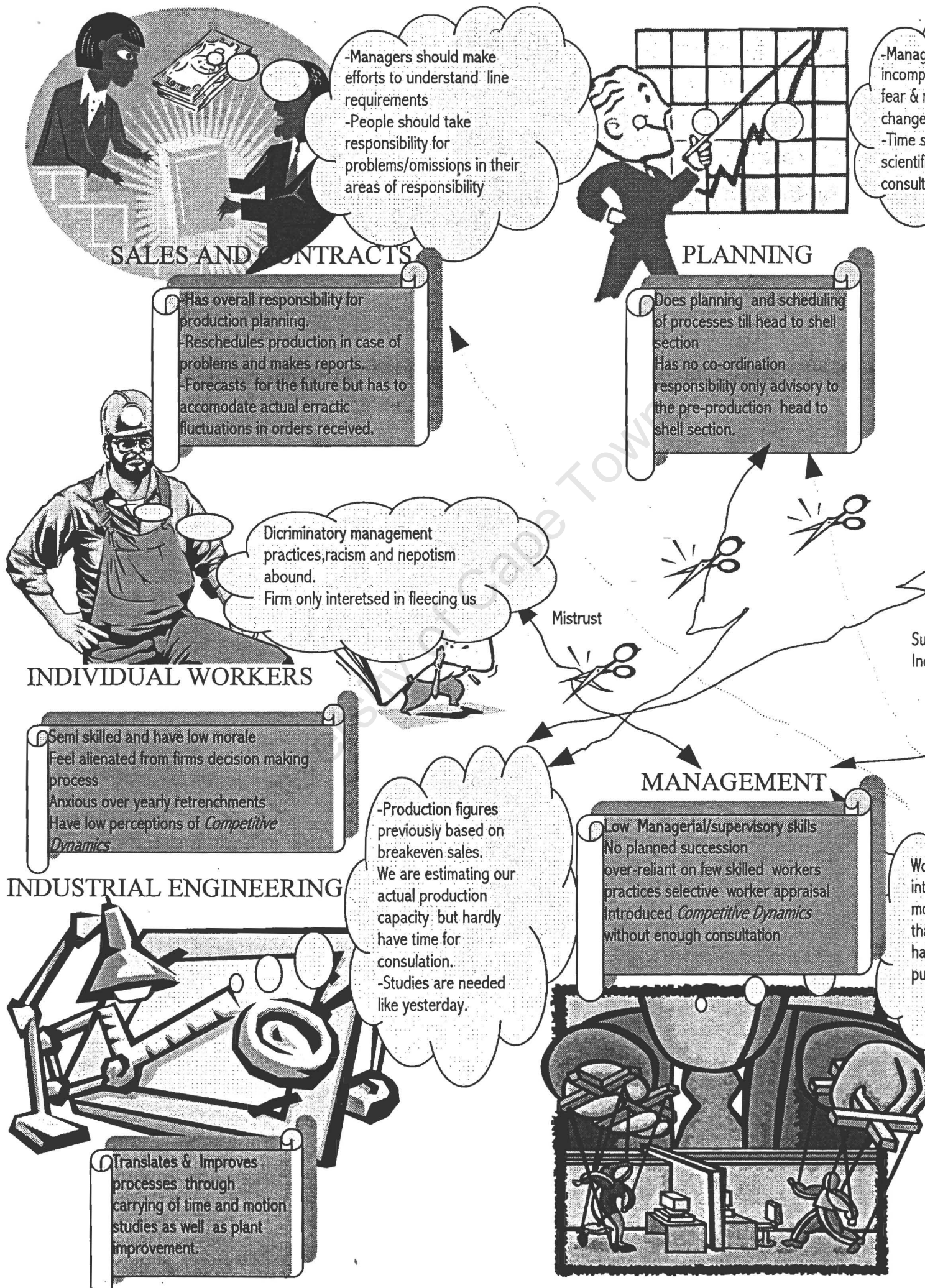
6.2 SOFT SYSTEMS METHODOLOGY RICH PICTURE OF MATERIALS SUPPLY SYSTEM OF ROMAGO STANDARD LINE

System of Focus: This is the Human Activity System within Romago of manufacturing, procurement, routing and delivering components to the various production points on the production line on time. Soft system methodology is concerned with getting from finding out about a problem situation to taking action to improve it using system thinking (if the finding out process has led to the conclusion that action can be taken). One needs some efficient, economical and illuminating way of summarising the situation in all its complexity. This is done by building a cartoon type representation- a rich picture which summarises everything one knows about the situation.

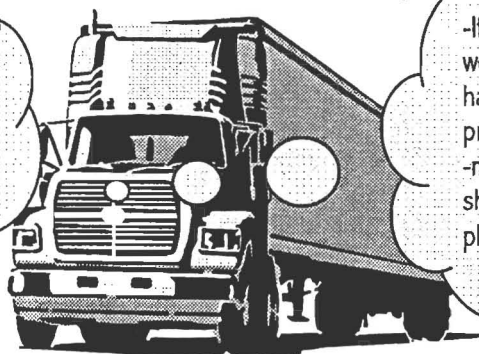
It contains:

- 1) Hard data- factual data concerning:
 - The departments
 - Individuals
 - Organisational structure
 - Reporting channel
- 2) Soft information
 - Subjective interpretation of aspects of situation.
 - Summaries of perceptions of the actors involved.
 - Judgements about-competence
 - efficiency of individuals
 - subjective judgements and opinions about situation

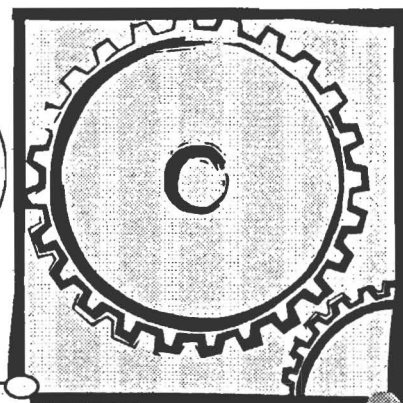
FIG 9: THE RICH PICTURE OF ROMAGO PRODUCTION



-Managerial incompetence leads to fear & resistance to change.
-Time studies semi-scientific, all not consulted for input



-If system procedures were improved we could have less supply problems
-more functional areas should be part of planning process



PROCUREMENT & STORES

Procures materials and accessories & delivers to stores for distribution
Liaises with production, stores and sales & contracts

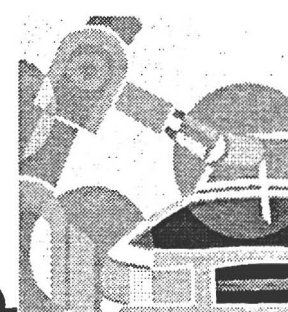
-Average Capetonian not geared to productivity but compensation
-Would like to see more co-ordination with production and planning
-Sees management attitudes as key to success

Translates technical information to drawings and cutting Lists, routing materials to right shops.
Reviews appropriateness of processes and procedures

Duplication?

Supervisory Incompetence?

Would like to see more co-operation with production
-prefers pull to push production system



PRE-PRODUCTION MANUFACTURE & SUPPLY

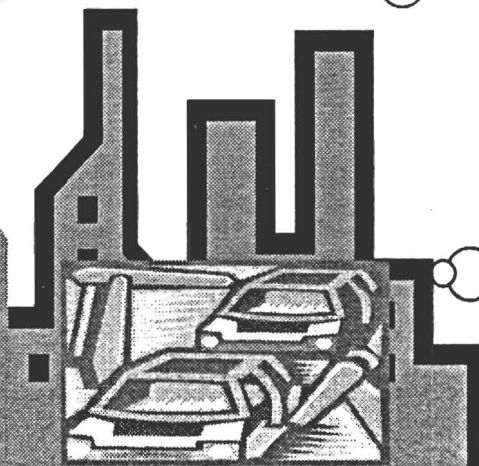
Component loss between stores & prod.
Unavailability of forklifts
Constraints of personnel & prod. facilities
Experiences pressure due to new line demands & increase in No. of tanks per day
Incurs excessive rework due to low quality components

Workers more interested in money more than work, you have got to push them

Communication gap?

PRODUCTION LINE

Experiences untimely supply of components
Inadequate planning/scheduling of production line.
High product mix fluctuations on line
High worker absenteeism.



Its the responsibility of supply to identify what we need and supply it.
If they fail to supply consistently we will report to big brother!
Our job is production not supply!

6.3 CONCEPTUAL SYSTEMS

Issue based systems, are topics of concern to someone in the situation or to the analyst, who seeks to address or act upon them in some way.

Primary task systems attempt to describe or capture the essential nature of the fundamental task, which must be carried out by the organisation under study.

The following human activity conceptual systems were deemed to be both relevant and to give a more representative as well as diverse perspectives on the problematic situation and issues at Romago.

- Container tank manufacturing system (meta/supra-system)
- Income generating system for employees
- Income generating system for shareholders
- A planning and schedule production system
- Component and accessory supply system
- Material procurement system.

The above six systems were deemed relevant to the process of improving the problem situation and will now be examined in detail in terms of their conceptual models based on the soft systems methodology

6.3.1 CONTAINER TANK MANUFACTURING SYSTEM.

Root definition: Describes what the system is, and what it aims to achieve, taking into account the persons who would be affected by it and who would affect it. It also defines the transformation that could be taking place and the environment that surrounds and influences this particular human activity system. The root definition for the Container tank manufacturing system would be, a system owned by Murray and Roberts and operated by employees (managers and workers) that combines the various inputs of externally bought accessories and internally manufactured components, in a constant cycle time production line to produce tank containers in an environment of fluctuating tank container demands and an increasingly competitive environment.

Container Tank manufacturing system, CATWOE

Clients/customers of system- Murray and Roberts, Romago employees, container leasing companies, containers tank owners.

Actors- Romago employees- managers and shop floor workers. (Blue collar).

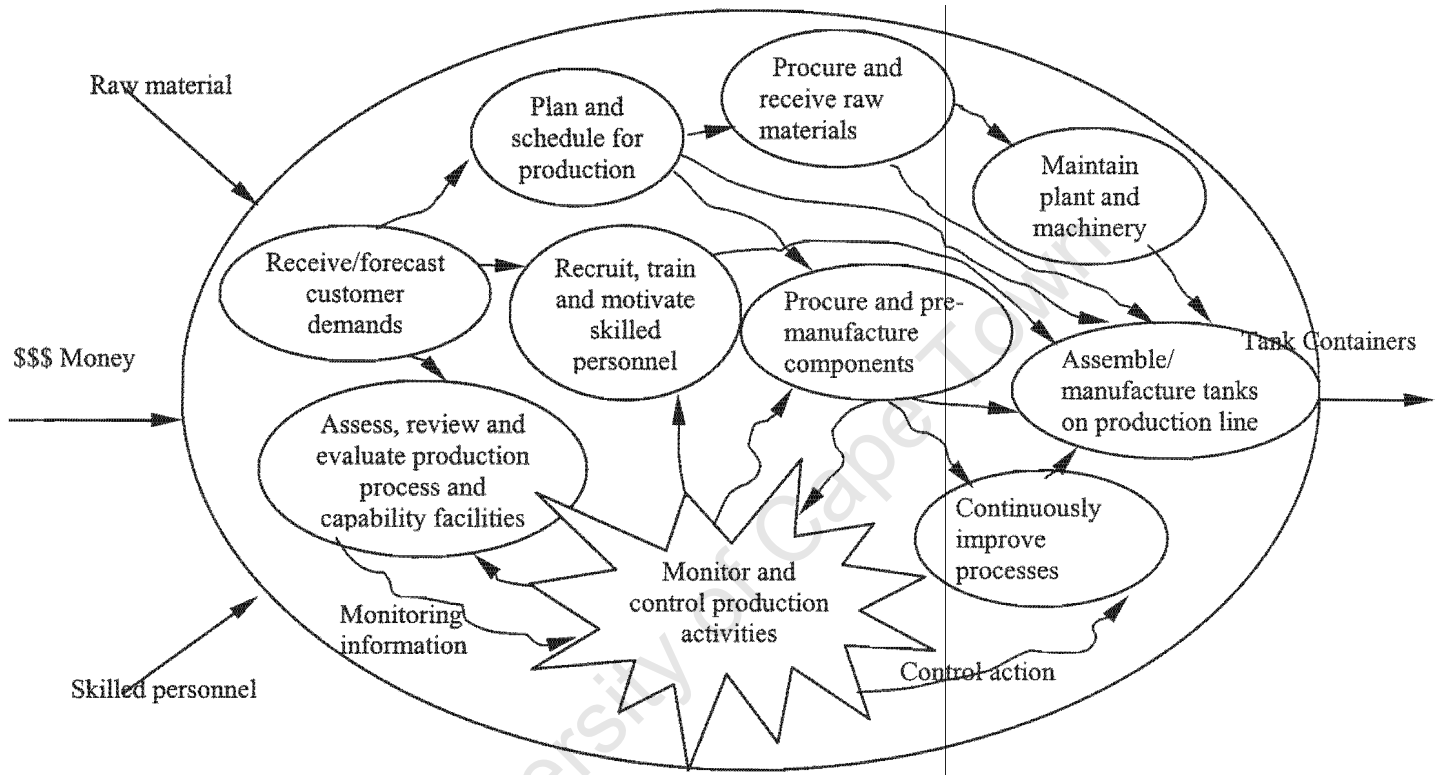
Transformation: The assembly of various components and accessories at different work centres along the production line to produce tank containers.

Worldview: The system exists to produce quality container tanks in the quantities and time constraints negotiated with the clients (i.e. as and when required by clients).

Owner: Murray and Roberts

Environment: Unpredictable/constantly fluctuating container tank demands and increasingly competitive environment.

FIG 10: CONCEPTUAL MODEL OF TANK CONTAINER MANUFACTURING SYSTEM



6.3.2 A MATERIAL PROCUREMENT SYSTEM

Root Definition: A system owned by the workers and managers concerned with procurement that ensures that the right components with the right specifications are procured and delivered in the right quantities, at market related costs for the timely production of tanks, in an environment of fluctuating /constantly changing material requirements and tightening budgets (cost saving drive).

Material Procurement system, CATWOE

Client/Customer of the system:- Production Line, Romago employees, Romago shareholders

Actors:-Procurement department employees and managers, Stores operators, Finance.

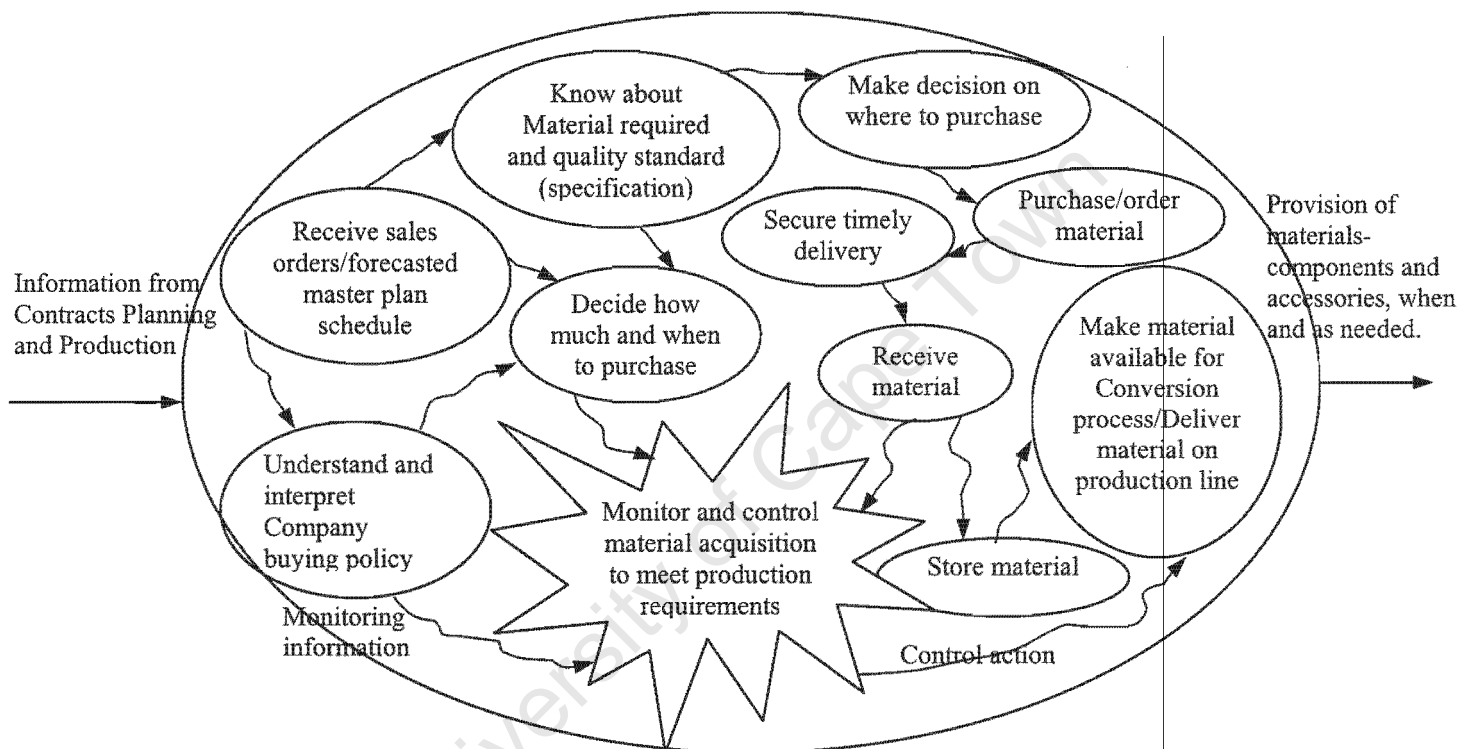
Transformation:- The use of information received from Contracts/Sales and Production for the timely provision of accessories and components that are of the right quality (specification) and at a competitive cost to the company.

Worldview:- The System exists to fulfil the functions of planning, requisition, acquisition, expediting, controlling quality and accepting deliveries of materials on behalf of Romago engineering.

Owner of system: Romago Engineering

Environment: Constantly changing materials requirements due to changing customer volume and design of tanks and the Romago drive towards minimising costs in a competitive market.

FIG 11: CONCEPTUAL MODEL OF MATERIAL PROCUREMENT SYSTEM



6.3.3. INCOME GENERATING SYSTEM FOR EMPLOYEES

Root Definition: An income generating system owned by Romago Engineering, operated by Romago managers and worker, that clarifies and satisfies the income needs of employees while developing them in an environment of competition for scarce resources as well as jobs, constrained by statutory laws affecting hours of work, employer obligations to employees, staff training, leave conditions and tax liabilities.

Income Generating System for employees, CATWOE

Client/Customer of the system:- Romago employees, (Managers and workers)

Actors:- Romago Customers, South African Government, Romago employees

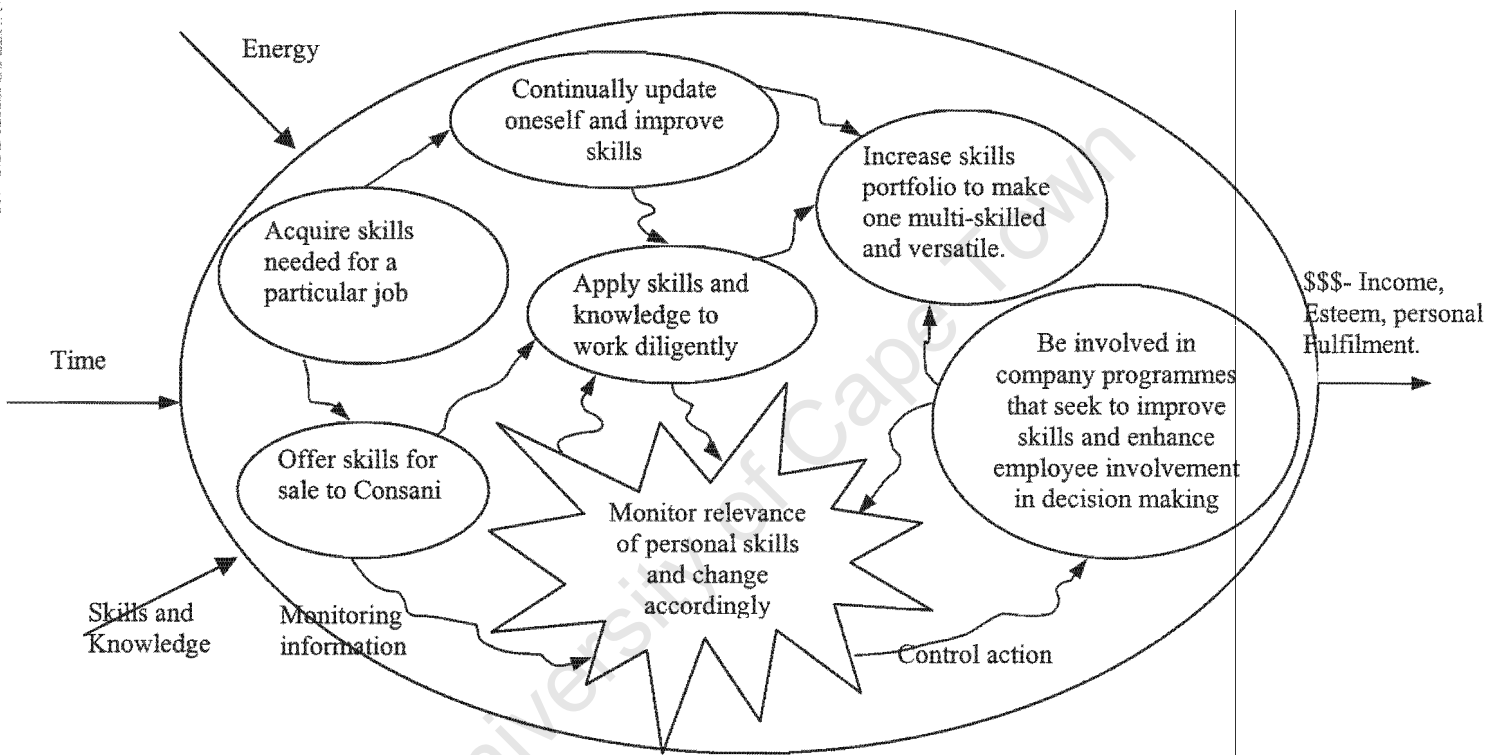
Transformation:- The identification and satisfactory fulfilment of the employee needs for personal development and income from the energy, time, skills and knowledge of the employees.

Worldview:- The System exists to meet the personal development of employees as well as generate for them a satisfactory income.

Owner of system: Romago Engineering, South African Government.

Environment: Government statutory laws concerning employer-employee relations, Romago's policy towards de-skilling and moving to contract semi-skilled workers, competition for limited job opportunities for employees as well as competition for financial resources with other necessary operations of the company.

FIG 12: CONCEPTUAL MODEL OF EMPLOYEE INCOME GENERATING SYSTEM



6.3.4. INCOME GENERATING SYSTEM FOR ROMAGO SHAREHOLDERS

Root Definition: An income generating system owned by shareholders and operated by customers, managers and workers, that maximises shareholders return on investment, both now and in the long term in an environment of increasing competition in the world container tank markets and increasing competition from alternative profit maximisation investment options.

Income Generating System for Romago Shareholders, CATWOE

Client/Customer of the system:- Romago customers, employees, (Managers and workers), Romago Shareholders

Actors:-, Romago Employees

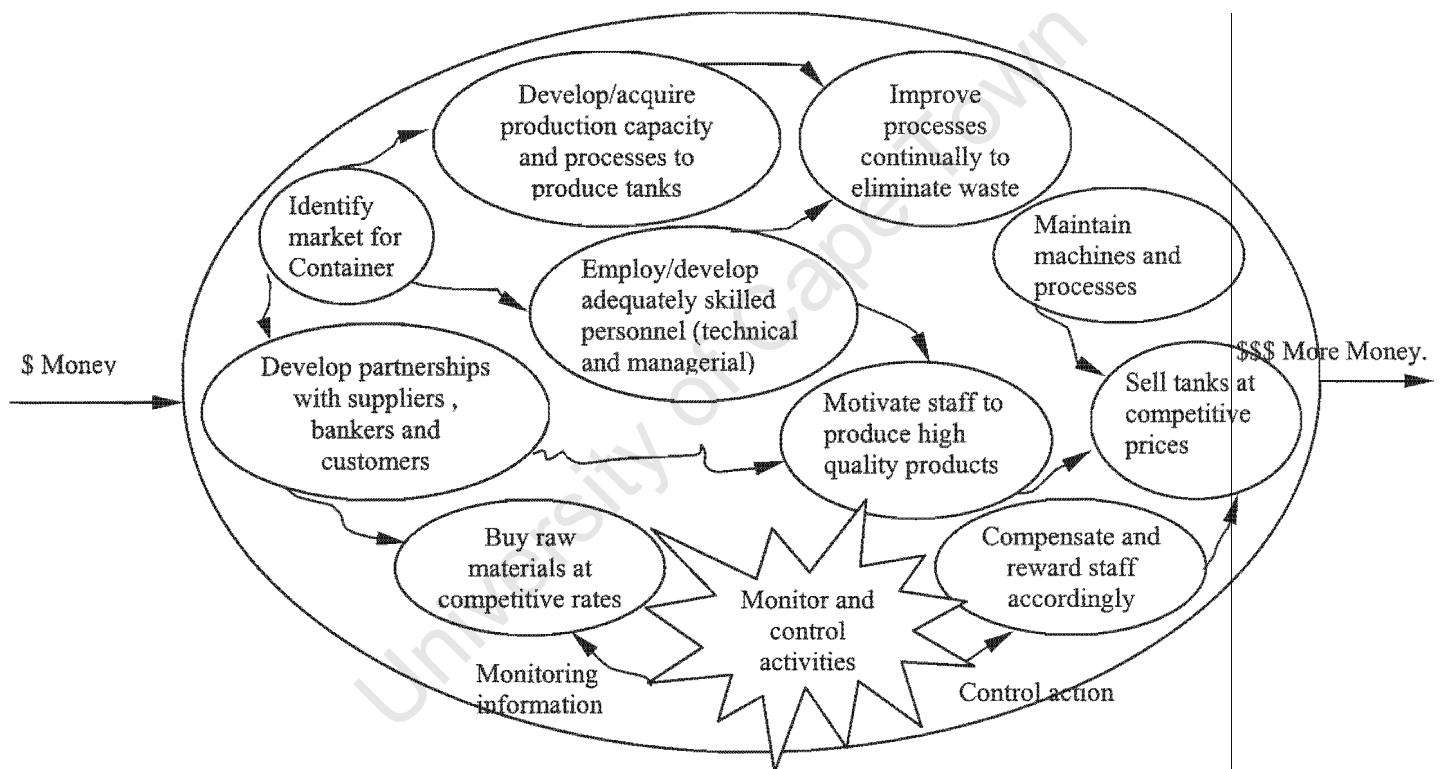
Transformation:- The amalgamation of resources, technical and managerial skills and their application through production of tanks for maximising profits for the shareholders.

Worldview:- The System exists to maximise return on investment in terms of profits for shareholders.

Owner of system: Romago Shareholders, South African Government.

Environment: Alternative profit maximisation investment options, competing for the same investment resources of shareholders, Increased global competition in container tank manufacture business.

FIG 13 : CONCEPTUAL MODEL FOR INCOME GENERATING SYSTEM FOR SHAREHOLDERS



6.3.5.A PLANNING AND SCHEDULE PRODUCTION SYSTEM

Root Definition: A system owned by Romago and operated by its employees skilled in planning and scheduling that captures customer demands and requirements and translates them into plans and schedules for fulfilment, in an environment of production capacity constraints and continuously fluctuating (unpredictable) customer demands.

Planning and Schedule Production Systems, CATWOE

Client/Customer of the system:- Romago customers, process engineering, pre-production shops, production

Actors:- Romago employees skilled in planning and scheduling

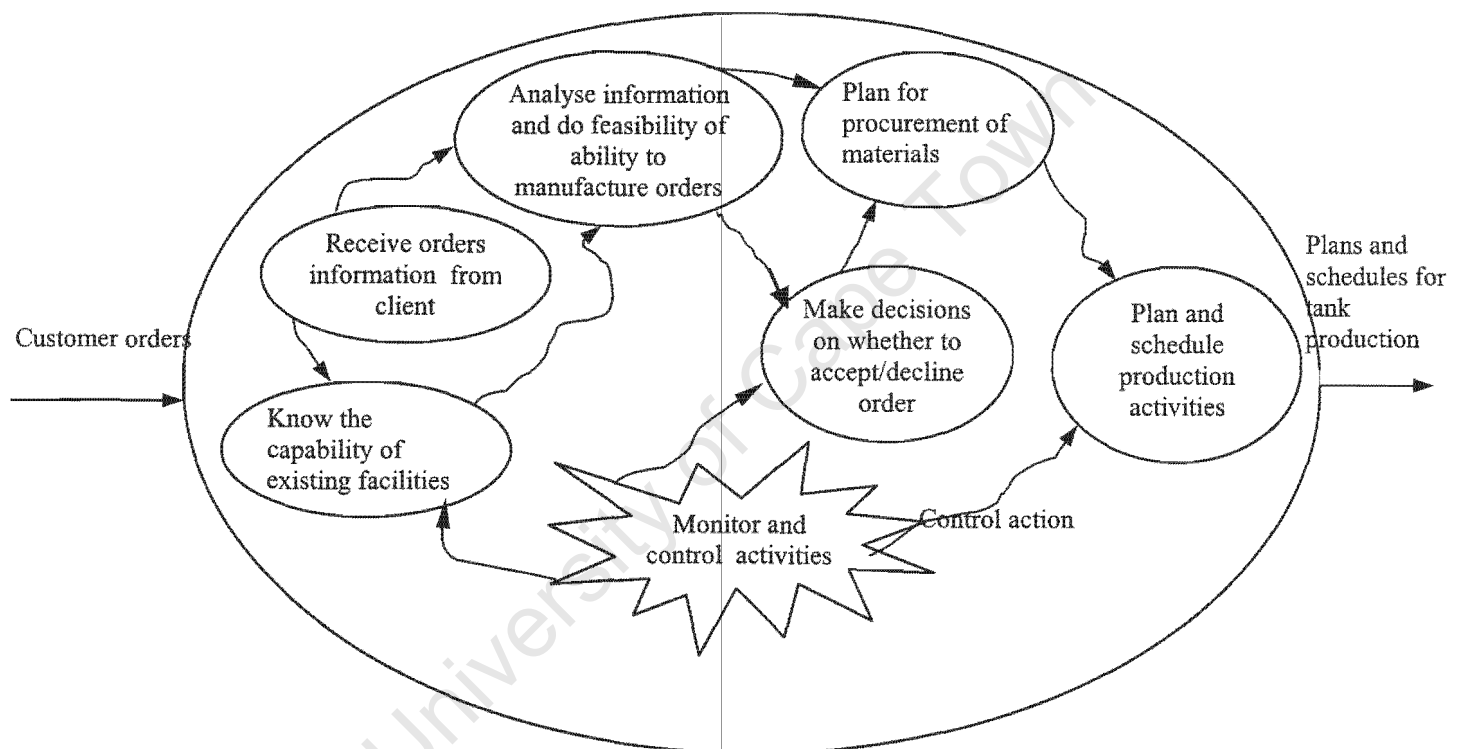
Transformation:- The conversion of customer orders into plans and schedules for production of container tanks

Worldview:- The System that provides a world class service in the planning and scheduling of component through the various work centres to meet the customers delivery date on time.

Owner of system: Romago Engineering

Environment: Production capacity constraints and continuously fluctuating (unpredictable) customer demands

FIG 14: CONCEPTUAL MODEL OF PLANNING AND SCHEDULE PRODUCTION SYSTEM



6.3.6. COMPONENT AND TANK ACCESSORIES SUPPLY SYSTEM

Root definition: a system owned by Romago Engineering and operated by employees skilled in supply techniques, that assures that component parts are routed and delivered on time to the planned work centres on the production line, in an environment of limited production capacity and transportation facilities.

Component and Accessories Supply Systems, CATWOE

Client/Customer of the system:- production line, pre-production shops (spinning, sheet metal, pre-emptive shop, component shops)

Actors:- Supply and pre-production shops

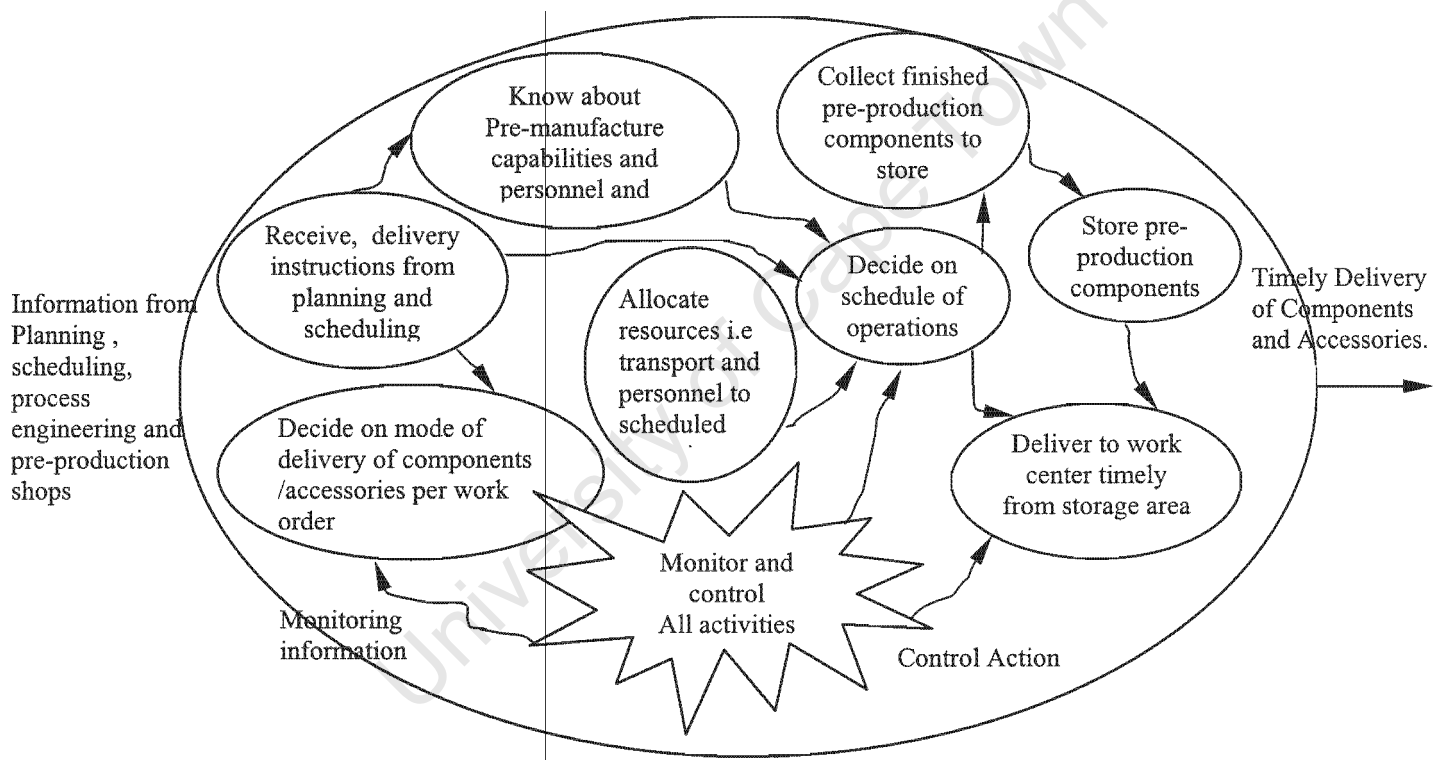
Transformation:- The receipt of information from planning and scheduling and process engineering and manufacture and delivery of components from that information, timely onto the work centres of the production line.

Worldview:- The System exists to convert information from planning, scheduling and process engineering onto the production and timely delivery of components and accessories onto the work centres of the production line.

Owner of system: Romago Engineering

Environment: Pre-manufacture production capacity constraints, transport facilities (forklifts) constraints.

FIG 15: CONCEPTUAL MODEL OF COMPONENT AND TANK ACCESSORY SUPPLY



6.4 COMPARISON OF CONCEPTUAL MODELS WITH RICH PICTURE

The following areas were identified as areas of differences between the various conceptual model and the rich picture and hence could form a basis of discussion for improvement:-

TABLE 4: COMPARISON OF CONCEPTUAL MODELS WITH RICH PICTURE

Tank Container Manufacturing System (Meta/Supra-System)						
Activity Present in Conceptual Model	Activity Present in Real world (rich Picture)	Comment 1	Include in Agenda for discussion ?	Systemically Feasible?	Culturally Desirable ?	Comment 2
1.Recruit, Train and Motivate skills	? partially	Personnel not adequately skilled or motivated	Yes	Yes	Yes	
2.Monitor and Control Production activities	?Uncoordinated	Communication Channels between business leader and shop-floor has gaps	Yes	Yes	Yes	
3.No	Demotivated, Alienated Shop-floor workers	Need for more worker involvement In decisions that affect them.	Yes	Yes	Yes	Seek for ways of motivating workers
4.No	Perception of discrimination by workers on racial lines		Yes	Yes	Yes	Managers need to walk their talk and narrow this perception
5. No (?)	Mistrust between workers and managers	Seek to arrow Gap causing mistrust	Yes	Yes	Yes	Create conditions to remove mistrust

Activity Present in Conceptual Model	Activity Present in Real world (High Picture)	Comment 1	Include in Agenda for discussion?	Systemically Feasible?	Culturally Desirable?	Comment 2
6. No	Parochial functional departmental approach to issues	This is my turf!! Keep off attitude needs to be removed	Yes	Yes	Yes	Seek for more integrated approach to issues through communication.
Material Procurement system						
7.Store Material	No	Finance responsible for stores –splits Responsibility for materials	Yes	Yes	Yes	
8.Make material available for conversion process	No	Under stores	Yes	Yes	Yes	
9. Monitor and control Material acquisition to meet production	? Ambiguous and fragmented	Currently responsibility split between procurement, Finance, co-ordination and stores	Yes	Yes	Yes	There should be a proper materials management system responsible for all material flow through the value chain

Employee Income Generating System

Activity Present in Conceptual Model	Activity Present in Real world (rich Picture)	Comment 1	Include in Agenda for discussion ?	Systemica lly Feasible?	Culturally Desirable ?	Comment 2
10. Continually update and improve skills	No	There is move to invest less in highly skilled permanent staff	Yes	Yes	Yes	
11. Apply skills to work diligently	No	Worker anxiety over impending retrenchment and apathy towards worker	Yes	Yes	Yes	
12. Be involved into programmes seeking to improve skills	? not clearly defined.	Avenue exists, but policy not clearly communicated nor fully involvement of workers allowed	Yes	Yes	Yes	
13. Monitor relevance of personnel skills	No	No skills portfolio exists for the company	Yes	Yes	Yes	

Shareholder Income generating System

Activity Present In Conceptual Model	Activity Present in Real world (rich Picture)	Comment 1	Include in Agenda for discussion ?	Systemica lly Feasible?	Culturally Desirable ?	Comment 2
14. Employ adequately skilled technical and managerial personnel	?Not clear	Management prefers semi- skilled technical personnel; a number of managers seem unaware what their responsibilities are?	Yes	Yes	Yes	
15. Motivate staff to produce high quality goods	?ambiguous	Slogan-quality starts here! But no tangible signal. Actions to encourage a quality culture. Maybe it also ends here	Yes	Yes	Yes	

Planning and Schedule Production System

16. Monitor and control activities production	No	Has only advisory role to production till head to shell section	Yes	Yes	No?	
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6.5 SUMMARY OF COMPARISON OF CONCEPTUAL MODELS WITH RICH PICTURE

From the above comparison process the following changes were agreed upon as being both systemically desirable and culturally feasible. Systemically desirable changes are those changes that do not violate or contradict the systems thinking that formed the root definition and construction of the conceptual model. Cultural feasibility deals with whether a particular change is feasible for the particular set of actions involved from the perspectives of the actors in the situation.

1. Recruit adequately skilled technical personnel.
2. Provide production-related incentives to all workers.
3. Keep communication channels between business unit leaders and shopfloor supervisors and workers open.
4. Involve shop floor workers more in decisions affecting them.
5. Look for ways of promoting professionalism as opposed to racism and nepotism; break organisational culture of cronyism.
6. Adopt free and open door communication policy to overcome mistrust between managers and workers.
7. Have frequent – once a week / once a month inter-departmental meeting to share ideas and solve inter- functional problems.
8. Provide an organisational structure that co-ordinates and controls all material issues from procurement till point of use on production line.
9. Critically assess the effects of the move to de-skilling by using contract workers on overall company productivity.
10. Seek alternative solutions, together with unions and worker representatives to ways of cost cutting that avoid retrenchment as a solution.
11. Communicate clearly to workers the company policy concerning the use of company training centre and acquisition of skills relevant to the company.
12. Compensate those who acquire skills and can be moved around easily without loss of income- to encourage multi-skilling.
13. Conduct a skill audit to understand and know the skill portfolio that the company has and identify the critical skills that need to be attracted, developed and retained.
14. Recruit and retrain competent supervisory staff and managers who are able to understand the big picture of the whole business.
15. Create/work towards creating a quality culture that goes beyond sloganeering by acting consistently towards encouraging quality as a competitive advantage of the company.

16. Restructure the organisation of materials management so as to have one manager responsible for the whole supply chain from suppliers to the delivery of material to production line.
17. Synchronise delivery of components and accessories on the production line by scheduling the delivery as opposed to current uncoordinated on-demand supply.
18. Strengthen the planning, scheduling and supply functions so that there is clearly defined structure for monitoring, co-ordination and control of supply.
19. Investigate the options for item delivery that minimises loss of items or waste due to rework (supply components/ accessories in kits per tank as opposed to per work order (batch))
20. Investigate the conditions that would enhance and encourage the adoption of a just-in-time pull system as opposed to the present push, and sometimes during crisis pull, system.
21. Since the pre-production processes are the initial bottleneck operations, use the production facilities and personnel here, to determine the overall production line balance. Deploy highly skilled (technical and managerial staff) in these areas as well as investigate other options of increasing productive capacity in these areas e.g. subcontracting with strategic partners.

The proposed Action plans and changes were seen as falling in the following broad categories:-

Changes in Structure

These include changes in organisational groupings, departments, reporting structures, lines of command, lines of functional responsibility or physical layout.

Changes in Policy

The goals and strategies of the human activity systems under investigated.

Changes in Procedures

These are alterations in the dynamic elements in the situation (the process or activities which go on within it). These changes amount to different ways of doing things.

Changes in attitude

These are the most enduring and hence difficult to bring about, though they are worth pursuing.

Changes in Communication

These are changes that enhance communication between various parties.

The above Twenty-one proposed changes and action plans fall in these groups as follows

Allocating the above 21 proposed changes in the five group groups yields

Structure – Numbers 6, 8, 16, 18, 19, 20, 21

Attitude-Numbers 3, 5, 6, 10, 12

Communication – Numbers 3, 4, 5, 6, 7, 8, 10, 11, 15, 16, 17, 18

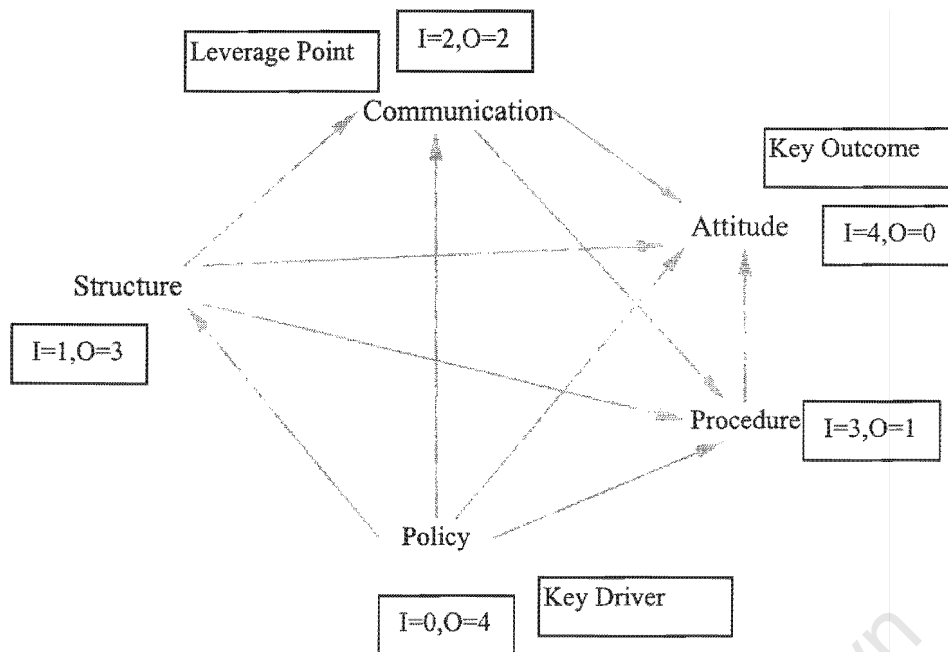
Policy – Numbers 1, 8, 9, 10, 13, 14, 15, 20, 21

Procedure – Numbers 2, 3, 4, 5, 6, 7, 10, 11, 12, 13, 14, 15, 16, 19, 21

An important sub-class of Policy and procedure is the Human Resource Policy,

Human Resource Policy – Numbers 1, 2, 4, 5, 9, 11, 12, 13, 14

FIG 16 :INTERRELATIONSHIP DIGRAPH



From the casual loop diagram above the following conclusions can be made:-

The policies the company sets are the key drivers in determining the greatest influence in other areas. Therefore starting by changing company policies will be of greatest value to the company. Next to changing policy, making changes in the organisational structure will be the next highest in bringing about change. All these are leveraged by effective communications. While attitudes may be the hardest to change, they are an obvious outcome of changes in other areas. Thus if changes are made in company policy, structure and communications, then people's attitude would change accordingly as the company scenario changes.

The four areas of changes of structure, communication, policy and procedures are also the areas that provide for a clear understanding of the relationship between the efficiency, effectiveness and efficacy of organisations. These areas have emerged as problem areas that need to be addressed, and provide some insights into the solutions to the material handling situation. However a question that arises is '*Are the material handling operations viable as an organisational unit?*'

To investigate the question of viability, a Viable Systems Diagnostics as advocated by Flood- and Jackson. (1991) is adopted.

6.5 VIABLE SYSTEM DIAGNOSIS OF THE VARIOUS SYSTEM'S THAT MAKE FOR VIABILITY.

The inquiry questions proposed by Espejo (1989) and Flood and Jackson (1991), in chapter 5 were applied to the materials management as a viable organisational unit and the results obtained are now presented below.

System 1- Implementation

The basic operational element of the materials handling and supply system is the manufacture and delivery of quality components and accessories to the planned work centers on the production line on time. The materials handling and supply system is scattered over various departments, namely, procurement, stores (finance), supply and production. Higher management imposes budgetary and time constraints on this system. Currently accountability seems to be lacking and other than timely delivery of components there are no other indications of performance taken.

System 2- Co-ordination

The possible sources of oscillation and conflict between the various parts of implementation units include fluctuating orders, managerial incompetence in managing product mix, production facility constraints, and un-negotiated implementation of new production demands. The elements that have a harmonising or damping effect on the system include adequate planning and scheduling of processes and advisory role to system 1 (supply) when they are lagging behind by planning and scheduling system. It would be strengthened, though, if planning and scheduling had more than just an advisory role. The co-ordination function for the system in focus is patently missing. Hence it is a weak point in the organisational unit for purposes of viability. Since it is basically non-existent, the issue of whether it is threatening or facilitating does not arise.

System 3 – control

There are weekly audits that were initiated by production – for problems that surface on the production line due to supply. There is dispersed control of the various part of supply and no co-ordinated control. There is no single point of accountability for the overall performance of supply.

System 4- Intelligence

The sales and contract's function captures all the relevant information about the system total environment. Thus it also distributes environmental and information upwards or downwards according to its degree of importance.

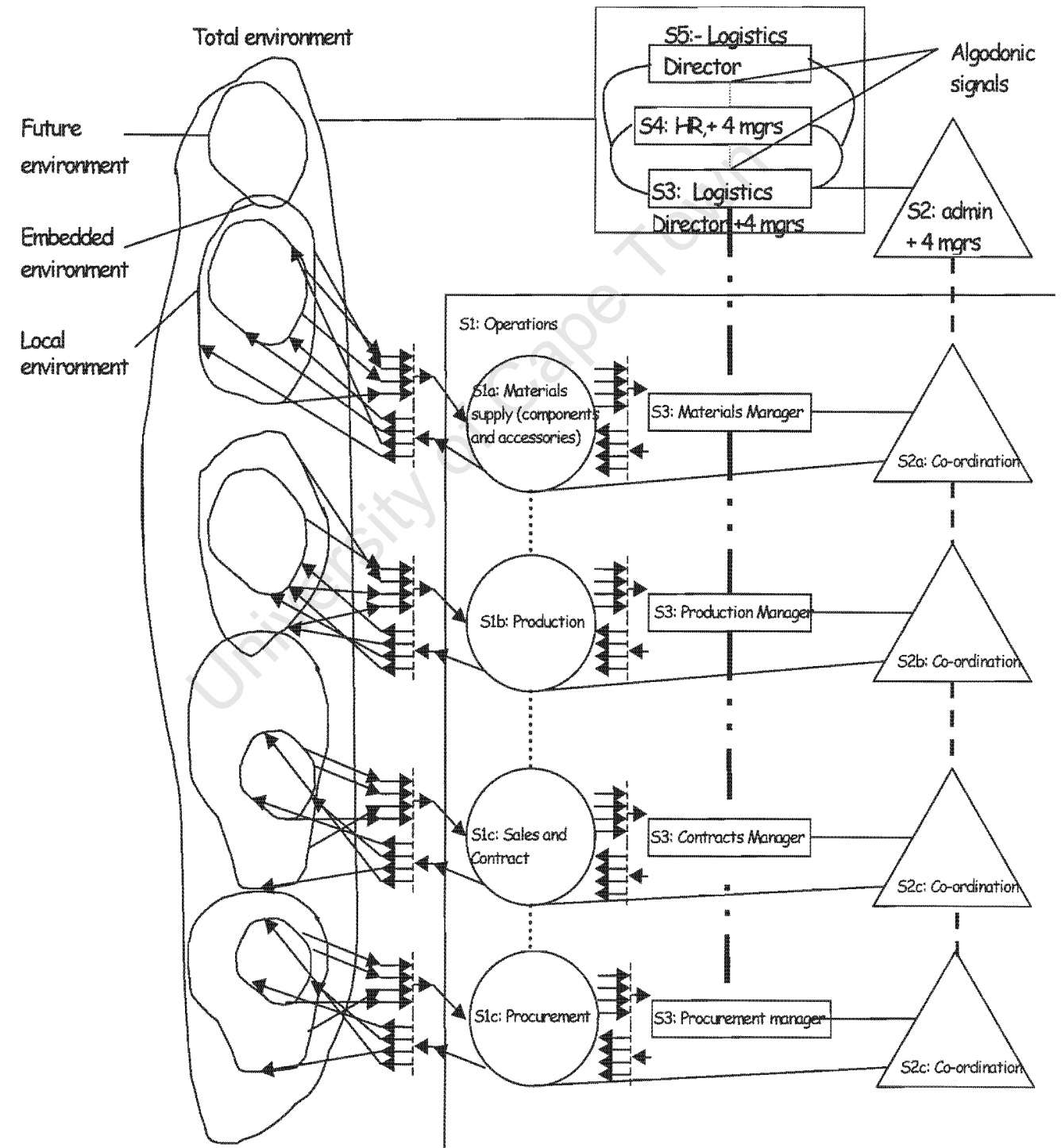
There seems to be no single point responsibility for bringing together internal and external information in an "operation room", an environment of decisions, as far as material handling and supply is concerned. There is no single point of transmission of urgent information from implementation, control and co-ordination and policy.

System 5- Policy

Company policy towards supplies is the development of strategic partners who are low cost. There is no identity and direction of material handling and supply. The general policy matters are perceived as different from the implementation.

The above diagnosis reveals that the materials handling and supply violates cybernetic principles for viability. Thus as is presently structured, organisational problems can be expected and hence they are not organised for effectiveness and efficiency.

**FIG. 17 PROPOSED MATERIALS MANAGEMENT ORGANIZATION FOR VIABILITY
ADOPTED FROM BEER IN ESPEJO AND HARNDEN (1994)**



6.7 PROPOSED ORGANISATION

Viable system model focuses on organisation rather than on structure. Thus the viable system model can be used to diagnose problems of organisation. Organisations ideally are ordered so as to achieve efficient and effective realisation of set goals, although the goals themselves have to be continually reconsidered in response to rapidly changing environment through self-questioning, learning and by accessing future scenarios.

The quest for integration in materials management should emphasise process management and seek the development of linkages in workflow as contrasted to functional groupings (Fig 17 above). The focus on an integrated process management may require new organisation structures.

Process integration occurs when management attention moves from pure financial excellence to concerns related to cross-functional linking of work effort to attain specific operational and strategic goals. Bowesox et al.(1994) postulate that an organisation goes through a functional organisational stage on its way to functional integration from complete fragmentation stage in its logistics management.

In the final organisational level two or more major logistical functions of the organisation are combined to form the nucleus of materials management and physical distribution group. The perception guiding this is that the integration would be facilitated when logistics- oriented groups are structured independently from manufacturing or finance.

In the final integration, which is the highest level of integration, development occurs when material physical distributions are combined to create a group responsible for overall logistics.

The adoption of activity based costing as an accounting tool will eliminate the shortcomings of traditional accounting methods and hence enhance the acceptance of materials management as an organisational function across the traditionally defined functional structures.

SUMMARY

This chapter takes the inquiry framework developed and applies it to research in the problematic situation at Romago Engineering. It begins with enumerating the various perceived problematic issues that were gathered during the immersion periods at the organisation. It proceeds to present a rich picture of the situation at the organisation and models the various perspectives using the conceptual systems of the Soft Systems Methodology. Six conceptual systems were identified and examined following the Soft Systems Methodology. A comparison between the conceptual systems and the rich picture was done, from which changes that were systemically desirable and culturally feasible were identified. These changes were categorised in five main groups namely, changes in structure, policy, procedures, attitudes and communication.

A relationship digraph to identify the areas of maximum leverage identified the key drivers to seeking intervention in the problematic situation as changes in company policies, organisational structure and communications. These areas identified a need for the examination of the organisation for viability through the use of the viable systems diagnostics. Arising from this diagnosis a proposed alternative organisational structure was proposed.

7. TEST

7.1 ORGANISATIONAL (STRUCTURE, POLICY, COMMUNICATION AND PROCEDURE)

The selling of products which is the function of marketing and sales is only half the job. With a policy of giving the customer what he wants, a company cannot have successful sales and marketing programme unless the logistics system provides accurate support. The costs of logistics are distributed throughout the company. Some are incurred in inventory, others in material handling, while others in transportation, work in progress etc. It is therefore important that instead of focusing on a narrow range of materials handling, Romago should consider a broader integrated approach to its business logistics that is congruent with its customer focus policy and long term strategic vision of being a competitive leader in the world supply of tank containers.

A fragmented spread of responsibility currently exists across the organisation, limiting the scope of responsibility to procurement, finance, and production, which prevents the organisation from achieving cost reductions across the internal organisational boundaries. A materials manager should integrate this role with responsibility for the efficient cost effective flow of materials throughout the organisation. A business logistics department is uniquely qualified to facilitate integration as a boundary spanning function. It is important that it develops a participative management style and focuses on processes rather than functions to achieve improved productivity. There is also a need to combine the information system and materials handling system for increased efficiency and effectiveness. All functions that are connected to the materials supply chain should have access to the status and point in time of where the various materials are. The combination of technology advances in materials handling and information processing will permit a faster, more accurate service delivery system. The viability of Bar-coding should be investigated with the aim of using it to achieve efficient distribution of materials and accessories to the work centres as well as inventory management.

Cycle time to market is a competitive advantage for Romago. In a rapidly changing world it is imperative that Romago should safeguard this advantage, by developing it further and bringing new value to customers. It must integrate and manage the complete logistics constellation both internally and between itself and the customer. It will require new skills, a new mind-frame and a new set of corporate performance measurement. The logistics manager needs to have the ability to manage between functions, as the ability to develop consensus across functional groups becomes more important than the traditional management functions. The logistics manager must go beyond the functional definition of materials manager as meaning, *'a single manager organisational concept embracing the planning, organising, motivating and controlling of all those activities and personnel principally concerned with the flow of materials into an organisation.'* Masters and Pohlen (1994)

While decreasing time to market increases productivity, decreases costs without penalty and reduces financial risk for a firm, this should not be done at the expense of quality. Quality considerations both in the product and processes of material handling must be given priority.

Delivery time as a competitive advantage, especially when achieved at the expense of quality can easily be duplicated by competitors. However when quality gains are maintained in decreasing time to market, they provide key advantages that the competition will find hard to duplicate, namely, improved on-line delivery, order completeness, invoice accuracy, order cycle reduction, on time contract documentation completion and overall productivity improvements. Thus competitive advantage can only be maintained by making it harder for competitors to duplicate quality goods and superior service being provided.

Romago may also investigate the need to concentrate on its core competencies or capacities and out source the light manufacturing of pre-production processes. As these processes are critical for the overall performance of meeting production schedules, care should be taken to include all the relevant, direct, discrete and identifiable costs as well as the less tangible costs that apply to the functions that the firm may otherwise relinquish such as convenience and control. To mitigate against the loss of control and convenience, a special relationship with the service providers for those critical inputs could be developed.

The formation of strategic alliances and partnership will require the following pre-requisites. These are:-

1. Operational information exchange- a connected information system where the equipment and software in use are compatible.
2. Operational control- the continual monitoring of each other's information system to be aware of the product and material flows and any potential supply problems.
3. Planning –considerable planning is needed to integrate members of the supply chain.
4. Compatible corporate culture (trust) compatibility or trust between partners corporate cultures that are compatible among parties involved for partnership to work.

7.2 HUMAN RESOURCES

Human Resources policies, which determine recruitment and development, compensation and performance measurement, promotion and termination, play a major role in determining the behaviour and capabilities of a firm's employees. According to Shapiro and Byrnes (1994) these policies enable management to:-

- *'Define and communicate company goals*
- *Motivate and focus company employees to accomplish these goals*
- *Obtain and develop the human capabilities necessary to move the business forward.'*

Shapiro and Byrnes (1994) argue that poorly constructed behaviour drivers embedded in human resource policies can act as sea anchor on co-ordinated material flow initiatives. Well-constructed policies have the potential and ability to focus and energise cross-functional and cross-company programmes. Co-ordinated product flow imposes a complex set of requirements upon a firm's compensation and performance system. Since all functional departments must co-ordinate to streamline product flow, the logistics senior manager has to begin with a precise understanding of the role that each department manager must perform, both in their own functions and jointly with counterparts from other functions. Recruitment and career development policies determine to a large extent the human resource capabilities that either creatively move a company forward or constrain its progress. Co-ordinating material flow within a company and through a company in a value channel presents fundamentally a new set of management tasks. Long term success will require the critical mass of flexible, broad visioned managers and new and different career path management processes. The daily business of management changes drastically in the context of co-ordinated product flow. Managers will need to assume a much broader perspective that spans not only the detailed operations of a particular department, but also the whole company. They will need to have the structured knowledge of product flow processes through out the company. This knowledge spans the whole value channel from point of identification of customer needs to the point of ultimate delivery of product to customer. The knowledge should comprise of the quantitative information on the actual flow over time and the qualitative information on the behaviour and role of different functions. Teamwork and co-ordination are essential and this requires managers who have developed strong interpersonal skills.

Thus the human resource capabilities of a firm are crucial aspects of providing superior products and customer service. The professionalism and skills of people providing services in materials management are critical to the success of the firm. There is need for continuing education with a varied benefit package that will not only attract but retain the best people, managers, and skilled workers, and ensure their productivity. It is my belief that these two broad areas provide a starting point from which Romago can begin to improve its organisation of materials management for the efficient and effective achievement of its goals.

SUMMARY

This chapter summarises the two main recommendations of this thesis namely:

1. The integration of Logistics/materials management under a senior manager, who facilitates integration with more focus on process rather than functional areas. This has the implication of changing the organisation in terms of its structure, policies, communication and procedures. One of the keys to reducing and eventually eliminating the material problems currently being faced at Romago engineering is a re-organisation of the firm aimed at achieving efficiency and effectiveness in the total operations and dealing with the root problems other than treating the symptoms.
2. The second recommendation is the change/development of Human Resource Policies that aim to attract, develop and retain competent staff, both technical and managerial. This is staff that is able to embrace new ways and thinking of dealing with issues without the fear of losing the safety found in conventional ways of doing things. Human resource policies play a major role in determining the behaviour and capabilities of the employees of a firm. It is therefore of utmost importance that in addition to a re-organisation, these should be developed to be in line with the new organisational structure and philosophy.

8. REFLECTION/EVALUATION

8.1 REFLECTION ON CONTEXT

The problematic situation at Romago Engineering, being complex, does not easily lend itself to simple solutions that are derived from the reductionist scientific thinking that is prevalent in management action. Though initially I had been asked to look into the causes of Supply problems to the final production section of the standard production line, my immersion in the situation revealed a much broader context for the problematic situation. The assumption that had been made in the initial problem boundary definition was a reductionist one, which was that the problem existed only with the supply department and I needed to see what exactly those problems were. An attempt at defining the problem through a narrow prism of procedural inadequacies though providing temporal relief would only be treating the symptoms, rather than the sickness. The application of system tools and multiple perspective paradigms enabled me to better understand the situation and hence derive an appropriate methodology for inquiring into it.

Romago as a socio-technical system has participants with multiple perspectives as to its purpose. The introduction of interventions in any problematic situations without understanding the different perspectives may result in unexpected resistance to and possible undermining and failure of the proposed intervention. The adoption of system thinking models proved useful in providing a more inclusive context for the problematic issues. Systems thinking models, are an intellectual construct to help understand the situation and are not *reality*. They are tools for exploration and hence are pragmatic in nature.

8.2 REFLECTION ON PROCESS

Soft Systems thinking, *'will appeal to all those people in any discipline who are knowledgeable enough to know that there is much they do not know and that learning and re-learning is worthwhile'*, Checkland (1981, p. 25)

Soft Systems methodology is, *'a methodology for rational intervention in human affairs and seeks accommodation among conflicting interests'* Checkland (1991, p. 67)

These statements attempt to briefly encompass the uniqueness and usefulness of Soft Systems Methodology (SSM). SSM is differentiated from other methodologies in its process, in that it allows for a broader more lateral and open-minded view of a problematic issue. Checkland (1991) further argues that the *'soft'* tradition regards systems models as models relevant to arguing about the world, not models of the world. This means that *'learning'* replaces *'optimising'* or *'sacrificing'* and uses the language of *issues* and *accommodations* rather than *final solutions*.

A major problem in organisational management is the dearth of the ability to identify or formulate problems. SSM endeavours to achieve this through the sweeping in of the multiple perspectives of the stakeholders. Once a fuzzy problematic situation is identified and the problem clearly defined, then it becomes much easier to embark on a process of successfully resolving those issues.

Since SSM uses the mental model of culture for viewing social systems, it has the implicit assumption that the way to change social systems is to change the worldviews of people. Flood and Jackson, (1991) argue that *'it is extremely difficult to change peoples worldviews without first doing something about the political and economic structures which condition those worldview.'* Thus unless the people are involved in the identification, discussion and acceptance of the issues, they are faced with and implementation of the suggested solutions, they will remain the subjects of powerful groups in the situation. This is further shown through the application of the cultural acceptance of proposed solutions. Unless all the participants in an organisation, in our case, the workers, shareholders, and managers have the same power of implementation (a clearly impossible situation) the powerful groups (managers and shareholders) will always implement those issues they support from their cultural viewpoint. Since they are the ones with access to power, whatever they consider to be culturally acceptable to them may always be implemented despite it being detrimental to the workers. Thus the soft systems methodology's definition of culture in an organisation as unitary, gives power to the powerful groups in a problematic situation and hence eventually fails to emancipate those who participate in its process. Even when the organisation has an espoused culture, it usually reflects the values of the powerful groups in that organisation. However the workers usually have their own culture which may be different to the organisations' culture and may even be counter to it. A question that arises and may need further investigation, involves the process of democratisation of the workplace. If democracy indeed is useful for any form of governance, from federal government to the local county area, could it also be beneficial for business? Are the owners of business willing and ready to share decision making powers over their business with those who implement those decisions and create for them wealth? Is it feasible and desirable to democratise the workplace?

In a world where fast results are needed, the energy, time and thought processes that goes into problem formulation using SSM, makes it hard for it to be a practical managers tool. However seeing that it is a powerful tool in seeking solutions in problematic situations, one wonders whether it will perpetually remain in the hands of experts (consultants) who have the time and business interests to invest in it or whether it might remain as an avenue for continual collaboration between industry (where problematic issues arise) and University faculties, where the expertise, skills and knowledge in SSM resides. There is need to inquire into the viable use of SSM and other critical tools in the normal practice of management.

On the other hand the cybernetic model of organisation emphasises the organisational structure and control processes, the machine like qualities of organisation, which neglects qualities brought by human actors who make up organisations. Flood and Jackson (1991), say that viable system

models (VSM), *'has little to say about the social processes that go on in organisation, about organisational culture and about politics and power struggles in enterprises'*.

Connected to this first criticism of VSM is the argument that it neglects the purposeful role of individuals in organisations. Ulrich in Flood and Jackson (1991) accuses the model for being a *'tool'* rather than *'a social systems design,'* for emphasising *'purposiveness'* instead of *'purposefulness,'* and of encouraging *'intrinsic control'* but not *'intrinsic motivation'*.

Thus the tendency of the model is to take some predetermined goal as given and to pursue that goal as efficiently and effectively as possible by delegating control over means to parts of the organization. It hence emphasizes the pursuit of known goals, rather than the way of negotiating and arriving to those goals. VSM also fails to take account of individual viewpoints.

I personally initially struggled in seeing how VSM and VSD fitted in the overall project, as it assumes that the problem one seeks to solve is with the organisational structure, the flow, use and control of information. However in a fuzzy situation of multiple perspectives, one can not be justified to make this assumption from the beginning of the research. It is the research data that determines the type of methodology that may be used to inquire into the situation. To begin with a methodology and try to fit the data in it may not only miss the real issues, but could worsen the situation, for one would provide solutions to non-existent problems, which may have an destabilising effect on the whole organisation. However during my immersion phase of participant observation, coupled together with the emergent problem formulation from SSM, I was able to see that there may be problems with the viability of materials management as an organisational unit. This suggested the use of VSM and VSD in testing for viability

While the flaw of non-involvement of the people concerned with implementation robs these methods of their full emancipatory ability for the participants, and tends to support the power structures that exist, they complement each other deficiencies. Thus VSM compliments SSM for its deficiencies and vice versa. Although the criticisms of their inadequacies are valid when the methodologies are applied singularly in isolation, they fade into obscurity when the methodologies are used together.

8.3 REFLECTION ON CONTENT

The utilisation of a rigorous process to problem formulation and solution is of value to me as it encourages me to develop a management style that assures a level of detail, systemic thinking, inquiry and investigation in management problems, not normally applied by most managers.

As the context was unknown to me, the utilization of an interactive model of inquiry, through participant observation in soft systems methodology allowed me to view the situation from various perspectives and hence developed a more rich understanding of it. My ability to inquire,

critically evaluate and think has been greatly enhanced by the systems thinking development of a framework for inquiry and the research participation and reading about different approaches in management.

The inquiry paradigm of Action research adopted in this report is iterative in nature. Hence the proposals contained in this report were presented to the middle management of Romago Engineering as well as worker representatives to give participants feedback as well as clarify some of the issues that may not have been captured in the process. This was done in the month of August when Romago was undergoing rapid changes in its management structure as well as moving to the low production season of the business. In the new changes materials supply and production planning was integrated under a single manager responsible for scheduling as well as materials and sub-assembly manufacture and supply. It is hoped that the gains benefited from this integration should serve as the kernel for a move towards complete integration of logistics/materials management in line with the recommendations of this thesis. A move towards the electronic integration of material requirement database at the various points of production and planning was also underway. It is hoped that this real time access to the material requirement database will provide timely feed back w especially when material requirements on the production line change from the planned schedules.

The process of intervening and seeking to improve a situation, brings with it new challenges and perceptions and hence one is in a new problematic situation which needs to be improved again.

Action research as applied through SSM and VSM allows for the evaluation of thoughts, results, solutions and checking them against theories and those involved parties, resulting in enhanced personal learning.

8.4 REFLECTION ON PERSONAL LEARNING

As I stated in the prologue, the action researcher cannot separate himself from the activities taking place in the organisation. In fact his own experiences and worldview acts as filters through which he sees and evaluates the situation he is embedded in. When I began the research I was interested not only in bringing about change in the problematic situation but also empowering through facilitation the shop-floor workers in being able to derive locally contingent solutions. The majority of the managers were white while the majority of workers were African. The African workers felt that the non-African workers were given preferential treatment on account of their race. My desire to empower and enskill the participants was further sharpened by several utterances made by the shop-floor workers. Referring to his manager one worker said: *'When you are working with people, create an atmosphere of understanding not one of manipulation and intimidation'*. Another worker quipped referring to a pushy manager: *'that man, (manager) is educated, but he is educated for himself, his attitude towards others is not good, "when the boss*

has spoken, the boss has spoken, do what you are told, take your brain, put it in your pocket and do as I say" - will that attitude really bring results?' Thus both the managers and workers needed to learn how to derive solutions through true collaboration without resort to coercive power

It is within such an environment that I first had to negotiate through to gain the trust of both the management and shop-floor workers. Thus at the end of my preliminary research, I produced a project proposal that highlighted two main problem areas. These areas were the 'technical' materials management problem and the more 'people' oriented human resources problem. The proposal is included in this thesis as appendix 2. As the people oriented problem formulation would have provided more scope for worker participation and enskilling, it was my preferred path of study. Negotiations with the management and my supervisor on which research trajectory I would concentrate on, showed that though there was an acknowledgement of the human resources problem, the powerful, in this case management were wary to allow me to have this as the focus of my research. As a researcher noting the power limitations placed on me, I continued the research by generating cross co-ordinated discussions and isolating issues for further discussion. Nonetheless I had to make up my mind as to how to continue with the study while not closing space for further discussion. Management's fear of the enskilling/empowerment of workers could be traced to the historical racial tensions that had previously been maintained at the factory. The limitations of action in the project were further heightened when, the study link manager felt uncomfortable with opening the issues I had brought up in an open forum. It later transpired that as the company was undergoing rapid changes his own survival in the company was in question. Therefore to upset his colleagues, who might have been suspicious of his own intentions through an open forum, which would have generated contestation was not acceptable to him.

Certain lessons emerge for me on reflection:-

Lesson 1: This thesis, as an action research project was limited in a sense that an orientation to generate co-learning, an increased awareness leading to improved practice on part of the participants, workers and managers. This was partly due to the asymmetry of power, and the reluctance on part of the management to learn.

This may be explained partially as an understanding of power as being the ability to dominate and advance ones interest as opposed to power as the ability to bring about the maximum benefit to society. Being a new initiate to action research, I seem to have subsumed its emancipatory objective in the quest to bring about change in the problematic situation. Thus this experience illustrates vividly the three components that are vital or key to the carrying out of an action research project. These are including within one's research, those who are concerned about the situation (the concerned), those who have power to bring about change, (the powerful) and those who may be affected by the action taken (the affected). Nonetheless the powerful need to be

willing to share the decision making with those who are affected, if the study is to fulfil its emancipatory role. The emancipatory objective of action research is important as it develops a way in which what has been learned in a project setting can be applied on a continuous basis to other problematic situations. Thus it facilitates people's opportunity to participate in make relevant decisions.

Lesson 2: Conflict is not necessarily evil, these are times we need to constructively engage in conflict so as to change our perception, if we are to make any progress.

If a researcher is to attempt to address all participants so that they can see the practical and/or moral value of re-addressing issues of concern that have been raised by others, he must accept that he plays a role that requires a certain courage and might have to accept that not everyone will rate his involvement as having generated improvements. Sometimes the researcher may have to accept the discomfort of some participants who may initially or eventually be displeased with his presence.

Romago managers are reluctant to share their decision making power with their workers for fear of loss of control. They also seem to be afraid of constructive conflict with each other. This was made apparent when, the link manager preferred me talking to individual sectarian participants, than reporting my observations in a consultative seminar where common grounds would be explored. This to me was a rather strange preference, as I had earlier emphasised that collaborative discussions would be of benefit to the whole process. The desire not to upset the power sensitivities, rather than the pragmatic reasons for the commissioning of the study seemed to have dictated the process of study to a large extent. Collaborative discussion would also have set in motion ways of implementing the proposed changes in a co-ordinated way and would have given more impetus to the proposal.

When I began the research an assumption had been made that the link manager would facilitate the process of dialogue, the reality of the vulnerability of my link manager to the power relations was not apparent to me. This vulnerability weakened my ability to encourage constructive confrontation and contention between the various participants of differing opinions. Soft Systems Methodology on the other hand is silent on the issue as to whether researchers may encourage confrontation and contention in a quest to render 'fairer' the dialogical process. As managers however, facing the reality of our attitudes towards each other and seeking to resolve them, will help us in making progress.

On a personal level the action of the managers at Romago Engineering, brought to the fore that I too tend to avoid conflict as much as possible. While conflict may be uncomfortable, it is

necessary that we have the courage to constructively engage in it. To shy away from conflict is to assume that it is not there which only aggravates the situation. To engage in constructive conflict on the other hand will enable me to overcome my irrational fears, while understanding the premises from which others act.

In conclusion, while the problem situation required a solution that needed more powerful people than I had access to for its full implementation, it is my hope that the envisaged change will occur in line with the new changes taking place. As an individual I have learnt through the reflection process, to be able to design a better action research process, which will not only have the aims of bringing about change in a problematic situation, but which will also seek to enskill the participants to work out solutions for their situations through a more wise way of negotiating with those that hold decision making power.

SUMMARY

This chapter wraps up the thesis by reflecting on the various phases of the project.

The adoption of systems thinking models, which are an intellectual construct, to help understand the situation provided a pragmatic foundation for the development of the multiple perspective inquiry framework within qualitative research. The problematic situation warranted the use of both qualitative research and systems thinking methodologies, as it required the exploratory understanding of people's attitudes, thoughts, words and actions in a socio-technical setting.

None the less the two methodologies chosen for the inquiry, Soft Systems Methodology and Viable Systems Diagnostics, each have their own limitations in capturing all the salient features of the socio-technical systems and more so in ensuring the emancipatory claims of action research. While some of the inadequacies are compensated for when the methodologies are used together, they both fail in liberating ALL the participants. While this may be considered a serious flaw for these methods in certain type of researches, this inadequacy while apparent in this study in the lackadaisical way Romago managers received this report, did not affect the research inordinately. It only showed that maybe the best implementation would have been possible if either the researcher had as the point of entry a manager far much higher than the one who allowed me entry. Whether the study would have been significantly different had the researcher been part of Romago engineering in terms of the implementation strategy is a question to ponder.

The research process itself was however exhilarating and liberating as well as providing me with an opportunity to learn more about the intricacies and complexities of apparently simple management problems. I believe has also sharpened my skill in being a more astute manager, who is ready not just to jump to easy ready made solutions, but to seek for real solutions that are rigorous and context specific

9.0 REFERENCES

- Ackoff, R. L. (1974), *Redesigning the Future*, John Wiley, In *Soft Systems Analysis: An introductory Guide, Block IV*, (1990) Naughton, J. Open University Press, Milton Keynes, UK.
- Ainsworth ,M. (1978), *Patterns of attachment: A Psychological study of strange situations*, Lawrence Erlbaum Associates, Hillsdale, NJ.
- Argyris, C. and Schön, D. A. (1991), *Participative action research and action science compared: a commentary*. In W.F. Whyte, ed., *Participatory Action Research*. Newbury Park: Sage [85-96].
- Argyris, C., Putman, P., and Smith, D.M (1985), *Action Science, Concept, Methods and Skills for Research and Intervention*. Jossey-Bass San Francisco. [pp 8-9]
- Beer, S (1985), *Diagnosing the System : For organizations*, Wiley, Chichester :
- Bernard J. L, Grabner J. R. and Robeson J.F., '*Integrated Distribution Management: A Management Perspective*', *International Journal of Physical Distribution* No. 1 (October 1970 :44)
- Bowersox, D. J, David J.F, Schmitz, J.M. (1994), *Organizing For Effective Logistics*, In *The logistics Handbook-* (1994) edited by Robeson, F.J. and Copacino W.C. The Free Press, New York)
- Carlisle, J. and Parker, L. (1991), *Beyond Negotiation*, Wiley, Chichester, In Brown Steve, (1996) *Strategic Manufacturing for Competitive Advantage*, Prentice Hall Inc, Englewood Cliffs.
- Carr, W. and Kemmis, S. (1986), *Becoming Critical, Education, Knowledge and Action Research*. London, England: The Falmer Press.
- Carter R, J. and Price P.M. (1993) *Integrated Materials Management*, Pitman Publishing, London.
- Checkland, P. (1998), *Systems Thinking, Systems Practice*, John Wiley and Sons Ltd, Chichester, UK
- Checkland, P. and Scholes, J (1990), *Soft Systems methodology in Action*. In Dick, B. and Swepson, P. (1994) *Appropriate validity and its attainment within action research: an illustration using soft systems methodology* [On line]. Available at <http://www.scu.edu.au/schools/gcm/ar/arp/sofsys2.html>
- Checkland, P. (1981), *From Optimising to Learning: A Development of Systems Thinking in the 1990s*, In Flood, R.L. and Jackson, M.C (Ed, 1984) *Critical System Thinking : Directed Readings*, John Wiley and Sons Ltd, Chichester, UK
- Checkland, P. (1981), *Systems Thinking, Systems Practice*, John Wiley and Sons Ltd, Chichester, UK

- Checkland, P. (1981), *Systems thinking, systems practice*. In Dick, B. and Swepson, P. (1994) Appropriate validity and its attainment within action research: an illustration using soft systems methodology [On line]. Available at <http://www.scu.edu.au/schools/gcm/ar/arp/sofsys2.html>
- Churchman, C. W (1982), *Thought and Wisdom*, Intersystems Publications, Seaside California, In Linstone, A, Harold (1984), *Multiple perspectives for Decision Making, Bridging the gap between Analysis and Action*, Elsevier Science Publishing, Amsterdam. p 63
- Clemson, B. Dr (1984), *Cybernetics: A New Management Tool*, Abacus Press, Turnbridge Wells, Kent:
- Conant, B.J, *Modern Science and Modern Man*, (1952) Double day Anchor Books.
- Dean. S. Ammer- *Materials management as a profit centre*, Harvard business review 47 no 1 (January-February 1969) 39-47 In *The logistics Handbook-* (1994) edited by Robeson, F.J. and Copacino W.C. The Free Press, New York)
- Denzin, N.K. (1978) *The Research Act: A Theoretical Introduction to Sociological Methods*, in Patton, M.Q. (1990) *Qualitative Evaluation and Research Methods* (2nd ed.), in Maykut, P and Morehouse, R. (1994): *Beginning Qualitative Research, A philosophy and Practical Guide*. The Falmer Press, pp.72
- Descartes R. (1927), *A Discourse on the Method*, Dent, London
- Dick, B. and Swepson, P. (1994), *Appropriate validity and its attainment within action research: an illustration using soft systems methodology* [On line]. Available at <http://www.scu.edu.au/schools/gcm/ar/arp/sofsys2.html>
- Dick, B. *A beginners guide to action research*. Southern Cross University. [On line]. Available at <http://www.scu.edu.au/schools/gem/ar/guide.html>
- Espejo Raul and Roger Harnden (Ed, 1989) *The Viable Systems Model, Interpretations and Applications of Stafford Beer's VSM*, John Wiley and Sons Ltd, New York
- Flood, R. L. and Jackson, M. C. (1991) , *Creative Problem Solving – Total System Intervention*, John Wiley and Sons , Chichester, UK.
- Gartona, J. Trost G, and Kerr,N. (1990), *The Gower handbook of Logistics and Distribution Management*, Gower Publishing , Vermont
- Gharajedaghi, J and Ackoff, R. (1984), *Strategic Management Journal, Volume 5* (1984) John Wiley and Sons, Ltd.
- Gill J. & Johnson P. (1991), *Research Methods for Managers*, Raul Chapman Publishing Ltd, London, UK
- Harris Errol, (1970), *Hypothesis and Perception*, George Allen and Unwin, London.

- Hume, D, *Enquiry concerning the Human understanding*, iv part 1, In Sutherland W.J, (1973), *A General Systems Philosophy for the Social and Behavioural Sciences*, George Brazilliar, New York.
- Kemmis, S., and McTaggart, R., (1988) *The Action Research Planner*, Deakin University Press Victoria, Australia.
- Kolb, D. (1984), *Experiential learning: experience as the source of learning and development*. Englewood Cliffs, NJ. Prentice-Hall.
- Kuhn, T. S: (1970) *The Structure of Scientific Revolutions*, Chicago : Chicago University Press.
- Lever, J.(1976) 'Sex differences in games children play', in Maykut, P and Morehouse, R. (1994): *Beginning Qualitative Research, A philosophy and Practical Guide*. The Falmer Press, pp.111.
- Lieb, C. (1953) *Charles S. Peirce's letters to Lady Welby*, Whitlocks , New Haven.
- Lisa, M. Ellram and Martha Cooper, " *Supply Chain Management, Partnerships and the Shipper third Party relationship*", *International Journal of Logistics Management* 1 No 2 (1990) pp 1-10.
- Maykut, P. and Morehouse, R. (1994): *Beginning Qualitative Research, A philosophy and Practical Guide*. The Falmer Press.
- Magad,L.E.and Amos M.J, *Total Materials Management, Achieving Maximum Profits through Materials/Logistics Operations*, (1995) Chapman Hall, New York.
- Master, M. J. and Pohlen,L.T. (1994), *Evolution of the Logistics Profession*, in *The logistics Handbook*- edited by Robeson, F.J. and Copacino W.C. Free press, New York.
- Magee F. J, (1968), *Industrial Logistics: Analysis and Management of Physical Supply And distribution Systems*, Macgraw Hill, New York.
- Minto B. (1987), *The Pyramid Principle, Logic in Writing and Thinking*, Pitman Publishing, London.
- Mothibi J. (1999), *A Pragmatic-Evolutionary Based Systems Approach For Science and Technology Formulation for Sustainable development, with Application to Botswana*, Phd Thesis, University Of Cape Town.
- Noffke, S., Stevenson, R. (1995). *Educational Action Research, Becoming Practically Critical*. New York, New York: Teachers College Press.
- Perry, W. G. (1970), *Forms of Intellectual and Ethical Development in the College Years: a scheme*, Holt, Pinehart and Winston, New York.
- Pepper S.C.(1942), *World Hypothesis*, University Of California Press
- Pierce C.S. *Collected papers of Charles Sanders Pierce* Vol.1-6 Eds. Hartsthorne, C. and Weiss, P.

- Porter, M. (1985), *Competitive Strategy*, The Free press, New York, In Brown Steve, (1996) *Strategic Manufacturing for Competitive Advantage*, Prentice Hall Inc, Englewood Cliffs.
- Revans Reginald, (1982) ,The Origins And Growth of Action Learning, Chartwell-Bratt Ltd
- Rogers C. (1951) *Client Centered Therapy*, Cambridge, MA, Riverside In Maykut, P. and Morehouse, R. (1994): *Beginning Qualitative Research, A philosophy and Practical Guide*. The Falmer Press.
- Rogers C. (1942) The use of electrically recorded Interviews In improving Pschotherapeutic Technique, *American Journal of Orthopshychiatry* 12 pp 429-34 In Maykut, P. and Morehouse, R. (1994): *Beginning Qualitative Research, A philosophy and Practical Guide*. The Falmer Press.
- Shapiro, D.R. and Byrnes L. S. J.(1994), *Focused Human Resources Management: Key to Logistics Effectiveness in The logistics Handbook*- edited by Robeson, F.J. and Copacino W.C. The Free press, New York
- Simon H. (1969) "*The Sciences of the Artificial*" Cambridge, Mass: MIT Press, in Argyris, C., Putman, P., and Smith, D.M (1985), *Action Science, Concept, Methods and Skills for Research and Intervention*. Jossey-Bass San Francisco.
- Stoddart, K. (1986) '*The presentation of everyday life*,' Urban life , in Maykut, P and Morehouse, R. (1994): *Beginning Qualitative Research, A philosophy and Practical Guide*. The Falmer Press, pp.72.
- Sutherland W.J, (1973), *A General Systems Philosophy for the Social and Behavioural Sciences*, George Brazilliar, New York.
- Tesch Renata, (1990), *Qualitative Research: Analysis types and Software Tools*, The Falmer Press, New York.
- Vivian F. (1969), *Thinking Philosophically*, Basic Books, New York.
- Von Bertalaffy L (1972) *The History and Status of General Systems Theory*, In *Trends in General System Theory*, Ed George Klir , Wiley Interscience, New York.
- Von Bertalaffy L. (1967), *Robots, Men, And Minds*, George Brazillier, New York.
- Whitehead Alfred North. (1961) *Process and Reality* In Laszlo E. (1972) *Introduction to the Systems Philosophy : toward a new paradigm of Contemporary Thought*, Gordon And Breach , New York.
- Whyte, W. F. (1991). *Participatory Action Research*. Sage Publications, Inc. Newbury Park, California:
- Zuber-Skerrit, O.(1992) *Professional Development in Higher Education- A Theoretical Framework for Action Research*, Kogan Page, London
- Zuber-Skerrit ,O. (1992) *Action Research in Higher Education-Examples and Reflections*. Kogan Page, London

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10. APPENDICES

APPENDIX 1: PROBLEM SITUATION UNSTRUCTURED

The issues involved in the problem unstructured were captured through participant observation and interviews. The issues identified were as follows:

- Un-availability of forklifts,
- Loss of components between stores/shops, machine and product line,
- Poor or low maintenance of machinery,
- Untimely supply of components especially plate and coils,
- Poor/inadequate planning/scheduling of production line,
- Special line commissioned in 1998 without proper planning of pre-production line manufacture shops leading to - late supply of components
 - maximum stretching of work-shop capacity
 - increased overtime costs
 - low/poor quality supply,
- Increased pressure by management to manufacture more tanks from the present twelve to eighteen on a production line initially designed for twelve, but new time studies suggest the line can support twenty two tanks per day,
- Erratic orders received from customers affecting production patterns,
- Increased absenteeism,
- Fluctuation of product mix of containers on production line,
- Low managerial skill and thus inability to competently supervise production,
- Manager/worker mistrust from previous experiences,
- Reactive approach to maintenance,
- No appreciation of possible various product mix (scenario planning),
- Inflexible, old technology, limited capacity manufacturing capability,
- Unmotivated workers, no clear performance incentives,
- No training for unskilled workers, no clearly defined skill development,
- Excessive re-work/low quality of work done,

- No planned succession training and over-reliance on individual skilled workers,
- Parochial (functional department) approach to issues,
- Items in work centre distribution points are open for all to pick at will. No control of access to components or accessories,
- Inadequate/insufficient communication between stores and production line, stores and pre-assembly manufacture, stores and planning as well as procurement,
- Worker management- lack of accountability- no clear accountability structure,
- Selective appraisal of workers, not everybody is appraised on their work,
- Continuous movement of permanent workers to work centres they either are not interested in or hardly have the skills for,
- Perceived favouritism and racism practised by managers,
- Workers resentment to withdrawal of certain privileges under new management e.g. change of food provision conditions for those working over time,
- Inadequate communication to workers, of policies emanating from outside the company's control e.g. the scrapping of compensation for sick leave days not taken,
- Worker anxiety over the yearly June/July worker retrenchment,
- Near religious keeping of records that are hardly used (ritualistic record keeping),
- Romago is in a state of flux as it restructures,
- Inexperience of contract people especially in welding, compiled with time pressure to perform leads to quality problems,
- People are not conscious of waste (of time/materials) and its consequences to their lives,
- *Competitive dynamics*: a management initiated programme aimed at improving quality, increasing productivity and keeping Romago competitive was not adequately explained, hence workers perception of its green area meetings as a talk show,
- Perception by workers that competitive dynamics is a clever trick by management to have them work or produce more, with no attendant benefits for them.
- People still suffer from the legacy of apartheid and generally have negative attitudes towards each other. White people feel threatened by affirmative action legislation, Malaysian and mixed race descended people feel besieged and hence have negative attitudes towards both African and white, while Africans are still stigmatised by the effects and conditioning of apartheid.

UNIVERSITY OF CAPE TOWN
SCHOOL OF ENGINEERING MANAGEMENT
MEC525Z- MASTERS OF ENGINEERING
MANAGEMENT
HALF-THESIS PROPOSAL SUBMITTED TO THE
UNIVERSITY OF CAPE TOWN:

*TOPIC: AN EXPLORATION INTO HOW
WORKER/MANAGEMENT MENTAL MODELS
DETERMINE
THEIR RELATIONS AND ITS EFFECT ON COMPANY
PRODUCTIVITY AND VIABILITY*

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STUDENT NUMBER : MGTMOS002
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ROMAGO ENGINEERING
DATE : MAY 2000*

TABLE OF CONTENTS

1.0 ROMAGO'S HISTORY AND MANUFACTURING CAPABILITY	118
2.0 SOME PROBLEM AREAS /ISSUES/SITUATIONS IDENTIFIED AT ROMAGO.	119
2.1 <i>IN WHAT AREAS AM I ABLE TO INTERVENE IN? EXAMINATION OF MY POSSIBLE SPHERES OF INFLUENCE</i>	120
3.0 WHAT ARE MENTAL MODELS?	121
4.0 PROBLEM BOUNDING FOR ROMAGO.....	122
4.1.1A. <i>WHO ARE STAKEHOLDERS IN THE HRP?</i>	122
4.4.1B. <i>WHO ARE THE STAKEHOLDERS IN THE ISP</i>	122
4.1.2A. <i>HRP-WHAT MAKES THIS PROBLEM A PROBLEM?</i>	123
4.1.2B. <i>ISP WHAT MAKES THIS PROBLEM A PROBLEM?</i>	123
4.1.3A. <i>HRP- PHRASING THE PROBLEM IN TECHNICAL/HUMAN VARIABLES</i>	124
4.1.3B. <i>ISP- PHRASING THE PROBLEM IN TECHNICAL/HUMAN VARIABLES</i>	124
4.1.4B. <i>ISP WHAT ARE THE ETHICAL ,EXISTENTIAL ,ENVIRONMENTAL AND POLITICAL PERSPECTIVES OF THE PROBLEMS SO FAR DEFINED?</i>	124
4.1.5A- <i>HRP SYSTEMIC VIEW OF PROBLEM</i>	124
4.1.5B- <i>ISP-SYSTEMIC VIEW OF PROBLEM</i>	125
5.0 RESEARCH DESIGN	125
6.0 METHODS	126
6.1 <i>BUILDING A PURPOSIVE SAMPLE</i>	126
6.3 <i>SOME POSSIBLE DIFFICULTIES</i>	128
7.0 SIGNIFICANCE OF STUDY	128
7.1 <i>FOR ROMAGO</i>	128
7.2. <i>FOR SOCIETY</i>	128
7.3 <i>FOR MYSELF.....</i>	129
7.4 <i>REPORT OF OUTCOMES.....</i>	129
8.0 REFERENCES.....	129

1.0 ROMAGO'S HISTORY AND MANUFACTURING CAPABILITY

Romago was founded in 1928 by an Italian, Adriano Romago, and from its inception has specialised in tank work. The company has constructed thousands of vessels for the South African Breweries, it has built most of the bulk storage facilities in South Africa for customers such as Caltex and it has supplied well over ten thousand tank containers to the world. The Romago family disposed of their share holding in the company in the 1970's and later, in 1985, ownership of Romago was acquired by the South Africa Conglomerate Murray and Roberts. Romago is the largest engineering concern in the Western Cape Region of South Africa. Romago is situated in Cape Town.

Romago's record has been built on four cornerstones, namely,

- ◆ design capability
- ◆ manufacturing excellence
- ◆ quality management systems and
- ◆ expertise in project management.

These elements combine to provide the customer with products which meet with his or her specifications and comply with international regulations and standards. However there are still areas that need continual improvement, if the customer is to get more value for his investment.

Romago makes use of computer aided design systems which include finite element stress analysis and computerised draughting. Theoretical designs are validated by physical testing of components and prototypes. Romago's materials testing laboratory provides in-house service which is also available to others who may require materials to be tested. The Test Centre's non-destructive facilities include Real Time Radioscopy, X and gamma radiography. Destructive facilities include tensile, bend, notch-impact and hardness testing.

Romago is a holder of the important ASME U stamp which demonstrates a design and fabrication capability beyond that of the average fabricator. The ASME U stamp enables Romago to construct pressure vessels such as IMO Gas Tank Containers which are used for the international transport of pressure liquifiable gasses. A major part of the company's manufacturing activity revolves around the manufacture of ISO tank containers.

A production line capable of producing upwards of 90 units a week was commissioned in late 1995. This facility has given Romago the ability to remain the largest tank container manufacturer in the world.

Container products for which Romago has designs include

- | | |
|---------------------------|----------------------------|
| ◆ Standard ISO containers | ◆ Offshore tanks |
| ◆ Gas tank containers | ◆ Swap tank containers |
| ◆ Tote bins and | ◆ overwide tank containers |

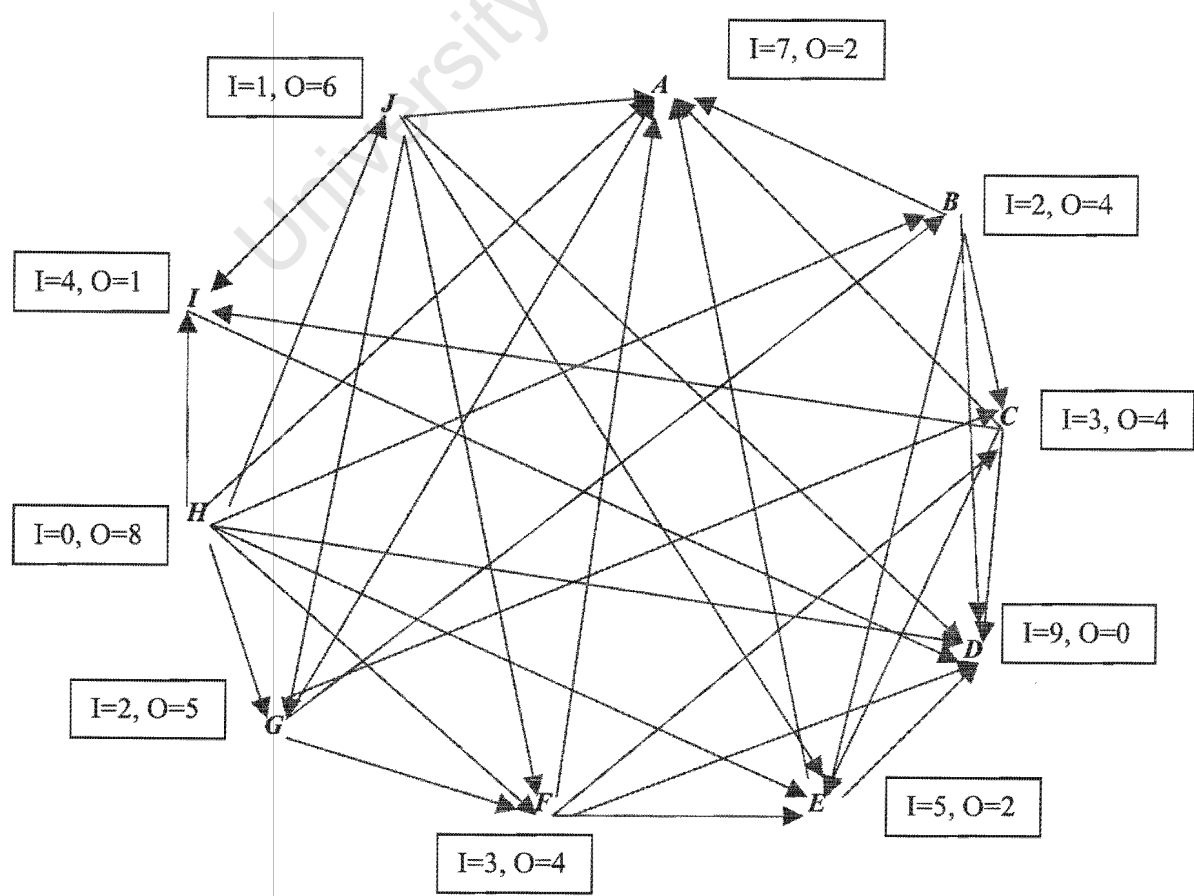
- ◆ Brewery vessels
- ◆ Petrochemical tanks
- ◆ Wine tanks

2.0 SOME PROBLEM AREAS /ISSUES/SITUATIONS IDENTIFIED AT ROMAGO.

These problem issues were identified after an initial period of immersion into the situation of about six weeks. These areas are:-

- | | |
|--|---|
| 1.Excessive rework/Low quality of work done ~ 40% of all products | A |
| 2.High Absenteeism/low worker morale | B |
| 3 Delayed/Missing parts to various production points (supply problems) | C |
| 4 Reduced profits/market share | D |
| 5 Inadequate equipment-inappropriate /low maintenance | E |
| 6. No skill development/low worker skills | F |
| 7. Management / worker mistrust | G |
| 8. Ivory tower management | H |
| 9. Inappropriate costing/pricing mechanism | I |
| 10. No planned/production scheduling of plant | J |

Fig 1 Interrelation ship digraph of problem areas:



I = Incoming arrows

O= Outgoing arrows

From the evaluation of interrelationship digraph

The following outcomes can be seen from the interrelationship diagram.

From the evaluation of interrelationship digraph

The following outcomes can be seen from the interrelationship diagram.

Primary drivers of the process in order of Importance

1. Primary Tower Management
2. No planned production Scheduling
3. Management/Worker mistrust
4. No/Low skill development
4. Delayed/missing parts to various Production points (supplier problems)

4. Low worker morale

Primary outcomes of process in order of importance most important outcome is last on list

1. Reduced profits/market share
2. Excessive rework/low quality work
3. inappropriate costing/pricing mechanism
4. inadequate equipment/inappropriate /no maintenance
4. No/low skill development
4. Supply problems

The leverage points from the diagram are :- C-Supplier problems and F-No/low skill development

2.1 In what areas am I able to intervene in? Examination of my possible spheres of influence

<u>Area</u>	<u>Able to influence?</u>
1. Ivory Tower management	No
2.Lack of production planning schedule	No/Yes ?
3. Management/worker mistrust	Yes
4.No/low skill development	
4.Low worker morale	
4.Delayed/missing parts-supplier problems	Yes

From this examination it seems that the areas that I could be of influence in are the four areas of management worker mistrust, no/low skill development , low worker morale and supplier problems

The first three can be further grouped into one broad area of human resource management. These areas also form the leverage points of the relationships between the various problem issues being currently experienced at Romago. This thesis will therefore focus in these two broad areas.

Statement of proposed thesis /problem bounding

The purpose of this study is to

- 1) Understand further how management and worker mental models about each other and the organization affect their relationships and its effects on achieving organizational goals effectively and efficiently { to further understand how the mental models workers(managers included) have about each other and about the organization and how these affect their motivation towards achieving organizational goals.} This will be done through a proposed worker involvement program the company is currently implementing called competitive dynamics.
- 2) Understand more about how organizations organize themselves for the efficient and effective fulfillment of their vision and how this organization (flow of information, materials and people) influences, the achievement of organizational objectives. This will be done by focussing the study to supply problems the production line has been experiencing occasionally /frequently.

3.0 WHAT ARE MENTAL MODELS?

How do we understand reality? How do we make sense of the world that we interact with?? What is the basis of our decision as to what exists out there? These questions are fundamental to our existence and understanding of the universe around us. Since the world we exist in is complex we all have simplifications of the real world, which are the basic units our minds use to store and manipulate information and phenomena. A psychologist Kelly has proposed an understanding of the world using his personal construct theory. His epistemological position is 'constructive alternativism' that is based on the assumption that there is no objective knowledge of reality. Reality can only be known through our constructions which are subject to constant revisions. Thus we do not have an interpretation free reality. Our present constructs or interpretations of the universe are subject to revision or replacement.

Kelly's fundamental postulate and its corollaries present an individual as a personal scientist, with a hierarchical construction system (organization) which is personally unique (persons differ from each other in their constructions of events) and those constructions can be explored individually as well as with others (sociality). He asserts that a group of people may be similar in terms of their construction of experience (commonality). The development of conceptual change depends on the permeability of a persons construct (modulation) and on the balance between hierarchical integration and consistency of differing constructs on one hand and their differentiation and inconsistency (fragmentation) on the other. He stresses the personal nature of meaning within a framework of commonality of thinking and individuals as personal scientists being the center of inquiry. Kelly argues that individuals who are learners should be able to articulate their worldview and open their minds to refutation and potential alternatives. In this way they will realize that their way of seeing reality is not static but open and subject to change.

Mental models are thus unstructured little scenarios or script that run through our minds. They represent our view of the world and of the forces that act on it. Thus they are assumptions that are deeply held and often unconscious about how the world works.

By framing how we see the world, our mental models determine not only how we make sense of the world but also how we take action. Chris Argyris who has worked with mental models and organizational learning for 30 years put it as “ *Human beings have programs in their heads about how to be in control, especially when they face embarrassment or threat, two conditions that could lead them to get out of control. These programs exist in the human mind in two very different ways.*

The first way is a set of beliefs and values people hold about how to manage their lives(espoused theories).The second way is the actual rules they use to manage their beliefs .We call the first ,their espoused theories of action ,the second their theories-in-use. ”

Balle (1994)asserts that although most people do not always behave consistently with their espoused theories(what they say),they do behave according to their theories in use(their mental models).Often people tend to accept at face value what others tell them about how they see a situation. While computers use zeros and ones to think ,we use images, mental models, theories in use, microcosms: complex sets of ideas that are triggered by circumstances. Mental models are active-they shape how we act. They affect what we see and how we think we should react.

The problem with mental models lies not in whether they are right or wrong-because by definition, they are simplifications. Most problems arise because most mental models are tacit-they exist below the level of consciousness and to be able to get to the root of any problem we need to understand the mental model that shapes it, i.e see the perspectives/assumptions that shape that problem.

4.0 PROBLEM BOUNDING FOR ROMAGO

The two areas that have been identified as the areas of concern for the purpose of this study are the problem's associated with human resources and Internal supplies. These problems are of concern because they contribute to reduced profit/market share as well as excessive rework/low quality work, two main problems that are threatening the viability of the organization. The problem bounding which looks at these problems from different perspectives denotes the two problem areas as, the Human Resources Problem(HRP) and the Internal Supplies Problem(ISP)

4.1.1a.Who are Stakeholders in the HRP?

- Workers(permanent)
- Workers (contract)
- Operational managers
- Unions-Numsa
- Managers(senior)
- Production line
- Human resources department
- Romago shareholders
- Romago Financiers
- Romago Customers
- Job Brokers

How do these people define the problem as, especially with reference to –skills development, low worker morale and management / worker mistrust? What assumptions/mental models shape these definitions?

4.4.1b. Who are the stakeholders in the ISP

Supplies department

- Marketing department
- Production line
- Contracts/purchasing department
- Romago suppliers(external)
- Romago customers
- Fabrication/Sheet metal workshop

How does delayed delivery or missing parts affect? What is your contribution to delayed parts /missing parts? What do you think is the problem with supplies? What assumptions/mental models shape these definitions?

4.1.2a. HRP-What makes this problem a problem?

The organisational structure? The attitudes of the people : i.e. managers and blue collar workers
Probable definitions

Workers definition of problem. The management is not interested in us as individuals, but only as tools for making money for the company and that we resent as we are as human as they are.

Management definition of problem: the workers really do not want to work, they just want to loaf about and do the bare minimum, so we have to push them. If we gave the workers tenure of employment they become hard nosed through their unions, and it becomes hard for us to control them, we therefore prefer contract workers whom we can manipulate and easily control.

Unions definition of the problem: The management has not changed, it is still the same oppressive apartheid management, the transformation that is taking place elsewhere can't be seen here, therefore the workers struggle continues....*Alutta continua!*

Government definition of problem.: we need not only to safeguard the jobs that we have, but there is need to create more job opportunities and enhance skills for our people.

4.1.2b.ISP What makes this problem a problem?

The organizational structure? The attitudes of the people: i.e. managers and blue collar workers (*here seemed to be a lot of buck –passing as concerns who was contributing to the supply problems*) i.e *Do not even think about it , the buck does not even begin to slow down here leave alone stop here!!*

Probable definitions

Management definition: The supplies department is either missing or supplying late the parts that are required because its either understaffed or its workers are incompetent.

Production line Definition: The supplies department is not able to supply parts on time because it gets the purchase orders late or the said parts were omitted by the contracts /procurement people on the parts list.

The supplies department definition: The supply department has no problem, it's the fabrication workshops problem, as they have not yet fabricated what we require. {At the beginning of the study, I was able to establish that the sheet metal fabrication workshop lacked reliable well skilled personnel and supervisory staff who were able to read the drawings and make basic scheduling-most of the technicians there were contract workers.}

4.1.3a. HRP- phrasing the problem in technical/human variables

- Employment is a contractual matter and workers should not expect more—it's a contract.
Technical definition-legal rights
- Employment is part of the political struggle we have in our wider society-Its about power and resources of our country and who has access to them-Human variable definition-its our human right to be employed.
- Employment provides meaning and self esteem for me-the work that I do is an expression of my abilities and talents- Human variable definition-is my life!

4.1.3b.ISP- Phrasing the problem in technical/human variables

- Is it because of the incompetence of the supplies, fabrication, contracts department? about the lack of technical skills-technical definition
- Is it due to the organizational structural deficiencies? bad organizational structure? absence of management skills? - technical definition
- Is it because of individual ego/power struggles over tuff?.-Human variable
- Is it due to demotivated/low morale of staff?-Human variable

4.1.4a. HRP-What are the ethical, existential, environmental and political perspectives of the problems so far defined?

- In what broader environment does this problem exist in? what other circumstances outside the organization could be contributing to the problem?
- Government legislation?
- Change in Management and the accompanying changes in management styles?
- Political liberation of South Africa?
- Increased market competition due to lifting of sanctions?

4.1.4b ISP What are the ethical, existential, environmental and political perspectives of the problems so far defined?

In what broader environment does this problem exist in? What culture in the organization is contributory to the supply problems? What other perspectives need to be considered in solving the problem?

4.1.5a-HRP systemic view of problem

What is the meta-system of which this problem is a part? How does the interactions of this system produce this problem or result/contribute to it?

4.1.5b- ISP-Systemic view of problem

What is the meta-system of which this problem is a part? How does the interactions of this system produce this problem or result/contribute to it?

5.0 RESEARCH DESIGN

The areas the study proposes to explore is best suited to a qualitative action research approach. Guba and Lincoln (1985 , P. 227) assert that the purpose of qualitative research is to '*accumulate sufficient knowledge to lead understanding*'. The purpose of the action research is both to yield an understanding of a social system and to determine the best opportunity for change. It seeks to learn from experience and to apply that learning in bringing about change. It begins with an exploratory and descriptive focus of inquiry through the tools of idea generation. The development of the focus of inquiry helps guide discovery about social phenomena-how mental models affect relationships between workers and management and how organizational design may impede or enhance the achievement of organizational objectives.

Unlike the quantitative research methods which begin with the development of a question and are followed to the end with a conclusion action research is an emergent process. This means that it begins with fuzzy questions ,using fuzzy methods and results in initial fuzzy answers, but these answers refine the initial questions and the study continues. Thus an emergent design of the process implies that research design evolves overtime. As one carries the research important leads are identified in the early phases of data analysis and pursued by asking of new questions, observing new situations or previous situations with a slightly different lens or examining previously unimportant documents. The emergent nature of action research make it responsive to the situation and the process takes place gradually. Thus Action research is suited well for qualitative and participative approaches to research.

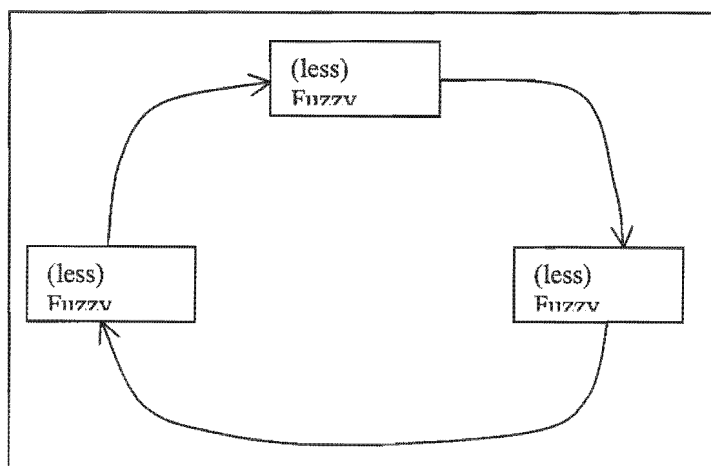


Fig 2a: Iteration of inquiry [adapted from, Dick, B. and Swepson, P. (1994)]

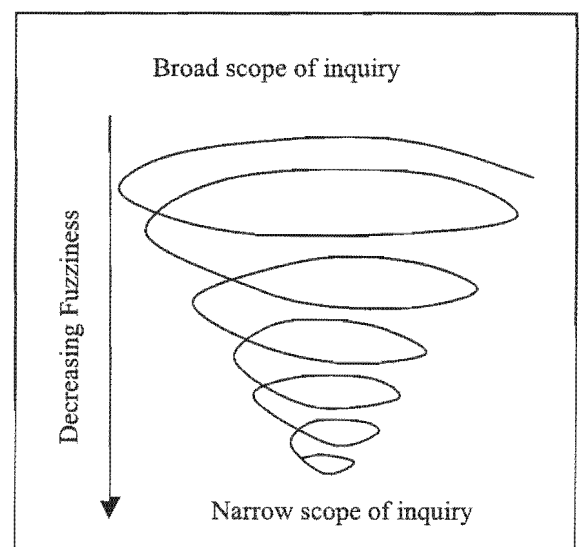


Fig 2b: The spiral of increasing clarity with successive inquiry iteration.

Fig 2-Emergent Process of Action Research

The assumptions behind the use of Action research is that people can learn and create Knowledge

- On the basis of their concrete experience
- By observing and reflection on that experience
- By formation of abstract concepts and generalizations
- By testing the implications of those concepts of those in new situations, which lead to new concrete experience and hence a new cycle.

Several things have been built into the research design that will increase the trustworthiness of the result. Several data collection methods will be used as well as several sources of information-this process which has already began will be done over a six month period. Once the data has been analyzed it will be presented to those who participated in the research They will be asked if the research has accurately captured at east some of the experiences of workers and management and clarification sought.

6.0 METHODS

The research will be conducted through various methods of data collection. Using a purposive sample approach ,participants will be selected based on maximum variation among workers and managers.

6.1 Building a purposive sample

The type of sample for any study is usually a function of the purpose of the study. If the purpose of the study is generalization to the larger population then random sampling is appropriate. A random sample increases the likelihood that the sample accurately represents the population from which it was selected. However qualitative research is context sensitive and seeks to gain a deep understanding of the phenomena being experienced. This can only be achieved through a careful selection of a group of people. This approach acknowledges the complexity that characterizes human and social phenomena and the limits of generalizability. Participants are carefully selected for inclusion based on the possibility that each participant will expand the variability of the sample. Purposive sampling is aimed at increasing the likelihood that variability common in any social phenomena will be represented in the data, in contrast with random sampling which tries to achieve variation through the use of random selection and large sample size. Different strategies exist for purposive sampling depending on the focus of inquiry and the researchers judgement as to which approach will yield the clearest understanding of the phenomena.

Examples of the approaches include:-

Extreme cases-If research seeks to better understand unusual phenomena or the cases chosen are particularly illuminating, otherwise one chooses typical cases.

Critical cases-If research seeks to understand larger phenomena subsumed by the critical cases

Maximum variation-If research seeks to understand phenomena by seeking persons /settings that represent the greatest differences in phenomena. This provides the qualitative researcher with a method by which variability characteristics of random selection can be addressed, while recognizing that the goal of qualitative research is not generalizability.

In the study of factors that might affect worker/management interactions the following areas were identified as the substantive characteristics that need to be considered in order to maximize the contrast between the study participants.

e) <i>Type of worker</i>	d) <i>Work content</i>	c) <i>Worker Education</i>	f) <i>Skill level</i>	d) <i>Job Experience</i>
Permanent	Mental/ knowledge application	Illiterate	Unskilled	0-5years
Temporary	Physical/ manual	Barely literate	Semi-skilled	6-10years
Contract	Manager, Blue collar worker	Matriculant	Highly skilled	10+years
		University/ Technikon		
		Graduate		
		Postgraduate		

6.2 Qualitative methods of data collection.

Qualitative data is in the form of actions and words which require methods that capture language and behavior.

The most useful way of gathering this data involves:-

Participant observation*- I will observe the various groups of people in their various aspects of their work life –meetings and work by participating in the meetings and work.

In-depth interviews* -individual interviews of select workers and managers according to the maximum variation principles.

Group interviews* -Involvement in green area meetings and competitive dynamics participation.

Collection of relevant documents

Photographs, and video-taped observations if allowed by industry.

The methods marked with an asterisk * involve documenting the collected data through a researchers journal, field notes and audio-taped interviews. These methods capture the situations, words and actions of those involved in it and hence provide the beginning place for the qualitative researcher to start his understanding of it.

The sample will also seek to include the following categories of stakeholders:-

Those who know:- Those who have knowledge and information about the company and the various phenomena that guide human relations in human resources and supplies

Those who care/are affected:- those for whom the phenomena of study and hence the results of study are important for and those who are customers –are affected either positively or negatively by the phenomena.

Those who have power:- the facilitators-those who have the authority to effect changes in the company. The owners of the system.

6.3 Some possible difficulties

Since Romago is going through a period of rapid transition as tries to restructure, being able to convince those with power to facilitate participation as well as implementation of the proposed solutions may be difficult. To a large extent I have been able to win the favour of workers and they may be willing to buy in the participatory idea. However if it is not well understood and supported by management, this thesis may not go beyond identification of problems and probable solutions that could help Romago begin to address them. This limitation may be overcome through discreet gaining of access to those with power to encourage/promote participation and commitment to implementation of changes. Alternatively this could be made through a scaling down of some of the thesis objectives and joining forces in the promotion of the already fledging competitive dynamics green areas concept. The problem of management acceptance of people participation due to fear of loss of power and control over workers also needs to be discussed with our contact manager Mr Jarro for his explanation to the other managers about the benefits the company may gain through participation of workers in problem and solution formulation.

7.0 SIGNIFICANCE OF STUDY

7.1 For Romago

In a rapidly changing and highly world, companies cannot afford to rest on their laurels of success in the past. Though Romago has been in the Tank business for over 50 years and has been continually successful, it is currently faced by a myriad of problems which if not managed effectively could lead to bankruptcy, hostile takeover/bid by competitors or being sold by their holding Company, Murray and Roberts. This study seeks not to solve the superficial symptoms of organizational problems but cores to the core of those problems by exposing the mental models that shape and give rise to those problems. In making the mental models which both workers and managers have about each other and the organization, the best way of creating a mutual beneficial relationship that results into a more viable organisation will be suggested and if acceptable to the management partially implemented during the study period to test their robustness.

The study in increasing understanding of how the enterprise is currently organized for the transformation of resources into products or services(especially the supply line management),it is hoped that light will be shed on how to restructure so as to enhance the achievement of efficiency and effectiveness in creating value for the customers.

7.2. For Society

It is hoped that the effective use of qualitative action research will contribute towards the increased use of this methodology among managers as powerful tools in the study and theory