

GRADUATE SCHOOL OF MANAGEMENT: PU FOR CHE

**SASOL COAL RESEARCH AND DEVELOPMENT:
A STRATEGIC PERSPECTIVE**

BY:

JOHAN FRANCOIS BRAND

B.Ing (Mech.)

November 1998

**This dissertation is presented as partial fulfilment for the degree MASTER IN
BUSINESS ADMINISTRATION at the Graduate School of Management,
Potchefstroom University for Christian Higher Education.**

STUDY LEADERS: MR. J. G. STEENEKAMP and Prof. J. G. KOTZÉ

ACKNOWLEDGEMENTS

This dissertation was created with the love and support I received from my family. I want to thank them for the encouragement and family time they sacrificed.

This document would not have been possible without the support and ideas I received from the members of the Projects and Research Department of Sasol Coal. My thanks goes to you all. My special thanks go to Mr. J. G. Steenekamp, Manager R&D for his support.

J. F. BRAND

NOVEMBER 1998

SECUNDA

AFRIKAANS ABSTRACT

Sasol Steenkool Naforsing en Ontwikkeling: 'n Strategiese Oorsig

Sasol Steenkool is 'n divisie van die Sasol groep en is ten doel om steenkool te verskaf aan Sasol Sintetiese Brandstowwe vir die vervaardiging van petrochemiese produkte. In 1982 het Sasol Steenkool 'n projek afdeling gestig om kennis en ondervinding in verband met projekte intern te kweek, sodat nuwe myne en kapitaal projekte meer koste effektief bestuur kan word.

Die departement het betrokke geraak by navorsings projekte en die departement se naam is verander na Projek en Navorsingsdienste (P&RS). Die departement het twee hoof doelwitte, naamlik die uitvoering van navorsing en ontwikkeling en die bestuur van kapitaal projekte. Tans bestaan P&RS uit meer as 50 personeellede met die volgende onderafdelings: 'n werkstudie groep, 'n projekte afdeling, 'n afdeling vir spesiale projekte, 'n navorsings afdeling, die ingenieurs- en verskaffers dienste asook 'n ontwerp dienste afdeling.

In 1997 het Sasol Steenkool begin met 'n **vernuwings proses** wat 'n nuwe fokus gebring het op kostebestuur en 'n visie vir Sasol Steenkool om 'n wêreld leier te word in steenkool ontginning. Die vernuwings proses dwing die herstrukturering van P&RS departement sodat die departement hierdie leierskap strategie kan ondersteun. Die vernuwings proses sal verder ook help om die departement se diens aan sy kliënte te optimaliseer en sodoende 'n integrale deel van die Sasol Steenkool se besigheidsplan te bly.

Die huidige P&RS is hoofsaaklik funksioneel gestruktureer en maak slegs gebruik van 'n matriks struktuur vir die rapportering en plasing van verantwoordelikhede binne projekte. Die aktiwiteite van die verskillende funksionele onderafdelings word bepaal deur die behoeftes van die projekspanne sowel as die tegnologiese strategieë van Sasol Steenkool.

Om aan die strategiese vereistes te voldoen wat deur die hernuwings proses gestel word is 'n strategiese beplanningsproses in Mei 1998 geloods. Dit is die doel van hierdie skrywe om hierdie proses te assisteer en leiding te gee rondom die aspekte van:

- Strategieë wat die departement se kliënte diens verbeter.
- 'n Strategie ondersteunende struktuur.
- Produktiwiteits-meetinstrumente.

Die eerste stap is om die veranderende behoeftes van die P&RS departement se kliënte (die myne) te beraam. Hierdie inligting word dan gebruik in 'n **SWOT** analise om die sterkpunte, swakpunte, geleenthede en bedreigings van die departement te bepaal.

Die tweede stap is die gebruik van 'n **Quad** analise om aanvals-, verdedigings- en verbeterings strategieë vir die toekoms te formuleer. Dit dui ook die kwesbaarheid en versoekinge aan wat deur die departement vermy moet word. Hierdie strategieë en aksieplanne vorm die basis van die voorgestelde veranderinge vir die departement se bestuurstruktuur.

'n Nuwe matriks struktuur word voorgestel wat sal verseker dat beide die tegniese vaardighede en nodige beheer daar gestel word om groter inter-

dissiplinêre projekte te bestuur. Verder word 'n fasiliteerder vir elke myn voorgestel met die oogmerk om nouer bande met die kliënte te vorm.

Projekspanne word ontbind na afloop van 'n projek. Die projek koördineerders, wat geselekteer word uit die projekbestuur funksie sal net tydelik aangestel word as leiers en die projek spanlede sal gekies word uit die verskillende dissiplines en onderafdelings. Die voorgestelde struktuur is dus 'n matriks struktuur met tydelike projekspanne. Hierdie struktuur bevorder desentralisasie van gesag na die funksionele bestuurders, projek koördineerders en die projek se spanlede.

Die laaste doelwit is om die effektiewe **metingskriteria** te vind wat die departementele bestuurders van inligting sal voorsien oor die doeltreffendheid van die departement.

Die aanbevelings wat gemaak word sal help om 'n meer effektiewe en kliënt georiënteerde P&RS departement te ontwikkel. Terselfdertyd sal die fokus op kostebestuur verseker dat die departement goeie besigheidsbeginsels en ondernemerskap kweek.

ENGLISH ABSTRACT

In 1997 Sasol Coal started a Renewal process that brought a renewed focus on attaining cost leadership in its mining operations. This brought about the restructuring of the Projects and Research department to complement this leadership strategy.

The first step is to assess and plan for the changing requirements of the department's clients (the mines). Each project represents a potential profit centre and therefore the financial viability of each project should be calculated and measured using Full Time Equivalent units as a base value.

The use of a Quad analysis helped to create offensive, defensive and improvement strategies and the action steps necessary to achieve them. It also indicated the vulnerabilities and temptations that should be avoided when setting up the strategies. The action steps taken from the Quad analysis formed the basis of the changes suggested for the department's management structure; therefore the structure followed the strategies.

The structure was organised along functional lines with a matrix structure used for reporting in projects. A facilitator for each mine was suggested in order to work more closely with the clients and to oversee the implementation and co-ordination of all the project work for that mine.

TABLE OF CONTENTS

ACKNOWLEDGEMENTS	ii
AFRIKAANS ABSTRACT	iii
ENGLISH ABSTRACT	vi
TABLE OF CONTENTS	vii
LIST OF FIGURES	x
LIST OF TABLES	x
DEFINITION OF TERMS	xi
CHAPTER 1 THE NATURE AND SCOPE OF THIS STUDY	1
1.1 INTRODUCTION	1
1.2 PROBLEM DEFINITION	2
1.3 BACKGROUND	3
1.3.1 The Department Under Study	3
1.3.2 The Present Situation	5
1.3.3 The Present Structure	6
1.3.4 The Strategic Planning Process	8
1.3.5 The Objectives of the Study	8
1.4 RESEARCH METHODOLOGY	9
1.4.1 Client Interviews	9
1.4.2 Internal Interviews	9
1.4.3 Strategic Planning Process	9
1.4.4 Literature Study	10
1.5 LIMITATIONS OF THE STUDY	10
1.6 STRUCTURE OF THE DISSERTATION	11
CHAPTER 2 LITERATURE STUDY	12
2.1 INTRODUCTION	12
2.2 ASSESSMENT OF A STRATEGY	12
2.2.1 SWOT-Analysis	12
2.2.2 Quad Analysis	13
2.3 ORGANISATION STRUCTURE	14

2.3.1	<i>The Traditional (Functional) Organisation</i>	15
2.3.2	<i>The Line-Staff Organisation</i>	17
2.3.3	<i>The Product or Strategic Business Unit (SBU) Organisation</i>	18
2.3.4	<i>The Matrix Organisation</i>	20
2.3.5	<i>Elements of Organisation Structure</i>	22
2.3.5.1	Complexity	23
2.3.5.2	Formalisation	24
2.3.5.3	Centralisation	24
2.3.6	<i>Five Factors That Affect Organisation Structure</i>	24
2.3.6.1	Strategy	24
2.3.6.2	Environment	25
2.3.6.3	Technology	25
2.3.6.4	Size	25
2.3.6.5	Power and Control	25
2.4	EFFICIENCY MEASUREMENT	26
2.5	FUNCTIONAL MODEL FOR EVALUATING P&RS	27
CHAPTER 3 EVALUATION OF THE P&RS DEPARTMENT		29
3.1	INTRODUCTION	29
3.2	R&D WITHIN THE COAL MINING INDUSTRY	29
3.3	R&D FUNCTION AT SASOL COAL	31
3.3.1	<i>Major Events that Influenced the Department</i>	31
3.3.2	<i>Major Decisions that Influenced the Department</i>	32
3.3.3	<i>Project & Research Services Profile</i>	32
3.4	ENVIRONMENTAL ANALYSIS (SWOT)	33
3.5	QUAD ANALYSIS	33
3.5.1	<i>Offensive Strategy Action Steps</i>	33
3.5.2	<i>Defensive Strategy Action Steps</i>	34
3.5.3	<i>Improvement Strategy Action Steps</i>	35
3.5.4	<i>Action Steps To Minimise Vulnerabilities</i>	36
3.5.5	<i>Action Steps to Minimise Temptations</i>	36
3.6	STRUCTURE ANALYSIS OF P&RS	37

3.6.1	<i>Functional Sub-Divisions of the P&RS Department</i>	38
3.6.1.1	Manager strategic development	38
3.6.1.2	Engineering and supplier services	38
3.6.1.3	Project management services	38
3.6.1.4	Special projects	39
3.6.1.5	Design services	39
3.6.1.6	Research Services	39
3.6.1.7	Workstudy and Quality	40
3.7	STRUCTURE EVALUATION	40
3.7.1.1	Complexity	40
3.7.1.2	Formalisation	40
3.7.1.3	Centralisation	40
3.8	SUMMARY	41
CHAPTER 4	CONCLUSION & RECOMMENDATIONS	42
4.1	CONCLUSION	42
4.1.1	<i>The P&RS Environment</i>	42
4.1.2	<i>The P&RS Structure</i>	43
4.1.3	<i>Efficiency Measurement</i>	45
4.2	RECOMMENDATIONS	45
4.2.1	<i>The Proposed P&RS Structure</i>	45
4.2.1.1	Project Teams	45
4.2.1.2	Functional Groups	46
4.2.1.3	Client Facilitators	47
4.2.1.4	Communication	48
4.2.2	<i>Efficiency Measurement Tools</i>	49
4.2.3	<i>Summary</i>	50
REFERENCES	51	
APPENDIX 1 - QUAD ANALYSIS RESULTS	53	
APPENDIX 2 – SASOL VISION & MISSION AND SASOL COAL VISION & CORE VALUES	60	

LIST OF FIGURES

FIGURE 2.1 THE QUAD ANALYSIS	13
FIGURE 2.2 THE TRADITIONAL ORGANISATIONAL STRUCTURE	16
FIGURE 2.3 THE LINE-STAFF ORGANISATION	18
FIGURE 2.4 THE PRODUCT OR STRATEGIC BUSINESS UNIT (SBU) ORGANISATION	19
FIGURE 2.5 THE MATRIX ORGANISATION	20
FIGURE 2.6 FUNCTIONAL MODEL FOR EVALUATING P&RS	28
FIGURE 3.1 THE SASOL GROUP OF COMPANIES	30
FIGURE 4.1 RECOMMENDED STRUCTURE FOR P&RS	46
FIGURE 4.2 SAMPLE PROJECT COMMUNICATION	48

LIST OF TABLES

TABLE 1.1. THE FIVE STRATEGIC PRINCIPLES OF THE RENEWAL PROCESS	5
TABLE 2.1 ADVANTAGES AND DISADVANTAGES OF THE FUNCTIONAL ORGANISATIONAL STRUCTURE	17
TABLE 2.2 ADVANTAGES AND DISADVANTAGES OF THE MATRIX ORGANISATION	21
TABLE 2.3 BASIC CONDITIONS FOR THE MATRIX ORGANISATION	22
TABLE 3.1 SWOT-CHART	33

DEFINITION OF TERMS

- **Coal mining:** All fields pertaining to the mining, transporting and handling of coal.
- **Contamination:** At Sasol Coal the mining of coal is mostly done with Continuous Miners (CM). The CM operator cuts into the roof and floor adding rocks and stones as contaminants to the coal. A renewal process objective is to reduce the percentage of the contamination to less than 2%.
- **Continuous Miner:** These remote controlled machines are responsible for cutting the coal at the coal face and therefore form the front line of Sasol Coal. They are the first link in the value chain and they represent a substantial capital investment.
- **Development:** The conceptualisation of an applicable research idea by building and testing prototypes that will have a positive value added effect on coal mining.
- **Environment:** The diverse conditions that, taken as a whole, influence the behaviour and development of the organisation.
- **Fines:** Transforming coal into petrol and chemicals uses coal particles of 6mm diameter or larger. The particles that are too small are called fines and can

only be used for the less profitable generation of steam. A renewal process objective is to reduce the percentage of fines to less than 28%.

- **FTE:** A Full Time Equivalent (FTE) is the equivalent of an employee working 8.25 hours a day or 2000 hours a year. All work can be relayed back to the amount of FTE time employees spend doing it. The renewal process set out to benchmark all the different jobs using FTE's and calculated the optimum human resource level for each mining section.
- **Organisation:** "An organisation is a consciously co-ordinated social entity, with a relatively identifiable boundary, that functions on a relatively continuous basis to achieve a common goal or set of goals" (Robbins, 1990:4).
- **Project:** "A series of related jobs usually directed toward some major output and requiring a significant period of time to perform" (Chase and Aquilano, 1995:484).
- **Project Management:** "Planning, directing and controlling resources to meet the technical/quality, cost and time constraints of a project" (Chase and Aquilano, 1995:485).

- **Renewal Process:** A reengineering and downsizing process, started in 1997 at Sasol Coal, driven by international consultants and top management in order to restore profitability.
- **Research:** Studying and discovering facts about new creative ideas or fields of knowledge that can be applied in accordance with the Sasol vision and mission.
- **R&D:** The combining of Research and Development.
- **Strategy:** "The pattern of actions and business approaches managers employ to please customers, build an attractive market position and achieve organisational objectives" (Thompson and Strickland, 1998:25).
- **Structure:** "Organisation structure defines how tasks are to be allocated, who reports to whom, and the formal co-ordinating mechanisms and the interaction patterns that will be followed." (Robbins, 1990:5)

CHAPTER 1 THE NATURE AND SCOPE OF THIS STUDY

1.1 Introduction

Sasol Coal has taken part in the mining, handling and transportation of coal for more than 40 years but over the past two decades was forced into funding and performing its own internal research and development (R&D). This came about because of a lack of R&D funding and focus on coal mining in the South African mining industry.

At Sasol Coal, the R&D function is incorporated within the Projects and Research Services department (P&RS). This department is responsible for all coal mining specific R&D as well as managing capital projects. The aim of this dissertation is therefore to undertake a study of a leading South African company's R&D department by investigating the environment, strategies and activities of this department.

Sasol Coal's declining profits brought on the renewal process in 1997 and this prompted the management of P&RS to perform a survey. From the survey results it became clear that the mines were dissatisfied with the department's service. The department set out to re-evaluate its strategic focus and to deliver a more refined and client orientated service.

This dissertation will attempt to supply a guideline of the strategic steps that should be taken by this department in order to help fulfil Sasol Coal's vision and mission. (See Appendix 2 for Sasol Coal's vision and mission). It will therefore assist the department in enhancing its service to its customers and

to become an integrated part of the Sasol Coal business plan. The objectives of the business plan can be stated as follows:

- Build a strategy for attaining customer satisfaction.
- Restructure the department to complement the strategy.

The first step will be to decide on strategies for attaining customer satisfaction and then the second step will be to change the structure of the department to follow the proposed strategies. The structure must therefore lend itself to the dynamics of the different functions within the department and help co-ordinate and channel all project and research work. The third step will be to find measurement criteria that will supply the department's clients feedback of the department's efficiency.

The goal of the proposed departmental structure modifications and the efficiency measurement criteria is to enable the department to operate efficiently and effectively. It must assist the department's management to lead and co-ordinate activities toward predetermined goals in a way that harmonises with the rest of the company.

1.2 Problem Definition

In order to survive and grow an organisation today must not only keep up with currently used technologies, but also invest funds and labour in an attempt to influence the rate and direction of technological change. This is done through research and development work, which can be divided into three main areas of activity:

- a) Basic research: devoted entirely to the creation of new knowledge.

- b) Applied research: carried out to achieve specific practical and/or commercial objectives.
- c) Development work: attempts to put research findings into practice.

The P&RS department will have to refocus on the above areas and set-up a road map for their future that is aligned with the Sasol Coal vision and mission. The following problem areas will be focused on:

- The requirement of the clients that use the services of the P&RS department needs to be assessed and planned for.
- There is no formal forum for employees to explain new or innovative ideas and it is very difficult to fund these pet projects.
- The benchmarking of R&D expenditure against mine managers expectations.
- For the department to be effective, it needs a measuring system to check the return on investment.
- The quality and quantity of R&D problems tackled per year.
- Creating an innovative environment in P&RS that includes creativeness and entrepreneurship.

1.3 Background

1.3.1 THE DEPARTMENT UNDER STUDY

Sasol Coal Division is a division of the Sasol Group of Companies (see figure 3.1). At present it is the only provider of coal to the two Sasol Synthetic Fuels plants at Secunda and the Sasol Chemical Industries plant at Sasolburg. The mines at Secunda form the Secunda Mines complex. There are the four underground mines: Brandspruit, Bosjesspruit, Twistdraai and Middelbult and

the Syferfontein opencast mine. The mines at Sasolburg consist of the Sigma underground and Wonderwater opencast mines. Together they produce a total of 45 million tons of coal per annum. This makes Sasol Coal the third largest coal producer in South Africa, after Ingwe and Amcoal.

The Projects and Research Services department of Sasol Coal started as a projects department in 1982 to help with projects like the opening of new or replacement mines. The department transformed over time to start managing and optimising very large projects and to be available and controllable within the SASOL Coal structure. The department has currently more than 50 members and consist of a workstudy group, projects department, special projects, research department, engineering and supplier services and design services.

The expertise within P&RS covers a wide range of technologies used in the coal mining process. This department handles basic research and development work on existing and possible future product and process enhancements. It also provides a technical service on problem areas for the mines.

A substantial part of the business comes from the project department, which is involved with the project management of capital projects. This section focuses more on applied research and the implementation of replacement mines and shafts. They also focus on the infrastructure necessary for the efficient operation of the mines.

1.3.2 THE PRESENT SITUATION

Sasol Coal has seen an economic downturn over the last 4 years with their relative profits dropping to an all time low in 1997 of less than R200 million. At the same time, the attributable earnings to the Sasol mother company shrank to around 5% and made Sasol Coal one of the worst investments in the Sasol group. The comparative cost and quality of the coal became so bad that the Sasol group stated that it could buy coal cheaper from the competitors' mines 30km to 100km away.

This became the burning platform for Sasol Coal's top management to start a renewal process with a turnaround strategy for Sasol Coal. This process is focused on the 5 strategic principles listed in Table 1.1 and all departments must adhere to them.

TABLE 1.1. The five strategic principles of the renewal process
Source: Internal document

Q	Quality	Less than 28% fines. Less than 2% contamination.
C	Cost	Reductions of at least 17%.
D	Delivery	50% of gap.
S	Safety	No injuries.
M	Morale	Highest morale possible.

With these objectives set, the P&RS department is facing an uncertain future. The P&RS clients are dissatisfied with the quality of service and the high cost. To them the department constitute an unnecessary overhead and forms part of the costs that must be reduced by at least 17%. The mines are willing to sacrifice this department for the short-term benefit of meeting their reduced budgets. At the same time, these objectives are also applicable to the P&RS

department and it therefore also needs to look at cutting its own cost and increasing its productivity.

1.3.3 THE PRESENT STRUCTURE

The structure (see figure 1.1) within the P&RS department is organised along functional lines with a matrix structure used for reporting on projects. The current structure has a double leadership because the manager of the P&RS department is going on pension in April 1999 at which time the strategic development manager would take over.

The activities of each section within P&RS are determined by the technological strategy of Sasol Coal as a whole. Three important aspects in this regard are:

- For production activities within the mines, the development of processes is of secondary importance, and technology is purchased whenever possible.
- The research and development effort will concentrate on those areas in which P&RS has a competitive advantage, for example as leaders in cutter drum and pick design.
- Knowledge must be developed in areas of purchased technology to enable the optimum usage of equipment.

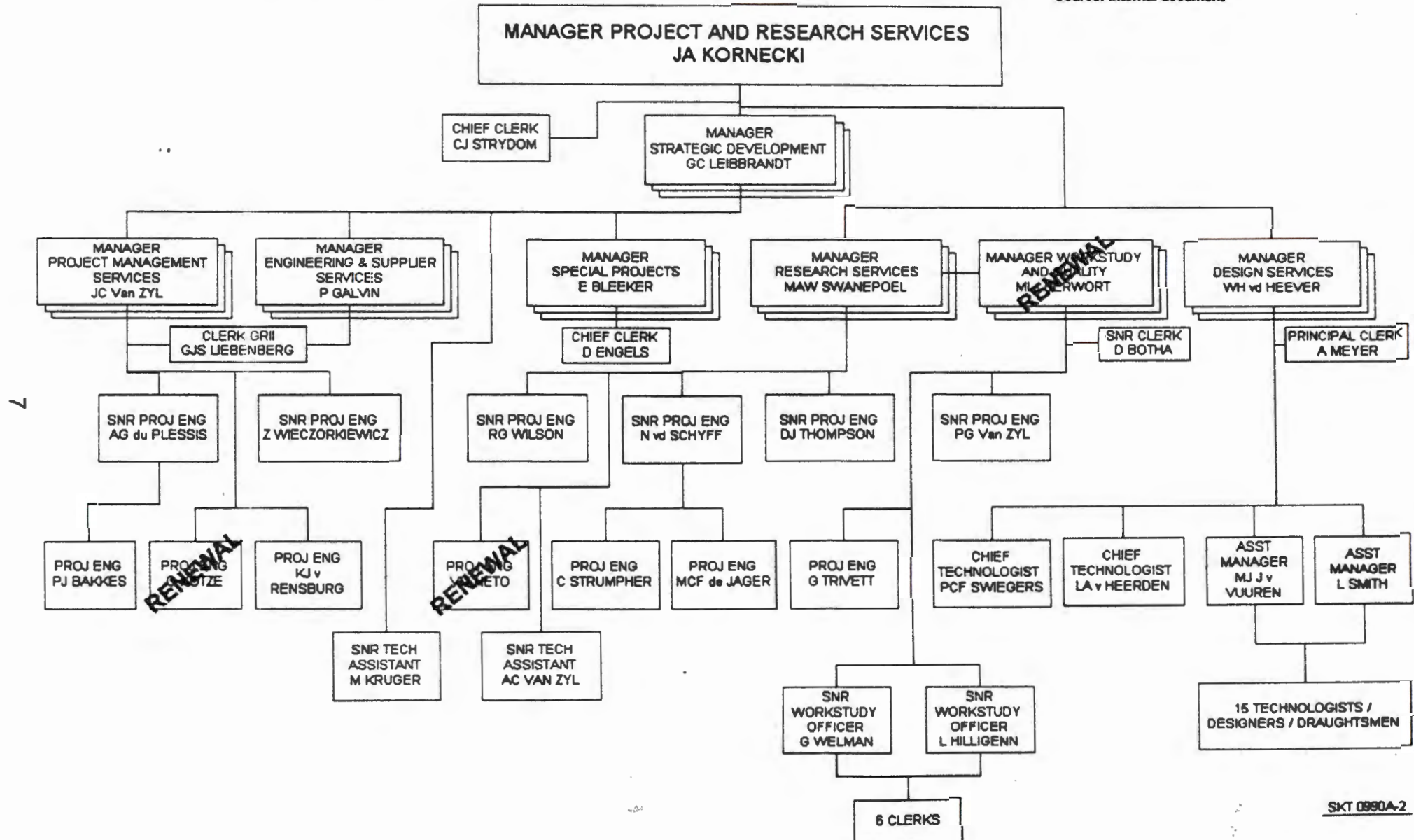
The co-ordination of project activities, especially across section boundaries, is important. In order to improve the co-ordination of projects, project managers were introduced. If a project is large enough or crosses several functional boundaries, it is subdivided into several sub-parts and tasks. In each case, a person is appointed as the responsibility holder for the planning and the

Figure 1.1

PROJECT AND RESEARCH SERVICES DEPARTMENT

12 October, 1998

Source: Internal document



execution of that particular project or sub-project. An in-depth examination of the current structure will be made in section 3.6.

1.3.4 THE STRATEGIC PLANNING PROCESS

The Strategic Planning Process was launched within P&RS in May 1998 with the purpose of conforming P&RS to the five strategic principles of the renewal process. Firstly, a brainstorming session was held in which participants considered the strengths, weakness, opportunities and threats of the department.

The following steps in the process will be the Quad analysis to formulate strategies and the appointment of teams to investigate the action plans and provide suggestions and methods for implementation of a business plan for P&RS. The relevant findings from the strategic planning process will be incorporated in Chapter 3 and 4.

1.3.5 THE OBJECTIVES OF THE STUDY

Although the Sasol group has a specific designated company that does its R&D namely Sasol Technology (Pty) Ltd, the Sasol Coal affiliate has its own R&D department. This was born out of the initiative Sasol Coal had to take to do a wide range of research projects and a need to rely on own resources and expertise. Therefore the major objective of this study is to find a supportive structure for an effective P&RS department that is devoted to obtaining, implementing, optimising and supplying technology for Sasol Coal.

The subsidiary objectives that will support this major objective will include:

- To determine the most important elements in the internal and external environments of the department.

- To determine the strengths, opportunities, weaknesses and threats facing the department and use them to formulate strategies.
- To optimise the formal organisational structure of the department.
- And to measure the effectiveness and co-ordination of activities of the department in the future.

1.4 Research methodology

The information for this study was obtained via a number of techniques:

1.4.1 CLIENT INTERVIEWS

A number of interviews were conducted early in 1998 by the top management of the department to determine the client requirements for a P&RS department. The results of these interviews will be used extensively as a guideline for the future.

1.4.2 INTERNAL INTERVIEWS

Interviews were conducted with the management of the department and senior people to gain opinions on a number of issues such as project co-ordination, work priorities and management.

1.4.3 STRATEGIC PLANNING PROCESS

As mentioned in section 1.3.4, this process was launched in May 1998 as a means to enable the department to examine the challenges facing it. The relevant results of these sessions will be incorporated in the study.

1.4.4 LITERATURE STUDY

A literature survey of the R&D function as well as organisation structure design was made. The theoretical aspects of both the macro and micro implications were researched, as well as the numerous factors influencing the effectiveness of a particular structure within a certain environment.

1.5 Limitations of the Study

Enterprises operate in a dynamic world in which the environment is ever changing. If this is combined with the fact that the coal mining industry is in the mature stage of its life cycle, it is not difficult to understand why this will lead to constant changes in organisation strategy. Therefore, the process of monitoring important elements and analysing the suitability of a business strategy and structure should be part of a continuous process.

The information supplied in this work, and the recommendations made, should thus be evaluated in their correct context, and the application of the recommendations made with the necessary caution.

The organisational structure and a feedback system is not the only variables that influence a department's efficiency and effectiveness but it is a good starting point for change and relatively easy to implement. Therefore, other important factors like the quality of P&RS's work and the level of skills and competencies in the department will not be dealt with in this dissertation. It is recommended that the strategic planning process address these and other significant factors in the proposed business plan for P&RS.

Finally, due to the sensitive nature of information obtained during the research on the P&RS department, limitations have been placed on the use of certain documents.

1.6 Structure of the Dissertation

Chapter 2 will contain the literature study. It includes work done on the macro and micro levels of structure development, as well as a study of the factors influencing the department's structure. Efficiency measurement formulas are proposed and a model for evaluating P&RS will be formulated.

In Chapter 3 the situation in the P&RS department is examined in depth. This analysis was done mainly by using interviews and the results of the strategic planning process. The factors influencing the strategy of the department are discussed, along with the effects this will have on the structure.

Recommendations, proposals for change and a summary of the analysis follow in Chapter 4.

CHAPTER 2 LITERATURE STUDY

2.1 Introduction

In section 1.3.4, the primary challenges in this study are stipulated. This chapter identifies how similar problems were addressed or solved in the literature. The result of this chapter will be a model for optimising P&RS in three areas namely: strategy, organisational structure and financial analysis.

2.2 Assessment of a Strategy

There is an extensive field of literature dealing with the formulation of strategy. The best known of these approaches is the use of the Strength, Weaknesses, Opportunities and Threats (SWOT) analysis. The SWOT analysis supplies an environmental overview from which decisions can be based for the formulation of strategies. A tool that helps to determine strategies from a SWOT is the Quad analysis and it uses the SWOT analysis results as the building blocks for strategies (see section 2.2.2).

2.2.1 SWOT-ANALYSIS

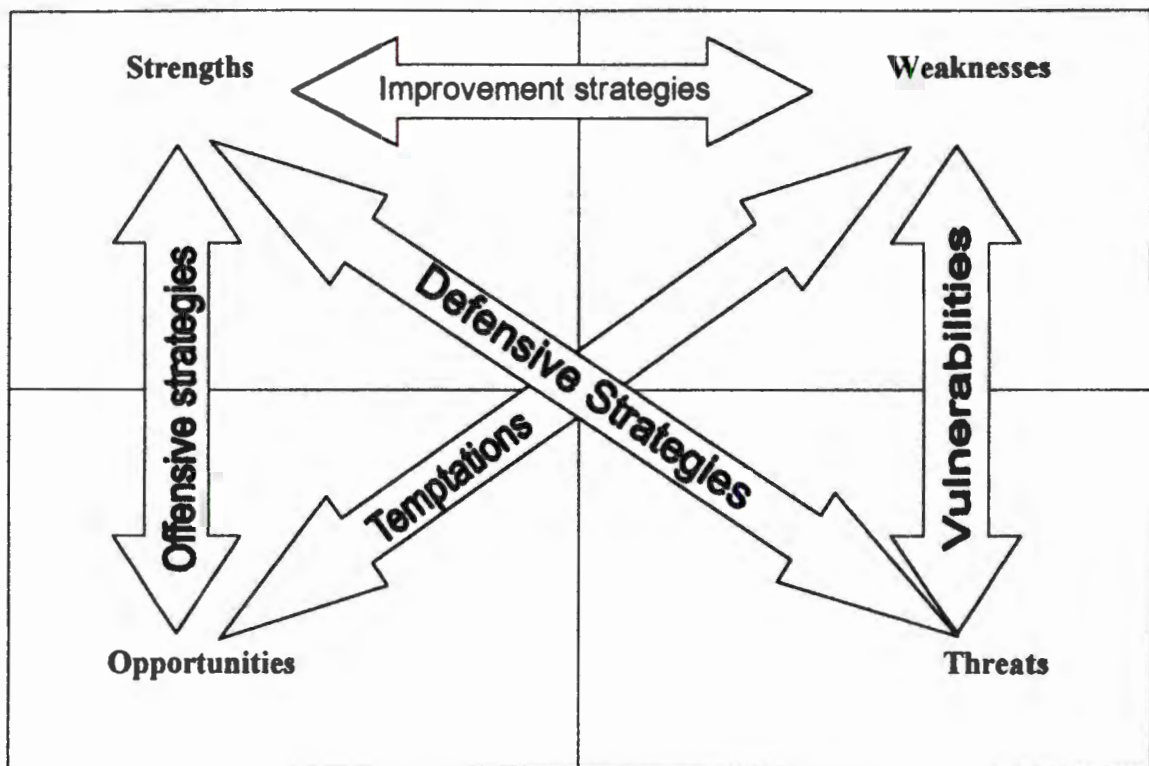
A SWOT analysis starts with a brainstorming session in which a group of participants supplies their interpretations of the department's internal Strengths and Weaknesses and the departments external Opportunities and Threats. This is consolidated and summed up into the most relevant and critical factors and placed in the Quadrants of a table called a SWOT-chart. See Table 3.1 for an example of a SWOT-Chart.

2.2.2 QUAD ANALYSIS

Van Veijeren (1994:68) explains the use of the Quad analysis as the formulation of strategic indicators, derived from the linkage of items in the four Quadrants of the SWOT-chart. The items in the SWOT-chart are prioritised and the most important items are linked by placing them in a table (see Appendix 1 for an example).

FIGURE 2.1 The Quad analysis

Source: Van Veijeren (1994:72)



Traditionally, the capitalising on opportunities, the avoiding of threats, the building on strengths and the improving of weaknesses lead to the development of strategies. Linking of the Quadrants as follows can strengthen the entire process of formulating strategies further into:

- **Offensive strategies:** This is the combination of the strongest competencies with the best opportunities. The best attack strategies lie in this area.

- **Defensive strategy:** These strategies are derived from linking skills with threats. Generally speaking, the resources applied to these strategies should be just enough to ensure that threats do not become significant in the long term.
- **Improvement Strategies:** By linking strengths and weaknesses, strategies can be formulated to improve the weaknesses and move them into positions of strength. This analysis usually results in strategies that can ensure long term growth.
- **Vulnerabilities:** Combining weaknesses and threats highlights the department's vulnerability in the present environment and in anticipation of the renewal process. The solution here is to improve the weaknesses and then to deal with the threats as a defensive strategy.
- **Temptations:** Situations to best be avoided may be identified by linking weaknesses with opportunities. A person may be tempted to include this in a strategy, but this is usually a dangerous option and one should steer away from these temptations.

2.3 Organisation Structure

The existence of formal organisation structures has been known to mankind for many centuries. In Exodus 18: 21-22 we read:

"... and appoint them over the people as officers over units of a thousand, of a hundred, of fifty and of ten. ... In this way your burden will be lightened, and they will share it with you".

It is only since the Industrial Revolution of the nineteenth century however, that significant attention has been given to this subject. At a macro-level there exists a variety of organisational forms in which enterprises can be structured and restructured. The forms that are applicable to P&RS will be discussed below, along with their advantages and disadvantages, and the factors affecting them.

2.3.1 THE TRADITIONAL (FUNCTIONAL) ORGANISATION

The traditional organisation, also known as a functional structure, has survived for more than a century. For companies with only one or two product lines, this organisation could provide satisfactory control and conflicts are kept to a minimum. As seen in figure 2.2, the general manager has beneath him all of the functional entities that are needed for the production of the organisation's products and services. The manager of each functional unit would hire a number of specialists to perform the tasks, and they would hire a number of specialists to perform their sub-tasks.

Both the formal and informal organisations are well established in this structure. For both organisational forms, the communication channels are well structured (each individual reports to one person only), and the levels of authority and responsibility are clearly defined.

From the P&RS point of view, the major disadvantages of this form of structure centre around the fact that there is no strong central authority

responsible for a total project in which a number of functional groups may participate, hence conflicts occur as each functional group struggles for power. Another disadvantage is high formalisation (see section 2.3.5.2 for an explanation of formalisation) because, in an effort to improve co-ordination of the flow of work between functional units; rules and procedures, planning processes, hierarchical referral, and direct contact are used as integrating mechanisms.

FIGURE 2.2 The Traditional Organisational Structure

Source: Steynberg, B. A. (1986:26)

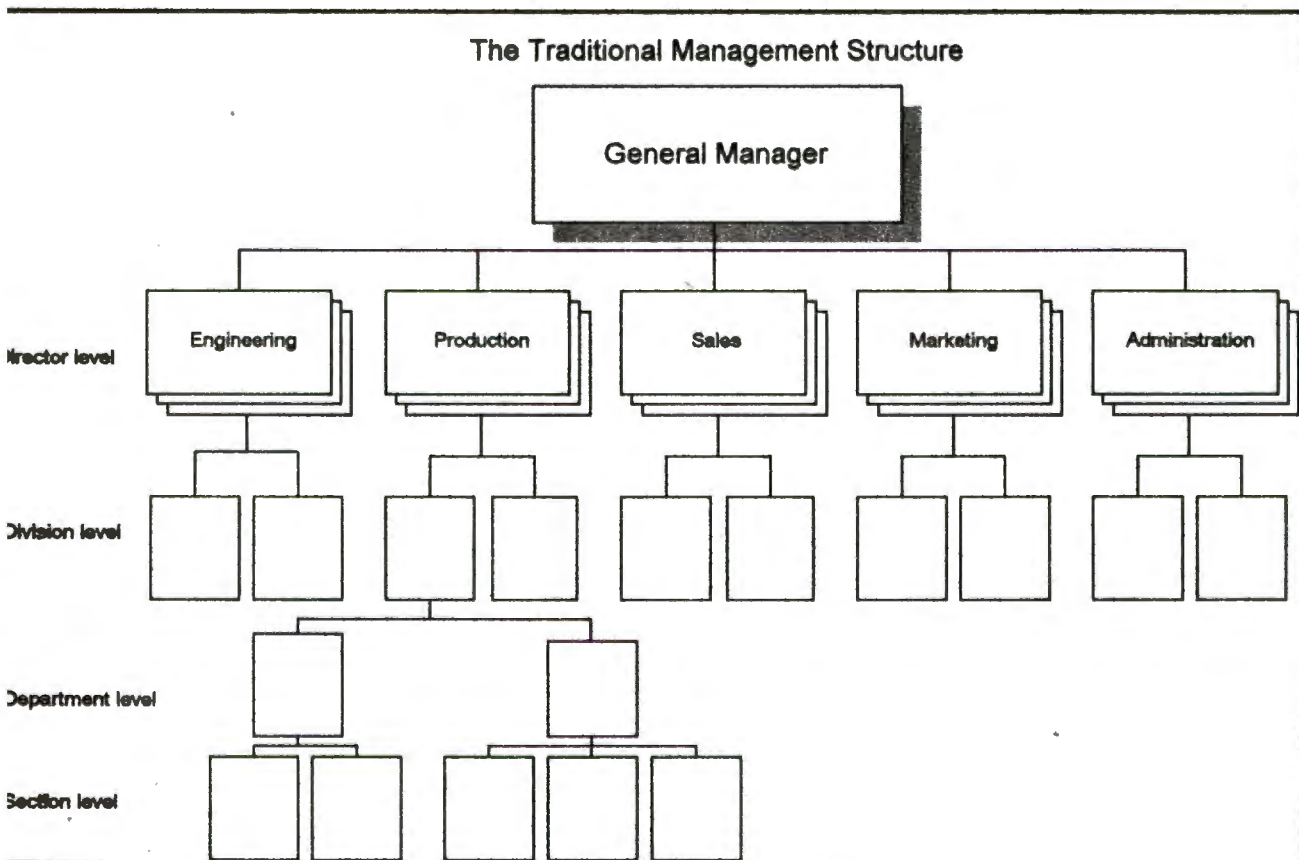


TABLE 2.1 Advantages and Disadvantages of the Functional Organisational Structure**Source: Steynberg, B. A. (1986:27) & Kotzé, J. G. (1998:15)**

	ADVANTAGES	DISADVANTAGES
1	Easier budgeting and cost control.	Response to customer needs is slow.
2	Better technical control. Specialists can be grouped.	Does not provide the project-orientated emphasis.
3	Permits centralised control and communication channels are vertical and well established.	Motivation and innovation are decreased and difficulty in pinpointing responsibility.
4	Provides continuity in the functional disciplines; policies, procedure and lines of responsibility are more easily defined and understandable.	Co-ordination becomes complex and additional lead-time is required for approval of decisions.
5	Provides good control over personnel since each employee has only one person to report to.	Decisions normally favour the strongest functional groups.

2.3.2 THE LINE-STAFF ORGANISATION

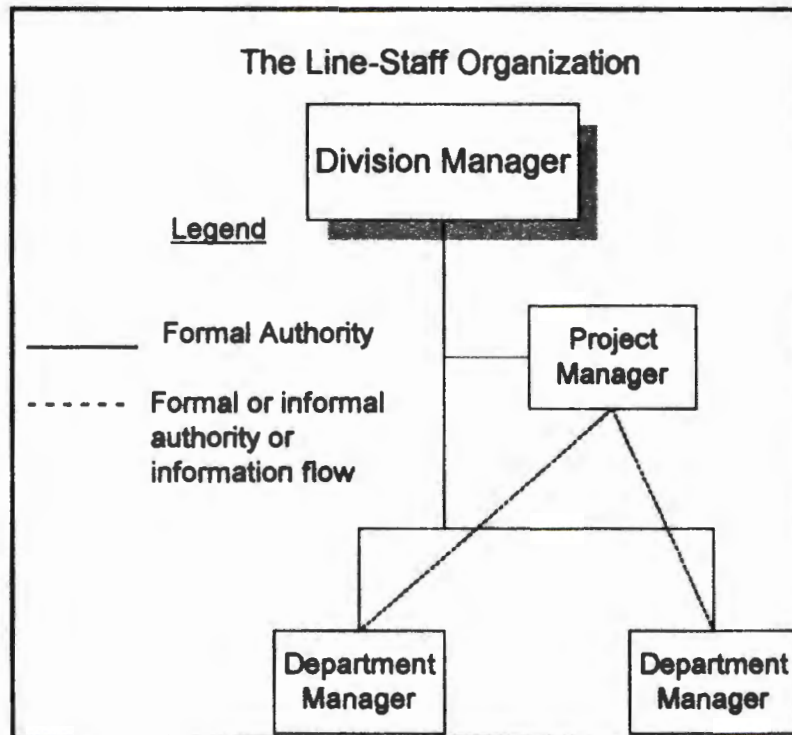
This organisational structure is a form of infancy stage of the matrix structure. The line relationship refers to persons, positions and components directly accountable for achieving objectives and with the authority needed for that purpose.

The staff position refers to individuals or groups in an organisation whose main functions are to provide a service, advice or counsel to the line function, or perform an auditing or monitoring function.

Usually the project manager would operate in one of two situations: He would serve only as a focal point for activity control or he would be given authority to assign work to individuals in the functional departments.

FIGURE 2.3 The Line-Staff Organisation

Source: Steynberg, B. A. (1986:28)



Problems can arise because of the fact that upper level management are not ready to cope with shared authority and that they are reluctant to relinquish power and authority to project managers. Another problem arises when line-staff project managers, who reported to a division head, do not have any authority or control over portions of a project in other divisions. For example: if the project manager in the mechanical engineering line could not direct activities in the civil engineering line.

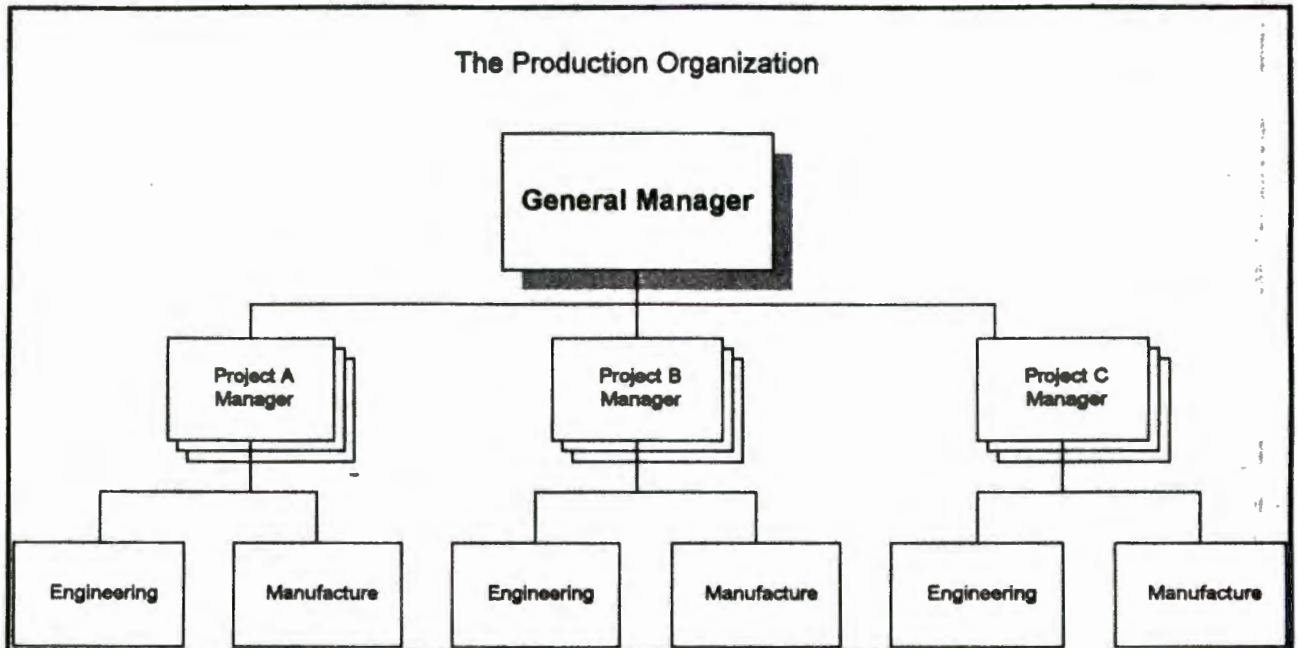
2.3.3 THE PRODUCT OR STRATEGIC BUSINESS UNIT (SBU) ORGANISATION

In the divisional-type structure, each division is accountable for a completed end product. The most common forms of divisionalisation are by product, service and geography. As can be seen in figure 2.4, this organisation structure tends to the development of divisions within a division. One person,

the project manager, now maintains complete line authority over an entire project. He assigns work and remains the ultimate responsible person.

FIGURE 2.4 The Product or Strategic Business Unit (SBU) Organisation

Source: Kotzé, J. G. (1998:16) & Steynberg, B. A. (1986:29)



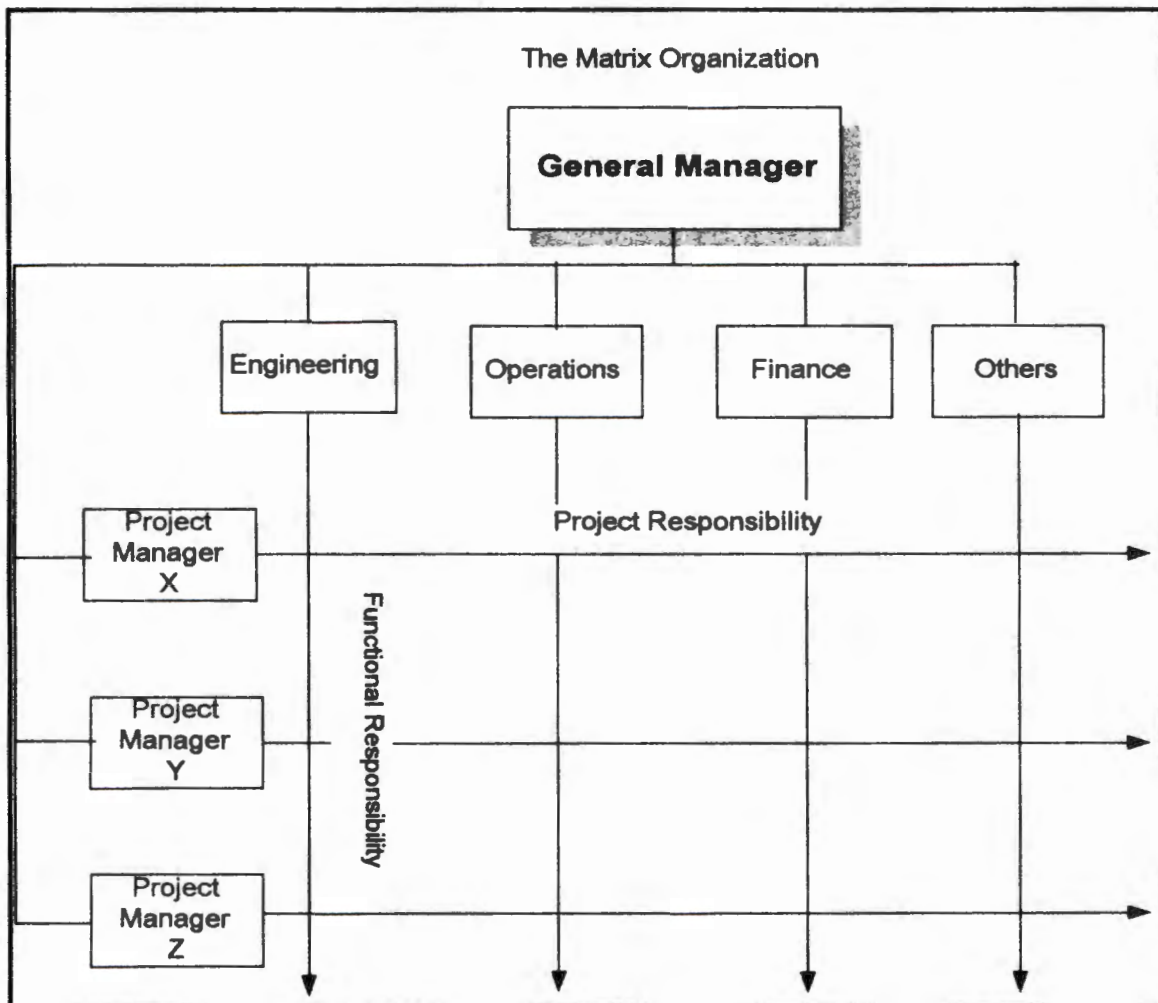
Because each individual reports to one-person only, strong communication channels develop and reaction times become rapid. As the project manager handles all conflicts both internal to his division and external with other projects, upper-level management can now spend sufficient time on executive decision-making rather than conflict arbitration. Functional managers are able to maintain qualified staff for new product development without sharing personnel with other programs and projects.

The major disadvantage of this structure is the cost of maintaining the organisation as staff are not shared between projects and are usually attached to the projects long after they are actually needed. Another major disadvantage can arise when more than one project requires the same equipment. If this occurs, upper level management has to set the priorities.

2.3.4 THE MATRIX ORGANISATION

FIGURE 2.5 The Matrix Organisation

Source: Steynberg, B. A. (1986:30) & Kotzé, J. G. (1998:17)



This form attempts to combine the advantages of the pure functional structure and the SBU organisational structure. In the matrix organisation, an attempt is made to give equal stature to the set of functional (resource) groups on the one side of the matrix and to the set of project or business units on the other. This organisational form is depicted in figure 2.5.

Each project represents a potential profit centre. The project manager has total responsibility and accountability for the project success, and his power and authority derives directly from the general manager. The functional

departments have the functional responsibility to maintain technical excellence on each project while their members are shared between projects.

TABLE 2.2 Advantages and Disadvantages of the Matrix Organisation

Source: Kotzé, J. G. (1998:17)

	ADVANTAGES	DISADVANTAGES
1	The project participants work directly for the project manager and have loyalty to the project.	Tendency to retain personnel on a project long after they are redundant.
2	Strong communications channels.	Complex to manage.
3	Upper level management maintains more free time for executive decision-making.	Hard to maintain the balance between two lines of authority.
4	Very rapid reaction time.	Difficult to move quickly without clearance from many people.

In most other structures, each individual reports formally to one boss only, in the matrix structure the team members on a project report both to the project leader and to their functional manager. Although this might appear problematic, no confusion or conflicting orders should be issued to the team members as long as the areas of authority and responsibilities of each manager are clearly defined.

The basis for the matrix approach is an attempt to create synergy by providing project and functional managers with shared responsibility for a project. Continual negotiation between the two types of managers is thus essential if they are to share the authority, responsibility and accountability on each project.

Kotzé (1997:48-51) warns that three conditions should be present before a matrix organisational structure can be implemented. If all three conditions in

table 2.3 are not present simultaneously, the advantages of a matrix structure will be lost to the disadvantages.

TABLE 2.3 Basic Conditions for the Matrix Organisation

Source: Kotzé, J. G. (1998:48-51)

Condition 1	Pressure for a dual focus.	There must be two or more critical sectors, functions, products, etc that are seen as equally important.
Condition 2	Pressure for high information processing capacity.	Each person will perform uncertain, complex and interdependent tasks containing high volumes of information.
Condition 3	Shared and flexible use of scarce human resources.	High-pressure to achieve economics and capital of scale in human terms, as well as physical facilities.

The matrix can provide flexibility through rapid response to changes, conflicts and technical expertise. The main disadvantage is that it is an unstable system and conflict is inherent in a dual management structure.

2.3.5 ELEMENTS OF ORGANISATION STRUCTURE

Organisational design is the division of the organisation's labour into a number of distinct tasks and the co-ordination of all these tasks to accomplish the organisation's mission in a unified way.

The starting point for any structure design is the analysis of the organisation's objectives. These objectives can be regarded as targets that must be reached if the organisation is to achieve its goals. It is these objectives which determine the extent of the organisation's operations and the level of importance given to different dimensions of the organisation structure.

Implied in organisation design are accordingly, factors such as the formal structure for effective interaction with the environment (like planning, control and information systems that ensure efficient use and allocation of all resources) and co-ordination and leadership to ensure that all tasks are accomplished and the goals met. The co-ordination of all efforts towards the achievement of the organisation's objectives is maintained through the communication process, work flow and decision-making processes. We define an organisation's structure as having three components: complexity, formalisation and centralisation. An organisation's structure can be described by the degree to which it deals with these three components.

2.3.5.1 COMPLEXITY

The division of labour of the total workload of the organisation is achieved through job specialisation. Specialised division of labour allows people to sharpen skills and become expert at their individual job functions and this increases the productivity of the organisation.

Complexity therefore, refers to the degree of differentiation that exists within an organisation. There are three types of complexity:

- **Horizontal differentiation:** refers to the degree of differentiation between units based on the members, the nature of the tasks they perform and their education.
- **Vertical differentiation:** refers to the depth in the structure (the hierarchical levels). This is driven by the span of control or rather, the number of subordinates that a manager can manage effectively.

- **Spatial differentiation:** refers to the degree to which the organisation is dispersed geographically.

2.3.5.2 FORMALISATION

Formalisation refers to the degree to which jobs within an organisation are standardised. This includes the written regulations in the organisation and the degree to which they are spelled out and enforced. Formalisation differs greatly between levels in an organisation and whether jobs are unskilled, stable, repetitive or professional. Types of formalisation are rules, rituals, procedures, training and policies.

2.3.5.3 CENTRALISATION

Centralisation can be described as the degree to which the formal authority is concentrated in an individual, unit or level (usually high in the organisation) in order to make discretionary decisions, thus permitting employees (usually low in the organisation) minimum input into their work.

2.3.6 FIVE FACTORS THAT AFFECT ORGANISATION STRUCTURE

2.3.6.1 STRATEGY

Strategy creates a unified direction for the organisation in terms of its many objectives, and it guides the deployment of the resources used to move the organisation toward those objectives. The impact of strategy on structure consists of three parts:

First; strategy determines the organisational tasks and how the lines of authority and channels of communication are set up between managers and sub-units. This influences the flow of information, as well as the mechanisms

for planning and decision-making. Secondly; strategy influences the resources by determining the choice of technology and the appropriate people, the product-market area and therefore resource development and allocation. Finally; the strategy will determine the specific environment within which the organisation will operate.

2.3.6.2 ENVIRONMENT

Although the effects of the present structure and value systems, culture and climate and management style are important factors for consideration in the design process, the internal environment should not be over-emphasised. The influence of the broader environment can be felt through the attitude of the public or through laws governing aspects such as pollution.

2.3.6.3 TECHNOLOGY

A number of research studies have confirmed that an organisation's tasks and technologies are major determinants of its structure. Technology lowers the complexity by making the work easier and it lowers formalisation by making the work routine.

2.3.6.4 SIZE

As organisations increase in size the main effect on structure are the greater division of labour and thus more functional departments.

2.3.6.5 POWER AND CONTROL

Robbins, (1990:238) stated that although strategy, size, technology and environment can explain 50 to 60 percent of the variability in structure, a

substantial residual variance can be explained by the power-control variable. This means the people in control of an organisation will choose a structure that will maintain and enhance their power and control.

2.4 Efficiency Measurement

The need to quantify what is done with R&D funds and how effectively this is spent will be addressed in this section. The focus is to look for formulas that will help supply feedback to P&RS management on their effectiveness. In the literature a lot of different methods are used in a wide variety of industries to calculate efficiency, but when it comes to measuring R&D effectiveness in the mining industry very little information is available. For this reason the formulas proposed in this section will be modified in section 4.2.3 to be better suited for the P&RS environment.

Using the ratio of R&D expenditure per employee, a very strong correlation between R&D and subsequent profit margin is observed by Morbey and Reithner (1990:11-14). They also showed that investment in R&D per employee at a greater rate than the competition would usually result in higher employee productivity than the competitors. This ratio can be measured with the following formula:

$$1) \quad \text{R\&D per employee} = (\text{Sales per employee}) \times (\text{R\&D expenditure} / \text{Sales}).$$

$$\text{Which is equivalent to} = (\text{Productivity}) \times (\text{Research Intensity}).$$

When Lee, Son and Lee (1996:28-31) set out to measure R&D effectiveness in Korean companies they measured input, throughput, output and outcome of

the R&D department with 15 criteria. However, the most applicable of these, to P&RS, is the way they measured the effective outcome of R&D expenditure as:

2) Outcome effectiveness = $\frac{\text{The actual increase in profit}}{\text{Expected increase in profit}}$

Werner and Souder (1997: 36) state that they measure R&D effectiveness by using quantitative metrics frequently reported in literature. They propose three formulas:

3) R&D effectiveness index = $\frac{\text{Revenue from products or processes introduced in the last 3 years}}{\text{Total R\&D cost}}$

4) R&D innovation index = $\frac{\text{Revenue from products or processes introduced in the last 3 years}}{\text{Total Revenues}}$

5) R&D quality index = $\frac{\text{The number of R\&D products and services produced that meet customer needs}}{\text{number of customer needs}}$

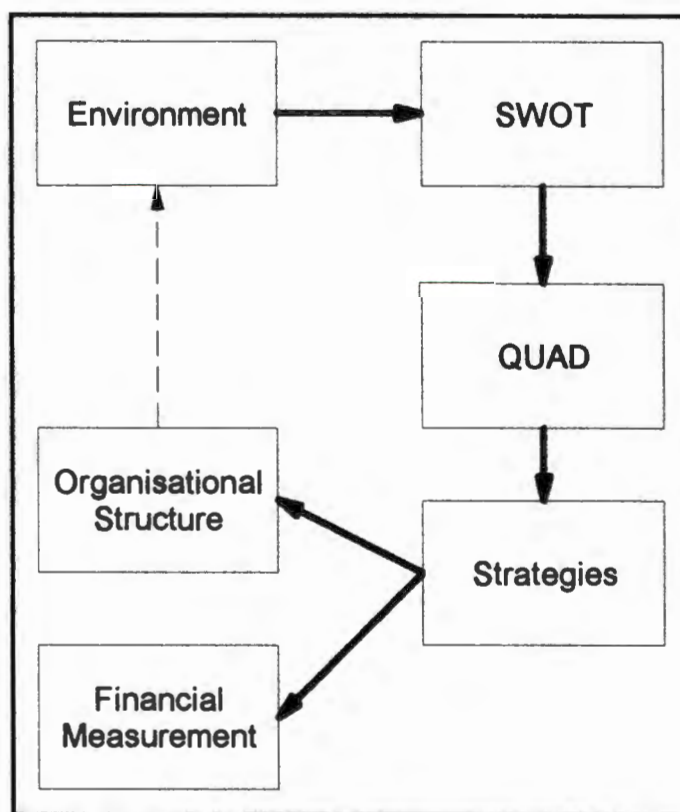
It is important to choose ratios that are relevant and easily applicable and that will give meaningful results. Although the above formulas provide only a limited view of R&D effectiveness they should be effective as a starting point for P&RS to gain feedback.

2.5 Functional Model for Evaluating P&RS

From the literature study a model for evaluating P&RS are derived and proposed in figure 2.6. Numerous factors give rise to the attributes of the

organisation's external environment that influence the strong and weak points as well as the opportunities and threats. These attributes in turn have an impact on the strategies of the organisation and they determine the organisational structure. Structure in turn influences the environment making it a closed loop system.

FIGURE 2.6 Functional Model for Evaluating P&RS



Therefore, a close link exists between strategy, environmental attributes and structure. The strategy according to the environment in which an organisation operates, determine the type of structure required for each organisation and as the environment is dynamic both the strategies and structure will change over time.

With the background information taken from this literature study and according to the model showed in figure 2.6, the P&RS department will be evaluated in Chapter 3 and recommendations made in Chapter 4.

CHAPTER 3 EVALUATION OF THE P&RS DEPARTMENT

3.1 Introduction

In this chapter the present situation in the P&RS department is analysed. The analysis follows the steps in the model in figure 2.6. The relevant information needed on the P&RS department was obtained from interviews and the results of the strategic planning process initiated in the P&RS department.

3.2 R&D Within the Coal Mining Industry

R&D are not commonly developed in a coal mining company. The usual approach is to utilise centralised or government-driven research, but these usually cater for the industry and not for an individual coal producer's specific requirements.

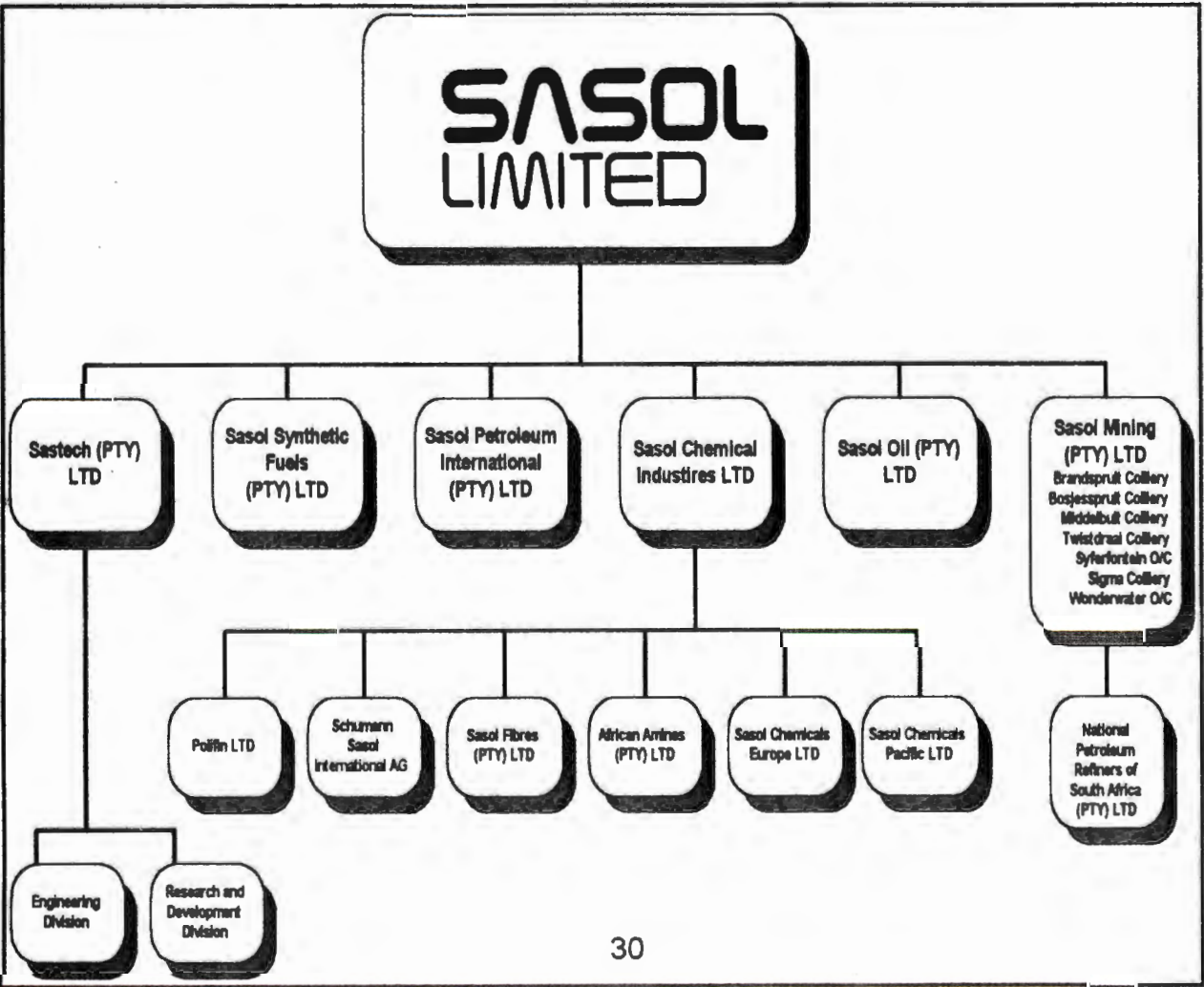
The Chamber of Mines Research Organisation (COMRO) and some projects done by universities were until recently the only institutes in South Africa that worked on R&D. The research projects were predominantly focused on the gold mining industry, which was also largely the biggest supplier of funds. Ironically, the coal mining industry, which is much more technologically advanced, was always neglected. COMRO was integrated into the Council for Scientific and Industrial Research (CSIR) in the late 1980's with the aim of providing a more customer focused approach. However, very little of this realised for the coal industry.

It is for this reason that Sasol Coal has never been a full-time member of COMRO or the CSIR. Every company needs to have a strong R&D program

to be able to develop technologies to beat its rivals. To ensure a competitive advantage in the coal-mining sector, Sasol Coal has opted to establish its own in-house R&D facility.

It is important to evaluate the role of the Sastech division at this stage. (See figure 3.1). Sastech's objective is to provide an R&D, engineering and project management service to the Sasol group and employs about 300 highly educated and qualified people for this purpose. In addition, they provide the development of new unique processes as well as the supply of engineering services and project management to the Group (excluding Sasol Coal). Sastech does not provide R&D services to Sasol Coal as their main focus is the improvement of existing chemical processes at Sasol.

FIGURE 3.1 The Sasol Group of Companies
Source: Internal Sasol Coal document.



3.3 R&D Function at Sasol Coal

Sasol Coal's suppliers were not prepared for the extreme South African coal cutting conditions. Most of the technology available was based on coal mining conditions in the USA, the UK and Europe and alternative solutions had to be found. In-house R&D had to be done because the original equipment manufacturers of the continuous miners (see definition of terms) were not able to come up with workable solutions.

Early in 1980, Sasol Coal's engineers started to develop a continuous miner for South African conditions in partnership with Joy Manufacturing, the world's leading manufacturer of coal mining machines. This resulted in a breakthrough on cutter drum design and formed the basis for further R&D and the initiation of Sasol Coal's own R&D department within the project services department.

In 1991, a number of concurrent events at Sasol Coal opened up new avenues for the Project Services Department, which subsequently influenced the change of the title of the department in that year to P&RS.

3.3.1 MAJOR EVENTS THAT INFLUENCED THE DEPARTMENT

- Sasol Coal's ability to comply with Sasol Synthetic Fuel's coal demand changed from an under to an over supply.
- The emphasis changed from coal at "any" cost, to coal at the most economical cost.
- Sasol Coal started benchmarking against other mining houses and this brought a focus on the reduction of its total process costs.

- Changes in the senior management structure brought changes in strategy.

3.3.2 MAJOR DECISIONS THAT INFLUENCED THE DEPARTMENT

- A change in strategy forced the centralisation of the long-term planning function. (This function, done by the various underground mines, was transferred to P&RS. For P&RS, this move meant better access to vital information required for long-term projects).
- The project function was centralised. Previously each mine did its own ad-hoc projects.
- P&RS had to formulate a strategy in order to contribute to the accomplishment of operational objectives set for Sasol Coal.
- The use of external consultants had to be limited by expanding the design capacity in the department and to find opportunities to do bigger projects at lower costs with its own expertise.

3.3.3 PROJECT & RESEARCH SERVICES PROFILE

P&RS is the only group in Sasol able to offer bulk materials handling consultancy as well as providing a professional service in design and project management specialising in power reticulation, infrastructure and control and telemetry systems.

P&RS is the only department in the Sasol group that can do mining related projects, provide workstudy services to the mines and provide a professional engineering service to Sascoal Engineering (an engineering works owned by Sasol Coal).

3.4 Environmental Analysis (SWOT)

The SWOT analysis has been reduced to only the three most important variables for each quadrant, otherwise the amount of combinations and permutations would make the Quad analysis inflated and repetitive.

TABLE 3.1 SWOT-Chart

Source: Internal document

<u>Strengths</u>	<u>Weaknesses</u>
1 P&RS are familiar with the Sasol internal environment.	1 Business plan not in line with company strategies.
2 Specialist expertise and service.	2 Insufficient business principles of which one is a lack of focus on clients requirements.
3 Applied R&D capability.	3 Lack suitable managerial and technical systems.
<u>Opportunities</u>	<u>Threats</u>
1 Renewal project.	1 External competition to P&RS.
2 Cost reduction projects underground.	2 Short term pressure on cost cutting.
3 Synergy between P&RS and other consultants and companies.	3 Availability of technically competent replacement staff.

3.5 Quad Analysis

The full Quad analysis will be shown in Appendix 1. However the results from the Quad analysis were used to create the following action steps for the different strategies.

3.5.1 OFFENSIVE STRATEGY ACTION STEPS

- Dedicate a P&RS facilitator to the renewal team to build on existing relationships and advertise our expertise and to make the renewal team aware of P&RS's services and skills.

- Accept renewal team challenges and help to identify cost saving projects by identifying costly procedures, processes, and equipment and find alternatives to them.
- Use workstudy monitoring to highlight problem areas and concentrate on projects that improve the operation and implementation of new technology.
- Identify P&RS resource shortages, look for external companies with these available resources, and apply networking to provide a total project management service.

3.5.2 DEFENSIVE STRATEGY ACTION STEPS

- Focus on P&RS' ability to make a fast head start (not having to first learn how Sasol "works") and apply this to all action steps.
- P&RS to develop its own marketing strategy to market P&RS' skills, abilities and expertise to clients to let the right people know of our successes. The department should also develop market intelligence to learn more about the competition.
- Proactively identify client needs and utilise own expertise to identify areas where cost can be reduced and prove to the clients that we can solve their cost-problems. Find out what the client requires to move away from the general perception of being "overheads".
- Show top management that P&RS is worth more to Sasol than the cost of having the department by quantifying the value of R&D projects and concentrating on projects that will reduce costs in the short term.
- Motivate P&RS staff by giving recognition and support to ensure that technical staff has a feeling of belonging in the department. Share

knowledge and experience with colleagues and become an efficient team.

3.5.3 IMPROVEMENT STRATEGY ACTION STEPS

- Develop the new business plan as soon as possible with inputs from all role players (top management, clients, consultants and P&RS personnel) and make sure it conforms to Sasol Coal long-term strategies. The elements of sound business practice should become an integral part of P&RS by improving work ethic and focus on clients' requirements. The business plan should convince the right people that P&RS focuses on their clients' requirements by quantifying and reporting benefits achieved.
- Re-evaluate resources required (on current R&D projects) and see that they fulfil the clients' requirements and company objectives in relation to company strategy.
- It is very important that research, development, implementation and control should be seen as a package. Therefore actively and objectively provide consultation and offer complete solutions.
- Get close co-operation with clients by speaking to first line supervisors. Give feedback to them regarding process bottlenecks and possible solutions and meet their requirements of cost, time and quality.
- Form "project teams" with experienced P&RS personnel to evaluate existing systems and design practical alternatives. Discuss project problems with experienced P&RS personnel and make use of formal and informal training to teach members the management of technological innovation.

3.5.4 ACTION STEPS TO MINIMISE VULNERABILITIES

- The business plan must work within the company's guidelines and include marketing, knowledge of the competitors, long and short term cost reduction strategies, value-adding strategies, and contingency plans. Advertise the new business plan to clients and have a formal well-structured plan before the renewal process reaches P&RS.
- Assume that the renewal team will have the same perception as our mining clients of P&RS being an overhead; therefore advertise P&RS's new business plan to the renewal team. Dedicate representatives to the renewal team meetings to change their perceptions by proving that P&RS is worth more than its costs by advertising major cost saving projects.
- Prove that P&RS should continue to exist by playing a major role in the renewal process.
- Initiate a training program to learn about the applicable business principles, or acquire the services of a competent facilitator to help us compile the business plan.

3.5.5 ACTION STEPS TO MINIMISE TEMPTATIONS

- Do not expect to make a large impact on the renewal team without a proper business plan. Therefore, identify insufficient business principles that have to be developed further beforehand.
- Advertise and present our business plan to the renewal team to propagate P&RS commitment to company strategies and make sure it addresses the company mission and strategy.

- Ensure that client requirements are clearly understood, through close co-operation on the mines and know the underground environment and its problems.
- Improve our service with in-time feedback of project progress and by confirming requirements. Only take up projects where P&RS have the available experience.
- Synergy is required between P&RS members; make sure experience is passed on inside the department.
- Never lose focus on the need for Sasol Coal to continuously improve.
- P&RS must maintain preferred supplier status in all disciplines. Do not allow P&RS's competitors to be more focused on the requirements of the mines than P&RS is.

3.6 Structure Analysis of P&RS

The structure within the P&RS department must be changed to handle the large number of action steps that was determined by the P&RS strategies. The structure should incorporate lines of authority and communication between projects co-ordinators and the project workers, and between the project leaders and top management. This will ensure that management will be aware of the expertise of all employees, and that employees will know of the progress made in different projects (so they do not re-invent the wheel).

Make sure a friendly, pleasant atmosphere is maintained; that innovation, creativity and participation are encouraged; and objectives and instructions are communicated and understood. P&RS should be a team effort.

3.6.1 FUNCTIONAL SUB-DIVISIONS OF THE P&RS DEPARTMENT

The current organisation structure of P&RS is shown in figure 1.1. The units marked with the word “RENEWAL” are people that have been temporally moved to help with the renewal process and that would reclaim their position at the end of the process. The purposes of the functional divisions are described below.

3.6.1.1 MANAGER STRATEGIC DEVELOPMENT

This is the latest addition to the organisational structure. The purpose of this position is to manage the engineering functions for new development and expansion projects that are of strategic importance to Sasol Coal. As mentioned in chapter 1, this position will fall away when this manager takes over from the retiring manager of P&RS.

3.6.1.2 ENGINEERING AND SUPPLIER SERVICES

This sub-division conducts in depth investigations into essential suppliers. It executes techno-economical analyses of problems with production equipment, creates and manages a database on most important equipment and components, provides technical requirements and compiles equipment specifications. It also carries out inspections of equipment manufacturing and repairs and compiles quality procedures for manufacturing, refurbishing, and modifications to mining equipment.

3.6.1.3 PROJECT MANAGEMENT SERVICES

This sub-division manages projects over a wide range of magnitudes, from the very small to multi-million Rand projects. These projects are executed in

close collaboration with the other sub-divisions of the department, which entails a fully integrated project management service. This includes identification of problems, development of requirements, development of alternative solutions, proposals for rectification of problems, cost estimates, pre-feasibility and feasibility studies, scope of work, design and development, scheduling of execution, post-mortem analysis and the substantiation of designs and modifications.

3.6.1.4 SPECIAL PROJECTS

This sub-division investigates and executes critical projects of a very specialised nature. These projects also range from small to multi-million Rand projects.

3.6.1.5 DESIGN SERVICES

The major function of this sub-division is to provide a design and draughting service, mainly for the P&RS, but also for the rest of Sasol Coal on request. Depending on the size and amount of projects, they hire in contractors on an ad-hoc basis to cope with the workload.

3.6.1.6 RESEARCH SERVICES

This is one of the major sub-divisions of the department and it specialises in the research in the following fields of expertise:

- Mechanical, Electrical and Electronic engineering.
- Bulk materials handling.
- Standardisation and optimisation of equipment.

This department does continual research and development on the improvement of coal quality, such as the reduction of coal fines, measuring equipment for ash content and blending of coal on the coal stockyards.

3.6.1.7 WORKSTUDY AND QUALITY

This section also resides under the Research Services sub-division. Their main function is to carry out time and method studies and to improve productivity, and to investigate, test and develop various operations to reduce operating cost. They also carry out coal sampling exercises to improve the quality of coal and evaluate and assist in the development of incentive schemes to optimise people performance.

3.7 Structure Evaluation

3.7.1.1 COMPLEXITY

The department has a high degree of horizontal differentiation, while at the same time, there is a low degree of vertical and spatial differentiation. This gives the organisational structure a wide and shallow pyramid form.

3.7.1.2 FORMALISATION

The department has a low level of formalisation. This is due to the fact that all the employees of the department are highly skilled and educated to work on a wide variety of projects under their own responsibility.

3.7.1.3 CENTRALISATION

Most decisions are decentralised with the responsibility of the project residing with the project manager. Decisions relating to the functional groups are taken by each group's manager and are therefore also decentralised. The centralisation of the department are thus low.

3.8 Summery

In Chapter 2 it was found that a close link exists between strategy, environmental attributes and structure. In this Chapter the P&RS department was evaluated according to the model proposed in figure 2.6.

The changing environment was inspected as well as the reason that lead to the creating of a Projects and Research department at Sasol Coal. The environment was assessed by using the SWOT analysis and from this the strategies for the future was concluded using the Quad analysis method.

The next step was to analyse the organisational structure and the functional groups in the department. From the evaluation it became clear that the department delivers a wide spectrum of services resulting in a high level of complexity while at the same time the levels of formalisation and centralisation are low leaving authority and decision making to employees rather than management.

CHAPTER 4 CONCLUSION & RECOMMENDATIONS

4.1 Conclusion

It can be concluded that the R&D function at Sasol Coal was born out of a need to rely on own resources and expertise to fulfil the company's objectives. In order to produce the required quantities of coal at the right time and at the right costs, Sasol Coal had to take the initiative to do a wide range of research projects and thus the Project & Research Services Department was formed.

4.1.1 THE P&RS ENVIRONMENT

The department has the privilege of having a captive client base, but new strategies brought about by the renewal process, forced P&RS and its clients to re-evaluate its position. The environment can now be defined as turbulent, diverse and technically complex but not particularly hostile or restrictive. Other important environmental issues are:

- The Sigma mine in Sasolburg is far removed from the P&RS department and this can cause delays and a loss of communication. Although P&RS is situated near the Brandspruit mine, it is far removed from the other mines in Secunda. Despite this fact, a geographically dispersed structure will not be considered because of its higher cost and the fact that it will result in the loss of internal communication.
- The existing method of project handling is effective and project co-ordination and scheduling are well executed. For this reason, the functional departments will stay as they are in the present structure.

- The P&RS staff are highly qualified professionals, people who can work independently, display high needs for achievement and enjoy challenges. It is thus essential that the structure of the department takes into account the need for freedom (in order to allow innovative and creative thinking) and the need for achievement and recognition. Opportunities exist to broaden the scope of expertise offered by the department by using external people and companies on a contract or consultant basis.
- Proper planning is essential to ensure that desired inputs and outputs are known and the department must also possess control systems by which progress and results can be monitored. (The planning must make a realistic assessment of the number of people required to carry out the tasks in the desired time, and the work load of the project leaders).
- Before the renewal process, competition did not directly influence P&RS. This resulted in the department being isolated from marketing details and this will cause problems for P&RS in promoting itself.

4.1.2 THE P&RS STRUCTURE

The department's analysis determined certain functions and characteristics that the structure must have. These are listed below:

- The structure must take into account the different mines for which work will be done and the close relations that should be kept with them.
- The achievement needs and level of education of people must be appreciated in the design of the decision-making processes, i.e. in the decentralisation of authority. Within P&RS, vertical decentralisation of

authority downward to the professionals is considered desirable. This will also enable the people who are actually working on the problem to make the decisions.

- Channels of communication must be established within the department and between P&RS and other departments.
- The structure and style of management must be able to adapt to the dynamic environment and be democratic enough to enable the professionals within the department to work closely with their clients.

The structure should be one that ensures the maintenance of technical specialisation and the maintenance of line authority. A matrix structure (using project teams) will ensure that both the technical expertise and necessary control can be maintained on larger inter-disciplinary projects.

Project selection is an important aspect. If fewer projects are handled at a time, the P&RS effort can be more concentrated, the team building effect improved and the times to completion shortened. This will allow the professionals to work on a greater variety of projects.

Regardless of the structure selected for P&RS, implementation of a structural change must only be made after careful study and consultation with the members most affected. It is essential to draw up phase plans for the implementation of changes and plan for possible reactions in response to the changes. Management must keep in mind that people are averse to change they did not buy into.

No structure is permanent and therefore, future monitoring of influencing factors may identify necessary changes. The structure has to be flexible

enough to take into account both the situation in which it must exist and the strategy of the organisation so that it facilitates the organisation in its bid to achieve its objectives.

4.1.3 EFFICIENCY MEASUREMENT

There must be a cost saving estimate before any project can be accepted. FTE's (see definition of terms) will be used to estimate the cost of the project and the savings brought on by the project. A further use of this information would be to quantify and measure the effectiveness of the P&RS department.

4.2 Recommendations

4.2.1 THE PROPOSED P&RS STRUCTURE

The structural configuration in figure 4.1 fuses experts drawn from different specialities into project teams. It is an organic structure with little formalisation of behaviour and extensive horizontal job specialisation based on formal training. The strategy is to group the professional specialists in functional units for housekeeping purposes, but to deploy them in small market based teams to do their project work, and it relies extensively on the matrix structure.

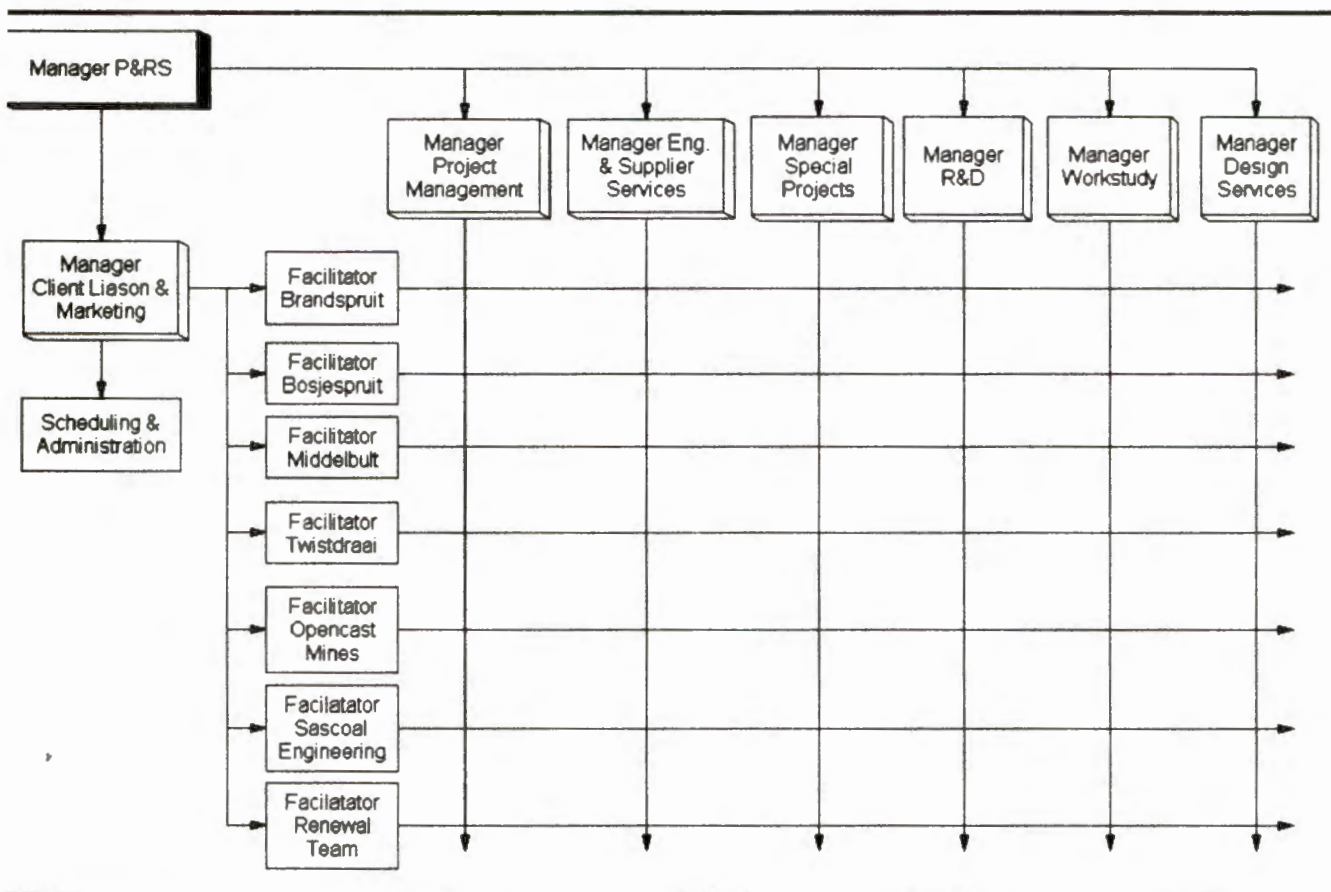
4.2.1.1 PROJECT TEAMS

Innovation is achieved by the grouping of professionals into multidisciplinary teams with a project co-ordinator as leader. Project teams performing the work are temporary, and are disbanded after completion of the project. Project co-ordinators are temporary leaders only, selected from the project

management group, but the project team members are drawn from groups across the spectrum of functional disciplines. The strategy is not imposed from above, but emerges from a stream of ad hoc decisions made by everyone involved in the project.

In this situation, both the project leader and functional managers would be required to agree upon the personnel to be involved, and the work schedules and priorities. The project co-ordinator would then have full responsibility for the execution and co-ordination of the project within budget and on schedule.

FIGURE 4.1 Recommended Structure for P&RS



4.2.1.2 FUNCTIONAL GROUPS

The functional skeleton allows specialists in a specific area to be grouped together. Research and project work is more productive if handled by

dedicated specialist teams. The functional skeleton also offers the best system of control for administrative purposes.

Because of the technical complexity, a manager should head and co-ordinate each selected functional area. This person is responsible for the quality and co-ordination of all work in the group, as well as the control of administrative and service work required. If they are required, there can be section leaders under each functional manager. These groups are permanent structures within the department.

The functional section leaders would retain responsibility for the technical quality of the work delivered by their subordinates on the project. It is also essential that sufficient authority be given to the project co-ordinator, as his level of authority must be equal to that of the functional group's section leaders from which his staff is drawn. This authority is given formally through the levels of meetings he may attend, and the level of decision-making he may exercise.

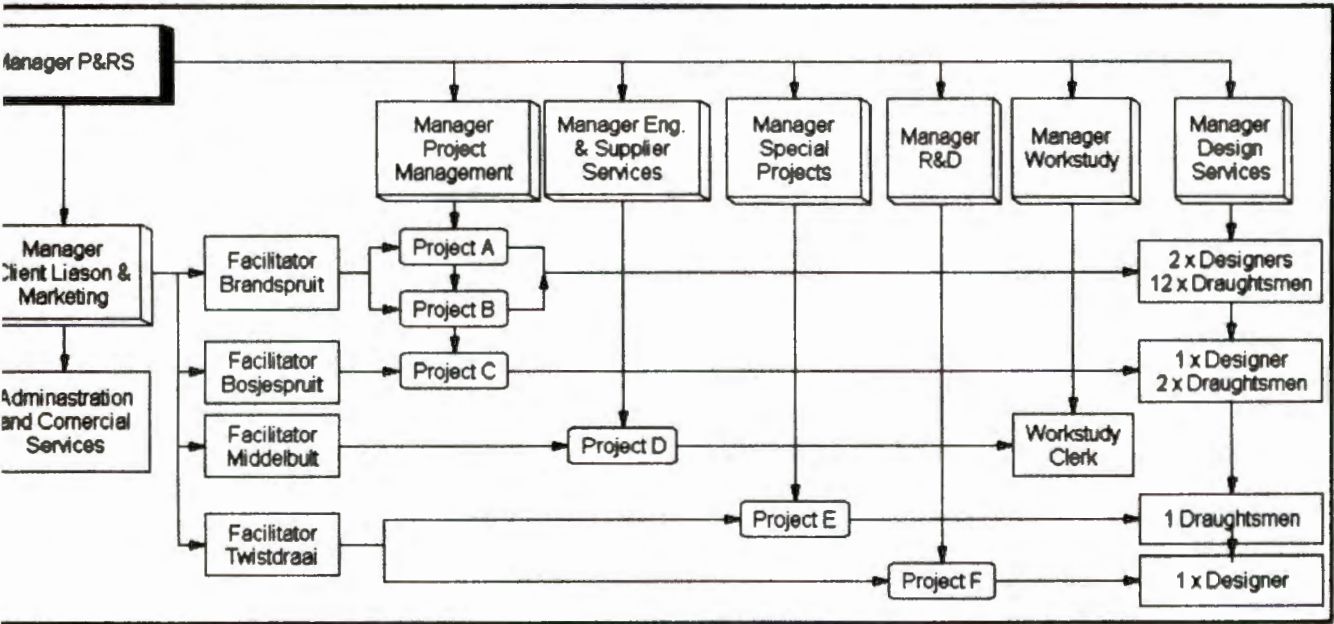
4.2.1.3 CLIENT FACILITATORS

In order to improve the service to clients, dedicated facilitators should be appointed to work in the department under a Client Liaison and Marketing Manager. He will be responsible for the administrative management services and the scheduling of projects. The facilitators will report to him and he should keep control to make sure that all clients are serviced. This should improve the quality of services because the service is planned and co-ordinated by one senior manager.

The structure depicted in figure 4.1 is thus a hybrid structure of a functional skeleton and matrix sub-groups in the form of permanently appointed dedicated service department personnel, and temporary project teams. This structure requires decentralisation of authority to the functional managers, project co-ordinators and trained professionals.

4.2.1.4 COMMUNICATION

FIGURE 4.2 Sample Project Communication



To achieve the desired level of integration it is essential that communication channels, both formal and informal, be well established. The formal communication (both up and down) must ensure that all the necessary instructions and information reach the correct level of personnel. Informal communication must be encouraged to create an open door atmosphere. This will enable a feeling of unity to develop within the department and fields of expertise of members can be determined. It also improves idea generation opportunities and boost moral.

All the departmental strategies and objectives must be formally communicated to the members of the department so that everyone has a sense of direction and aligned commitment.

4.2.2 EFFICIENCY MEASUREMENT TOOLS

The formulas that should be used by the P&RS department are the following five. They would indicate how P&RS have applied themselves on a year to year basis and give trends of the effectiveness of the department. The formulas are as follows:

- 1) R&D per employee = $(\text{Annual ton's of coal produced per employee}) \times (\text{P\&RS expenditure} / \text{Annual ton's of coal})$.
- 2) Outcome effectiveness = $\text{The increase in profit directly related to P\&RS efforts} / \text{Yearly increase in profit}$.
- 3) R&D effectiveness index = $\text{Total FTE units saved over the last 3 years directly related to P\&RS efforts} / \text{Total P\&RS cost over the last 3 years}$.
- 4) R&D innovation index = $\text{Total FTE saved over the last 3 years directly related to P\&RS efforts} / \text{Total Revenues over the last 3 years}$.
- 5) R&D quality index = $\text{Average time taken to provide a result} / \text{number of customer requests}$.

For the last formula the projects should be divided into three groups namely:

- Immediate response projects
- Short term projects (0-6 months time frame)

- Long term projects (6 months and longer)

The quality of service can then be worked out for each of the three categories.

4.2.3 SUMMARY

The recommendations made in this chapter should lead to a more efficient and client orientated P&RS department. By using facilitators for each mine, the client's needs and requirements will be assessed and planned to resulting in a better and faster service. This also creates a forum to improve communication and to assist with the ownership and sponsorship of projects by mines.

A measuring system that will contribute to the benchmarking of P&RS expenditure was proposed. This will facilitate the determination of the effectiveness of the department, and quantify the value added by the department to Sasol Coal's bottom line. The measuring system will also help to sift the quality and quantity of assignments tackled per year by only allowing projects that add value to be chosen.

Finally, the renewed focus in P&RS on client satisfaction will foster an innovative and creative environment. At the same time, the focus on the cost management of the department will ensure that the P&RS service includes business principles and entrepreneurship.

REFERENCES

- Carter, R. 1997. *Financial analysis of R&D decisions*. SRA journal. Vol. 29, no. 1. & 2, Summer/Fall. p. 5-15.
- Chase, R. B. & Aquilano, N. J. 1995. *Production and operations Management: manufacturing and services*. Irwin, p. 483-510 & 736-751.
- Kotzé, J. G. 1997. Implementing of Strategy: Potchefstroom: PU for CHE. (MBA III - Class Notes). p. 16-51.
- Lee, M. Son, B. and Lee, H. 1996 *Measuring R&D effectiveness in Korean Companies*. Research Technology Management. Vol. 39, no. 6. Nov/Dec. p. 29.
- Morbey, G.K. and Reithner R.M. 1990. *How R&D affects sales growth, productivity and profitability*. Research Technology Management. Vol. 33, no. 3. May/June. p.11-14.
- Robbins, S. P. 1990. *Organizational Theory: structure design and applications*. Englewood Cliffs, N.J. Prentice-Hall. p. 81-275.
- Schriefer, J. 1996. *Increasing R&D productivity*, Iron Age - New Steel., Vol. 12, no. 6. June. p. 72-78.
- Steynberg, B. A. 1986. *Structural configurations for a R&D Department*, Potchefstroom: PU for CHE. (MBA thesis).
- Thompson, A. A. & Strickland, A. J. 1998. *Strategic Management: concepts and cases*. N.Y. Irwin/McGraw-Hill, p. 1-335.
- Twiss, B. 1995. *Managing Technological Innovation*. London, Pitman Publishing, p: 41-189.

Van Veijeren, C.F. 1994. *Industrial Marketing*. Cape Town, Juta, p. 68-74

Viewing, K. 1995. *R&D for mining*, Chamber of mines journal. Vol. 37, no. 8. Aug, p. 27.

Werner, B.M. and Souder, W.E. 1997. *Measuring R&D performance – State of the art*. Research Technology Management Vol. 40, no. 2 Mar/Apr, p. 34-42.

Ziff, Z. and McCarthy, D. J. 1997. *The R&D Cycle: The influence of product and Process R&D on short term ROI*. IEEE Transactions on Engineering Management. Vol. 44, no. 2, May, p. 114-123.

APPENDIX 1 - QUAD ANALYSIS RESULTS

Source: Internal document

QUAD ANALYSIS : TEMPTATIONS – LINK WEAKNESSES AND OPPORTUNITIES

OPPORTUNITIES

WEAKNESSES

	Business plan not in line with company strategies	Insufficient business principles of which one is a focus on client requirements	Lack suitable managerial and technical systems
Renewal project	➤ Don't expect to make a large impact on the Renewal team without a proper business plan ➤ Accepting the challenges of the Renewal wave would be fatal without a business plan ➤ Having a business plan that is not in line with company strategies may be interpreted by the Renewal team as being a Mickey Mouse operation ➤ Prevent negative perceptions from reaching Renewal team, by advertising positive accomplishments ➤ Avoid temptation to "ride" on old projects – rather ensure P&RS are positioned adequately to compliment the Renewal team	➤ Ensure that client requirements are clearly understood, through close co-operation on the mines ➤ Identify insufficient business principles that have to be developed further ➤ Implement a structure to improve knowledge/application of sound business principles ➤ Discuss plan with Renewal team to obtain "ownership" by them ➤ Present business plan to Renewal team ➤ Be in the right mindset when dealing with Renewal team members	➤ Get systems in place before approaching the Renewal team to offer our assistance ➤ Ensure systems are in order well before the Renewal wave hits us ➤ Get P&RS management on the Renewal Project band wagon, for in time feedback ➤ Obtain copies of feedback from pilot wave units, as base input to systems development
Cost reduction projects underground	➤ If the clients feel that P&RS does not support the company strategies, their perceptions will not be changed ➤ Propagate P&RS commitment to company strategies ➤ Advertise our new business plan, even if it is still in development ➤ Give feedback to plans being made, in answer to the survey that was done ➤ Develop business plan while keeping the survey in mind ➤ When included in cost reduction projects, be the one who understands what is expected	➤ Ensure clear understanding of client requirements ➤ Know the underground environment and its problems ➤ In-time feedback of project progress to confirm requirements ➤ Select clear-cut projects while business plan is still being developed	➤ Strong leadership is required where systems lack during cost reduction projects ➤ Take up projects only where experience is available and develop systems as work proceeds ➤ Discuss with colleagues (QIT meeting) ➤ Synergy is required between P&RS members ➤ Experience must be passed on inside the department
Synergy between P&RS and other consultants/ companies	➤ P&RS will not know with whom to form teams, in order to address client requirements. ➤ P&RS must understand company strategies to know when corporations are required ➤ Address company mission and strategies in the business plan ➤ Never loose focus on the need for Sasol Coal to continuously improve and the need for R&D	➤ Never allow P&RS to become the tail of the dog re. external PM and R&D sources ➤ P&RS must maintain preferred supplier status in all disciplines ➤ Do not allow competitors to be more focussed on the requirement of the mine than we are	➤ A lack of systems is a weak bargaining issue when co-operating with external companies ➤ Obtain corporations with companies who already have suitable systems – learn from them ➤ Use other successful companies' systems as benchmarks for developing our own systems

WEAKNESSES

	Business plan not in line with company strategies	Insufficient business principles of which one is a focus on clients requirements	Lack suitable managerial and technical systems
External competition to P&RS	If P&RS do not work within company guidelines, competition will take over ➤ Re-evaluate P&RS business plan, and formulate to support company strategy ➤ Business plan to include marketing, knowledge of the competitors, long and short term cost reduction strategies, value adding strategies, and contingency plans ➤ Have formal, well structured plan before the renewal wave hits us (better to make small changes than to re-design a plan) ➤ Advertise P&RS commitment to the corporate plan ➤ Advertise this Business Plan Development exercise to top management – get their commitment ➤ Get executive management's approval of the new P&RS business plan ➤ Advertise new business plan to clients	If P&RS do not focus on client requirements, the clients will go more-and-more to external competitors of P&RS. ➤ Dedicate a P&RS representative to each client ➤ Dedicate representatives to Renewal team meetings ➤ Technical & managerial systems to understand clients needs ➤ Open door for competition must be closed, through direct communication – be visible on the mines	In the past this was not a major issue, but this expertise may be lost with key personnel leaving the department, and if not revitalised, may result in the slow death of P&RS ➤ Replacement personnel must be well-trained in these skills ➤ Systems can be described in a "users manual" as references ➤ Develop new, modern systems where required ➤ Multiskilling ➤ Identify, prioritise and develop suitable systems ➤ Allocate a sponsor to each system
Short term pressure on cost cutting	If the business plan is not in line with company strategies, the P&RS department can be closed, cut from Sasol Coal, or downsized drastically. Perceptions of P&RS being an overhead will not be changed. Renewal team will have same perception as clients. ➤ Re evaluate P&RS business plan ➤ Have well-prepared plan as per schedule ➤ Advertise P&RS new business plan to clients and renewal team ➤ Advertise P&RS commitment to company strategies ➤ Get top management approval and support ➤ Include cost saving measures in business plan	This would flow naturally from the previous vulnerability, when top management will cut P&RS to the bone. ➤ Understand clients requirements regarding QCDSM and prove that P&RS is worth more than what it costs ➤ Identify major cost saving projects ➤ Focus on cost bottle-necks in the mining process ➤ Involvement with opencast mines ➤ Prove P&RS existence by playing a major role in the Renewal process	If management does not agree with the systems used, they may succumb to the perception that we are overheads ➤ Prepare practical systems and get input from Renewal team if possible ➤ Discuss systems with knowledgeable personnel in preparation of fine-tuning the systems ➤ Professionalism may hamper cost cutting in P&RS ➤ Systems must support cost reduction targets ➤ Avoid unnecessary red-tape ➤ Focus on fast, cost effective systems, rather than long, tiresome work descriptives
Availability of competent replacement technical staff	A combination of these two issues will mean a slow death for the department, with very little chance of re-organising. ➤ Review the business plan with special emphasis on resource requirements. ➤ Special attention to HR issues, based on types of projects required by clients. ➤ Re-deploy P&RS personnel on the mines, other departments. ➤ Acquire new personnel to be trained, parallel to developing a new business plan.	If top management thinks that P&RS has insufficient business experience, they may decide that technical staff will not be replaced or trained any further ➤ Initiate a training program for trainers, to learn about the applicable business principles ➤ Acquire the services of a competent facilitator to help us compile the business plan ➤ Frequent feedback of projects to client to ensure that progress is in line with his expectations	If suitable systems are not in place, it will be difficult to motivate replacement of replacement staff, because most of their efforts will be required on figuring out the systems, instead of contribution to value adding. ➤ Developing practical systems can even help overcoming shortage of replacement staff ➤ Systems can be designed to temporarily make use of personnel from other companies/consultants ➤ Obtain services of skilled/competent persons to help develop suitable systems

QUAD ANALYSIS : OFFENSIVE STRATEGIES – LINK STRENGTHS AND OPPORTUNITIES

STRENGTHS

	P&RS knows the Sasol internal environment	Specialist expertise and Service	Applied R&D
Renewal Project	Dedicate a P&RS facilitator to each Renewal unit to build on existing relationships	➤ Advertise our expertise to Renewal team ➤ Facilitators to be made aware of P&RS's services and skills ➤ Identify projects for renewal team ➤ Ensure Renewal team makes use of P&RS by close co-operation (P&RS representation)	➤ Provide specific researched solutions for Renewal project targets ➤ Identify problem areas of which little is known, and do research ➤ Variety of disciplines available in P&RS to do comprehensive research in a specific problem ➤ Accept challenges from Renewal team to de-bottle-neck processes, procedures and equipment.
Cost reduction projects underground	➤ Road show to each mine, Sascoal and SCS ➤ Make P&RS expertise and services available to mines ➤ Consulting work to mines ➤ Middle-man between mines and external companies ➤ Middle-man between mines, Sascoal and SCS ➤ P&RS's ability to act quickly ➤ Help to identify cost saving projects ➤ Joint ventures with mines ➤ Identify P&RS's area of influence, and catalyse client's needs	➤ Close co-operation between P&RS and underground personnel ➤ P&RS representation on mine management meetings ➤ P&RS involvement at Executive Eng. Workgroup meetings ➤ Using renewal process as benchmark for other sections ➤ Use P&RS expertise in detail analysis of problem areas ➤ Workstudy monitoring to highlight problem areas	➤ Identify new methods, procedures to cut costs. ➤ Advertise P&RS accomplishments to the mines to change perceptions ➤ Concentrate on projects to improve the operation and implementation of new technology ➤ Identify costly procedures, processes, equipment and find alternatives
Synergy between P&RS and other consultants/companies	➤ Identify opportunities to utilise external experts as part of P&RS total project management ➤ Research with other companies in applicable areas ➤ P&RS networking: circumvent red tape to get work done quickly. ➤ Monitor projects and results. ➤ Joint ventures with other consultants / companies. ➤ Identify P&RS resource shortages and external companies' available resources.	➤ Do consulting to mines and use resources from other companies ➤ Assist other companies in execution of work for Sasol Coal ➤ Identify own shortcomings and how it can be strengthened by other companies ➤ Joint ventures, using our expertise and other companies skills together	➤ Joint ventures with universities, Technicons ➤ Use other companies resources to assist with R&D ➤ Fine-tune developments already done, or in the process, by using other companies to implement ➤ Co-operate with others to market P&RS technology

OPPORTUNITIES

STRENGTHS

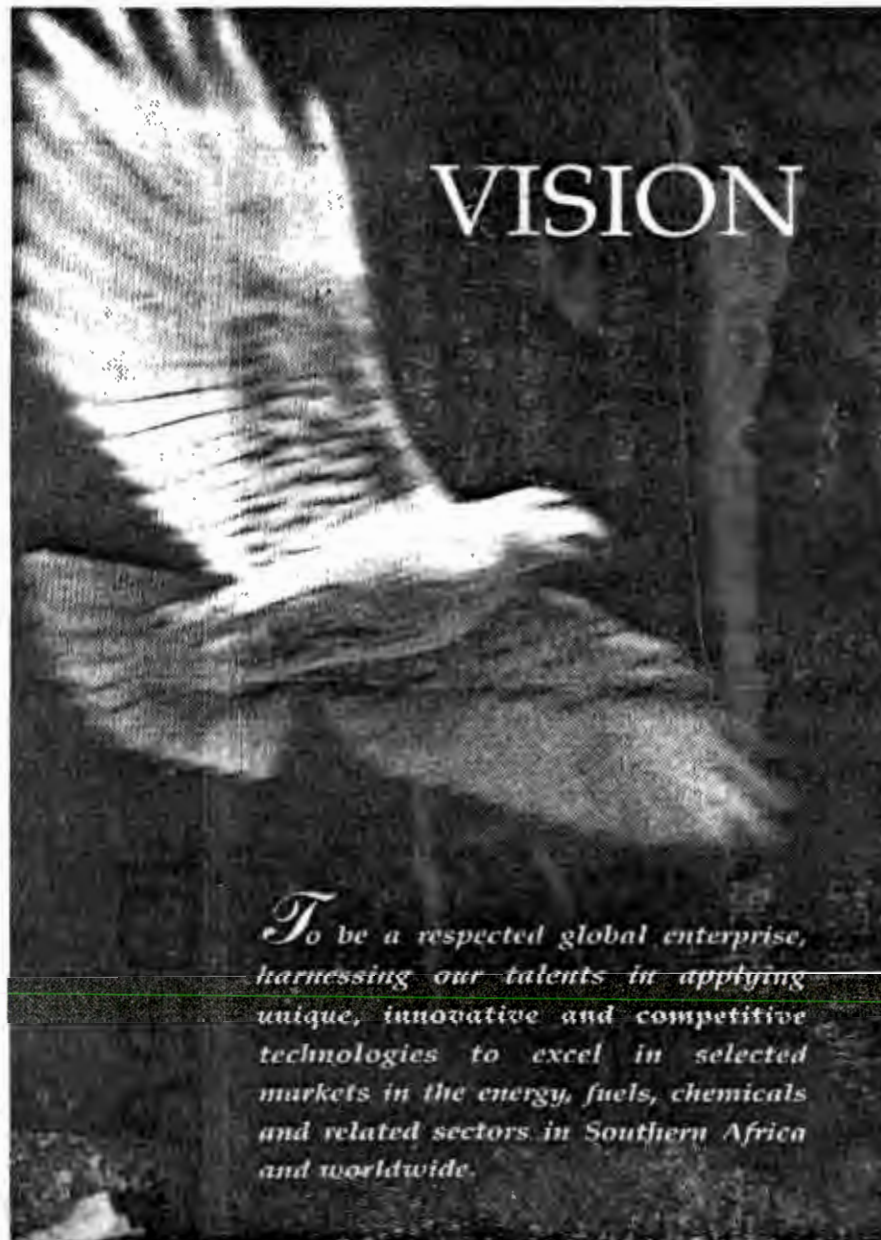
THREATS

	P&RS knows the Sasol internal environment	Specialist expertise and Service	Applied R&D
External competition to P&RS	➤ Politics to convince clients to make use of P&RS ➤ Promote P&RS knowledge of how Sasol "works" ➤ Focus on P&RS ability to make a fast head start, not having to first learn how Sasol "works" ➤ Focus on time, quality and meeting the budget as a competitive advantage ➤ P&RS to develop its own marketing strategy ➤ Know the competition	➤ Further development of P&RS skills and expertise ➤ Marketing P&RS abilities to clients ➤ Market the advantages of using P&RS ➤ Involvement with client will increase dependence on P&RS	➤ Concentrate on projects that will increase skills ➤ Develop market intelligence – know the competition ➤ Proactively identify industry – and client needs ➤ Work together with external companies ➤ Form alliances with other research institutions ➤ Advertise P&RS abilities in R&D ➤ Advertise P&RS accomplishments ➤ Advertise P&RS "world first" accomplishments ➤ Focus on ability to influence cost, time & quality ➤ P&RS already knows what the client wants
Short term pressure on cost cutting	➤ Let the right people know of our successes ➤ Communicate with clients on our abilities, to change negative perceptions ➤ Quantify cost saving/value adding of all projects ➤ Combine strengths within P&RS through open discussions (QIT-meetings) ➤ Synergy within P&RS ➤ P&RS has ability to "grasp" problems, not having to first be explained ➤ Advertise our skills, experience and knowledge	➤ Utilise own expertise to identify areas where cost can be reduced. ➤ Show/prove to clients that we can solve their cost-problems. ➤ Show that P&RS can grasp a client's problem and save cost. ➤ P&RS must quantify how we can save, and have saved costs, rather than the general perception of being "overheads". ➤ Bring attention to P&RS's small influence on overhead costs. ➤ Show top management that P&RS is worth more to Sasol than the cost of having the department.	➤ Concentrate on projects that will "immediately" reduce costs ➤ Find out what the client requires ➤ Advertise P&RS accomplishments ➤ Top management must understand the need for research ➤ Quantify value of R&D projects ➤ Substitutes of key personnel leaving the department must have same appreciation of the value of research ➤ Be better at cutting costs, rather than being cut from costs ➤ Communicate with clients to show P&RS is not just an overhead
Availability of competent replacement technical staff	➤ Identify other persons in Sasol that can be coached ➤ Share knowledge and experience with colleagues ➤ Rotate jobs ➤ Motivate staff – recognition, responsibilities, support ➤ Train new staff (engineers in training) ➤ Increase depth of skills - from other departments - outsourcing - partnerships	➤ Ensure that technical staff has a feeling of belonging in the department ➤ Promote depth of skills -civil engineering -materials -quantity survey -finance ➤ Multi-disciplined projects ➤ Identify new engineers to be trained ➤ Share knowledge and information with colleagues ➤ Motivate staff-recognition, responsibilities, support ➤ Synergy within P&RS ➤ Discuss projects as in QIT meetings	➤ Multiskilling – increase depth of skills ➤ Cross-involvement ➤ Team efforts in R&D projects ➤ Key researchers must train a "second-in-command" ➤ Share information with colleagues ➤ Identify new personnel to be coached in R&D ➤ Work with client to identify potential of others ➤ Keep researchers motivated through recognition, responsibilities and support

QUAD ANALYSIS : IMPROVEMENT STRATEGIES – LINK STRENGTHS AND WEAKNESSES

STRENGTHS

	P&RS knows the Sasol internal environment	Specialist expertise and Service	Applied R&D
WEAKNESSES	Business plan not in line with company strategies ➤ Develop the new business plan as soon as possible, with inputs from all role players – top management, clients, consultants, P&RS personnel ➤ Evaluate Sasol and Sasol Coal long-term strategies and compile business plan accordingly ➤ Involve the right people, apply knowledge correctly and pay specific attention to the company culture, in conjunction with Renewal change management	➤ Bring fields of specialisation in line with company strategies ➤ Concentrate expertise in support of company strategies ➤ Re-evaluate resources required to fulfil company requirements and objectives ➤ Consult with top management	➤ Evaluate company strategies and compile/identify possible areas for research and development ➤ Re-evaluate current R&D projects in relation to company strategies ➤ Discuss identified areas of research with top management and clients ➤ Get input from management, clients and right through to operators ➤ Get inputs from training department where required
	Insufficient business principles of which one is a focus on clients requirements ➤ Convince the right people that P&RS focuses on their clients requirements ➤ The elements of sound business practice should become an intricate part of P&RS marketing structure and work ethic ➤ understand the client and his needs ➤ actively and objectively provide consultation ➤ communicate openly and honestly ➤ meet requirements of cost, time and quality ➤ quantify and reports benefits achieved ➤ The new business plan should be as for a separate, individual business/company ➤ Keep in mind that the Renewal team can suggest that P&RS, or part thereof, be outsourced	➤ Close co-operation with clients ➤ management meetings ➤ underground visits ➤ speaking to first line supervisors ➤ Discuss problems observed with experienced P&RS personnel ➤ Discuss problems observed in a combined forum – QIT ➤ Give feedback to clients regarding process bottle-necks and possible solutions	➤ Informal business principles of which one is a focus on clients requirements ➤ Informal/formal training of researchers on management of technological innovation ➤ Research, development, implementation and control should be seen as a package ➤ Complete analysis of processes, procedures and methods of operation, on order to identify problems for R&D
	Lack suitable managerial and technical systems ➤ Identify and quantify our needs ➤ Establish a programme/project to develop the required systems ➤ P&RS should put themselves in McKinseys' shoes and compile systems accordingly ➤ Obtain services of in-house experts to compile systems ➤ Make use of other departments to help compile the necessary systems	➤ Identify shortages, problems in specific systems ➤ Form "project teams" with experienced P&RS personnel to evaluate existing- and design practical systems ➤ Devide responsibilities of systems into units, staffed by applicable personnel ➤ Obtain inputs from clients, other departments and senior management to design systems ➤ Evaluate company strategies and compile/identify possible areas for research and development ➤ Re-evaluate current R&D projects in relation to company strategies ➤ Discuss identified areas of research with top management and clients ➤ Get input from management, clients and right through to operators ➤ Get inputs from training department where required	➤ Initiate a R&D project to compile suitable systems ➤ Implement principles of management of technology in all R&D projects ➤ Obtain inputs from experienced researchers to assist in system development



VISION

To sustain growth by
being a preferred and
caring supplier of coal



SASOL
STEENKOL
COAL

Sasol Coal Core Values

Our shared core values at Sasol Coal as expressed in the conduct of every employee, are:-

- ◆ **OPEN COMMUNICATION** as a channel for mutual information sharing.
- ◆ Fair and just **HUMAN RELATIONS**, by recognising and managing the diverse nature of the people of Sasol Coal.
- ◆ Focused **BUSINESS ORIENTATION** where everyone is given the opportunity to add value through a sense of commitment and joint ownership.
- ◆ Innovative **TEAMWORK** through co-operation, mutual respect, trust and leadership, thereby promoting thinking and doing!
- ◆ A culture of continuous performance enhancement through **TRAINING AND DEVELOPMENT**, where everyone takes responsibility for the improvement of their own competencies, while receiving proper support.
- ◆ **SAFE AND HEALTHY** work conditions by adhering to set standards at all times and continuously reducing the impact of our activities on the environment.

vidcom (012) 327-5238