The re-design of CSIR Manufacturing

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1998

UITTREKSEL

TITEL: DIE HERONTWERP VAN WNNR VERVAARDIGING

AARD EN OMVANG VAN DIE STUDIE

Die skripsie het dit ten doel om die organisasiestruktuurontwerp van die nuutgestigte strategiese vervaardigingsinisiatief (SMI) binne die Wetenskaplike Nywerheidsnavorsingsraad (WNNR), weer te gee.

Die winsgewendheid van die WNNR se vervaardigingsbeen het gedurende die laaste vier jaar sedert 1993 baie verswak. Die redes wat aangevoer word vir hierdie verswakking is dat:

- geen gemene doel tussen die programme bestaan het nie;
- programme en inisiatiewe verkeerd gemeet is;
- geen integrasie tussen kontrakte bestaan het nie;
- geen data beskikbaar was oor lopende of afgehandelde kontrakte nie; en
- geen bestuursintegrasie bestaan het vir die vervaardigingsinisiatiewe binne die WNNR nie.

Die doel van die studie was om 'n strategies-belynde organisasiestruktuur te ontwerp wat die besigheid ook instaat sou stel om die vereiste doelwitte van die onderneming te bereik. Die belangrikste hiervan is die belyning van SMI met die Suid Afrikaanse vervaardigingsektor wat deur hulle bedien moet word en die vestiging van 'n geïntegreerde vervaardigingsbeen vir die WNNR.

Die Discon metodologie vir besigheidsingenieurswese is gebruik as raamwerk vir die studie.

Die studie het bestaan uit drie fases:

- Fase I: strategiese posisionering ;
- Fase II: definiering van die verwantskappe tussen besigheidsentiteite; en
- Fase III: ontwerp van die organisiestruktuur afgestem op die vorige twee fases.

AANBEVELINGS

Daar word aanbeveel dat die organisaiestruktuur, soos ontwerp, so gou moontlik geïmplimenteer sal word. Indien die proses vertraag word, kan dit lei tot die ongewenste situasie waar die vervaardigingsektor in Suid Afrika, WNNR- vervaardiging sien as 'n irrelevante entiteit en dus nie meer van hulle dienste gebruik maak nie.

WITH SPECIAL APPRECIATION

TO

MY CHILDREN

Mathao,

Gian,

Danica,

and

Ya-Lea.

ACKNOWLEDGEMENTS

I would like to express my gratitude and sincere thanks to everybody who supported and encouraged me during my MBA studies:

- To GOD, the Almighty Father who makes all things possible.

- To my dear wife Ansa, for her unselfish support and encouragement.

- To my children Mathao, Gian, Danica and Ya-Lea who have paid the highest price.

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DESCRIPTION OF ACRONYMS USED

ADD	ATTRIBUTE DEPENDENCY DIAGRAM
AEROTEK	THE DIVISION OF MANUFACTURING AND AERONAUTICAL SYSTEMS TECHNOLOGIES
BRD	BUSINESS REQUIREMENT DEFINITION
CDF	CONTRACT DEVELOPMENT & FULFILMENT
CSF	CRITICAL SUCCESS FACTOR
CSIR	COUNCIL FOR SCIENCE AND INDUSTRIAL RESEARCH
FEBT	FUNCTIONAL EFFECT BACKTRACKING
FSD	FUNCTIONAL STRUCTURE DIAGRAM
JAD	JOINT APPLICATION DESIGN
KRA	KEY RESULT AREA
KRI	KEY RESULT INDICATOR
MEC	MANUFACTURING EXCELLENCE CENTRES
OID	OBJECT INTERFACE DIAGRAM
RFP	REQUEST FOR PROPOSAL
SDD	SCENARIO DEPENDENCY DIAGRAM
SID	SUB-SCHEMA INTERDEPENDENCY DIAGRAM
SMI	STRATEGIC MANUFACTURING INITIATIVE
SOD	SYSTEM OPERATIONS DIAGRAM
SWOT	STRENGTH WEAKNESS OPPORTUNITY THREAT
TEC	TECHNOLOGY EXCELLENCE CENTRE

CHAPTER 1

NATURE AND SCOPE OF THE STUDY

1.1 INTRODUCTION

The Council for Science and Industrial Research (CSIR) was established in 1945 by an Act of Parliament. Part of the mission of the newly launched CSIR was to build up a research force of substance; it recruited high-level scientific and support staff. In line with current Western practices, every effort was made to create a climate in which scientists could thrive. As the CSIR gained in stature, universities advised their best science students to continue their studies at the CSIR. The objective was to assist the South African industry in the area of research and development.

The all too common phenomenon of empire building was, however, prevalent at the CSIR as in any large organisation. Although it has healthy connotations of providing the motivation and drive to get something off the ground, it inevitably has its negative side. From the outset, empire building was one of the biggest sources of growth and trouble for the CSIR. Personal ambitions and aspirations became entwined with scientific discipline. This finally sparked off severe professional rivalry and many new institutes and even statutory bodies were founded.

Once these institutes were operational, each jealously guarded its own domain. This, combined with the entrenched tradition of conventional research practices, probably doubled the resistance to change.

After South Africa became a republic in 1961, the emphasis on defence research increased steadily. By the early 1970's the pattern was well established. Researchers who were exposed to similar research organisations during the mid 1970's observed a shift in emphasis to more "applied" research and the erosion of the elitist approach.

The scientist's utopia eventually lead to the harbouring of unproductive passengers and gradually lost touch with reality, both locally and globally.

To this day the CSIR's greatest concern is the fact that they are unable to translate the Industry's requirements into CSIR strategy and development. This has caused the CSIR to become misaligned with its market. Due to the lack of competition and the backing of state funding, the CSIR lost their competitiveness and became unprofitable. They came too rely heavily on the government of the day to fund its operations by what they call 'Step' funding and a 'government grant'.

Over the years the CSIR has grown substantially to encompass a number of divisions and programmes. At present it consists of the following nine divisions:

- Aerotek
- Boutek
- Environmentek
- Foodtek
- Mattek
- Mikomtek
- Miningtek
- Textek
- Transportek

During the late 1980s (1987 is the date most widely referred to), the CSIR took a major step in realigning itself with a changed environment. Moving away from old "institutes" and the common perception that it was nothing more than a non-fee paying university, CSIR management took the brave step to reorganise the organisation into strategic business units (SBUs). It also attempted, with some success in certain areas, to increase its relevance to South African demands and also to increase its external income.

The CSIR has set themselves the goal of becoming the foremost in technology, leadership and partnering and – through their people – to fight poverty, build global competitiveness and make enduring differences in people's lives.

1.2 PROBLEM STATEMENT

Production technology, a division of the CSIR, was closed in 1993 due to what was regarded as poor management and leadership. CSIR management decided to integrate the remaining manufacturing business with Aeronautical Systems Technologies (Aerotek). The purpose was to elevate the manufacturing technologies to a higher level in the systems hierarchy. This ongoing evolution resulted in the Aerotek of today - a division of Manufacturing and Aeronautical Systems Technology. Aerotek consists of different programmes, each measured separately on their contribution as cost centres. The problem arose that these divisions did not share a common goal or purpose and mostly worked against each other, through withholding crucial information and even sabotaging other divisions. As a result the Manufacturing division of Aerotek and Mattek have incurred major losses since 1993.

The situation escalated to such a degree that the board of directors at the CSIR founded another division by the name of 'Manufacturing Excellence Centre' in trying to combine some of the manufacturing effort. Up to this point each programme handled aspects such as its own marketing and invoicing.

Main factors contributing to the above-mentioned situation were:

- the lack of a common goal between programmes (integration);
- wrong measurements;
- no integration of contracts;
- no data on current or past contracts; and
- no integrated management of CSIR manufacturing.

When J. R. Ahlers (managing director) joined Aerotek, it became obvious that he intended to introduce focus and strategic direction for Aerotek's manufacturing related activities. Strategic sessions of the divisional management team (DMT) during 1997 reflected a few important precursors towards an integrated manufacturing drive:

- an attempt to define market segments more clearly;
- seriousness relating to STEP funds and application of this scarce resource;
- "higher level" investment thrusts, aimed to redirect R&D efforts; and
- a clearer distinction between Aerotek's defence and manufacturing challenges.

By late 1997, under the initial guidance of the programme manager at Aerotek, it was decided that the Strategic Manufacturing Initiative (SMI) should gain more momentum. The only way in which this could happen would be to dedicate high-level manpower to the task.

The director of Aerotek appointed Dr. F.A. Volschenck of Lyttleton Engineering Works (LIW) as the project champion of the business engineering team for SMI. He was placed on the CSIR board of directors and given an open hand in the design of the new business.

From the onset, it became clear that localised improvements at a programme or project level could not achieve the desired change in the manufacturing business. The decision to embark on a comprehensive business repositioning approach was taken at the beginning of January1998, and the project was formally launched on 21 January 1998.

The first step towards defining this new business was to define its vision for the future. This vision states that the strategic manufacturing initiative should increase the global market share of the South African manufacturing industry.

The project champion of SMI summarises the problem at the CSIR as follows:

> In order to align itself with its target and external environments, CSIR should reposition its internal operational activities. Translating numerous factors implied by manufacturing (in general) to the organisation's current ability to deal with those issues leads to the conclusion that maintaining the status quo will not be enough to guarantee survival. The opinion is expressed that the current scenario with regard to addressing correct issues in the correct manner is so far removed from the required state, that certain death is inevitable.

The specific brief that was presented to the project champion was to design a manufacturing business that would optimise the CSIR's internal alignment with that of their external and target environments.

1.3 STUDY OBJECTIVES

1.3.1 Primary objectives

The primary objectives of this study are:

- to give an account of the organisational structure design developed for SMI;
- the aim of the design was to develop a structure which would enable SMI to align itself with it's target and external environment; and
- to translate the industry's requirements into SMI strategy, thus enabling the SA manufacturing industry to increase its global market share.

1.3.2 Secondary objectives

The secondary objectives of the study are:

- to establish a sound base for the understanding of the concepts of business engineering and business architecture. Aligned with this is the need for a sound organisational structure derived from the specific characteristics and goals associated with the business;
- to establish architecture for the newly designed SMI; and
- to enable the CSIR to maintain their own business architecture.

1.4 SCOPE OF THE STUDY

The focus of this study will be on the business engineering of the SMI business within the CSIR, with the aim of creating an organisational structure that will allow for the attainment of stated business goals and requirements.

The project plan was developed with Dr. F. A. Volschenk who arranged the sessions and scheduled the participants required at each session.

The Joint Application Development (JAD) sessions were used to obtain business knowledge from the participants. This knowledge was then translated into design for future business.

The DISCON methodology was used as the basis for this project (Engelbrecht, 1996). The methodology that was used consists of three phases:

- phase I, determining the business priorities;
- phase II, determining architectural priorities; and
- phase III, developing an organisational structure from the business priorities and the architectural priorities.

1.5 RESEARCH METHODOLOGY

1.5.1 Overview of the study

The scenario in which to operate is taken from the strategic document of the CSIR called "CSIR 2002" (because of its confidentiality no further details can be revealed).

From the given scenario, a Strength Weakness Opportunity Threat (SWOT) analysis is compiled. The next step is to establish Critical Success Factors (CSFs), together with a "certain death" scenario for the projected future business.

The goal delineation of the new business is compiled in the form of a Function Structure Diagram (FSD). The FSD is mapped against the CSFs to ensure its comprehensiveness and to establish the importance of each function goal within the new business. Gaps in the FSD are rectified to ensure that all the CSFs were addressed by the goal delineation.

The CSIR launched a separate strategic session with leaders within the South African manufacturing sector with the help of Dr. Willem Mostert. They spent four days discussing their needs and how the CSIR could position itself to satisfy their specific needs. The results are mapped on the SWOT analysis that was done for SMI. It is found that their results correspond well with the CSFs derived and thus increase the credibility of this study.

The entity relationship of the business is established with specific focus on the dependencies that exist between entities – this is called an Attribute Dependency Diagram (ADD). These entities are then mathematically grouped into objects describing the business. From these objects, Sub-schema Interdependency Diagrams (SID) are developed. These sub-schemas are mapped back to the FSD to determine the natural cohesion of the business function (components of the business that are naturally "bonded" and would therefore be logically grouped together within a system or department.)

From this mapping, adjustments are made to the organisational structure and a new organisational structure is developed defining the specific goals required from each unit in the organisational structure.

The execution of the designed business is described by means of an Object Interface Diagram (OID). This technique is used to depict the process flow within an organisational unit – it gives an account of how it should actually work. The techniques used is taken from the DISCON methodology (Engelbrecht, 1996).

Finally the recommendation for the new venture at the CSIR is given. The examples of parts of the design are incorporated into this dissertation (the detail designs and diagrams are available on the 36-inch roll as an attachment).

1.5.2 Literature study

In creating an understanding of the concepts, a literature survey introduces business engineering and business re-engineering, architecture and organisational structure development. The specific model for business engineering is discussed as well as the specific recipe/methodology used to establish the business design for SMI at the CSIR.

The DISCON methodology of business engineering is discussed in detail. This is done as background to explain the recipe or methodology that was used to the reader.

1.5.3 Structure of knowledge acquisition sessions

A colleague and the author facilitated the design at the CSIR. A project plan was developed and agreed upon between the company I represented and the CSIR

The project was executed using JAD sessions where all the participants were actively involved in the design. The designs were discussed and signed off by the project champion before the next phase was attempted.

Employees of the CSIR conducted the project and change management required for the project. All the designs discussed are the property of the CSIR and were signed off as their designs. It is consequently regarded as highly confidential and non-disclosure documents were signed between the two parties to assure confidentiality of these designs.

1.6 DEPLOYMENT

This dissertation is divided into four chapters:

Chapter 1 aims at orientating the reader to the nature and scope of the study. The company is presented together with the problems resulting in the study.

In chapter 2 the related literature on the concepts of business process re-engineering, business engineering architecture and the major organisational structures are analysed and discussed. The business engineering methodology from DISCON specialists are also discussed here.

Chapter 3 gives an overview of the methodology that was used together with the results obtained during the JAD sessions. The proposed designs are also discussed in this chapter.

Chapter 4 contains an account of the research findings and recommendations for implementation of the SMI business in the CSIR. The interaction of the physical operation of the organisation as designed will be discussed here as part of the SMI organisational design.

CHAPTER 2

LITERATURE STUDY

2.1 INTRODUCTION

In order to develop an understanding of business process re-engineering, business engineering, architecture and organisational structure development, this chapter will focus on the literature survey of the mentioned concepts. To begin with, definitions and approaches to business engineering/re-engineering, architecture and organisational structures as given by various authors will be viewed. As the DISCON methodology was used in this project the specific methodology will also be discussed.

2.2 DEFINING BUSINESS PROCESS RE-ENGINEERING

Many methods have in the past been used to improve business. Improvement infers change; these projects have generally been called improvement efforts or change projects. Every improvement method could then be called a methodology of change. Re-engineering is therefore a methodology of change.

Competent and well-trained personnel, who are highly motivated and encouraged by the best possible incentive scheme, will come to nothing if the work they do is not well designed. A poorly designed process will not lead to work well executed (Hammer & Stanton, 1995:6)

Davenport (1993:2) uses the term *process innovation*. The author views re-engineering as only one part of what is necessary in the radical change of processes. Re-engineering only refers specifically to the design of the new process. The term *process innovation* encompasses the envisioning of new working strategies, the actual process design activity, and the implementation of change in all its complex technological, human and organisational dimensions.

Re-engineering is an approach to planning and controlling change. Business re-engineering means redesigning business processes and then implementing the new processes (Morris & Brandon, 1993:10).

Business process re-engineering is the means by which an organisation can achieve radical change in performance as measured by cost, cycle time, service and quality. This is achieved by applying a variety of tools and techniques that focus on the business as a set of related customer-orientated core business processes rather than a set of organisational functions (Johansson *et al.*, 1993:15).

According to Bennis (1995:10), re-engineering is reinventing the enterprise by challenging its existing doctrines, practices, and activities and then innovatively re-deploying its capital and human resources into cross-functional processes. This reinvention is intended to optimise the organisation's competitive position, its value to shareholders, and its contribution to society.

Hammer and Stanton (1995:3) define business process re-engineering as "[t]he fundamental rethink and radical redesign of business processes to bring about dramatic improvements in performance".

To understand the encompassing definition of re-engineering as cited by Hammer and Stanton, it is necessary to have a closer look at the keywords the authors used in the above definition:

Fundamental:

The following fundamental questions should be asked: "Why do we do what we do? And why do we do it the way we do? These fundamental questions force people to look critically at the things they do. Re-engineering first determines what a company should do, then how to do it. It takes nothing for granted. It ignores what is and concentrates on what should be."

Radical:

Radical redesign means disregarding all existing structures and procedures, inventing completely new ways of accomplishing work. Re-engineering is about business reinvention – not business improvement, business enhancement, or business modification.

Dramatic:

Re-engineering should be brought in only when a need exists for heavy blasting. Marginal improvement requires fine-tuning; dramatic improvement demands blowing up the old and replacing it with something new.

Processes:

A business process is a collection of activities that takes one or more kinds of input and creates an output that is of value to the customer.

According to Bennis (1995:4), five elements are essential for re-engineering:

- a bold vision;
- a systemic approach;
- a clear intent and mandate;
- a specific methodology; and
- effective, visible leadership.

In line with the above-mentioned elements for successful re-engineering,, Engelbrecht (1996:13) states that business engineering is a radical approach, initiated by executive commitment, to deliver short-term and long-term business benefits. This is achieved by implementing and utilising an organisation-specific set of methods that will meet the changes that occur with time.

2.3 DEFINING BUSINESS ENGINEERING/RE-ENGINEERING

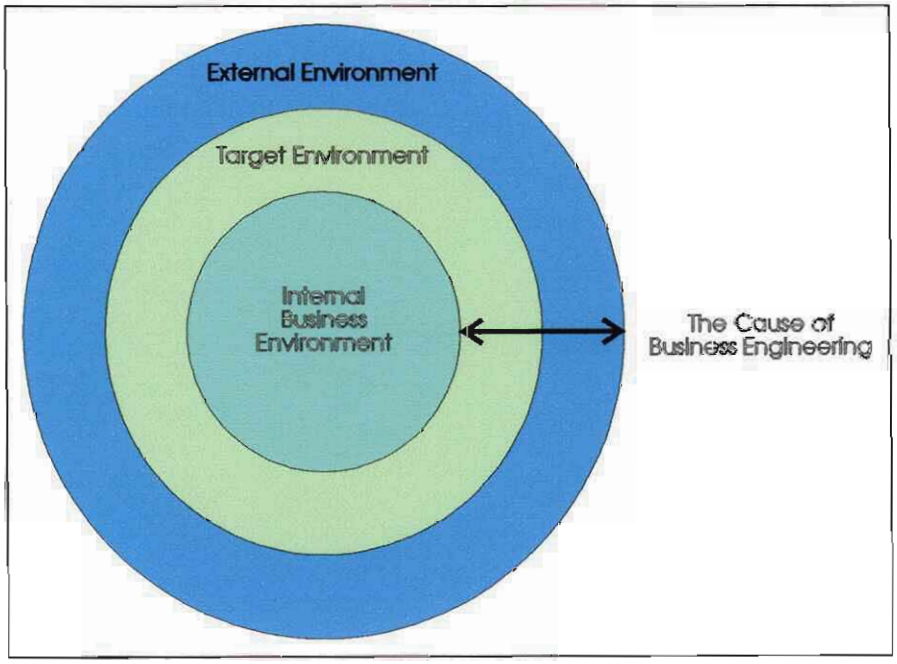
The environment in which the business operates is defined by Engelbrecht (1996:16) as an external target and internal environment (see Figure 2.1).

The external environment is defined as the environment that influences the business without the business having an effect upon it – for example political, economical and technological influences.

The target environment is defined as the environment that influences the business but on which the business could also have an effect. This includes customers, suppliers and other stakeholders.

The internal environment is defined as the internal business that is influenced by the external and target environment

Figure 2.1: Definition of the business environment



Source: Engelbrecht (1996:16)

2.3.1 Discussion of business engineering and re-engineering

According to a study by Gardner in 1997 it was found that successful modern architectures leverage the appropriate use of the following fundamental design principles:

- modularity;
- encapsulation;
- re-use or sharing of functions;
- separation of presentation (user interface) logic from flow control, business rules and data access logic;
- use of server-centric processing to minimise software distribution problems and to maximise code re-use; and
- incremental adoption of any desired changes in application style or middleware.

Engelbrecht (1996:13) states that the business engineering approach has the following objectives:

- To establish control over the business' architecture. Architecture provides a base for ongoing building and automation. Control requires that objects should exist at all three architectural levels of business from which systems could be constructed. These levels are:
  (i) strategic architectural level;
  (ii) process architectural level and
  (iii) technology architectural level.

- To provide a business solution to a business problem across three architectural levels encompassing all eight dimensions of a business. These dimensions are:
  (i) data;
  (ii) object;
  (iii) function;
  (iv) strategy;
  (v) time;
  (vi) locality;

(vii) organisation; and

(viii) operation.

- To ensure strategic alignment of a business within its future external and target environments and to create business awareness of the forces influencing them.
- To contain risks through the use of project management and change management.
- To maximise benefits and returns on investment to all stakeholders.
- To construct a business consisting of business objects across three architectural levels.
- To effect the required change in the organisation's culture;
- To establish a company-specific engineering methodology

Authors such as Ould (1995:42), Morris (1993:14) and Bennis (1995:33) all agree with Engelbrecht and Hammer that the high failure rate of re-engineering projects is a result of the lack of integrated and systematic business re-engineering methodologies applied to projects.

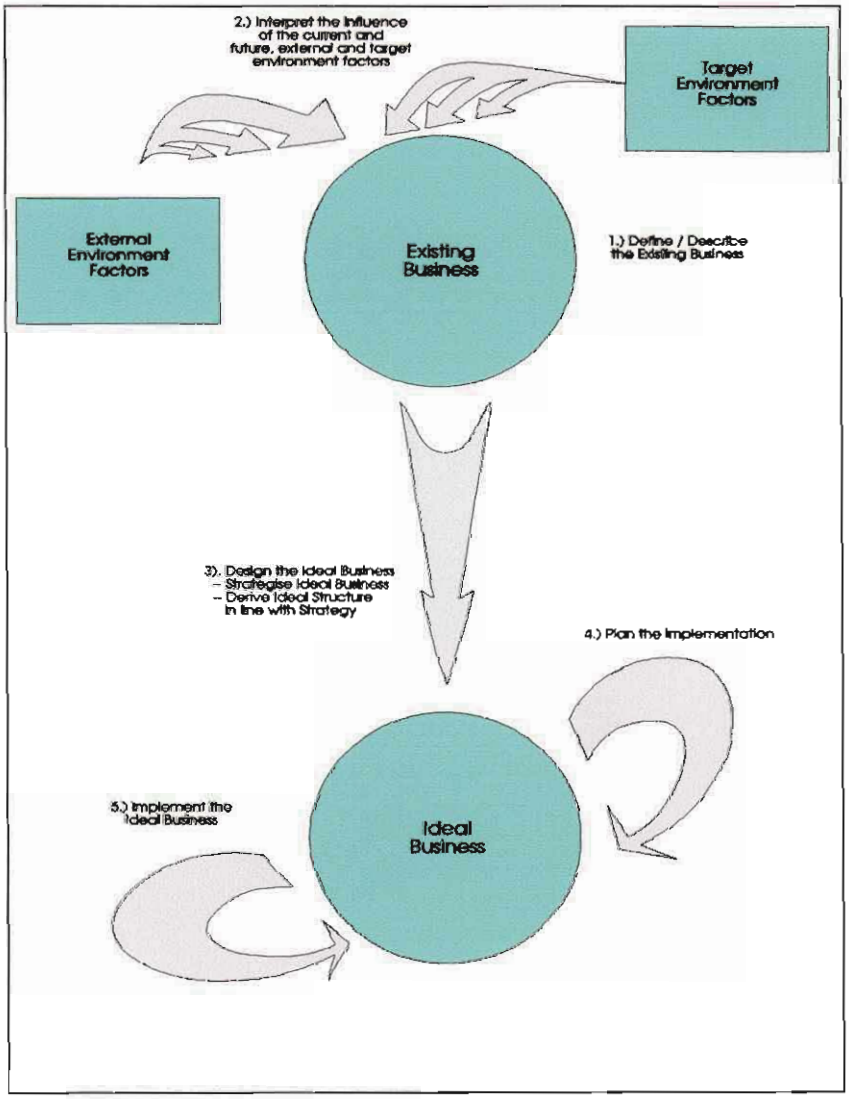
Three factors critical for business engineering that are often taken for granted and overlooked or ultimately lacking are:

- project management;
- change management; and
- architecture.

2.3.2 The scope of business engineering

The scope of business engineering includes the interpretation of the effect from factors in the target and external business environments. It does not have to include the accumulation and custodianship of the information. The scope of business engineering is depicted in Figure 2.2 below.

Figure 2.2: The scope of business engineering



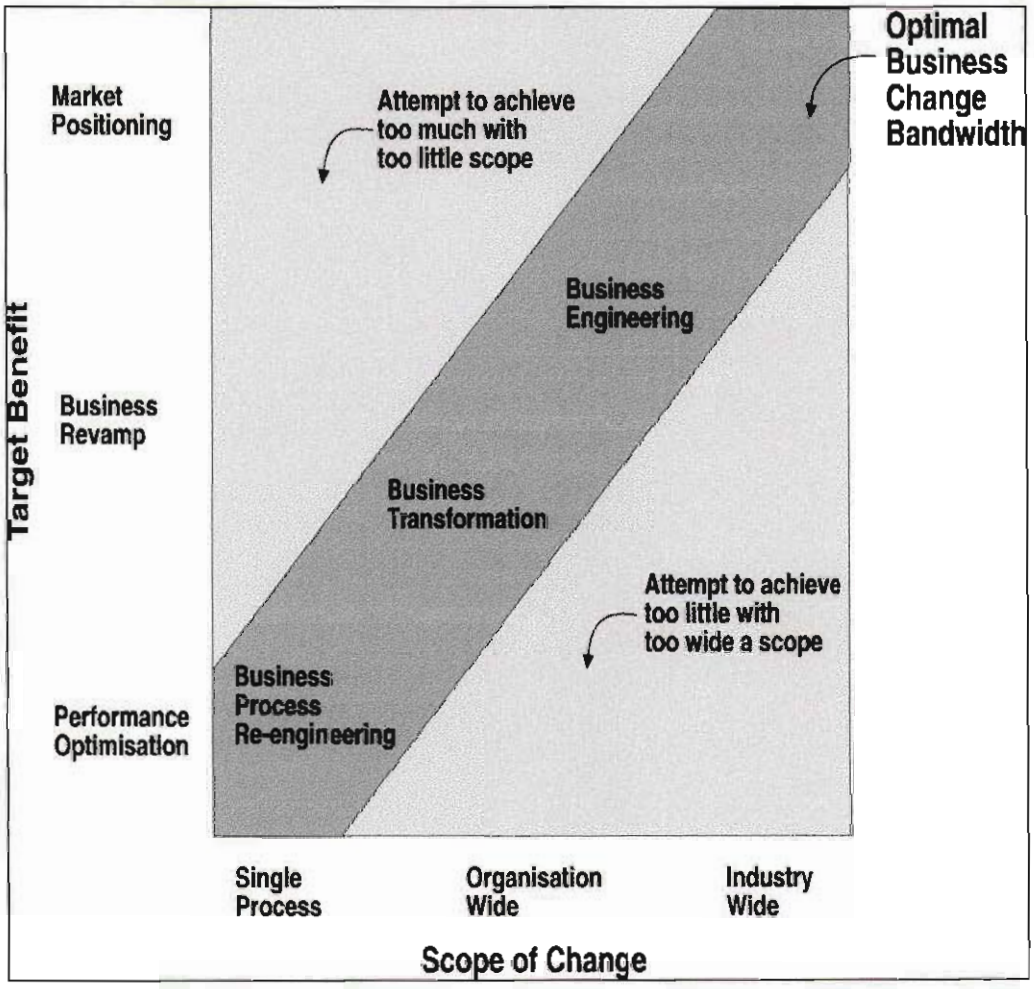
Source: Engelbrecht (1996:25)

The above definition of business engineering exceeds ordinary process improvement or business process re-engineering, but it includes it.

Business engineering, according to Figure 2.2, is an attempt to strategically reposition the entire business within the industry. This is done by considering the players around the business, it includes the suppliers, potential business alliances, customers and markets.

Business engineering, according to Engelbrecht (1996:25), is not an alternative to business transformation (BT) or business process re-engineering (BPR) but they are viewed as subsets of business engineering. See Figure 2.3 for business benefits obtained from business engineering as opposed to business re-engineering.

Figure 2.3: Benefits of business engineering



Source: Engelbrecht (1996:26)

We should thus beware of attempting to achieve too much from lesser attempts. Similarly it is also not feasible to attempt too wide a scope with too little business benefit in mind. There is a relevant business change bandwidth that applies to this science (Engelbrecht, 1996:26).

2.4. ORGANISATIONAL STRUCTURES

There are few aspects in business design that are as tangible as the proposed organisational structure around which functions are to be executed. Most people may agree on functions, processes and more, but only when they are personally affected or implicated does the reality of business change really hit home.

Thompson and Strickland (1996:247) state that customising organisational structures are appropriate due to the fact that business and its strategies are grounded in their own set of key success factors and value chain activities.

Strickland and Thompson propose four guidelines helpful in matching structure with strategy:

- pinpoint the primary activities and key tasks in the value chain that are pivotal to successful strategy execution and make them the main building blocks in the organisational structure;
- if all factors of a strategy-related activity cannot, for some reason, be placed under the authority of a single manager, establish ways to bridge departmental lines and achieve the necessary co-ordination;
- determine the degrees of authority needed to manage each organisational unit endeavouring to strike an effective balance between capturing the advantages of both centralisation and decentralisation; and
- determine whether non-critical activities can be outsourced more efficiently or effectively than they can be performed internally.

While no universally accepted framework exists for classifying organisations, Henry Mintzberg (1981:105) argues that there are five basic parts to any organisation, namely:

- **The operating core** – Employees who perform the basic work related to the production of products and services;
- **The strategic apex** – Top-level managers who are charged with the overall responsibility for the organisation;
- **The middle line** – Managers who connect the operating core to the strategic apex;

- **The techno-structure** – Analysts who are responsible for effecting certain forms of standardisation in the organisation; and
- **The support staff** – People who fill the staff units providing direct support services for the organisation.

According to Robbins (1990:167), millions of organisations in our society could be reduced to one of five general configurations: the simple structure, the machine bureaucracy, the professional bureaucracy, the divisional structure and the adhocracy.

In accordance with Robbins, Reese (1990:73) defines the major organisational structures as follows:

- simple structure;
- machine/industrial bureaucracy;
- professional bureaucracy/expertocracy;
- divisional structure/divisionalisation; and
- adhocracy.

The characteristics of these major organisational structures are summarised in table 2.1.

Table 2.1: Characteristic of major organisational structures

Characteristics	Simple structure	Machine bureaucracy	Professional bureaucracy	Divisional structure	Adhocracy
Specialisation	Low	High functional	High social	High functional	High Social
Formalisation	Low	High	Low	High within divisions	Low
Centralisation	High	High	Low	Limited decentralisation	Low
Environment	Simple and dynamic	Simple and stable	Complex and stable	Simple and stable	Complex and dynamic
General structural classification	Organic	Mechanic	Mechanic	Mechanic	Organic

Source: Reese (1990:73)

Thompson and Strickland (1996:254) propose five formal approaches to matching structure with strategy:

- functional specialisation;
- geographic organisation;
- decentralised business divisions;
- strategic business units;
- matrix structures featuring dual lines of authority and strategic priority.

In conclusion it should be noted that the main consideration for the development of an appropriate organisational structure is the business' specific needs. An organisational structure should not be super-imposed onto a business because it looks like the right thing to do. The total business should be regarded when an organisational structure is designed. The organisational design should consider the strategic intent and at the same time achieve the goals.

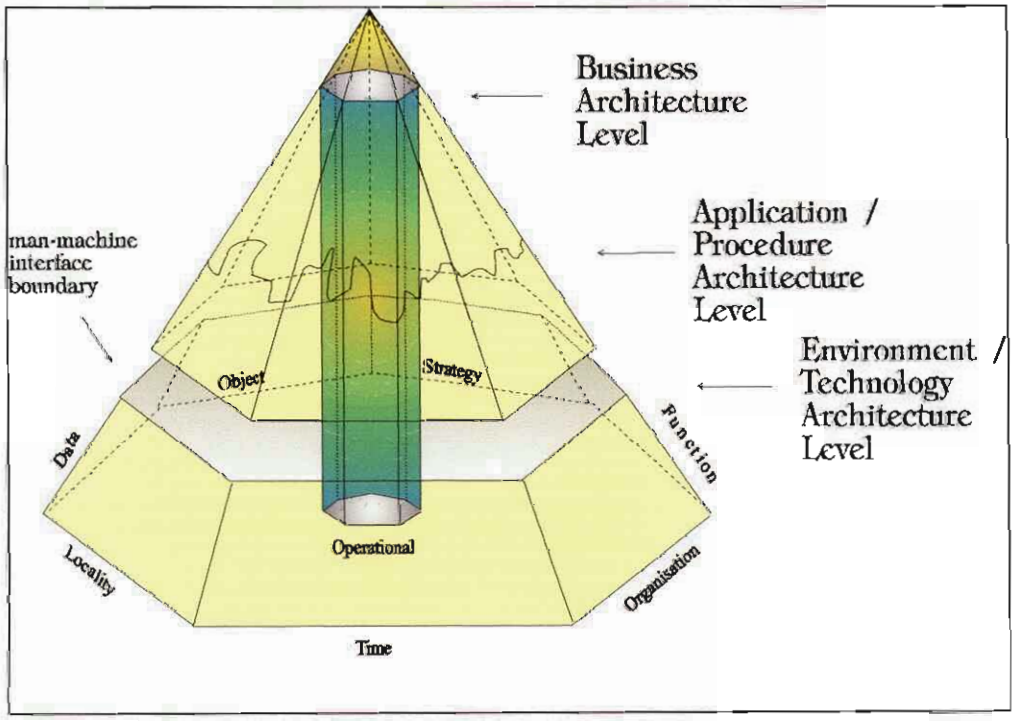
2.5 BUSINESS ARCHITECTURE

Jill Staints (1988:22-23), the applications manager of the company *Boulton & Paul,* comments that once you have a reasonably sound corporate data architecture in place, the task of building computer systems becomes very different. The author states that building an application is less difficult because most of the data analysis and design has already been done. Staints further states that the lesson they learned was that they should always try to build as solid a foundation of data as possible before embarking upon development, thus emphasising the importance of architecture.

According to Engelbrecht (1996:39), architecture provides an organisation with the ability to co-ordinate subsequent sub-projects that are derived from the global architecture. He states that this is the only way of ensuring integrated functioning of the total business architecture.

Architecture is the combination of all the building blocks, at all three architectural levels (See Figure 2.4) that, combined, constitute the business. It includes how these building blocks relate to one another, in other words, it depicts the contexts in which they exist.

Figure 2.4: Business architecture



Source: Engelbrecht (1994:39)

The architectural levels are defined in Figure 2.4 as:

- strategic/business architectural level;
- application/procedure level, and
- environment/technology level.

The definition of each level presented by Engelbrecht (1996:40-41) is given below:

- Strategic/business architectural level refers to the framework, structure and style that is used to mastermind, design, engineer and create something. Architecture defines the scope of the business systems/objects and how they relate to one another.

- Application architectural level defines the business at a procedural level consisting of programmable and non-programmable processes that are implemented across a geographical influence. To enable these procedures we associate them with an organisational structure and staff it.

- Environment/technology architectural level consists of a combination of technologies like manufacturing equipment, a manufacturing plant and information technology. In the information environment it is represented by a combination of hardware and software.

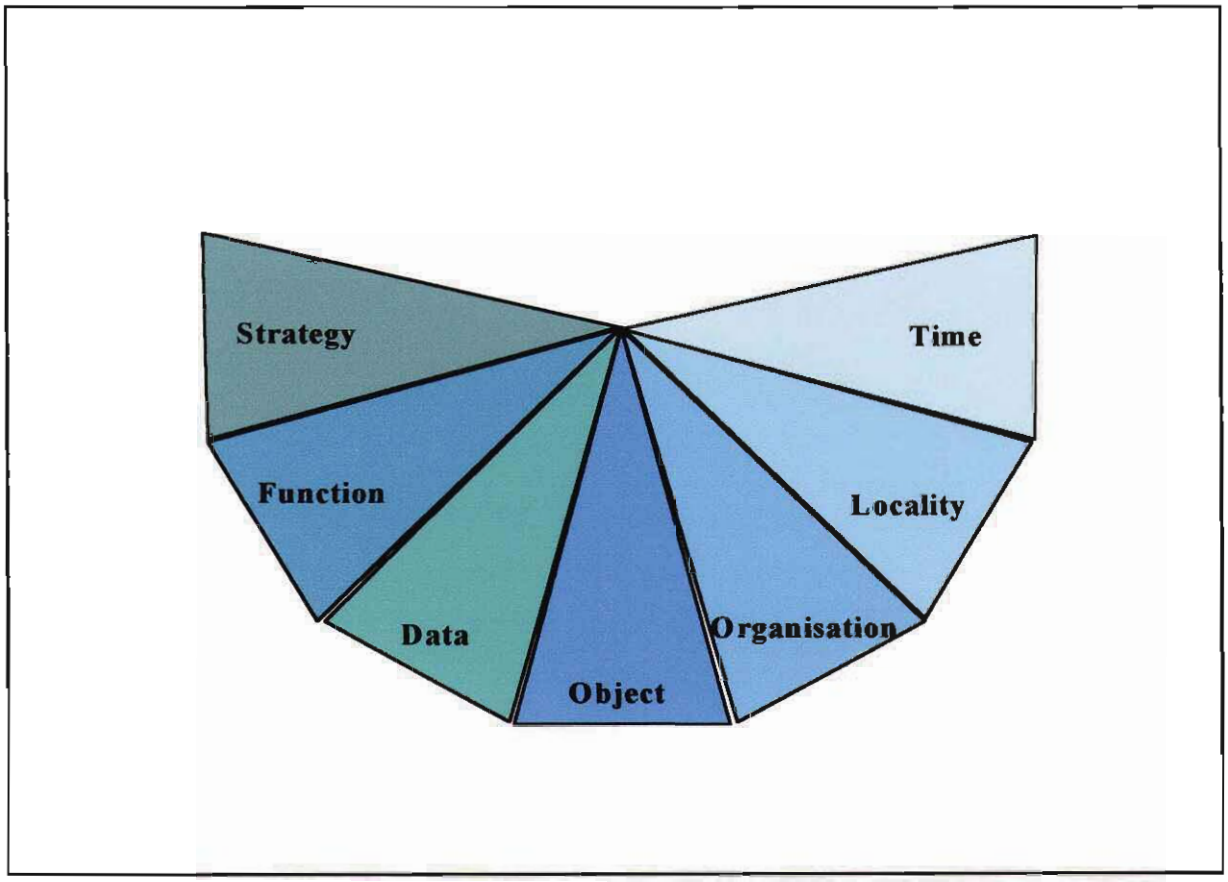
Most organisations succeed in establishing a fundamental understanding of architecture. Few organisations succeed in transforming that architecture into business benefit. As a rule, companies fail to maintain their architecture.

2.6 DISCON SPECIALISTS METHODOLOGY FOR BUSINESS ENGINEERING

The Discon specialist methodology ensures integration between the dimensions of a business by its paracentric approach to business engineering. The business dimensions that are addressed by this methodology will be discussed in this section.

The dimensions of a business are defined as strategy, function, data, object, organisation, locality, and time. These dimensions are illustrated in the architectural deployment model in Figure.2.5

Figure 2.5: Architectural model deployed



Source: Engelbrecht (1996:61)

2.6.1 Business engineering methodology for business dimensions

The methodology for business engineering as proposed by Engelbrecht (1996) provides that, when designing/engineering a business, specific tools are recommended. These designs at each dimension are mapped to designs on the other dimensions to ensure completeness and integration, thus establishing a paracentric approach to business engineering.

Business engineering strives to minimise the throw-away component of business design in the long term by first establishing the business priorities, then determining the architectural priorities and finally by establishing a compromise by accommodating the business priorities within the architectural priorities.

There are different ways of defining these business and architectural priorities. The specific techniques used by Discon specialists in defining each dimension will be discussed for the remainder of this chapter.

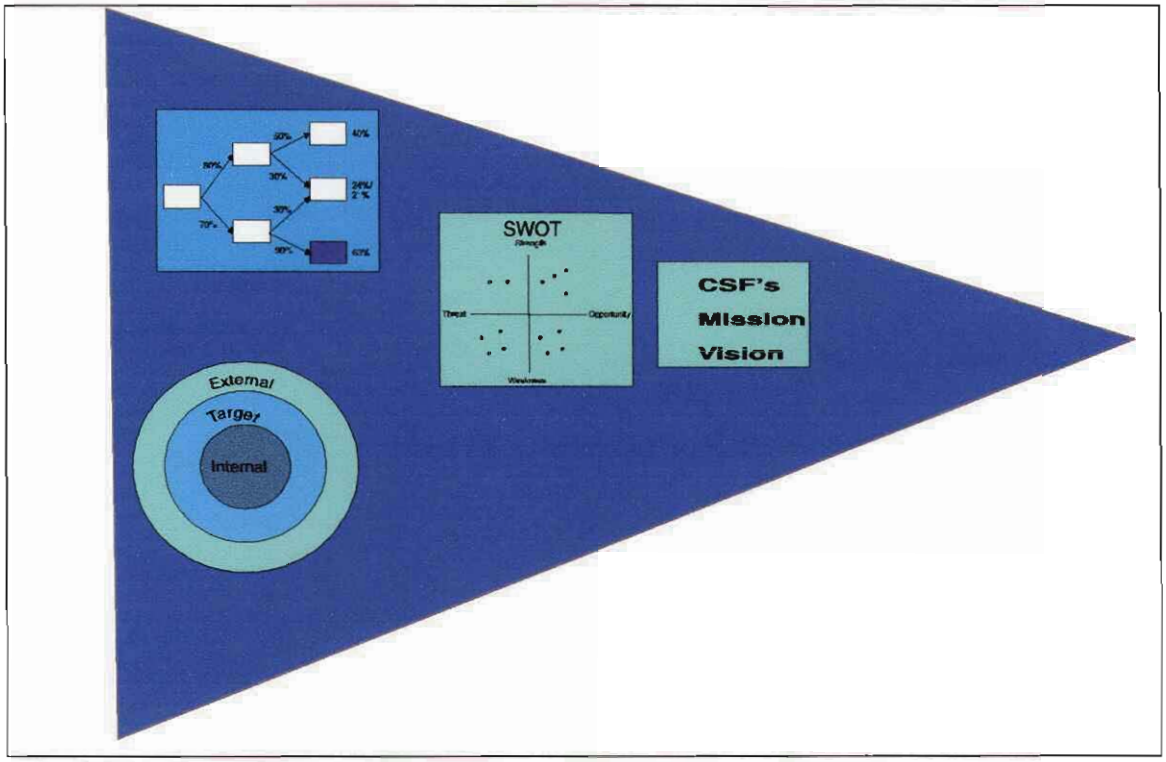
2.6.2 Determining business priorities

Business priorities are determined by conducting a strategic positioning of the business. The details of the specific method employed to determine the business priorities will be discussed in the dimensions: strategy and function.

2.6.2.1 Dimension 1: Strategy

Strategic positioning is initiated by first establishing the projected future picture of the business. This projection is done using a Scenario Dependency Diagram (SDD). Businesses do not exists in isolation and this projection should be done considering the target and external environments the business will exist in. The influences of these environments and the business' internal ability to handle these influences are defined by doing a SWOT analysis.

Figure 2.6 Dimension 1: Strategy



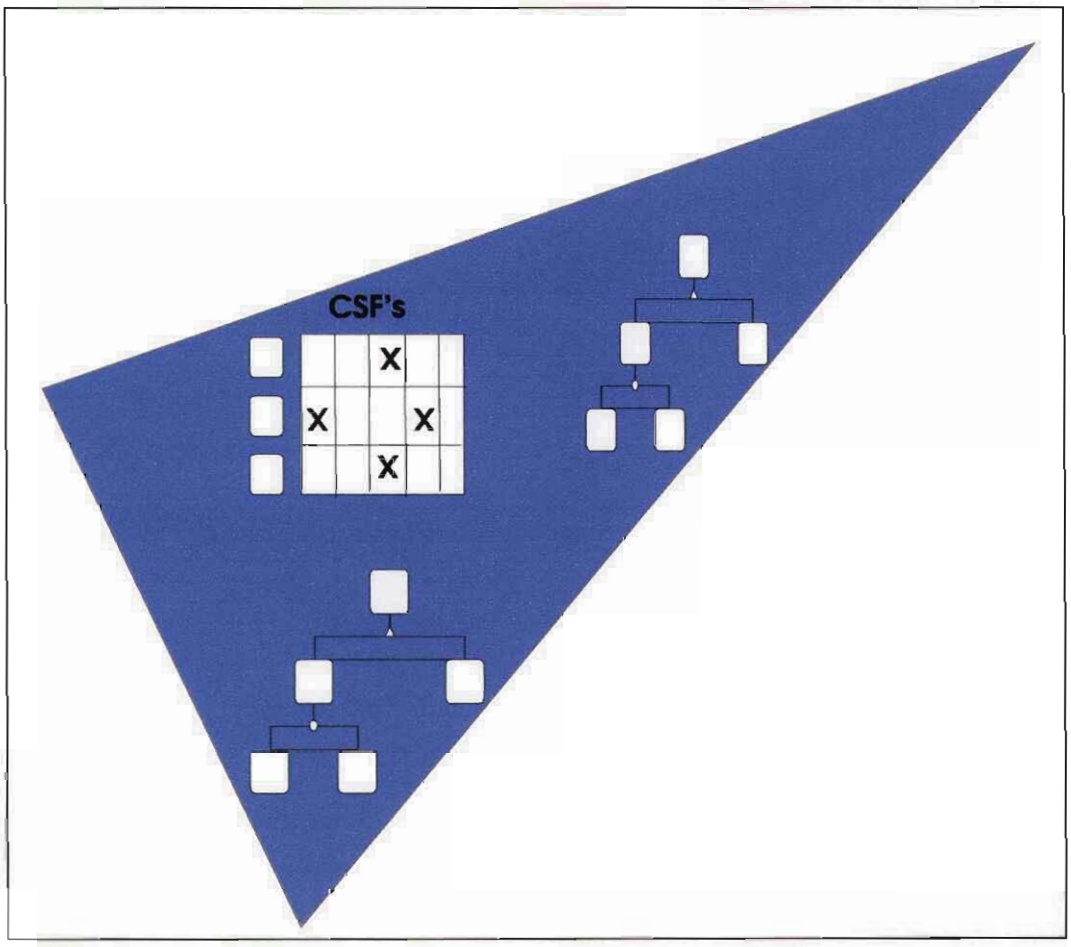
Source: Engelbrecht (1996:72)

A "certain death" scenario is defined next. This is done by evaluating the current condition of the business together with the major forces in the market by asking the questions: "If what doesn't happen?" and "Will it cause the business to close down?". The answer to these questions will give rise to what "certain death" will mean to a specific business. This scenario needs to be defined within a given time frame. The aim of the "certain death" scenario is to establish an understanding of what has to happen to ensure survival, given the future projection of the business environment. CSFs are derived from the SWOT analysis and the "certain death" scenario. These are factors effecting the business and if not they will cause the business to experience the defined death. Vision and mission statements can now be derived from these CSFs and the future scenario that was defined.

2.6.2.2 Dimension 2: Function

The function dimension is engineered using a goal decomposition technique called Function Structure Diagramming (FSD). The main goals of the business are broken down into sub-goals. These sub-goals are broken down further until a goal is described as actions. At this stage the boundary is crossed between a goal and an action. In compiling an FSD we stop just before crossing this boundary. These goals are called "leaf node" functions/goals. The generic goal decomposition model for manufacturing depicts that it should consist of three main goals or functions: execution functions, auxiliary functions, and management control functions.

Figure 2.7: Dimension 2: Function



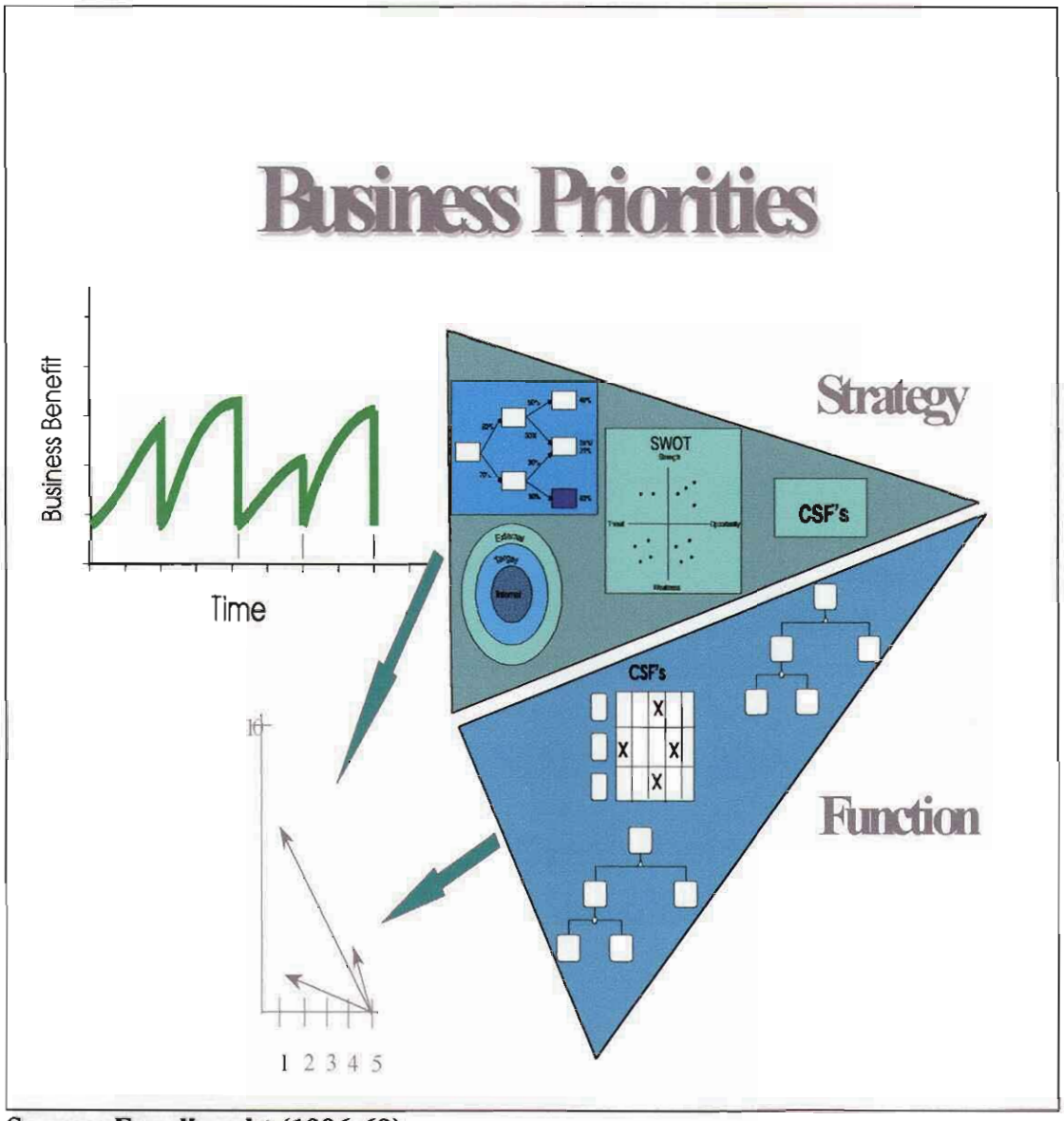
Source: Engelbrecht (1996:66)

2.6.2.3 Combining dimensions 1 and 2 to establish business priorities

In combining the dimensions of strategy and function we are able to establish the business priorities of the business. This is done by mapping the functions from the FSD at the "leaf node" level to the CSFs that were derived from the strategy dimension. By doing this, the criticality of each function is determined and the FSD is adjusted to establish a strategically aligned FSD.

In Figure 2.8 a green graph is presented to indicate the effect that process re-engineering has if initiated to satisfy only the business priorities, disregarding the architectural priorities. The business benefit obtained from this process can only be demonstrated in the short-term, causing the throw-away component of these developments to be very high. The vector diagram at the bottom gives a graphical presentation of the relative criticality of each function. These criticalities were determined by the mapping between the FSD and the CSFs as discussed above.

Figure 2.8: Business Priorities



Source: Engelbrecht (1996:69)

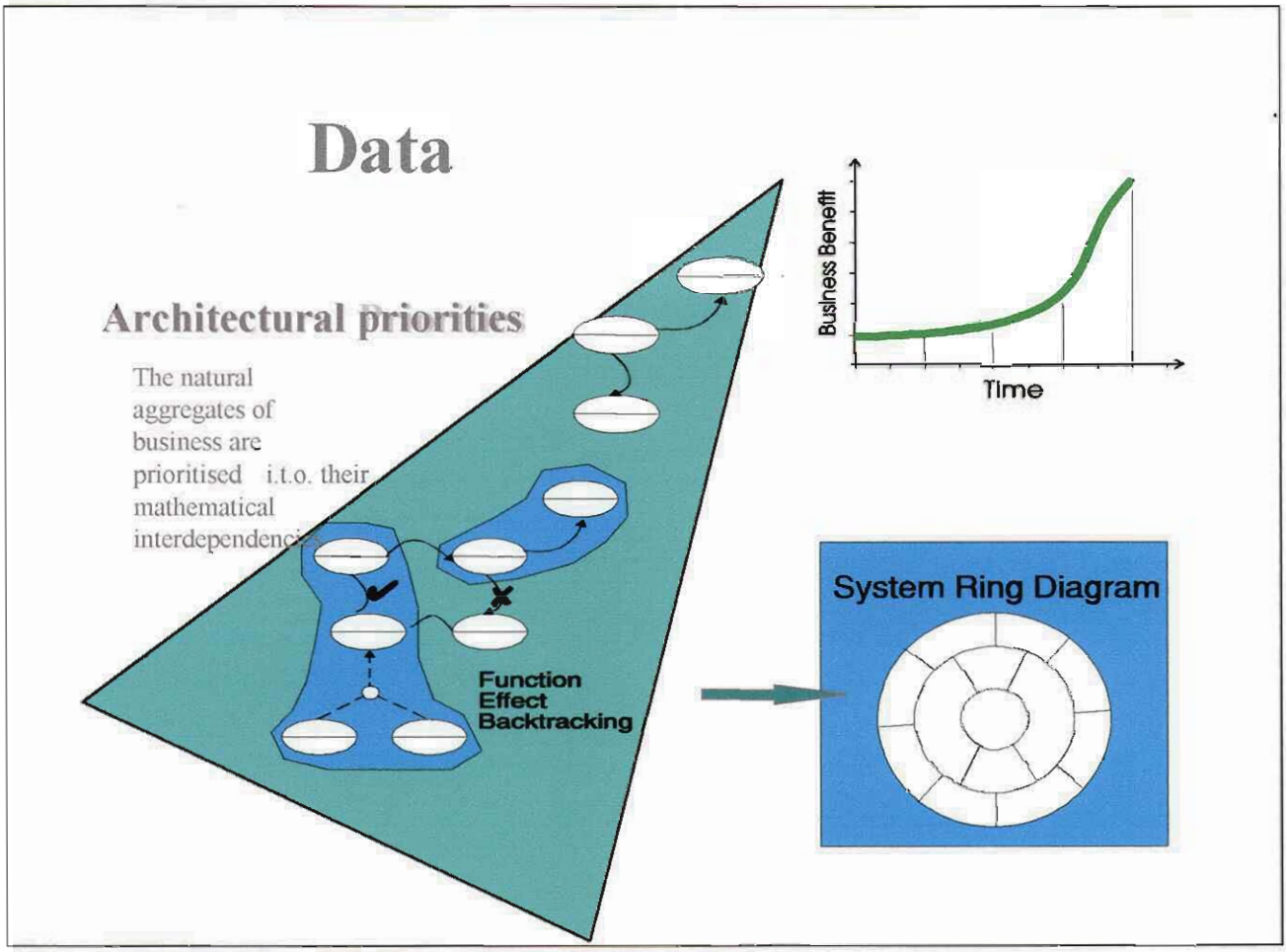
2.6.3 Determining architectural priorities

2.6.3.1 Dimension 3: Data

The green graph in Figure 2.9 shows that there are no throw-away components when development is done as proposed by the architectural priority.

The statement by Jill Staints as discussed in paragraph 2.5 is very relevant, the only problem is (as can be seen from the graph in Figure 2.9) that the business benefit from architecture only realises in the long run. A business has current needs that should be addressed. These short-term needs cannot wait for the establishment of business-wide architectural development before they are addressed.

Figure 2.9: Dimension 3: Data



Source: Engelbrecht (1996:48)

The technique used to define the relationship between data entities in a business is called an Attribute Dependency Diagram (ADD). This technique is applied to the architectural data design. It gives an account of the data relationships/dependencies within a business. Functional Effect Backtracking (FEBT) is used on the ADD to identify groupings of entities with the greatest natural cohesiveness, forming natural data clusters. These clusters are then translated into SIDs and also graphically represented in a systems ring diagram as depicted in Figure 2.9.

The ring diagram indicates the sequence of development starting from the centre of the ring and then rippling to the outside. Systems in every layer are dependent on the systems on the inner layer of the ring; the inner layer should therefore be developed first. Development priority is the highest in the centre of the diagram and becomes lower and more dependent on other systems as we move towards the outside of the ring.

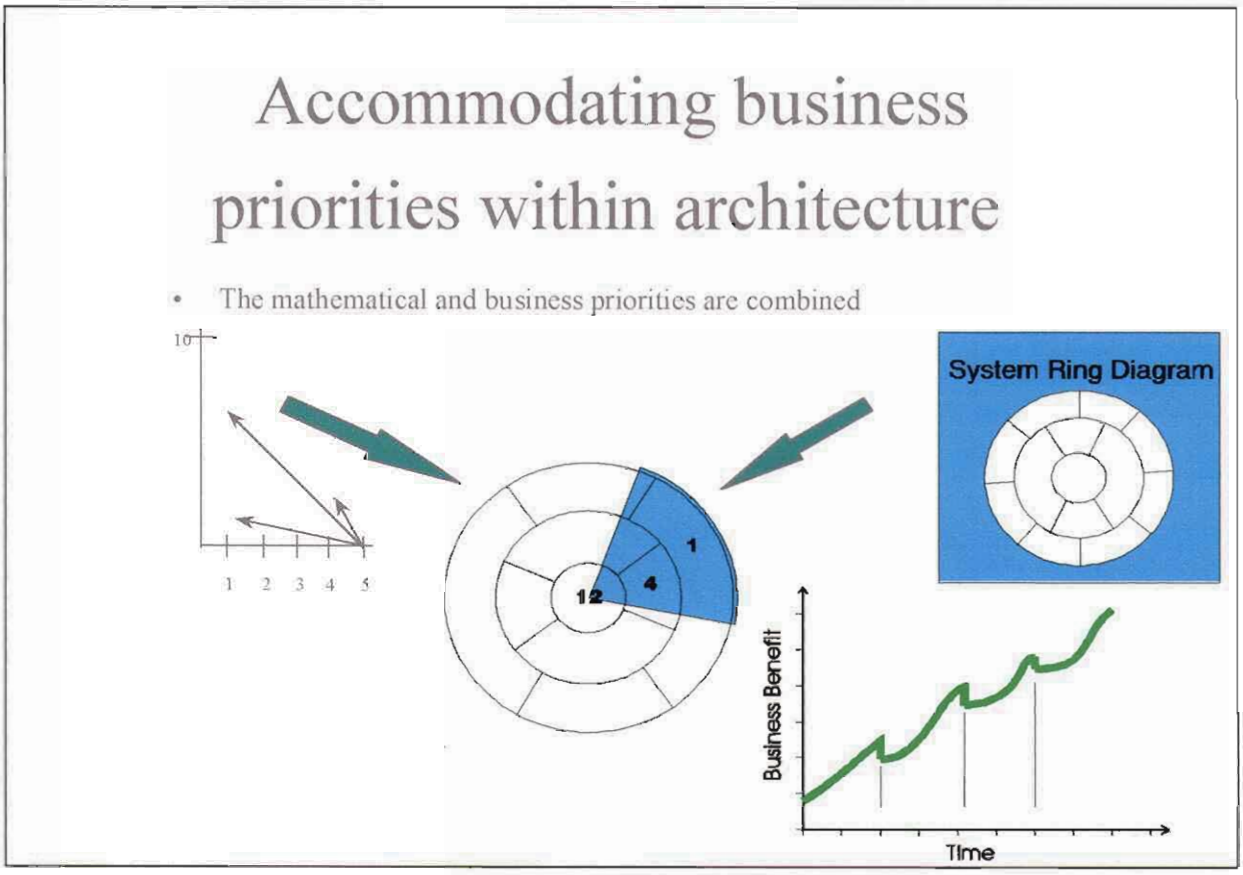
2.6.3.2 Accommodating business priorities within architectural priorities

It is clear at this point that a compromise should be established between business priorities and architectural priorities. The business priorities are now mapped onto the architectural priorities by creating a "pizza slice" of the ring diagram depicting the satisfying of business priorities without violating the architectural priorities. In Figure 2.10 the vector diagram provides the business priorities and the systems ring diagram provides the architectural priorities. Mapping these two produces the "pizza slice" in the middle.

In this example, to be able to develop system "1" – that is required from a business priority perspective – one should start by developing a part of system "12", then a part of system "4" and only then will you be able to develop system "1" and minimise the throw-away component of the development.

The benefit of business engineering over time is depicted on the graph at the bottom of Figure 2.10. It clearly indicates that business benefit could be obtained faster than by just using an architectural priority. The throw-away component is minimised because architectural priorities are not violated in satisfying business priorities.

Figure. 2.10. Accommodating business priorities within architectural priorities



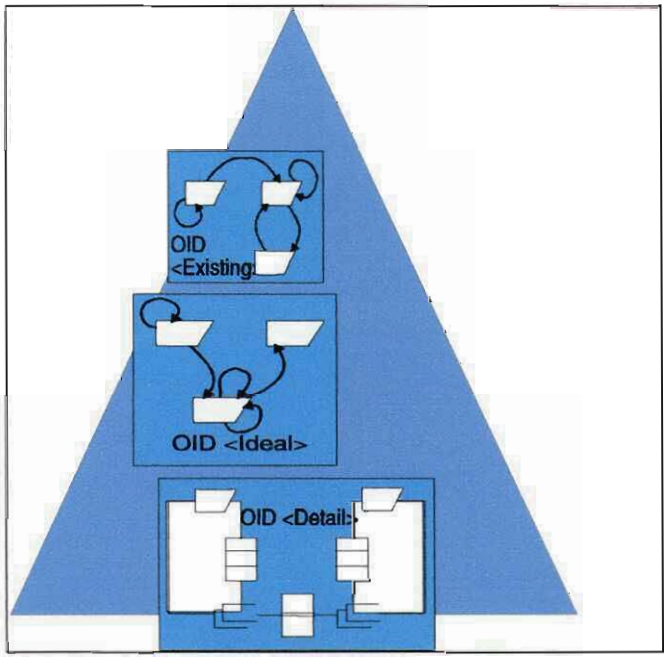
Source: Engelbrecht (1996:52)

2.6.4 Dimension 4: Object

Businesses consist of objects at any level. The definition of objects encompasses physical objects such as people, functions or divisions, equipment and logistical items. The flow of business is diagrammed using arrows to depict the flow between business objects. The numbers on the flow-text indicate the sequence in which the flows take place. If more than one flow take place simultaneously, the numbering used is duplicated. If alternatives to a certain flow exist, the numbering is supplemented with a symbol (e.g. "a" or a "b"). The text associated with an arrow is a description of the operational flow that takes place between two objects. Arrows going back to the same object from which they originated indicate an internal operation on an object.

These OIDs exist at three architectural levels. Diagrams on a lower level can be summed up at a higher level. Thus, high level OIDs are exploded into more detail in the detail OID found at the next level of business (see Figure 2.11). On the technology architectural level the objects are systems with data/commands flowing from one system to another, depicting the data that the system carries and the main functionality found in the system. The control boxes between them indicate the "handshake" between systems.

Figure 2.11: Dimension 4: Object

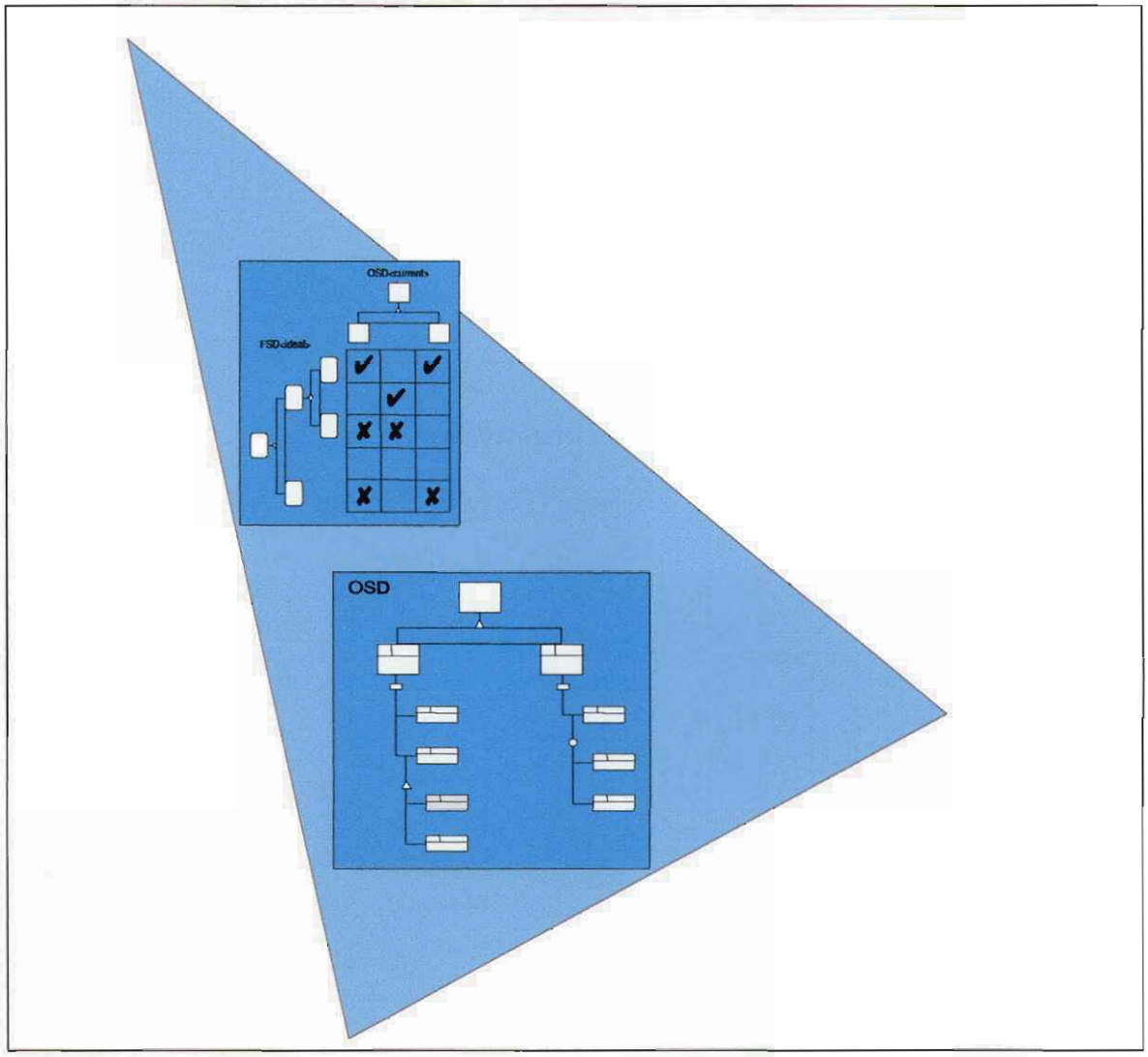


Source: Engelbrecht (1996:88)

2.6.5 Dimension 5: Organisation

Organisational structure has to be designed and people allocated to perform the functions/processes designed in dimensions 1 and 2. The FSD and SIDs are mapped onto the Organisational Structure Diagram (OSD) (see Figure 2.12). This ensures that the OSD is complete and that some organisational unit addresses the goals of the business. It also enforces a paracentric approach. We determine responsibilities associated with each organisational area with the Key Result Areas and Indicators (KRAs & KRIs). These responsibilities and measurement criteria are then assigned to specific people appointed to these positions after being matched with the profiles required for executing the functions.

Figure 2.12: Dimension 5: Organisation

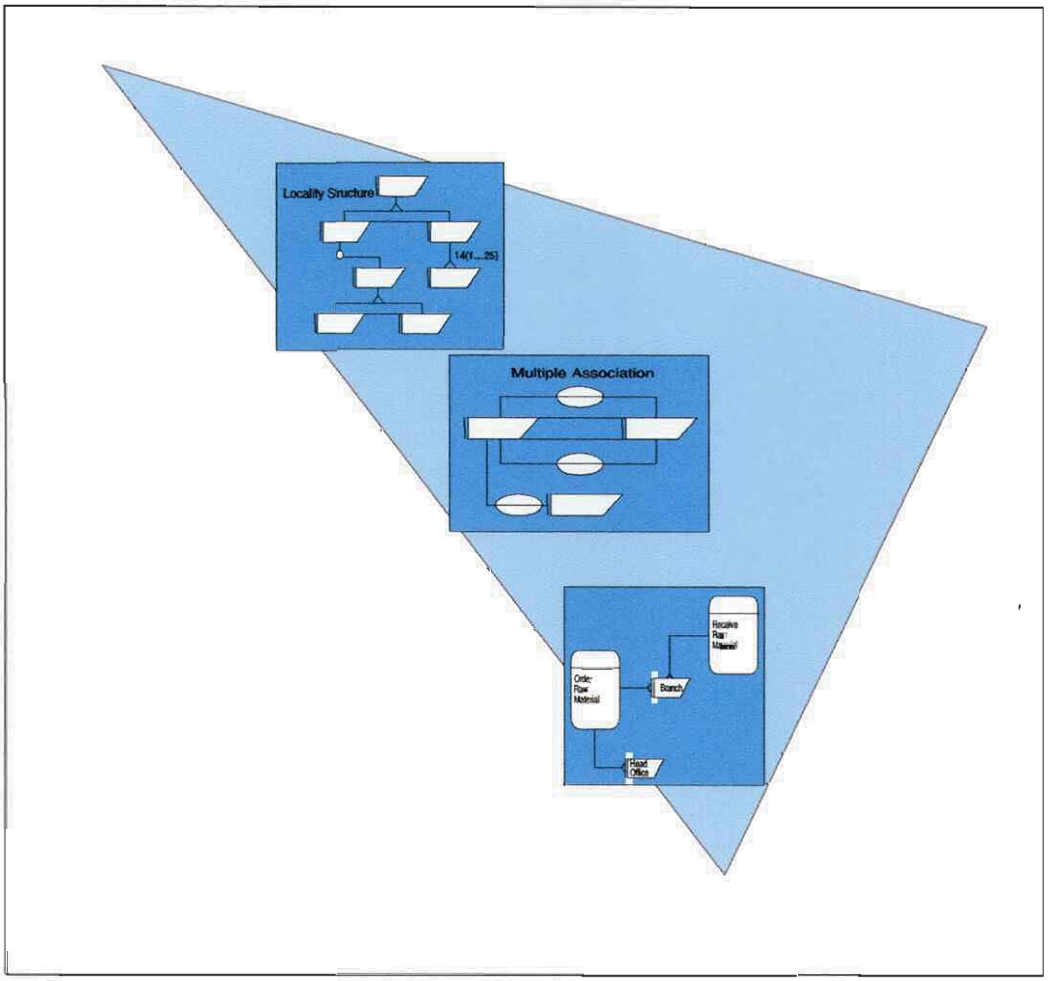


Source: Engelbrecht (1996:75)

2.6.6 Dimension 6: Locality

Dimensions of locality are important in businesses that operate in geographically distributed areas (see Figure 2.13). On a technological level this dimension is of utmost importance as the location of a system could be indicated, together with the people responsible for the data integrity. When designing distributed databases this definition is even more crucial.

Figure 2.13: Dimension 6: Locality

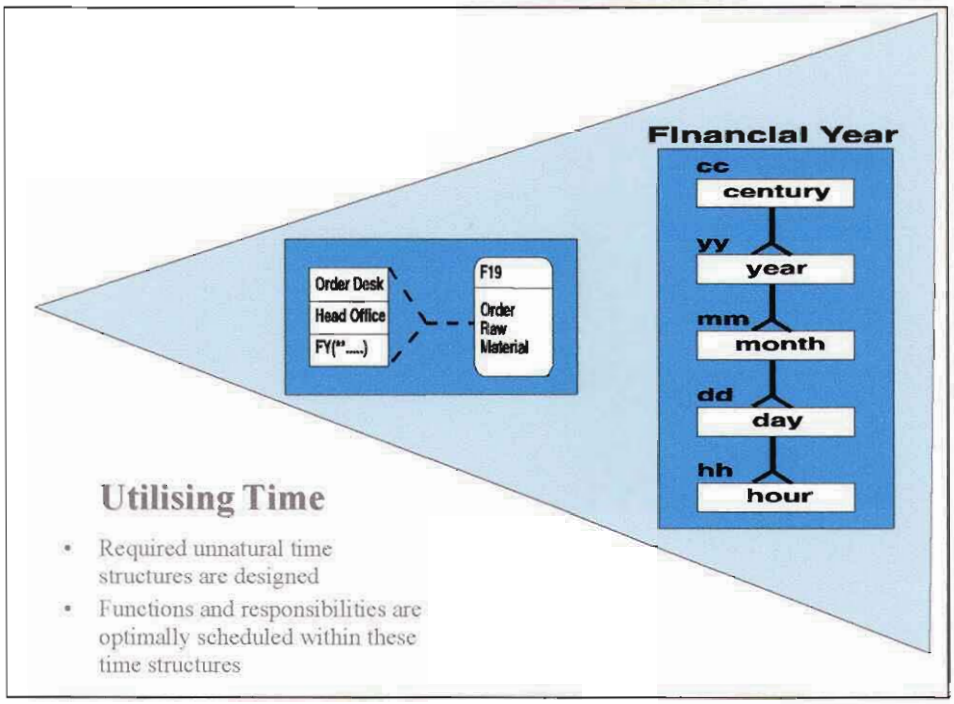


Source: Engelbrecht (1996:82)

2.6.7 Dimension 7: Time

The dimension of time is useful when the designs or systems have to be executed at unnatural times or where it is important that specific transactions be done at specific times. This function is especially important to the banking industry. Responsibility for the performance/execution of these functions is scheduled within these time structures. The specific time units used, the unit acronyms and decompositions are diagrammed. This is linked back to functions and systems in the SOD.

Figure. 2.14 Dimension 7: Time



Source: Engelbrecht (1996:60)

2.6.8 Dimension 8: Operation

This Dimension is where everything is brought together. When doing an SOD, all the dimensions of a business as defined in dimensions 1 to 7 are drawn together and correlated with one another. This diagram is used to enforce the paracentric approach to business engineering. This means that no dimension of a business exists in isolation, but that every dimension of the business is dependent on the other dimensions to ensure that the business will function as a unit.

2.7 SUMMARY

Business engineering is defined as a radical approach, initiated by executive commitment, to deliver short-term and long-term business benefits. This is achieved by implementing and utilising an organisation-specific set of methods.

The definitions that were proposed for the different concepts of business engineering/re-engineering and process re-engineering interrelate to form a clearer picture of the role of each. Business engineering encompasses business process re-engineering and business transformation. Business architecture is fundamental to business engineering together with project management and change management.

The literature survey also revealed that organisational structure should always follow strategy and not vice versa.

An organisational structure should include the following five basic parts (Mintzberg, 1981:105):

- **The operating core** – Employees who perform the basic work related to the production of products and services;
- **The strategic apex** – Top-level managers who are charged with the overall responsibility for the organisation;
- **The middle line** – Managers who connect the operating core to the strategic apex;
- **The techno-structure** – Analysts who are responsible for effecting certain forms of standardisation in the organisation; and
- **The support staff** – People who fill the staff units providing direct support services for the organisation.

The DISCON methodology for business engineering proposes a set of techniques to enable the definition of a business at all eight dimensions across three architectural levels.

CHAPTER 3

RESULTS

3.1 INTRODUCTION

According to Bennis (1995:4), it is essential for re-engineering to use a specific methodology. In line with these definitions of Bennis, Engelbrecht (1996:13) states that "Business engineering is achieved by implementing and utilising an organisation-specific set of methods".

What is a methodology? According to The new Webster's dictionary of the English language page 942 a methodology is defined as: "The system of methods or of classification as it is applied by science or art."

Authors such as Ould (1995:42) and Morris (1993:14) all agree with Engelbrecht and Bennis (1995:33) that the high failure rate of re-engineering projects is due to a lack of integrated and systematic business engineering methodologies applied in the projects.

It can thus be concluded that without a clear definition of the specific methods needed and their inter relationships, it will be virtually impossible to re-design a business without neglecting aspects of the business. It is therefore of paramount importance that a sound methodology be used when embarking upon the road of re-designing a business or its processes.

3.2 METHODOLOGY USED

The actual design of the business is by far the most comprehensive and time-consuming of all three phases. The methodology used to design the SMI business at the CSIR was taken from the DISCON methodology that is discussed in Chapter 2. It was decided to use this specific methodology due to the integration between dimensions of a business that it facilitates. This integration is enforced by a paracentric approach to business modelling.

The methodology was separated into three phases:

- phase I: Strategic positioning;
- phase II: Defining business entity relations; and
- phase III: Organisational structure design

3.3 PHASE I – STRATEGIC POSITIONING

3.3.1 Introduction

The dimensions of function and strategy are addressed during a strategic positioning exercise. The aim of the exercise is to determine the business priorities that will exist in the projected future of the business. The specific sequence of events followed is presented graphically in Figure 3.1. Step eight was addressed as part of another project to compile the master business plan, and is therefore not addressed in this document. The first seven steps followed during this study are briefly discussed below.

- Scenarios and related environmental factors that have any relevance to the business are translated into two aspects:

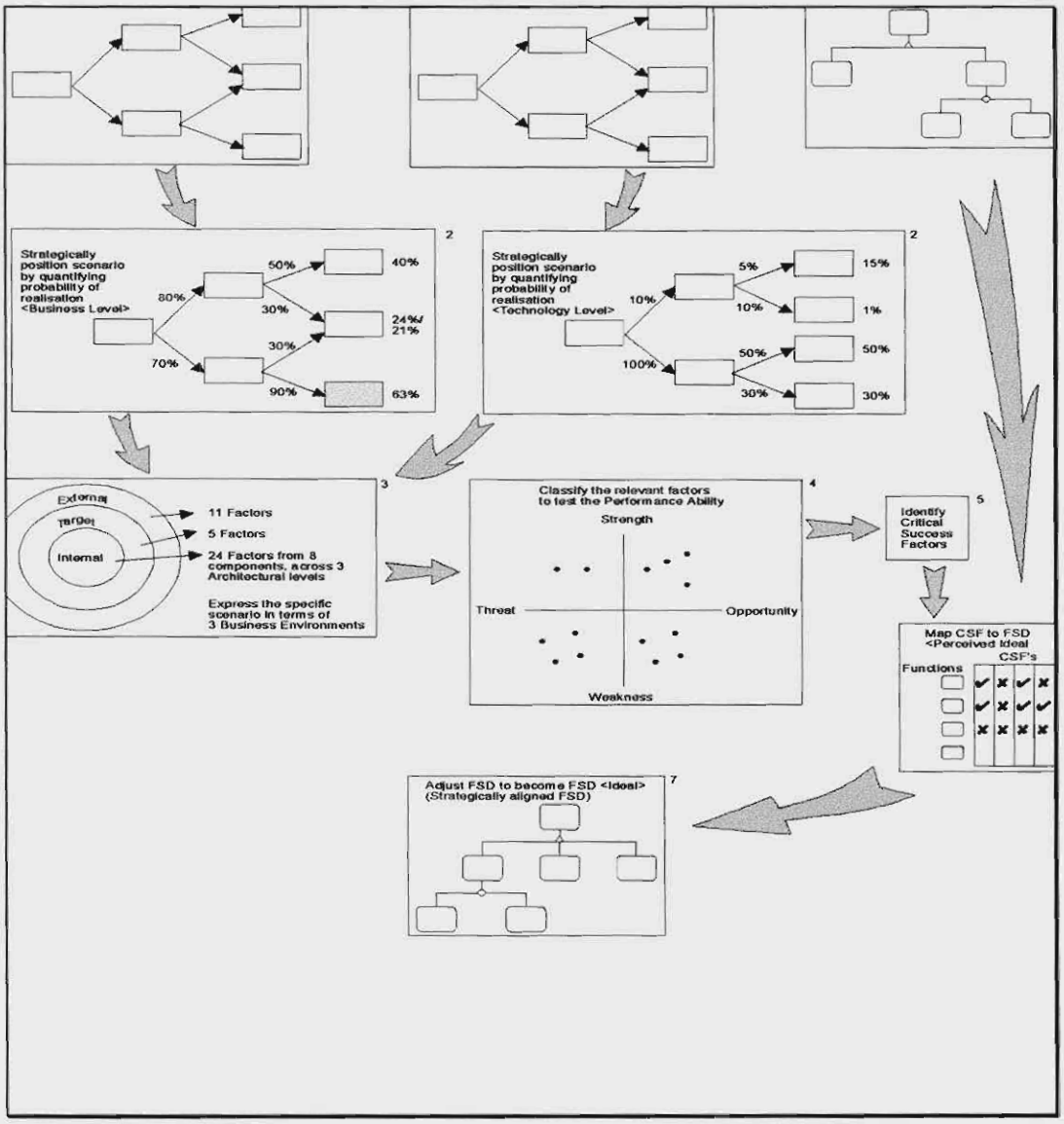
  (a) Does the factor pose a threat or an opportunity? and

  (b) Can we or can we not deal with this factor adequately?

  It is a Cartesian SWOT mapping of our ability to deal with the external and target environments.
- The SWOT plots are analysed and interpreted. Where the CSIR is both weak and the factor implies a threat, we are forced to deal with such issues to counter the threat of the defined "certain death". Similarly, strengths and opportunities combined may imply business waiting to be capitalised upon.
- Posing the question "What will at some future time indicate whether CSIR Manufacturing is not viable as a business?", allows us to define a "certain death" scenario for the SMI within the CSIR. Asking such a question serves two purposes. Firstly we are forced to think in terms of goals, and secondly the factors arising from the SWOT analysis that pose threats and expose our weaknesses can be measured against the "certain death" scenario. It they fall within the scope of our question, we have to deal with them.

- CSFs are next derived for the business. A few rules can be applied to derive those factors we have to manage in order to stay in business. For this exercise, seven (7) factors were identified (see Appendix A).
- Concurrently with the above, the high-level functions/processes are broken down into much more detail (See Appendix B), and tested against the critical success factors. This allows for adjustment of the FSD and also indicates gaps.
- At this point in time, numbers of organisational designs are mapped against a complete set of functions for the business, and the best match is used to map the functions.

Figure 3.1: Determining business priorities



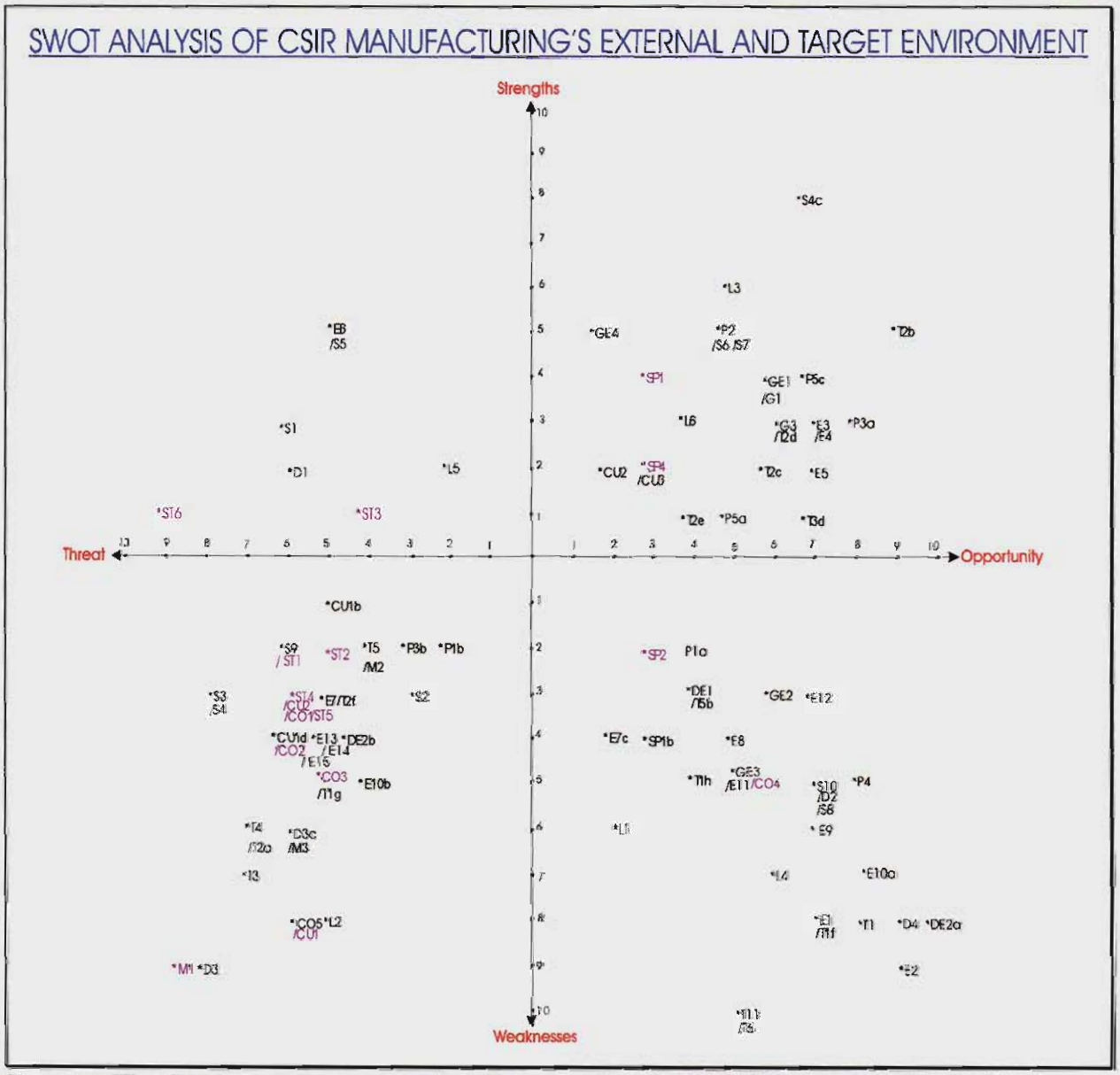
Source: Engelbrecht (1996:11)

3.3.2 Determining CSFs

CSFs are defined as those critical issues in a business that must be addressed within a given time frame to ensure the survival of the business. If they are not attained within the specific time frame, the defined "certain death" scenario is inevitable (Engelbrecht, 1996:71).

Before the CSFs were determined, a SWOT analysis of the alignment of CSIR Manufacturing with the external and target environment was generated (See Figure 3.2).

Figure 3.2: CSIR's ability to perform in the Manufacturing environment



Source: The SWOT plot was compiled from the detailed SWOT shown in Appendix A

An analysis of the SWOT plot in Figure 3.2 reveals the following:

- Factors posing a *threat* and exposing our *weaknesses*, constitute the biggest portion (41%), indicating the serious misalignment of the current mode of operation;
- there are a surprising number of *opportunities* (26%) on which the CSIR could capitalise; and
- a number of *opportunities* are left unexplored (25%), mainly due to a weakness or lack of current methodologies, structures, individuals and processes to deal with these issues.

It should be kept in mind that this plot will change with time and as scenarios unfold.

The "certain death" scenario that was proposed for CSIR Manufacturing states that SMI should succeed within eighteen months to make a contribution to the purpose of CSIR Manufacturing (*"Help South African manufacturers to increase their global market share"*). The example used is that of an insurance salesman failing to sell a policy within a given time frame. He must realise that he is in the wrong business if no sales are made – the same applies to CSIR Manufacturing.

We can, within a given time frame and scope, test each factor of our environmental analysis against this "certain death" scenario. The result of asking "The 18 months Question for CSIR Manufacturing" yielded a number of factors that pose a threat and expose our weaknesses to deal with them. The factors are grouped together in the categories of analysis they pertain to. The factors that are both a threat to and weakness of CSIR Manufacturing and could contribute to the defined "certain death" are listed below:

Technological

T5W5. Global access for manufacturing sector to sources of global information.

T7W7. The rate at which technology changes, requires the CSIR to accelerate the rate of learning and mentorship. The environment in which investment decisions are made has become more volatile and a careful analysis of technological life cycle should be done before investment is made in any potentially obsolete technologies. The "Half-life" or S-curves plotting of technology should be considered carefully to minimise these risks.

T7W6. Ancillary costs are increasing due to the threat of losing skilled staff, technology, intellectual property and trade secrets. The CSIR's technological resources are not aligned with the needs of their market.

T4W2. CSIR has an inability to convert information to strategy and to reflect the implication of the strategy onto business processes, technology and resource implications.

Economical

T5W4. The increased number of players in the manufacturing playing field requires careful short-term navigation and the identification of critical industry associations to form alliances with.

Directional

T8W9. CSIR Manufacturing's market has changed, causing a re-definition of the CSIR's business focus in terms of new products and markets, thus resulting in a miss-alignment of the CSIR's resources. This necessitates the re-researching of technological resources (including reverse engineering and skilling of resources).

Stakeholders

T5W2. Understanding the motives of the trade unions and anticipating the implication to business benefit that could be obtained by capitalising on the incorporation of their applicable aspirations into business.

T6W3. The CSIR is not aligned with the manufacturing sector's real needs; we need to interpret the real and potential needs. We have to understand their "need to deliver on promises" and develop the ability to translate technology to the level of sophistication and ability of the customer.

T6W3. It is of the utmost importance for the CSIR to identify trend-setters and their interpretation of technological trends in manufacturing to be able to align our business with them and the trends predicted.

Customers

T5W1. The CSIR is very low on customer/market intimacy. The manufacturing community is ignorant of the CSIR's existence and professional abilities apart from defence-related business.

The next step is the interpretation of the results. The team defined the following seven factors as those that are critical for the survival of a CSIR Manufacturing business, given the defined "certain death" scenario.

Critical Success Factors (CSFs)

- Ensure trade union and employee understanding of the CSIR's reason for existence, their commitment to change, and incorporate their aspirations in the overview design by 1 October 1998.
- Segment markets, analyse needs and build intimate customer relations – creating an environment conducive to selling – by 1 October 1998.
- The ability to change, represented by a continuous business process (enabled with change-instruments) has to be established and manned by 1 October 1998.
- Achieve measurable and sustainable financial success and business growth for CSIR Manufacturing. The measurement mechanisms required must be in place by 1 October 1998.
- Identify the appropriate organisations (matched to market need as per CSF above in the market with an impact-weighted rating [% and probability of benefit]) and align for strategic association (alliance) on particular projects as per CSF above by 1 March 1999.
- Translate industry requirements and international manufacturing technology trends into a technological strategy for CSIR Manufacturing by October 1998.
- The CSIR Manufacturing business has to be fully functional and adequately manned to service the focused market demand by 1 March 1999.

3.3.3 High-level business design

In itself, a process does not stand alone, but enables the business to achieve its goal. Again, a parent process can be broken down into sub-processes and so forth until activities are defined. However, before any design of any process is embarked upon, clarity should be obtained in the participating group by asking a seemingly simple question:

"What is the purpose of the business?"

Arriving at an answer with the internal workgroup constituted almost an entire morning session. It was encouraging that the answer elevated the debate to a higher level than expected. In fact, the environmental analysis confirmed the relevance of the answer to the question.

Once clarity is reached with regard to the purpose of the business, processes are defined. Dr. W. Mostert defines the characteristics of a process as follows:

- It is started by means of a "trigger";
- it has governance, or can be subjected to external governance (or localised rules of execution);
- any process must provide an output or "token";
- it requires resources (of all types) to execute; and
- usually, any process has an owner or owners, and any number of stakeholders that have an interested in, or is affected by its outcome.

There are many other dimensions to a process, but the above 5 pointers usually suffice to provide a scope for high-level business definition purposes.

Two sessions were scheduled. A first iteration with internal (CSIR, cross-divisional) participants, and secondly with six champions of industry and two CSIR directors. Dr. Willem Mostert facilitated both sessions. The results presented were compare to the results obtained from the strategic positioning sessions and tested notably similar. In itself it lends a level of credibility to the results obtained from the strategic positioning and also provided an amount of confidence to proceed to the next level.

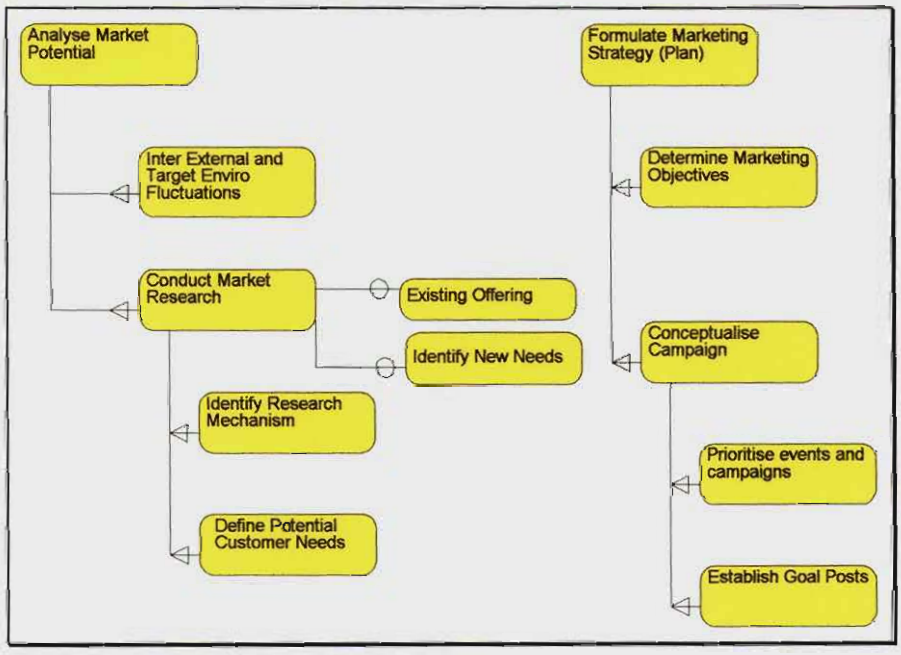
3.3.4 Detailed business function/goal design

This section covers a detailed translation from high-level processes to functions and activities where applicable.

It will be beneficial to pause for a brief moment before indulging in the detail that follows. Why do we have to have so much detail? Will it not be sufficient to simply give the go-ahead for various functions' "owners" and tell them to implement according to their best knowledge? Unfortunately, the answer is that business demands discipline, and perhaps most significant, clarity of the roles and responsibilities of each area, individual or team. We all have opinions and sometimes gaze into the future without telling each other exactly what we have in mind. It is like a captain sailing his ship in a general direction, guided by the whims of the crew, instead of clarifying how, where and what exactly should happen to sail the ship.

Keep in mind that a high-level process was defined in the previous section to *create demand* (or *marketing* in external terminology). Part and parcel of this process would be to create a master marketing plan, which could comprise many actions, processes and or functions to be executed. Figure 3.3 below graphically illustrates the interdependencies of an extract from this process. See Appendix A for an enterprise-wide, graphical and textual version.

Figure 3.3: An extract from the enterprise-wide FSD for SMI



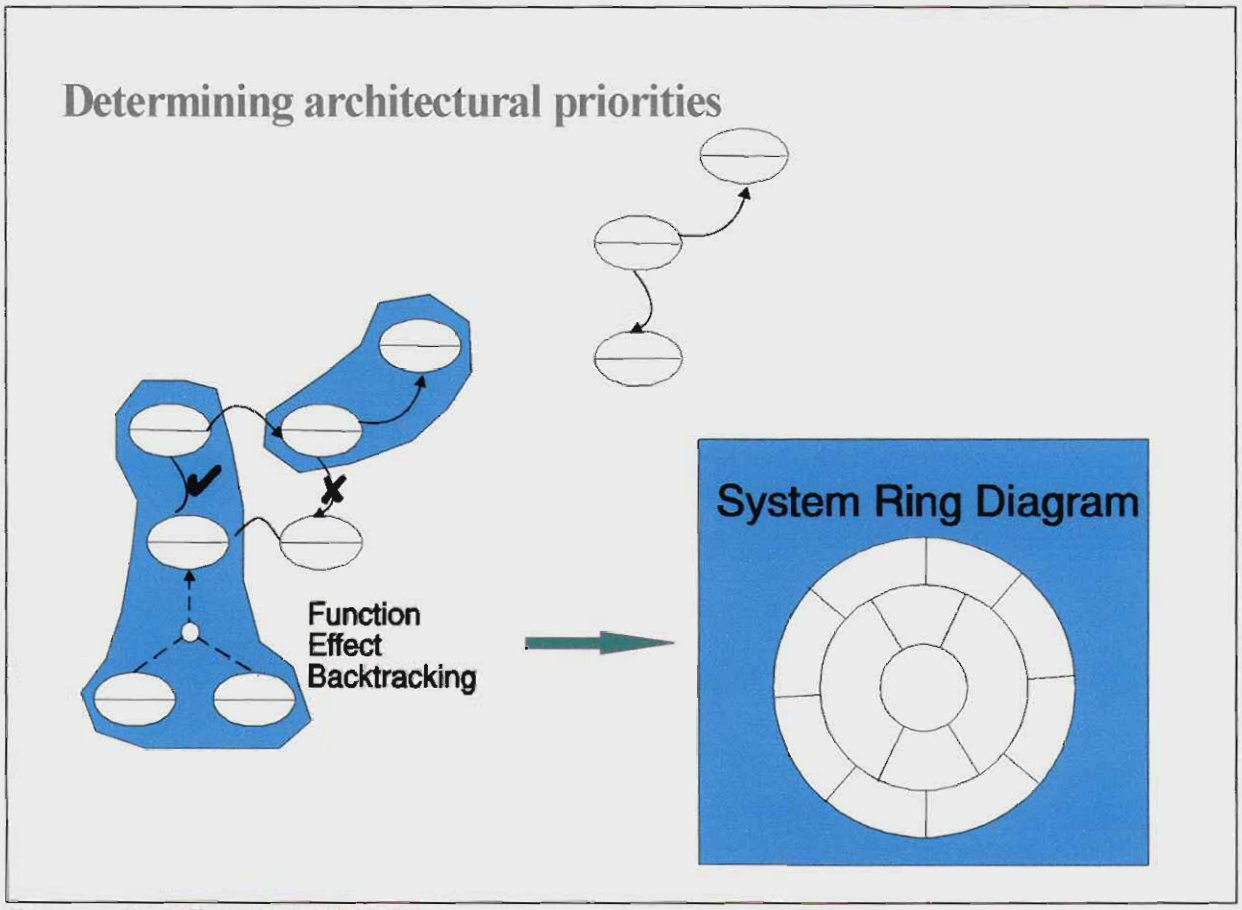
Source: Extract was taken from Appendix B

3.4 PHASE II – DEFINING BUSINESS ENTITY RELATIONSHIPS

3.4.1 Introduction

The aim of Phase II is to establish an understanding of the dependencies between business entities and the business rules pertaining to them. Figure 3.4 provides a graphical presentation of the techniques involved in the process

Fig. 3.4: Determining architectural priorities from entity relationships



Source: Engelbrecht(1996:48)

The steps involved in determining architectural priorities are:

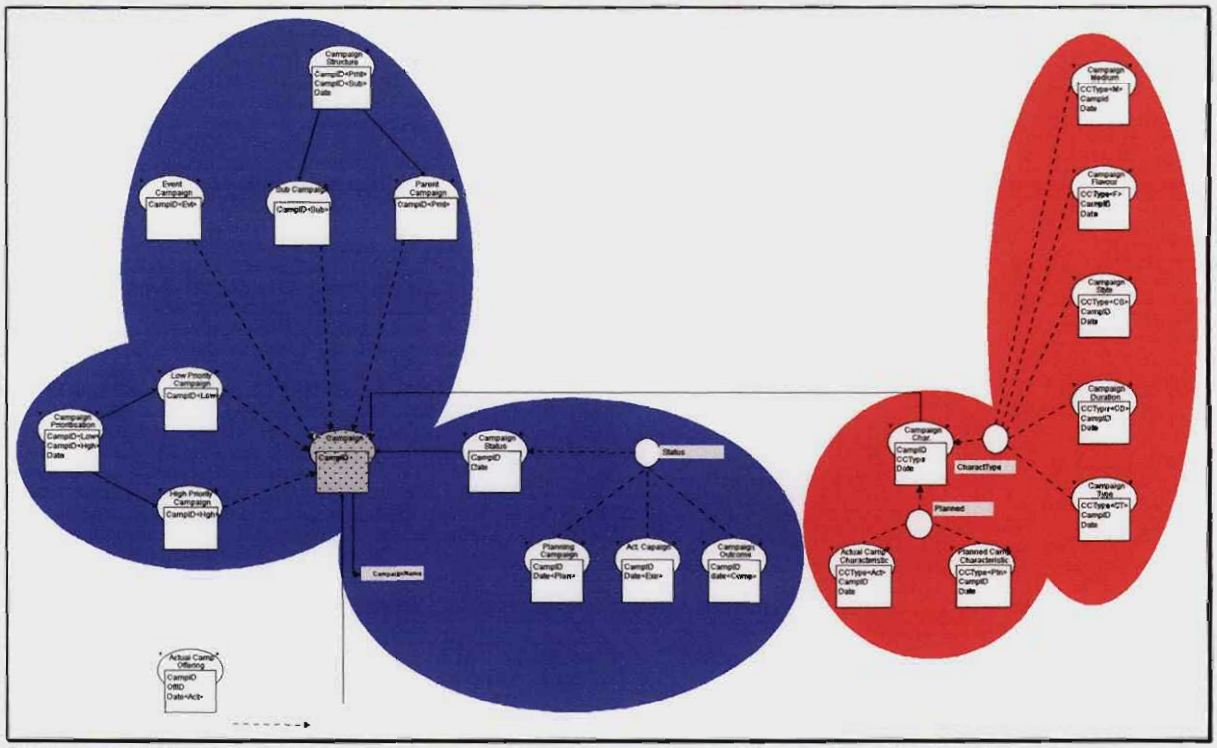
- The attribute dependencies are determined between the entities of the business at the lowest or atomic level (mapping shown in Appendix C);
- mathematical dependencies between these entities are mapped, and by applying algebraic manipulation, an exact architectural mapping is extracted for the business;
- from the FEBT clusters an SID is constructed; and

- a ring diagram is constructed from the SID to graphically represent the deployment sequence of systems (Appendix D).

3.4.2 Defining attribute dependencies between business entities

All high-level areas are exploded to enough detail to model the specific area of the design. Although mathematically intriguing, this facet of the design must ensure completeness (i.e. all interrelationships are defined), as well as logical integrity of the functional design. An extract from the ADD in the area of *defining campaigns* is shown below. This was done for the entire business – see Appendix C for detail.

Figure 3.5: Extract from the ADD of a campaign



Source: Extract was taken from detail ADD presented in Appendix C

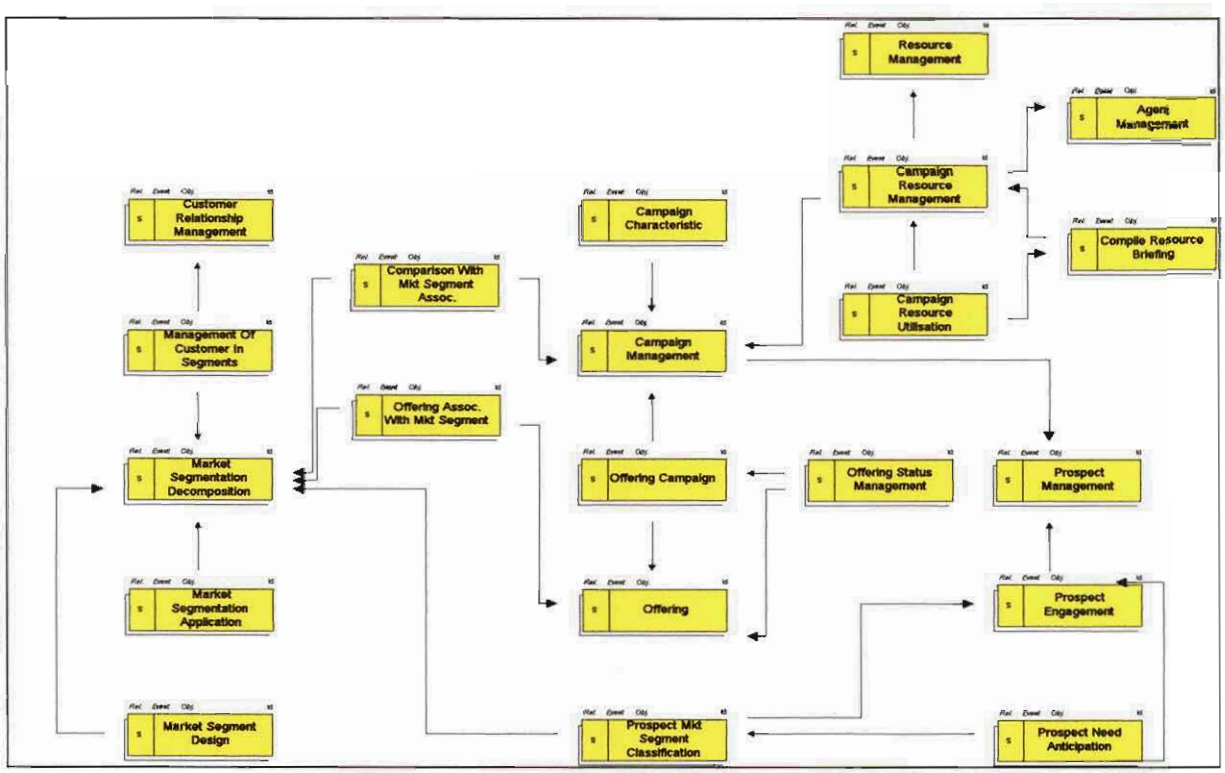
The figure above is an extract from the enterprise-wide ADD, and serves only as an example.

3.4.3 Sub-schema interdependency

The SID is constructed from the ADD after FEBT was done. The SID is a summary of the clusters that were identified and grouped together because of their natural cohesiveness.

Figure 3.6 below is an example of an SID for Marketing. The enterprise-wide SID is available in Appendix E

Figure 3.6: Extract of a sub-schema interdependency diagram for marketing

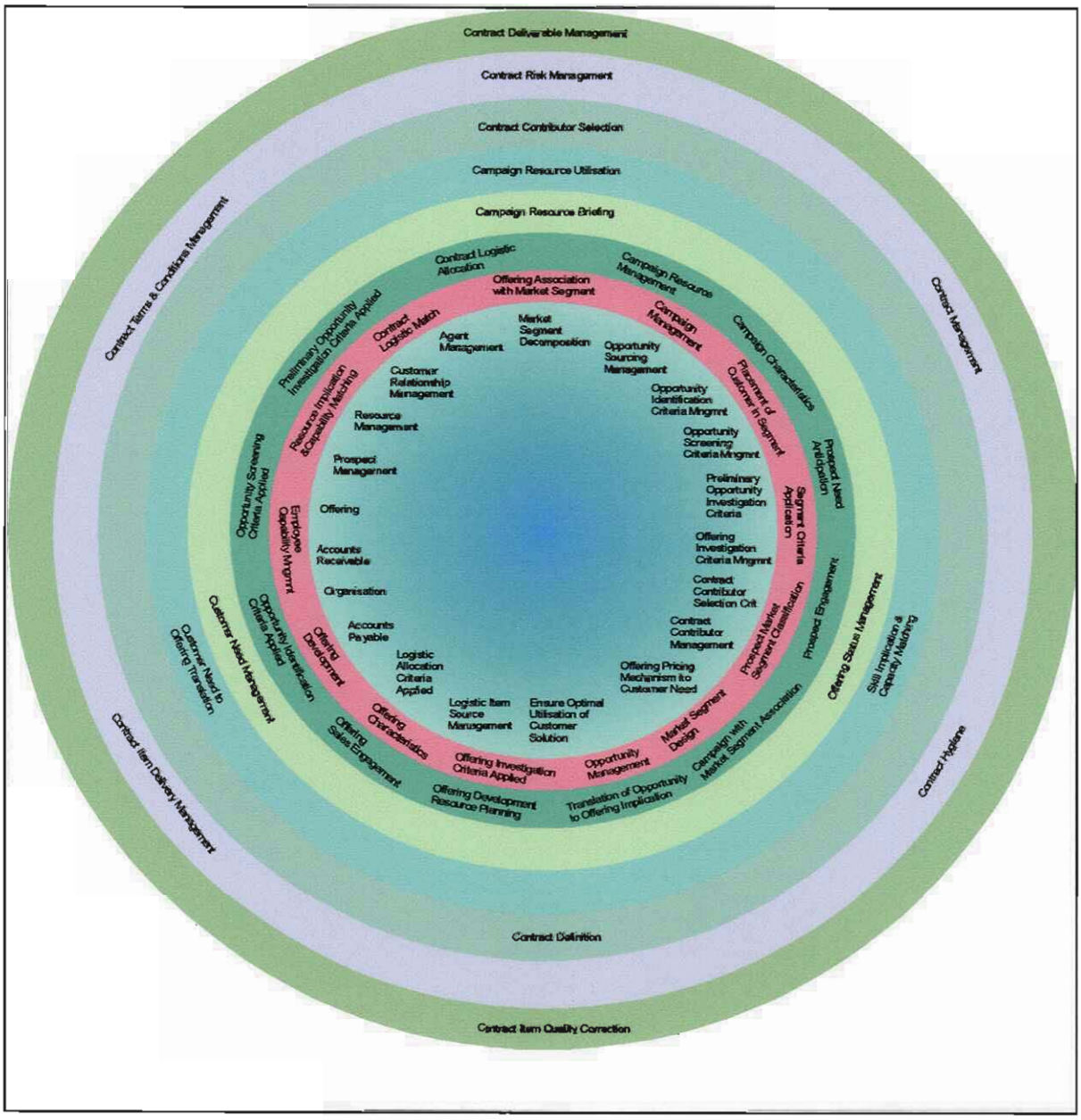


Source: Abstract was taken from enterprise-wide SID in Appendix E

3.4.4 Graphical presentation of entity dependencies (ring diagram)

The ring diagram (Figure 3.7 – see Appendix F for a bigger version) is a graphical representation of the deployment sequence of the objects of the business as derived from the SIDs. The ring diagram is only used to create understanding with top management. Development details must be taken from the SID that allows for more detail. The SID provides detail on the scope, content and context of the proposed systems for implementation.

Figure 3.7: Systems Ring diagram



Source: The systems ring diagram was compiled from the detail SID in Appendix E

3.5 PHASE III – DEVELOPMENT OF AN ORGANISATIONAL STRUCTURE

3.5.1 Introduction

There are few aspects in a business design that are as tangible as the proposed organisational structure around which functions are to be executed. Most people may agree on functions, processes and more, but only when they are personally affected or implicated does the reality of business change strike home.

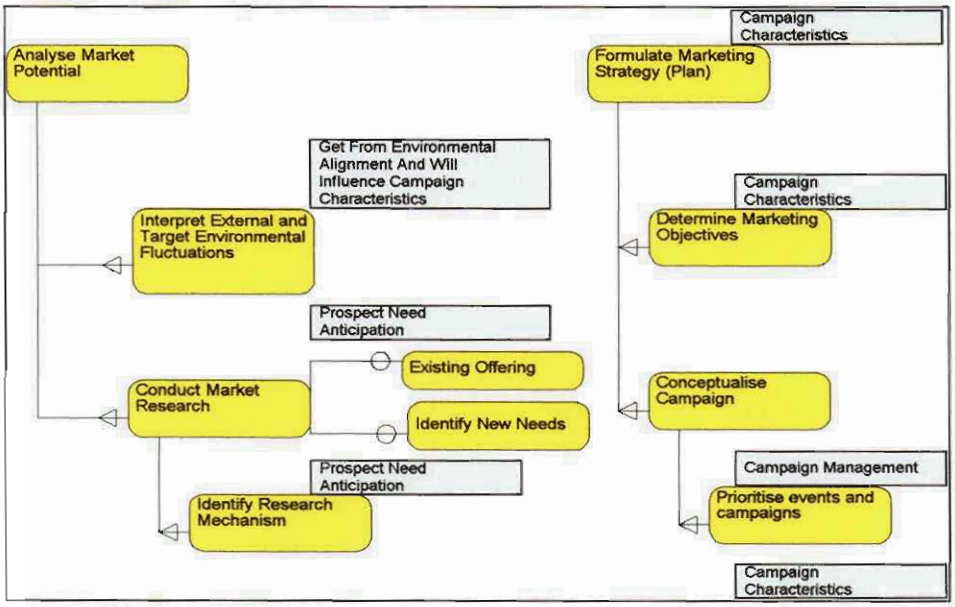
Designing an appropriate organisational structure to accommodate functions is one of the least problematic components of business design. A look at the history of the Roman Empire, and at what evolved in which context, provides the business engineer of today with numerous options. However, designing the ***optimum*** structure presents more difficulties.

3.5.2 Organisational structure design

The aim of this study was to develop an organisational structure. We have established a complete set of goals and functions for the execution of the business from the strategic positioning exercise in phase I. From phase II the natural cohesion between goals was established when the SID was mapped back to the FSD (See Figure 3.8). This was done to determine the natural groupings of the business' goals. From this an organisational structure was designed (see Appendix for detail).

At this stage in the process we accept that all the functions designed up to this point have to be executed in order for the business to survive. Should a function not be executed correctly, the business may fail to address a CSF, and hence also face certain death.

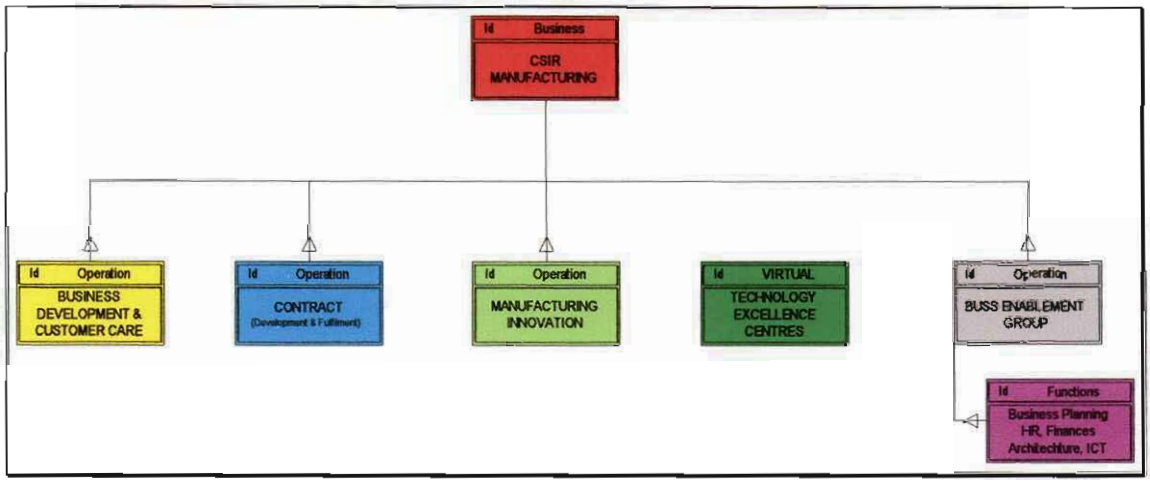
Figure 3.8: Extract of SID/FSD mapping



Source: The extract was taken from the SID/FSD mapping in Appendix H

Different structures were evaluated initially. These models ranged from divisions with autonomous programmes, divisions with management teams and functional support, all the way to loosely coupled organic networks. Many problems could be identified with any of the models, and many reasons were given by the group as to why each one could or would not work. At the end of the exercise, the value-chain (or process driven) model was chosen by the team as the most appropriate model to address the specific design. In the end it was decided that a value-chain approach would be followed with a project structure governance (see Figure 3.9 for a high-level presentation of the OSD).

Figure 3.9: Value-chain based organisational structure

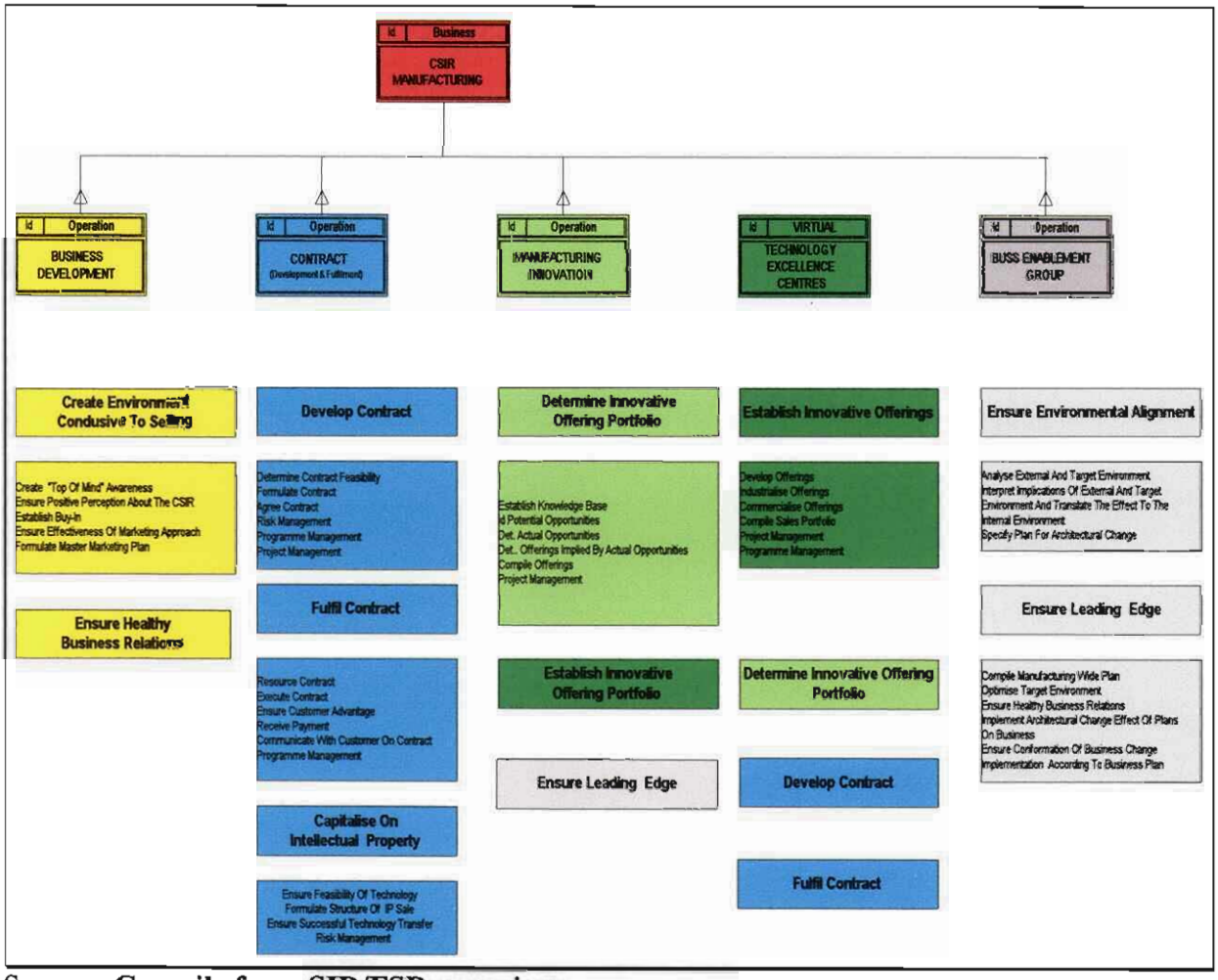


Source: Compiled from SID/FSD mapping

3.5.2.1 Functions/goals associated with each organisational unit

From the mapping (Figure 3.8) of the SID to the FSD, the OSD was derived with the associated goals that must be performed by each organisational unit (see Figure 3.10).

Figure 3.10: Functions allocated to organisational structure



Source: Compile from SID/FSD mappings

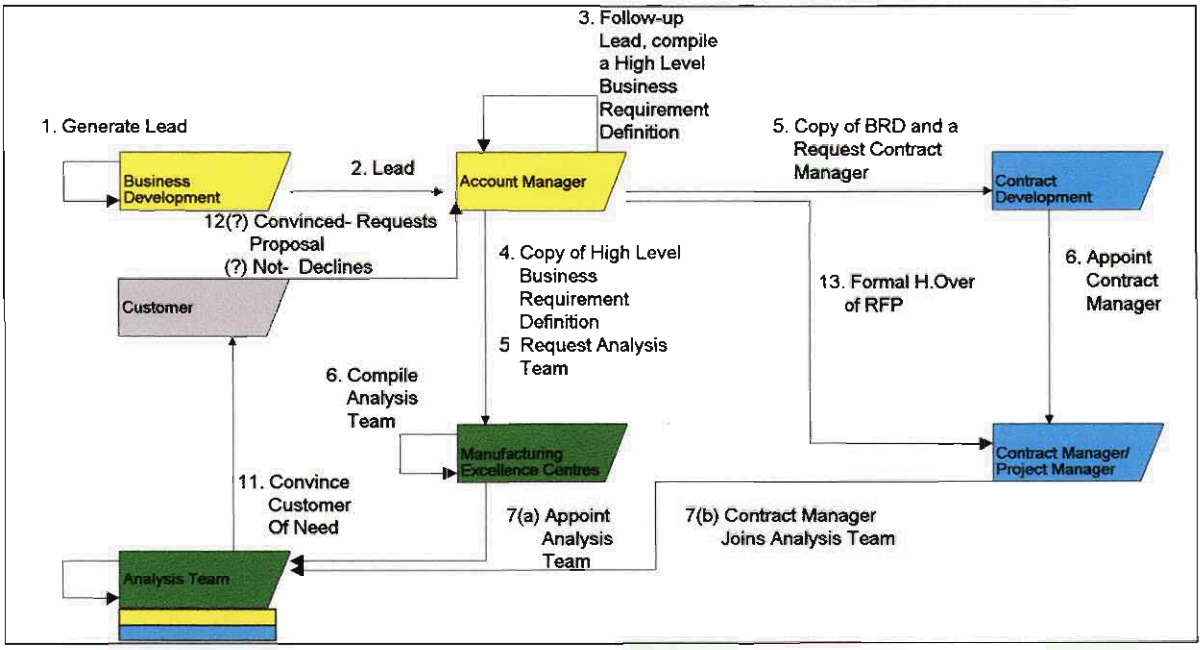
3.5.3 Process flow – how things work

The robustness of the deployed methodology allows an exact description of the process. The diagramming process that was used is called an Object Interface Diagram (OID) (see Appendix I for detail OID). A text version together with an extract from the business OIDs are given below.

3.5.3.1 Customer engagement

The perceived process flow of how customer engagement will work is presented in Figure 3.11 below as the OID for customer engagement.

Figure 3.11: Customer Engagement



Source: Extract from Appendix I

The colours in the legend of the text version of the process flow for customer engagement presented below, correspond with the colours of the objects and the numbers of the flow as presented in the graphical presentation in Figure 3.11 above.

Text version customer engagement OID

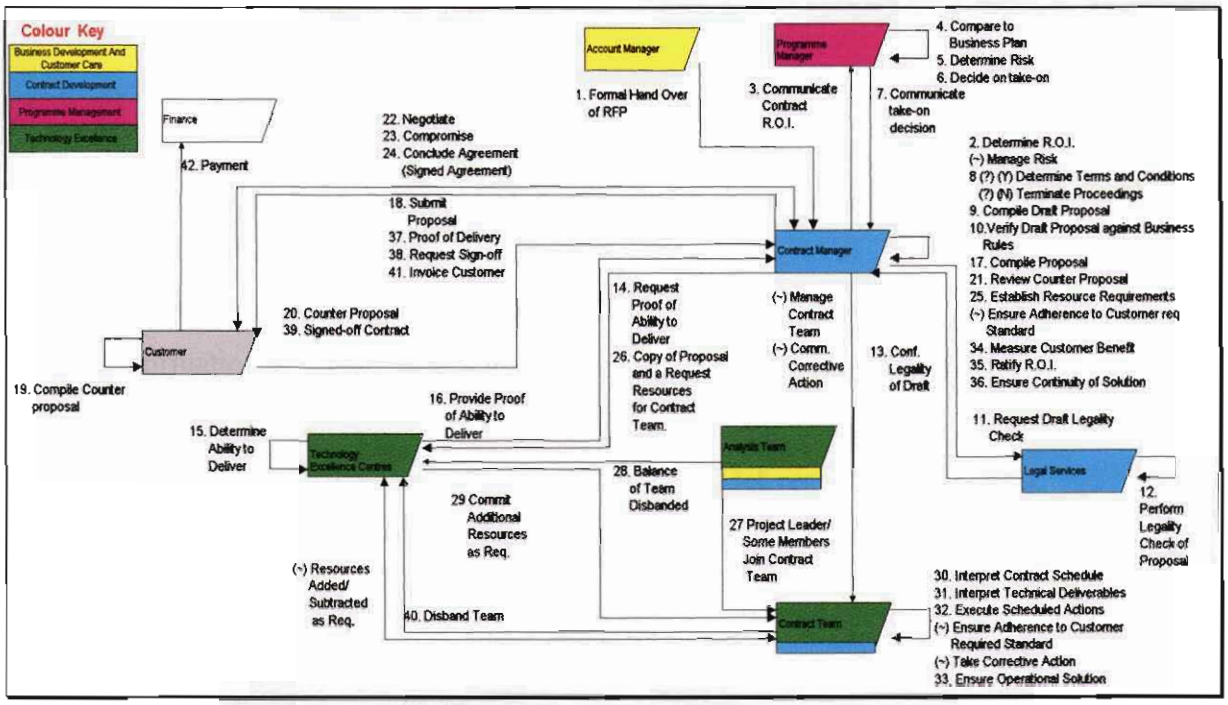
1	Business development generates a "lead".
2	The "lead" is passed on to the account manager concerned.
3	The account manager follows up on the lead and compiles a high-level Business Requirement Definition (BRD).
4	The account manager passes the BRD on to the Technology Excellence Centre (TEC) and to Contract Development & Fulfilment (CDF).
5	The account manager requests an analysis team of specialists from the TEC including a project leader. They will assist in defining the customer's need as well as in compiling the draft proposal. He also requests a contract manager from CDF, who will also form part of the analysis team.
6-8	The TECs appoint the technical members of the analysis team. The analysis team determines the real need, (9) compiles the functional specification definition. (10) The analysis team breaks it into solution components: ID key deliverables Test/verify assumptions
11	The analysis team now meets with the customer to convince him/her of his/her "real need" and of the CSIR as preferred solution supplier.
12	The customer will either request a proposal or decline the proposed solution.
	Should the customer request a proposal, the dealings are formally handed over to a contract manager, and we migrate to the next level.

Note: Up to this point the main responsibility was with the account manager.

3.5.3.2 Contract development and fulfilment

The process flow during the development and fulfilment of a contract is presented in Figure 3.12 below as the OID for customer engagement.

Fig. 3.12: Contract development and fulfilment:



Source: Extract from Appendix I

The colours in the legend of the text version of the process flow for contract development and fulfilment presented below, correspond with the colours of the objects and the number of the flow as presented in the graphical presentation in Figure 3.12 above.

Text version of contract development and fulfilment

1 Formal hand-over from the account manager to the contract manager takes place.

2 The contract manager firstly determines the projected current and future return on investment (ROI).

3 The contract manager communicates the project ROI to the programme manager.

4 The programme manager ensures that the proposed project fits into the business plan, and (5) completes a risk assessment. (6) Based on the above information

he/she decides whether the project will be taken on or not. (7) This decision is then communicated to the contract manager.

8 Should the answer be in the affirmative, the contract manager determines the terms and conditions of the draft contract. Should the answer be negative, the contract manager terminates the process and disbands the analysis team.

9 The contract manager in co-operation with the analysis team compiles the draft proposal.

10 The contract manager ensures that the proposal is verified against the business rules.

11 Once the draft has been completed the contract manager passes the draft on to Legal Services to ensure legal compliance.

12 The draft is checked for legality by Legal Services.

13 The confirmation of legality and any amendments are passed back to the contract manager.

14 The contract manager requests a "Proof of Ability to Deliver" from the MECs.

15 The MECs establish whether they have all resources available to be committed to the contract.

16 The MECs provide confirmation of the ability to deliver.

17 The contract manager completes a full proposal.

18 The contract manager submits the proposal to the customer.

19 The customer takes the proposal under consideration and offers a counter-proposal on terms or conditions, which he/she may regard as acceptable.

20 The counter-proposal is returned to the contract manager.

21 The contract manager assesses the impact of the changes on the counter-proposal.

22 The terms and conditions are negotiated, (23) compromised, and (24) agreed upon by the parties.

25 The contract manager re-establishes resource requirements in consultation with the analysis team.

26 The contract manager requests the said resources from the MECs.

27 The project leader and some analysis team members are re-assigned from the analysis team to the contract team from the MEC.

28 Those members who are not re-assigned to the contract team return to the MECs

for re-assignment to other teams.

29 Additional resources that may be required for the project are assigned to the contract team by the MEC.

30 The contract team commences by interpreting the contract schedule.

31 The contract team then interprets the technical deliverables, (32) executes the scheduled actions, and ensures an (33) operational solution.

34 The contract manger measures the solution's customer benefit.

35 He ratifies the ROI

36 The contract manager ensures the continuity of the solution for the customer.

37 The contract team delivers the solution to the customer.

38 The contract manager delivers proof of delivery to the customer and requests "sign-off" from the customer to ensure complete satisfaction and to confirm the fulfilment of the contract.

39 The customer, if satisfied, provides sign-off.

40 The contract team can now be disbanded by the contract manager for re-assignment to another team.

41 The customer will now be invoiced.

42 The customer pays what is outstanding.

The following is done on a continual basis throughout this phase:

The contract manager manages the contract team.

The contract manager manages the total contract risk.

The contract manager ensures that the contract team adheres to customer-required standards.

The MEC continually adds resources to and removes them from the contract team, as the project requires.

The contract team ensures continual adherence to the customer-required standard.

Corrective action is communicated to the contract team and corrective action is taken continually to achieve customer-required standards

The contract manager is responsible for the formal hand-over of the RFP from the account manager up to the sign-off and invoicing of the customer.

The project leader is responsible for the technical adherence of the project

solution deliverable according to contracted specifications.

The customer/account is handed back to the account manager

The account manager is responsible for the "after-care service" of the customer.

Perceived responsibilities

Account manager:

The account manager from Business Development picks up the lead and is responsible for the follow-up of the initial discussions with the customer. From these discussions he/she will be able to formulate a high-level BRD.

The BRD is then passed on to the MECs and to Contract Development, requesting appropriate resources.

Programme manager:

The programme manager is responsible for the integration of the contracts.

He/she decides whether to proceed with a contract.

He/she is also responsible for ensuring that the proposal complies with the business rules/strategies and ROI requirements.

Contract manager :

The contract manager is responsible for the full life-cycle of the project as a project manager.

The contract manager will determine the anticipated return on investment (ROI); he/she must also determine the appropriate contract terms and conditions.

The contract manager will also compile the proposal together with the analysis team.

The contract manager will then negotiate the terms and conditions of the proposal with the customer and at the same time ensure adherence to business rules and the legality requirements.

The contract manager will also obtain the required authorisation to continue from the programme manager.

The contract manager will be responsible for the management function of the contract team. For the entire duration of the project he will ensure that the contract team delivers in adherence to the customer's requirements.
The contract manager will also calculate and ensure customer benefit.

Legal Services:

Legal Services are responsible for ensuring that proposals comply with the legal standards of the CSIR.

Manufacturing Excellence Centres (MECs):

The MECs are responsible for correct resourcing of the analysis and contracting teams. The MECs are responsible for ensuring the correct resource and skill match with the contract requirements. They are responsible for problem solving after implementation as well as for the maintenance of the solutions.

Project leader:

The project leader will ensure technical conformance of the project deliverable to agreed standards.

Analysis team:

This team consists of a project leader and appropriate technical staff appointed by the MEC.
A contract manager is also assigned to the team from CDF.
The team is responsible for the initial investigation and for convincing the customer up to the point where the customer requests a proposal.
The account manager will then hand the RFP to the contract manager.

Contract team:

The Contract team is responsible for the delivery and execution of the contract schedule.

3.6 SUMMARY

The organisational structure was designed using a methodology that incorporates five of the eight dimensions of a business (as defined in Chapter 2). They are: function, data, strategy, object and organisation.

The dimensions of time and locality were not addressed due to the fact that SMI business does not view them as important factors pertaining to their business. The operational dimension was addressed by another project together with the developing of the master business plan.

The paracentric approach of mapping dimensions against other dimensions ensured the completeness of the designs.

The organisational structure was designed via a two-tiered approach. The structure was designed taking the strategic intent of the business into account, enabling the achieving of the future business goals, while ensuring that natural dependencies between entities are not violated. Thus, the business priorities were satisfied by accommodating them under the architectural priorities.

CHAPTER 4

CONCLUSION, RECOMMENDATIONS AND SUMMARY

4.1 INTRODUCTION

The main objective of this study was to give an account of the organisational structure that was designed for the SMI at the CSIR and the approach followed.

This was achieved by following the two-tiered approach/methodology as discussed in Chapter 3. The organisational structure was designed from the strategic positioning input together with the dependencies between atomic forms of entities that constitutes the business. From these deliverables the organisational structure was designed. The final organisational structure design is presented at the end of this chapter.

4.2 CONCLUSION

In order to align itself with its target and external environments, the CSIR should reposition its internal operational activities. Translating numerous factors implied by manufacturing (in general) to the organisation's current ability to deal with those issues leads to the conclusion that maintaining the *status quo* will not be enough to guarantee survival. The opinion is expressed that the current scenario with regard to addressing correct issues in the correct manner is so far removed from the required state that "certain death" is inevitable.

A decision with regard to the deployment of a manufacturing business should be taken from the alternative scenarios presented in Figure 4.1 below.

Figure 4.1: Alternative scenarios for implementation.

It is important to consider each scenario and its full implications for decision-making. A clear favourite from the perspective of the team is option "C". However, there may be certain practicalities to be kept in mind when moving to this approach.

The factors critical to the success of establishing the SMI in the manufacturing sector are "helping SA manufacturing to increase their global market share".

4.3 RECOMMENDATIONS

This paper recommends that:

- Manufacturing as a whole be addressed as a new business thrust - integrated across what are currently divisional and programme boundaries;
- activities and contracts embedded in current structures be transferred to a new operating business unit (virtual or not), along with staff and leadership from the CSIR where applicable;
- consideration be given to one of three proposed deployment scenarios, and CSIR executive approval be sought for implementation (see Figure 4.1 for the different scenarios);
- further progress depends on two key tasks: the go-ahead for implementation, and the formal appointment of the senior management team. Procrastination on these two issues for longer than one month **is not** advised; and
- the CSFs be used as drivers for the implementation to ensure survival of the new structure. The CSFs are listed below:

Critical success factors:

(i) Ensure trade union and employee understanding of the CSIR's reason for existence, their commitment to change, and incorporate their aspirations in the overview design by 1 October 1998.

(ii) Segment markets, analyse needs and build intimate customer relations – creating an environment conducive to selling – by 1 October 1998.

(iii) The ability to change, represented by a continuous business process (enabled with change-instruments), has to be established and manned by 1 October 1998.

(iv) Achieve measurable and sustainable financial success and business growth for CSIR Manufacturing. The measurement mechanisms required must be in place by 1 October 1998.

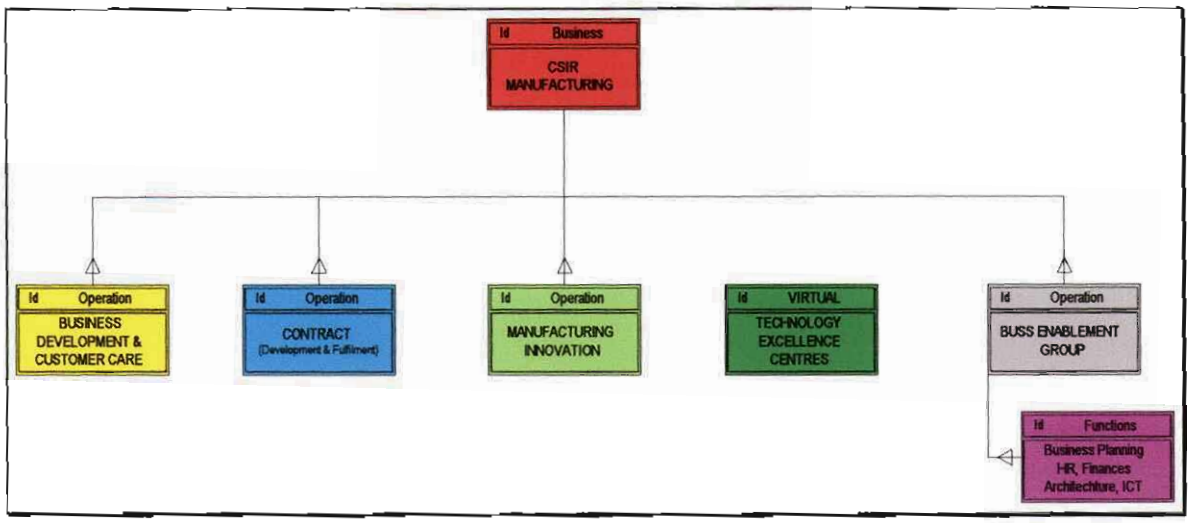
(v) Identify the appropriate organisations (matched to market need as per CSF above in the market with an impact-weighted rating [% and probability of benefit]) and align for strategic association (alliance) on particular projects as per CSF above by 1 March 1999.

(vi) Translate industry requirements and international manufacturing technology trends into a technological strategy for CSIR Manufacturing by October 1998.

(vii) The CSIR Manufacturing business has to be fully functional and adequately manned to service the focused market demand by 1 March 1999.

The OSD was derived after translation of environmental factors, their implications, functions and low-level activities that provide a comprehensive functional solution. By itself an organisational structure is an empty shell. The description of its purpose, functions, activities and goals constitutes operational aspects that must enable the execution of its strategic intent (or highest level/reason for existence). Presented below in Figure 4.2 is the high level of a proposed organisational structure for SMI at CSIR.

Figure 4.2: Manufacturing organisational structure

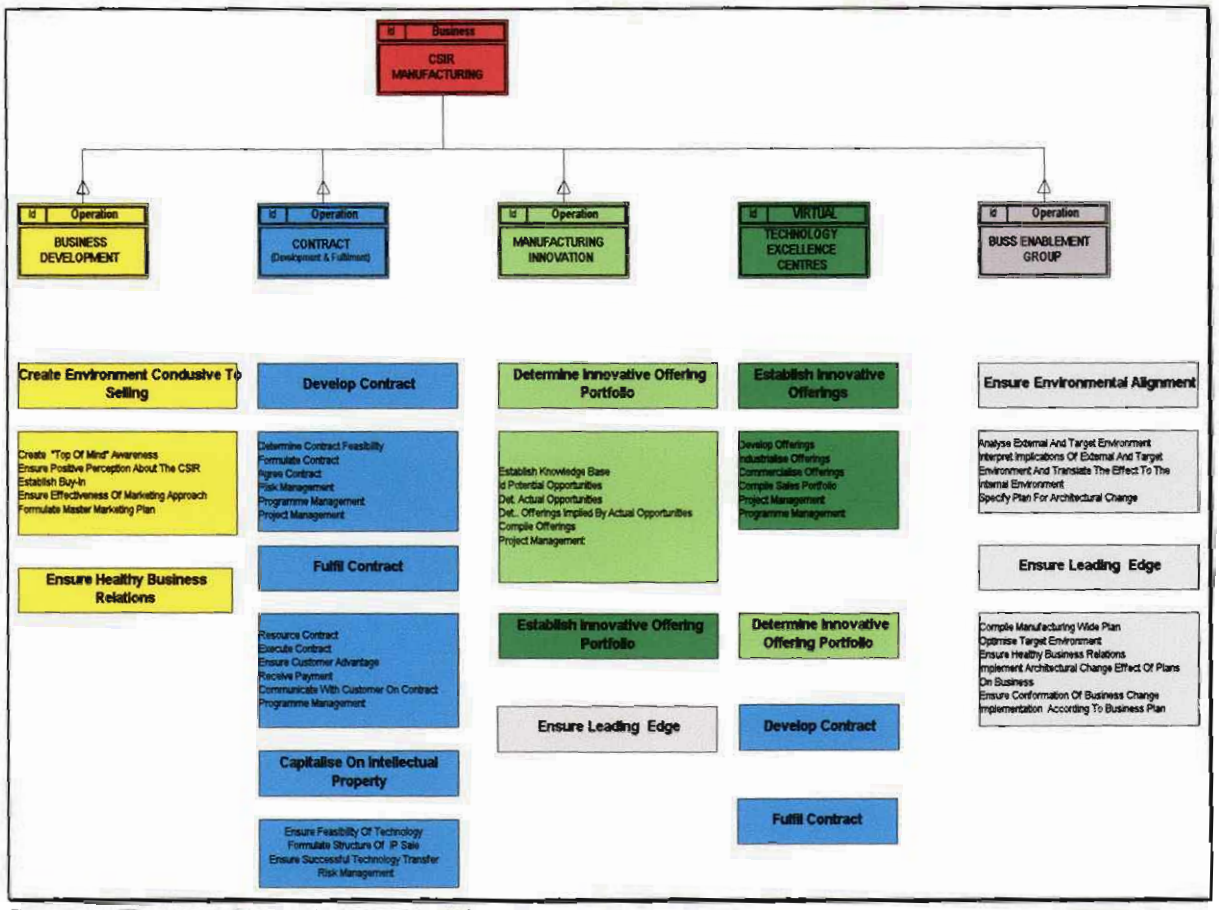


Source: Extract from Appendix G.

With reference to Figure 4.2, a number of comments are made:

- It is described as a "business", not a "division";
- deciding not to join the TECs with a solid line to the overall structure implies "Virtually". Joining the TECs to the main structure implies re-organised business in the CSIR;
- presented below in Figure 4.3 are the functions allocated to the various organisational areas. This is perhaps the most comprehensive executive summary of what *functionality* is allocated to which *area*; and
- the colour codes demonstrate involvement at any organisational level in other processes than own parentage. One rule of business is that the execution of any function in any area is subject to the governance of the processes of the area it is operating in.

Figure 4.3: Functions allocated to organisational structure



Source: Extract from Appendix H.

Part of the formal process highlighted certain risks for the deployment of a manufacturing business. The following points are notable, and for executive attention:

- There has been no noticeable progress with change management at the level where employee buy-in has to be ensured. Not only do we require union understanding and acceptance, but also clarity of all employee aspirations in order to finalise the design;
- a new financial year has just been entered into, bringing with it a latent lack of urgency. Keeping in mind that we have limited time before a next budgetary cycle, a tendency to "take time" may jeopardise many aspects that are in need of urgent attention such as STEP funding, market segmentation and business development;
- personal positions are and will always be pressing questions for any organisation undergoing change. The design was done around the concept of *doing the correct thing, in the correct manner*, and not how any individual can or could be placed;

- a risk to the team is embedded in the fact that momentum may be lost if a decision for implementation (or not) is not made within the foreseeable future. The environmental analysis already indicated that we are on the critical path if we would like to make an impact on the market; and
- the author and team are firm in their belief that business dictates and drives information technology and architecture. The CSIR must ensure that corporate efforts support this proposed enterprise design. There is a significant risk that other actions with seemingly good intent may undermine this proposed business instead of supporting it.

4.4 SUMMARY

4.4.1 Attainment of study objectives

The primary study objective was the design of an organisational structure for CSIR Manufacturing. The structure as demonstrated in this study reflects the structure that was designed together with the process flow to arrive at the specific design. The organisational structure is primarily a project structure allowing the CSIR to change its pockets of technology as the market requirements may arise. The governance of this structure is based on a combination of architecture, project management and change management.

The secondary objectives of the study were to establish the architectural requirements for the newly-designed SMI, to establish an understanding of architecture at the CSIR and to enable the CSIR to maintain their own architecture. The establishment of the architecture for the SMI business was done via the logical data structure (Appendix C) that was designed together with the functional decomposition (Appendix B) of the business.

Understanding of the concepts of business engineering and architecture by the CSIR was attained through several courses spanning all the major sections/programmes of CSIR Manufacturing. Key people were identified in co-operation with the project leader to whom knowledge of the process was transferred.

4.4.2 Future research at SMI

It is suggested by the author that a research project be launched by the CSIR to map the business design to a systems design and a systems or package due diligence then be performed. The reason for suggesting this is because none of the systems at the CSIR at present allows for the implementation of the new design. The first system that needs to be obtained is a project management system. By a project management system the author does not refer to something like MS Project but rather to an enterprise resource management system. The change management of implementing the new design is another thing that is not currently viewed as being very important by the CSIR. The author is of the opinion that this is a grave mistake and that it could cost them dearly in the foreseeable future.

4.4.3 Epilogue

Although the study has attained all its set goals, it would have been even better if it was possible to state at this point that the design as proposed has already been implemented. While this is not the case, several initiatives resulting from the design are presently addressed by the CSIR. One such initiative is a due diligence that was performed using the data design and mapping it against the abilities of a package by the name of Qmuzik. It was consequently decided to implement the project management and cost control components of this package as a first phase of implementing the design. The initial project leader left the CSIR and took an enormous amount of knowledge and drive with him, leaving quite a gap for his successor to fill.

It remains uncertain whether this design will ever be implemented by the CSIR. Since the newly-appointed project leader was not part of the design process, it is possible that he could view the design with less enthusiasm, rather choosing to embark upon his own initiative.

In closing, the author firmly believes that the design as presented in this document is sound and, if given the opportunity, will demonstrate the value of the design in enabling the CSIR to align with its target market.

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APPENDIX A

TABLE OF CONTENTS

1 ESTABLISHING THE FUTURE BUSINESS ENVIRONMENT

The nature of the future business environment in which CSIR Manufacturing will operate was established in a structured way by addressing the following categories of information:

The **external environment** factors that were used as an indexing mechanism to determine the factors that influence the business are:

- Political
- Cultural
- Economical
- Socio-economic
- Directional/Ppofessional
- Technological
- Demographics
- Geographical
- Legislative
- Industrial
- Geological

The parties that are part of the **target environment** and that could influence the business can be divided into the following categories:

- Customers
- Suppliers
- Markets
- Competitor factors
- Other stakeholders

Factors affecting the future business environment are listed below:

1.1 CSIR Manufacturing external environmental factors

#	CSF	FACTOR	INTERPRETATION	CO-ORD.
		Politics:		
P1		Election '99	a. Capitalise on cluster participation DTI & DACST need for good news. b. Potential union muscle flexing. Manufacturing focus not on development but on labour.	O4W2 T2W2
P2		Similar conditions will prevail	a. New funding mechanisms. b. More role-playing is known. c. More stability in policies.	O5S5
P3		Increased levels of provincial power	a. Increased market for make it SA. b. Misalignment of national & provincial policies causing an increase in costs for CSIR marketing and lobbying.	O8S3 T3W2
P4		Coherent industrial strategy	a. Pitching at strategic level in the marketplace.	O8W5

Continue/...

#	CSF	FACTOR	INTERPRETATION	CO-ORD.
P5		Improved international relations	a. Increased presence of CSIR Manufacturing in Africa. b. Increased CSIR Manufacturing's alliance internationally.	O5S1
		Demographic:		
DE1		Strained infrastructure	a. Private sector will need to take over certain sectors from Government.	O4W3
DE2		Effectivity/productivity	a. Major thrust in competitiveness improvement (total value chain). b. Inability to communicate with new management.	O10W8 T4W4
		Legislative:		
L1		Tax implication	a. Increased knowledge of the tax laws.	O2W6
L2		Labour law	a. Knowledge of the law. b. Enforced transparency. c. Greater employee involvement. d. Labour replacement practices more unacceptable— Employment Equity Bill. e. Transformation in Manufacturing requires understanding of ethnic culture systems.	T5W8
L3		Green laws	a. ISO 14000 Implementation (Environment). b. Close co-operation with environmental technology—both clean and cleaning technology.	O5S6
L4		Deregulation	a. Increased levels of competition in the manufacturing sector. b. Pre-competitive R&D. c. National Centre of Automotive.	O6W7
L5		Competition law	a. Understanding and managing the threat of lawsuits on grounds of unfair competition.	T2S2
L6		Industrial participation policy	a. Off-set of 100% if international purchase exceeds $10m.	O4S3

Continue/...

#	CSF	FACTOR	INTERPRETATION	CO-ORD.
		Geological:		
G1		Improved exploitation of base minerals	a. New downstream manufacturing business in SA (MATTEK).	O6S4
		Technology:		
T1		Increase IT and communication domination	a. Availability of enabling technology (for modern technology) must be in place. b. Manufacturing will be restructured, necessitating re-alignment in CSIR. c. Market demand for value-chain networking skills will increase. d. Technology as communication mechanism (Mikomtek). e. Internet/Intranet & Extranet. f. Worldwide access to knowledge sources for CSIR. g. Global access for manufacturing sector to sources of global information. h. Increased need for data reduction analysis.	O8W8 O7W8 T5W5 O4W5
T2		Emerging technology (Examples) • Distributed manufacturing. • Technologies that reduce the production start-up costs for manufacturing. • Integrated design systems. • Automated optimisation of in- and outbound logistics. • Flexible manufacturing. • End-to-end value chain optimisation. • Intelligent equipment that automatically detects manufacturing problems (maintenance due). • Computer-integrated manufacturing (CIM). • Mass customisation technologies. • Virtual reality modelling language (VRML). (Need to be extended into MATTEK context)	a. Manufacturing sector's resistance to accept emerging/new technology. b. Develop new technology for Manufacturing to enable competitive advantage. c. Political support for new technology. d. CSIR honest-broker role. e. Establish the ability to transfer new technology in a value-added way to the manufacturing sector. f. Mass support for incorrect technologies.	T7W6 O9S5 O6S2 O6S3 O4S1 T5W3

Continue/...

#	CSF	FACTOR	INTERPRETATION	CO-ORD.
T3		Technology changes	a. Enable fast-follower mode. b. Accelerated rate of learning/mentorship required. c. Increased need for technology forecasting. d. More careful analysis of technology lifecycle before investing in potentially obsolete technology (half-life of technology – S-curves). e. CSIR needs to be the thinktank of the manufacturing industry and not only the short-term problem solvers.	T7W7 O7S1
T4		Ancillary costs	a. Cost to counter the threat of losing skilled staff. b. Cost of losing technology: IP, trade secrets. c. Technology resources not fully aligned with market need.	T7W6
T5		Inability to convert information to strategy and to reflect the implications for technology	a. CSIR. b. Manufacturing sector.	T4W2 O4W3
T6		Knowledge management system internal to CSIR	a. Integrated mobilisation of knowledge and resources.	O5W10
		Geographical:		
GE1		SA as gateway into Africa	a. Partners in Africa.	O6S4
GE2		Geographical position of premises	a. Increase regionalised presence and prominence (CME regional access). b. Provincial offices.	O6W3
GE3		Remote access (organisation structure)	a. Virtual organisation.	O5W5
GE4		Infrastructure including harbours	a. Monitor impact on industry.	O2S5
		Economical:		
E1		Growth 2-3%	a. Increased pressure to increase SA industry's productivity.	O7W8
E2		High unemployment	a. Pressure on job-creating industry.	O9W9
E3		Convergence of development and growth imperatives	a. Low-Tech. industry involvement.	O7S3
E4		More start-up instruments for small business/communities getting organised/growing entreprencurship	a. Increase small business focus.	O7S3
E5		Informal business moving into the formal business sector	a. New ways of transferring knowledge have to be developed.	O7S2
E6		Intense competition for capital	a. Better capital understanding is necessary.	T5S5

Continue/...

#	CSF	FACTOR	INTERPRETATION	CO-ORD.
E7		National system of innovation encompasses all facets of society, strong vertical linkages exist	a. Renewed focus for funding mechanisms. b. Less discretionary funding. c. More consortium type R & D.	T5W3 O2W4
E8		Wider gaps between provincial governments i.t.o. economic power	a. Multiple-pronged approach is necessary (National & Provincial).	O5W4
E9		Multi- level access on DTI	a. Identifying and positioning of CSIR at all levels of DTI.	O7W6
E10		GEAR	a. Enthusiastic involvement is necessary in GEAR (Cluster). b. Market mechanisms within the context of GEAR.	O8W7 T4W5
E11		Exchange rate	a. Sophisticated knowledge of exchange rate fluctuation management is required (increased focus on manufacturing for export).	O5W5
E12		Neighbouring countries' economic wealth, SADC	a. Export possibilities for SA manufacturers. b. Partnering with an SA company for international involvement.	O7W3
E13		Funding opportunities for manufacturing	a. Complex instruments available for credit utilisation	T5W4
E14		Technical trade barriers contained in for example NAFTA, GATT, etc.	a. More trade barriers to be negotiated (technology context).	T5W4
E15		Many players in the manufacturing playing field (NPI, DTI, Centre for Excellence in Manufacturing, Manufacturing roundtable etc.)	a. Careful short-term navigation. b. Identify critical industry associations and form alliances as long-term strategy.	T5W4
		Socio- Economical:		
S1		Affirmative action/employment equity	a. HR 2002 implementation/mentorship. b. Increased pressure on growth to ensure more jobs to accommodate employment equity	T6S3
S2		Decline in social consciousness	a. Conflict between job creation & bottom line.	T3W3
S3		Significant but insufficient delivery of houses/water/telecommunication	a. Increased pressure to deliver as promised.	T8W3
S4		Violence and crime	a. Loss of skills – emigration. b. Demoralising, investment money more tricky to obtain. c. Focus on crime-prevention mechanisms.	T8W3 O7S8
S5		Patchy progress in HRD and S&T	a. Establish skills development at CSIR. b. Buy skills.	T5S5
S6		Educational institutions under intense scrutiny	a. Direct involvement in education value chain.	O5S5
S7		Life-long learning	a. Assist customers to keep up-to-date i.t.o. technology. b. Focus on HR development.	O5S5

Continue/…

#	CSF	FACTOR	INTERPRETATION	CO-ORD.
S8		Greater demand for knowledge workers	a. Increase in headhunting costs. b. Equity reward.	T6W2
S9		New work patterns	a. Virtual organisations are and should be emerging in the industry as well as at the CSIR (availability of international skills).	O7W5
		Directional:		
D1		Away from conservative approach to business approach	a. Establish business architecture for "the new organisation".	T6S2
D2		Current structure may change	a. Re-organisation or more "virtual" organisation.	O7W5
D3		Re-definition of business environment	a. New products and markets. b. Re-resourcing (includes reverse engineering and re-skilling of resources). c. Focused skilling.	T8W9 T6W6
D4		Globalisation	a. Must be able to do business no matter where you are.	O9W8

1.2 CSIR Manufacturing target environmental factors

#	CSF	FACTOR	INTERPRETATION	CO-ORD.
		Stakeholders:		
ST1		Employees	a. Equity rewards. b. Trusted, empowered employees.	T6W2
ST2		Trade union	a. Their motives, the implication to business. b. Applicable aspirations & establish and capitalise on benefits.	T5W2
ST3		Environmental groups	a. Understanding of environmental issues and requirements plus the implication on the SA manufacturing industry. • What are the requirements & implications for the SA manufacturing sector.	T4S1

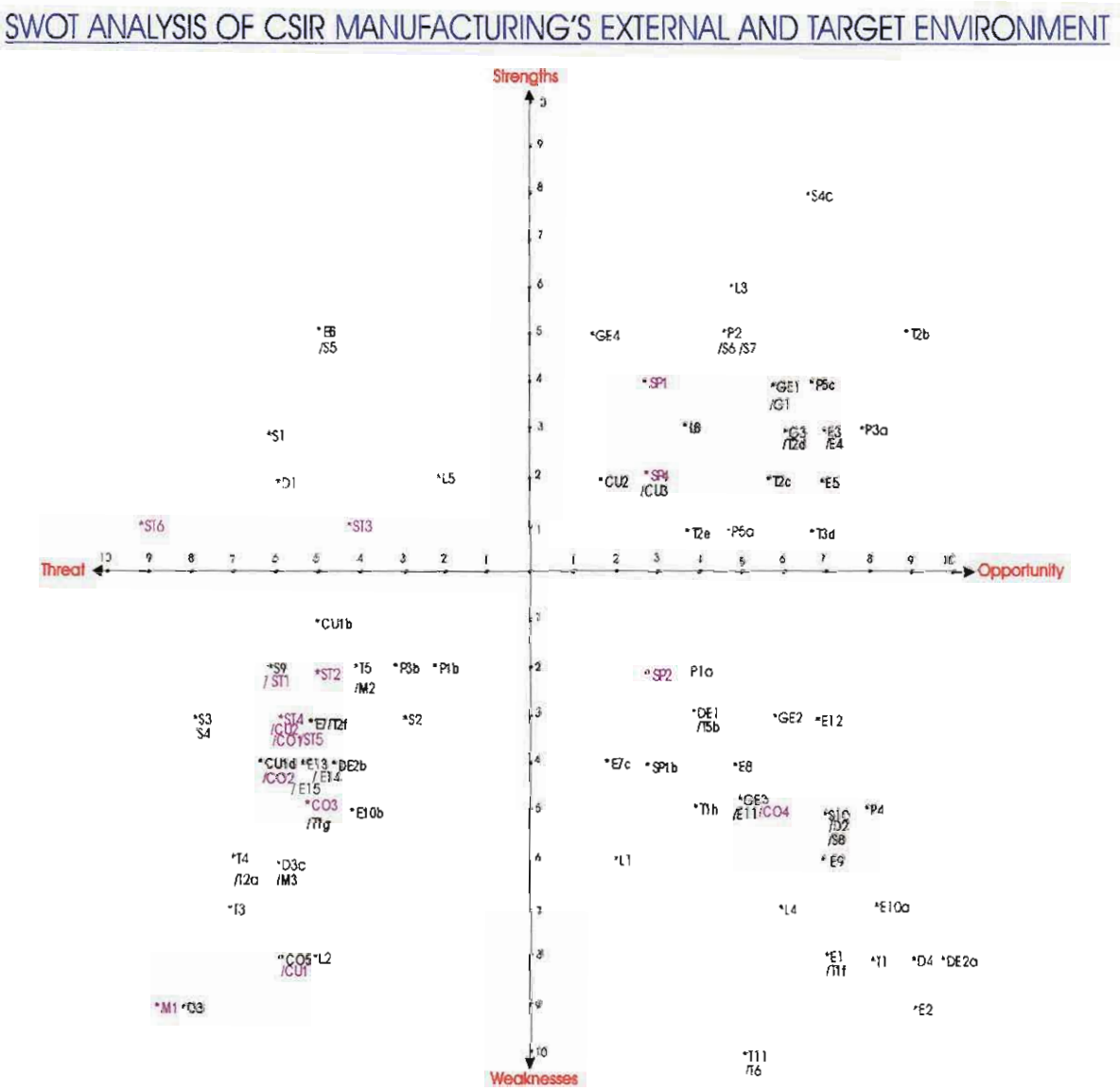
Continue/...

#	CSF	FACTOR	INTERPRETATION	CO-ORD.
ST4		Manufacturing sector	a. Understand their needs & deliver on promises. b. Ability to translate knowledge to customer's level of sophistication and ability. c. Not aligned with customer's 'real needs". d. CSIR fluctuate with manufacturing market fluctuation. e. Interpret customer's "real" & potential needs/requirements.	T6W3
ST5		Leading trendsetters in manufacturing	a. Identify trendsetters and their interpretation of technological trends in manufacturing.	T6W3
ST6		Government /DTI/DACST	a. CSIR must be seen to be responsible custodian of S&T investment. b. CSIR governance is dictated. c. Provide funding.	T9S1
		Competitors:		
CO1		International competitors	a. Identify & understand competitors' competitive profile.	T6W3
CO2		Specialist competitors	a. Identify & understand competitors' competitive profile.	T6W4
CO3		Competitive products	a. Need to familiarise own resources with competitors' products.	T5W5
CO4		Customers own in-house R&D divisions	a. Interpret i.t.o. CSIR manufacturing opportunities. b. Capitalise on non-core pre-competition R&D.	O5W5
CO5		Internal competition in the CSIR	a. Restructure ability to address higher-level solution provision.	T6W8
		Customer: ***Decision Criteria:*** a. SA first b. Alliance with SA Manufacturing partner who deals in Southern Africa c. SADC d. If resources are idle and not needed in SA then international contracts could be negotiated		

Continue/...

#	CSF	FACTOR	INTERPRETATION	CO-ORD.
CU1		SA Manufacturing community	a. Inability to deliver what we have set as our purpose. b. Manufacturing community unaware of our professional abilities. c. Ignorance of the CSIR's existence and ability apart from defence business. d. Low customer intimacy. e. Missed opportunities due to market intelligence.	T6W8 T5W1 T6W4
CU2		International customers	a. Extent to which CSIR should be involved.	O2S2
CU3		Customer database	a. Capitalise on demographic information.	O3S2
		Suppliers:		
SP1		Possible suppliers/alliances for the CSIR	a. Establish "Best of Knowledge" pools. b. Utilise benefits c. Formation of value-chain partnerships.	O3S4 O3W4
SP2		Knowledge Organisations (IKO)	a. Establish work/projects/exchanges not just agreements.	O3W2
SP3		Supplier Intimacy	a. Low supplier intimacy.	
SP4		Supplier database (accessibility of knowledge)	a. Update information centre. b. Buy demographical information. c. Capitalise on demographical information.	O3S2
		Markets		
M1		SA manufacturing community	See CU1	T9W9
M2		Market segmentation/trends	a. Tendency to segment the market i.t.o. sectorial and technological segments resulting in missed opportunities.	T4W2
M3		Identification of market (bordering)	a. Misallocation of resources to market.	T6W6

2 SWOT ANALYSIS



3 CSIR MANUFACTURING BUSINESS DEFINITION

CSIR MANUFACTURING LINE FUNCTIONS

1. CREATE ENVIRONMENT CONDUCIVE TO SELLING

1.1 Create "Top of the Mind" awareness
- 1.1.1 Conduct personal networking
  - 1.1.1.1 Identify possible networking opportunities
  - 1.1.1.2 Decide on objectives
  - 1.1.1.3 Identify appropriate contact person from CSIR
  - 1.1.1.4 Evaluate feedback
  - 1.1.1.5 Decide on action
- 1.1.2 Conduct integrated promotion campaign for manufacturing in CSIR
  - 1.1.2.1 Decide on campaign objectives
  - 1.1.2.2 Select agencies
    - 1.1.2.2.1 Identify agencies
    - 1.1.2.2.2 Request proposals
    - 1.1.2.2.3 Evaluate proposals
  - 1.1.2.3 Award contracts
  - 1.1.2.4 Execute promotion campaign
    - A Structure campaign
    - B Layout campaign
    - C Resource campaign
- 1.1.3 Get feedback – evaluate campaign

1.2 Ensure positive perception of the CSIR in the manufacturing sector
- 1.2.1 Determine current realities (branding, product and organisation)
- 1.2.2 Determine preferred scenario
- 1.2.3 Determine misalignment
- 1.2.4 Establish action plans
- 1.2.5 Execute the plans

1.3 Ensure customer satisfaction
- 1.3.1 Determine customer's level of satisfaction with CSIR
  - 1.3.1.1 Obtain feedback from customer
  - 1.3.1.2 Evaluate customer's feedback
- 1.3.2 Execute decision

1.4 Establish buy-in (create eagerness of customers to request proposals)
- 1.4.1 ID leads (opportunity)
  - 1.4.1.1 Detail customer (implicit and explicit)
  - 1.4.1.2 Match CSIR specification offering
- 1.4.2 Create needs (open customer's eyes)
  - A. Needs unknown
  - B. Referrals
  - C. Call-ins (single point of contact/entry)
  - 1.4.2.1 Determine customer's real needs
    - 1.4.2.1.1 Establish customer's requirements
      - 1.4.2.1.1.1 Interpret need-time schedule
      - 1.4.2.1.1.2 Understand market/customer need (perception)
      - 1.4.2.1.1.3 Formulate customer intent and service level agreement
    - 1.4.2.1.2 Diagnose customer's needs
      - 1.4.2.1.2.1 Establish need-related information
        - A. Expert/domain knowledge
        - B. Customer expression
        - C. Research
      - 1.4.2.1.2.2 Analyse need-related information
      - 1.4.2.1.2.3 Formulate need understanding
      - 1.4.2.1.2.4 Classify needs i.t.o. purpose and ability
  - 1.4.2.2 Convince customer of "real" needs (root cause)
  - 1.4.2.3 Interpret implications of customer needs i.t.o. CSIR's current abilities and offerings

1.4.3 Convince customer of solution
1.4.4 Action need
A. Refer misfits
B. Take on needs
1.4.4.1 Convince customer of CSIR's ability to deliver
1.4.4.2 Initiate contract development

1.5 Ensure effectiveness of marketing approach

1.5.1 Determine effectiveness
1.5.1.1 Determine market share
1.5.1.2 Compare offering to market equivalents
1.5.1.3 Evaluate success of campaign
1.5.2 Identify winners/losers
1.5.3 Re-align strategy as required

AUXILARY 1A: FORMULATE MASTER MARKETING PLAN

1.1 Analyse market potential

1.1.1 Interpret external and target environmental fluctuations
1.1.2 Conduct market research
a. Existing offerings
b. Identify new needs
1.1.2.1. Identify research mechanism
1.1.2.2. Define potential customer needs
1.1.2.3. Identify potential customers
1.1.2.4. Scope potential market
1.1.2.5. Formulate market profile
1.1.2.6. Determine market segments
1.1.3 Define market segments
1.1.3.1. Identify key market players
1.1.3.2. Match offering to market segment

1.2. Formulate marketing strategy (plan)

1.2.1. Determine marketing objectives
1.2.2. Conceptualise campaign
1.2.2.1 Prioritise events and campaigns
1.2.2.2 Establish goalposts
1.2.2.3 Identify target market
1.2.2.4 Forecast anticipated market penetration
1.2.2.5 Identify best campaign characteristics
A Promotion/sales
B Flavour
C Style
D Duration
E Publicity
F etc.
1.2.2.6 Determine resources per campaign
A Agents
B Manpower
C Capital
D Technology
E Skills
F Consumables
1.2.2.7 Anticipate potential campaign partners
1.2.3 Conceptualise campaign offering mix
1.2.4 Schedule campaign and events
1.2.5 Conceptualise relative position in corporate campaign
1.2.6 Identify potential agencies
1.2.6.1 Compile agency brief
A Product
B Market
C Target market
D Objective

E Budget
F Timing (relative to CSIR's campaign)
G etc.

1.2.6.2 Review agencies' reaction
1.2.6.3 Classify agents
1.2.7 Ensure campaign integration into CSIR marketing strategy

AUXILLARY 1B: PROGRAMME MANAGEMENT

1.1 Understand market needs (quantities, frequencies, offerings etc.)
1.2 Understand campaign development ability i.t.o. resources
1.3 Determine optimal campaign class mix
A. Ideal
B. Suggested
C. Compromised
1.4 Establish optimal campaigns-resource mix
1.4.1 Determine ideal campaign vs. resource mix
1.4.1.1 Determine priority method (capability and availability)
1.4.1.2 Prioritise resources
1.4.1.3 Interpret campaign attributes
1.4.1.4 Allocate ideal campaign-resource mix
1.4.2 Obtain suggested campaign vs. resource mix
1.4.3 Negotiate suggested campaign vs. resource mix
1.4.4 Accept negotiated campaign vs. resource mix
1.4.5 Monitor accepted campaign vs. resource mix
1.5 Interpret effect of optimal campaign vs. resource mix on current resource base
1.6 Compile campaign-resource adjustment plan
1.7 Integrate campaigns into enterprise-wide marketing strategy

2. ESTABLISH INNOVATIVE OFFERINGS

Portfolio Selection Criteria
A. Cost (life-cycle, etc.)
B. Manufacturability
C. Time restriction

2.1 Develop offering
2.1.1 Determine functional feature specification
2.1.2. Synthesise concept
2.1.3. Design offering
2.1.3.1. Ensure technical solutions
2.1.3.2. Ensure manufacturability of solution
2.1.3.3. Ensure maintainability of solution
2.1.3.4. etc.
2.1.4. Develop prototype
A Product
B Process
C Service
2.1.5. Test/validate against functional required features
2.1.6. Compile a pre-production data package

2. 2 Industrialise offering
A Manufacturing
B Service
2.2.1 Ensure CSIR's manufacturing ability
2.2.2 Ensure maintainability
2.2.3 Test/validate prototype (post-maintainability test) against functional specification
2.2.4 Ensure offering-resource alignment (capability to manufacture)
2.2.4.1. Determine capabilities to manufacture
2.2.4.2. Determine delivery capacity requirements

2.2.4.3. Determine gap within CSIR ability

2.2.5. Resource the offering (CSIR)

A. Training
B. Buy know-how
C. Build
D. Develop skill/product etc.
E. etc.

2.2.6. Qualify the data package

2.3. Commercialise offering

2.3.1. Formulate rollout plan
2.3.2. Launch offering
2.3.3. Conduct market testing and evaluation for the offering

2.4 Compile sales portfolio

2.4.1 Review portfolio selection criteria
2.4.2 Evaluate combinations and permutations
2.4.3 Admit offering
2.4.4 Establish and communicate offering portfolio

A. Offering-to-need match
B. Market segment
C. Campaign
D. Market share
E. Market equivalence

2.4.5 Terminate offering

AUXILARY 2A: PROJECT MANAGEMENT

1.Planning

1.1.Negotiate offering priority

2 Organising

3 Directing

3.1 Ensure specification adherence

4 Re-planning (control)

AUXILARY 2B: DETERMINE INNOVATIVE OFFERINGS

A. Technology
B. Market
C. Internal capabilities
D. Offer fate

2.1. Identify potential opportunities

2.1.1 Establish opportunity identification framework
2.1.2 Establish opportunity identification sources

A. Marketing
B. Literature
C. Scans
D. Surveys
E. Develop projects
F. Fulfil project
G. Analyse external and target environments
H. etc.

2.1.3. Identify investigatabile opportunities

2.1.3.1 Apply identification methodology
2.1.3.2 Apply selection criteria

2.1.4. Screen opportunities

2.1.4.1. Screen for fundamental flaws
2.1.4.2. Scan for strategic fit

2.1.5. Decide on investigatabile opportunity's fate i.t.o. potential
2.1.6. Classify potential opportunity

A Technical push
B Market-driven

2.2 Determine actual opportunities (list)

2.2.1. Establish preliminary assessment criteria

A. Market
B. Technology
C. Finance
D. Legal
E. Manufacturing
F. Capabilities internal

2.2.2. Conduct preliminary investigation
A Technical push
B Market-driven

2.2.3. Select opportunity to develop

2.3. Translation of opportunity to offering

2.3.1. Relate opportunity to existing offerings

2.3.2. Determine offerings implied by actual opportunities

2.4. Compile Offering

A Generate from contract fulfilment

B Generated from need-analysis

Auxiliary 2f project management

i. Planning
ii. Organising
iii. Directing
iv. Controlling

2.4.1. Select offering (screen)

2.4.1.1. Conduct preliminary Investigations
A Market
B Technical
C Financial

2.4.1.2. Reject inappropriate offerings

2.4.2. Establish offering profile (business case)

2.4.2.1. Determine user needs

2.4.2.2. Ensure competitiveness

2.4.2.3. Understand market

2.4.2.4. Ensure value to customer

2.4.2.5. Understand financial implication

2.4.2.6. Test concept

2.4.3. Establish "product profile"

2.4.3.1. Establish proposed product schedules

2.4.3.2. Establish schedule's resource implications

2.4.3.3. Balance to current production allocations

AUXILLARY 2B (I): ESTABLISH KNOWLEDGE BASE

A Buy
B Build
C Network

AUXILLARY 2B (II): PROGRAMME MANAGEMENT

1.1 Understand market needs (quantities, frequencies, offerings etc.)

1.2 Understand innovative development ability i.t.o. resources

1.3 Determine optimal innovative offerings class mix
D. Ideal
E. Suggested
F. Compromised

1.4 Establish optimised innovative offering vs. resource mix

1.4.1 Determine ideal innovative offering vs. resource mix

1.4.1.1 Determine priority method (capability and availability)

1.4.1.2 Prioritise resources

1.4.1.3 Interpret innovative offering attributes

1.4.1.4 Allocate ideal innovative offering-resource mix

1.4.2 Obtain suggested innovative offering vs. resource mix

1.4.3 Negotiate suggested innovative offering vs. resource mix

1.4.4 Accept negotiated innovative offering vs. resource mix

1.4.5 Monitor accepted innovative offering vs. resource mix

1.5 Interpret effect of optimal innovative offering vs. resource mix on current resource base
1.6 Compile innovative offering-resource adjustment plan
1.7 Integrate innovative offering into overall offering mix

3. DEVELOP CONTRACT (ends with signed contract)

3.1 Determine contract feasibility

3.1.1 Breakdown of customer's "real needs" into solution components
3.1.1.1 Identify key deliverables
3.1.1.2 Test/verify assumptions
3.1.2 Determine implication of solution on organisational ability to deliver
3.1.2.1 Determine implication on capabilities of CSIR's ability to deliver
3.1.2.1.1 Match CSIR's capabilities (recipe, info, know-how, skill, and packaging to solution component requirement)
3.1.2.1.2 Identify capability gap
3.1.2.2 Determine implication on resources to deliver components of solution
3.1.2.2.1 Match CSIR's resources to solution component requirement (quality quantity etc.)
3.1.2.1.2 Identify resource gap
3.1.3 Determine potential resource mechanisms
A. Outsourcing
B. Alliances
C. Internal growth/development
D. Subcontracting
E. Internal resources
3.1.3.1 Select players
2.1.3.1.1 Determine evaluation criteria
2.1.3.1.2 Evaluate alternatives against criteria
3.1.3.2 Ensure players' resource availability
3.1.3.3 Compile permutations of alternatives (match resources to jobs)
3.1.4 Ensure healthy long-term ROI
3.1.4.1 Determine possibility of future returns from customer for CSIR manufacturing
3.1.4.1.1 Determine probability of future customer's/offering's return
3.1.4.1.2 Quantify returns (ballpark figure)
3.1.4.2 Determine current contract ROI
A. Value-based pricing
B. Cost-based pricing
3.1.4.2.1 Determine price
3.1.4.2.1.1 Determine cost of contract
3.1.4.2.1.2 Determine value to customer (contract)
3.1.4.2.1.3 Selecting pricing mechanisms
3.1.4.2.2 Determine investment required
3.1.4.2.3 Quantify current ROI
3.1.4.3 Compare current against future returns
3.1.4.4 Select appropriate ROI per specific contract

3.2 Formulate contract

3.2.1. Determine terms of contract (deliverable, time scales, etc.)
3.2.2 Compile draft quantity agreement
3.2.3 Verify draft for compliance with business rules
3.2.4 Ensure legality of contract terms

3.3 Agree contract

3.3.1 Prove ability to perform (conditions, alliances, subcontracting, resource placing etc.)
3.3.2 Finalise terms of agreement
3.3.2.1 Submit proposal
3.3.2.2 Review customer counter-proposal
3.3.2.3 Negotiate proposal
3.3.2.4 Establish compromise
3.3.3 Conclude agreement

A. Commit to contract
B Cancel customer contract requirements

3.3.4. Commit contract resources

AUXILARY 3A: PROJECT MANAGEMENT

i. Planning
ii. Organising
iii. Directing
iv. Re-planning (control)

AUXILARY 3B: RISK MANAGEMENT

a. Commercial criteria
b. Technical criteria
c. Combination
i. Determine risk of contract
ii. Determine extend of CSIR exposure in the contract
a. Determine customer creditworthiness
b. Damage claims possibility
iii. Decide contract's fate
a. Continue with contract development
b. Cancel contract development

AUXILARY 3C: PROGRAMME MANAGEMENT

1.1 Understand market needs (quantities, frequencies, offerings etc.)
1.2 Understand contract development ability i.t.o. resources
1.3 Determine optimal contract development class mix
A. Ideal
B. Suggested
C. Compromised
1.4 Establish optimal contract development vs. resource mix
1.4.1 Determine ideal contract vs. resource mix
1.4.1.1 Determine priority method (capability and availability)
1.4.1.2 Prioritise resources
1.4.1.3 Interpret contract attributes
1.4.1.4 Allocate ideal contract-resource mix
1.4.2 Obtain suggested contract vs. resource mix
1.4.3 Negotiate suggested contract vs. resource mix
1.4.4 Accept negotiated contract vs. resource mix
1.4.5 Monitor accepted contract vs. resource mix
1.5 Interpret effect of optimal contract vs. resource mix on current resource base
1.6 Compile contract-resource adjustment plan
1.7 Integrate contract into contract mix

4. FULFIL CUSTOMER CONTRACT

4.1. Resource contract (commit resources to contract)

A. Procure raw materials
B. Procure consumables
C. Procure customer contract part
D. Procure equipment
E. Obtain human resources
F. Obtain know-how
G. Obtain information
H. Procure funds
I. etc.

4.1.1. Contract with key contributors
4.1.2. Allocate resources to contracts

4.2. Execute contract

A. Technical output
B. Schedule: due date
C. Budget

4.2.1. Interpret contract schedule
4.2.2. Interpret technical deliverables

4.2.3. Execute scheduled actions
4.2.3.1 Access actual vs. planned status
4.2.3.2 Request contract offering input material/component
4.2.3.3 Accept and schedule contract offering input material/component
4.2.3.4 Set and allocate operational resources
4.2.3.5 Route contract offering components
4.2.4. Ensure adherence to customer's required standards
4.2.4.1. Identify deviations from specifications (classes)
4.2.4.2. Communicate corrective actions
4.2.4.3. Action corrective action

4.3. Ensure customer advantage

A. Localised
B. Systemic
4.3.1 Ensure operation of solution
4.3.2 Measure benefit
4.3.3 Ratify ROI
4.3.3.1 Benefits vs. bottom line
4.3.3.2 Customer contract investment
4.3.3.3 Quantify ROI
4.3.4. Ensure continuity of solution
4.3.4.1. Consult on problem-solving
4.3.4.2. etc.

4.4. Receive payment

4.4.1. Obtain customer acceptance and sign-off
4.4.2. Provide proof of delivery
4.4.3. Collect payment

AUXILARY 4A: PROGRAMME MANAGEMENT

1.1 Understand contract content (quantities, frequencies, offerings etc.)
1.2 Understand contract execution ability i.t.o. resources
1.3 Determine optimal contract-offering input class mix
A. Ideal
B. Suggested
C. Compromised
1.4 Establish optimal contract-offering input vs. resource mix
1.4.1 Determine ideal contract-offering input vs. resource mix
1.4.1.1 Determine priority method (capability and availability)
1.4.1.2 Prioritise resources
1.4.1.3 Interpret contracts' attributes
1.4.1.4 Allocate ideal contracts' resource mix
1.4.2 Obtain suggested contract-offering input vs. resource mix
1.4.3 Negotiate suggested contract-offering input vs. resource mix
1.4.4 Accept negotiated contract-offering input vs. resource mix
1.4.5 Monitor accepted contract-offering input vs. resource mix
1.5 Interpret effect of optimal contract-offering input vs. resource mix on current resource base
1.6 Compile contract-offering input resource adjustment plan
1.7 Integrate contract-offering input into enterprise-wide contract-offering inputs

AUXILARY 4B: PROJECT MANAGEMENT

i. Planning
a. Negotiate contract, priority
ii. Organising
iii Directing
iv Re-planning (control)
a. Monitor contract process actual vs. planned schedule (production, distribution, delivery, etc)
b. Identify contract processing problems
c. Measure/monitor actual contract performance (attribute value)

AUXILARY 4C: COMMUNICATE WITH CUSTOMER ON CONTRACT

i. Status
ii.Enquiry
iii. Complaint
iv. Requirement

5. CAPITALISE ON INTELLECTUAL PROPERTY

A. License patent rights
B. Sell patent rights & product designs
C. License proprietary process know-how
D. Produce in "lab factory"
E. Sell/privatise business unit or ongoing concern

AUXILARY 5A: Risk management

i. Commercial criteria
ii. Technical criteria
iii. Combination

5.1 Determine risk of contract
5.2 Determine extent of CSIR exposure in the contract
5.3 Decide contract's fate
5.3.1 Continue with contract development
5.3.2 Cancel contract development

5.1 Ensure feasibility of technology commercialisation

5.1.1 Establish feasible implementation model
5.1.1.1 Determine position of opportunity on hierarchy life-cycle map
A. Technology balance sheet
B. Identify window of opportunity
C. etc.
5.1.1.2 Investigate past case studies
5.1.1.3 Determine ROI of IP sale
5.1.1.4 Understand market/customer needs (specify offering)
5.1.1.5 Perform scenario plan for commercialisation
5.1.2 Demonstrate IP value or lab factory profitability
A. Fulfil customer service contract in lab factory
B. Valuation of business opportunities
B1. Forecasting
B2. Techno-economic study
5.1.3 Identify appropriate receptor/customer
5.1.3.1 Define marketing campaign
5.1.3.2 Execute marketing campaigns
5.1.3.3 Establish evaluation criteria
5.1.3.4 Evaluate possible customers against criteria
5.1.3.5 Select appropriate permutations of customers

5.2 Formulate structure of IP package and sale

5.2.1. Define commercial terms of IP sale
5.2.2. Define terms of technology transfer packaging
5.2.2.1. Initiate due diligence on technology performance
5.2.2.1.1 Demonstrate technology integrity
5.2.2.1.2 Establish understanding of technology integrity
5.2.3 Compile proposal of business plan
5.2.3.1 Compile draft business plan
5.2.3.2 Verify draft business plan for compliance with CSIR's business rules
5.2.3.3 Ensure legality of contract terms
5.2.3.4 Initiate due diligence
5.2.3.5 Finalise business plan proposal
5.2.3.6 Compile technology transfer plan

5.3 Ensure successful technology transfer

5.3.1 Transfer know-how
5.3.1.1 Transfer documentation
5.3.1.2 Training of customer staff
5.3.1.3 Implement equipment if applicable
5.3.2 After-sales support
5.3.2.1 Consult on problem-solving
5.3.2.2 etc.

CSIR MANUFACTURING AUXILARY FUNCTIONS

1. ENSURE ENVIRONMENTAL ALIGNMENT

1.1 Analyse external- and target environment

1.2 Interpret the implications of the external and target environment fluctuations and translate to effect on internal environment.

1.2.1. Determine business priority
- 1.2.1.1. Define and prioritise future scenario
- 1.2.1.2. Define environmental factors (target and external)
- 1.2.1.3. Identify and define CSFs
- 1.2.1.4. Measure direct effect of CSFs on business area (i.t.o. operational resources and efficiency and effectiveness)
- 1.2.1.5. Prioritise on business area/function i.t.o. criticality and resource gap

1.2.2. Define ideal business architecture
- 1.2.2.1. Define ideal/current business process and technology architecture
- 1.2.2.2. Determine vertical and horizontal gap
- 1.2.2.3. Define architectural priority

1.2.3. Ensure business and architectural alignment
- 1.2.3.1. Define and prioritise contract initiatives needed
- 1.2.3.2. Identify and asses current contract/initiatives
- 1.2.3.3. Determine contract operational resource ability
- 1.2.3.4. Allocate operational resources to contracts/initiatives
- 1.2.3.5. Monitor, evaluate & implement

Auxiliary A Specify plan for architectural change

- A1. Interpret business change requirements
- A2. Interpret strategic position (CSFs and business priorities)
- A3. Interpret architectural gap
- A4 Determine architectural priorities
- A5 Determine business priorities
- A6 Accommodate business priorities under architectural priorities
- A7 Determine resource fix-it priority and gap
- A8 Compile architectural adjustment plans
  - A Quick fix plans
  - B Business engineering project
  - C Resource fix-it plans

2. ENSURE LEADING EDGE

2.1. Determine manufacturing-wide plan

2.1.1. Define KRA's

2.1.2. Define group governance

2.1.3. Ensure planning interpretation

2.1.4. Specify acquisition plan
- 2.1.4.1. Identify resources to be procured (attributes)
- 2.1.4.2. Specify supplier vs. resources (attributes)
  - A Quantity
  - B Lead time
  - C Periodicity
  - D Point of responsibility
  - E People
  - F Equipment
  - G Technology

H Capital
I etc.

2.2. Optimise target environment

2.2.1 Align customer behaviour according to the implied target environment
2.2.2 Create walls for competitors
2.2.3 Functionally align suppliers
2.2.4 Influence market dynamics
2.2.5 Establish positive behaviour in other stakeholders

2.3. Ensure healthy business relationship

A Project relations
B Continuous customer care
C Support service provision

2.4. Implement architectural change effect of plans on business

2.4.1. Launch architectural change projects according to plans
2.4.2. Implement high level business parameters
A. KRA's & KRI's
B. Governance
C. Offering mix
2.4.3 Action low-level plans
A. Market
B. Opportunity development
C. Contract development
D. Contract fulfilment
E. Procurement
2.4.3.1 Determine resource optimisation method
2.4.3.2 Allocate resources according to method and plan

2.5. Ensure conformance of business change implementation according to business plan

2.5.1 Identify deviations
2.5.1.1 Identify non-performance areas i.t.o. rectification
2.5.1.2 Measure planned vs. actual business
2.5.2 Communicate effect of business change to relevant parties

4 CRITICAL SUCCESS FACTORS (CSFs)

A Ensure trade union and employee understanding of the CSIR's reason for existence, their commitment to change, and incorporate their aspirations in the overview design by 1 October 1998.

B Segment markets, analyse needs and build intimate customer relations – creating an environment conducive to selling – by 1 October 1998.

C The ability to change, represented by a continuous business process (enabled with change-instruments) has to be established and manned by 1 October 1998.

D Achieve measurable and sustainable financial success and business growth for CSIR Manufacturing. The measurement mechanisms required must be in place by 1 October 1998.

E Identify the appropriate organisations (matched to market need as per CSF above in the market with an impact-weighted rating [% and probability of benefit]) and align for strategic association (alliance) on particular projects as per CSF above by 1 March 1999.

F Translate industry requirements and international manufacturing technology trends into a technological strategy for CSIR Manufacturing by October 1998.

G The CSIR Manufacturing business has to be fully functional and adequately manned to service the focused market demand by 1 March 1999.

5 FSD/CSF MAPPING's

Critical Success Factors	A	B	C	D	E	F	G	Σ
Line Functions								
1 CREATE ENVIRONM. CONDUSIVE TO SELLING								
1.1 Create top of mind awareness								
1.1.1 Conduct personal networking								
1.1.1.1 Identify possible networking opportunities		✔			✔			2
1.1.1.2 Decide on objectives		✔			✔			2
1.1.1.3 Identify appropriate contact person from CSIR		✔			✔			2
1.1.1.4 Evaluate feedback					✔			1
1.1.1.5 Decide on action		✔			✔			2
1.1.2 Conduct integrated promotions for mfg. in CSIR								
1.1.2.1 Decide on campaign objectives		✔						1
1.1.2.2 Select agencies								
1.1.2.2.1 Identify agencies		✔						1
1.1.2.2.2 Request for proposals		✔						1
1.1.2.2.3 Evaluate proposals		✔						1
1.1.2.3 Award contracts		✔						1
1.1.2.4 Execute promotion campaign		✔						1
1.1.3 Get feedback – evaluate campaign		✔						1
A Structure campaign								
B Layout campaign								
C Resource campaign								
1.2 Ensure positive perception about the CSIR in the manufacturing sector								
1.2.1 Determine current realities (branding, product and organisation)	✔	✔						2
1.2.2 Determine preferred scenario	✔	✔						2
1.2.3 Determine misalignment	✔	✔						2
1.2.4 Establish action plans	✔	✔						2
1.2.5 Action the plans	✔	✔						2
1.3 Ensure customer satisfaction								
1.3.1 Determine customer's level of satisfaction with CSIR								
1.3.1.1 Obtain feedback from customer		✔						1
1.3.1.2 Evaluate customer feedback		✔						1
1.3.2 Execute decision		✔						1
1.4 Establish buy-in (create eagerness of customers to request proposals)								
1.4.1 ID leads (opportunity)								
1.4.1.1 Detail customer needs (implicit and explicit)		✔				✔		2
1.4.1.2 Match CSIR specification offering		✔				✔		2
1.4.2 Create needs (open customer's eyes)								
A. Needs unknown								
B. Referrals								
C. Call-ins (single point of contact/entry)								
1.4.2.1 Determine customer's real needs								
1.4.2.1.1 Establish customer's requirements								
1.4.2.1.1.1 Interpret need-time schedule		✔				✔		2
1.4.2.1.1.2 Understand market/customer needs (perception)		✔						1
1.4.2.1.1.3 Formulate customer intent and service level agreement		✔				✔		2
1.4.2.1.2 Diagnose customer's needs								
1.4.2.1.2.1 Establish need-related information		✔				✔		2
A. Expert/domain knowledge								

Continue/...

Critical Success Factors	A	B	C	D	E	F	G	Σ
B. Customer expression								
C. Research								
1.4.2.1.2.2 Analyse need-related information		✔				✔		2
1.4.2.1.2.3 Formulate need understanding		✔				✔		2
1.4.2.1.2.4 Classify need i.t.o. purpose and ability		✔				✔	✔	3
1.4.2.2 Convince customer of "real" need (root cause)		✔						1
1.4.2.3 Interpret implications of customer need i.t.o. CSIR's current abilities and offerings		✔						1
1.4.3 Convince customer of solution		✔						1
1.4.4 Action need		✔						1
A. Refer misfits								
B. Take on need								
1.4.4.1 Convince customer of CSIR's ability to deliver	✔	✔				✔	✔	4
1.4.4.2 Initiate contract development	X	x	x	x	x	x	x	
1.5 Ensure effectiveness of marketing approach								
1.5.1 Determine effectiveness								
1.5.1.1 Determine market share		✔		✔	✔	✔		4
1.5.1.2 Compare offering to market equivalents		✔			✔	✔		3
1.5.1.3 Evaluate success of campaign		✔		✔				2
1.5.2 Identify winners/losers		✔			✔			2
1.5.3 Re-align strategy as required		✔			✔			2
AUXILIARY 1a: FORMULATE MASTER MARKETING PLAN								
1.1 Analyse market potential								
1.1.1 Interpret external and target environmental fluctuations		✔				✔		2
1.1.2 Conduct market research								
a. Existing offerings								
b. Identify new needs								
1.1.2.1. Identify research mechanism		✔				✔		2
1.1.2.2. Define potential customer needs		✔				✔		2
1.1.2.3. Identify potential customers		✔				✔		2
1.1.2.4. Scope potential market		✔				✔		2
1.1.2.5. Formulate market profile		✔				✔		2
1.1.2.6. Determine market segments		✔				✔		2
1.1.3 Define market segments								
1.1.3.1. Identify key market players	✔	✔			✔	✔		4
1.1.3.2. Match offering to market segment		✔			✔	✔		3
1.2. Formulate marketing strategy (plan)								
1.2.1. Determine marketing objectives		✔						1
1.2.2. Conceptualise campaign								
1.2.2.1 Prioritise events and campaigns		✔						1
1.2.2.2 Establish goalposts		✔						1
1.2.2.3 Identify target market		✔						1
1.2.2.4 Forecast anticipated market penetration		✔						1
1.2.2.5 Identify best campaign characteristics		✔						1
A Promotion/sales								
B Flavour								
C Style								
D Duration								
E Publicity								
F etc.								
1.2.2.6 Determine resources per campaign		✔					✔	2
A Promotion/sales								
B Flavour								

Continue/…

Critical Success Factors	A	B	C	D	E	F	G	Σ
C Style								
D Duration								
E Publicity								
F etc.								
1.2.2.7 Anticipate potential campaign partners		✔						1
1.2.3 Conceptualise campaign offering mix		✔						1
1.2.4 Schedule campaign and events		✔						1
1.2.5 Conceptualise relative position in corporate campaign		✔						1
1.2.6 Identify potential agencies								
1.2.6.1Compile agency brief		✔						1
A Product								
B Market								
C Target market								
D Objective								
E Budget								
F Timing (relative to CSIR's campaign)								
G etc.								
1.2.6.2 Review agencies' reaction		✔						1
1.2.6.3 Classify agents		✔						1
1.2.7 Ensure campaign integration into CSIR marketing strategy		✔						1
AUXILARY 1b: PROGRAMME MANAGEMENT								
1.1 Understand market needs (quantities, frequencies, offerings etc.)		✔		✔				2
1.2 Understand campaign development ability i.t.o. resources				✔			✔	2
1.3 Determine optimal campaign class mix				✔				1
A. Ideal								
B. Suggested								
C. Compromised								
1.4 Establish optimal campaigns vs. resource mix								
1.4.1 Determine ideal campaign vs. resource mix								
1.4.1.1 Determine priority method (capability and availability)		✔		✔			✔	3
1.4.1.2 Prioritise resources		✔		✔			✔	3
1.4.1.3 Interpret campaign attributes		✔		✔				2
1.4.1.4 Allocate ideal campaign-resource mix		✔		✔			✔	3
1.4.2 Obtain suggested campaign vs. resource mix		✔		✔			✔	
1.4.3 Negotiate suggested campaign vs. resource mix		✔		✔			✔	3
1.4.4 Accept negotiated campaign vs. resource mix		✔		✔			✔	3
1.4.5 Monitor accepted campaign vs. resource mix		✔		✔			✔	3
1.5 Interpret effect of optimal campaign vs. resource mix on current resource base		✔		✔			✔	3
1.6 Compile campaign-resource adjustment plan		✔		✔			✔	3
1.7 Integrate campaigns into enterprise-wide marketing strategy		✔		✔				2
2 ESTABLISH INNOVATIVE OFFERINGS								
Portfolio selection criteria								
A. Cost (life-cycle, etc.)								
B. Manufacturability								
C. Time restriction								
2.1Develop offering								
2.1.1Determine functional feature specification						✔		1
2.1.2. Synthesize the concept						✔		1

Continue/…

Critical Success Factors	A	B	C	D	E	F	G	Σ
2.1.3. Design offering								
2.1.3.1. Ensure technical solutions								
2.1.3.2. Ensure manufacturability of solution							✔	1
2.1.3.3. Ensure maintainability of solution							✔	1
2.1.3.4. etc.								
2.1.4. Develop prototype								
A Product								
B Process								
C Service								
2.1.5. Test/validate against functional required features								
2.1.6. Compile a pre-production data package								
2. 2 Industrialise offering								
A Product								
B Process								
2.2.1 Ensure CSIR's manufacturing ability								
2.2.2 Ensure maintainability								
2.2.3 Test/validate prototype (post-maintainability test) against functional specification								
2.2.4 Ensure offering resource alignment (capability to manufacture)								
2.2.4.1. Determine capabilities to manufacture						✔	✔	2
2.2.4.2. Determine delivery capacity requirements						✔	✔	2
2.2.4.3. Determine gap within CSIR ability						✔	✔	2
2.2.5. Resource the offering (CSIR)						✔	✔	2
A. Training								
B. Buy know-how								
C. Build								
D. Develop skill/product etc.								
E. etc.								
2.2.6.Qualify the data package								
2.3. Commercialise offering								
2.3.1. Formulate rollout plan								
2.3.2. Launch offering						✔		1
2.3.3. Conduct market testing and evaluation for the offering						✔		1
2.4 Compile sales portfolio								
2.4.1 Review portfolio selection criteria						✔		1
2.4.2 Evaluate combinations and permutations						✔		1
2.4.3 Admit offering								
2.4.4 Establish and communicate offering portfolio								
A. Offering-to-need match								
B. Market segment								
C. Campaign								
D. Market share								
E. Market equivalence								
2.4.5 Terminate offering								
AUXILLARY 2A: PROJECT MANAGEMENT								
1.Plan								
1.1.Negotiate offering priority								
2 Organising								
3 Directing								
3.1 Ensure specification adherence								
4 Re-planning (control)								

Continue/…

Critical Success Factors	A	B	C	D	E	F	G	Σ
AUXILARY 2B: DETERMINE INNOVATIVE OFFERINGS								
A. Technology								
B. Market								
C. Internal capabilities								
D. Offer fate								
2.1. Identify potential opportunities								
2.1.1 Establish opportunity identification framework						✔		1
2.1.2 Establish opportunity identification sources			✔		✔	✔		3
A. Marketing								
B. Literature								
C Scans								
D Surveys								
E Develop projects								
F Fulfil project								
G Analyse external and target environments								
H etc.								
2.1.3. Identify investigatabile opportunities								
2.1.3.1 Apply identification methodology						✔		1
2.1.3.2 Apply selection criteria						✔		1
2.1.4. Screen opportunities								
2.1.4.1. Screen for fundamental flaws						✔		1
2.1.4.2. Scan for strategic fit						✔		1
2.1.5. Decide on investigatable opportunity's fate i.t.o. potential						✔		1
2.1.6. Classify potential opportunity								
A Technical push								
B Market-driven								
2.2 Determine actual opportunities (list)								
2.2.1.Establish preliminary assessment criteria						✔		1
A. Market								
B. Technology								
C. Finance								
D. Legal								
E. Manufacturing								
F. Capabilities internal								
2.2.2. Conduct preliminary investigation						✔		1
A Technical push								
B Market-driven								
2.2.3. Select opportunity to develop						✔		1
2.3. Translation of opportunity to offerings								
2.3.1. Relate opportunity to existing offerings						✔		1
2.3.2. Determine offerings implied by actual opportunities						✔		1
2.4. Compile offering						✔		1
A Generate from contract fulfilment								
B Generate from need-analysis								
AUXILARY 2F: PROJECT MANAGEMENT								
i. Planning								
ii. Organising								
iii. Directing								
iv. Controlling								
2.4.1. Select offering (screen)								
2.4.1.1. Conduct preliminary investigations								
A Technical								

Continue/…

Critical Success Factors	A	B	C	D	E	F	G	Σ
B Market								
C Financial								
2.4.1.2. Reject inappropriate offerings						✔		1
2.4.2. Establish offering profile (business case)								
2.4.2.1. Determine user needs		✔						1
2.4.2.2. Ensure competitiveness						✔		1
2.4.2.3. Understand market						✔		1
2.4.2.4. Ensure value to customer		✔						1
2.4.2.5. Understand financial implication						✔		1
2.4.2.6. Test concept						✔		1
2.4.3. Establish product profile								
2.4.3.1. Establish proposed product schedules		✔						1
2.4.3.2. Establish schedule's resource implications						✔		1
2.4.3.3. Balance to current production allocations						✔		1
AUXILLARY 2B (I): ESTABLISH KNOWLEDGE BASE								
A. Buy								
B. Build								
C. Network								
AUXILLARY 2B (II): PROGRAMME MANAGEMENT								
1.1 Understand market needs (quantities, frequencies, offerings etc.)		✔		✔				2
1.2 Understand innovative development ability i.t.o. resources				✔			✔	2
1.3 Determine optimal innovative offerings class mix				✔				1
A. Ideal								
B. Suggested								
C. Compromised								
1.4 Establish optimised innovative offering vs. resource mix								
1.4.1 Determine ideal innovative offering vs. resource mix								
1.4.1.1 Determine priority method (capability and availability)				✔			✔	2
1.4.1.2 Prioritise resources				✔			✔	2
1.4.1.3 Interpret innovative offering attributes				✔			✔	2
1.4.1.4 Allocate ideal innovative offering resource mix				✔			✔	2
1.4.2 Obtain suggested innovative offering vs. resource mix				✔			✔	2
1.4.3 Negotiate suggested innovative offering vs. resource mix				✔			✔	2
1.4.4 Accept negotiated innovative offering vs. resource mix				✔			✔	2
1.4.5 Monitor accepted innovative offering vs. resource mix				✔			✔	2
1.5 Interpret effect of optimal innovative offering vs. resource mix on current resource base				✔			✔	2
1.6 Compile innovative offering resource adjustment plan				✔			✔	2
1.7 Integrate innovative offering into overall offering mix				✔				1
3. DEVELOP CONTRACT (ends with signed contract)								
3.1 Determine contract feasibility								

Continue/...

Critical Success Factors	A	B	C	D	E	F	G	Σ
3.1.1 Breakdown of customer's "real needs" into solution components								
3.1.1.1 Identify key deliverables								
3.1.1.2 Test/verify assumptions								
3.1.2 Determine implication of solution on organisational ability to deliver								
3.1.2.1 Determine implication on capabilities of CSIR's ability to deliver								
3.1.2.1.1 Match CSIR's capabilities (recipe, info, know-how, skills, and packaging to solution component requirement)						✔	✔	2
3.1.2.1.2 Identify capability gap						✔	✔	2
3.1.2.2 Determine implication on resources to deliver components of solution								
3.1.2.2.1 Match CSIR's resources to solution component requirement (quality quantity etc.)						✔	✔	2
3.1.2.2.2 Identify resource gap					✔	✔	✔	3
2.1.3 Determine potential resource mechanisms								
A. Outsourcing								
B. Alliances								
C. Internal growth/development								
D. Subcontracting								
E. Internal resources								
3.1.3.1 Select players								
3.1.3.1.1 Determine evaluation criteria					✔	✔	✔	3
3.1.3.1.2 Evaluate alternatives against criteria					✔		✔	2
3.1.3.2 Ensure players' resource availability					✔		✔	2
3.1.3.3 Compile permutations of alternatives (match resources to jobs)					✔		✔	2
3.1.4 Ensure healthy long-term ROI								
3.1.4.1 Determine possibility of future returns from customer for CSIR manufacturing								
3.1.4.1.1 Determine probability of future customer/offering return				✔		✔		2
3.1.4.1.2 Quantify returns (ballpark figure)				✔		✔		2
3.1.4.2 Determine current contract ROI								
A. Value-based pricing								
B. Cost-based pricing								
3.1.4.2.1 Determine price								
3.1.4.2.1.1 Determine cost of contract				✔				1
3.1.4.2.1.2 Determine value to customer (contract)				✔		✔		2
3.1.4.2.1.3 Selecting pricing mechanisms				✔		✔		2
3.1.4.2.2 Determine investment required				✔		✔		2
3.1.4.2.3 Quantify current ROI				✔		✔		2
3.1.4.3 Compare current against future returns				✔		✔		2
3.1.4.4 Select appropriate ROI per specific contract				✔				1
3.2 Formulate contract								
3.2.1 Determine terms of contract (deliverable, time scales, etc.)				✔				1
3.2.2 Compile draft quantity agreement								
3.2.3 Verify draft for compliance with business rules				✔				1
3.2.4 Ensure legality of contract terms				✔				1
3.3 Agree contract								
3.3.1 Prove ability to perform (conditions, alliances, subcontracting, resource placing etc.)		✔		✔	✔			3

Continue/…

Critical Success Factors	A	B	C	D	E	F	G	Σ
3.3.2 Finalise terms of agreement								
3.3.2.1 Submit proposal								
3.3.2.2 Review customer counter-proposal								
3.3.2.3 Negotiate proposal				✔				1
3.3.2.4 Establish compromise				✔				1
3.3.3 Conclude agreement				✔				1
A. Commit to Contract								
B. Cancel customer contract requirements								
3.3.4 Commit contract resources							✔	1
AUXILLARY 3A: PROJECT MANAGEMENT								
i. Planning								
ii. Organising								
iii. Directing								
iv. Re-planning (control)								
AUXILLARY 3B: RISK MANAGEMENT								
a. Commercial criteria								
b. Technical criteria								
c. Combination								
i. Determine risk of contract								
ii. Determine extend of CSIR exposure in the contract								
a. Determine customer creditworthiness								
b. Damage claims possibility								
iii. Decide contract's fate								
a. Continue with contract development								
b. Cancel contract development								
AUXILLARY 3C: PROGRAMME MANAGEMENT								
1.1 Understand market needs (quantities, frequencies, offerings etc.)		✔		✔				2
1.2 Understand contract development ability i.t.o. resources				✔			✔	2
1.3 Determine optimal contract development class mix				✔				1
A. Ideal								
B. Suggested								
C. Compromised								
1.4 Establish optimal contract development vs. resource mix								
1.4.1 Determine ideal contract vs. resource mix								
1.4.1.1 Determine priority method (capability and availability)				✔			✔	2
1.4.1.2 Prioritise resources				✔			✔	2
1.4.1.3 Interpret contract attributes				✔			✔	2
1.4.1.4 Allocate ideal contract-resource mix				✔			✔	2
1.4.2 Obtain suggested contract vs. resource mix				✔			✔	2
1.4.3 Negotiate suggested contract vs. resource mix				✔			✔	2
1.4.4 Accept negotiated contract vs. resource mix				✔			✔	2
1.4.5 Monitor accepted contract vs. resource mix				✔			✔	2
1.5 Interpret effect of optimal contract vs. resource mix on current resource base				✔			✔	2
1.6 Compile contract-resource adjustment plan				✔			✔	2
1.7 Integrate contract into contract mix				✔				1
4. FULFIL CUSTOMER CONTRACT								
4.1. Resource contract (commit resources to contract)								
A. Procure raw materials								
B. Procure consumables								
C. Procure customer contract part								

Continue/...

Critical Success Factors	A	B	C	D	E	F	G	Σ
D. Procure equipment								
E. Obtain human resources								
F. Obtain know-how								
G. Obtain information								
H. Procure funds								
I. etc.								
4.1.1. Contract with key contributors					✔		✔	2
4.1.2. Allocate resources to contracts							✔	1
4.2. Execute contract								
A. Technical output								
B. Schedule: due date								
C. Budget								
4.2.1. Interpret contract schedule							✔	1
4.2.2. Interpret technical deliverables								
4.2.3. Execute scheduled actions								
4.2.3.1 Access actual vs. planned status				✔				1
4.2.3.2 Request contract offering input material/component								
4.2.3.3 Accept and schedule contract offering input material/component								
4.2.3.4 Set and allocate operational resources							✔	1
4.2.3.5 Route contract offering components								
4.2.4. Ensure adherence to customer required standards								
4.2.4.1. Identify deviations from specifications (classes)		✔		✔				2
4.2.4.2. Communicate corrective actions		✔						1
4.2.4.3. Action corrective action		✔		✔				2
4.3. Ensure customer advantage								
A. Localised								
B. Systemic								
4.3.1 Ensure operation of solution		✔		✔				2
4.3.2 Measure Benefit		✔		✔				2
4.3.3 Ratify ROI								
4.3.3.1 Benefits vs. bottom line		✔		✔				2
4.3.3.2 Customer contract investment		✔		✔				2
4.3.3.3 Quantify ROI		✔		✔				2
4.3.4. Ensure continuity of solution								
4.3.4.1. Consult on problem-solving		✔						1
4.3.4.2. etc.								
4.4. Receive payment								
4.4.1. Obtain customer acceptance and sign-off		✔		✔				2
4.4.2. Provide proof of delivery				✔				1
4.4.3. Collect payment				✔				1
AUXILARY 4A: PROGRAMME MANAGEMENT								
1.1 Understand contract content (quantities, frequencies, offerings etc.)		✔		✔				2
1.2 Understand contract execution ability i.t.o. resources				✔			✔	2
1.3 Determine optimal contract offering input class mix				✔				1
A. Ideal								
B. Suggested								
C. Compromised								
1.4 Establish optimal contract offering input vs. resource mix								

Continue/...

Critical Success Factors	A	B	C	D	E	F	G	Σ
1.4.1 Determine ideal contract offering input vs. resource mix								
1.4.1.1 Determine priority method (capability and availability)				✔			✔	2
1.4.1.2 Prioritise resources				✔			✔	2
1.4.1.3 Interpret contracts' attributes				✔				1
1.4.1.4 Allocate ideal contracts' resource mix				✔			✔	2
1.4.2 Obtain suggested contract-offering input vs. resource mix				✔			✔	2
1.4.3 Negotiate suggested contract-offering input vs. resource mix				✔			✔	2
1.4.4 Accept negotiated contract-offering input vs. resource mix				✔			✔	2
1.4.5 Monitor accepted contract offering input vs. resource mix				✔			✔	2
1.5 Interpret effect of optimal contract-offering input vs. resource mix on current resource base				✔			✔	2
1.6 Compile contract-offering input resource adjustment plan				✔			✔	2
1.7 Integrate contract-offering input into enterprise-wide contract-offering inputs				✔			✔	2
AUXILARY 4B: PROJECT MANAGEMENT								
i. Planning								
a. Negotiate contract, priority								
ii. Organising								
iii Directing								
iv Re-planning (control)								
a. Monitor contract process actual vs. planned schedule (production, distribution, delivery, etc)								
b. Identify contract processing problems								
c. Measure/monitor actual contract performance (attribute value)								
AUXILARY 4C: COMMUNICATE WITH CUSTOMER ON CONTRACT								
i. Status								
ii. Enquiry								
iii Complaint								
iv Requirement								
5. CAPITALISE ON INTELLECTUAL PROPERTY								
A. License patent rights								
B. Sell patent rights & product designs								
C. License proprietary process know-how								
D. Produce in "lab factory"								
E. Sell/privatise business unit or ongoing concern								
AUXILARY 5A: RISK MANAGEMENT								
i. Commercial criteria								
ii. Technical criteria								
iii. Combination								
5.1 Determine risk of contract				✔				1
5.2 Determine extent of CSIR exposure in the contract		✔		✔				2
5.3 Decide contract's fate								
A. Continue with contract development								
B. Cancel contract development								
5.1 Ensure feasibility of technology commercialisation								
5.1.1 Establish feasible implementation model								

Continue/...

Critical Success Factors	A	B	C	D	E	F	G	Σ
5.1.1.1 Determine position of opportunity on hierarchy life-cycle map						✔		1
A. Technology balance sheet								
B. Identify window of opportunity								
C. etc.								
5.1.1.2 Investigate past case studies						✔		1
5.1.1.3 Determine ROI of IP sale				✔		✔		2
5.1.1.4 Understand market/customer needs (specify offering)		✔				✔		2
5.1.1.5 Perform scenario plan for commercialisation				✔		✔		2
5.1.2 Demonstrate IP value or lab factory profitability		✔		✔		✔		3
A. Fulfil customer service contract in lab factory								
B. Valuation of business opportunities								
B1. Forecasting								
B2. Techno – economic study								
5.1.3 Identify appropriate receptor/customer								
5.1.3.1 Define marketing campaign		✔						1
5.1.3.2 Execute marketing campaigns		✔						1
5.1.3.3 Establish evaluation criteria		✔						1
5.1.3.4 Evaluate possible customers against criteria		✔		✔				2
5.1.3.5 Select appropriate permutations of customers		✔		✔				2
5.2 Formulate structure of IP package and sale								
5.2.1. Define commercial terms of IP sale				✔				1
5.2.2. Define terms of technology transfer packaging								
5.2.2.1. Initiate due diligence on technology performance								
5.2.2.1.1 Demonstrate technology integrity								
5.2.2.1.2 Establish understanding of technology integrity								
5.2.3 Compile proposal of business plan								
5.2.3.1 Compile draft business plan								
5.2.3.2 Verify draft business plan for compliance with CSIR's business rules				✔				1
5.2.3.3 Ensure legality of contract terms				✔				1
5.2.3.4 Initiate due diligence								
5.2.3.5 Finalise business plan proposal				✔				1
5.2.3.6 Compile technology transfer plan				✔		✔		2
5.3 Ensure successful technology transfer								
5.3.1 Transfer know-how								
5.3.1.1 Transfer documentation								
5.3.1.2 Training of customer staff								
5.3.1.3 Implement equipment if applicable								
5.3.2 After-sales support								
5.3.2.1 Consult on problem-solving		✔						1
5.3.2.2 etc.								
CSIR MANUFACTURING AUXILIARY FUNCTIONS								
1 ENSURE ENVIRONMENTAL ALIGNMENT								
1.1 Analyse external- and target environment								
1.2 Interpret the implications of the external and target environment fluctuations and translate to effect on internal environment.								
1.2.1. Determine business priority								
1.2.1.1. Define and prioritise future scenario	✔	✔	✔			✔	✔	5
1.2.1.2. Define environmental factors (target and external)	✔	✔	✔		✔			4

Continue/…

Critical Success Factors	A	B	C	D	E	F	G	∑
1.2.1.3. Identify and define CSFs	✔		✔	✔	✔	✔		5
1.2.1.4. Measure direct effect of CSFs on business area (i.t.o. operational resources and efficiency and effectiveness)	✔	✔	✔	✔	✔	✔	✔	7
1.2.1.5. Prioritise on business area/function i.t.o. criticality and resource gap	✔	✔	✔	✔	✔	✔	✔	7
1.2.2. Define ideal business architecture								
1.2.2.1. Define ideal/current business process and technology architecture	✔		✔	✔			✔	4
1.2.2.2. Determine vertical and horizontal gap			✔			✔	✔	3
1.2.2.3. Define architectural priority			✔			✔		2
1.2.3. Ensure business and architectural alignment								
1.2.3.1. Define and prioritise contract initiatives needed			✔				✔	2
1.2.3.2. Identify and assess current contract/initiatives			✔				✔	2
1.2.3.3. Determine contract operational resource ability			✔				✔	2
1.2.3.4. Allocate operational resources to contracts/initiatives			✔				✔	2
1.2.3.5. Monitor, evaluate & implement	✔		✔				✔	3
Auxiliary A: Specify plan for architectural change								
A1. Interpret business change requirements								
A2. Interpret strategic position (CSFs and business priorities)								
A3. Interpret architectural gap								
A4 Determine architectural priorities								
A5 Determine business priorities								
A6 Accommodate business priorities under architectural priorities								
A7 Determine resource fix-it priority and gap								
A8 Compile architectural adjustment plans								
A Quick fix plans								
B Business engineering project								
C Resource fix-it plans								
2 ENSURE LEADING EDGE								
2.1. Determine manufacturing-wide plan								
2.1.1. Define KRA's			✔				✔	2
2.1.2. Define group governance			✔	✔				2
2.1.3. Ensure planning interpretation			✔	✔			✔	3
2.1.4. Specify acquisition plan								
2.1.4.1. Identify resources to be procured (attributes)							✔	1
2.1.4.2. Specify supplier vs. resources (attributes)							✔	1
A. Quantity								
B. Lead time								
C. Periodicity								
D. Point of responsibility								
E. People								
F. Equipment								
G. Technology								
H. Capital								
I. etc.								
2.2. Optimise target environment								
2.2.1 Align customer behavior according to the implied target environment		✔	✔	✔	✔			4
2.2.2 Create walls for competitors		✔	✔	✔	✔	✔		5

Continue/...

Critical Success Factors	A	B	C	D	E	F	G	Σ
2.2.3 Functionally align suppliers			✔	✔	✔	✔	✔	5
2.2.4 Influence market dynamics		✔	✔	✔	✔	✔		5
2.2.5 Establish positive behavior in other stakeholders	✔		✔	✔	✔			4
2.3. Ensure healthy business relationship	✔	✔			✔			3
A Project relations								
B Continuous customer care								
C Support service provision								
2.4. Implement architectural change effect of plans on business								
2.4.1. Launch architectural change projects according to plans	✔		✔	✔			✔	4
2.4.2. Implement high-level business parameters				✔				1
A. KRA's & KRI's								
B. Governance								
C. Offering mix								
2.4.3 Action low-level plans								
A. Market								
B. Opportunity development								
C. Contract development								
D. Contract fulfilment								
E. Procurement								
2.4.3.1 Determine resource optimisation method		✔		✔	✔		✔	4
2.5. Ensure conformance of business change implementation according to business plan								
2.5.1 Identify deviations								
2.5.1.1 Identify non-performance areas i.t.o. rectification		✔		✔				2
2.5.1.2 Measure planned vs. actual bussiness		✔		✔				2
2.5.2 Communicate effect of bussiness change to relevant parties	✔		✔					2

APPENDIX B-I

Obtainable from the Graduate School for Management, Potchefstroom University for Christian Higher Education