CHAPTER 7 ACQUISITION

7.1 HUMAN RESOURCES

7.1.1 OVERVIEW

Technology and Products Systems have to be supported to a greater or lesser degree by human beings. These vary from highly skilled engineers and scientists to operators. The organisation must therefore acquire and develop appropriate candidates. The acquisition of human resources includes the recruitment of new members and the identification of members for redeployment. Human resource support involves the education, training and development of personnel.

The Support Forces process requires personnel with a broad spectrum of skills and competencies. The scope of this study is, however, limited to the ETF.

7.1.2 THE ENGINEERING PROFESSION

The term "Engineer" conjures up divergent images in discussions with people from various backgrounds. To a member of the Army, the term may call up images of the soldiers laying Bailey bridges, whereas in a factory environment, the engineer could be the manager whom controls maintenance.

Until the mid 19th century, it was military engineers who executed large-scale construction work including the preparation of topographical maps, the location, design and construction of roads, bridges, forts and docks. Thereafter, "civilian (or civil) engineers" performed this category of work for non-military purposes. With the increasing diversification of engineering into disciplines, new branches such as mechanical engineering emerged. The number of engineering disciplines has since expanded even further. (Microsoft Encarta Encyclopedia 2000)

The following were obtained from a list of definitions of engineering on the web page of the Institute of Electrical and Electronic Engineers (IEEE):

The activity characteristic of professional engineering is the design of structures, machines, circuits, or processes, or of combinations of these elements into systems or plants and the analysis and prediction of their performance and costs under specified working conditions. *M. P. O'Brien* (1954)

Engineers participate in the activities which make the resources of nature available in a form beneficial to man and provide systems which will perform optimally and economically. L. M. K. Boelter (1957)

Engineering is the profession in which a knowledge of the mathematical and natural sciences gained by study, experience, and practice is applied with judgement to develop ways to utilize, economically, the materials and forces of nature for the benefit of mankind. Engineers Council for Professional Development (1961/1979)

Engineering is not merely knowing and being knowledgeable, like a walking encyclopedia; engineering is not merely analysis; engineering is not merely the possession of the capacity to get elegant solutions to non-existent engineering problems; engineering is practicing the art of the organized forcing of technological change … Engineers operate at the interface between science and society … Dean Gordon Brown; Massachusetts Institute of Technology (1962)

The term "Engineer" and specifically "Professional Engineer" has a particular context in this document and pertains to persons registered or registerable as a Professional Engineer in terms of the Act.

7.1.3 ENGINEERING PROFESSIONS ACT

The Engineering Profession of South Africa Act, 1990, that replaced the previous Act and its amendments, established a baseline for engineering activities in the Republic of South Africa. In terms of the act, a council known as the Engineering Council of South Africa (ECSA) was established to administer and control these activities.

The Act sets out the powers of the ECSA in this statement:

The council shall have the power to take the steps which it may consider expedient for the protection of the public in their dealings with persons registered in terms of the Act, for the maintenance of the integrity and the advancement of the status of such persons and for the improvement of the services rendered by, and the standards of professional qualifications of, such persons.

7.1.4 CERTIFICATION OF COMPETENCE

ECSA certifies persons as competent in the engineering field. Persons are regarded as competent if they have the prescribed theoretical and practical training and experience in their discipline. The tertiary qualification and post-qualification experience required for each category of competence is presented in Table 24.

As an example, ECSA prescribes the requirements for consideration for registration as a Professional Engineer as follows:

- A recognised bachelor's degree in engineering.
- At least three years' appropriate post graduate experience in engineering work.
- The prescribed reports of work conducted, submitted by the candidate.
- Assessments of the candidate's work performance by at least two referees. At least one of these referees shall be registered as a Professional Engineer.

If the reports of the candidate and referees indicate satisfactory work over a period of at least three years as considered by a Professional Advisory Committee, and given that the engineering degree is recognised, the candidate may then be deemed competent to be registered as a Professional Engineer.

Registration	Entry Qualifications	Experience [Years]
Professional Engineer	B Sc. (Eng.) or B Eng.	3
Professional Technologist (Engineering)	M Dip Tech or B Tech (Eng.)	3
Registered Certificated Engineer	Government Certificate of Competency	3
Registered Engineering Technician	N. Dip	2
	Nat. N. Dip.	4

Table 24: ECSA Registration Qualifications and Experience Requirements.

Organisations with a Commitment and Undertaking to train engineering personnel registerable in one of the categories in Table 25 are expected to have at least one mentor to oversee the professional development. This leads to easier assessment of the candidates when they apply for professional registration.

7.1.5 ENGINEERING DISCIPLINES

ECSA has reserved the titles in Table 25 for persons registered as professional engineers. Any unregistered person making improper use of these titles or abbreviations is guilty of an offence and is liable to a fine not exceeding R 5 000. This is an indication of the seriousness with which the profession is regarded.

Aeronautical engineer	Electrical engineer	Mechanical engineer
Agricultural engineer	Electronic engineer	Metallurgical engineer
Chemical engineer	Industrial engineer	Mining engineer
Civil engineer	Marine engineer	Naval architect

Table 25: Professional Engineering Disciplines Registered by ECSA.

7.1.6 ROLES IN THE ENGINEERING TECHNICAL FAMILY (ETF)

The categories of persons involved in the ETF include the artisan, technician, technologist and engineer, each complementing the other in their respective roles. ECSA registers successful applicants in the categories listed in Table . ECSA does not currently register artisans but may do so in the near future.

Title	Abbreviation
Professional Engineer	Pr Eng
Professional Technologist	Pr Tech (Eng)
Registered Certificated Engineer	Reg Cert Eng
Registered Engineering Technician	Reg Eng Tech

Table 26: Categories of Registration by ECSA.

The level of work of each of the ETF occupational classes differs in the amount of theoretical and practical competence required. Competence will therefore require commensurate training and experience for each of these categories. Figure 56 attempts to illustrate the four occupational classes and their relative theoretical and practical profiles. The individual occupational 'spaces' overlap as reflecting the shared work. The individual will also vary in his or her mix of theoretical and practical competencies within each space, depending on the level of training and experience (Joubert 1988: 2).

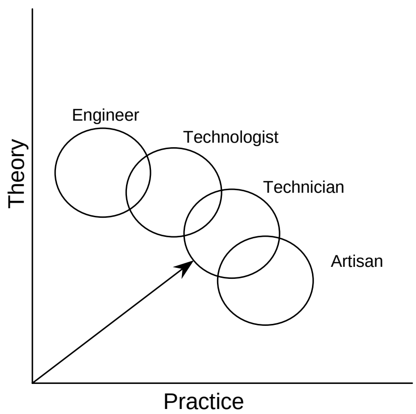

Figure 56: ETF Occupational Work Areas (Joubert 1988: 2).

Each of the occupational categories in the ETF has a specific combination of skill spread and competence. The skills are classified into two categories: technical and concomitant skills. Technical skills include manipulative and thinking skills as well as technological knowledge. Non-technical or concomitant skills include communication, management, personal and interpersonal skills. Concomitant skills are important to achieve success in tasks or projects and differ in importance depending on the occupational class and level of the person (Joubert 1988: 3).

Figure 57 attempts to show the combination of skill spread and competence required of each of the occupational categories in the ETF. The levels of competence in each of the skills areas for each category are shown in Figure 58 (Joubert 1988: 13).

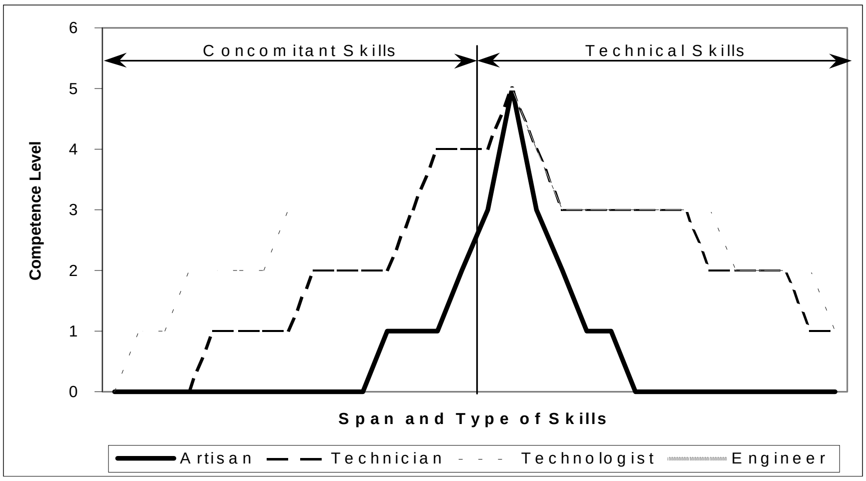

Figure 57: Occupational Skills Spread and Competencies (Joubert 1988: 13).

The ETF occupational class differences lead to differences in their suitability for various types of tasks. The higher level of theoretical skills and competencies of the engineers makes them more suitable for less well-defined or understood tasks.

Significant amounts of management and communication skills are essential for longer, more complex tasks. In those tasks using the skills or support of other people, interpersonal skills are also an essential asset. The higher level and spread of concomitant skills of engineers makes them most suitable for dealing with complex projects requiring the support of, and interaction with other people. The engineer deals with a high level of uncertainty in developing a solution that can be prescribed for the Artisan's execution. This engineer's solution is documented, qualified and certified by extensive tests as effective and safe enough to be a standard work process or a configuration item.

The artisans' skill strengths lie in their manipulative competencies. Their profile, however, also indicates underdeveloped communication, management, inter-personal and thinking skills.

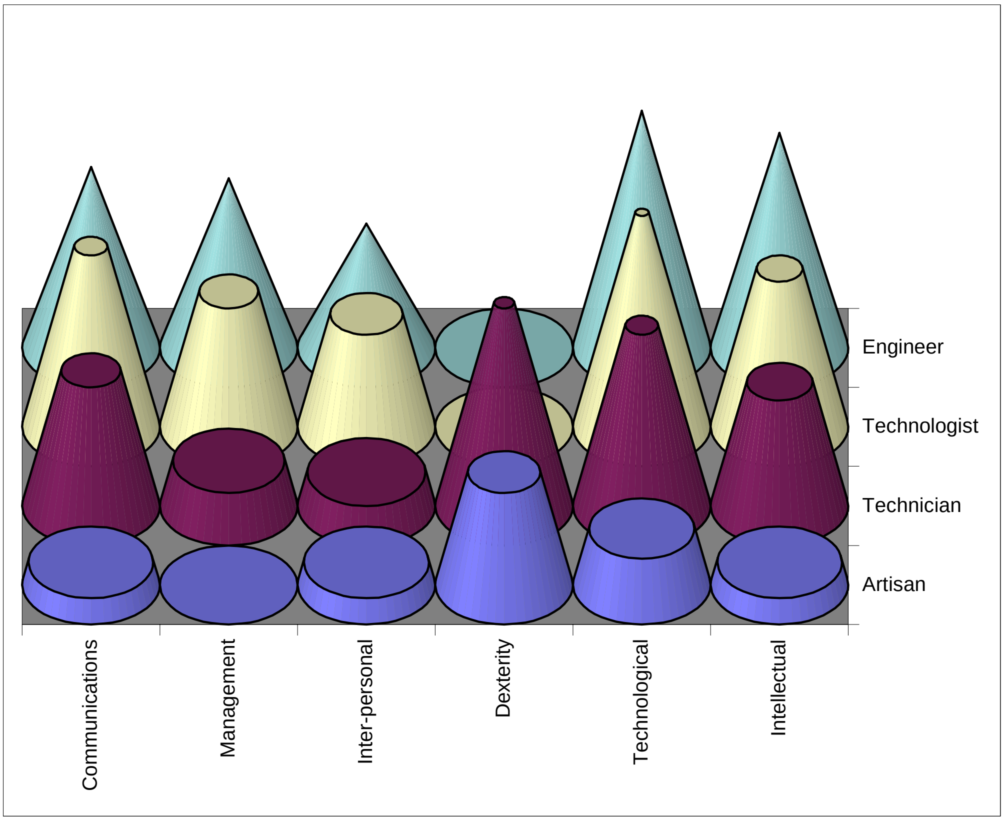

Figure 58: Competence Levels for each Skill in the ETF Categories (Joubert 1988: 13).

The differences in the profiles of the engineer, technologist, technician and artisan make them suitable for differing roles as already mentioned. Engineers appear to be more suitable for work with a larger content of uncertainty than do artisans at the other end of the scale. Based on their relative concomitant and technical skills, it is proposed that the task mix of the ETF could be defined as shown in Figure 59. Figure 59 below shows the engineer as being suitable for executing processes containing a higher level of uncertainty, while artisans are suited for well-defined and prescribed work processes. The manipulative skills for the various categories appear however to be questionable. Intuitively the artisan should display the highest competence levels across the broadest span. Engineers, technologists and technicians should also develop and sustain at least a moderate level of manipulative competence. Scientists would work with few prescribed processes, dealing mostly with uncertainty. The Operating Baseline of Products Systems prescribes the processes for operators.

For the purposes of this study, the engineers and technologists will be broadly referred to as engineering and the artisans and technicians will be broadly referred to as technical Services. These divisions are not absolute, as the services of artisans are often necessary to engineers.

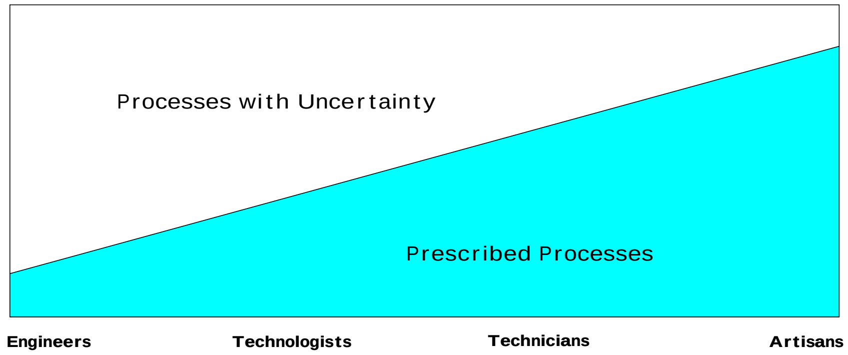

Figure 59: The Proposed Spread of the Scope of Engineering Work for the ETF.

7.2 PRODUCT AND TECHNOLOGY ACQUISITION FOR THE SANDF

The DoD's Support Forces process includes the acquisition of Products and people. The Departmental Acquisition and Procurement Division (D APD) is responsible for the acquisition of Products for the SANDF. The Defence Review (1998: Ch 13) describes in some detail the acquisition management process of the DoD.

The DoD acquires Products and technologies from local and foreign suppliers. The basis for acquisition is both strategic value and cost-effectiveness. Products and technologies that are of strategic value, will however be nurtured locally to ensure supply and possible competitive advantage to the SANDF. Local industry is also encouraged to supply its Products internationally to promote price competitiveness.

ARMSCOR is the DoD's acquisition agency responsible for the management of programmes, drafting of tender documents and the contracting of industry on behalf of the D APD. Within this division, the SAAF, Army and Navy each have a directorate to manage their acquisitions. The Technology Development directorate manages the corporate technology acquisition for the DoD. The Weapons Systems Management directorate oversees the integrity of the management of the other directorates' programmes. This directorate also manages the acquisition for SAMHS and common Products such as ammunition. Figure 60 diagrammatically presents the context of the D APD.

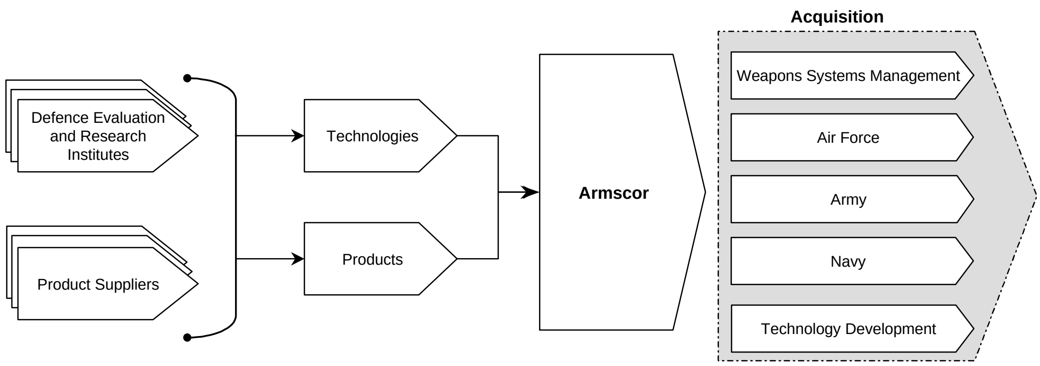

Figure 60: Product and Technology Input to the SANDF.

Where practically and economically justifiable, local industrial development will be promoted. In other cases procurement from foreign suppliers is preferable. A needs analysis indicated the following levels of importance (Defence Review 1998: Ch 13 paragraph 73 – 78):

- Military-Strategic Importance: The defence industry is the strategic asset ensuring the supply of Products and services to the SANDF.
- Military-Operational Importance: The local defence industry provides the following significant operational advantages for the SANDF:
- Technological Advantages: Local capabilities offer a winning edge over adversaries by providing access to unique solutions to threats.
- Tailor-made Equipment: Products more suitable to the RSA environment provide the SANDF with a winning edge over adversaries and are more easily supported.
- Logistic Support: A local support capability is essential for the combat readiness of Products.

Socio-Economic Importance: The competence of the local industry can be positively influenced by the local defence industry. This has socio-economic benefits.

High risks and costs generally accompany the advanced technologies typically used in the defence industry. COTS offer a hedge against some of these risks.

Products and Products Systems are generally expected to be available in the SANDF's inventory for use for up to 20 years or more.

Acquisition programmes consist of teams consisting of various specialists led by the ARMSCOR Programme Manager and the Project Officer. Their responsibility for the acquisition begins after the requirements formulation phase, and ends after the Product or Products System is accepted by the PSM for use. Upgrades to a Products System are managed on the same basis.

7.3 BEING A GOOD CUSTOMER

The DoD is a customer to those firms and other organisations offering Products and services for sale. The DoD has a responsibility to the stakeholders, including the taxpayer, to ensure that it acts as a ‘good’ customer on their behalf. This means that during acquisition the project team must become experts at handling problems to ensure that they timeously deliver a cost-effective solution to satisfy the user’s requirements. By employing the systems engineering principles presented in paragraph 7.5, the organisation will attain the ability to be good customers (Stevens 1998: 351):

7.4 THE ACQUISITION PROCESS

For purposes of convenience, the requirements formulation phase will be included in the discussion of the acquisition process.

Knowledge of the acquisition process facilitates the assessment of those activities and skills necessary for efficient and effective execution.

The acquisition process is a sequence of decision points interspersed with activity phases with the goal of achieving the overall programme objectives and reducing risks. It begins with the concept exploration phase and terminates with the commissioning phase. The increasing sophistication and capabilities of weapons has driven an increase in these systems' level of complexity. Complex systems have to be developed with great care to ensure their integrity in use. To this end, the structured programme management approach to acquisition is essential. The process is divided into several phases, each with its own main purpose. At the end of each phase, a set of values, contained in a baseline, is checked to ensure the integrity of the completed work, thereby creating a clear audit trail for rectifying or improving aspects of the subject.

A baseline is a formally allocated configuration description of information, an item or system, valid from a specific time during its life cycle. The baseline and the approved changes from the baseline constitute the current configuration identification of the system or its elements.

Each of the acquisition phases has a baseline as an output. The definition of the scope of deliverables at these milestones ensures that the work of the previous phase has been fully completed before the commencement of the next. Based on the information available at this point, an informed decision to proceed or terminate is possible.

To reduce the influence of complexity of a target system to be acquired, the process is fragmented to distinguish between the user's requirements, system requirements and engineering designs.

The acquisition process based on that of the US Secretary of Defence in the 1960s (Hatchett *et al* 1992: 87) is typically made up of the following phases and associated baselines, also shown in Figure :

- Requirements Formulation with a Requirements Baseline (RBL).
- Concept Exploration with a Functional Baseline (FBL).

- Demonstration and Validation with an Allocated Baseline (ABL).
- Full-Scale Engineering Development with a Product Baseline (PBL).
- Industrialisation with a Manufacturing Baseline (MBL).
- Production and Commissioning with an Operating Baseline (OBL).

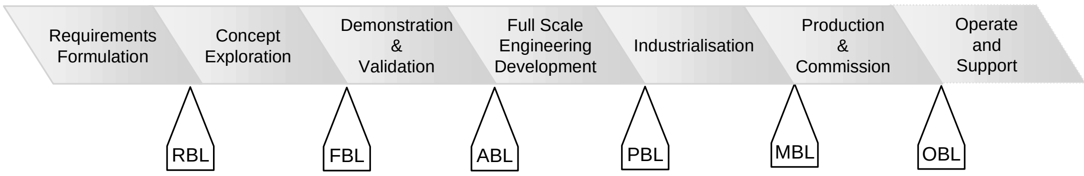

Figure 62: The Phases of the Acquisition Process.

The scope of the acquisition process activities can be visualised as the hierarchical structure shown in Figure 63 in a decomposed form illustrating the context of the main deliverables due at each milestone.

The process starts with a statement of the Required Operational Capabilities (ROC) after the Requirements Formulation phase. System Specifications are in turn, derived from the ROC. The ROC is therefore transformed into a set of potential solutions, each in the form of System Specifications, for consideration. After selection, the most suitable System Specification is decomposed into lower level specifications. These can be Item Development Specifications (IDSs) or Item Product Specifications (IPSs). The IDS is the specification to direct the development of the item. The IDSs can be further decomposed into either IDSs or IPSs at lower levels of the system hierarchy. The IPS is intended for use where an existing item is available for purchase without development being necessary. Lower level specifications are each derived from their higher-level specifications.

The data describing the manufacturing, operating and supporting of the item developed or purchased is held in the PBL.

The items' data is upgraded to MBL by means of the industrialisation process.
The main intention of the development process is to produce a set of documentation containing the data from which the Products can be provided, operated, supported and phased out. The integrity of this data must therefore be qualified and certified.

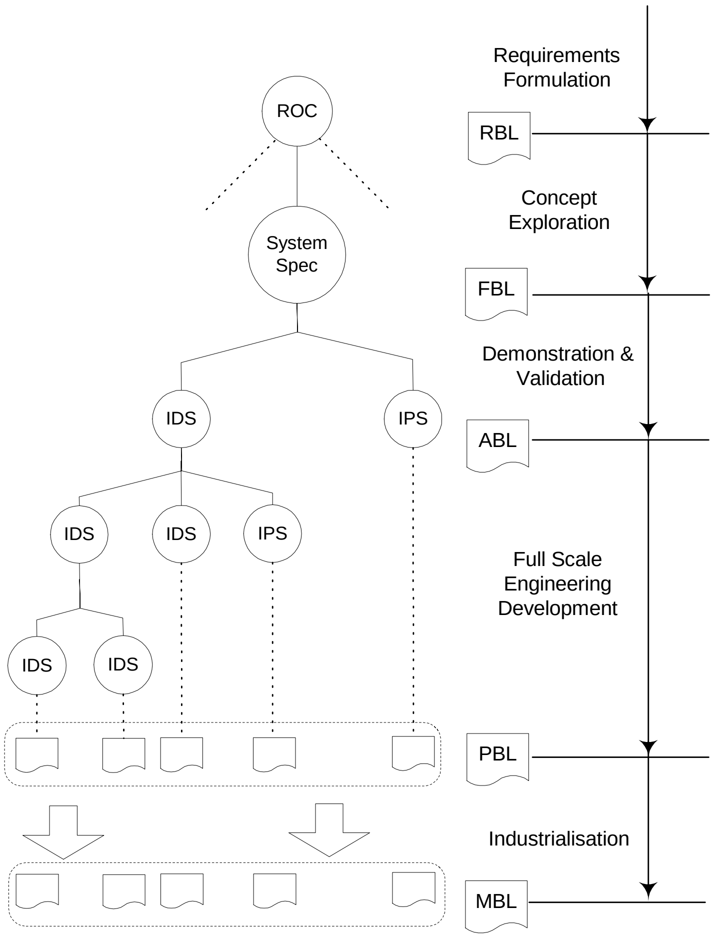

Figure 63: A Hierarchical View of Acquisition.

The target system of the acquisition has two general categories:

- The major equipment, which is the prime purpose of the acquisition, for example a missile and its launching system.
- That "enabling" category which supports the prime purpose of the acquisition, for example the test equipment, storage and repair facilities and the human resources to operate and support the major equipment.

Verification is the process whereby the integrity of a specification reflecting the higher origin is proven.

Validation is the process of confirming that the Product complies with the ROC. In other words, it is a formal process proving that the deliverable Product satisfies the requirements stated by the user.

7.4.1 REQUIREMENTS FORMULATION

This phase precedes the acquisition process and states the requirements that are sought.

The operational requirements necessary to succeed against a threat or range of threats form the body of input to the formulation of requirements.

The major intention of this phase is the accurate and complete documentation of the operational capabilities necessary to achieve the client's goals.

This phase requires the contribution of those knowledgeable in the operational scenarios in question and any evolving or new threats.

Simulation of scenarios can provide useful insights for those developing the requirements statements.

There are three general categories of requirements:

- User requirements: These are normally in the users' vernacular and typically in non-technical language.
- Customer requirements: The customers often tend to translate the users' requirements into a form that they perceive to be accurate. These requirement statements may originate from more than one customer.
- Stakeholder requirements: The system exists in an environment, which includes several stakeholders. Typical examples of these constraints include similar systems which may be expected to share facilities, platforms or other resources for design, technologies, manufacture, support, operation or disposal.

The management of requirements is therefore a complex and demanding business.

The role-players should review the finalised ROC and RBL. After the changes, if any, have been implemented, it is essential that these documents be formally approved (or authenticated) by the main role-players and then placed under configuration control. Any further changes may then only be incorporated in a later issue level of the document after a review and approval. The previous issues must then be withdrawn from circulation and the latest version issued to ensure that all the role-players work from the same baseline.

The prime selection criteria should be clearly identified and classified as mandatory or otherwise to facilitate the selection process downstream.

The authority to proceed with acquisition must be approved or denied at this point.
The Required Operational Capability (ROC) is the main Product of the Requirements Formulation phase. The ROC forms the core of the Requirements Baseline (RBL). The Requirements Baseline (RBL) defines the minimum user requirements for carrying out operations. The RBL defines the capability, availability, dependability and cost of the operational requirement.

The other Product of this phase is the decision whether or not to proceed with the acquisition process.

7.4.2 CONCEPT EXPLORATION

After receiving the authority to proceed, this phase of the acquisition process commences with the data pack from previous phase.
During the Concept Exploration phase, the acquisition team synthesises several alternative solutions to satisfy the ROC. These are typically conceptual solutions and not detail designs. The process should also establish the validity of the ROC by considering present and evolving threats.
The systems engineer derives a system requirement from the user's requirements. This system requirement serves as a conceptual design. The logistics aspects are also designed.
The life cycle costs for each alternative are estimated, allowing for its optimisation.
Using exploratory development models (XDM), the system concepts are then assessed in terms of their feasibility and cost-effectiveness. Simulation of scenarios can facilitate the effort of assessing the various concepts that could satisfy the requirements.
The most suitable alternative is selected for further consideration in the next phase in the acquisition process.

The authority to proceed with the acquisition process is considered and either given or the project terminated.

The output of this phase is the Functional Baseline (FBL) and the decision on whether to proceed with acquisition process.

7.4.3 CONCEPT DEMONSTRATION AND VALIDATION

After receiving the authority to proceed, this phase of the acquisition process commences with the data pack from the previous phase.
The concept is demonstrated using Advanced Development Models (ADM).
The performance of the ADM is compared with the RBL to validate the concept.
The output of this phase is the Allocated Baseline (ABL) and the decision on whether to proceed with the acquisition process.

7.4.4 FULL-SCALE ENGINEERING DEVELOPMENT

After receiving the authority to proceed, this phase of the acquisition process commences with the information in the EDM data pack from the previous phase.
The development personnel develop the system's lower level specifications. They then design and develop the Configuration Items that constitute the system. This includes their testing and evaluation to verify compliance with the specifications. These Configuration Items are the Engineering Development Models (EDM).
The output of this phase is the Product Baseline (PBL) and the decision of whether to proceed with acquisition process.

7.4.5 INDUSTRIALISATION

After receiving the authority to proceed, this phase of the acquisition process commences with the information of the data pack from previous phase.
During this phase, the design of the CIs is upgraded to the Manufacturing Baseline (MBL) for ease of the production process. The Pre-Production Models (PPM) are based on the MBL.

The output of this phase is the MBL and the decision on whether to proceed with the acquisition process.

7.4.6 PRODUCTION AND COMMISSIONING

After receiving the authority to proceed, this phase of the acquisition process commences with the data pack from the previous phase.

Products based on the MBL are subjected to qualification, acceptance testing and certification for fitness for use. The Air Force would for example require airworthiness certificates for airborne Products Systems, Products or Configuration Items.

The MBL is upgraded to the Operation Baseline (OBL) against which the Products are supported.

Combat-ready Products or Products Systems are allocated for use within User Systems.

7.4.7 FINDINGS

The acquisition process is an orderly, structured process with milestones at the end of each phase. The progress of the acquisition project can be assessed and if unsatisfactory, it can terminate at any of the milestones. The use of baselines enables a coherent approach to acquisition and provides a standard against which performance and upgrades can be managed.

7.5 THE SYSTEMS ENGINEERING PROCESS

7.5.1 INTRODUCTION

The Systems Engineering Process is a formal procedure designed to cope with the complexity of the acquisition and upgrade of weapons systems. It forms a subset of the Project Management activities. The US DoD's MIL-STD-499A (1974: paragraph 3.3) defines the Systems Engineering Process as:

> *A logical sequence of activities and decisions transforming an operational need into a description of system performance parameters and a preferred system configuration.*

The amount of documentation defining the system being created should be kept to a minimum. Stipulated plans, reports, and other data items should be used to record the engineering outputs wherever possible. The repository of the data accumulated in this process must be defined. Engineering data must be the sole source of performance requirements used in the design and production of the system being created. For each project the technical objectives must be established so that meaningful relationships between need, urgency, risks, and worth can be established. Each baseline along the acquisition life cycle phases must be developed progressively (MIL-STD-499A 1974: paragraph 4).

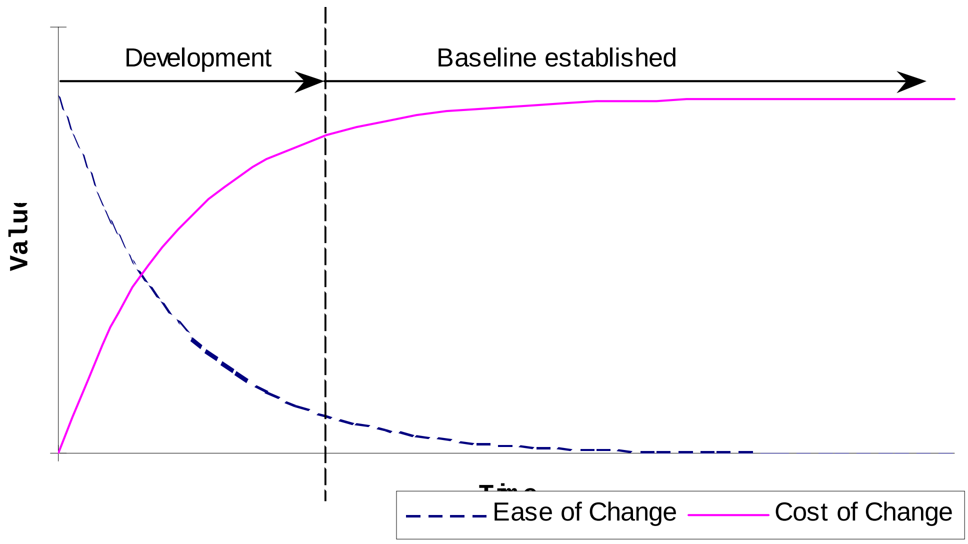

Figure 64: The Trend of Cost and Ease of Change Over Life cycle.

Figure 64 shows how changes to the design or configuration are considerably easier and less expensive earlier in the development phase of the life cycle (Blanchard et al 1998: 37). Therefore designs should be verified as soon as possible so that changes have a smaller cost effect. Poor decisions made upstream are considerably more expensive to rectify later, especially when the design is in the operational and support phase. Sound design requires competent engineers using processes with integrity.

7.5.2 SYSTEMS ENGINEERING ACTIVITIES WITHIN THE VALUE CHAIN

Rigby (2000: 1) proposed the basic model of the development process shown in Figure 66 illustrating its iterative nature. The significance of the data and its integrity is also prominent in the model.

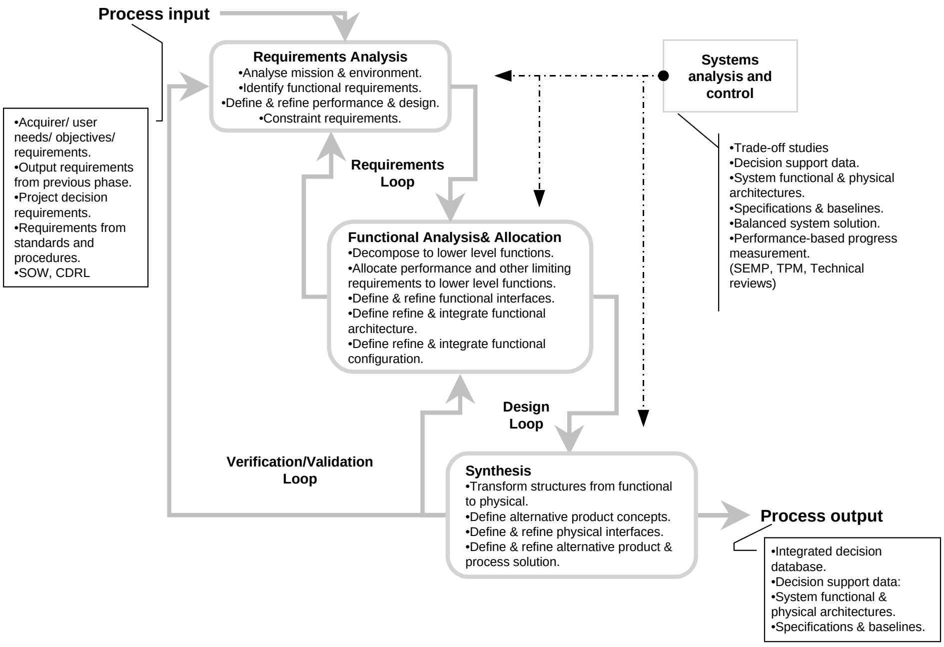

Figure 66: The Basic Systems Engineering Process Model (Rigby 2000: 1).

Figure 67 shows another perspective of the Systems Engineering Process described by the IEEE P1220 (1994: 13)

During the Concept Exploration phase of the Acquisition process, the Systems Engineer compiles a plan known as the Systems Engineering Management Plan (SEMP). The following activities form part of the Systems Engineering Process (SEP) (Rigby 2000: 1):

- Mission requirements analysis: This process includes the analysis of the stated operational characteristics, mission objectives, threats, environmental influences and minimum functional performances.

- Functional analysis: This includes those activities that systematically identify the modes and states of the system. In this manner it is possible to identify suitable alternatives for meeting system performance and design requirements.

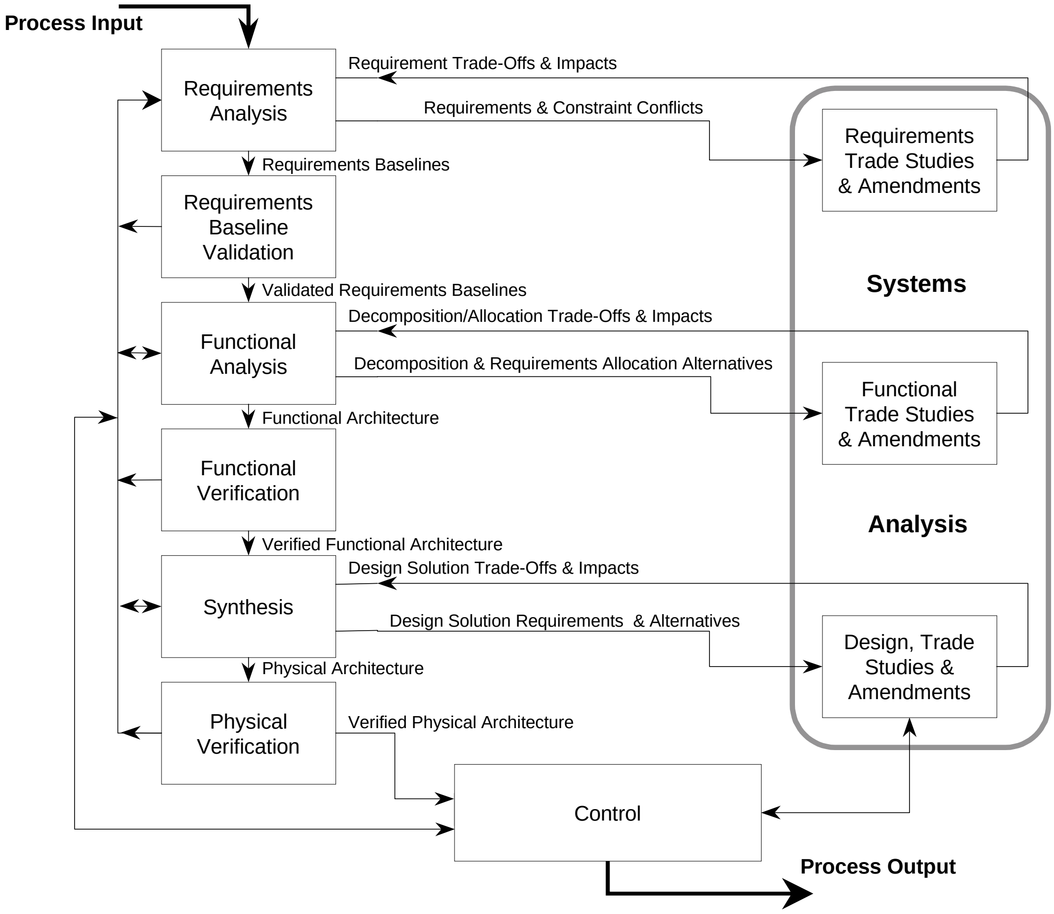

Figure 67: The Systems Engineering Process (IEEE P1220 1994: 13)

- Functional allocation: Each function within the system is allocated a set of performance and design characteristics. This is typically found in the interface requirements specification, software requirements specification and the critical item development specification.

- Synthesis: This should develop the preliminary design to the extent that the allocated performance and design requirements are sufficiently complete for detail design to be possible. Requirements must be stipulated so that new ideas and concepts are not inhibited. The Product of this synthesis must include the data needed to develop the following:

- The specifications for the Products System, Products, sub-systems, configuration items, and their realisation.
- Interface control documentation.
- Facility requirements.
- Procedural manuals, etc.
- The task loading of personnel.
- Computer software configuration items (CSCI) and designs.
- Specification trees.
- Project management plans such as WBSs and SOWs.

- Logistic engineering: This develops the cost-effectively optimal logistic requirements for the deployment and operational phases of the programme. The process for achieving this goal is the Logistic Support Analysis (LSA).
- Life cycle cost analysis: This analyses the cost of the system over its life cycle to enable the acquisition team to be able to quantify the cost of ownership for each of the alternatives. This should be performed regularly to reflect the latest concept design changes.
- Optimisation: It is necessary to consider the life cycle costs, risks, performances and schedules in optimising the alternatives.
- Production engineering analysis: This considers the feasibility of producibility, production engineering, and trade-off studies.

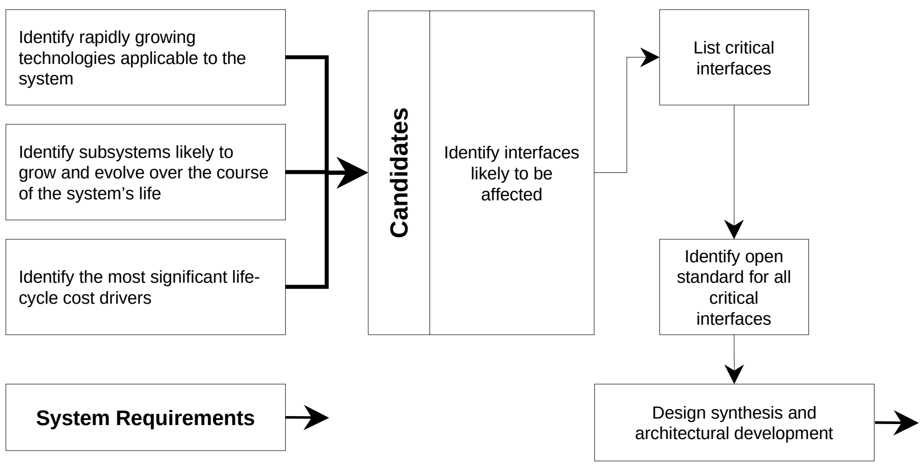

Figure 68: Open Systems Analysis for Integrated Design Solutions (Hanratty *et al* 1999: 53).

Systems Engineering is a key role for SANDF Engineering. The trend towards Open Systems requires a competence in analysis and defining the most suitable market-supported interfaces for the SANDF's applications. Figure 68 shows the process for Open Systems design (Hanratty *et al* 1999: 53).

7.5.3 THE CONTRIBUTION OF SYSTEMS ENGINEERING TO GOOD CUSTOMERSHIP

Employing the following systems engineering principles can ensure good customership (Stevens *et al* 1998: 351):

Acquire for upgradeability: The rate of technological progress dictates that capabilities do not remain static. Upgrades are cost-effective solutions to recover capability leadership.

Acquire Products in families: This minimises the level of effort in support, replacement and upgrading.

- Acquire systems of systems: Open interfaces between the system components ease integration, testing, support and upgrading. A Systems Engineering approach that straddles the individual Products Systems to ensure the compatibility and operation of the systems of systems is desirable.
- Evolutionary acquisition: During the procurement of high-risk items, an iterative approach can reduce risk. This however requires close interaction between the customer and the contractor.
- Employ simulation technology: Simulation technology offers powerful tools for assessing requirements, design and trade-off analysis.
- Acquire for minimum life cycle costs: Faulty or injudicious upstream decisions early in the life cycle may increase support costs. Considerable care in this regard is essential.
- Compatibility with the organisation's business processes: Understanding of the customer's internal business processes when specifying the item being procured can ensure its compatibility. This approach reduces the level of effort in achieving a fit between the organisation and its acquired Products.