

THE DEVELOPMENT OF A SINGLE LOGISTIC PROCESS FOR THE SOUTH AFRICAN NATIONAL DEFENCE FORCE

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Introduction

The South African National Defence Force (SANDF) contracted the CSIR to investigate and propose methods to improve its logistics and inventory accounting capabilities. The CSIR proposed that a supply chain management approach should be followed using the Supply Chain Operations Reference (SCOR) model. The SANDF indicated that the augmented SCOR model (Bean, Schmitz and Engelbrecht, 2009) should be extended into a single logistics process which should include a life-cycle perspective as prescribed by ISO-15288:2008 (SANS, 2008)

The South African Department of Defence developed a Logistics Strategy to determine the requirements for a logistic process. Analysing the Logistics Strategy Map, six perspectives were identified, namely: system; process; quality improvement; asset management as prescribed by the National Treasury; supply chain; and life cycle perspectives. The first five perspectives were adequately addressed in the augmented SCOR model for the SANDF (Bean, Schmitz and Engelbrecht, 2009). The SCOR Version 9.0 model (Supply-Chain Council, 2008) and the augmented SCOR model for the SANDF did not make provision for the life cycle of logistics products, that is, matériel, logistic services and facilities. However, the life cycle perspective needed to be integrated with the augmented SCOR model.

The integration of the life-cycle perspective as prescribed by ISO 15288:2008 into the augmented SCOR model constituted a single, comprehensive, rigorous and tailorable logistics process within the SANDF that allows them to make quantum improvements to their logistics service delivery.

Research approach

The South African Department of Defence developed a Logistics Strategy to determine the requirements for a logistic process. Analysing the Logistics Strategy Map, six perspectives were identified.

System perspective

The objective of using a system perspective is to move the observer of organisations away from seeing the parts of the organisation as isolated objects, toward understanding them as sets of interacting components working together to sustain themselves and achieve designated goals. Organisations are, according to Bounds *et al* (1995:17), normally categorised as open systems and as such, they must contain at least the following three stages, namely the input of material and energy from the larger environment; the transformation of inputs into outputs; and the release of outputs back to the larger environment.

Using the IDEF systems definition context, two system components can be added to the system perspective, namely the controls for the transformation of inputs into outputs; and the enablers or mechanisms that will enable the system to transform inputs into outputs.

Two relevant system attributes are efficiency and effectiveness. Efficiency refers to the minimising of waste in transforming inputs into outputs and in delivering them to customers and effectiveness refers to the delivery of outputs that customers and others in the external environment will accept, value and desire (Schmitz *et al*, 2010:26-27).

Systems in the South African Department of Defence are managed at different levels as given in Table 1. Systems are in general integrated using a bottom up approach. Product system managers are responsible for the products and the integration thereof in Levels 1 to 5, whereas the logistics process must enable the integration of weapon systems from level 6 upwards.

Level	Designation	Example
8	Operational Force	Joint National Force
7	Combat Grouping	Joint Task Force
6	User System	AA Battalion
5	Product system	Radar
4	Product	Power supply
3	Product Sub-system	Modulator
2	Component	Resistor
1	Material	Silicon

Table 1: System Hierarchy (Table 4.1. in Schmitz *et al*, 2010:27)

Process perspective

A process is seen in this context as a functional layout in which products move from one function or process to the next function or process. The function or process describes the required product inputs, the transformation of the product and the output that is the input for the next function or process. Since products move from one function or process to the next, the process perspective can be seen in this context as the transfer function of the system (Schmitz *et al*, 2010).

Quality improvement perspective

With regards to the quality improvement perspective the philosophy of Total Quality Management (TQM) is followed to reduce military logistic risks and to improve the quality of service rendered. TQM aims to improve the function or process based on various elements, namely unity of purpose; personnel involvement and empowerment; customer focus; using a scientific approach in measuring quality; long-term commitment; freedom through control; teamwork, education and training; as well as continuous improvement (Vogt, Pienaar and de Wit, 2005).

Asset management perspective

The South African National Treasury has clear guidelines on the management of the state's assets. They define asset management as the process of guiding the acquisition, use, safeguarding and disposal of assets to make the most of their service delivery potential and manage the related risks and costs over their entire life. The management and accounting of assets are included in the single logistic process where applicable (Schmitz *et al*, 2010).

Supply chain perspective

The supply chain perspective is the augmented Supply-Chain Operations Reference (SCOR) model as developed for the SANDF (Bean, Schmitz and Engelbrecht, 2009). Figure 1 illustrates the augmented SCOR model for the SANDF.

The supply chains in the SANDF are configured as end-to-end supply chains as illustrated in Figure 2 and each end-to-end supply chain is then configured based on Figure 1. The SANDF end-to-end supply chain is partitioned into three areas, namely force provision that includes product system and commodity supply chains; force preparation that has a user system supply chain; and force employment that has a supply chain to provide supported combat ready forces for employment. The use of the supply chain model, depicted in Figure 1, in an end-to-end fashion indicates that the supply chain is robust but unfortunately not designed specifically to manage the products' life cycle (Schmitz *et al*, 2010).

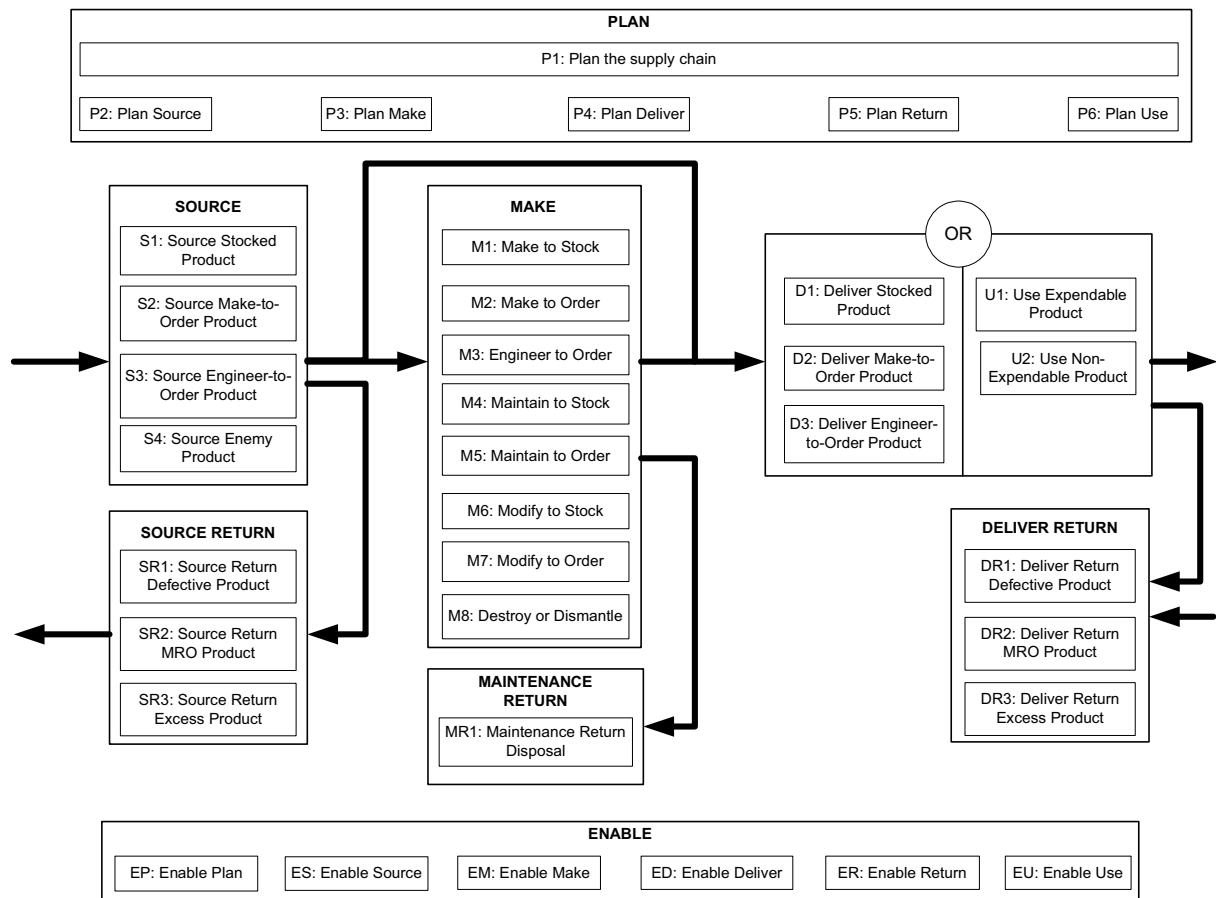


Figure 1: The augmented SCOR model for the SANDF (Figure 4.3 in Schmitz *et al*, 2010:34)

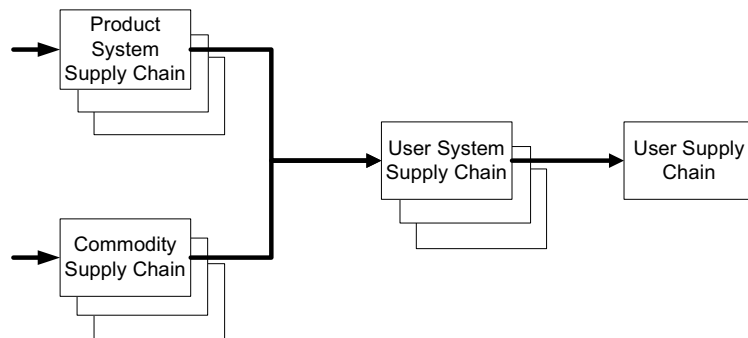


Figure 2: End-to-end supply chain (Figure 4.4 in Schmitz, *et al*, 2010:44)

Life-cycle perspective

The historical evolution of military logistics since the 1960's led to the establishment of seven challenges, namely:

1. The systems approach, where all the elements are integrated into a system, thus integrating all the logistics elements.
2. Design influence, where the logistics support considerations for a product or system are integrated into the acquisition process from the beginning. The outcome of this challenge is the establishment of the logistic support analysis (LSA) concept and the resulting logistics support analysis report (LSAR).
3. Design-to-readiness objectives, which provide the acceptable readiness under configuration control of a product or system at an affordable life cycle cost.
4. Computer-aided acquisition and logistic support. In this challenge information technology is integrated into acquisition logistics based on the principle of entering the data only once, but use it many times.
5. The Perry Memorandum implying the "industrialisation" of military logistics. In this challenge all military standards are cancelled and generally-accepted industry best practices adopted.
6. Performance based logistics where weapon system sustainment is purchased as an affordable, integrated package based on output measures rather than input measures.
7. Life cycle management where the product or system life cycles are managed in an integrated fashion across all phases of the product's or system's life cycle (Schmitz *et al*, 2010).

ISO-15288 provides a common framework for establishing and implementing agreements between an entity acquiring a system and the system or sub-system suppliers with respect to developing, using and managing a system within its defined life cycle. The life cycle of the system spans from its conception of ideas through to the retirement of the system at the end of its life cycle. The life cycle consists of several stages or phases. Based various entry and exit criteria a decision is made at the end of each stage or phase to either proceed to the next stage; to terminate the project; to continue with the current stage; to go to the previous stage; or to hold the project. Each stage or phase consists of one or more processes, which in turn has one or more activities. Each activity may consist of one or more tasks to support the process outcomes. Processes are strongly cohesive, implying that all the parts of a process are strongly related, as well as loosely coupled, meaning that the number of interfaces among various processes is kept to a minimum. In addition, each process is associated with a particular responsibility (Schmitz *et al*, 2010).

Based on the ISO-15288 there are 25 processes that can be applied to any level in the system hierarchy. These processes are grouped into four process groups as illustrated in Figure 3.

Integrating life-cycle management with the end-to-end supply chain model will provide a robust supply model that also caters for the life-cycle management of products or systems.

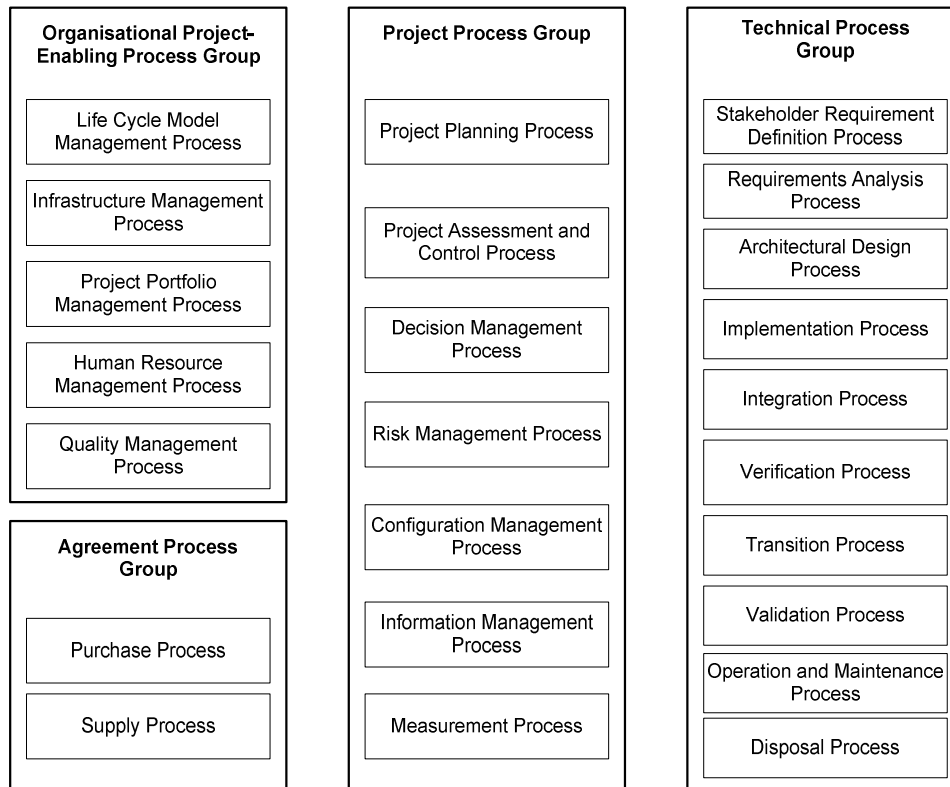


Figure 3: System life cycle processes (Figure 4.7 in Schmitz *et al*, 2010:64)

The Logistics Process Framework

To derive a single logistics process allowing for the optimal functioning of the relevant supply chain whilst simultaneously enabling the management of the products' life cycles in the chain, an integrated logistics process framework was proposed and accepted by the client. This model is shown in Figure 4. The purchase or alternatively the acquisition process of the ISO 15288 life cycle process shown in Figure 3 is integrated into the SOURCE management process of the SCOR and augmented SCOR model. The supply process has been integrated with the DELIVERY management process. The processes listed in the technical process group of the ISO 15288 life cycle process as shown in Figure 3 has been integrated into the logistics process framework in Figure 4 as follows:

- Stakeholder requirement definition process through to validation process has been included in the SOURCE management process to enable the sourcing of complex materiel such as frigates and aircrafts.
- The operation and maintenance process has been integrated into the USE and MAKE management process respectively.
- The disposal process in MAKE and RETURN management processes.

Disposal in MAKE is for financial gain where the product is disposed off as a complete product to an outside entity; dismantled and parts of the product are re-used by the SANDF and the remainder sold as scrap or it is destroyed and the end product is sold as scrap to an outside entity. The disposal of products in the RETURN management process is where the products are destroyed by the SANDF and disposed off without any financial gain. The destruction of ammunition occurs in this process. The remainder two process groups as shown in Figure 3 have been incorporated into the ENABLE processes as shown in Figure 4.

The main deviation from the SCOR model and the augmented SCOR model is that the numbering system does not allow for different sourcing, making, delivering, returning and using process categories as proposed by the Supply-Chain Council. Thus S1 in the logistics process framework is the first sourcing process and S1.1 refers to the first sub-process to S1. Not all the processes in the logistics process framework as shown in Figure 4 have sub-processes.

However, the logistics process framework adheres to the Supply-Chain Council's philosophy of selecting only those processes that are applicable to a specific supply chain, thus making it a tailorable process framework. The logistics process framework is a single process framework since it can be used for materiel, services and facilities. The logistics process framework is comprehensive since it provides for all requirements, activities, cultures, traditions, and terminology emanating from the various Services and Divisions of the SANDF; their environments, systems, products and industries be it landward, air, maritime, sub-surface and cyberspace; as well as the various implementation technologies such as mechanical, hydraulic, pneumatic, electronic and software. The logistics process framework is designed to ensure systems integrity through the incorporation of the life-cycle management processes. Further, the process ensures regulatory compliance by implementing the asset management requirements set of the National Treasury. These are done while maintaining effectiveness, efficiency and economy.

Taking all the above attributes into account, it can be said the logistics process framework can be seen as a single, comprehensive, rigorous and tailorable logistics process (Schmitz *et al*, 2010).

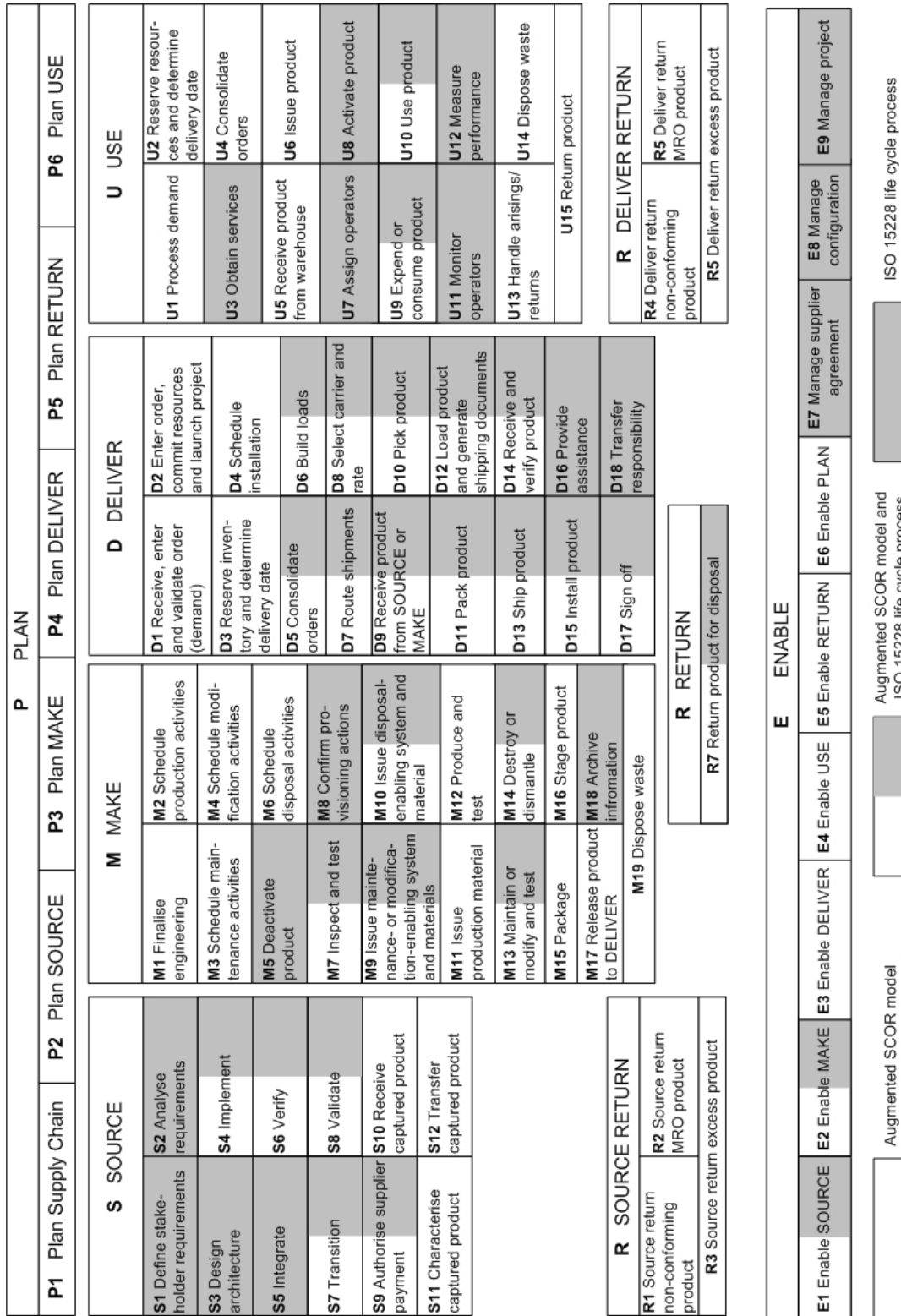


Figure 4: The SANDF Logistics Process Framework. The augmented SCOR model was derived from the SCOR v.9 model.

Using a combination of SCOR and IDEF0, each process and sub-process are described and relevant inputs, outputs, controls and enablers identified. Figure 5 provides an example of a process in the logistics process framework. It is important to note that the enablers at each process are not necessarily the ENABLE processes as defined by the SCOR model; however the various ENABLE processes can serve as enablers of process as illustrated in Figure 5. Asset management activities are included in the process or sub-process where applicable.

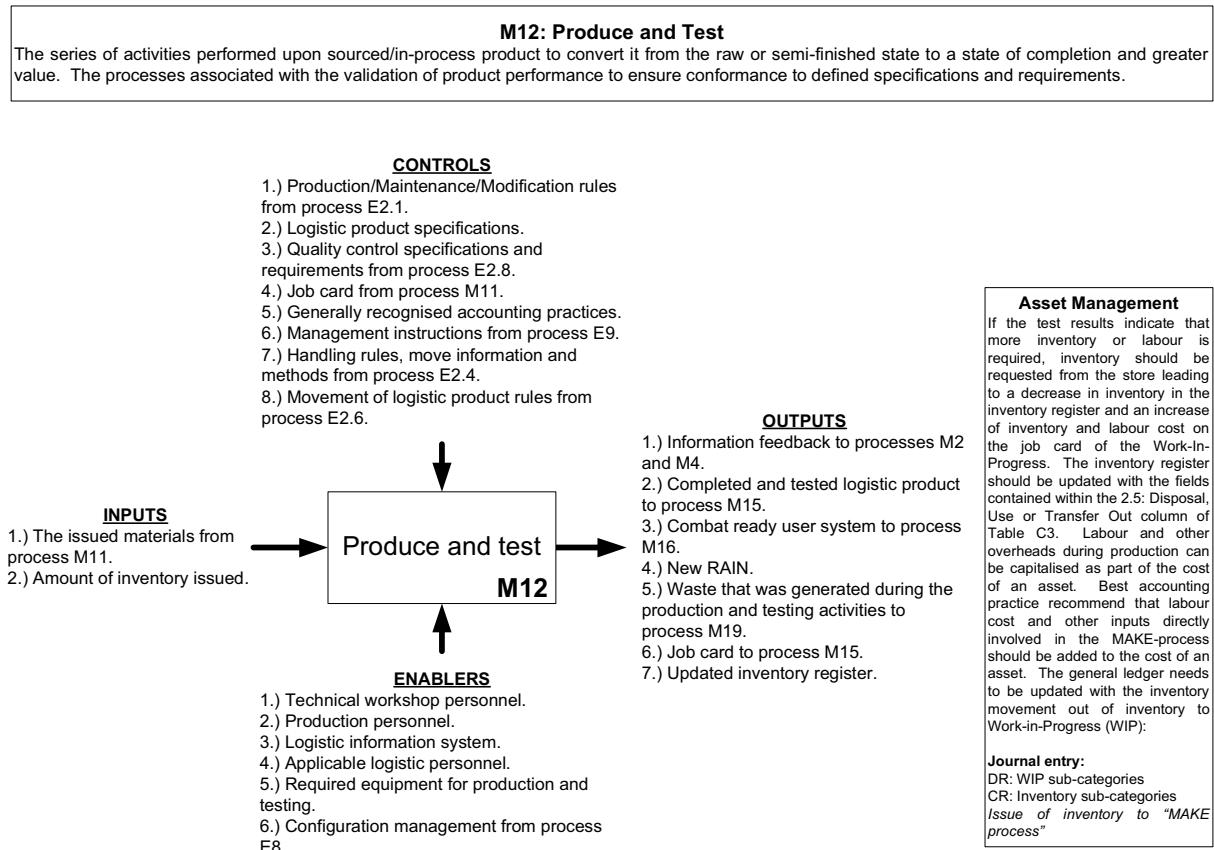


Figure 5: The SCOR and IDEF0 approach used for each process.

The logistics process framework uses the five performance attributes as developed by the Supply-Chain Council for the SCOR model. These five performance attributes are (Supply-Chain Council, 2008):

- Reliability, which measures the ability of the supply chain to deliver the product to the customer when required;
- Responsiveness, indicating the speed at which the supply chain can deliver the product to customers;
- Agility, focusing on the ability of the supply chain to respond to changes in its demand;
- Cost, focusing on the cost of the supply chain where the aim is to keep cost at a minimum without compromising the competitiveness of the supply chain; and
- Assets, which indicates the effectiveness of the supply chain in utilising and managing its assets to support it customer demand optimally.

Conclusion

The project's research impact lies in the fact that a new way of looking at supply chains has been formulated. This will contribute to solving the military's problem of having to deal with seemingly different logistic objectives in an integrated manner. The practical impact constitutes a single, comprehensive, rigorous and tailorable logistics process within the SANDF that allows them to make quantum improvements to their logistics service delivery.

Further work is being done to determine the metrics for each process and sub-process using the SCOR model's metrics where applicable as well as developing new metrics. Once the metrics have been completed, research will be done to establish the best practices for each process and sub-process based on the SCOR model. The project team is currently training officers from the SANDF in using this new concept as well as obtaining feedback to update the framework. The final logistics process framework will be a manual similar to that of the SCOR model. In order to allow for the orderly improvement of the logistics process, this manual will be kept under strict configuration control and updated in future to effect the improvement of process quality.

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