Integrating the augmented SCOR model and the ISO 15288 life cycle model into a single logistic model.

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Logistics and Quantitative Methods
CSIR Built Environment
For want of a nail, the shoe was lost –
For want of a shoe, the horse was lost –
For want of a horse, the rider was lost –
For want of a rider, the battle was lost.

Benjamin Franklin
Three supply chain case studies

SC1: 76mm High Effect Fused Proximity Ammunition

Photo credits: Fuchs Electronics

SC2: Multi-commodity from manufacturer to SANDF contingent in Burundi

Photo credits: www.wikipedia.org

SC3: Weapon systems

Photo credits: www.wikipedia.org, SA Navy and Dr P Schmitz
After the case studies:

  - Used the SCOR model for the military.
  - We felt that the standard MAKE process categories were to vague for the SANDF with regards to maintenance, modification and disposal activities.

- There is a point in the supply chain where the SANDF does not deliver a product to a demanding entity, but employs it in training, war or peace keeping activities.

- The SANDF incorporates captured enemy materiel for future use in the SANDF.

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The augmented SCOR model

**Plan the supply chain**

- **P1: Plan the supply chain**
  - **P2: Plan Source**
  - **P3: Plan Make**
  - **P4: Plan Deliver**
  - **P5: Plan Return**
  - **P6: Plan Use**

**Source**
- **S1: Source Stocked Product**
- **S2: Source Make-to-Order Product**
- **S3: Source Engineer-to-Order Product**
- **S4: Source Enemy Product**

**Make**
- **M1: Make to Stock**
- **M2: Make to Order**
- **M3: Engineer to Order**
- **M4: Maintain to Stock**
- **M5: Maintain to Order**
- **M6: Modify to Stock**
- **M7: Modify to Order**
- **M8: Destroy or Dismantle**

**Deliver**
- **D1: Deliver Stocked Product**
- **D2: Deliver Make-to-Order Product**
- **D3: Deliver Engineer-to-Order Product**
- **D4: Deliver Retail Product**

**Return**
- **SR1: Source Return Defective Product**
- **SR2: Source Return MRO Product**
- **SR3: Source Return Excess Product**

**Maintenance**
- **MR1: Maintenance Return Disposal**

**Enable**
- **EP: Enable Plan**
- **ES: Enable Source**
- **EM: Enable Make**
- **ED: Enable Deliver**
- **ER: Enable Return**
- **EU: Enable Use**
Configuring a Supply Chain

- A series of supply chains from raw material extraction to final product delivery at end user.
- The SANDF the End-to-End supply chain is configured as follows:
Configuring a Supply Chain

Product system SC

Commodity SC

User system SC

User SC
The six logistics perspectives for the SANDF

• Logistics Strategy:
  • Developed by South African Department of Defence.
  • Determine the requirements for a logistic process.
  • Based on six perspectives.

1. System perspective

<table>
<thead>
<tr>
<th>Level</th>
<th>Designation</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Operational Force</td>
<td>Joint National Force</td>
</tr>
<tr>
<td>7</td>
<td>Combat Grouping</td>
<td>Joint Task Force</td>
</tr>
<tr>
<td>6</td>
<td>User System</td>
<td>AA Battalion</td>
</tr>
<tr>
<td>5</td>
<td>Product system</td>
<td>Radar</td>
</tr>
<tr>
<td>4</td>
<td>Product</td>
<td>Power supply</td>
</tr>
<tr>
<td>3</td>
<td>Product Sub-system</td>
<td>Modulator</td>
</tr>
<tr>
<td>2</td>
<td>Component</td>
<td>Resistor</td>
</tr>
<tr>
<td>1</td>
<td>Material</td>
<td>Silicon</td>
</tr>
</tbody>
</table>
The six logistics perspectives for the SANDF

2. **Process perspective**
   - Process is seen as a functional layout in which products move from one function or process to the next.
   - Function of process describes required inputs, product transformation and outputs.

3. **Quality improvement perspective**
   - Total Quality Management principles used to reduce military logistics risk and improve quality of service.
The six logistics perspectives for the SANDF

4. **Asset management perspective**
   - Takes South African National Treasury asset management guidelines into account.
   - Asset management is the process of guiding the acquisition, use, safeguarding and disposal of assets to maximize their service delivery potential and manage risks and costs over their entire life.
   - The management and accounting of assets are included in the single logistic process where applicable.

5. **Supply chain perspective**
   - SIT ‘N KORT SIN IN WAT DIT NET WEER VERDUIDELIK.
The six logistics perspectives for the SANDF

6. Life-cycle perspective
   • Product or system life cycles are managed in an integrated fashion across all phases of the product’s or system’s life cycle.
   • The first 5 perspectives are adequately addressed by the augmented SCOR model.
   • The sixth perspective needs to be incorporated into the augmented SCOR model that resulted in the creation of a single logistics process model for the SANDF.
     • Must be a single, comprehensive, rigorous and tailorable logistics process.
Life-cycle perspective

• **ISO-15288**
  • Provides a common framework for establishing and implementing agreements between the acquiring entity and the system or subsystem suppliers.
  • Agreements focus on 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.

• Based on various entry and exit criteria a decision is made at the end of each life cycle 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.
Life-cycle perspective

• Each 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 - all the parts of a process are strongly related.
  • Loosely coupled - the number of interfaces among various processes is kept to a minimum.
  • Associated with a particular responsibility.
Life-cycle perspective

Organisational Project-Enabling Process Group
- Life Cycle Model Management Process
- Infrastructure Management Process
- Project Portfolio Management Process
- Human Resource Management Process
- Quality Management Process

Project Process Group
- Project Planning Process
- Project Assessment and Control Process
- Decision Management Process
- Risk Management Process
- Configuration Management Process
- Information Management Process
- Measurement Process

Technical Process Group
- Stakeholder Requirement Definition Process
- Requirements Analysis Process
- Architectural Design Process
- Implementation Process
- Integration Process
- Verification Process
- Transition Process
- Validation Process
- Operation and Maintenance Process
- Disposal Process
The single logistics process

- Sourcing of complex materiél such as frigates and aircrafts:
  - Included processes from stakeholder requirement definition to validation in SOURCE.

- The operation and maintenance process:
  - Integrated into the USE and MAKE.

- The disposal process:
  - Included in MAKE and RETURN.
The single logistics process

<table>
<thead>
<tr>
<th>S SOURCE</th>
<th>M MAKE</th>
<th>D DELIVER</th>
<th>U USE</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1 Define stakeholder requirements</td>
<td>M1 Finalise engineering</td>
<td>D1 Receive, enter and validate order (demand)</td>
<td>U1 Process demand</td>
</tr>
<tr>
<td>S2 Analyse requirements</td>
<td>M2 Schedule production activities</td>
<td>D2 Enter order, commit resources and launch project</td>
<td>U2 Reserve resources and determine delivery date</td>
</tr>
<tr>
<td>S3 Design architecture</td>
<td>M3 Schedule maintenance activities</td>
<td>D3 Reserve inventory and determine delivery date</td>
<td>U3 Obtain services</td>
</tr>
<tr>
<td>S4 Implement</td>
<td>M4 Schedule modification activities</td>
<td>D4 Schedule installation</td>
<td>U4 Consolidate orders</td>
</tr>
<tr>
<td>S5 Integrate</td>
<td>M5 Deactivate product</td>
<td>D5 Consolidate orders</td>
<td>U5 Receive product from warehouse</td>
</tr>
<tr>
<td>S6 Verify</td>
<td>M6 Schedule disposal activities</td>
<td>D6 Build loads</td>
<td>U6 Issue product</td>
</tr>
<tr>
<td>S7 Transition</td>
<td>M7 Inspect and test</td>
<td>D7 Route shipments</td>
<td>U7 Assign operators</td>
</tr>
<tr>
<td>S8 Validate</td>
<td>M8 Confirm provisioning actions</td>
<td>D8 Select carrier and rate</td>
<td>U8 Activate product</td>
</tr>
<tr>
<td>S9 Authorise supplier payment</td>
<td>M9 Issue maintenance or modification enabling system and materials</td>
<td>D9 Receive product from SOURCE or MAKE</td>
<td>U9 Expend or consume product</td>
</tr>
<tr>
<td>S10 Receive captured product</td>
<td>M10 Issue disposal enabling system and material</td>
<td>D10 Pick product</td>
<td>U10 Use product</td>
</tr>
<tr>
<td>S11 Characterise captured product</td>
<td>M11 Issue production material</td>
<td>D11 Pack product</td>
<td>U11 Monitor operators</td>
</tr>
<tr>
<td>S12 Transfer captured product</td>
<td>M12 Produce and test</td>
<td>D12 Load product and generate shipping documents</td>
<td>U12 Measure performance</td>
</tr>
<tr>
<td>R SOURCE RETURN</td>
<td>M13 Maintain or modify and test</td>
<td>D13 Ship product</td>
<td>U13 Handle arisings/returns</td>
</tr>
<tr>
<td>R1 Source return non-conforming product</td>
<td>M14 Destroy or dismantle</td>
<td>D14 Receive and verify product</td>
<td>U14 Dispose waste</td>
</tr>
<tr>
<td>R2 Source return MRO product</td>
<td>M15 Package</td>
<td>D15 Install product</td>
<td>R15 Return product</td>
</tr>
<tr>
<td>R3 Source return excess product</td>
<td>M16 Stage product</td>
<td>D16 Provide assistance</td>
<td>R1 DELIVER RETURN</td>
</tr>
<tr>
<td>M17 Release product to DELIVER</td>
<td>M18 Archive information</td>
<td>D17 Sign off</td>
<td>R4 Deliver return non-conforming product</td>
</tr>
<tr>
<td>M19 Dispose waste</td>
<td></td>
<td>D18 Transfer responsibility</td>
<td>R5 Deliver return MRO product</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>E ENABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>E1 Enable SOURCE</td>
</tr>
</tbody>
</table>

- Augmented SCOR model
- ISO 15228 life cycle process
- ISO 15228 life cycle process
The single logistics process

• Combination of SCOR and IDEF0.
  • Processes and sub-processes are described.
  • Process inputs, outputs, controls and enablers identified.

• The enablers at each process are not necessarily the ENABLE processes as defined by the SCOR model.
  • But the various ENABLE processes can serve as enablers of process.

• Asset management activities are included in the process or sub-process where applicable.
The single logistics process

**M12: Produce and Test**
The series of activities performed upon sourced/in-process product to convert it from the raw or semi-finished state to a state of completion and greater value. The processes associated with the validation of product performance to ensure conformance to defined specifications and requirements.

**CONTROLS**
1.) Production/Maintenance/Modification rules from process E2.1.
2.) Logistic product specifications.
3.) Quality control specifications and requirements from process E2.8.
4.) Job card from process M11.
5.) Generally recognised accounting practices.
6.) Management instructions from process E9.
7.) Handling rules, move information and methods from process E2.4.
8.) Movement of logistic product rules from process E2.6.

**INPUTS**
1.) The issued materials from process M11.
2.) Amount of inventory issued.

**ENABLERS**
1.) Technical workshop personnel.
2.) Production personnel.
3.) Logistic information system.
4.) Applicable logistic personnel.
5.) Required equipment for production and testing.
6.) Configuration management from process E8.

**OUTPUTS**
1.) Information feedback to processes M2 and M4.
2.) Completed and tested logistic product to process M15.
3.) Combat ready user system to process M16.
4.) New RAIN.
5.) Waste that was generated during the production and testing activities to process M19.
6.) Job card to process M15.
7.) Updated inventory register.

**Asset Management**
If the test results indicate that more inventory or labour is required, inventory should be requested from the store leading to a decrease in inventory in the inventory register and an increase of inventory and labour cost on the job card of the Work-In-Progress. The inventory register should be updated with the fields contained within the 2.5: Disposal, Use or Transfer Out column of Table C3. Labour and other overheads during production can be capitalised as part of the cost of an asset. Best accounting practice recommend that labour cost and other inputs directly involved in the MAKE-process should be added to the cost of an asset. The general ledger needs to be updated with the inventory movement out of inventory to Work-in-Progress (WIP):

**Journal entry:**
DR: WIP sub-categories
CR: Inventory sub-categories

"Issue of inventory to "MAKE process"
What is currently happening?

• The development of a URS of the Logistics Information System (LIS):
  • To support the single logistics process model.

• Training of SANDF personnel:
  • To enable understanding the single logistics process model.
  • Used as a feedback platform for future improvement of the model.

• The development of metrics using the SCOR approach.
  • Most of SCOR’s reliability, responsiveness, agility, cost and asset metrics can be directly applied.
  • A sixth group of metrics introduced to measure combat-ready performance in the SANDF.
What is next?

- The development of best practices for each process element.
- Finalising the incorporation of the project processes.
- Developing the macro structures for the SANDF to enable the application of the model.
- The final single logistics process model will be a manual similar to that of the SCOR model.
  - 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.
Acknowledgements

• Supply-Chain Council (Southern African Chapter)
  • Invitation to give the presentation.

• SAPICS
  • Opportunity to present the paper.

• CSIR
  • Enabling model development.

• SANDF
  • Opportunity to develop the model to improve their logistics activities.
“The only thing harder than getting a new idea into the military mind is to get an old one out.”

- Sir B. H. Liddell-Hart
Placetne Frates?