Developing a benchmarking model for Safcor Panalpina's industry verticals as a catalyst for supply chain improvement

By
MM Ramotsedisi

04405994/27229417

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Executive Summary

Safcor Panalpina is a significantly proportioned company offering a number of supply chain services for several well known clients in the supply chain industry. Safcor Panalpina acts as a Clearing agent in the forwarding of goods for it clients across international borders. As a forwarder Safcor Panalpina renders a complete service, as well as various other services in door to door consignments offerings.

As a Forwarding agent Safcor Panalpina clears goods for its clients via seafrieght and airfreight depending on the particular needs of the client at the most optimal price; this can also include warehousing and inventory management etc.

A SCOR benchmarking model is used as a catalyst to improve the seafrieght forwarding operation at Safcor Panalpina. As the SCOR model uses metrics and best practices to find improvements for supply chain businesses, some best practices which are appropriated for the seafrieght operation are summarized in this document. An extensive analysis was conducted on the seafrieght operation and potential continuous improvement initiatives are concluded upon.

The main attribute which is envisaged in this project is the responsiveness of the operation. Through a financial analysis of a 5% improvement on on-time deliveries, it is concluded that a potential 30-50% improvement in profit from sales is an attainable achievement.

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1. Chapter 1

1.1 Introduction and Background

Safcor Panalpina is a member of the listed Bidvest Group and offers innovative supply chain management solutions. The company has been in existence for 100 years in the logistics business. The company's logistics solutions synchronise cargo through its infrastructure, inclusive of customised warehousing, transport and distribution solutions, with the objective of increasing the overall efficiency of its clients' particular logistics requirements. The company provides door-to-door service for consignments of any size by sea, air, rail or road, to and from anywhere in the world and throughout South Africa. The company specialises in the following services:

- International supply chain management and consulting services
- System integration
- Customs clearing
- Forwarding
- Logistics
- Financial services

1.1.1 Distribution and Value Added Services

The company's extensive network through owned vehicles or dedicated third party transporters provides an efficient, integrated transport system for the physical distribution of goods throughout global supply chains. In addition, the company has compiled a range of enhancement features that can be added to any of standard Air and Ocean Freight products, these enable the needs of different types of cargo such as High Value Cargo Handling (HVC) or Dangerous Goods Handling (DGR).

The company provides a full range of additional services to improve the management of specific logistics requirements and to meet the requirements of its clients' customers. These are:

- Order Management
- Vendor Managed Inventory Capabilities
- Repacking
- Kitting

- Specialised Labelling
- Reverse Logistics / disposal management

1.1.2 Forwarding

Designing, controlling and continually improving the complex global flows of goods from suppliers to production lines and then to resellers, right the way through to the final client or user, is a supply chain management and consulting service that Safcor Panalpina provides. The objective in managing such a service is getting goods to clients in the most efficient and cost-effective manner. This entails appropriate focus on the processes and resources that maintain solutions that optimize inventories and overall supply chain benefits and that shorten lead times.

Safcor Panalpina offers a differentiated combination of seafreight forwarding services. Cargo vessels from shipments are received at respective ports at Durban, Port Elizabeth, Cape Town and Richards Bay container terminals. At the Cargo terminals the goods are subject to customs clearing and relevant authorizations. Cargo is transported to the main inland container depot situated in Johannesburg where various services and functions are provided that add value to the clients goods. Some received goods at the depot are then transported further to the Unit 2 warehousing facility in Kempton Park. At the Unit 2 Degroup warehousing facility goods are received, allocated for storage and distributed to the final customer.

At the depot and the Unit 2 Degroup warehousing facility, the value added services which are provided for clients' goods are:

- Order Fulfilment
- Pick and Pack
- Special Handling
- Cross - docking
- Barcode Scanning
- Inventory Visibility
- Warehouse and Inventory Management
- Bonded / Virtual Warehousing
- High End Security Capabilities

As Safcor Panalpina offers a variety of logistics services to various clients, a range of products are catered for within numerous supply chains. These various products are characterised into separate business units. Business units at Safcor Panalpina have been organised into 8 main units which are:

- High Tech
- Automotive
- Pharmaceutical
- Oil and Gas
- Engineering/Construction
- Telecommunications
- Fashion/FMCG
- Mining

The forwarding of sea freight cargo is managed in combination with the business unit that is relevant with respect to the product. The purpose of this project is to analyse the sea freight forwarding operational leg at Safcor Panalpina. Then to identify continuous improvement initiatives that will place the company at a better competitive strategic level to satisfy its clients, and hence recommend best practices.

1.2 Problem statement

The seafrieght forwarding operation at Safcor Panalpina can be described as a system of coordination and collaboration throughout the supply chain. Cargo received at the container terminals at the ports, is moved by various modes of transport through nodes consisting of warehouses then ultimately through to the respective clients'.

The company believes that to achieve and maintain operational excellence, a continual review of current processes is an imperative. In this project the sea freight forwarding operation at Safcor Panalpina will be reviewed for continuous improvement initiatives. In this operation the commissioning of resources by management is triggered by information flows within the company as well as with external entities. Therefore the flow of information and the physical flow of goods enabled by resources within the supply chain will comprise the significant study. The project will seek for continuous improvement initiatives from a process mapping of the seafrieght operation.

Some common problems identified to be a hindrance while analysing and mapping the operation are:

- The receiving preparedness of warehouses.
- The amount of time taken by customs clearing.
- Achieving full truck load consolidations.
- Numerous communication errors.
- Storage visibility in warehousing

1.3 Project Aim

Safcor Panalpina continues in their endeavour to satisfy their clients with a quality service. The aim of this project is to analyse and compare the operation understudy with best practices. The main aims of the project are:

1. To conduct a process mapping of the sea freight Degroup operations.
2. Determine and recommend a best practice and prioritize areas for continuous improvement initiatives that will bring about the most financial and strategic gain to the company for the sea freight forwarding operations.

1.4 Project Scope

In this project only the seafrieght forwarding operation from the Port terminals, to the Unit 2 Degroup facility until to the dispatching of goods to the clients will be considered in the study. As only the flow of imports will be considered, the operation flow begins by the cargo terminals at the ports as shown on figure 1. The operation then continues from the ports to the warehouses until inevitably to the client.

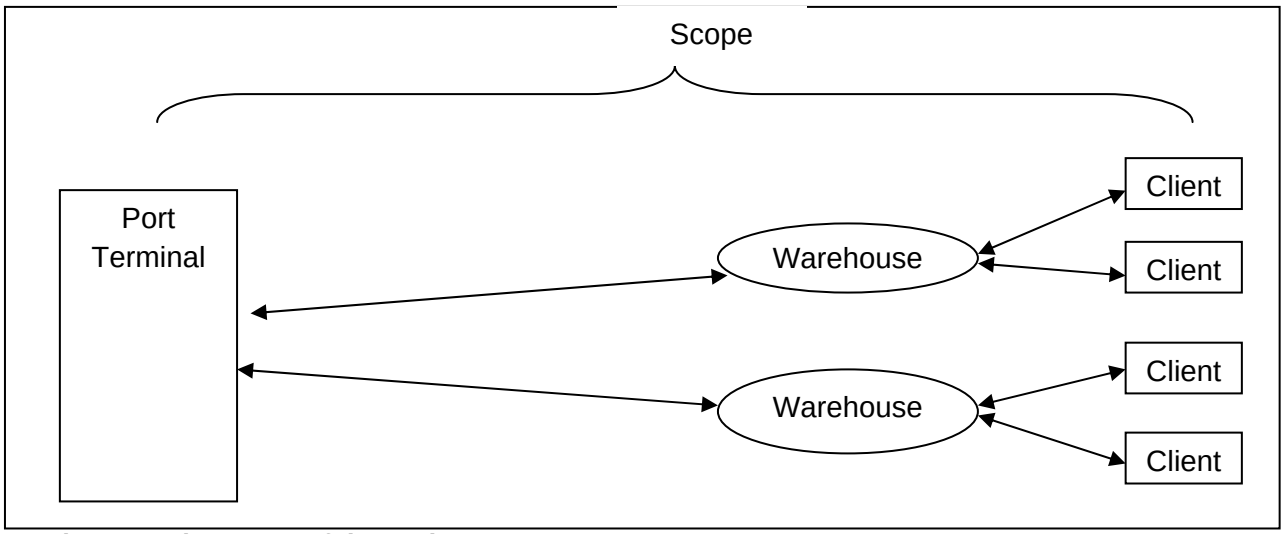


Figure 1: The scope of the project

This project will attempt to analyze and identify continuous improvement initiatives from an extensive approach. The initiatives identified will then be further analyzed against a cost benefit analyses. Only imports which flow through the Unit 2 warehouse will be considered, the methodology and approach used in this regard can be used generically for all other warehouses.

To execute the project in achieving its objectives, the SCOR model has been identified to be appropriately relevant. As the scope of the project has been elaborated above, the processes that will partake a dominant role from the SCOR model are shown on table 1 below categorized by planning, execution and enabling SCOR processes

Table 1: Relevant SCOR model processes

Planning	Plan source	Plan make (warehouse)	Plan deliver
Execution	Source stocked product	Make to stock (Warehouse)	Deliver stocked product
Enabling	Enable source	Enable make	Enable deliver

2. Chapter 2

2.1 Literature study

2.1.1 Benchmarking: A tool for continuous improvement

“A basic proposition is that benchmarking is a tool or trigger for continuous improvement and that the only reason to undertake benchmarking is to improve upon existing performance in an objective manner (McNair, 1992). Benchmarking allows a company to identify opportunities for improvement and to proactively direct efforts to become the best.”

Continuous improvement in industrial processes is increasingly a key element of competitiveness for Industrial systems. Continuous improvement through knowledge-guided analysis in experience feedback is presented by (Jabrouni , 2011). The method of continuous improvement in this regard is based upon knowledge sharing among problem solving practitioners of an organisation in order to improve processes and products. The four components (‘‘context–analysis–solutions–lessons learned’’) of the experience feedback process are described as follows:

- Event description: This is where a general picture of the problem to be solved is provided before in-depth analysis. It contains for instance the description of a faulty product and its use conditions when the problem occurred (Brézillon, 1999). In this stage, risk criteria also forms a significant part of analysis, this includes associated costs and benefits

- Definition and implementation of solutions to the event: An event is analysed according to its context and corrective actions are proposed.

- The knowledge level: This level refers to the knowledge of one or several experiences in industry, summarizing the involved analysis and the problem solving knowledge obtained and/or generalized rules from these set of experiences.

- The development of this integrated model is facilitated by using semantics description modelling to document for which problem solving occurrence the activity is intended to represent.

This framework of experience feedback provides means of understanding, interpreting, storing and indexing the activities of experts (Weber and Aha, 2003).

2.1.2 Pareto and Cause and Effect diagrams

The Pareto analysis which is also known as 80–20 rule is named after the Italian economist Vilfredo Pareto. The principle states that for many events, roughly 80% of the effects/problems come from 20% of causes (Jayswal, A., et al). A pareto analysis can be used to prioritise the amount of attention each problematic cause should be given based on the amount of impact it contributes.

The Fishbone diagram which is also known as Ishikawa diagram was proposed by Kaoru Ishikawa in 1960s, who founded quality management processes in Kawasaki shipyards. Cause and effect diagrams are used to show the root causes of certain events and are also used to identify potential factors which cause an overall effect. Causes for certain problems or impediments to process improvements that show variability in their behaviour, are categorised into factors, which are then constructed onto a “fish-bone” diagram. The problem is described in the centre of the diagram and the contributing factors are arranged surrounding “skeletal-bones” of the fishbone diagram.

A pareto analysis is used to prioritise which problems causes the most impact to a process; subsequently a fishbone diagram is then used to investigate the root causes of the problems identified with a pareto analysis.

2.1.3 Supply Chain Performance

An important notion that needs to be developed in business is that performance needs to change over time, this refers to not only a specific standard, but also the individual respective metric.”Traditionally, the focus of performance has been on process operations within the organisational boundaries of a business (Short and Venkatraman, 1992)”.”In the context of supply chain management, performance measurement involves not only the internal processes, but also requires an understanding of the performance expectation of other partners in the supply chain, backward from the suppliers and forward to the customers (Norman and Ramirez, 1993).”

“Mentzer and Konrad (1991) define performance measurement as effectiveness and efficiency in accomplishing a given task in relation to how well a goal is met. With respect to the context of logistics and supply chain, effectiveness is concerned with the extent in which goals are accomplished and these may be order fill rate, lead time or stock out probability.” Efficiency measures how well the resources are utilised in achieving organisational goals

and these are relatively monitored by operational costs and inventory costs. While many companies recognize both aspects of performance, they fail to understand them from a perspective of a balanced framework for performance measurement (Brewer and Speh, 2000).The difference in understanding performance from this perspective in the context of logistics and supply chain can lead to inconsistencies in the measures of performance by supply chain partners in the supply chain, this can lead to a sub optimisation of the supply chain performance.

For a logistics service provider it is imperative that both measures of effectiveness and efficiency be taken into account to satisfy their customers. For example, for a logistics service provider a measure of cost efficiency may be important in satisfying their clients; however a shipper or a consignee may be concerned with a demand of high quality products and low-price delivery of shipments

2.1.4 Value Stream Mapping (VSM)

Value stream mapping is a method of creating a “one page picture” of all the processes that occur in a company, from the time a customer places an order for a product, until the customer has received that product in their facility (Magneir et al, 2003). Value stream maps document all of the processes used to produce and ship a product, both value-adding and non-value-adding processes.

The four steps to value stream mapping are as follows:

1. Define and pick the product
2. Create the “current state” value stream mapping(CSVSM)
3. Create the “future state” value stream mapping(FSVSM)
4. Develop an action plan to make the CSVSM to the FSVSM

2.1.4.1 Drawbacks in VSM in conjunction with the project

- VSM is not strategically motivated to align interests of supply chain members, it is simply driven by the notion of eliminating waste

2.1.5 The SCOR-model

The Supply Chains Operations Reference Model (SCOR) developed by the Supply Chain Council (cf. Stewart, 1995) considers the performance requirements from supply chain partners in providing appropriate strategy in a supply chain. The SCOR model articulates measures of supply chain reliability, responsiveness, agility, costs and asset management into a common goal.

Performance Attribute	Performance Attribute Definition	Level 1 Strategic Metric
Supply Chain Reliability	The performance of the supply chain in delivering: the correct product, to the correct place, at the correct time, in the correct condition and packaging, in the correct quantity, with the correct documentation, to the correct customer.	Perfect Order Fulfillment (RL.1.1)
Supply Chain Responsiveness	The speed at which a supply chain provides products to the customer.	Order Fulfillment Cycle Time (RS.1.1)
Supply Chain Agility	The agility of a supply chain in responding to marketplace changes to gain or maintain competitive advantage.	Upside Supply Chain Flexibility (AG.1.1)
		Upside Supply Chain Adaptability (AG.1.2)
		Downside Supply Chain Adaptability (AG.1.3)
Supply Chain Costs	The costs associated with operating the supply chain.	Supply Chain Management Cost (CO.1.1)
		Cost of Goods Sold (CO.1.2)
Supply Chain Asset Management	The effectiveness of an organization in managing assets to support demand satisfaction. This includes the management of all assets: fixed and working capital.	Cash-to-Cash Cycle Time (AM.1.1)
		Return on Supply Chain Fixed Assets (AM.1.2)
		Return on Working Capital (AM.1.3)

Figure 2: Performance attributes and level 1 SCOR metric

Source: (Supply Chain Reference Model version 9.0)

The SCOR model which is a product of the Supply Chain Council is developed to describe the business activities associated with all phases of a customers demand. The SCOR model provides collaboration between business processes, metrics and best practices for improvement in supply chain effectiveness and efficiency.

2.1.5.1 Processes

The SCOR-model processes are based on five basic management processes of Plan, Source, Make, Deliver, and Return of which are shown on figure 3 below. These standard processes allow businesses of all varying supply chains to be able to describe their supply chains using these common set of definitions for supply chain improvement.

The SCOR model has been developed to describe the business activities associated with all phases of satisfying a customer's demand. The five primary management processes of the SCOR model are hierarchical in nature and can be decomposed from level 1 to level 3 process elements. Each process element has a standard notation, performance attributes that are associated with the process element, metrics that are associated with the performance attributes and best practices that are associated with the process.

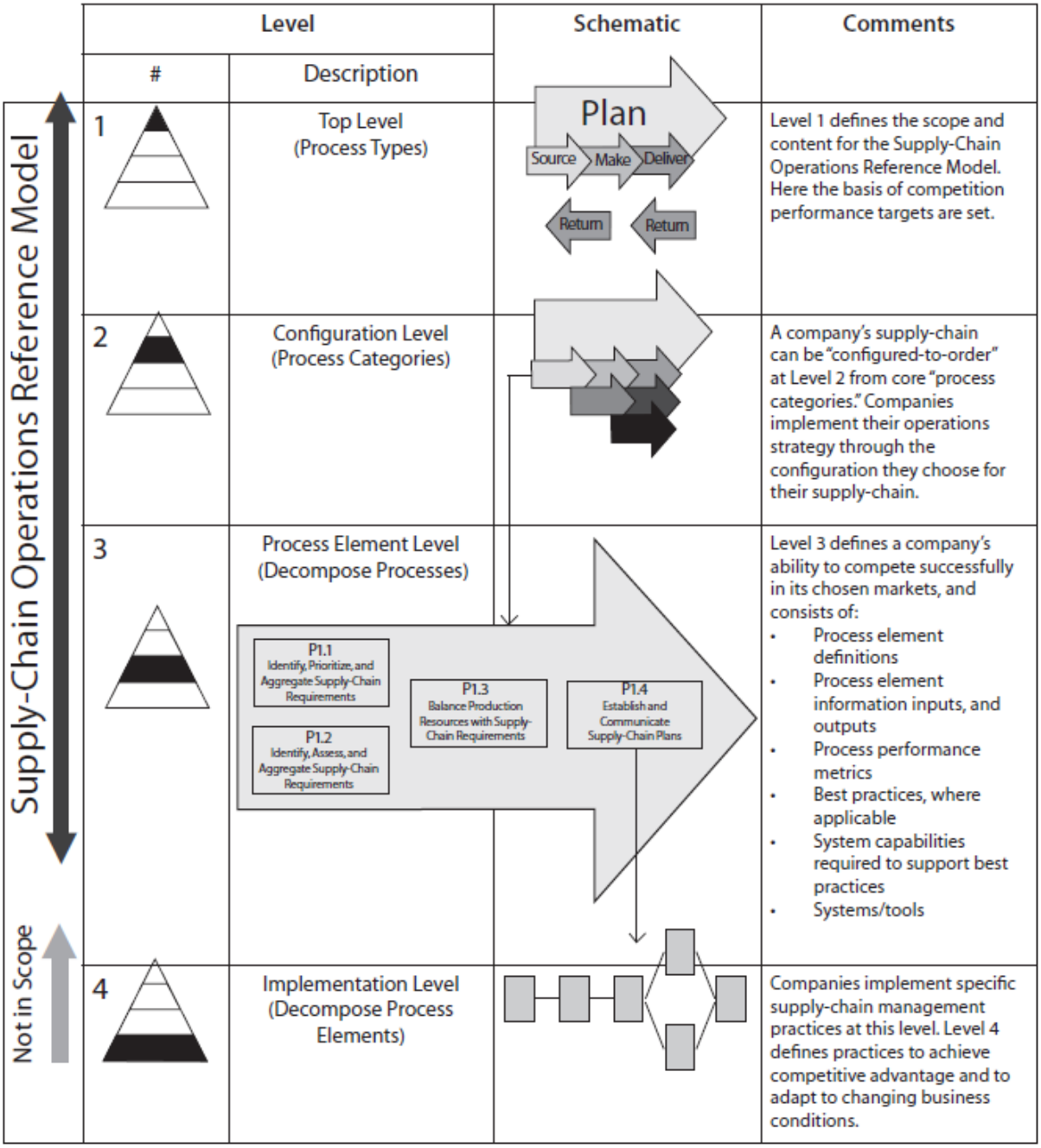


Figure 3: Process element hierarchical structure

Source: (Supply Chain Reference Model version 9.0)

The SCOR model is a model that is used to integrate well known concepts of business process engineering, benchmarking and process measurement into a cross functional framework as can be seen demonstrated in figure 4.

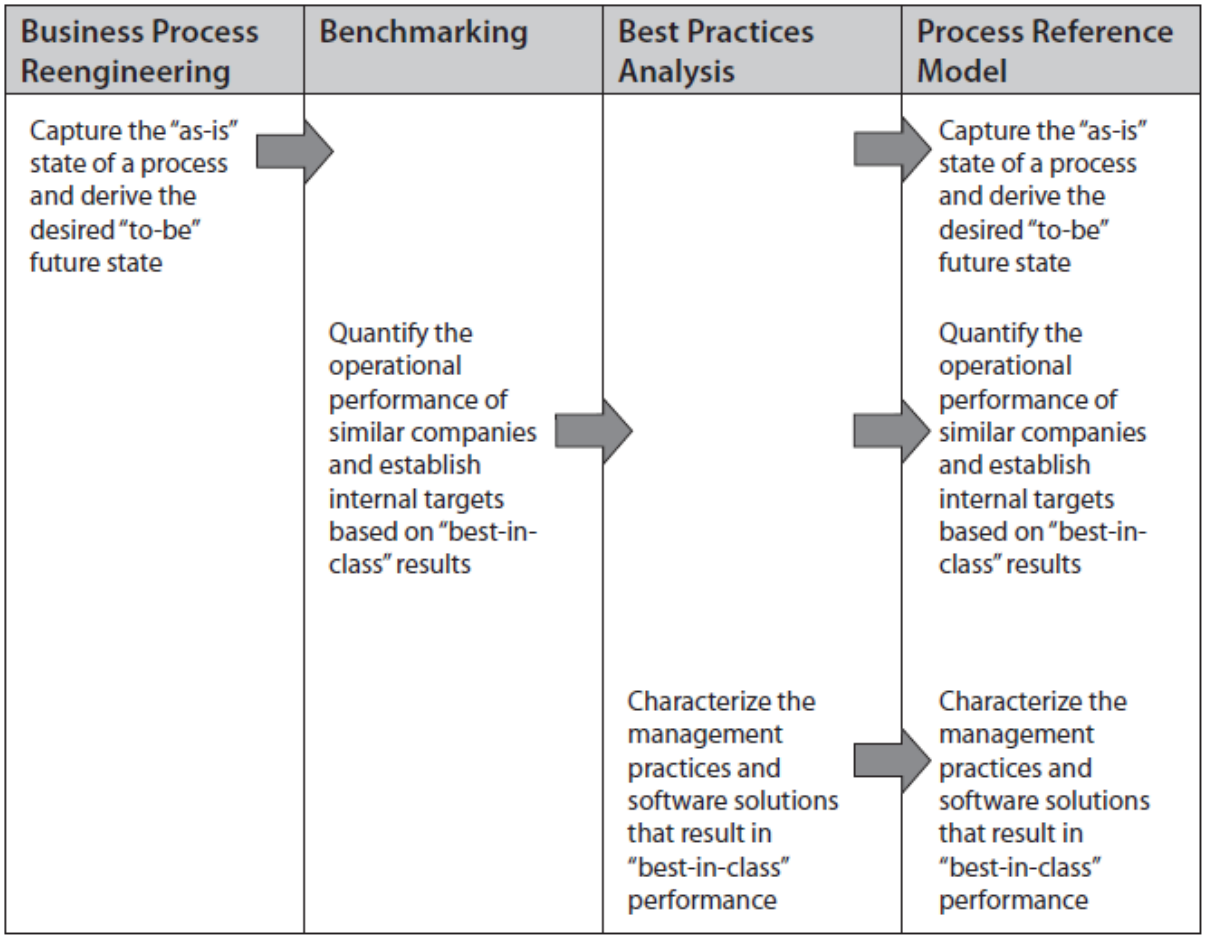


Figure 4: Process reference model

Source: (Supply Chain Reference Model version 9.0)

3. Chapter 3

3.1 Project Methodology

As discussed above, benchmarking is a tool that can be used as a catalyst for continuous improvement. Through thorough analyses, the SCOR model has been identified to be an appropriate model to utilize to construct a benchmarking model for Safcor Pinalpina's improvement objectives.

Therefore the objectives and approach of the project will be as follows:

- To construct an "as-is" analyses of the seafrieght forwarding operation.
- This will be followed by creating a logical and appropriate benchmarking model utilizing the SCOR model processes elements for the seafrieght operation.
- From the SCOR model created, best practice engineering processes and metrics will be selected which are appropriate and recommended into the seafrieght operation.
- The best practice processes recommended will be discussed in a manner reflective of their level of implementation accordingly into the operation.

3.2 Data and Information Gathering for the project

Data gathering for the "as-is" analysis of the project was conducted via a number of visits to the company, namely to the Unit 2 warehouse and the central co-ordinating offices. Information for the project was attained via meetings and interviews with relevant stakeholders of the seafrieght operation.

- Warehouse
    - Receiving and allocations department
    - Dispatching and delivering department
- Central offices
    - Operation managers
    - Freight forwarding controllers and staff

3.3 Sea Freight Operation “As-Is” Analysis

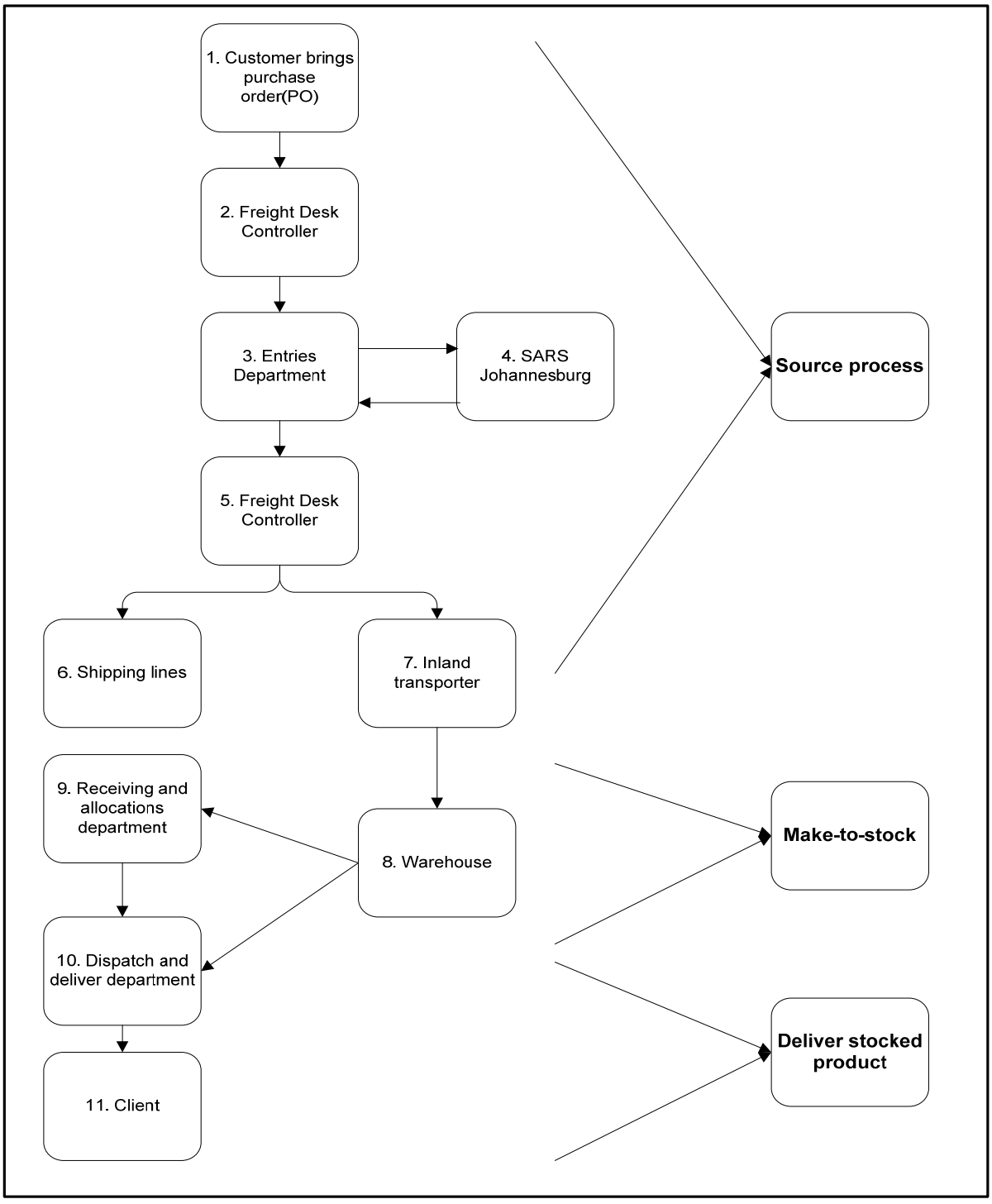


Figure 5: "As-is" analysis of the seafrieght forwarding operation

1. **Customer brings purchase order from overseas client**- The customer brings with the purchase order a number of other documents to the Freight desk controller:
    a. Clearing instructions
    b. Literature description
    c. Safety data sheet
    d. Suppliers invoice, etc
2. **Freight Desk Controller** – Prepares and makes sure that all important documentation from the clients are in order. The Controller sends the documents to the Entries Department
3. **Entries Department** – In the Entries Department the documents are framed and sent to SARS(South African Revenue Services) office electronically to Johannesburg and the forwarding process awaits for clearance of the incoming cargo by Customs
4. **SARS** – The incoming cargo is cleared and the documentation is sent back to Safcor Panalpina's Freight desk Controller
5. **Freight Desk Controller** – The Controller from Safcor prepares relevant documentation along with the payment to notify the shipping line so that they can release the cargo to the Port terminal. The Controller simultaneously organises a transporter based on the modal preference of the customer to transport the cargo to the warehouse.
    a. **Full container load goods(FCLG) from 1 client –** The container is transported immediately to the client
    b. **FCLG more than 1 client –** The container is transported to the warehouse for deconsolidation
6. **Shipping Line** – The shipping line is paid immediately or according to arrangement with Safcor, the shipping line releases the cargo and notifies the Controller
7. **Inland Transporter** – The transporter nominated by the controller then transports the cargo to the Unit 2 warehouse.
8. **Warehouse** – At the warehouse the container is received, it is de-bulked and the different products are allocated to their respective dedicated isles. The warehouse has 2 departments, a receiving and allocation department and a dispatching department.

3.4 SCOR level 3 Analysis

After an analysis of the seafrieght forwarding process, the SCOR model level 3 process elements are used to determine and identify the most relevant process elements that will enable identifications of improvement in the operation. It has been determined that the S1 Source Stocked Product, M1 Make-to- Stock, and D1 Deliver Stocked Product level 2 process will be further elaborated on their level 3 processes and their respective best practice methodologies and metric.

3.4.1 S1 Source stocked product

In the context of the sea freight forwarding operation, the inputs and outputs of this particular activity are concerned with the management of exchanging relevant documents between the customer, SARS (South African Revenue Services), shipping lines and inland transporters. Safcor Pinalpina acts as a clearing agent for its customers therefore it offers the service of processing all relevant documents and the organising of transporters and warehousing on behalf of its clients.

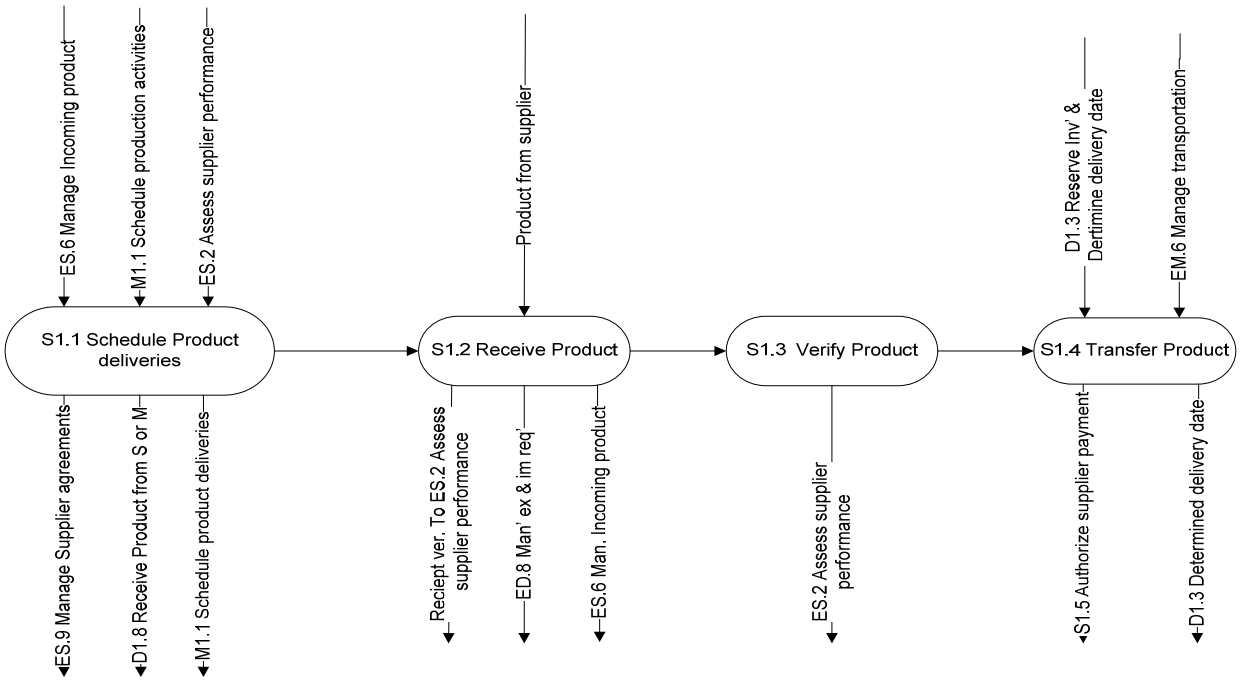


Figure 6: S1 Source stocked product

S1.1 Schedule Product Deliveries- Scheduling and managing the execution of the individual deliveries of product against an existing contract or purchase order. The requirements for product releases are determined based on the detailed sourcing plan or other types of product pull signals.

Table 2: Schedule product deliveries

Metrics:	**Best Practices:**
• % schedules changed within suppliers lead time • Average days per schedule change • Average release cycle of changes • Schedule product deliveries cycle time • Cost to schedule product deliveries	• Advanced shipping notices(S & M) • Consignment agreements are used to reduce assets and cycle time while increasing the availability of critical items • Mechanical(Kanban) pull signals are used to notify suppliers of the need to deliver product • EDI transactions to reduce cycle times

S1.2 Receive Product- The process and associated activities of receiving product to contract requirements

Table 3: Receive product

Metrics:	**Best Practices:**
• % Orders processed complete • % Orders received on-time to demand requirement • % Orders received with correct shipping documents • Cost to receive product • Receiving product cycle time	• Bar coding to minimise handling time and maximise data accuracy • Carrier agreements • Deliveries are balanced throughout each working day and week • Supplier certification programs are used to reduce or eliminate receiving inspection • Vendor managed inventory

S1.3 Verify Product- The process and actions required determining product conformance to requirements and criteria

Table 4: Verify product

Metrics:	**Best Practices:**
• % Orders received defect free • Cost to verify product • Verify product cycle time	• Bar coding to minimise handling time and maximise data accuracy • Carrier agreements • Deliveries are balanced throughout each working day and week • Supplier certification programs are used to reduce or eliminate receiving inspection • Vendor managed inventory

S1.4 Transfer Product- This is the transfer of accepted products to appropriate stocking locations within the supply chain. This includes all of the activities associated with repackaging, staging, transferring and stocking product.

Table 5: Transfer product best practice

Metrics:	**Best Practices:**
• % product transferred on-time demand requirement • % Product transferred without transaction errors • Cost to transfer product • Transfer product cycle time	1.1 Deliveries directly to point of use

3.4.2 M1 Make-to-stock

This level 2 process in this regard is used to define and construct the Unit 2 warehousing operations. The operation is included from receiving, allocations and dispatching of products to clients.

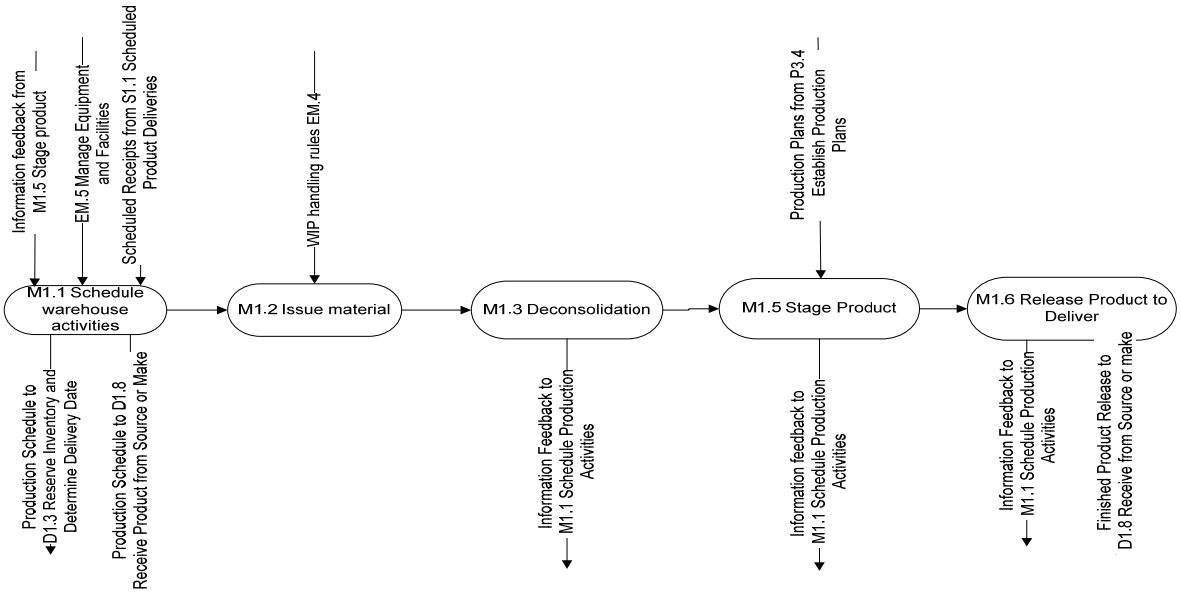


Figure 7: M1 Make to stock

M1.1 Schedule Warehouse Activities- Given plans for the production of specific parts, products, or formulations in specified quantities and planned availability of required sourced products, the scheduling of the operations to be performed in accordance with these plans. Scheduling includes sequencing, and, depending on the factory layout, any standards for setup and run. In general, intermediate production activities are coordinated prior to the scheduling of the operations to be performed in producing a finished product.

Table 6: Warehouse activities best practice

Metrics:	**Best Practices:**
• Cash-to-cash cycle time • Cost to make • Downside make adaptability • Make cycle time • Order fulfilment cycle time • Return on working capital • Upside make adaptability • Upside make flexibility	• Accurate and approved work instructions • Paperless order tracking and customer visibility of orders • Performance results compared to benchmarks • Production level loading • Continuous formal training to employees • Vendor managed inventories

• Yield	

M1.2 Issue Material- This entails the selection and physical movement of in-process product from a stocking location. The Bill of material/routing information or production instructions will determine the products to be issued to support the production operations.

Table 7: Issue material best practice

Metrics:	**Best Practices:**
• Issue material cycle time	• None appropriate

M1.3 Deconsolidation- The series of activities performed upon 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.

Table 8: Deconsolidation best practice

Metrics:	Best Practices:
• Capacity Utilisation • Cost to deconsolidation • Fill Rate • Deconsolidation cycle time • Warranty and returns • Warranty costs • Yield • Yield variability	• Accurate and approved process • Accurate and low cost batch/configuration records for warranty and regulatory tracking • Just-in-time demand flow techniques • Measuring process metrics and feedback to operators • Paperless production control • Continuous formal training to employees • Reduce chances operator error • Reduce non-value added activities, including queue, move, and set-up

M1.5 Stage Product- This entails the movement of packaged products into a temporary holding location to await movement to a finished goods location. The movement to finished goods is part of the deliver process.

Table 9: Stage product best practice

Metrics:	Best Practices:
• Cost to stage finished product • Stage finished product cycle time	• Electronic Material move transactions

M1.6 Release product to deliver- This is the activities to do with post-production documentation, testing, or certification required prior to delivery of finished product to customer.

Table 10: Release product best practice

Metrics:	Best Practices:
• Cost to release finished product to deliver • Release finished product to deliver cycle time	• Accurate and low cost batch records for regulatory compliance • Review batch records by exception

3.4.3 D1 Deliver Stocked Product

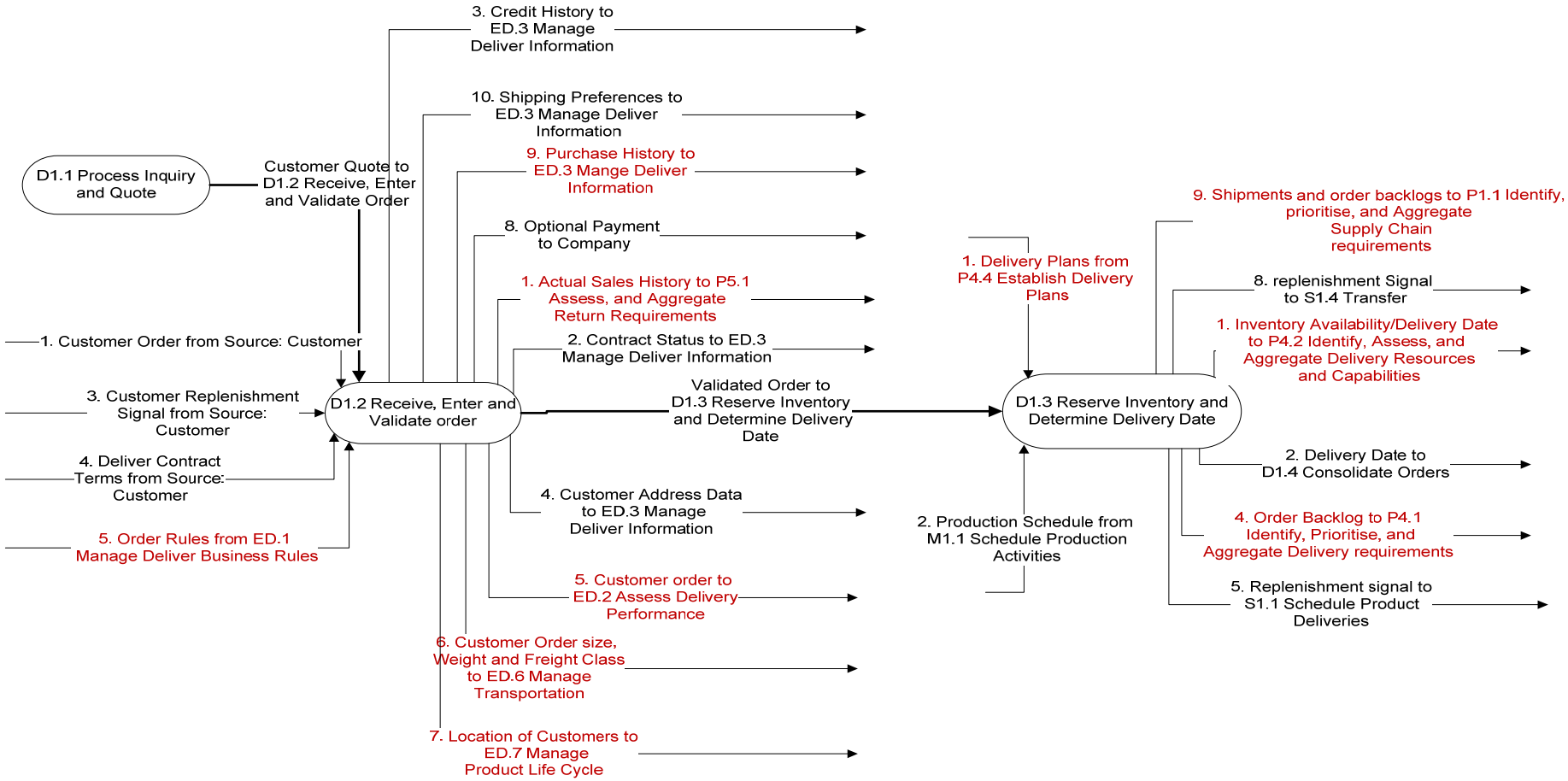


Figure 8: Deliver stocked product map

In the context of Safcor Panalpina, the deliver-stocked-product process elements describe the process of dispatching products out of the warehouse until to the final address of the consignee. On the figure above the red highlighted inputs and outputs are the ones included for analysis and are included in the appendix. This is the same for all highlighted inputs and outputs for the diagrams.

D1.1 Process Inquiry Quote- Receive and respond to general customer inquiries and requests for quotes

Table 11: Process inquiry quote best practice

Metrics:	Best Practice:
• Cost to Process Inquiry and Quote • Process Inquiry and Quote Cycle Time	• Quote capability without reserving inventory, which can be converted into an order in a single step • Single point of contact for all order inquiries Deliverable: • Customer Inquiry • Order Quote to customer

D1.2 Receive, Enter and Validate Order- Receive and enter order into the company's/warehouse order processing system. Orders can be received through phone, fax, or electronic media. Technically examine orders to ensure an orderable configuration and provide accurate price. Check the customer's credit. Optionally accept payment.

Table 12: Enter and validate order best practice

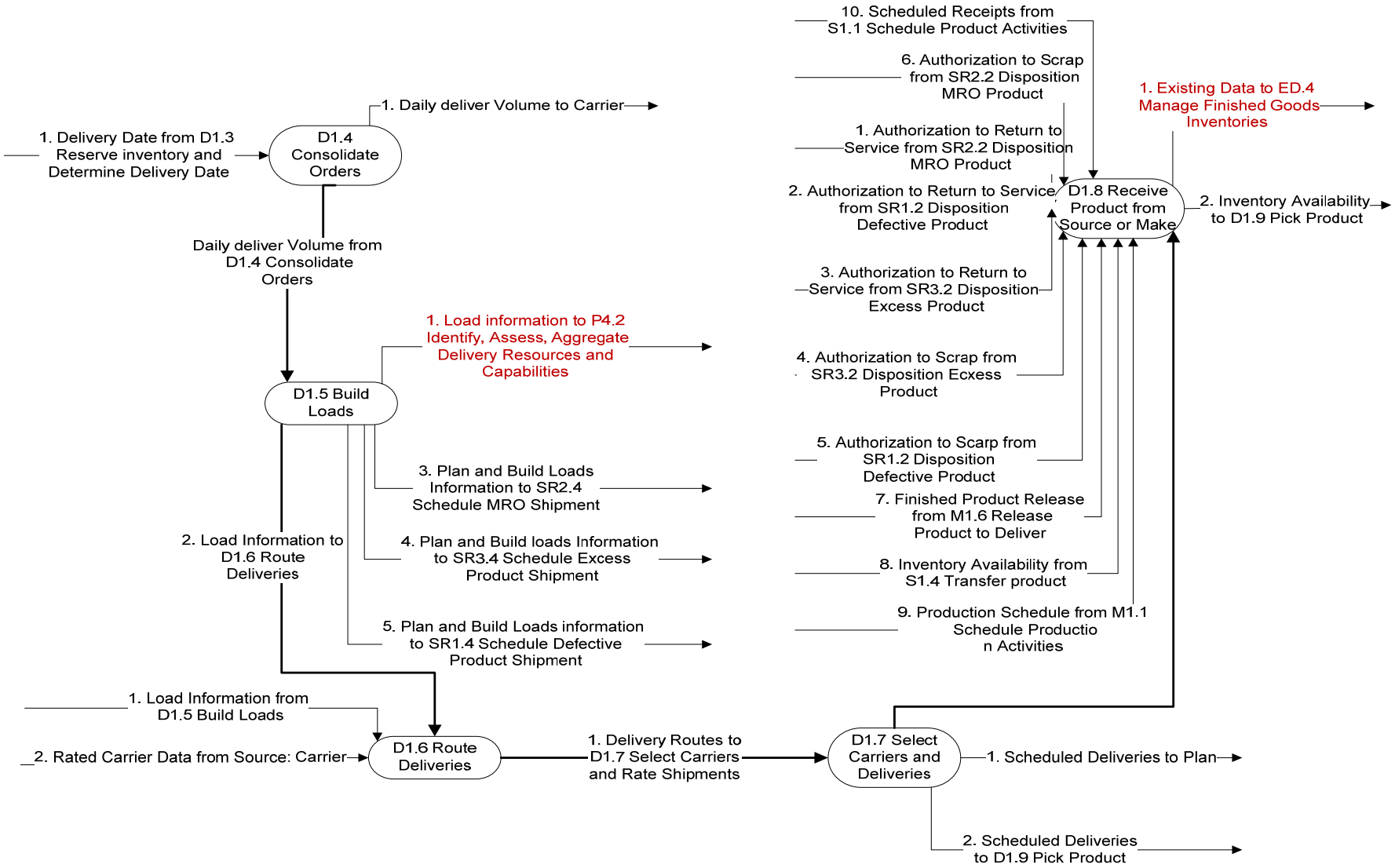
Metrics:	Best Practice:
• Cost to receive, enter and validate order • Order fulfillment dwell time • Receive, enter and validate order cycle time	4. Automatic multi-level credit checking: Dollar limits; days sales outstanding; margin testing 5. Value pricing based on "Cost to Serve";Cost plus pricing

D1.3 Reserve Inventory and Determine Delivery date- Inventory and/or planned capacity is identified and reserved for specific orders and delivery date is committed and scheduled.

Table 13: Reserve and determine deliver date

Metrics:	Best Practices:
• % orders delivered in full • Cost to determine delivery date • Delivery Performance to customer commit date • Fill Rate • Order fulfilment dwell time • Determine Delivery date Cycle Time	• Available to Promise • Priority-based inventory reservations, for key customers, with FIFO allocation for all others • Inventory allocation exception process is clearly defined and jointly owned by manufacturing and sales • Automatic Reservation of inventory and dynamic sourcing of product for single shipment to customer

3.4.4 Deliver stocked product cont.



D1.4 Consolidate Orders- The process of analyzing orders to determine the groupings that result in least cost/best service fulfillment and transportation

Table 14: Consolidate orders best practice

Metrics:	Best Practice:
• Consolidate orders cycle time • Cost to consolidate orders	• Combine consolidation needs with other products/divisions/companies • Consolidate orders by customer, source, traffic lane, carrier, etc

D1.5 Build Loads- Transport is selected and efficient loads are built

Table 15: Build loads best practice

Metrics:	Best Practice:
• Build loads cycle time • Cost to build loads	• Build load in stop sequence • Cost to build loads

D1.6 Route Deliveries- Loads are consolidated and routed by lane and location

Table 16: Route deliveries best practice

Metrics:	Best Practice:
• Cost to route shipment • Route shipment cycle time	• Carrier/Route optimization based on continuous movement and consolidation • Consolidation of carriers

D1.7 Select carriers and rate deliveries- Specific carriers are selected by lowest cost per route and deliveries are rated and tendered.

Table 17: Rate deliveries best practice

Metrics:	Best Practice:
• Cost to select carriers and rate shipments • Select carriers and rate shipments	• Select carriers by least cost per delivery and rate using actual rates prior to release billing

D1.8 Receive product from source or make – The activities such as receiving product, verifying, recording product receipt, determining put-away location, putting away and recording location that a company performs at its own warehouses; may include quality inspection.

Table 18: Product from source or make best practice

Metrics:	Best Practice:
• Cost to receive product from source or make • Receive product from source or make cycle time	• Automatic identification • Cross docking • Dynamic location assignment including lot control, zoned put away, quality assurance • Merge-in-transit

3.4.5 Deliver stocked product cont.

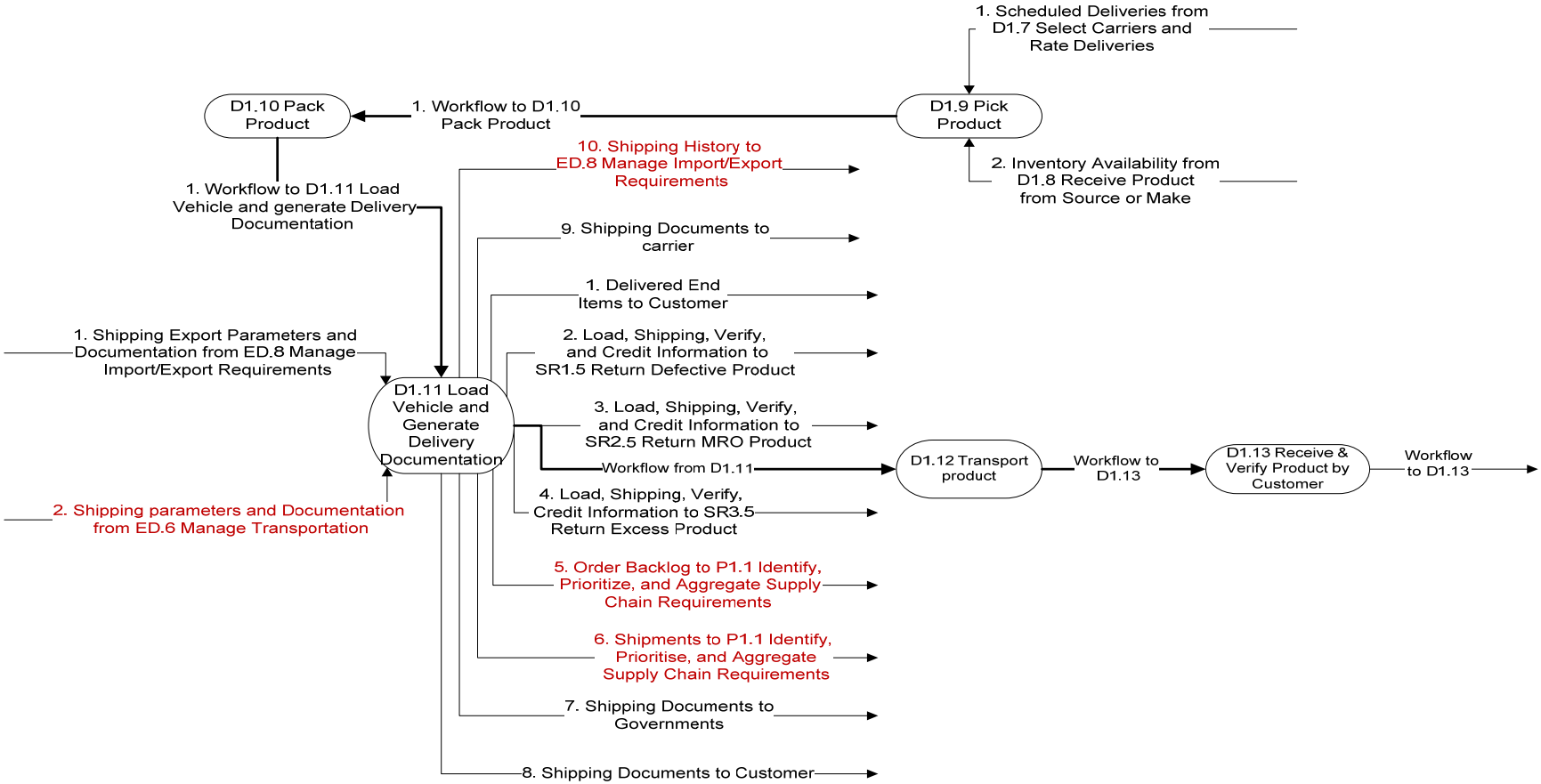


Figure 9: Deliver stocked product map

D1.9 Pick Product- The series of activities including retrieving orders to pick, determining inventory availability, building the pick wave, picking the product, recording the pick ,and delivering product to delivering in response to an order.

Table 19: Pick product best practice

Metrics:	Best Practice:
• Fill Rate • Pick product cycle time • Cost to pick product	• Wave picking-consolidates orders into “waves” where multiple orders with similar characteristics are picked at once. Orders can be consolidated by customer, geography or any other criteria that makes sense

D1.10 Pack Product- The activities such as sorting/combining the products, packing/kitting the products, paste labels, barcodes etc, and delivering the products to the dispatching area for loading.

Table 20: Pack product best practice

Metrics:	Best Practice:
• Cost to pack product • Pack product cycle time	• Non identified

D1.11 Load vehicle and generate delivery documentation- The series of tasks including placing/loading product onto transport and generating the documentation necessary to meet internal, customer carrier and government needs.

Table 21: load and generate documentation best practice

Metrics:	Best Practice:
• Documentation accuracy • Load product and generate delivery documentation cycle time • Delivery performance to customer commit date	• Cross docking

D1.12 Deliver Product- The process of delivering the product to the customer

Table 22: Deliver product best practice

Metrics:	Best Practice:
• % orders delivered in full • Delivery performance to customer commit date • Deliver product cycle time	• Cross docking

D1.13 Receive and verify product by customer- The process of receiving the shipment by the customer site and verifying that the order was delivered complete and that the product meets delivery terms

Table 23: Receive and verify customer best practice

Metrics:	Best Practice:
• % orders delivered in full • Delivery performance to customer commit date • Perfect condition • Receive and verify product by customer cycle time	• Advanced shipping notices

4. Chapter4

4.1 SCOR level 4 Analysis

The SCOR model constructed in the above section is for the purpose of benchmarking and finding continuous improvement initiatives for the seafrieght forwarding process at Safcor Panalpina. The best practices that are appropriate for the process were identified from the model and their level of implementation into Safcor Panalpina's forwarding process is discussed.

The highlighted best practices are the ones not implemented at Safcor currently

Warehouse best practice and metrics summary (make-to-stock)

In order to achieve increases in the responsiveness of the forwarding operation, the overall best practices of the make-to-stock (warehousing) is analysed.

Table 24: Best practice summary

Best Practice	**Level of implementation**
Accurate and approved work instructions for the warehouse operation	Currently the Unit 2 warehouse does have work instructions
Performance results compared to benchmarks(this refers to the warehouse objectives) • % achievement in cross docking	This metric is not established for analyses presently
Additional capacity for overflow(the use of flexible labour or machinery at times of capacity overflow)	A labour Broker is used in times of capacity overflow
Drum-buffer-rope scheduling technique(This is for times of capacity overflow – The scheduling of resources (labour and equipment) for the warehouse	Currently not used, scheduling is done on an ad-hoc basis
Schedule for warehouse departments optimises use of shared resources (between receiving and dispatching departments)	There is no present system which to manage/control this is
In-process product handling rules(to reduce damages due to products)	Yes this is done
Paperless production control, reduce chances operator error (bar-coding and scanning)	Yes there is for only certain products – HP computers

Sourcing best practice and metrics to consider

In order to identify continuous improvement initiatives in the sourcing process, the overall best practices are analysed and their level of implementation is discussed. The best practices below are the ones that are most appropriate and have a potential to improve the process.

Table 25: Sourcing best practice summary

Best Practice	Level of implementation
Carrier agreements – measured by immediate feedback and monthly reports	There are carrier agreements in place
Comparative analysis of Supplier Performance in sourcing decisions(for carriers) • Measurement of carrier performance for on-time delivery and completeness-ROA (acc. Receivable and cash assets)	Suppliers are sourced based on performance
Accurate and approved work instructions/process plans for sea freight desk controllers	Sea freight desk controllers have working instructions
Cost reduction and or cost avoidance opportunities identified, implemented and measured on a periodic basis	This is done by management but not necessarily formalised
Deliveries are balanced throughout each working day and week (deliveries are planned ahead of schedule for customer receipt from the warehouse) • Priority-based advanced delivery scheduling reservations, for key customers, with FIFO allocation for all others	This is not done and is difficult to achieve due to the fact that delivery times are dictated by the customers

As for metric analysis, Safcor has delay codes which are used to monitor delays of individual shipments. The average percentage of time which is taken by each delay code is displayed on the pie chart below.

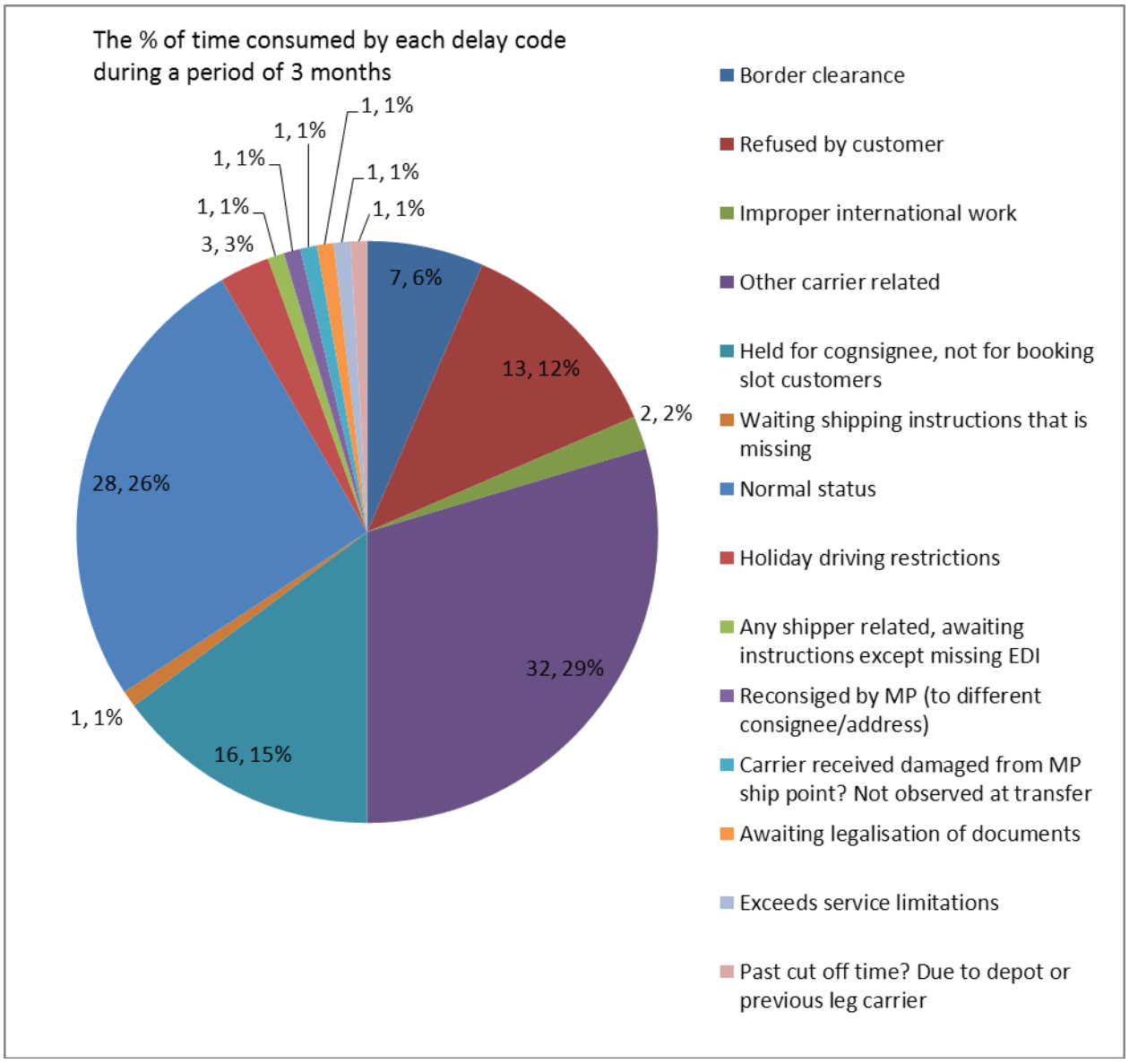


Figure 10: Percentage of time taken by each delay code

As can be concluded from the graph that the most delays are caused by

- Other carrier related
- Held for consignee, not for booking slot of customers
- Border clearance
- Holiday driving restrictions
- Improper international work

Deliver-stocked-product best practice

The best practices summarized on the table below are the ones with the most potential to bring about improvements in Safcor Panalpina seafrieght forwarding process. The ones highlighted in blue are the ones not currently implemented.

Best Practice	Level of implementation
To address conditions which cannot be adequately satisfied during the current planning period, each functional area develops prioritized recommendations for subsequent planning periods	Currently this is not done
Combine consolidation needs with other products/divisions/companies-To achieve full truck consolidation	Currently this is conducted to a certain degree (on an ad hoc basis).
Consolidate orders by customer, source, traffic lane, carrier, etc	This currently done as far as possible
Select carriers by least cost per delivery and rate using actual rates prior to release billing	Carriers are rated with the delay codes and set agreements are set in place which gives discounted rates.
Periodic review of metrics and strategy with comparisons to industry benchmarks	This is currently not done
Wave picking-consolidates orders into “waves” where multiple orders with similar characteristics are picked at once. Orders can be consolidated by customer, geography or any other criteria that makes sense	Not done

4.2 Conclusions

The objective of the project was to identify continuous improvement initiatives for the seafrieght forwarding operational leg of Safcor Panalpina's industry verticals via a benchmarking model. The SCOR model was used as a catalyst to construct the benchmarking model in the project. The SCOR model proved to contain numerous amounts of best practices as well as metrics which assist businesses to achieve their respective goals which are closely attached to their industry success.

The best practices suggested by the SCOR model need to be practically and specifically designed for the forwarding operation at Safcor Panalpina. It can be concluded that most of the best practices suggested by the SCOR model are already in place at Safcor. Advanced notices are used for the receiving and delivery department of the warehouse, work instructions for sourcing staff and the warehouse staff are present. Carrier agreements and SOP (statement of work) agreements are already in place with suppliers.

4.3 Recommendations

To summarize the continuous improvement initiatives for the warehouse

- A time study observation and standardization project should be done on the separate functions of the warehouse of receiving, allocation and dispatching using SCOR reliability metrics as diagnostics. Key issues that should be monitored.
    - The receiving preparedness of the warehouse.
    - The waiting time the dispatching department has to wait for delivery instruction to deliver which is determined by the invoicing department.
    - The planning and co-ordination of deliveries with respect to customer's receiving delivery times
    - Any other waiting time should be noted and resolved

To summarize the continuous improvement initiatives for the sourcing functions

- The assessment of supplier (carrier) performance is most important for the sourcing function. A project should be instituted to investigate the causes of the delays which can be improved on using a cause and effect analysis of the delays.
- The best practices identified from the SCOR model which are summarized in this document to be appropriate for the forwarding operation should be prioritized and practically designed.
- An effort should be made to conclude on a % cross docking achievement metric to be used to analyze the effects of improvement on the responsiveness of the warehouse.

4.4 Financial Perspective

The order processing time, as well as the transit time, affects the time required to receive a payment from a sale thereby affecting the accounts receivable and cash assets. Reductions in order-processing times, coupled with a reduction in the length of credit period extended to customers, reduce accounts payable and the cost of capital required to fund accounts payable. All these reductions in time improve the ROA (Return on Assets).

In appendix D the difference in profit is calculated for potential 5% improvement in on time-delivery from the current on-time delivery of 85% to 90%. The spreadsheet in appendix d contains symbols which explain the logic as to how the calculations are done. It can be concluded that a 5% improvement on on-time deliveries can yield a potential 30% to 50% improvement on profit generated by yearly orders.

The benefit of increasing on-time deliveries is that the percentage or rate of lost sales and invoice deductions or penalties, decrease due to more satisfied customers.

The initiation of a cycle time analysis project can be done by 2 vacation work students and the analysis of the delay codes may involve a cost of a new or modified information capturing system which may result in a cost incurred

4.5 Reference page

1. Gunasekaran, A., Patel, C., Tirtiroglu, E., 2001. Performance measures and metrics in a supply chain environment. International Journal of Operations & Production Management, 21 (1/2), p.71-87
2. Short, J.E., Venkatraman, N., 1992. Beyond business process redesign: redefining baxter's business network. Sloan Management Review 34 (1), 7–21.
3. Normann, R., Ramırez, R., 1993. From value chain to value constellation: designing interactive strategy. Harvard Business Review 71 (4), 65–77.
4. Brewer, P.C., Speh, T.W., 2000. Using the balanced scorecard to measure supply chain performance. Journal of Business Logistics 21 (1), 74–93.
5. Jabrouni, H., et al., Continuous improvement through knowledge-guided analysis in experience feedback. Engineering Applications of Artificial Intelligence (2011), doi:10.1016/j.engappai.2011.02.015
6. McNair C.J, Kathleen H.J Leibfried, 1992. Benchmarking: A tool for continuous improvement. Oliver Wight Publications, Inc.
7. Kee-hung Lai, Ngai E.W.T, Cheng T.C.E, 2002. Measures for evaluating supply chain performance in transport logistics. The journal of transportation research part E 38, 439 - 456
8. Brézillon, P.,1999. Context in problem solving: a survey. The Knowledge Engineering Review14(1),1–34.
9. Stewart, G., 1995. Supply chain performance benchmarking study reveals keys to supply chain excellence. Logistics Information Management 8 (2), 38–44.
10. Mentzer, J.T., Konrad, B.P., 1991. An efficiency/effectiveness approach to logistics performance analysis. Journal of Business Logistics 12 (1), 33–62.
11. Magnier, 2003. Value Stream Mapping. 2011-07-20. www.lean.org
12. Weber, Rosina O., Aha, David W., 2003. Intelligent delivery of military lessons learned. Decision Support Systems 34 (3), 287–304.
13. Kelleher, K. (1995). Cause-and-effect diagrams: Plain and simple. WI: Joiner Associates Incorporated.
14. Jayswal, A., et al. A sustainability root causes analysis methodology and its application. Computers and Chemical Engineering (2011)
15. Safcor Panalpina, 2009. Safcor Panalpina, A global supply chain of seamless motion.2009.http://safcorpanalpina.co.za. 2011-07-26.

Appendix A: Source Inputs and Outputs

Inputs and outputs for S1.1

Enablement Processes

Process	Inputs	Outputs
ES.6 Manage Incoming Product	• Contract Carrier Rates ES.8: This is concerned with selecting the appropriate and best inland transporter to transport the cargo from the Port to the warehouse. • Import/export requirements ES.8: This is concerned with processing all necessary and relevant documents with SARS for clearance for the cargo.	• Logistics Selection
Metrics: • Cost to manage incoming product • Manage Incoming product cycle time		Best Practices: • Appointment scheduling for pickup and delivery of customers shipments • Automated documentation for international shipments • Electronic manifest and electronic billing • Integrated order management, warehouse management, and transportation management systems view for analysis for all orders and shipments the following data: Logistics, product, cost, GL charging • Internet pooling(electronic brokerage of shipments) • Measurement of carrier performance for on-time delivery and completeness • Real-time shipment tracking(via internet)

Process	Inputs	Outputs
ES.2 Assess Supplier Performance	• Supplier data from ES.7: Structured carrier data	• Quality and delivery performance to ES.3: Measuring actual carrier performance against internal and/or external standards providing feedback to

		achieve and maintain performance required to meet the customers' needs • Supplier Performance to S1.1: The results of measuring the actual supplier performance on cost, quality and engineering based on an agreed set of measurements. • Supplier data to ES.7 Update structured carrier data
Metrics: • Assess Supplier Performance Cycle Time • Cost to Assess Supplier Performance		Best Practices: • Carrier Agreement • Comparative analysis of Supplier Performance in sourcing decisions • Continuous improvement and development is driven and measured through the performance review process • Cost reduction and or cost avoidance opportunities identified, implemented and measured on a periodic basis • Supplier Performance Assessment System • Suppliers are Evaluated, Selected and Qualified with Criteria Matched to Business Requirements and Competitive Needs • Supplier performance data collected and reported online on a real-time basis through extranet applications

Process	Inputs	Outputs
ES.9 Manage Supplier Agreements	• Supplier data from ES.7 Manage Supplier Network: Data information about the supplier	• Payment terms to S1.5: Authorisation of payments to carriers for services rendered.
Metrics: • Cost to Manage Supplier Agreements		Best Practices: • Carrier Agreements

• Manage Supplier Agreements Cycle Time	• Enterprise level policies/rules with local execution • Long term supplier agreements/partnerships • Optimized supply-chain processes, optimized supplier count, supplier and part rationalisation

Execution Processes

Process	Inputs	Outputs
M1.1 Schedule Warehouse activities	• Manage Equipment and Facilities EM.5: Time phased plans of (capacity required) all resources (Equipment and Facilities). Scheduled receiving activities • Scheduled Receipts D1.3: Determined delivery date	• D1.3 Determined delivery date: Arrival Notice
Metrics: • Capacity utilisation • Schedule achievement		Best Practices: • Accurate and approved work instructions/process plans • Paperless order tracking and customer visibility of orders

Inputs and Outputs for S1.2

Enablement Processes

Process	Inputs	Outputs
ES.2 Assess Supplier Performance	• Supplier data from ES.7: Mange Supplier Network	• Quality and delivery performance to ES.3: Measuring actual carrier performance against internal and/or external standards providing feedback to achieve and maintain performance required to meet

		the customers' needs • Supplier Performance to S1.1: The results of measuring the actual supplier performance on cost, quality and engineering based on an agreed set of measurements.

Metrics:	Best Practices:
• Assess Supplier Performance Cycle Time • Cost to Assess Supplier Performance	• Carrier Agreement • Comparative analysis of Supplier Performance in sourcing decisions • Continuous improvement and development is driven and measured through the performance review process • Cost reduction and or cost avoidance opportunities identified, implemented and measured on a periodic basis • Supplier Performance Assessment System • Suppliers are Evaluated, Selected and Qualified with Criteria Matched to Business Requirements and Competitive Needs • Supplier performance data collected and reported online on a real-time basis through extranet applications

Process	Inputs	Outputs
ES.8 Manage Import/Export Requirements	• Government Regulations from source	• Government Constraints to ED.7: Manage Product Life Cycle

Metrics:	Best Practices:
• Customs Clearance Cycle Time • Cost to Manage Import/Export Cycle Time	• Direct connections to Customs Clearance

• Manage Import/Export Requirements Cycle Time	

Process	Inputs	Outputs
ES.6 Manage Incoming Product	• Government Regulations from source	• Government Constraints to ED.7: Manage Product Life Cycle

Metrics:	Best Practices:
• Cost to manage incoming product • Manage incoming product cycle	• Appointment scheduling for pickup and delivery of customers shipments • Automated documentation for international shipments • Electronic manifest and electronic billing • Integrated order management, warehouse management, and transportation management systems view for analysis for all orders and shipments the following data: Logistics, product, cost, GL charging • Internet pooling(electronic brokerage of shipments) • Measurement of carrier performance for on-time delivery and completeness • Real-time shipment tracking(via internet)

Inputs and Outputs for S1.3

Enablement Processes

Process	Inputs	Outputs
ES.2 Assess Supplier Performance	• Supplier data from ES.7: Mange Supplier Network • Receipt Verification from S1.2	• Quality and delivery performance to ES.3: Measuring actual carrier performance against internal and/or external standards providing feedback to achieve and maintain performance required to meet

		the customers' needs • Supplier Performance to S1.1: The results of measuring the actual supplier performance on cost, quality and engineering based on an agreed set of measurements. • Supplier data to ES.7 Update structured carrier data
Metrics: • Assess Supplier Performance Cycle Time • Cost to Assess Supplier Performance		Best Practices: • Carrier Agreement • Comparative analysis of Supplier Performance • Supplier Performance System • Suppliers are Evaluated, Selected and Qualified with Criteria Matched to Business Requirements and Competitive Needs

Inputs and Outputs S1.4

Enablement Processes

Process	Inputs	Outputs
EM.6 Manage Transportation	• Projected Delivery Time from EM.7: Company's goal for the time to ship the product after the receipt of a customer's order • WIP Handling Rules, Move Information and Methods from Plan and Source	• Delivery location to S1.4
Metrics: • Cost to manage transportation • Transportation cycle time		Best Practices: • Short move paths • Reduce in-process product handling

Execution Processes

Process	Inputs	Outputs
D1.3 Reserve Inventory and Determine Delivery Date	• Delivery Plans from P4.4: Establish Delivery Plans • Available delivery times from M1.1 Schedule Warehouse Activities	• Determined Delivery Date and tracking updates
Metrics: • % orders delivered in full • Cost to determine delivery date • Delivery Performance to customer commit date • Fill Rate • Order fulfilment dwell time • Determine Delivery date Cycle Time		Best Practices: • Available to Promise • Priority-based inventory reservations, for key customers, with FIFO allocation for all others • Inventory allocation exception process is clearly defined and jointly owned by manufacturing and sales • Automatic Reservation of inventory and dynamic sourcing of product for single shipment to customer

Process	Inputs	Outputs
S1.5 Authorise Supplier Payment	• Payment Terms from ES.9 Manage Supplier Agreements • Transferred Product from S1.4	
Metrics: • Authorise Supplier Payment on Time • Cost to Authorise Supplier Payment		Best Practices: • Pay on Receipt

Appendix B: Make Inputs and Outputs

Inputs and Outputs for M1.1

Enablement Processes

<table>
<tr><td>Process</td><td>Inputs</td><td>Outputs</td></tr>
<tr><td>EM.5 Manage Equipment and Facility</td><td>• Equipment and Facilities Monitoring information from source company
• Manufacturers recommended maintenance schedules and specifications from source company
• Production plans from P3.4: Master production plan
• Production Quality and Policies from EM.2: Operational techniques and planned systematic activities</td><td>• Equipment and facilities maintenance history
• Equipment and facilities replacement and disposition plans to P3.2
• Equipment and facilities plans schedules and plans to M1.1
• Parts and services consumed to ES.5 Manage capital assets
• Preventative maintenance and calibration to M1.1
• Production Status to EM.7: Manage production network</td></tr>
<tr><td colspan="2">Metrics:
• Actual Asset life maintenance cost as % of replacement value
• Cost to Manage make equipment and facilities
• Manage make equipment and facilities Cycle Time</td><td>Best Practices:
• Changeover Reduction/Continuous improvement program
• Facility & equipment environmental/ safety audit system
• Factory floor electronic decision making information system: Capability of predicting ”best cost action plan” for maintenance
• Minimise capital assets required and maintenance required
• Predictive Maintenance monitoring(Heat, Noise, Lubrication composition and vibration)
• Total preventative maintenance program
• Systematic disposition of equipment
• Supplier managed inventory of parts</td></tr>
</table>

Execution Processes

Process	Inputs	Outputs
S1.1 Schedule product deliveries	• Manage Equipment and Facilities EM.5: Time phased plans of (capacity required) all resources (Equipment and Facilities). Scheduled receiving activities • Scheduled Receipts D1.3: Determined delivery date	• D1.3 Determined delivery date: Arrival Notice
Metrics: • % Schedules changed within suppliers lead time • Average days per schedule change • Average release cycle of changes • Schedule product deliveries cycle time • Cost to schedule product deliveries		Best Practices: • Carrier Agreements

Process	Inputs	Outputs
Information feedback from M1.5, M1.4, M1.3, M1.3	• Information flow back to monitor actual performance compared to planned	• Performance feed back to management
Metrics: • Capacity Utilization • Cost to schedule Production activities • Schedule achievement • Schedule Production Activities Cycle Time		Best Practices: • Additional capacity for overflow • Cross training certification • Drum-buffer-rope scheduling technique • production data, inventory levels, and schedule data requirements are 99% accurate • Provide scheduling output back to material and labour planning systems • Schedule optimises use of shared resources

Process	Inputs	Outputs
S1.1 Scheduled production activities	• Logistics selection ES.6: Manage Incoming Product • D1.3 Determined delivery date to client • Schedule Receipts to warehouse	• ES.9 Manage supplier agreements • D4.2 Receive Product at store: Product due to arrive

Metrics:	Best Practices:
• % Schedules changed within suppliers lead time • Average days per schedule change • Average release cycle of changes • Schedule product deliveries cycle time • Cost to schedule product deliveries	• Advanced shipping notices between Source and Make • Consignment agreements are used to reduce assets and cycle time while increasing the availability of critical items • Mechanical (Kanban) pull signals are used to notify suppliers of the need to deliver product • Utilize EDI transactions to reduce cycle times

Process	Inputs	Outputs
D1.3 Reserve Inventory and Determine Delivery Date	• Delivery Plans from P4.4: Establish Delivery Plans • Arrival notice from S1.4	• Determined Delivery Date and tracking updates

Metrics:	Best Practices:
• % orders delivered in full • Cost to determine delivery date • Delivery Performance to customer commit date • Fill Rate • Order fulfilment dwell time	• Available to Promise • Priority-based inventory reservations, for key customers, with FIFO allocation for all others • Inventory allocation exception process is clearly defined and jointly owned by manufacturing and sales

• Determine Delivery date Cycle Time	• Automatic Reservation of inventory and dynamic sourcing of product for single shipment to customer

Process	Inputs	Outputs
D1.8 Receive product from Source or Make	• M1.1 Scheduled warehouse activities • S1.1 Scheduled product deliveries	• ED.4 Manage finished goods inventory goods • Inventory availability to D1.9
Metrics: • Cost to receive product from Source or make • Receive product from source or make cycle time		Best Practices: • Automatic identification • Cross docking • Download P.O & advanced ship notices for automated receiving and put away • Dynamic location assignment including lot control, zoned put away, quality assurance, ABC frequency of access • Merge-in-transit

Inputs and Outputs for M1.2

Enablement Processes

Process	Inputs	Outputs
EM.4 Manage In-process products(WIP)	• Incoming product information from source	• WIP handling rules to M1.2, Deliver and Plan • WIP handling rules to EM.6
Metrics: • Cost to manage in-process products(WIP) • Inventory days of supply • Manage in-process products cycle time		Best Practices: • Dunnage control • FIFO • In-process product handling rules • Minimum product handling • Optimize packing

	• Statistical test count • Vendor managed inventory

Execution Processes

Process	Inputs	Outputs
D1.3 Reserve Inventory and Determine Delivery Date	• Delivery Plans from P4.4: Establish Delivery Plans • Arrival notice from S1.4	• Determined Delivery Date and tracking updates
Metrics: • % orders delivered in full • Cost to determine delivery date • Delivery Performance to customer commit date • Fill Rate • Order fulfilment dwell time • Determine Delivery date Cycle Time		Best Practices: • Available to Promise • Priority-based inventory reservations, for key customers, with FIFO allocation for all others • Inventory allocation exception process is clearly defined and jointly owned by manufacturing and sales • Automatic Reservation of inventory and dynamic sourcing of product for single shipment to customer

Inputs and Outputs for M1.5

Plan Processes

Process	Inputs	Outputs
P3.4 Establish Production Plans	• P3.3 Balance Production Resources with Production Requirements	• Production plan to EM.5 Manage Equipment and facilities • Production plans to P2.1 Identify, prioritise, and aggregate product requirements • Production plans to P4.2 Identify, assess, and aggregate delivery resources and capabilities

		• Production plans to EM.2 Manage Production Performance • Production plans to P1.2 Identify, assess, aggregate supply chain resources
Metrics: • Cost to establish production plans • Establish production plans cycle time		Best Practices: • Unplanned orders are accepted and scheduled only when there is no detrimental impact on overall product delivery plan

Inputs and Outputs for M1.6

Process	Inputs	Outputs
D1.8 Receive product from Source or Make	• M1.1 Scheduled warehouse activities • S1.1 Scheduled product deliveries from source (arrival notice)	• ED.4 Manage finished goods inventory goods • Inventory availability to D1.9
Metrics: • Cost to receive product from Source or make • Receive product from source or make cycle time		Best Practices: • Automatic identification • Cross docking • Download P.O & advanced ship notices for automated receiving and put away • Dynamic location assignment including lot control, zoned put away, quality assurance, ABC frequency of access • Merge-in-transit

Appendix C: Deliver Inputs and Outputs

Inputs and outputs for D1.2

Enablement Processes

Process	Inputs	Outputs
ED.1 Manage Deliver Business Rules	• Configuration rules from company • Planning decision policies from source • Supply chain metrics	• Configuration rules • Order rules
Metrics: • Cost to manage deliver business rules • Manage deliver business rules cycle time		Best Practices: • Integrated edit at order entry time • On-line rule base

Process	Inputs	Outputs
ED.2 Assess Delivery Performance	• Benchmark data from Source • Carrier contracts from source • Delivery performance from D1.2, ED.5, ED.6, ED.4	• Supply chain metrics to EP.2 , ED.1, ED.5 • Customer Service Requirements to ED.6, Plan • Management Process Reports
Metrics: • Assess delivery performance cycle time • Cost to assess delivery performance • Documentation accuracy • Perfect Condition		Best Practices: • Customer initiated package tracking • Real time package tracking

Process	Inputs	Outputs
ED. 3 Manage Deliver Information	• Contract status from D1.2 • Credit history from D1.2 • Customer Address data from D1.2 • Purchase History from D1.2 • Delivery Preferences from D1.2	• Customer master database to ED.4
Metrics: • Cost to manage deliver information • Manage deliver information cycle time		Best Practices: • Online Real-time customer entry and edit • Provide single source of information on the customer (Quality of customer data/Single group) • Comprehensive history of customer interactions including order history

Process	Inputs	Outputs
ED.6 Manage Transportation	• Carrier rates from source company • Customer order size, weight, and freight class from D1.2 • Projected delivery requirements from source • Standard practices from Plan	• Delivery performance to ED.2 • Delivery parameters and documentation to D1.11
Metrics: • Cost to manage transportation • Manage transportation cycle time		Best Practices: • Appointment scheduling for pickup and delivery of customers deliveries • Automated documentation for international shipments • Backhaul trading exchange

	• Electronic manifest and electronic billing • Integrated order management, warehouse management, and transportation management systems view for analysis for all orders and shipments the following data: Logistics, product, cost, GL charging • Internet pooling(electronic brokerage of shipments) • Measurement of carrier performance for on-time delivery and completeness • Real-time shipment tracking(via internet)

Process	Inputs	Outputs
ED.7 Manage Product Life Cycle	• Carrier rates from source company • Customer order size, weight, and freight class from D1.2 • Projected delivery requirements from source • Standard practices from Plan	• Delivery performance to ED.2 • Delivery parameters and documentation to D1.11
Metrics: • Cost to manage product life cycle • Manage product life cycle time		Best Practices: • Standard operating procedures and methodology

Planning Processes

Process	Inputs	Outputs
P5.1 Assess, and Aggregate Return Requirements	• Actual sales history from D1.2 • Business return rules processes from ER.1 • Contractual obligations from source Plan • Delivery plans from P4.4 • Historical return rates from SR1.3	

	• Return regulatory requirements from ER.8 • Revised business assumptions from EP.9, EP.5 • Supply chain plans	
Metrics: • Cost to identify, prioritize, and aggregate return requirements • Identify, prioritize, and aggregate return requirements cycle time		Best Practices: • Real time return anticipation

Inputs and outputs for D1.3

Planning Processes

Process	Inputs	Outputs
P1.1 Identify, Prioritize, and Aggregate Supply Chain Requirements	• Customer requirements from source • Order backlog from D1.3 • Planning data from EP.3 • Revised aggregate forecast and projections from EP.9 • Revised business assumptions from EP.9	
Metrics: • Forecast accuracy • Cost to Identify, Prioritize, and Aggregate Supply Chain Requirements • Identify, Prioritize, and Aggregate Supply Chain Requirements		Best Practices: • Collaborations among operation strategy • Digital links among supply chain members • Joint service agreements • Push-based forecasts are replaced with customer replenishment pull based signals • Supply chain advance planning system • Systems support accurate on-line visibility of full stream demand requirements and priorities

Process	Inputs	Outputs
P4.1 Identify, Prioritize, and Aggregate Delivery Requirements	• Actual shrink from source • Vendor lead Time from Source • Deliver Return Requirements from P5.4 • EOQ from source • Item Master from EP.7 • Markdown Plans from Source • Order Backlog from D1.3 • Service levels from EP.1 • Year to Year for like SKU/Subclass from Source	• Delivery requirements to P4.3 • Item Stocking Requirements to D4.2

Metrics:	Best Practices:
• Forecast accuracy • Cost to Identify, Prioritize, and Aggregate Delivery Requirements • Identify, Prioritize, and Aggregate Delivery Requirements Cycle Time	• Customer relationship and digital linkages provide accurate visibility into actual demand via customer forecasts, production plans and inventory positions • Forecasts are replaced with actual customer replenishment signals and orders where possible • Unplanned orders are accepted and scheduled only when there is no detrimental impact on overall product delivery plan

Process	Inputs	Outputs
P4.2 Identify, Prioritize, and Aggregate Resource Requirements and Capabilities	• Customer requirements from source • Order backlog from D1.3 • Planning data from EP.3 • Revised aggregate forecast and projections from EP.9 • Revised business assumptions from EP.9	

Metrics:	Best Practices:
• Forecast accuracy • Cost to Identify, Prioritize, and Aggregate Production Resources • Identify, Assess, and Aggregate Delivery Resources Cycle Time	• None stipulated

Process	Inputs	Outputs
P4.4 Establish Delivery plans	• Customer requirements from source • Order backlog from D1.3 • Planning data from EP.3 • Revised aggregate forecast and projections from EP.9 • Revised business assumptions from EP.9	• Delivery plans to P1.2, D1.3, P5.1, P2.1, • Delivery plans to PM1.5, M2.5

Metrics:	Best Practices:
• Forecast accuracy • Cost to Identify, Prioritize, and Aggregate Production Resources • Identify, Assess, and Aggregate Delivery Resources Cycle Time	• Plans that violate business rules are addressed cross-functionally, considering total business impacts • Plans which do not violate business rules are communicated cross-functionally, according to defined business rules • To address conditions which cannot be adequately satisfied during the current planning period, each functional area develops prioritized recommendations for subsequent planning periods

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Inputs and Outputs for D1.5

Plan Processes

Process	Inputs	Outputs
P4.2 Identify, Prioritize, and Aggregate Resource Requirements and Capabilities	• Customer requirements from source • Order backlog from D1.3 • Planning data from EP.3 • Revised aggregate forecast and projections from EP.9 • Revised business assumptions from EP.9	
Metrics: • Forecast accuracy • Cost to Identify, Prioritize, and Aggregate Production Resources • Identify, Assess, and Aggregate Delivery Resources Cycle Time		Best Practices: • None stipulated

Inputs and outputs for D1.8

Enablement Processes

Process	Inputs	Outputs
ED.4 Managed finished goods inventories	• Customer master database/up to date from ED.3 • Order rules from ED.1 • Returns data from ED.8 • Product mix plans from Source	• Delivery performance to ED.2 • Finished goods inventory target levels to P4.2 • Finished goods inventory location to S1.4 • Inventory rules to ED.5
Metrics: • % orders delivered in full • Cost to manage finished goods inventories		Best Practices: • Periodic review of metrics and strategy with comparisons to industry benchmarks

Inputs and outputs for D1.11

Planning Processes

Process	Inputs	Outputs
P1.1 Identify, Prioritize, and Aggregate Supply Chain Requirements	• Customer requirements from source • Order backlog from D1.3 • Planning data from EP.3 • Revised aggregate forecast and projections from EP.9 • Revised business assumptions from EP.9	
Metrics: • Forecast accuracy • Cost to Identify, Prioritize, and Aggregate Supply Chain Requirements • Identify, Prioritize, and Aggregate Supply Chain Requirements		Best Practices: • Collaborations among operation strategy • Digital links among supply chain members • Joint service agreements • Push-based forecasts are replaced with customer replenishment pull based signals • Supply chain advance planning system • Systems support accurate on-line visibility of full stream demand requirements and priorities

Enablement Processes

Process	Inputs	Outputs
ED.6 Manage Transportation	• Carrier rates from source company • Customer order size, weight, and freight class from D1.2 • Projected delivery requirements from source • Standard practices from Plan	• Delivery performance to ED.2 • Delivery parameters and documentation to D1.11

Metrics:	Best Practices:
• Cost to manage transportation • Manage transportation cycle time	• Appointment scheduling for pickup and delivery of customers deliveries • Automated documentation for international shipments • Backhaul trading exchange • Electronic manifest and electronic billing • Integrated order management, warehouse management, and transportation management systems view for analysis for all orders and shipments the following data: Logistics, product, cost, GL charging • Internet pooling(electronic brokerage of shipments) • Measurement of carrier performance for on-time delivery and completeness • Real-time shipment tracking(via internet)

Process	Inputs	Outputs
ED.8 Manage Import/Export Requirements	• Government Regulations from source • Shipping history from D1.11	• Government Constraints to ED.7: Manage Product Life Cycle • Delivery export parameters and documentation to D1.11

Metrics:	Best Practices:
• Customs Clearance Cycle Time • Cost to Manage Import/Export Cycle Time • Manage Import/Export Requirements Cycle Time	• Direct connections to Customs Clearance • Assessing export/import requirements during time of product development/manufacture

Appendix D: Financial Analysis

- Annual orders :An average of 1600 orders per month was used, this figure is for all seafrieght orders in all channels
- Profit mark of 15% was used
- Invoice deduction percentage of 10% was used for rectified orders therefore becomes 5% mark up
- **Assumptions:**
  The assumptions are indicated next to the value. These assumptions are there to protect Safcor Panalpina's confidentiality
- **Calculation:**

  The calculation takes into account

  1. Lost sales
  2. Cost to rectify orders

  The symbol column explains each line calculation

	Symbol	On-Time rate 85%	On-Time rate 90%	Input data	85%	90%	
Annual orders	AO	19200	19200	%CF	0.85	0.9	
Orders filled correctly	OFC=AO*%CF	16320	17280	Annual orders	19200	19200	
Service failure orders	SF=AO-OFC	2880	1920	SP=Revenue/order	57.5	57.5	(assumption)
lost sales orders	LS=SF*LSR	144	57.6	CG=Cost of goods/order	50	50	(assumption)
Rectified orders	RO=SF-LS	2736	1862.4	LSR=Lost sales rate	0.05	0.03	(assumption)
Net orders sold	NOS=AO-LS	19056	19142.4	RCO=Rehandling cost/order	23	23	(assumption)
				IDR=Invoice deduction rate	11.5	11.5	(assumption)
Sales	S=SP*AO	1104000	1104000	Transportation cost	6000	6000	(assumption)
Less: Invoice deduction lost sales revenue	ID=IDR*RO	31464	21417.6	Warehousing cost	1500	1500	(assumption)
lost sales revenue	LSR=LS*SP	8280	3312				
Net sales	NS=S-ID-LSR	1064256	1079270.4	Interest cost	3000	3000	(assumption)
COGS	CGS=CG*(NOS)	952800	957120	Other operating cost	5000	5000	
Gross margin(GM)	GM=NS-CGS	111456	122150.4	Inventory	6000	6000	(assumption)
Rehandle cost	RC=RCO*SF	66240	44160	Cash	40000	40000	(assumption)
Transportation	TC	6000	6000	Accounts recievable	1000	1000	(assumption)
Warehousing	WC	1500	1500	Fixed Assets	1500	1500	(assumption)
Inventory carrying	IC=IN*W	600	600	W=Inventory carrying rate	0.1	0.1	(assumption)
Other operating cost	OOC	5000	5000	INT	0.09	0.09	(assumption)
Total operating cost	TOC	79340	57260	TX	0.4	0.4	(assumption)
earnings before interest and tax	EBIT=GM-TOC	32116	64890.4				
interest	INT	2890.44	5840.136				
Tax(40%*(EBIT-INT))	TX	11690.224	23620.1056				
Net Income	NI=EBIT-INT-TX	17535.336	35430.1584				
Profit increase of 50% improvement			**17894.8224**				