

Supply Chain Management

Pure & Simple



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Introduction

I have been working in the supply chain field for over three decades. It is a fascinating area because this is where the connection from raw materials to everything we consume happens. It is called supply chain for a reason because there are many links from extracting raw materials through production, shipping, retailing, to consumption.

Each element of the supply chain is a very distinct process requiring vast resources in people, equipment, buildings, infrastructure, software. Each function within the supply chain is a topic of study and a field of expertise.

Supply Chain Management (SCM) is the discipline of coordinating all the activities of the chain in the most effective manner, minimizing waste and maximizing value. It does not concern itself with executing the actual physical processes of manufacturing, shipping, selling, but with the planning of the execution. I have often said that while the quality of execution depends on the professionals doing the work, the results of the execution depend on the quality of the plan.

The key functions of supply chain management are:

1. Forecasting
2. Production Planning/Master Scheduling
3. Inventory Planning
4. Material Requirement Planning
5. Capacity Planning
6. Purchasing (Sourcing & Procurement)
7. Detailed Production Scheduling
8. Distribution Planning

Introduction

We will cover all of the planning areas in detail and we also provide overviews of some of the execution processes.

In the critical areas of forecasting, production planning, and inventory planning we will explain the detailed mathematics and algorithms that drive software. There will be examples and worksheets for you to fill in so you get a hands on feel for how the planning engine works. The actual math is simple, basic arithmetic. The application to thousands of items and millions of daily calculations to get data for planning and decision making when you need them is what makes it highly complex. We will have workshops allowing you to understand your current supply chain management set ups and capabilities and then lead you to defining what you want to change.

There are many supply chain management resources available. Books, seminars, even degree programs can be found. And most of them are well constructed by excellent professionals, practitioners, and academics.

But they all take time and/or are fairly expensive. The main reasons they take time are:

1. There is excruciating detail
2. The scope is extended to include other management topics

We have taken the essentials, all you really need, and present them in a “pure & simple” format, including a recommended minimum set of metrics (key performance indicators)

This course is for you to review and understand all the functions within supply chain management, no fluff. It will guide you to redesign your organization, your processes, and your software as you deem necessary.

Agenda



Day 1: Morning Session

- Supply Chain Management Overview
- Workshop #1: Defining Your Supply Chain
- Supply Chain Flows
- Supply Chain Design – People, Process, Tools (Systems)
- Workshop #2: Current State – People, Processes, Tools

Day 1: Afternoon Session

- Supply Chain Flows – Forecasting
- Workshop # 3: Current State Forecasting & Demand Planning

Day 2: Morning Session

- Supply Chain Flows - Master Production Scheduling
- Workshop # 4: Current State MPS
- Supply Chain Flows - Materials Requirement Planning
- Workshop # 5: Current State MRP

Agenda

Day 2 Afternoon Session

- Supply Chain Flows – Production Schedule & Capacity Planning
- Workshop # 6: Production Scheduling & Capacity Planning – Current State
- Supply Chain Flows – Purchasing & Capital Procurement
- Workshop # 7: Purchasing

Day 3 Morning Session

- Supply Chain Flows – Labour & Material Schedules
- Supply Chain Flows – Production
- Supply Chain Flows – Warehousing
- Supply Chain Flows – Shipping
- Workshop # 8: Warehousing & Shipping

Day 3 Afternoon Session

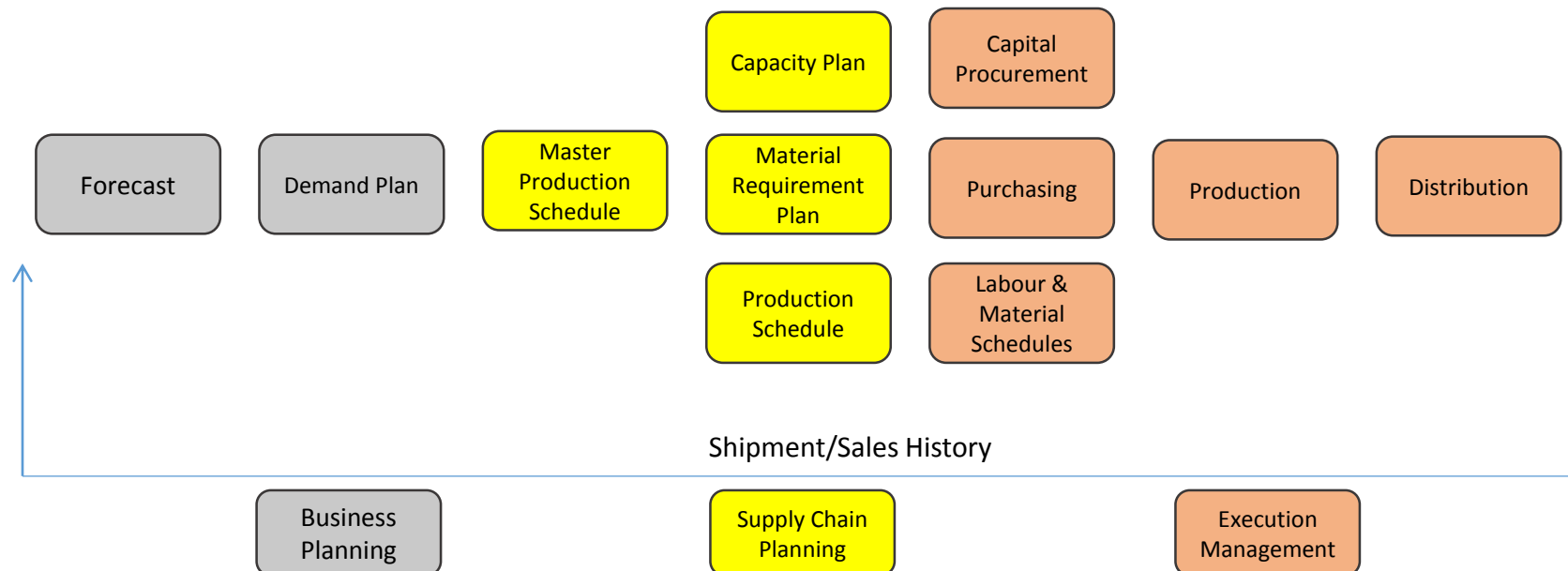
- Metrics/Key Performance Indicators
- Parking Lot Items
- Time Buffer



Supply Chain Flows

Flow of information makes or breaks the success of supply chain management:

1. Time – planning horizon and frequency of analysis/review
2. Quality of information – data accuracy
3. Aggregation of information – analysis & decision making
4. Disaggregation of information – allow for higher level inputs, such as forecast by business units, and break it down to the lowest level required for action



Forecast Accuracy Metric

There are many ways to measure forecast accuracy, and text books have been written about them. A common method is Mean Absolute Percent Error or MAPE.

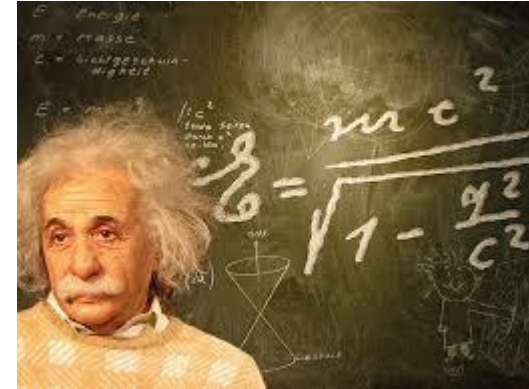
Statistically MAPE is defined as the average of percentage errors.

$$M = \frac{1}{n} \sum_{t=1}^n \left| \frac{A_t - F_t}{A_t} \right|,$$

- M Mean
- n Number of time periods of measurement
- t time period
- A_t actual value of sales/shipment
- F_t forecast value

$$\text{MAPE} = M * 100$$

$$\text{Forecast Accuracy} = 100\% - \text{MAPE}\%$$



Supply Chain Flows

Forecast

Demand Plan

Forecast accuracy calculation example:

SKU # 1 Month	Ft	At	At - Ft	At - Ft	$\frac{ At - Ft }{At}$
1	80	100	20	20	0.20
2	200	160	-40	40	0.25
3	100	80	-20	20	0.25
4	210	250	40	40	0.16
Sum	590	590	0	120	0.86

Example: FC accuracy target is 85%

$$MAPE = \frac{0.86}{4} * 100 = 21.5\%$$

FC Accuracy = 100% - 21.5%
= 78.5% (Fails Target)

This metric gets complex when aggregating different SKUs or time buckets. Let's add a second SKU:

SKU #2 Month	Ft	At	At - Ft	At - Ft	$\frac{ At - Ft }{At}$
1	110	100	-10	10	0.10
2	99	110	11	11	0.10
3	210	200	-10	10	0.05
4	270	250	-20	20	0.08
Sum	720	660	-29	51	0.33

MAPE = 8.25%

FC Accuracy = 91.75%

Passes Target

The aggregated MAPE for the 2 SKUs = 14.875%, FC Accuracy = 85.125%. Aggregating results in an overall Pass

Supply Chain Flows

Forecast

Demand Plan

Forecast Accuracy Exercise:

Fill in the blanks in the table and calculate MAPE, FC Accuracy

SKU Month	Ft	At	At - Ft	At - Ft	$\frac{ At - Ft }{At}$
1	220	200			
2	198	220			
3	420	400			
4	540	500			
Sum					

MAPE = %

FC Accuracy = %

Pass/Fail:

Forecast & Demand Planning Design

1. People
 - Who should forecast ?
 - Who should develop demand plan?
2. Processes (current state):
 - Forecast SIPOC(s) **
 - Demand Plan SIPOC(s)
 - Forecast KPIs & Metrics
3. Tools/Systems
 - Forecast software
 - Demand plan software
 - Any gaps to where we want to be?

**Suggestion: Use SIPOC methodology (next slide)

Workshop # 3: SIPOC Instructions

Forecast

Demand Plan

SIPOC is our preferred way of defining individual processes. We will define SIPOC and explain how to fill them out here. All SIPOCs are created the same way.

Supplier (S): The person/organization providing the input to the process

Input (I): The specific data inputs to the process

Process (P): The actual process, algorithm, or math that converts inputs to outputs

Output (O): The specific data outputs

Customer (C): The persons/organizations receiving the data outputs

SIPOCs are best filled out by a group consisting of all stakeholders.

Each SIPOC will have a filled out example to give you an indication of the type of information required. Each case is unique and you will need to decide what makes sense for you.

We use the same SIPOC chart to record any gaps we discovered in the discovery process.

We then make a list of gap closing actions everyone agreed to. These actions then form the deliverables for an implementation project plan.

Workshop # 3: SIPOC Example

Forecast

Demand Plan

Forecast Current	SUPPLIER	INPUT	PROCESS	OUTPUT	CUSTOMER
Forecast Data	Sales Managers Jim and Linda	Cases by customer	Keyed into Excel and uploaded to FC software	SKU Forecast by customer	Demand Planners Fred and Sue
Calculations			FC software converts aggregate input to detailed output (below)		
Horizon		24 months	24 months	24 months	
Time Bucket		Year	Weekly	weekly	
Item Aggregation		Brand family	Brand family	SKU	
Location (Org)		Customer	Customer, aggregates to business unit	Customer	
Frequency		Annual	Annual	Annual	
Software		Excel	Oracle Demantra	Oracle Demantra	

Workshop # 3: Forecasting SIPOC

Forecast

Demand Plan

Forecast Current	SUPPLIER	INPUT	PROCESS	OUTPUT	CUSTOMER
Forecast Data					
Calculations					
Horizon					
Time Bucket					
Item Aggregation					
Location (Org)					
Frequency					
Software					

Workshop # 3: Forecasting Gaps

Forecast

Demand Plan

Forecast Future	SUPPLIER GAP	INPUT GAP	PROCESS GAP	OUTPUT GAP	CUSTOMER GAP
Forecast Data					
Calculations					
Horizon					
Time Bucket					
Item Aggregation					
Location (Org)					
Frequency					
Software					

Workshop # 3: Forecasting Gap Closure

Forecast

Demand Plan

Forecast Future	SUPPLIER GAP CLOSER	INPUT GAP CLOSER	PROCESS GAP CLOSER	OUTPUT GAP CLOSER	CUSTOMER GAP CLOSER
Forecast Data					
Calculations					
Horizon					
Time Bucket					
Item Aggregation					
Location (Org)					
Frequency					
Software					