



QAD Enterprise Applications 2012
Enterprise Edition

Training Guide

Demand Management 6.1 Domain

Knowledge

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QAD Enterprise Applications 2012
February 2012

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Change Summary

The following table summarizes significant differences between this document and the last published version.

[illegible]

About This Course

Course Description

QAD designed this course to cover the basics of preparing to set up and use the QAD Demand Management (DM) program. The course includes hands-on activities and exercises that allow students to practice key concepts and processes in DM.

Course Objectives

By the end of this class, students will:

- Understand the importance of Demand Management in a business enterprise
- Recognize the impact of forecast errors on inventory levels and customer service
- Analyze some key business decisions before setting up DM
- Determine business requirements for setting up and using DM
- Understand the relationships of components in the DM program & Planning Portal
- Set up DM to best match the business rules of an organization

Audience

- DM technical support
- Appropriate business managers
- Implementation consultants and members of implementation teams
- Key end users

Prerequisites

- Demand Management User Learning Path
- Practical Guide to Business Forecasting (available April 15, 2012)

Course Credit and Scheduling

QAD designed this course to take 32 hours.

System Requirements

This course uses the QAD Enterprise Applications Enterprise Edition database. See the title page for the exact database title. Whether you are studying this material in a classroom or as a self-study exercise, this is launched in a virtual environment management system. QAD instructors will prepare classroom environments. If you encounter questions or problems on QAD software that are not addressed in this book, several resources are available.

Virtual Environment Information

Enterprise Edition 2011 Add-Ons r02, 10USACO

QAD Resources

If you encounter questions or problems on QAD software that are not addressed in this book, several resources are available.

Product Help

All QAD products ship with integrated help systems. A properly installed QAD application will display help when you press the Help key (F1), or access it through the menu. The help covers the normal use of the product.

QAD Web Resources

The QAD website provides product and company overviews. The Print Solution option on the opening page provides a means of compiling desired content into a document specialized to your industry, business implementation, and needs.

<http://www.qad.com/>

From QAD's main site, you can access QAD's Learning or Support sites.

QAD Learning Portal for Training Opportunities

To view available training courses, locations, and materials, use the QAD Learning Portal. Choose Learning under the Global Services tab to access this resource.

QAD Support for Product Documentation and the QAD Knowledgebase

To access release notes, user guides, installation and conversion guides by product and release, visit the Support website. Support also offers an array of tools depending on your company's maintenance agreement with QAD. These include the Knowledgebase and direct links to QAD Support experts.

Choose Support under the Global Services tab.

Any QAD customer can register for a QAD web account by accessing the Support web site and clicking the Accounts link at the top of the screen. Your customer ID number is required. Access to certain areas is dependent on the type of agreement you have with QAD.

Chapter 1

QAD Value Chain Certification

Types of Demand

Basics of Demand Management & Forecasting

Agenda

- **Types of Demand**
- Basics of Demand Management
- Basics of Forecasting



Two Types of Demand

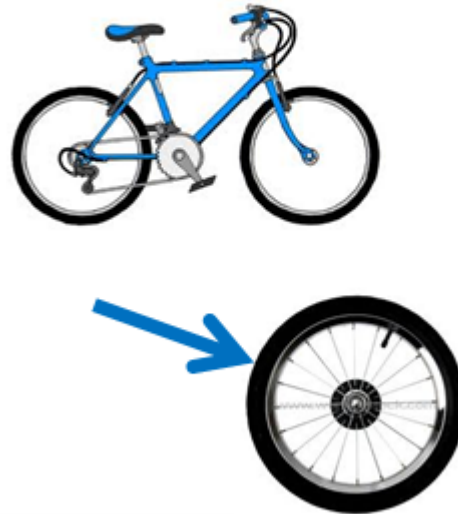
Types of Demand

Two Types of Demand

Independent Demand



Dependent Demand



Independent Demand

Types of Demand

Independent Demand

- Definition: demand for an item which is unrelated to the demand for any other item
- Demand directly from customer
- Includes samples, replacement parts
- Independent demand must be forecast



Dependent Demand

Types of Demand

Dependent Demand

- Definition: demand for an item which is directly related to or derived from the demand for other items
- A material or component
- Should be calculated



Knowledge Check

Knowledge Check

For a GM Assembly Plant, Tires Are

- a) Independent demand items
- b) Dependent demand items

Knowledge Check

For a GM Assembly Plant, Tires Are

- a) Independent demand item
- b) Dependent demand item

Knowledge Check

For a Goodyear Tire Plant, Tires Are

- a) Independent demand items
- b) Dependent demand items

Knowledge Check

For a Goodyear Tire Plant, Tires Are

- a) Independent demand items
- b) Dependent demand items

Basics of Demand Management

Basics of Demand Management & Forecasting

Agenda

- Types of Demand
- **Basics of Demand Management**
- Basics of Forecasting



Demand Management Defined

Basics of Demand Management

Demand Management Defined

- The function of recognizing all demands for goods and services and managing those demands to support the marketplace.



Sources of Demand

Basics of Demand Management

Sources of Demand

- Consumers
- Customers
- Dealers
- Distributors
- Interplant
- Service parts
- Samples



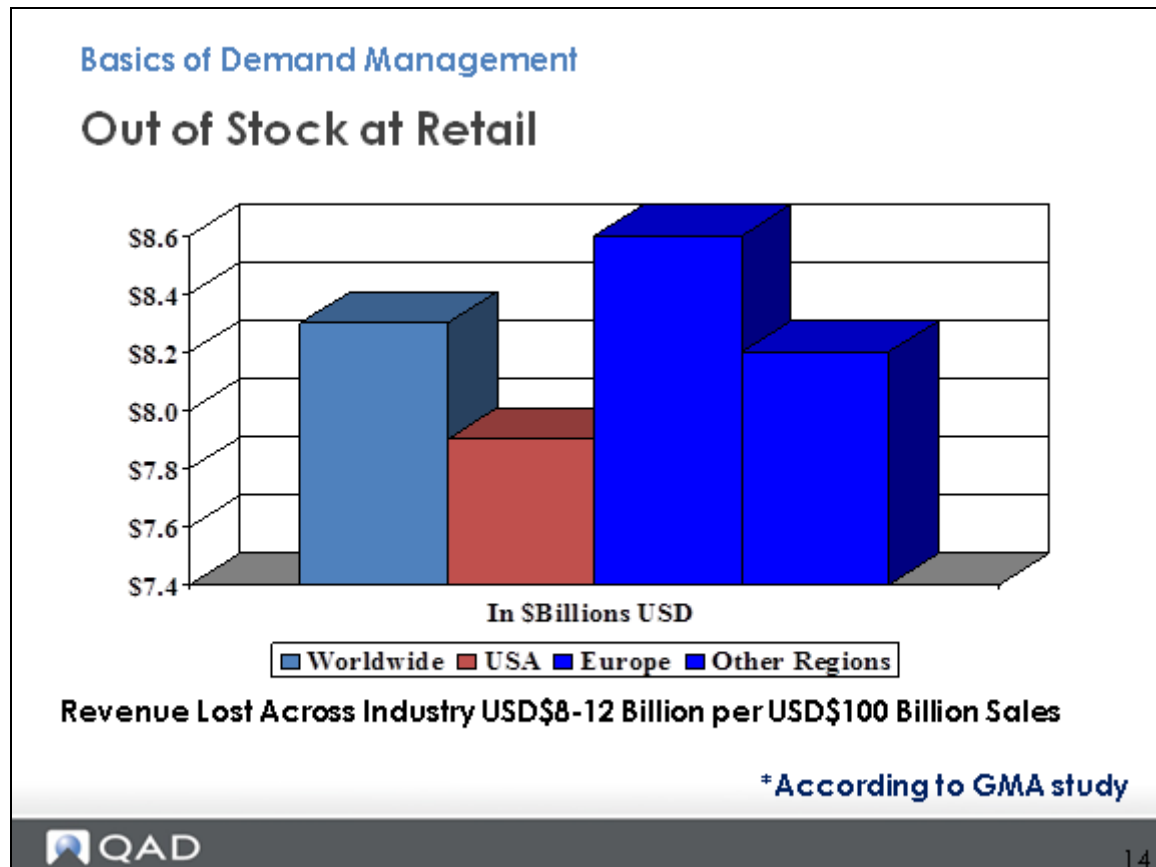
Companies That Do Not Manage Demand:

Basics of Demand Management

Companies That Do Not Manage Demand:

- Often have employees that work overtime for months, followed by layoffs
- Find themselves unable to fulfill “surprise” customer orders
- Disappoint customers by not responding to promotions on time
- Are poor users of manufacturing capacity
- Often face huge expediting charges

Out of Stock at Retail

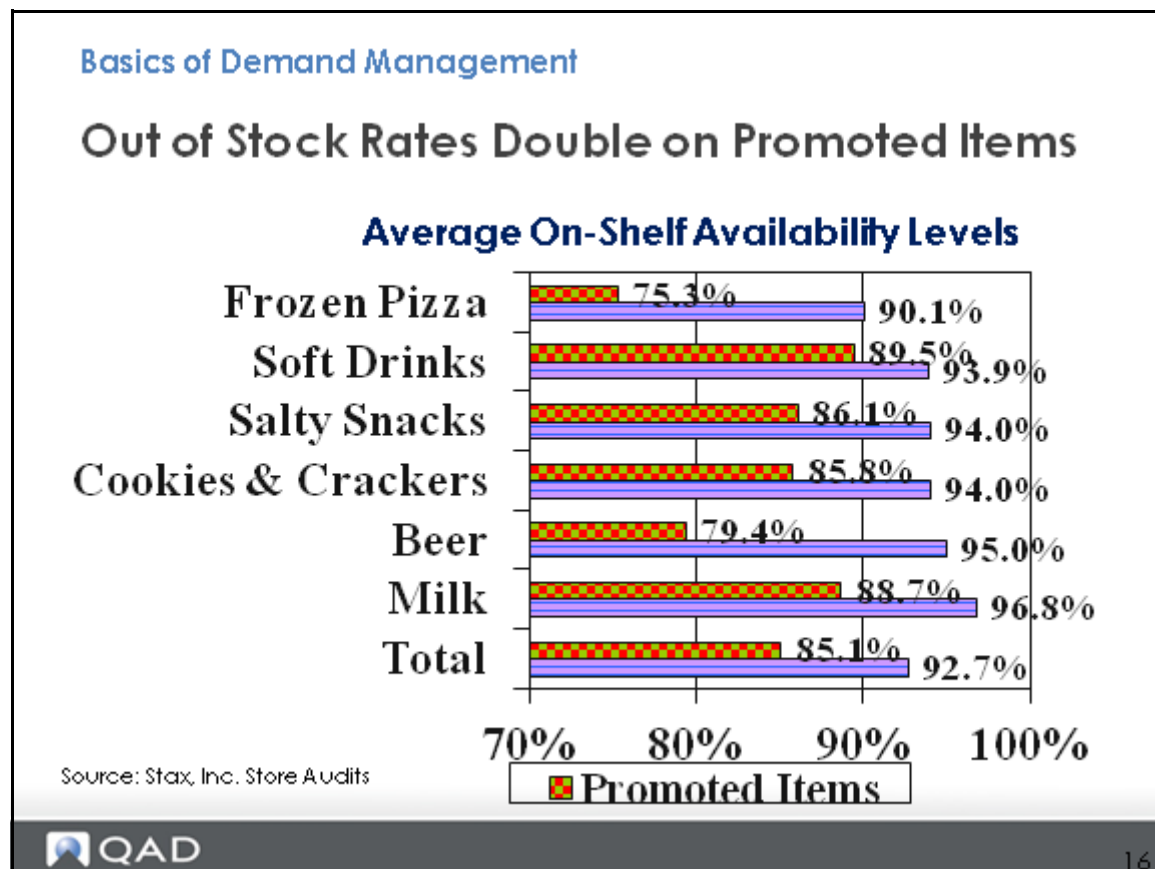


If A Manufacturer Generates \$10bn In Revenue***Basics of Demand Management****If A Manufacturer Generates \$10bn In Revenue***

- Average Out of Stock rate across US - **7.9%**
- Lost revenue **\$790,000,000**
- Lost Profit (assuming 20% margin)
\$158,000,000
- A 30% reduction in Out-of-Stock will yield
\$47,400,000

***According to GMA study**

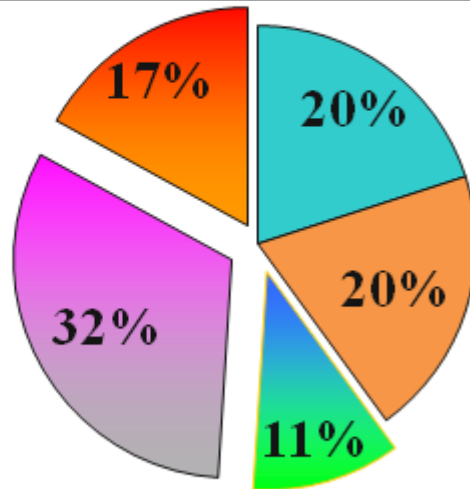
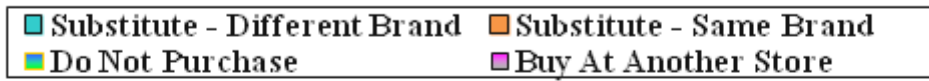
Out of Stock Rates Double on Promoted Items



When Consumers Encounter An Out-Of-Stock

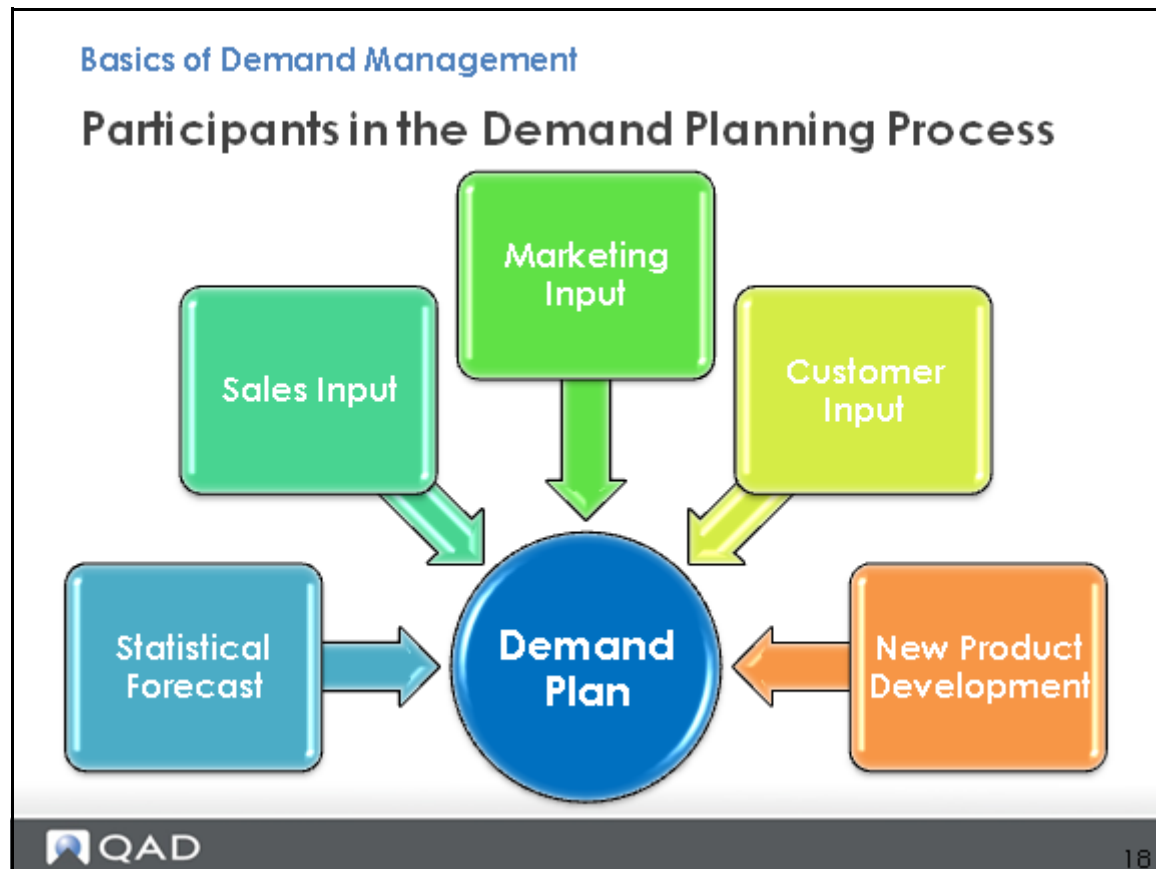
Basics of Demand Management

When Consumers Encounter An Out-Of-Stock

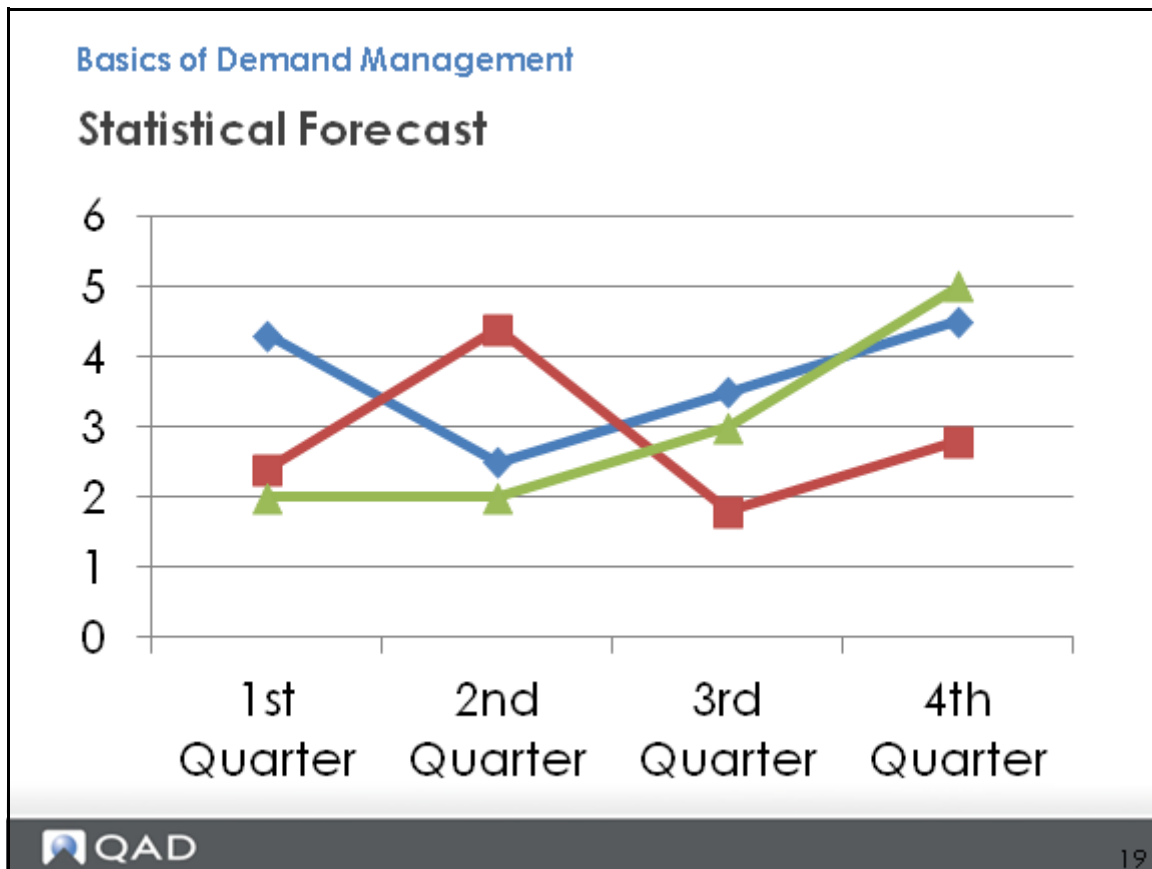


60% of Consumers Do Not Buy At The Same Store After Encountering An Out-Of-Stock

Participants in the Demand Planning Process



Statistical Forecast

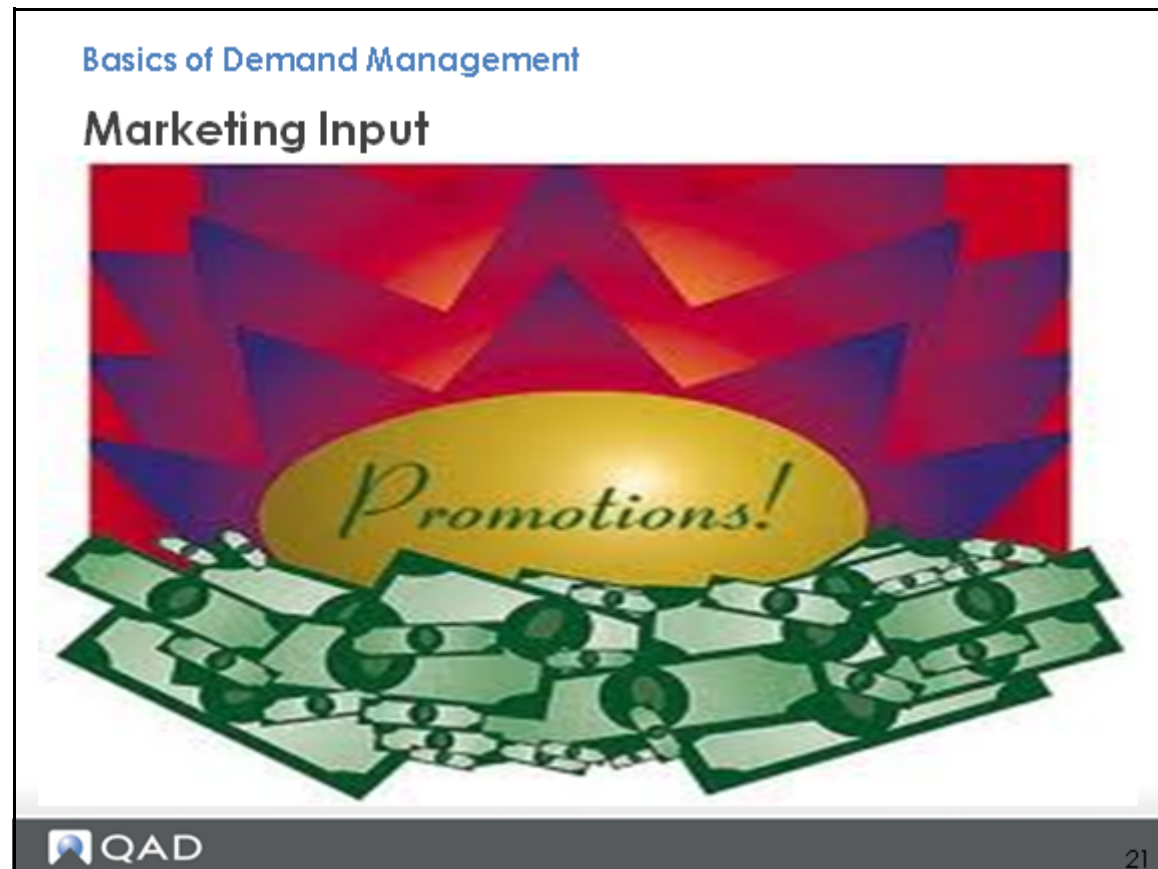


Sales Input



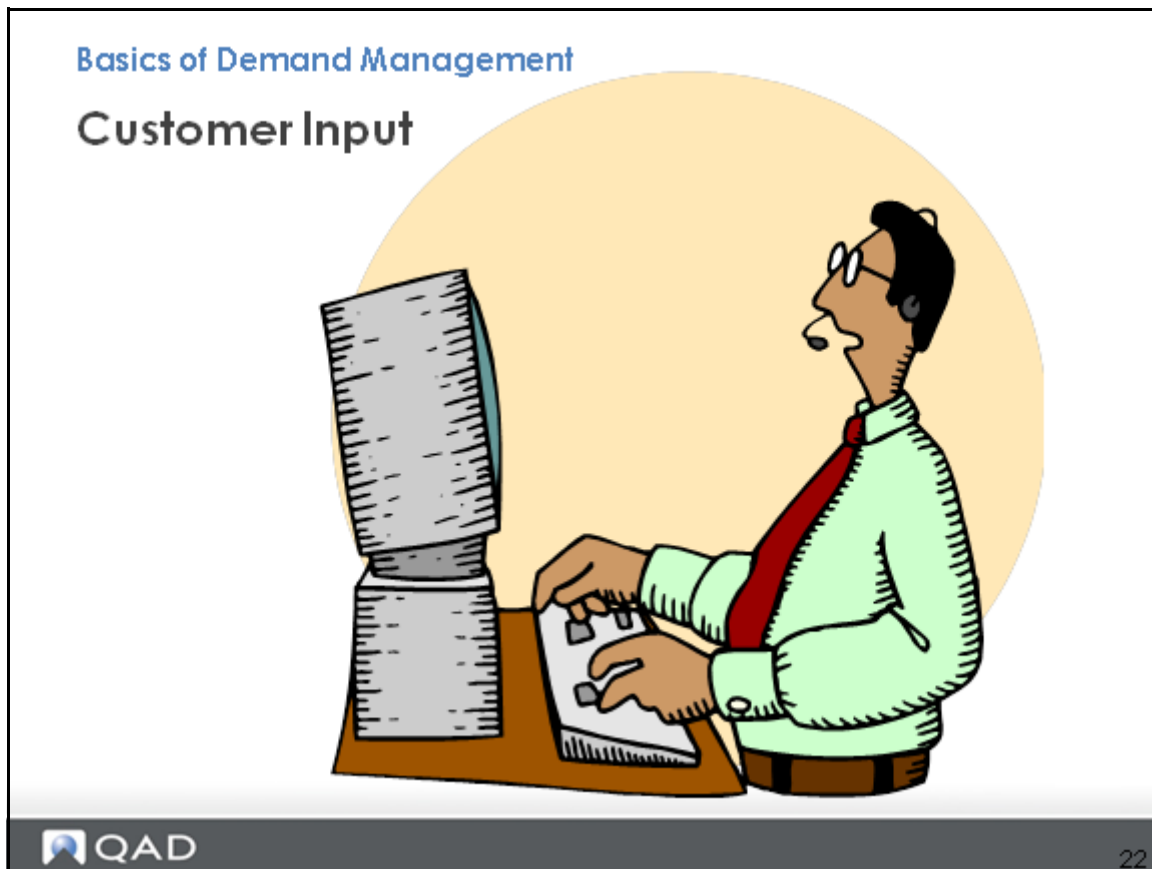
They are closest to the customers, and can detect trends, competitors challenges

Marketing Input



Promotions, market research, life cycle management

Customer Input



Many customers will share their data with you, either directly or through programs like VMI

New Product Development

Basics of Demand Management

New Product Development



The collage features six distinct product images arranged in two rows. The top row includes a black smartphone with a colorful app grid, a rocket launching with a large plume of smoke, and a blue and red toy robot. The bottom row shows a yellow sedan, a blue and white motorcycle, and a desktop computer system consisting of a monitor, keyboard, and mouse.

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New products are a major wild card, hard to forecast but incredibly important to the company.

Knowledge Check

Knowledge Check

Who Does Not Participate in the Demand Planning Process?

- a) Sales
- b) Marketing
- c) Purchasing
- d) Customers

Knowledge Check**Who Does Not Participate in the Demand Planning Process?**

- a) Sales
- b) Marketing
- c) Purchasing
- d) Customers

Knowledge Check

What Percent of Consumers Do Not Buy at the Same Store When an Item is Out of Stock

- a) 30%
- b) 40%
- c) 50%
- d) 60%

Knowledge Check

What Percent of Consumers Do Not Buy at the Same Store When an Item is Out of Stock

- a) 30%
- b) 40%
- c) 50%
- d) 60%

Knowledge Check

Which is Not Considered A Source of Demand

- a) Service parts
- b) Scrap
- c) Consumers
- d) Samples

Knowledge Check

Which is Not Considered A Source of Demand

- a) Service parts
- b) Scrap
- c) Consumers
- d) Samples

Basics of Forecasting

Basics of Demand Management & Forecasting

Agenda

- Types of Demand
- Basics of Demand Management
- **Basics of Forecasting**



What is a Forecast?

Basics of Forecasting

What is a Forecast?

An estimate of future demand. A forecast can be constructed using quantitative methods, qualitative methods, or a combination of methods, and it can be based on extrinsic (external) or intrinsic (internal) factors. Various forecasting techniques attempt to predict one or more of the four components of demand: cyclical, random, seasonal, and trend.

APICS Dictionary

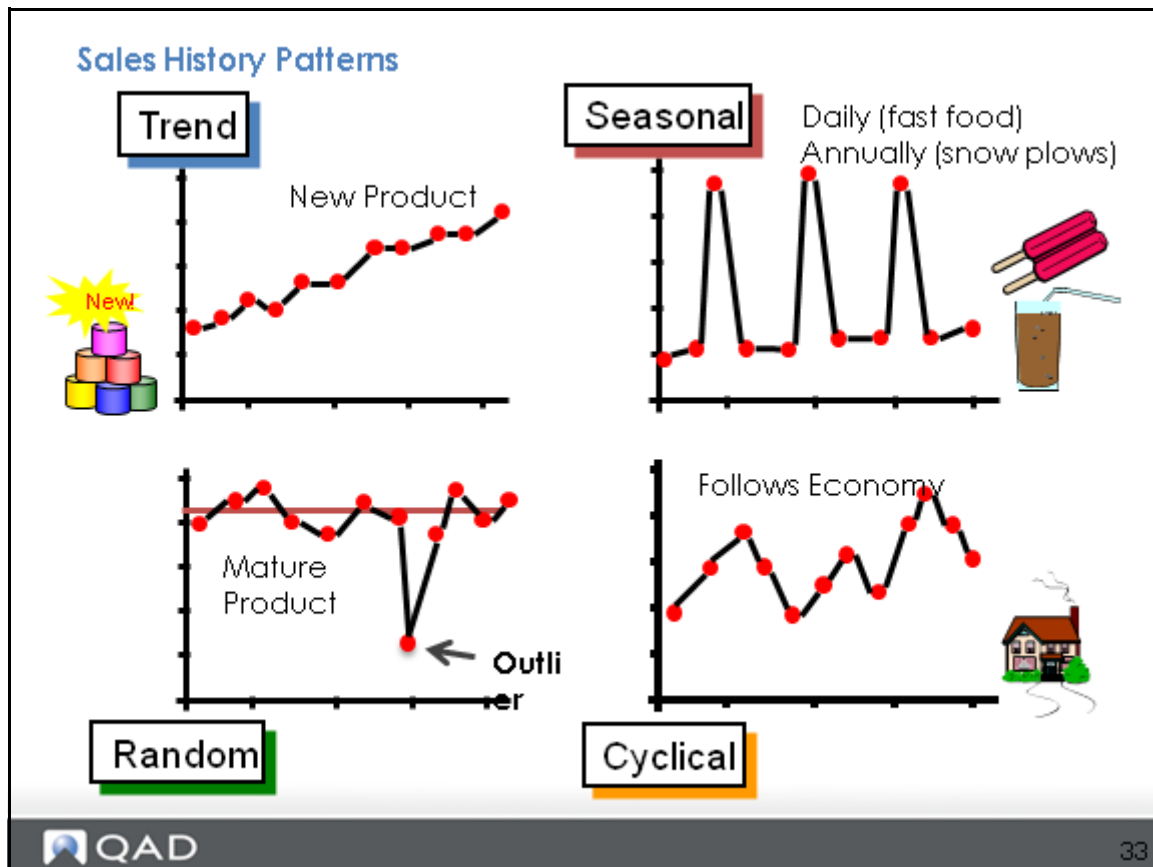
Forecasting Techniques

Basics of Forecasting

Forecasting Techniques

- Quantitative techniques – based on extrapolating past sales data and customer input to make future projections
- Qualitative techniques – based on expert opinion or judgment
- Collaborative techniques – based on sharing knowledge and information between customer and supplier

Sales History Patterns



Forecasting Horizons

Basics of Forecasting

Forecasting Horizons

Forecast	Horizons	Forecast Level	Result of Forecast
Long-term	2+ years	Size & type of business (manufacturing, retail), market share expectations	Which businesses to be in, number of facilities, investment in major capital equipment, long-term staffing plans
Mid-term	6 months – 2 years	Product groups, market share	Investment in minor capital equipment, hiring & training plans, purchasing contracts, outsourcing plans
Short-term	1 week – 6 months	Major customers, individual SKU's*	Stocking plans, inventory & safety stock levels, purchase orders & manufacturing releases, overtime or layoff

What Should We Forecast?

Basics of Forecasting

What Should We Forecast?

- Make-to-stock — finished goods
- Make-to-order — resource and material usage & availability
- Maintenance requirements, except periodic preventive maintenance
- Internal demands such as sample parts
- Other independent demands

Do NOT forecast any dependent demand items

Why Forecast?

Basics of Forecasting

Why Forecast?

- Plan for the future
- Manage change
- Anticipate inventory and capacity demands and shortages
- Provide competitive lead times
- Plan for promotions
- Budgeting processes

General Forecasting Methods

Basics of Forecasting

General Forecasting Methods

- Intrinsic forecasting is based on historical patterns of company sales data
- Extrinsic forecasting is based on information from outside the company



Forecast Methods - Intrinsic

Basics of Forecasting

Forecast Methods - Intrinsic

- Forecast is based on historical data obtained within the company
 - Historical sales
 - New product introductions
 - Promotional information
 - Products being phased out
- Assumes the past can be projected into the future
- Sales of a current model are used to predict sales of its replacement or a similar product

Internal (Intrinsic) Factors

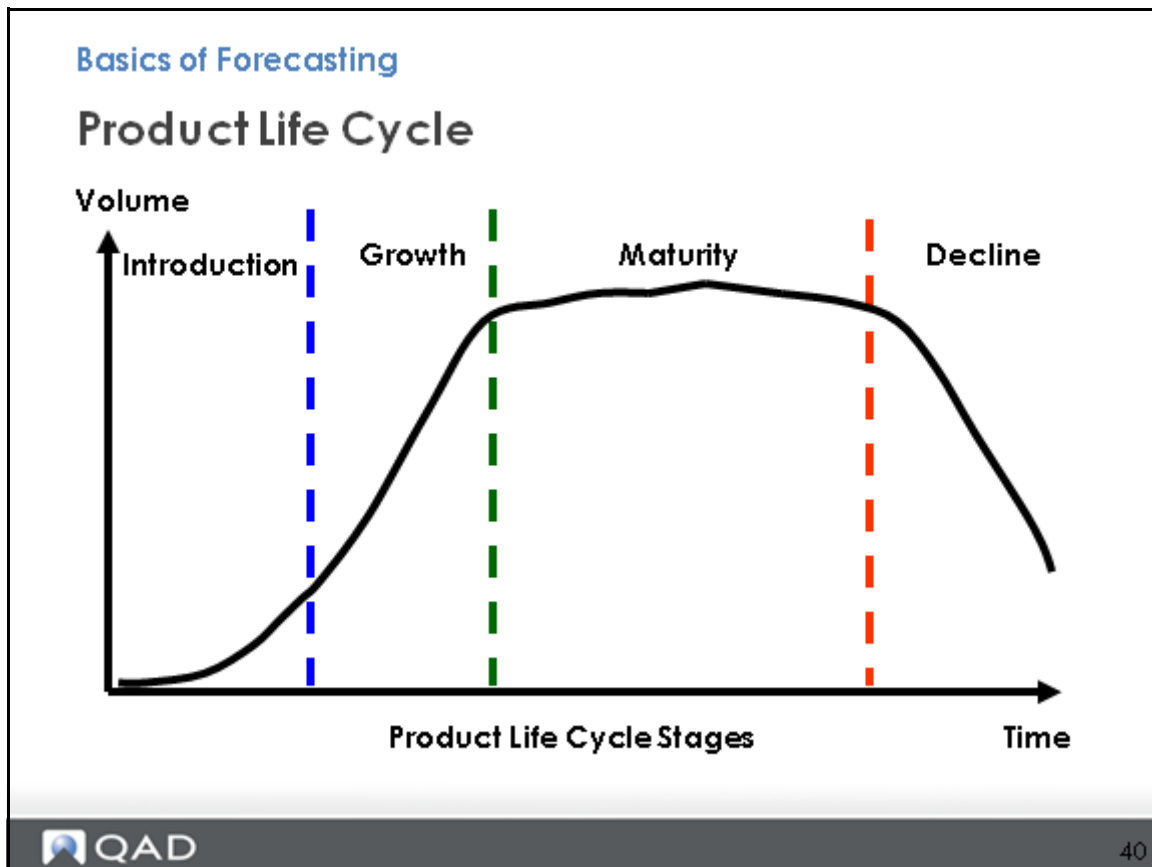
Basics of Forecasting

Internal (Intrinsic) Factors

- Planned price changes
- Changes in the sales force
- Resource constraints
- Marketing and sales promotion
- Advertising



Product Life Cycle



Forecast Methods - Extrinsic

Basics of Forecasting

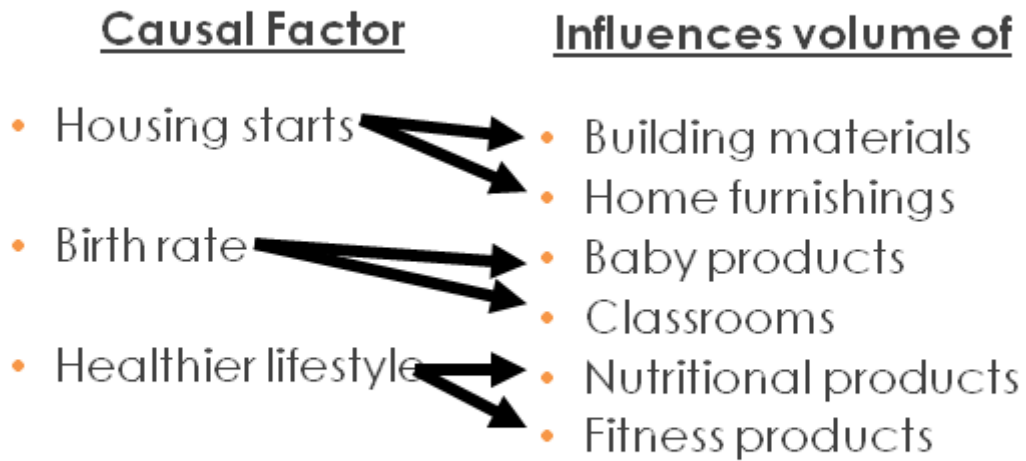
Forecast Methods - Extrinsic

- Forecast is based on data and other information that impacts the company from the outside
 - Weather is a prime consideration in determining sales of umbrellas or hurricane supplies
- Leading indicators often play a large role
 - Number of births is a leading indicator of the need for classroom space and diapers
 - Aging baby boomers are a leading indicator for health care needs

Leading Indicators

Basics of Forecasting

Leading Indicators



Extrinsic Factors Affecting A Forecast

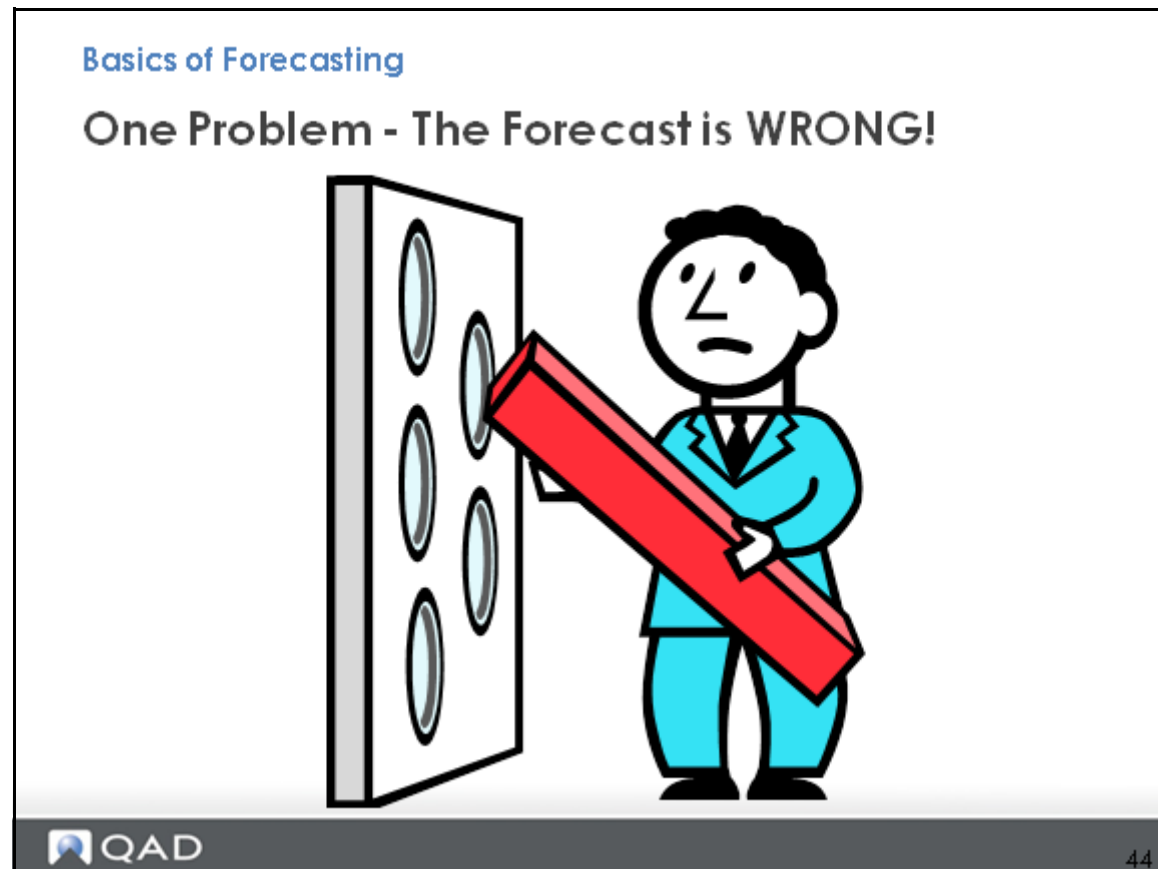
Basics of Forecasting

Extrinsic Factors Affecting A Forecast

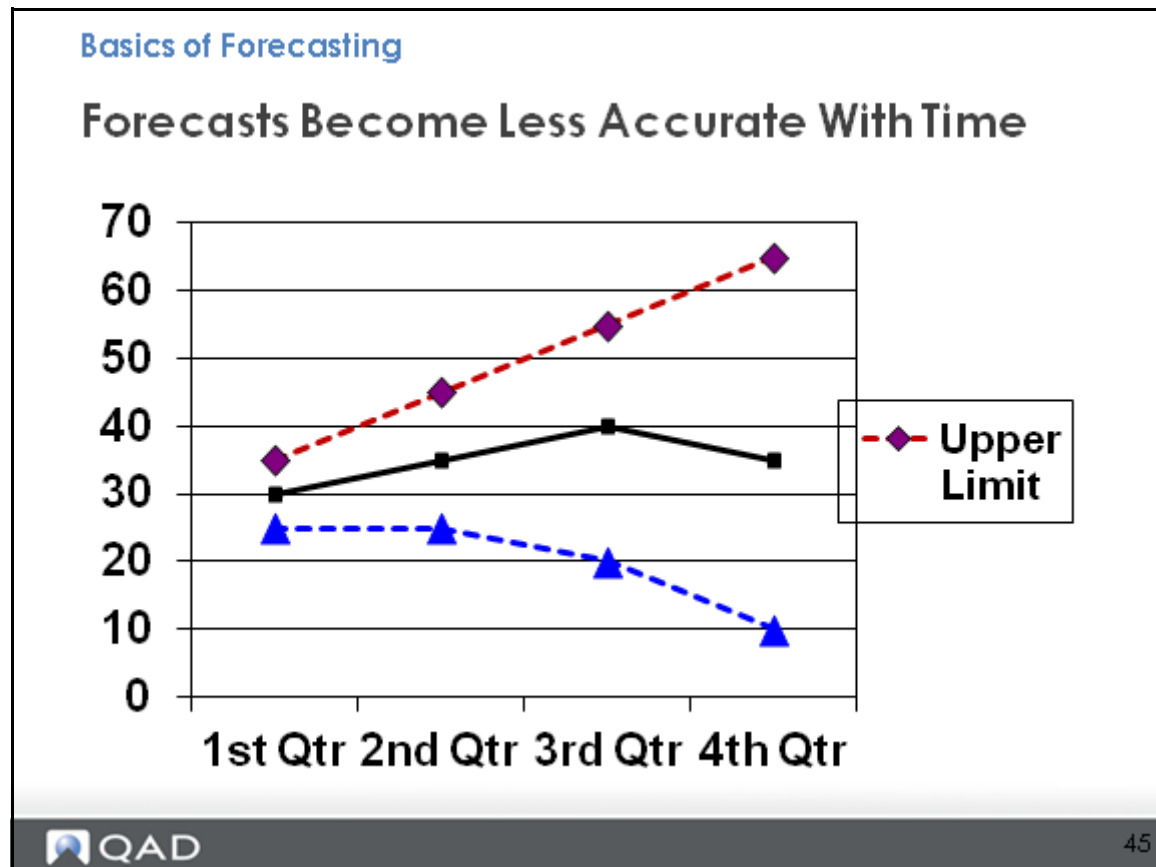
- Strategies of major customers
- New customers
- Competition
- Government regulations
- Economic conditions
- Weather
- Environmental trends
- Global trends



One Problem - The Forecast is WRONG!



Forecasts Become Less Accurate With Time



Forecasts Are More Accurate When Aggregated

Basics of Forecasting

Forecasts Are More Accurate When Aggregated



Not Very Accurate –
Just a Wild Guess



Accuracy will be much
higher, can use data to
support conclusion

Involving Customers Improves Forecasts

Basics of Forecasting

Involving Customers Improves Forecasts



Knowledge Check

Knowledge Check

Sales at a fast food restaurant are an example of ...

- a) Trend
- b) Cyclical
- c) Seasonality
- d) Horizontal

Knowledge Check

Sales at a fast food restaurant are an example of ...

- a) Trend
- b) Cyclical
- c) Seasonality
- d) Horizontal

Knowledge Check

Which Should NOT be Forecasted?

- a) Independent demand items
- b) Dependent demand items
- c) MRO items
- d) Samples

Knowledge Check

Which Should NOT be Forecasted?

- a) Independent demand items
- b) Dependent demand items
- c) MRO items
- d) Samples

Knowledge Check

Which statement is Not True?

- a) The forecast is almost always wrong
- b) Sales forecasts for next week are usually more accurate than forecasts for next month
- c) A tire manufacturer will forecast its need for rubber
- d) Housing starts are a leading indicator for a retailer like Home Depot

Knowledge Check**Which statement is Not True?**

- a) The forecast is almost always wrong
- b) Sales forecasts for next week are usually more accurate than forecasts for next month
- c) A tire manufacturer will forecast its need for rubber
- d) Housing starts are a leading indicator for a retailer like Home Depot

Knowledge Check

Which statement is Not True?

- a) Forecasts are more accurate for individual items than groups of items
- b) Customer input will improve a forecast
- c) 10 day weather forecasts are more accurate than 30 day weather forecasts

Knowledge Check

Which statement is Not True?

- a) Forecasts are more accurate for individual items than groups of items
- b) Customer input will improve a forecast
- c) 10 day weather forecasts are more accurate than 30 day weather forecasts

Chapter 2

Time Series Forecasting & Exponential Smoothing

Definition of Forecasting

Definition of Forecasting

What is a Forecast?

An estimate of future demand. A forecast can be constructed using quantitative methods, qualitative methods, or a combination of methods, and it can be based on extrinsic (external) or intrinsic (internal) factors. Various forecasting techniques attempt to predict one or more of the four components of demand: cyclical, random, seasonal, and trend.

APICS Dictionary

Forecasting Techniques

Types of Forecasting

Forecasting Techniques

- **Quantitative techniques – based on extrapolating past sales data and customer input to make future projections**
- Qualitative techniques – based on expert opinion or judgment
- Collaborative techniques – based on sharing knowledge and information between customer and supplier

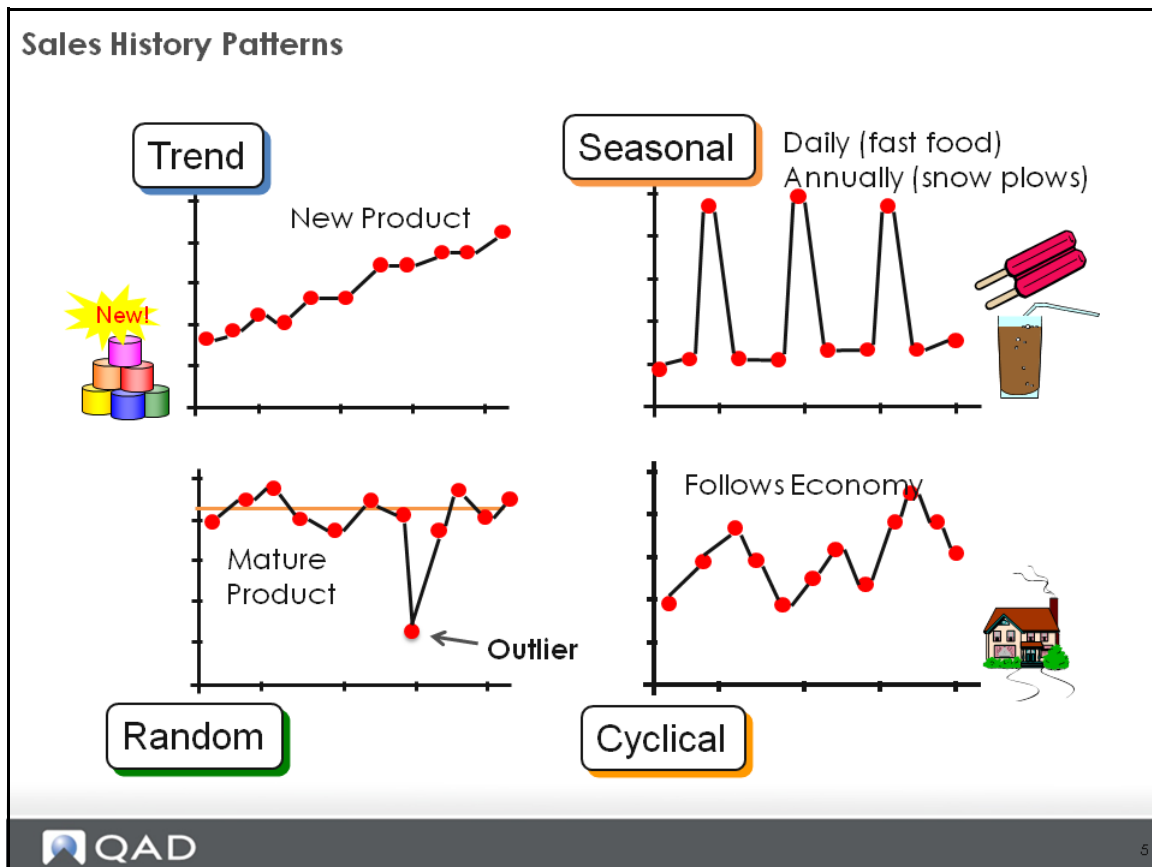
Forecasting Horizons

Time Periods of Forecasting

Forecasting Horizons

Forecast	Horizons	Forecast Level	Result of Forecast
Long-term	2+ years	Size & type of business (manufacturing, retail), market share expectations	Which businesses to be in, number of facilities, investment in major capital equipment, long—term staffing plans
Mid-term	6 months – 2 years	Product groups, market share	Investment in minor capital equipment, hiring & training plans, purchasing contracts, outsourcing plans
Short-term	1 week – 6 months	Major customers, individual SKU's*	Stocking plans, inventory & safety stock levels, purchase orders & manufacturing releases, overtime or layoff

Sales History Patterns

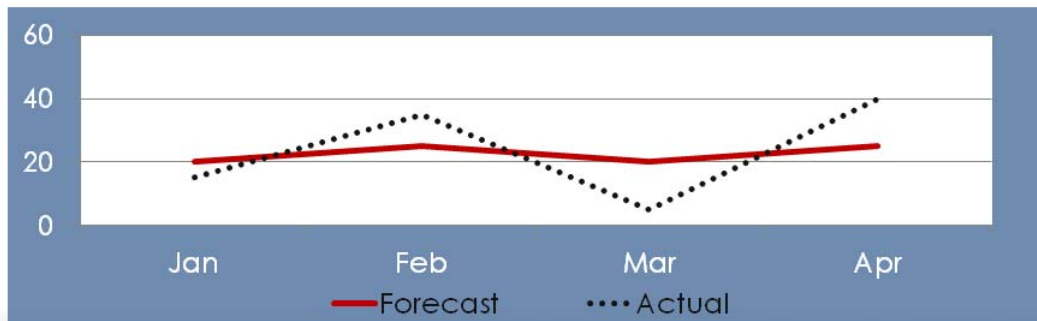


Principles of Forecasting

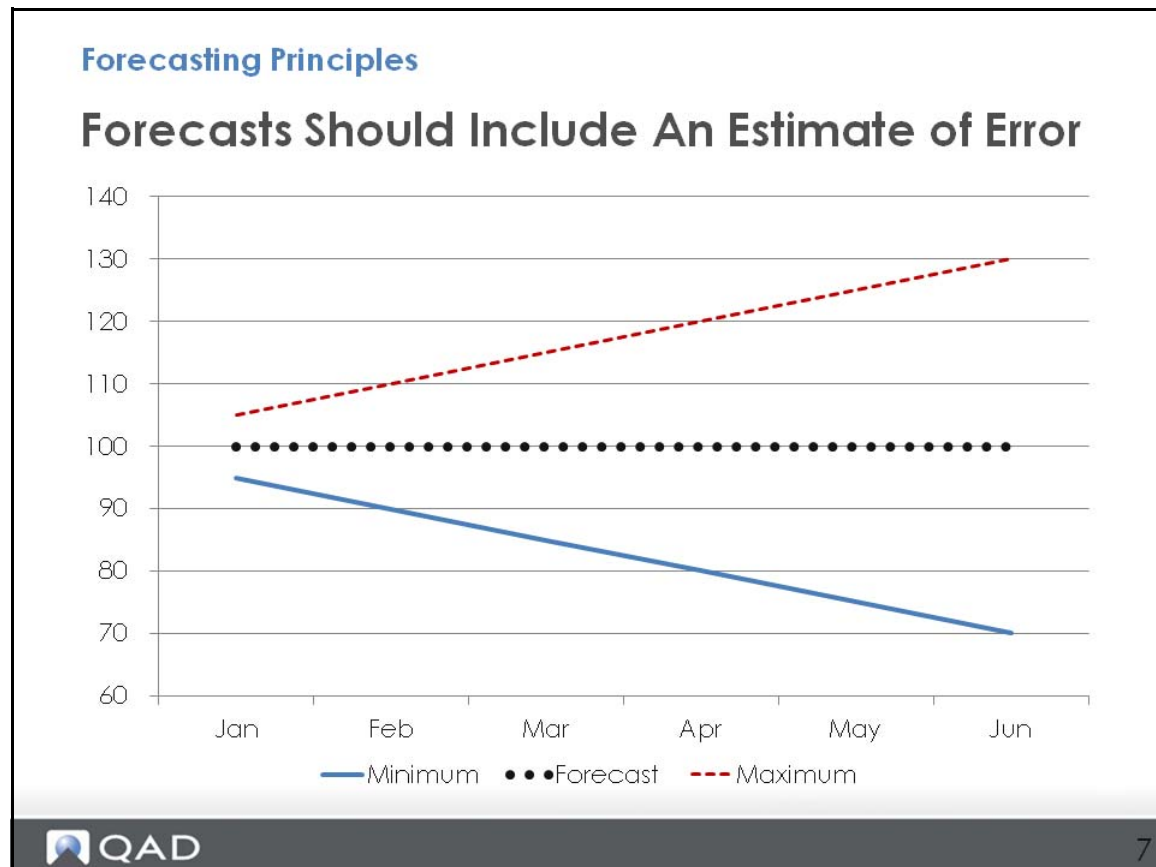
Forecasting Principles

Principles of Forecasting

- Forecast is WRONG!!
- Should include an estimate of error
- Forecasts become less accurate with time
- Forecasts are more accurate when aggregated



Forecasts Should Include An Estimate of Error



Forecasts Are More Accurate When Aggregated

Forecasting Principles

Forecasts Are More Accurate When Aggregated



Not Very Accurate –
Just a Wild Guess



Accuracy will be much
higher, can use data to
support conclusion

Data Collection and Preparation

Forecasting Principles

Data Collection and Preparation

- Record data based on forecast needs
 - If forecasting monthly, record data monthly
- Record circumstances relating to the data
 - Promotions, significant weather events
 - **Notes** function in DM 6.1
- Record demand separately for different customer groups
 - In the CPG world grocery chains, drug store chains, mass merchants and warehouse clubs all have different ordering patterns and should be grouped separately

Common Time Series Techniques

Quantitative Forecasting Techniques

Common Time Series Techniques

- Naïve forecasting
- Moving average
- Weighted Moving Average
- Seasonality
- Simple Exponential Smoothing



Naïve Forecasting

Naïve Forecasting

Naïve Forecasting

- The simplest method
- Used when no trend, seasonality or pattern exists
- Very easy to understand
- Many variations

Variations of Naïve Forecasting

Naïve Forecasting

Variations of Naïve Forecasting

- Last month's sales becomes this month's forecast

Item 38195X	Actual Sales	Forecast
April	150	
May	135	150
June	165	135
July	140	165

Naïve Forecasting

Variations of Naïve Forecasting

- Yesterday's sales becomes tomorrow's forecast

Green Bean Sales	Sales	Forecast
Monday	3,574	
Tuesday	3,824	3,574
Wednesday	3,247	3,824
Thursday	3,188	3,247
Friday	3,648	3,188
Saturday	3,529	3,648
Sunday	3,419	3,529

Naïve Forecasting

Variations of Naïve Forecasting

- Last years' sales during each month becomes this years forecast for that month

Underwear Sales	2010	2011
January	789	789
February	842	842
March	638	638
April	698	698
May	724	724
June	791	791
July	835	835
August	957	957
September	824	824
October	877	877
November	781	781
December	938	938

Moving Average Forecasting

Moving Average Forecasting

Moving Average Forecasting

- Forecast for next month is the average of a certain number of predetermined periods
- Easy to understand
- Useful to filter out random demand
- Can vary responsiveness to recent sales by varying number of periods
- Uses a rolling calendar
- Will lag trends

3 Month Moving Average

Moving Average Forecasting

3 Month Moving Average

- Divide total sales by number of periods
- Uses rolling calendar

January	17
February	22
March	15
Total	54
April Forecast (54/3)	18

February	22
March	15
April	23
Total	60
May Forecast (60/3)	20

5 Month Moving Average

Moving Average Forecasting

5 Month Moving Average

Month	Sales	Month	Forecast
January	25	January	
February	30	February	
March	36	March	
April	18	April	
May	40	May	
June	14	June	30
July	26	July	28
August	36	August	27
September	18	September	27
October	10	October	27
November	44	November	21
December	38	December	27

What is the Impact of Different Averaging Periods?

Moving Average Forecasting

What is the Impact of Different Averaging Periods?

January	1,211		
February	1,563		
March	1,398		
April	1,427	April	1,427
May	1,629	May	1,629
June	6,739	June	6,739
Total		Total	
Forecast (Total/6)		Forecast (Total/3)	

Longer Periods = Less Impact of Random Event

Moving Average Forecasting

Longer Periods = Less Impact of Random Event

January	1,211		
February	1,563		
March	1,398		
April	1,427	April	1,427
May	1,629	May	1,629
June	6,739	June	6,739
Total	13,967	Total	9,795
Forecast (Total/6)	2,328	Forecast (Total/3)	3,265

Weighted Moving Average

Weighted Moving Average

Weighted Moving Average

- An averaging technique in which the data to be averaged are not uniformly weighted but are given values according to their importance.

APICS Dictionary, 13th edition

- The weights should add up to 1

Examples of Weighted Moving Average

Weighted Moving Average

Examples of Weighted Moving Average

Month	Jan	Feb	Mar	Apr	May	Jun	Total
Sales	976	680	835	348	584	466	3,889
Weights	0.01	0.03	0.06	0.10	0.30	0.50	1.00
	10	20	50	35	175	233	523

July Forecast = 523

Month	Jan	Feb	Mar	Apr	May	Jun	Total
Sales	976	680	835	348	584	466	3,889
Weights	0.1	0.1	0.1	0.2	0.2	0.3	1
	98	68	84	70	117	140	575

July Forecast = 575

Forecasting Seasonal Products

Seasonal Forecasting

Forecasting Seasonal Products



The image displays a variety of products that are typically associated with different seasons. In the top row, there are tan cargo shorts, a mug of hot chocolate with whipped cream and sprinkles, and a blue-handled snow shovel. In the bottom row, there are a pair of white ice skates, two ice cream cones (one with chocolate sauce and sprinkles, the other with pink sauce and strawberries), and a red and white lawnmower. These products illustrate the seasonal nature of demand for certain goods.

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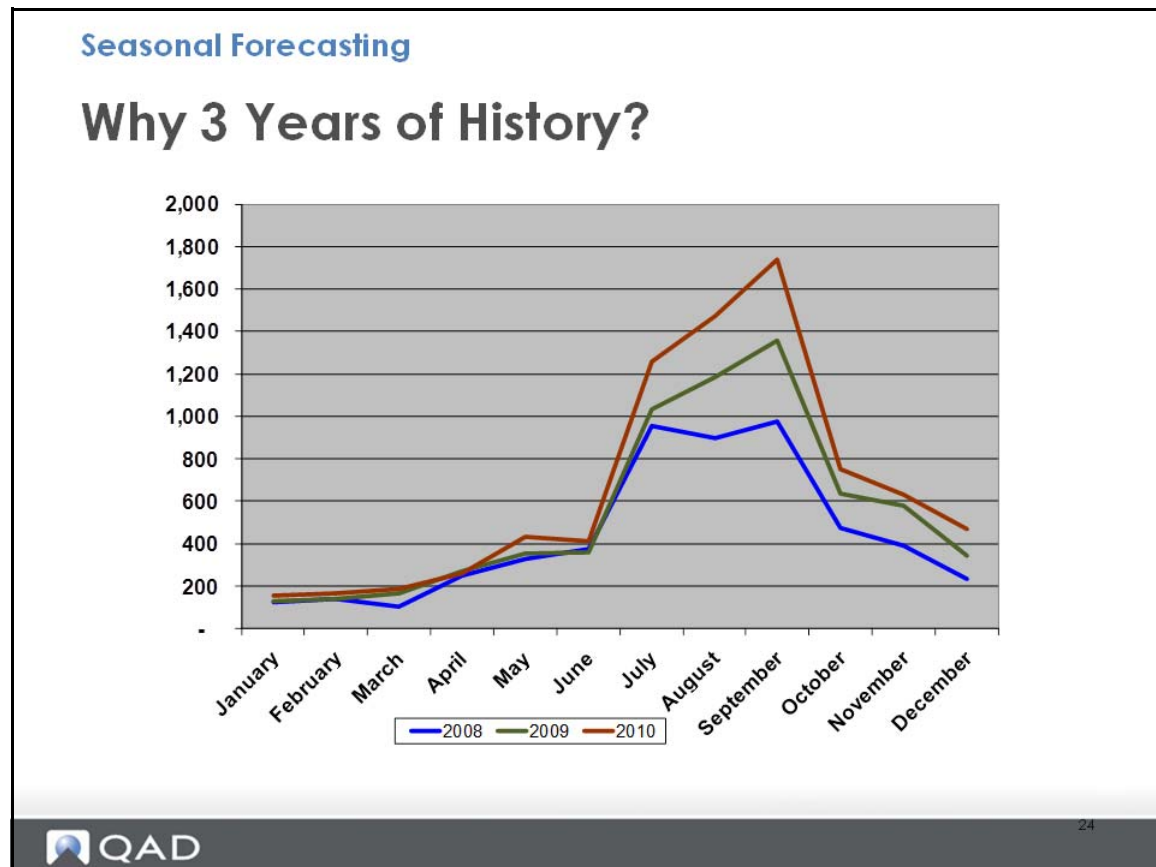
How to Forecast a Seasonal Product

Seasonal Forecasting

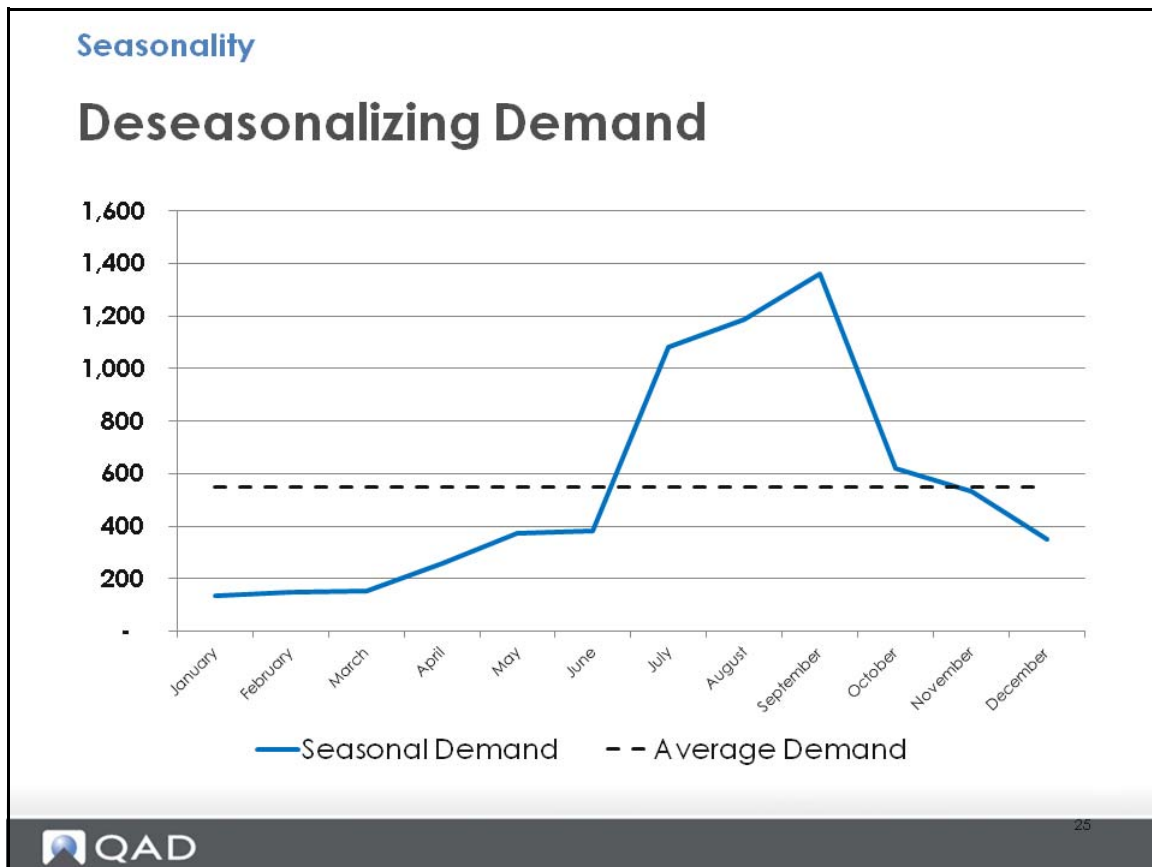
How to Forecast a Seasonal Product

- Obtain at least 3 years of history
- Determine monthly sales average
- Deseasonalize demand
- Calculate a seasonal index
- Forecast sales for entire year
- Determine deseasonalized monthly average
- Apply seasonal index to determine forecast

Why 3 Years of History?



Deseasonalizing Demand



Obtain 3 Years of History**Seasonal Forecasting****Obtain 3 Years of History**

Month	2008	2009	2010		
January	125	132	153		
February	142	138	164		
March	104	167	189		
April	249	269	258		
May	329	354	432		
June	376	360	412		
July	954	1,036	1,259		
August	896	1,187	1,473		
September	978	1,360	1,740		
October	472	634	749		
November	390	579	630		
December	233	345	469		
	5,248	6,561	7,928		

Determine Monthly Sales Average

Seasonal Forecasting

Determine Monthly Sales Average

Month	2008	2009	2010	Average	
January	125	132	153	137	
February	142	138	164	148	
March	104	167	189	153	
April	249	269	258	259	
May	329	354	432	372	
June	376	360	412	383	
July	954	1,036	1,259	1,083	
August	896	1,187	1,473	1,185	
September	978	1,360	1,740	1,359	
October	472	634	749	618	
November	390	579	630	533	
December	233	345	469	349	
	5,248	6,561	7,928	548	

Calculate The Seasonal Indexes

Seasonal Forecasting

Calculate The Seasonal Indexes

Month	2008	2009	2010	Average	Index
January	125	132	153	137	0.2493
February	142	138	164	148	0.2699
March	104	167	189	153	0.2797
April	249	269	258	259	0.4718
May	329	354	432	372	0.6779
June	376	360	412	383	0.6980
July	954	1,036	1,259	1,083	1.9754
August	896	1,187	1,473	1,185	2.1620
September	978	1,360	1,740	1,359	2.4794
October	472	634	749	618	1.1278
November	390	579	630	533	0.9722
December	233	345	469	349	0.6366
	5,248	6,561	7,928	548	

Index = $\frac{\text{Period Average Demand}}{\text{Average Demand For All Periods}}$

January: $\frac{137}{548} = .2493$ or .25

Determine Annual Forecast & Monthly Deseasonalized Average**Seasonal Forecasting****Determine Annual Forecast & Monthly Deseasonalized Average**

**Annual
Forecast
=
9,000**

**9,000/12
= 750**

Month	Monthly Average
January	750
February	750
March	750
April	750
May	750
June	750
July	750
August	750
September	750
October	750
November	750
December	750

Apply Seasonal Index

Seasonal Forecasting

Apply Seasonal Index

Month	Index	Deseasonalized Average	2011 Forecast
January	0.25	750	187
February	0.27	750	202
March	0.28	750	210
April	0.47	750	354
May	0.68	750	508
June	0.70	750	523
July	1.98	750	1,482
August	2.16	750	1,622
September	2.48	750	1,860
October	1.13	750	846
November	0.97	750	729
December	0.64	750	477
Average			750
2011 Forecast			9,000

Knowledge Check

Knowledge Check

Using a 3-Month Moving Average, What is the Forecast for July

- a) 34
- b) 38
- c) 42
- d) 48

Month	Sales
January	20
February	25
March	33
April	38
May	42
June	46

Knowledge Check

Using a 3-Month Moving Average, What is the Forecast for July

- a) 34
- b) 38
- c) 42
- d) 48

Month	Sales
January	20
February	25
March	33
April	38
May	42
June	46

Knowledge Check

Using a 6-Month Moving Average, What is the Forecast for July

- a) 34
- b) 38
- c) 42
- d) 48

Month	Sales
January	20
February	25
March	33
April	38
May	42
June	46

Knowledge Check

Using a 6-Month Moving Average, What is the Forecast for July

- a) 34
- b) 38
- c) 42
- d) 48

Month	Sales
January	20
February	25
March	33
April	38
May	42
June	46

Exponential Smoothing

Single Exponential Smoothing

- Provides a routine method of updating item forecasts
- Alpha is a weighting factor applied to the demand element
- Works well for items with fairly constant demand
- Is satisfactory for short-range forecasts
- Does not handle trends, seasonality or intermittent demand well

Single Exponential Smoothing

Exponential Smoothing

Single Exponential Smoothing

- Provides a routine method of updating item forecasts
- Alpha is a weighting factor applied to the demand element
- Works well for items with fairly constant demand
- Is satisfactory for short-range forecasts
- Does not handle trends, seasonality or intermittent demand well

Smoothing Factor

Exponential Smoothing

Smoothing Factor

$$\alpha = \frac{2}{n + 1}$$

- Referred to as Alpha (α)
- Range $0 < \alpha < 1$
- Sets responsiveness to changes in demand
- Higher alpha (.7 - .9) is more responsive to recent sales changes
- Lower alpha (.1 - .3) is less responsive to recent sales changes
- Always round any forecast with a decimal up to the next whole number

Exponential Smoothing Examples

Exponential Smoothing

Exponential Smoothing Examples

New forecast = $(\alpha) \times (\text{latest demand}) + (1 - \alpha) \times (\text{previous forecast})$

Example: actual = 200, old forecast = 160, $\alpha = 0.1$
new forecast = $(.1 \times 200) + (.9 \times 160)$
164 = 20 + 144

Example: actual = 200, old forecast = 160, $\alpha = 0.9$
new forecast = $(.9 \times 200) + (.1 \times 160)$
196 = 180 + 16

Exponential Smoothing

Exponential Smoothing Examples

New forecast = $(\alpha) \times (\text{latest demand}) + (1 - \alpha) \times (\text{previous forecast})$

Example: actual = 229, old forecast = 175, $\alpha = 0.8$

new forecast = $(.8 \times 229) + (.2 \times 175)$

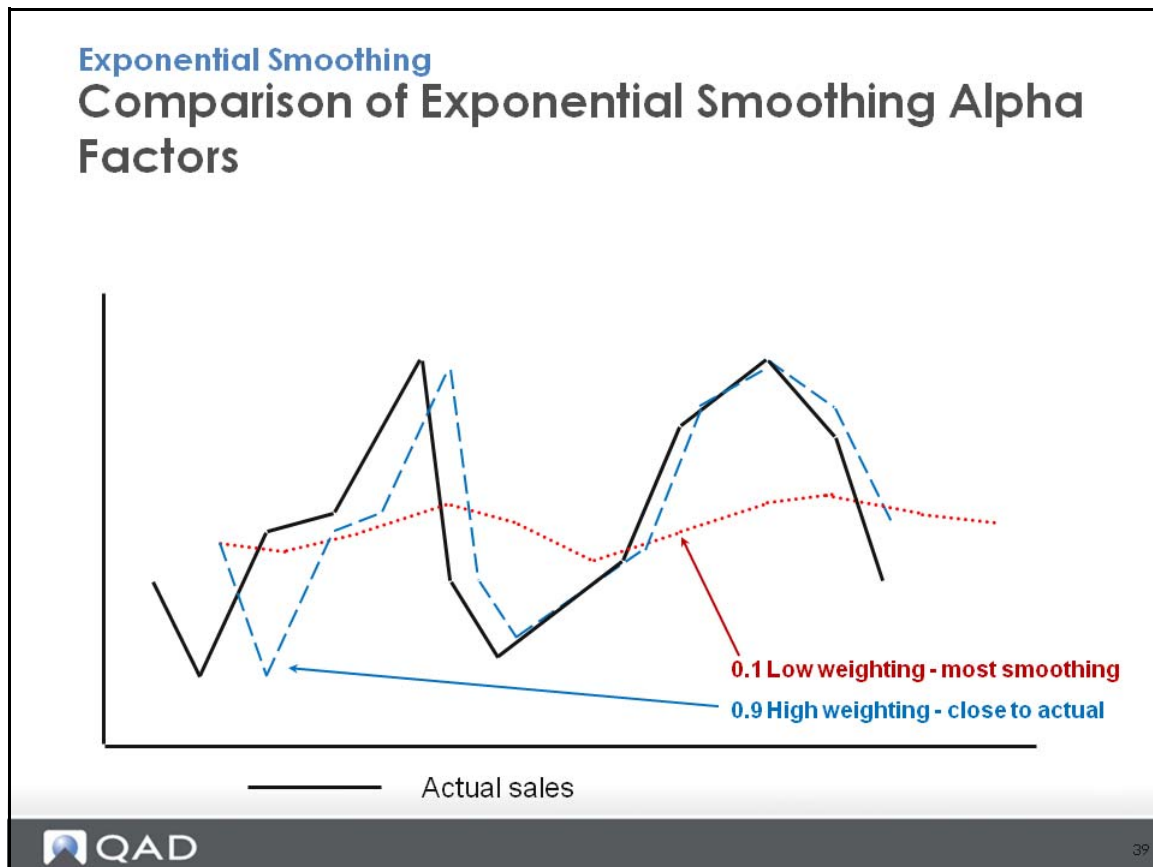
218.2 or **219** = $183.2 + 35$

Example: actual = 229, old forecast = 175, $\alpha = 0.3$

new forecast = $(.3 \times 229) + (.7 \times 175)$

191.2 or **192** = $68.7 + 122.5$

Comparison of Exponential Smoothing Alpha Factors



Double Exponential Smoothing

Exponential Smoothing

Double Exponential Smoothing

- A method of exponential smoothing for **trend** situations that employs two previously computed averages, the singly and doubly smoothed values, to extrapolate into the future. APICS Dictionary 13th Edition
- Two formulas in DM 6.1:
 - Double ES Brown
 - Double Holt
- For more information, see Professor Barry Keating's Qbit – Module 2 - Moving Averages & Smoothing

Triple Exponential Smoothing

Exponential Smoothing

Triple Exponential Smoothing

- A method of exponential smoothing that accounts for trends and seasonality
- Two formulas in DM 6.1:
 - Triple ES Brown
 - Holt - Winters
- For more information, see Professor Barry Keating's Qbit – Module 2 - Moving Averages & Smoothing

Knowledge Check

Knowledge Check

Using Exponential Smoothing, What is the Forecast for February ($\alpha = .7$)

- a) 16
- b) 17
- c) 18
- d) 19

Month	Forecast	Sales
January	15	20

New forecast = $(\alpha) \times (\text{latest demand}) + (1 - \alpha) \times (\text{previous forecast})$

Knowledge Check**Using Exponential Smoothing, What is the Forecast for February ($\alpha = .7$)**

- a) 16
- b) 17
- c) 18
- d) 19

Month	Forecast	Sales
January	15	20

New forecast = $(\alpha) \times (\text{latest demand}) + (1 - \alpha) \times (\text{previous forecast})$

New forecast = $.7 \times 20 + .3 \times 15$

New forecast = $14 + 4.5$

New forecast = 18.5 or **19**

Knowledge Check

If Sales Displays Trend and Seasonality, Use This Forecasting Technique

- a) Moving Average
- b) Single exponential smoothing
- c) Double exponential smoothing
- d) Triple exponential smoothing

Knowledge Check

If Sales Displays Trend and Seasonality, Use This Forecasting Technique

- a) Moving Average
- b) Single exponential smoothing
- c) Double exponential smoothing
- d) Triple exponential smoothing

Questions or Comments?



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Chapter 3

Forecast Errors & Safety Stock

Agenda

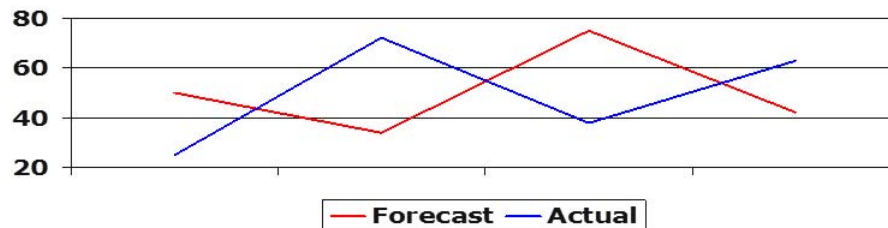
Agenda

- Measuring forecast accuracy
- Impact of forecast accuracy on safety stock levels

Measuring Forecast Accuracy

Measuring & Improving Forecast Accuracy

Measuring Forecast Accuracy



- Period forecast error (PE)
- Absolute percentage of error (APE)
- Mean absolute deviation (MAD)
 - Impact on Safety Stock
- Standard Deviation (SD)
- Mean absolute percentage of error (MAPE)
- Root Mean Square Error (RMSE)

Period Forecast Error

Measuring & Improving Forecast Accuracy

Period Forecast Error

$$\text{Period Forecast Error} = \text{Actual Demand} - \text{Forecast Demand}$$

Actual = 250 units

Forecast = 300 units

250 - 300 = -50 units

Absolute Percentage Of Error (APE)

Measuring & Improving Forecast Accuracy

Absolute Percentage Of Error (APE)

$$\text{APE} = \frac{|A-F|}{A} \times 100\%$$

$$\text{APE} = \frac{|250-300|}{250} \times 100\%$$

$$\text{APE} = \frac{|-50|}{250} \times 100\%$$

$$\text{APE} = \frac{50}{250} \times 100\%$$

$$\text{APE} = 20\%$$

F = Forecast
A = Actual

Forecast Accuracy

Measuring & Improving Forecast Accuracy

Forecast Accuracy

100% - APE

100% - 20%

Forecast Accuracy = 80%

Why Is The Measure of Error Important?

Measuring & Improving Forecast Accuracy

Why Is The Measure of Error Important?

Part No.	Jan	Feb	Mar	Apr	May	Jun	Total	Average
Forecast	98	96	103	99	105	99	600	100
Actual	98	96	103	99	105	99	600	100

- Error helps determine the level of safety stock
- Based on the example above, if you manufactured to forecast, how much safety stock would you need?

Safety Stock Variability

Measuring & Improving Forecast Accuracy

Safety Stock Variability

Part No.	Jan	Feb	Mar	Apr	May	Jun	Total	Average
Forecast	98	96	103	99	105	99	600	100
Actual	25	280	0	240	25	30	600	100

- Like the previous example, the forecast & actual totaled 600 for six months
- Do you think the level of safety stock should be the same?

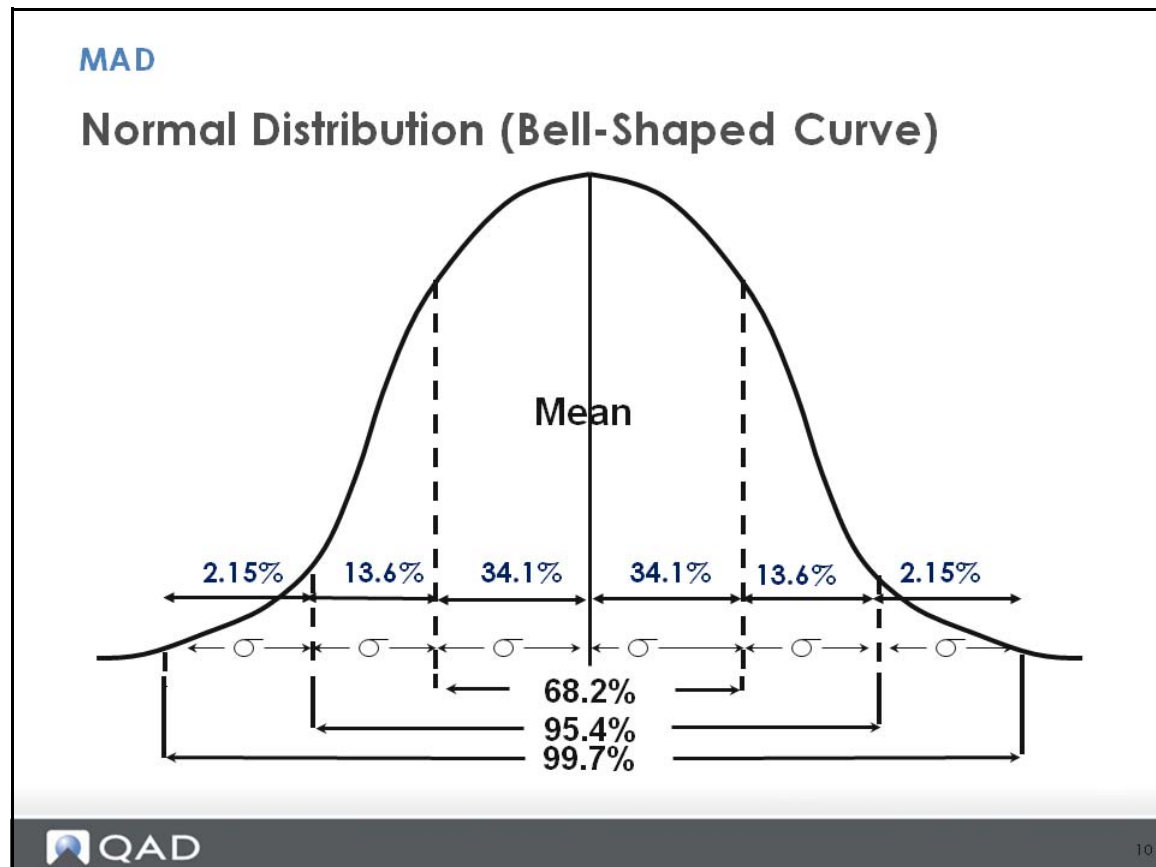
Safety Stock

Measuring & Improving Forecast Accuracy

Safety Stock

- Protects us from inaccurate forecasts
- Helps us cope with unexpected customer demand
- Protects us from supplier problems
- More lead time = more safety stock
- More forecast error = more safety stock
- Often misused & excessive

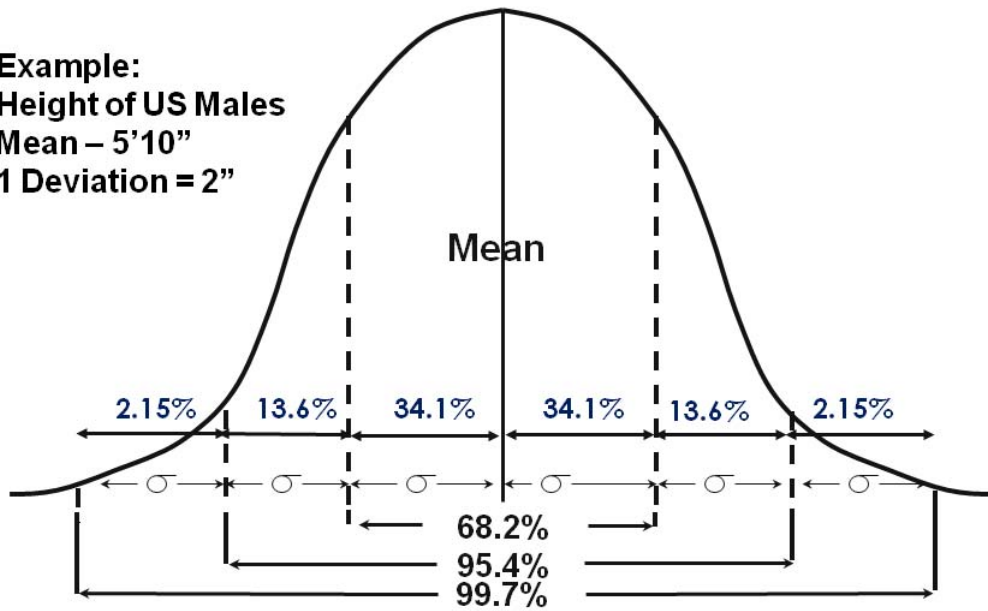
Normal Distribution (Bell-Shaped Curve)



MAD

Normal Distribution (Bell-Shaped Curve)

Example:
Height of US Males
Mean – 5'10"
1 Deviation = 2"



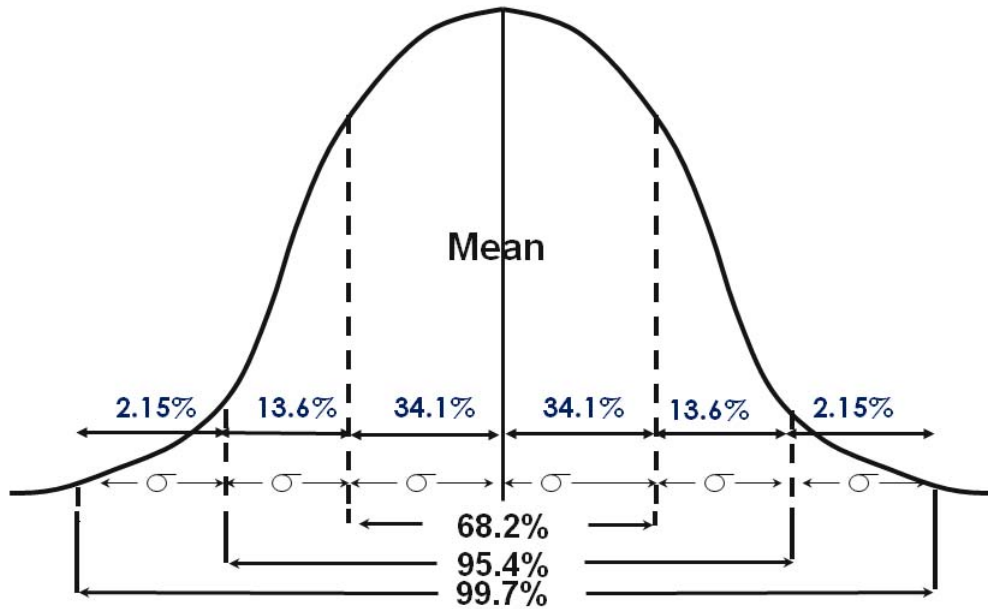
Height of US Males – 1 MAD = 2”**MAD****Height of US Males – 1 MAD = 2”**

# of Deviations	Lower	Mean	Upper	% of Males
		5'10"		50%
1	5'8"		6'0"	68.2%
2	5'6"		6'2"	95.4%
3	5'4"		6'4"	99.7%

Basic MAD Safety Stock Formula

$$\text{Safety Stock (SS)} = \text{MAD} \times \text{Safety Factor (SF)}$$

Basic MAD Safety Stock Formula



Mean Absolute Deviation Calculation

MAD

Mean Absolute Deviation Calculation

- Definition: Average of the absolute values (no + or - signs) of the deviations between actual demand and the expected demand (forecast).

$$\text{Sum of the Absolute Deviations} \div \text{Number of Periods} = \text{MAD}$$

How Much Safety Stock?

MAD

How Much Safety Stock?

	Forecast	Actual Sales	Forecast Error	Absolute Forecast Error
January	10	14	4	4
February	10	9	-1	1
March	10	11	1	1
April	10	7	-3	3
May	10	11	1	1
June	10	8	-2	2
Total	60	60	0	12

First Calculate MAD:

MAD

First Calculate MAD:

$$\begin{array}{|c|} \hline \text{Sum of the} \\ \text{Absolute} \\ \text{Deviation} \\ \hline 12 \\ \hline \end{array} \div \begin{array}{|c|} \hline \text{Number of} \\ \text{Periods} \\ \hline 6 \\ \hline \end{array} = \begin{array}{|c|} \hline \text{MAD} \\ \hline 2 \\ \hline \end{array}$$

 QAD

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Next Calculate Safety Stock

MAD

Next Calculate Safety Stock

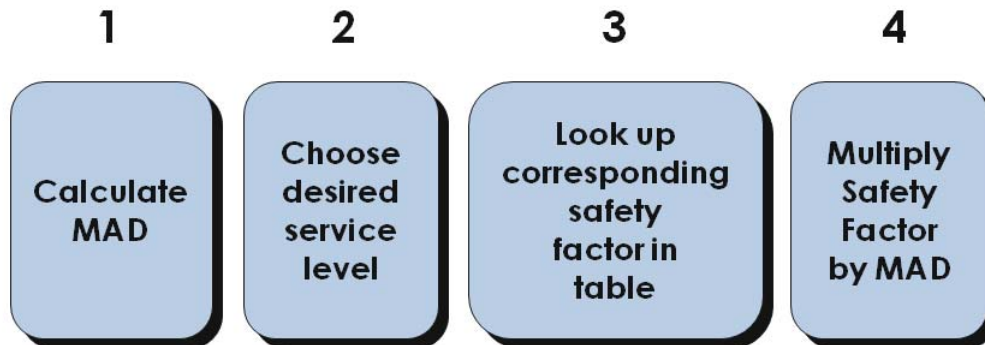


Table of Safety Factors (Using MAD)**MAD****Table of Safety Factors (Using MAD)**

<u>Desired Service Level</u>	<u>Safety Factor</u>
50%	0.00
75%	0.84
80%	1.05
85%	1.30
90%	1.60
95%	2.06
98%	2.56
99%	2.91
99.5%	3.20
99.93%	4.00
99.99%	5.00

Absolute Forecast Error = 12 Mad = 2

MAD

Absolute Forecast Error = 12 Mad = 2

Service Level Desired	Safety Factor	Safety Stock Needed
50%	0.0	0
80%	1.05	3
95%	2.06	5
99.5%	3.2	7
99.93%	4	8
99.99%	5	10

For an item that costs \$85,000, the difference can be significant.

How Much Safety Stock?

MAD

How Much Safety Stock?

	Forecast	Actual Sales	Forecast Error	Absolute Forecast Error
January	10	14	4	4
February	10	9	-1	1
March	10	11	1	1
April	10	7	-3	3
May	10	11	1	1
June	10	8	-2	2
Total	60	60	0	12

MAD

How Much Safety Stock?

	Forecast	Actual Sales	Forecast Error	Absolute Forecast Error
January	8	14	6	6
February	14	9	-5	5
March	9	11	2	2
April	11	7	-4	4
May	7	11	4	4
June	11	8	-3	3
Total	60	60	0	24

First Calculate MAD:

MAD

First Calculate MAD:

$$\begin{array}{|c|} \hline \text{Sum of the} \\ \text{Absolute} \\ \text{Deviation} \\ \hline 24 \\ \hline \end{array} \div \begin{array}{|c|} \hline \text{Number of} \\ \text{Periods} \\ \hline 6 \\ \hline \end{array} = \begin{array}{|c|} \hline \text{MAD} \\ \hline 4 \\ \hline \end{array}$$

 QAD

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Does MAD of 2 Vs. 4 Matter?

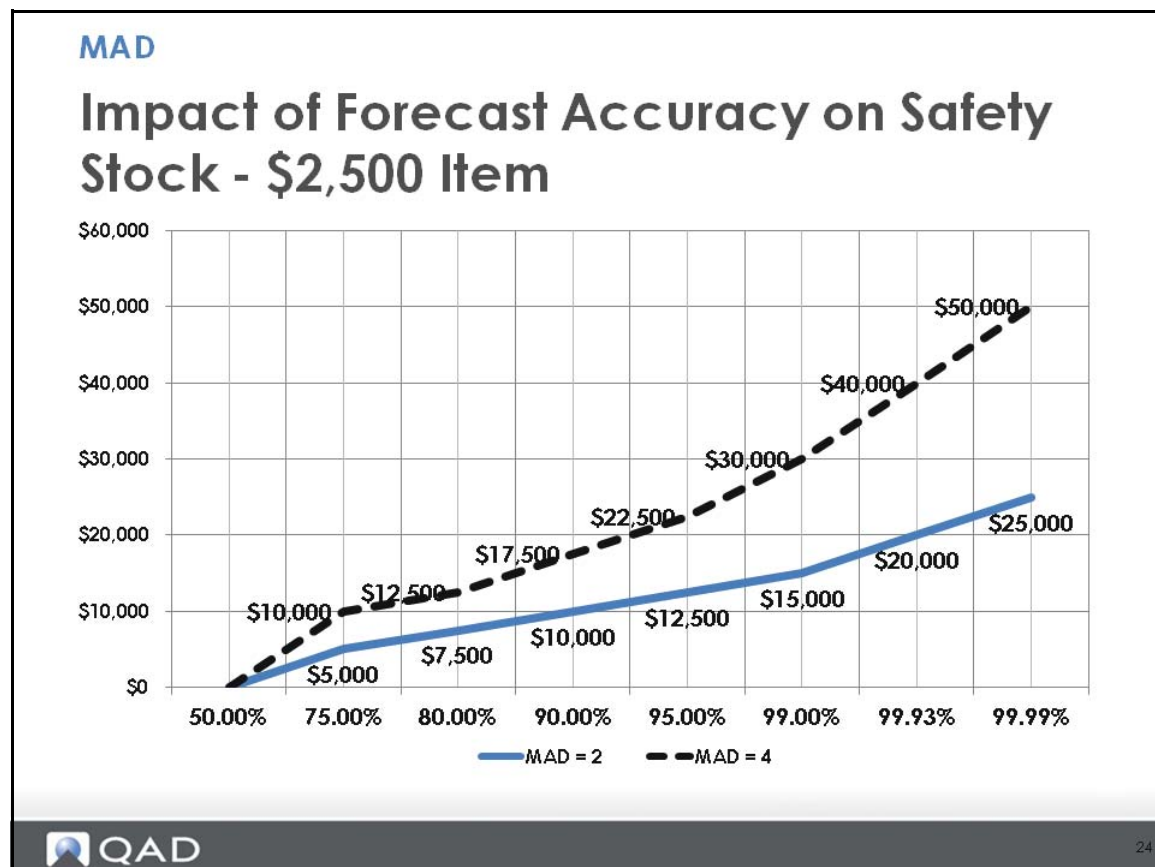
MAD

Does MAD of 2 Vs. 4 Matter?

Service Level Desired	Safety Factor	Safety Stock Needed MAD = 2	Safety Stock Needed MAD = 4
50%	0.0	0	0
80%	1.05	3	5
95%	2.06	5	9
99.5%	3.2	7	13
99.93%	4	8	16
99.99%	5	10	20

For an item that costs \$85,000, the difference can be significant.

Impact of Forecast Accuracy on Safety Stock - \$2,500 Item



Calculating Standard Deviation

Standard Deviation

Calculating Standard Deviation

1. Subtract Forecast from Actual to get Error
2. Square the Error
3. Total the Errors Squared
4. Divide the Totals for Errors Squared by the number of occurrences minus one
5. Standard Deviation is Square Root of #4

Standard deviation is approximately 1.25 X MAD

Calculating Standard Deviation

Standard Deviation

Calculating Standard Deviation

Month	Forecast (A)	Actual (B)	Error (C)	Error ² (D)
	Calculation		B-A	C ²
January	200	190	(10)	100
February	200	230	30	900
March	200	195	(5)	25
April	200	240	40	1,600
May	200	180	(20)	400
June	200	175	(25)	625
July	200	260	60	3,600
August	200	150	(50)	2,500
September	200	235	35	1,225
October	200	185	(15)	225
November	200	170	(30)	900
December	200	255	55	3,025
Totals	2,400	2,465	65	15,125
Standard Deviation				37



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Calculating Standard Deviation:

- Subtract Forecast (A) from Actual (B) to get Error (C)
- Square (D) the Error (C)
- Total the Errors Squared (Totals for Column D) = 15,125
- Divide the Totals for Errors Squared by the number of occurrences minus one (12-1=11) = 15,125/11 = 1,375
- Standard Deviation is Square Root of #4 ($\sqrt{1,375}$) = 37
- Standard deviation is approximately 1.25 X MAD

Calculating MAPE

MAPE

Calculating MAPE

1. Subtract Forecast from Actual to get Error
2. Determine Absolute Value of Error
3. Determine Absolute Percentage Error
4. Total Absolute Percentage Error (APE) for all periods (Absolute Error / Actual X 100%)
5. Total APE and divide by number of periods

The Lower the MAPE – the Better

Calculating Mean Absolute Percentage Error

MAPE					
Calculating Mean Absolute Percentage Error					
Month	Forecast (A)	Actual (B)	Error (C)	Absolute Error (D)	Absolute % Error (E)
Calculation			B-A	C	(D/B) * 100%
January	200	190	(10)	10	5.26%
February	200	230	30	30	13.04%
March	200	195	(5)	5	2.56%
April	200	240	40	40	16.67%
May	200	180	(20)	20	11.11%
June	200	175	(25)	25	14.29%
July	200	260	60	60	23.08%
August	200	150	(50)	50	33.33%
September	200	235	35	35	14.89%
October	200	185	(15)	15	8.11%
November	200	170	(30)	30	17.65%
December	200	255	55	55	21.57%
Totals	2,400	2,465	65	375	181.56%
MAPE = Total of E (181.56%) / # of Occurrences (12)					15.13%

Calculating MAPE:

- 1 Subtract Forecast (A) from Actual (B) to get Error (C).
- 2 Determine Absolute Value of Error (D).
- 3 Determine Absolute Percentage Error (Absolute Error / Actual) X 100%.
- 4 Total Absolute Percentage Error (APE) for all periods (Absolute Error / Actual) X 100%.
- 5 Total APE and divide by number of periods.

The Lower the MAPE – the Better

Calculating RMSE

Root Mean Squared Error

Calculating RMSE

1. Subtract Forecast from Actual to get Error
2. Square the Error
3. Total the Squared Errors
4. Divide the Total Squared Errors by the number of occurrences
5. Obtain the Square Root of the Total Squared Errors / by the # of occurrences

The Lower the RMSE – the Better

RSME Example

Root Mean Squared Error

RSME Example

Month	Forecast (A)	Actual (B)	Error (C)	Squared Error (D)
Calculation			B-A	
January	200	190	(10)	100
February	200	230	30	900
March	200	195	(5)	25
April	200	240	40	1,600
May	200	180	(20)	400
June	200	175	(25)	625
July	200	260	60	3,600
August	200	150	(50)	2,500
September	200	235	35	1,225
October	200	185	(15)	225
November	200	170	(30)	900
December	200	255	55	3,025
Totals	2,400	2,465	65	15,125
			Total Squared Error/ 12	
			1,260	
			RMSE $\sqrt{1,260}$	
			35.50	



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Calculating RMSE:

- 1 Subtract Forecast (A) from Actual (B) to get Error (C).
- 2 Square the Error (D).
- 3 Total the Squared Errors.
- 4 Divide the Total Squared Errors by the number of occurrences.
- 5 Obtain the Square Root of the Total Squared Errors / by the # of occurrences.

The Lower the RMSE – the Better

Improving Forecast Accuracy

Measuring & Improving Forecast Accuracy

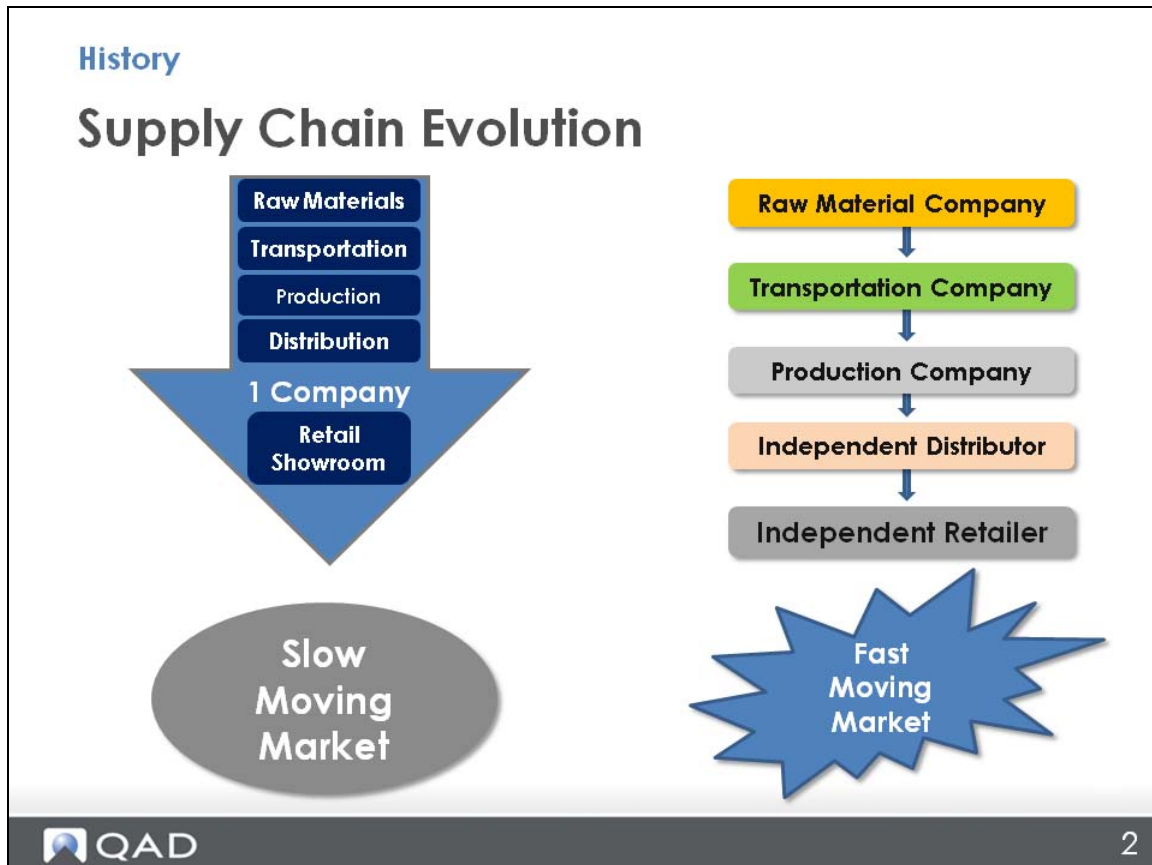
Improving Forecast Accuracy

- Assign responsibility for forecasts
 - Demand planning
 - Sales & Marketing
- Set realistic – and increasing – goals
- Tie performance bonuses to accuracy goals
- Provide good forecast tools & training
- Measure forecast accuracy regularly
- Work with poor performers

Chapter 4

History of Collaboration & the Bullwhip Effect

Supply Chain Evolution

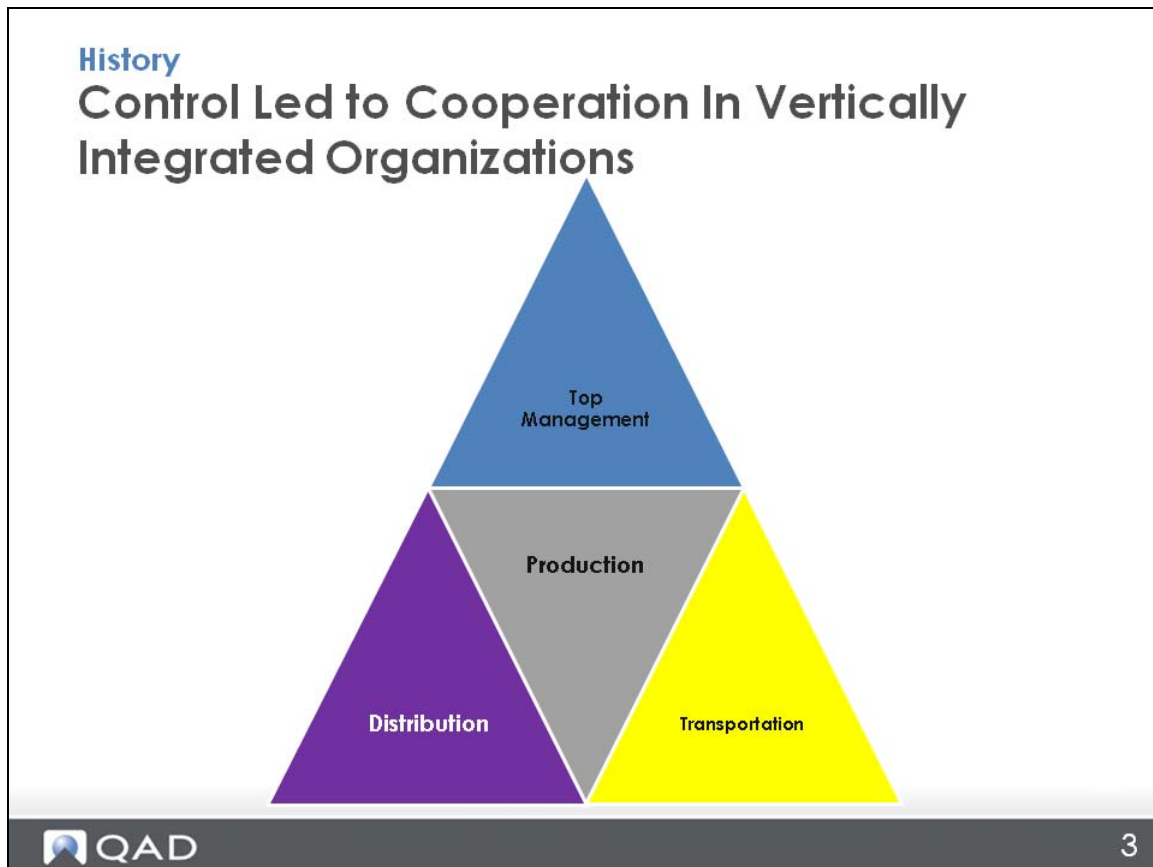


Vertical integration was rule for large manufacturing companies. In the early 20th century, Henry Ford owned:

- Iron ore mines in Northern Michigan
- Ocean-going vessels to bring the ore to his factories around Detroit
- Factories capable of making all parts of the car except tires
- Dealers to sell the cars

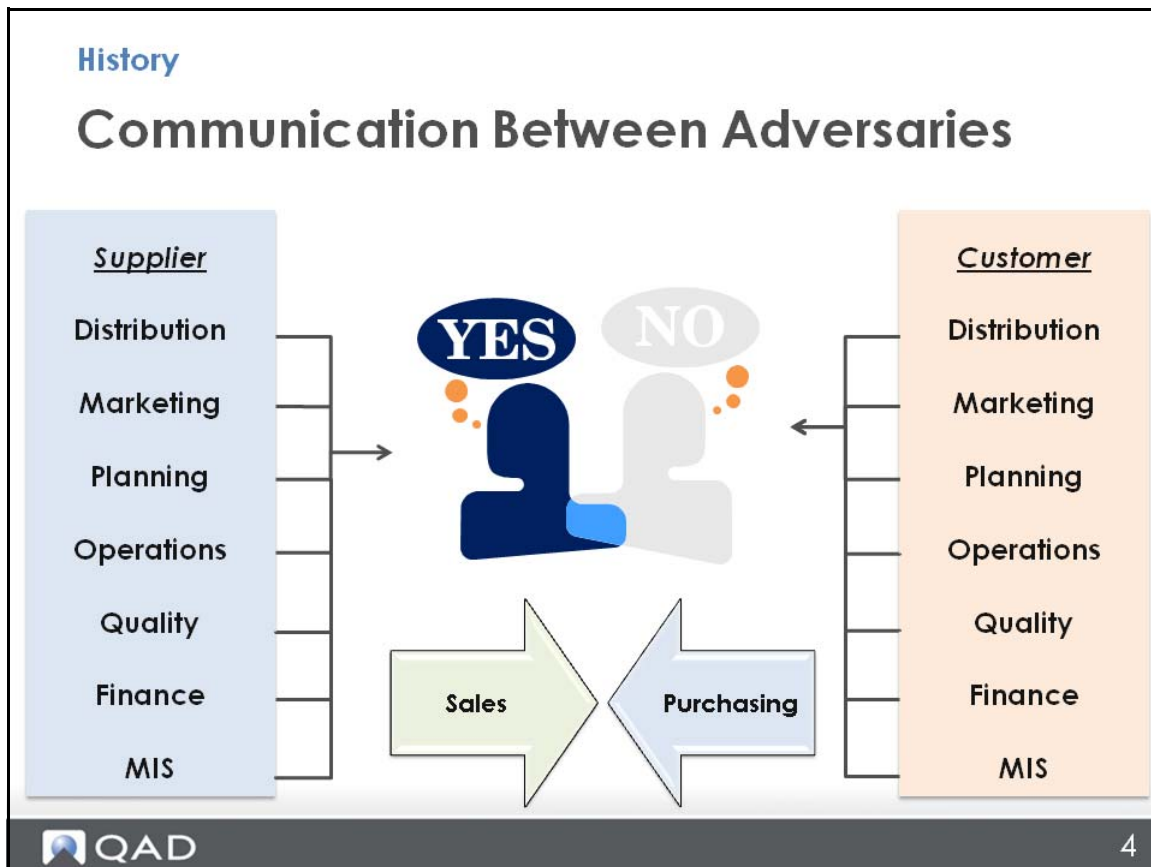
This changed as companies began to focus on their core competencies, selecting the niche that they were strongest.

Control Led to Cooperation In Vertically Integrated Organizations



Ensuring cooperation between departments was one of the functions of top management. They could force different departments to cooperate, or face severe consequences.

Communication Between Adversaries



When it came to relationships between customers and suppliers, the only point of contact was between the customer's purchasing department and the supplier's salespeople. Unfortunately, most salespeople thought buyers were constantly bluffing to get a better deal, and most buyers thought salespeople had never become acquainted with the truth. Adversarial relationships between customers and suppliers were the rule. Funneling all communication through the Purchasing & Sales departments meant that problems – about Quality, Marketing, MIS or other functional areas – had to be communicated by a buyer or sales person that may have had little understanding of the real key issues.

Traditional Adversarial Relationships

History

Traditional Adversarial Relationships

Retailer

- Direct customer access
- Direct access to data
- Buying power
- Does not trust supplier with information
- Safety stock

Manufacturer

- Services many retailers
- Indirect access to data
- Needs retailers
- Does not trust customer with information
- Safety stock

Lessons From Japan

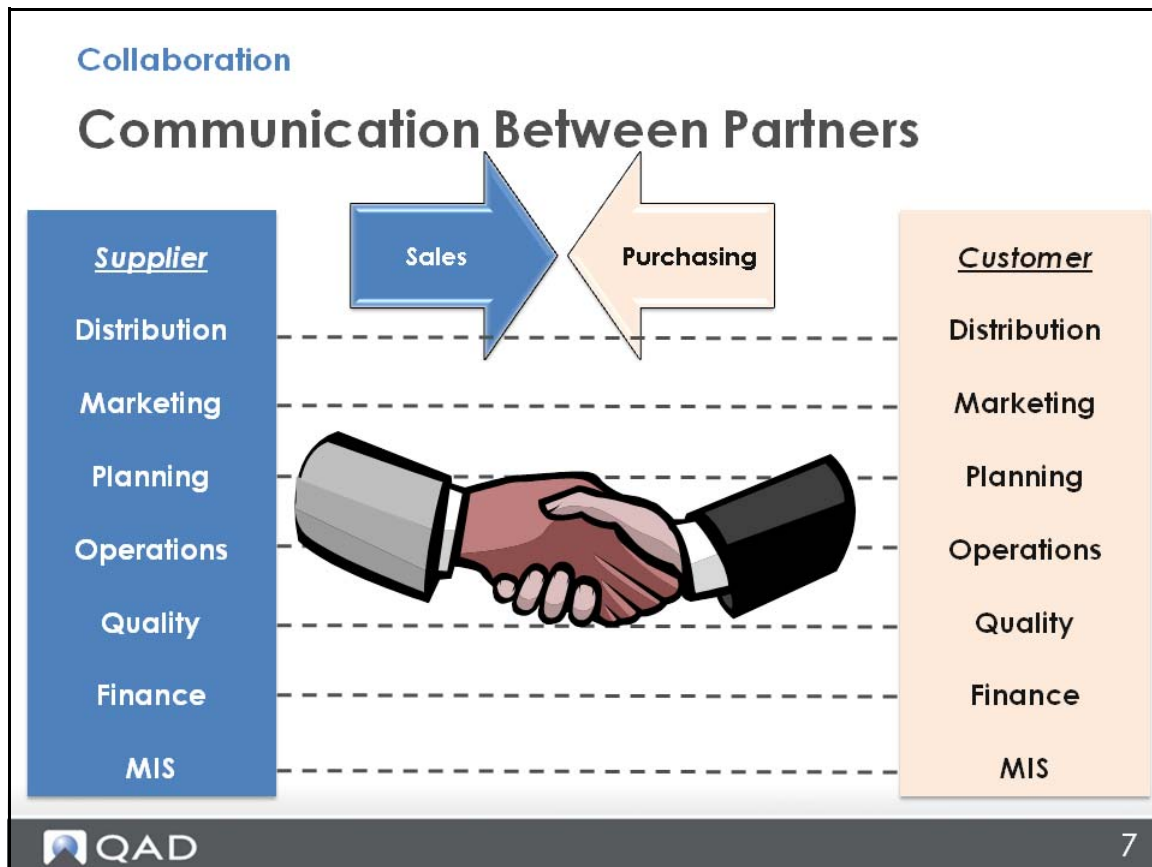
Collaboration

Lessons From Japan

- Suppliers treated as part of extended corporate "family" or "Keiretsu"
- Cooperation, leading to a long-term relationship, is more profitable than short – term "vendor bashing"
- Trust between supply chain partners is absolutely essential in building a strong supply chain

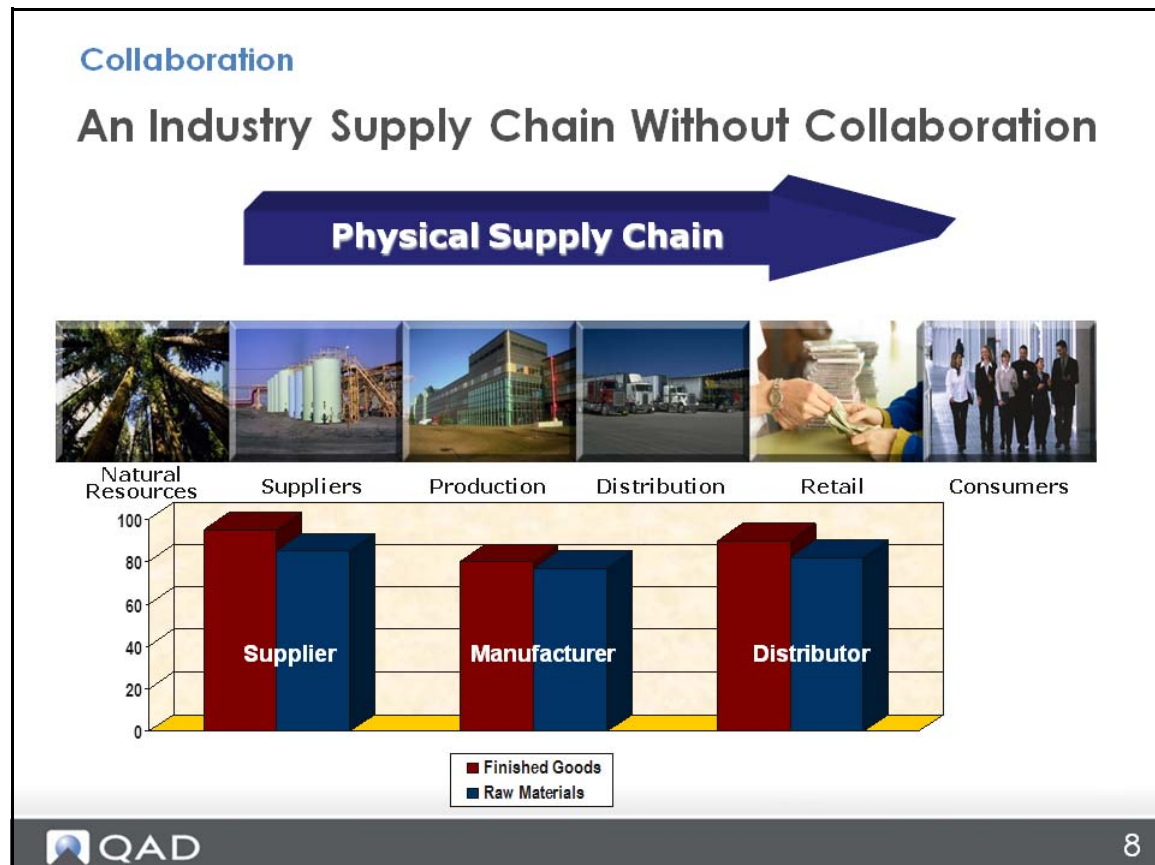
Keiretsu includes cross-ownership of companies, including customer & suppliers.

Communication Between Partners



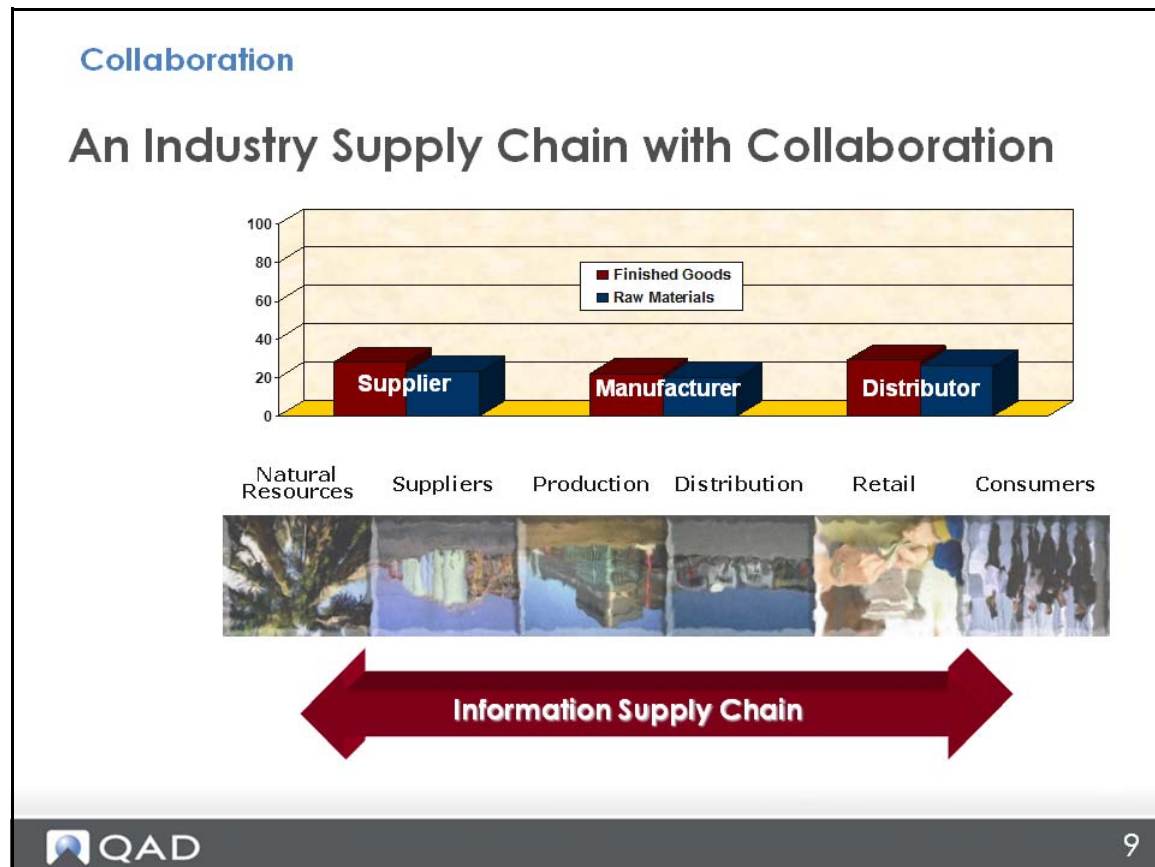
Taking to heart the lessons from Japan, companies began to open up communication channels and create partnerships. As companies focused on their niche, they could no longer treat their customers & suppliers as the enemy. Although the principal point of contact remained Purchasing and Sales, in a collaborative relationship they began to work together as partners. In addition, other functional units were now able to contact their counterparts at the other company. Because they spoke the same language and terminology, they could solve problems faster.

An Industry Supply Chain Without Collaboration



The lack of trust and coordination between customers and suppliers in the supply chain led to poor delivery and substandard quality. Companies at each step of the supply chain would keep high levels of Safety Stocks of incoming materials to protect against poor supply delivery and quality, plus high levels of finished goods to protect against unexpected customer demand.

An Industry Supply Chain with Collaboration



By sharing information and improving quality, companies were able to dramatically reduce Safety Stocks of both incoming and outgoing materials.

Knowledge Check

Knowledge Check

The Ford Motor company of the early 1900's was an example of:

- a) Extended enterprise
- b) Vertical integration
- c) Supply chain partnership

Knowledge Check

The Ford Motor company of the early 1900's was an example of:

- a) Extended enterprise
- b) Vertical integration
- c) Supply chain partnership

Knowledge Check

To make up for the lack of information sharing, customers & suppliers would each carry extra safety stock:

- a) True
- b) False

Knowledge Check

To make up for the lack of information sharing, customers & suppliers would each carry extra safety stock:

- a) True
- b) False

The Bullwhip Effect

Collaboration

The Bullwhip Effect

How smelly
diapers
changed
Supply Chain
Management!



14

Proctor & Gamble (P&G) went to Wal-Mart and asked “Since babies go to the bathroom on a fairly regular basis, why do your orders fluctuate so much”? Their joint study led to the discovery of The Bullwhip Effect.

Problems With Supply Chain Coordination

Collaboration

Problems With Supply Chain Coordination

- Demand forecasting
- Order batching
- Product Rationing
- Product Pricing
- Performance Incentives



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Demand Forecasting

Inherently inaccurate, the further removed from the end user the forecasting company is, the more they are incorporating the forecast errors of their customers, their customer's customers...

Order Batching

To gain economies of scale in transportation and order processing, companies often batch orders in weekly or monthly orders. This is seen as actual demand by their suppliers.

Product Rationing

During times of shortage, manufacturers will often ration the amount of product they will apply against a customer's order. In order to "beat the system", customers will increase the size of their orders.

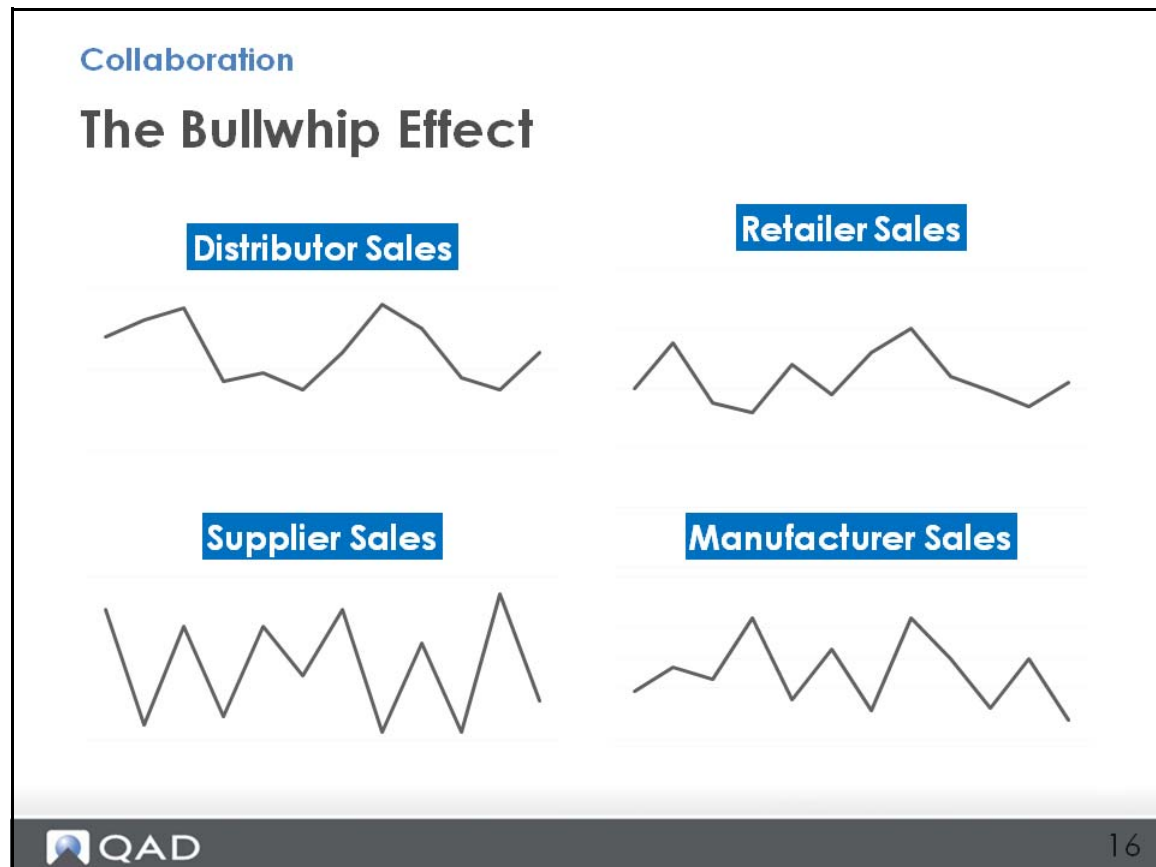
Product Pricing

Companies that engage in frequent promotional pricing incentives will drive extra sales during the promotion, normally followed by a period of below normal sales.

Performance Incentives

Many companies have monthly or quarterly performance bonuses for their sales force. This encourages salespeople to offer their customers “deals” if they near the end of their bonus qualification period short of their sales target. Conversely, many buyers are incented based on obtaining purchase discounts. This encourages the purchasing of large quantities.

The Bullwhip Effect



The further away we get from the end user, the wider the swings in orders.

Breaking the Bullwhip Effect

Collaboration

Breaking the Bullwhip Effect



Natural
Resources

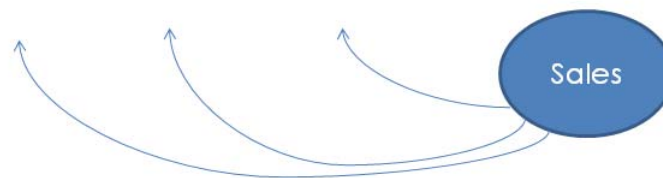
Suppliers

Production

Distribution

Retail

Consumers



The sharing of POS data from the supply chain partner that is closest to the customer allows improved responsiveness and synchronization

The Keys to Collaboration

Collaboration

The Keys to Collaboration

- Communication
- Confidentiality
- Confidence



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Communication

Must be open between supply chain partners.

Confidentiality

Suppliers that are on the receiving end of information from a customer often sell to the customer's competitors. Keeping information from one customer from all other customers is critical.

Confidence

When suppliers agree to share the information and need to be confident that the supplier will use it and respond to changing order patterns rapidly.

Knowledge Check

Knowledge Check

According to the Bullwhip Effect, order variability would be greatest for the:

- a) Retailer
- b) Distributor
- c) Producer
- d) Supplier

Knowledge Check

According to the Bullwhip Effect, order variability would be greatest for the:

- a) Retailer
- b) Distributor
- c) Producer
- d) Supplier

Chapter 5

Collaborative Planning, Forecasting & Replenishment

9 Step CPFR? Process

Collaborative Planning, Forecasting & Replenishment®

9 Step CPFR® Process

- Collaborative Planning, Forecasting & Replenishment
- Developed by Voluntary Interindustry Commerce Standards (VICS) association
www.cpfr.org or www.vics.org



A Few CPFR? Users



Why CPFR?

CPFR®

Why CPFR®?

Companies can optimize their internal processes, but...

- Internal gains can be wiped out by supply chain inefficiencies
- Competition keeps raising the bar
- Global competition gives customers more leverage to increase demands



 4

CPFR should lead to:

- Increased sales, via improved in-stock performance
- Reduced supply chain costs, i.e., production, storage, transportation, and handling through improved information flow
- Reduced safety stock inventory for the entire supply chain
- Improved relationships between key trading partners
- Improved technology Return on Investment (ROI)

CPFR? Manufacturer & Retailer Tasks

CPFR®

CPFR® Manufacturer & Retailer Tasks

Retailer Tasks	Collaboration Tasks	Manufacturer Tasks
Strategy & Planning		
Vendor Management	Collaboration Arrangement	Account Planning
Category Management	Joint Business Plan	Market Planning
Demand & Supply Management		
POS Forecasting	Sales Forecasting	Market Data Analysis
Replenishment Planning	Order Planning/Forecasting	Demand Planning
Execution		
Buying/Re-buying	Order Generation	Production & Supply Planning
Logistics/Distribution	Order Fulfillment	Logistics/Distribution
Analysis		
Store Execution	Exception Management	Execution Monitoring
Supplier Scorecard	Performance Assessment	Customer Scorecard

 **QAD** 5

- Review Retailer Tasks
- Review Manufacturer Tasks
- Review Collaboration Tasks

Step 1: Collaboration Arrangement

Nine Step CPFR® Process

Step 1: Collaboration Arrangement

- Goals and Objectives
- Confidentiality
- Information Sharing
- Resources
- Responsibilities
- Expectations
- Resolutions




6

Goals & Objectives – Decide whether agreement will be all encompassing or for certain product categories only. Determine alignment of the two parties goals – exclusivity, market share. Agree about changes that will cause for agreement to be reopened.

Confidentiality – Suppliers that enter into CPFR agreements also sell to competitors. Designate individuals to access customer information on a need to know basis. Spell out consequences of violation.

Information Sharing – Determine information to be shared and agree on frequency and format.

Resources – Identify management & information technology (IT) resources needed. Determine which of the parties will take the lead in this area. Establish pilot project scope and determine realistic timetable for resource deployment.

Responsibilities – Agree on partner responsibilities, including which individuals will take the lead? Who will be the backups during vacations? Who will handle logistics, set up meetings, etc.?

Expectations – Lay out expectations of each party. What will constitute success? What is the timetable for judgment? How will performance be communicated?

Resolutions – Who has the authority to resolve problems? At what point will problems be escalated? To whom?

Step 2: Create Joint Business Plan

Nine Step CPFR® Process

Step 2: Create Joint Business Plan

- Corporate Strategies
- Partnership Strategies
- Category Roles & Objectives
- Item Management
- Promotional Notification
- Exception Criteria
- Metrics

QAD 7

Corporate & Partnership Strategies – Both companies must agree on how to go forward strategically.

Category Roles & Objectives – Companies must agree on market share goals, growth and profit goals and promotional strategies. Where differences exist, they must be resolved.

Item Management – Determine capacity/order limits, both for standard orders and promotions. Operations groups at each party should take part to hammer out day-to-day detail regarding order minimums, multiples, and lead times.

Promotion Notification – How much advance notice is required? What options exist if capacity doesn't exist?

Exception Criteria – What will trigger a review?

Metrics - Must lead to a common definition of success.

Step 3: Create Sales Forecast

Nine Step CPFR® Process

Step 3: Create Sales Forecast

- Both parties create sales forecast
- Sales forecasts based on
 - History
 - Category trends
 - Seasonality (if applicable)
 - Known promotional activity
- Compare item forecasts



Step 4: Identifying Exceptions

Nine Step CPFR® Process

Step 4: Identifying Exceptions

Part #	Customer Forecast	Supplier Forecast	% Difference
A-763	12,786	14,346	12.2%
R-349	36,475	65,789	80.4%
F-921	122,838	132,445	7.8%
B-637	192,789	155,089	-19.6%
S-795	211,897	222,731	5.1%

Agreed exception level: +/-15%



- Two sales forecasts reviewed against exception criteria
- If sales forecasts of two parties are within exception criteria guidelines established by Joint Business Plan, differences handled automatically by predetermined agreement
- If sales forecasts violate exception criteria guidelines, differences presented to individual buyer and forecaster to resolve during forecasting conference call

Step 5: Resolving Exceptions

Nine Step CPFR® Process

Step 5: Resolving Exceptions

Part #	Customer Forecast (CF)	Supplier Forecast (SF)	% Difference	Resolution
A-763	12,786	14,346	12.2%	
R-349	36,475	65,789	80.4%	SF based on last years promo – use CF
F-921	122,838	132,445	7.8%	
B-637	192,789	155,000	-19.6%	SF based on RM allocation – use SF
S-795	211,897	222,731	5.1%	


 Arrange Collaboration → Joint Business Plan → Create Sales Forecast → Identify Exceptions → Resolve Exceptions → Forecast Orders → Identify Exceptions → Resolve Exception → Generate Orders


10

Many companies stop with Step 5.

Step 6: Create Order Forecast

Nine Step CPFR® Process

Step 6: Create Order Forecast

- Create purchase order forecast based on
 - Mutually agreed sales forecast
 - Customers' inventory position & policies

APR02000
8:50
000

STATE OF NORTH CAROLINA PURCHASING SYSTEM
LISTING OF PURCHASE ORDER ENCUMBRANCES BY PO LINE

PAGE 1
C-040405 ENCUMBRANCE
04/02/00

BUYING OFFICE NUMBER	BUYING OFFICE NAME	PO LINE NUMBER	VENDOR SHORT NAME	PO LINE DESCRIPTION	ENCUMBRANCE DATE	PO LINE ENCUMBRANCE DATE
0000	0000000000	0001	VADEZUNBARNES, SERVICE CONTRACT WITH VADEZUNBARNES	2,204,000.00	04/02/00	
0000	0000000000	0002	COMEST, SERVICE CONTRACT WITH COMEST	1,000.00	04/02/00	
0000	0000000000	0003	NECA, PSC WITH INDIANA TECHNIC	60.00	04/02/00	
0000	0000000000	0004	ECU, PSC WITH DR. VIRGINIA STILES	2,370.24	04/02/00	
0000	0000000000	0005	UNCG, PSC WITH DR. JUDY MENDEN	1,307.00	04/02/00	
0000	0000000000	0006	EFFECTIVE SCHOOLS, SERVICE CONTRACT WITH EFFECTIVE SCHOOLS PRODU	96.40	04/02/00	
0000	0000000000	0007	REGISTRATION SCHOOLS, SERVICE CONTRACT WITH REGISTRATION SCHOOLS	97.00	04/02/00	
0000	0000000000	0008	ECU, SERVICE CONTRACT WITH EAST CAROLINA UNIVERSITY	1,000.00	04/02/00	
0000	0000000000	0009	CONFERENCE CENTER, SERVICE CONTRACT WITH CONFERENCE CENTER	2.00	04/02/00	
0000	0000000000	0010	POSSAMPTON, SERVICE CONTRACT WITH POSSAMPTON COUNTY BOARD	4,000.00	04/02/00	
0000	0000000000	0011	ECU, SERVICE CONTRACT WITH EAST CAROLINA UNIVERSITY	430.00	04/02/00	
0000	0000000000	0012	UNCG, SERVICE CONTRACT WITH UNCG-CHAPEL HILL	300.00	04/02/00	
0000	0000000000	0013	LEARNERSHOW, PSC WITH LEARNERSHOW	400.00	04/02/00	
0000	0000000000	0014	ECU, PSC WITH DR. HAROLD GRIFFIN	240.00	04/02/00	
0000	0000000000	0015	UNCG, PSC WITH DR. ROBERT ROYLAND	500.00	04/02/00	



Step 7: Identify Exceptions to Order Forecast

Nine Step CPFR® Process

Step 7: Identify Exceptions to Order Forecast

- Identify exceptions to the order forecast based on:
 - Suppliers material constraints
 - Suppliers capacity constraints
 - Violations of the joint business plan



Step 8: Resolve Exceptions to Order Forecast

Nine Step CPFR® Process

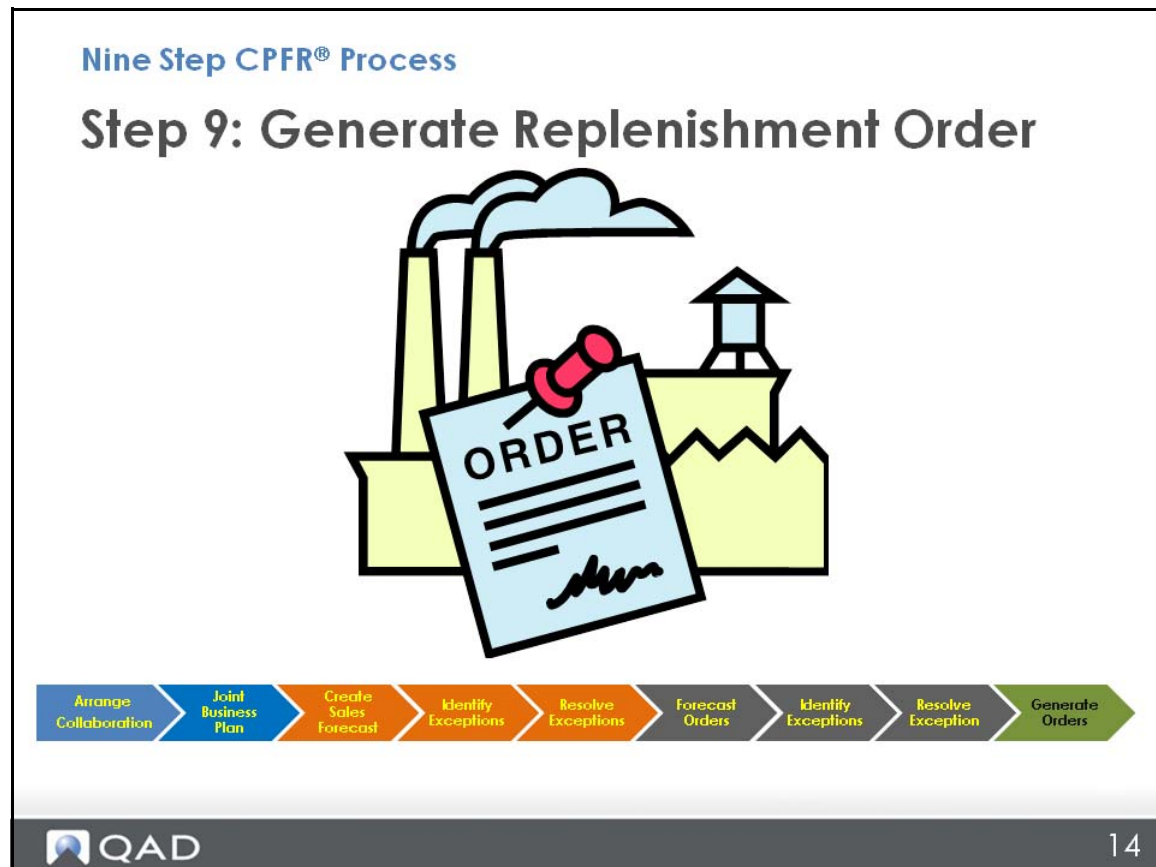
Step 8: Resolve Exceptions to Order Forecast



 QAD

13

Step 9: Generate Replenishment Order



Value Added by CPFR

Nine Step CPFR® Process

Value Added by CPFR

- Improved working relationships
- Reduced safety stocks
- Reduced lost sales due to stockouts
- Improve response to promotions
- Improve asset utilization and distribution
- Align goals across the supply chain
- Increase ability to manage brands and categories



Knowledge Check

Conclusion

Knowledge Check

CPFR® is an abbreviation for

- a) Cooperation, Profit, Forecasting & Return
- b) Collaborative Planning, Forecasting & Replenishment

Conclusion

Knowledge Check

CPFR® is an abbreviation for

- a) Cooperation, Profit, Forecasting & Return
- b) Collaborative Planning, Forecasting & Replenishment

Conclusion

Knowledge Check

How many steps are required to implement CPFR® ?

- a) 7
- b) 8
- c) 9
- d) 10

Conclusion**Knowledge Check**

How many steps are required to implement CPFR® ?

- a) 7
- b) 8
- c) 9
- d) 10

Conclusion

Knowledge Check

What is the second step taken during a CPFR® implementation?

- a) Joint business plan
- b) Forecast orders
- c) Generate orders
- d) Arrange collaboration

Conclusion

Knowledge Check

What is the second step taken during a CPFR® implementation?

- a) Joint business plan
- b) Forecast orders
- c) Generate orders
- d) Arrange collaboration

Chapter 6

Sales & Operations Planning

What Is Sales & Operations Planning?

Definition

What Is Sales & Operations Planning?

*The process brings together **all the plans** for the business (sales, marketing, product development, manufacturing, sourcing and financial) **into one integrated set of plans.***

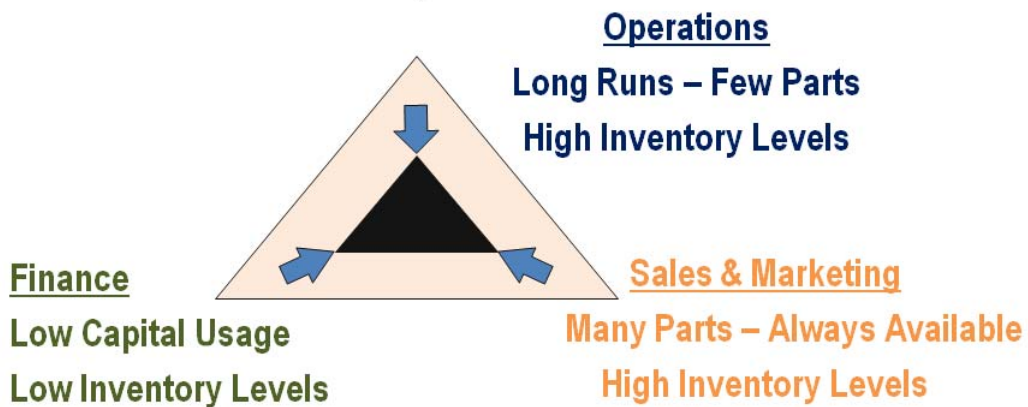
APICS Dictionary

Conflicts of Inventory Management

Why S&OP?

Conflicts of Inventory Management

- Improve productivity
- Improve customer service
- Reduce inventory investment



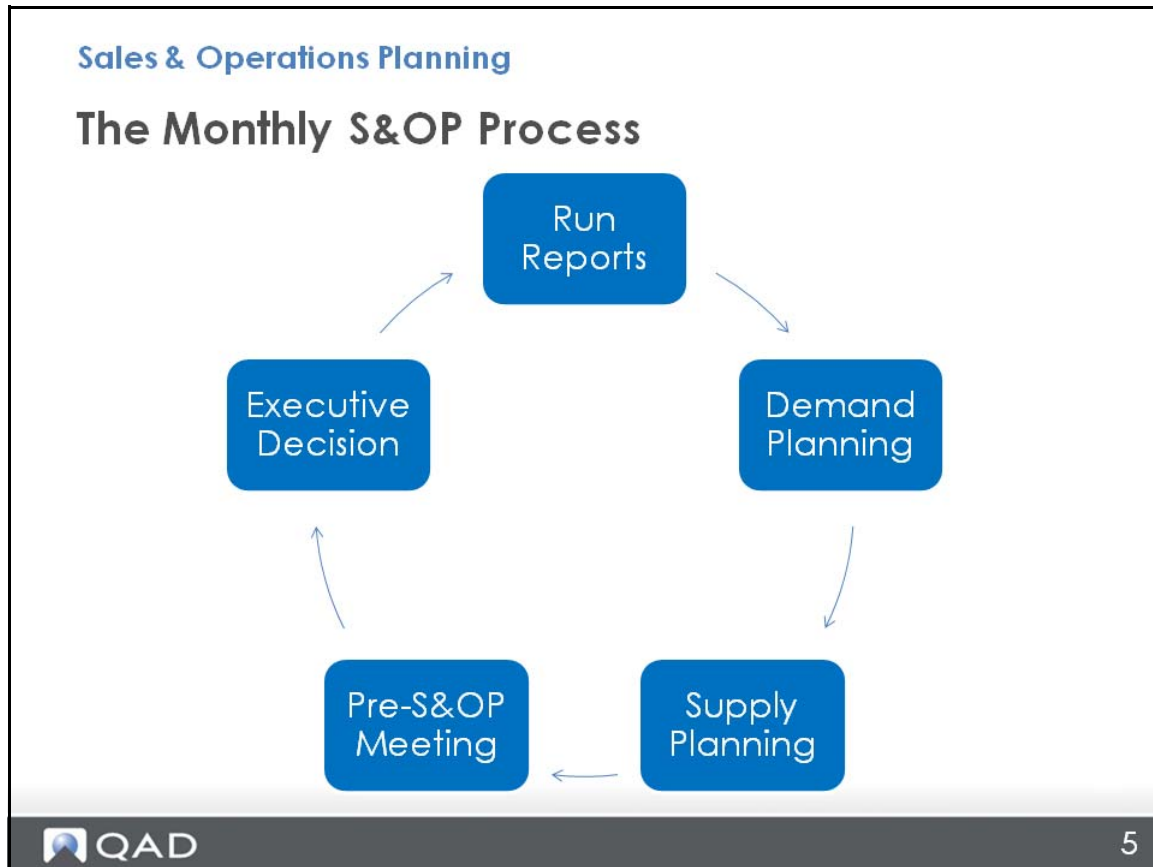
Bring Supply & Demand Into Balance

The Goal of S&OP

Bring Supply & Demand Into Balance



The Monthly S&OP Process



Key Elements of S&OP Process

Sales & Operations Planning

Key Elements of S&OP Process

- A monthly process
- Performed at aggregate level
- Reconcile all supply, demand, new product and financial plans
- Goal: ONE plan for executing business strategy



Run Sales Forecast Reports

Step 1

Run Sales Forecast Reports

- Key players – Demand Planning & IT
- Update sales, production, inventory information from the month just ended
- Provide statistical forecast information needed to revise forecasts
- Provide actual production & inventory information Vs. last month's goals



Demand Planning Process

Step 2

Demand Planning Process

- Key players – Demand Planning, Sales, Marketing
- Demand Planning analyzes statistical data to provide input to Marketing
- Sales & Marketing review last month's performance and explains significant misses



Sales – A Bit Soft

Step 2 – Demand Planning Process

Sales – A Bit Soft

	March	April	May	Totals
Sales Plan	24,000	24,000	24,000	72,000
Actual Sales	22,000	23,000	21,000	66,000
Difference	(2,000)	(1,000)	(3,000)	(6,000)
Cumulative Difference	(2,000)	(3,000)	(6,000)	



Document Causes & Corrective Actions

Step 2 – Demand Planning Process

Document Causes & Corrective Actions

- Promotions not meeting targets
 - Review advertising budget and methods
- Product shortage
 - Review cause – determine preventive steps
- Unexpected customer promotion
 - Determine reason for lack of notification



1st Pass Spreadsheet Developed

Step 2 – Demand Planning Process

1st Pass Spreadsheet Developed

- Old forecast + growth in market
 - <decline in market>
- + New customers
 - <lost customers>
- + Promotions
- + New product launches



Supply Planning Process

Step 3

Supply Planning Process

- Key players – Demand Planning & Operations Groups
- Review last month's performance against goals
- Examine reasons for variances against goals and determine actions to compensate
- Revise product level operations plans



Production– Getting Further Behind

Step 3 – Supply Planning Process

Production– Getting Further Behind

	March	April	May	Totals
Production Days	21	22	22	65
Planned Production	45,000	45,000	45,000	135,000
Actual Production	43,000	41,000	40,000	124,000
Difference	(2,000)	(4,000)	(5,000)	(11,000)
Cummulative Difference	(2,000)	(6,000)	(11,000)	(11,000)



Document Causes & Corrective Actions

Step 3 – Supply Planning Process

Document Causes & Corrective Actions

- Supplier issues
- Capacity issues
- Personnel issues



Operations Produces 2nd Pass Spreadsheet

Step 3 – Supply Planning Process

Operations Produces 2nd Pass Spreadsheet

- 1st Pass Spreadsheet forms baseline
- Review 1st Pass Spreadsheet against capacity, labor and material constraints
- Must be achievable



Pre-S&OP Meeting



Step 4 – Pre-S&OP Process

Pre – S&OP Meeting

- Key Players – Department Heads
- Review 1st & 2nd pass spreadsheet differences
- Resolve differences if possible
- Determine areas where agreement cannot be met
- Set Executive Meeting Agenda



Executive Review

Step 5 – Executive S&OP Process

Executive Review

- Key players – top company executives, department heads of Sales, Operations and Marketing, Demand Planning
- Review of last month's sales & operations metrics against plan
- Review status of new products
- Review major problems/opportunities



Executive Decision & Approval

Step 5 – Executive S&OP Process

Executive Decision & Approval

- Review/approve changes to each product family
- Review/approve changes in Product/Procurement rates that have a major impact
- Review/approve decisions made in Pre-S&OP meeting
- Timing – Middle/End of Week 4
- Output – **One** Sales & Operations Plan



Challenges in Implementing S&OP

Conclusion

Challenges in Implementing S&OP

- Fear of change
 - Change is not universally embraced
- Conflict
 - In many companies, conflict is kept below the surface
 - In S&OP, conflict is brought to the surface
- Accountability
 - Many people would prefer not to explain last month's misses
 - Do not understand that learning from past occurrences is the best way to improve future performance

Knowledge Check

Let's take a knowledge check.



1. S&OP is an acronym for sales & operations planning.
2. S&OP process involves?
 1. Sales
 2. Marketing
 3. Product Development
 4. Manufacturing
 5. Sourcing
 6. Financial
3. All departmental objectives are consistent and easily achieved? **FALSE**

Before we conclude let's take another knowledge check.



1. Who should drive the S&OP process? **CEO**
2. Which comes first, Pre-S&OP Meeting, Supply Planning or **Demand Planning**?
3. Name one challenge of implementing S&OP
 1. **A. Fear of change**
 2. **B. Desire to avoid conflict**
 3. **C. Desire to avoid accountability**
4. What is the goal of the S&OP process?
One set of plans for the company
5. Who approves the final S&OP?
Executive management

Questions or Comments?

Questions or Comments?



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