

# **DEMAND-DRIVEN PLANNING AND OPTIMIZATION BIG DATA AND SUPPLY CHAIN MANAGEMENT**

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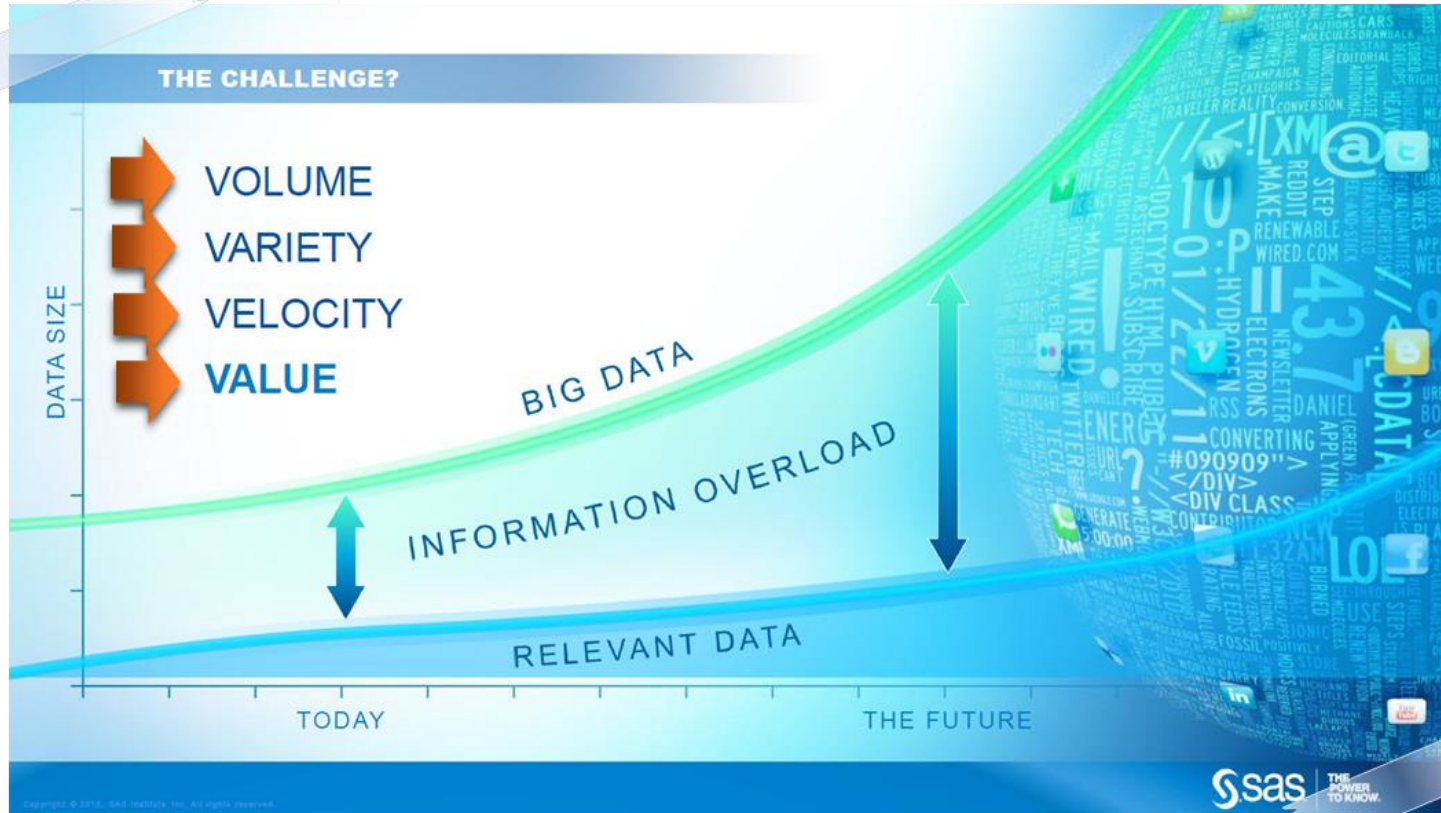


THE POWER TO KNOW.

## **AGENDA** | BIG DATA AND SUPPLY CHAIN MANAGEMENT

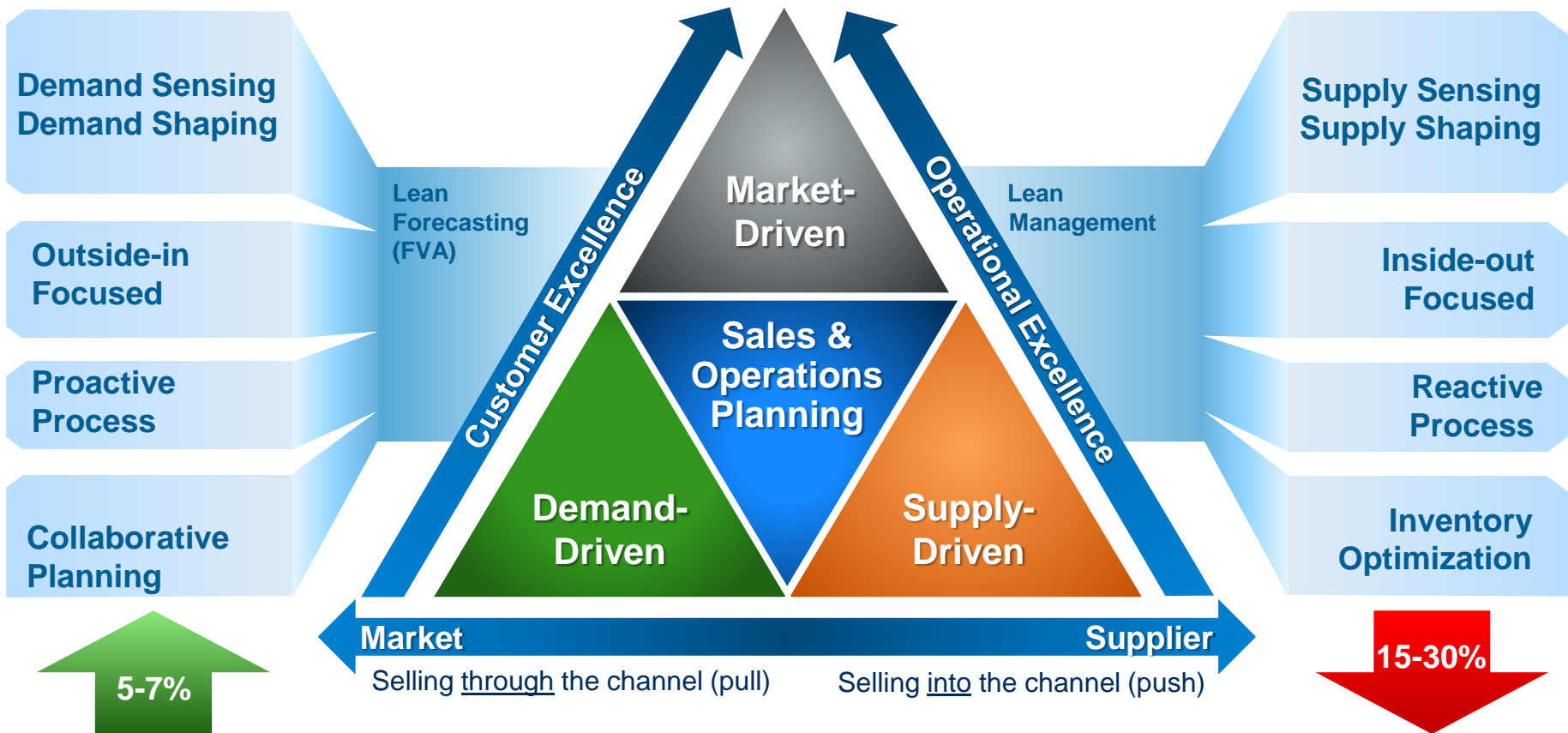
- Big Data
- Demand synchronization
- Common challenges and demands
- Demand-Driven Planning and Optimization (DDPO)
  - Forecasting
  - Collaborative Planning
  - Inventory optimization
- Results and take-aways
- Further readings

# BIG DATA WHAT IS DRIVING BIG DATA?



# DEMAND SYNCHRONIZATION

Synchronize the demand and supply sides of the supply chain equation



# DEMAND-DRIVEN FORECASTING

## DEFINITION

- Demand-driven forecasting is the use of forecasting technologies along with demand sensing, shaping, and translation techniques to improve supply chain processes. Focuses on identifying the market signals and translating them into the drivers of demand.
- The input signals from the market are:
  - Trend
  - Seasonality
  - Sales promotions
  - Marketing events
  - Price
  - Advertising
  - In-store merchandising
  - Competitive pressures
  - Others



*“Demand-planning has evolved from a shadowy concept to a critical planning function.”*

*—Deborah Goldstein,  
Vice President Demand Planning, McCormick*

## COMMON CHALLENGES

- Incoherent flows
- High stock values
- Many out-of-stock (OOS) situations
- Many manual processes
- Gut feeling instead of facts
- Many man-hours spent on replenishment

## COMMON DEMANDS

- Coherent replenishment flow
- Forecasting based on POS data
- Automated orders
  - Fewer man-hours
- Higher turnover rate
- Fewer OOS situations
  - Especially on critical articles

# DEMAND SYNCHRONIZATION

## SOLUTION OVERVIEW

Collaborative Planning

### SAS DEMAND-DRIVEN PLANNING & OPTIMIZATION



**Demand**

POS/Syndicated Scanner

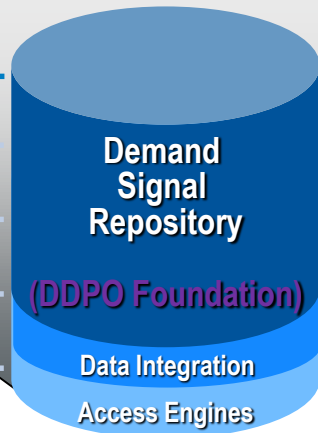
Sales Promotions

Distribution

Price

Advertising

In-Store Merchandising (Display, Feature, TPR, and others)



Sales Orders

Shipments

Trade Promotion

Wholesale Gross Price

Off Invoice Allowances

Retail Inventory

**Supply**

# FORECASTING | THE LAWS OF FORECASTING

1. Forecasts are almost always wrong!
2. Forecasts for near future are more accurate
3. Forecasts on SKU level are usually less accurate than forecasts on product group level
4. Forecasts cannot substitute calculated values

# FORECASTING

## RESULTS OF POOR FORECASTING

Forecast Error

Over Forecast

Excess Inventory

Holding Cost

Transshipment Cost

Obsolescence

Reduce Margin

Under Forecast

Expediting Cost

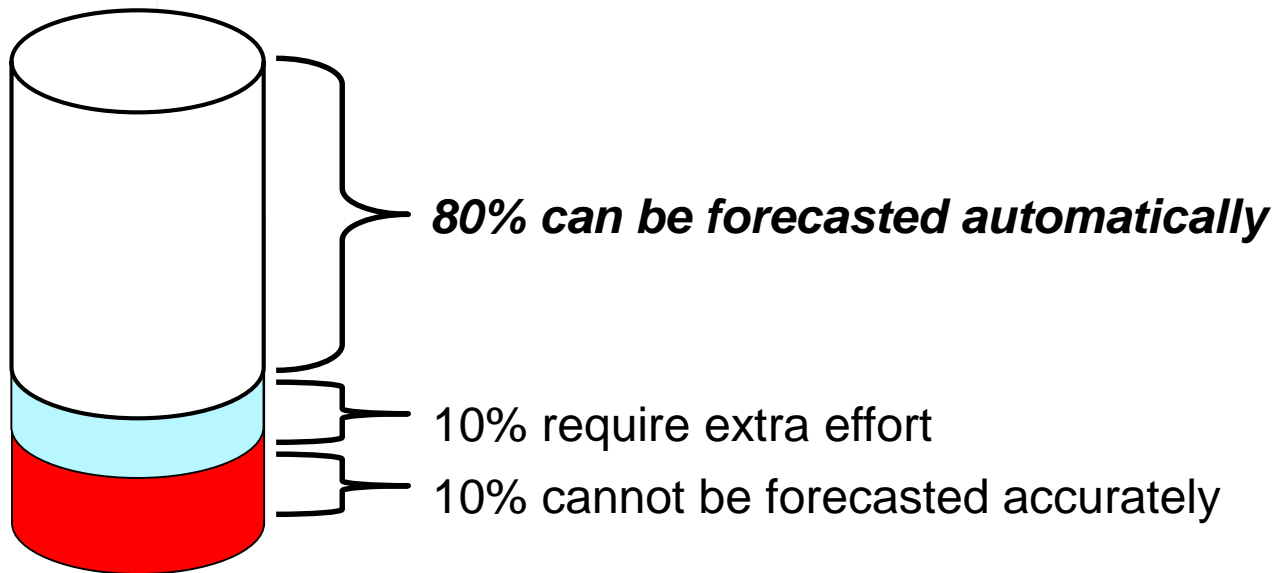
Higher Product Cost

Lost Sales Cost

Lost Companion Sales

Customer Satisfaction

# FORECASTING LARGE-SCALE FORECASTING SCENARIO



Time Series Data

## EXAMPLE FROM A HIGH-PERFORMANCE FORECASTING (HPF) INSTALLATION

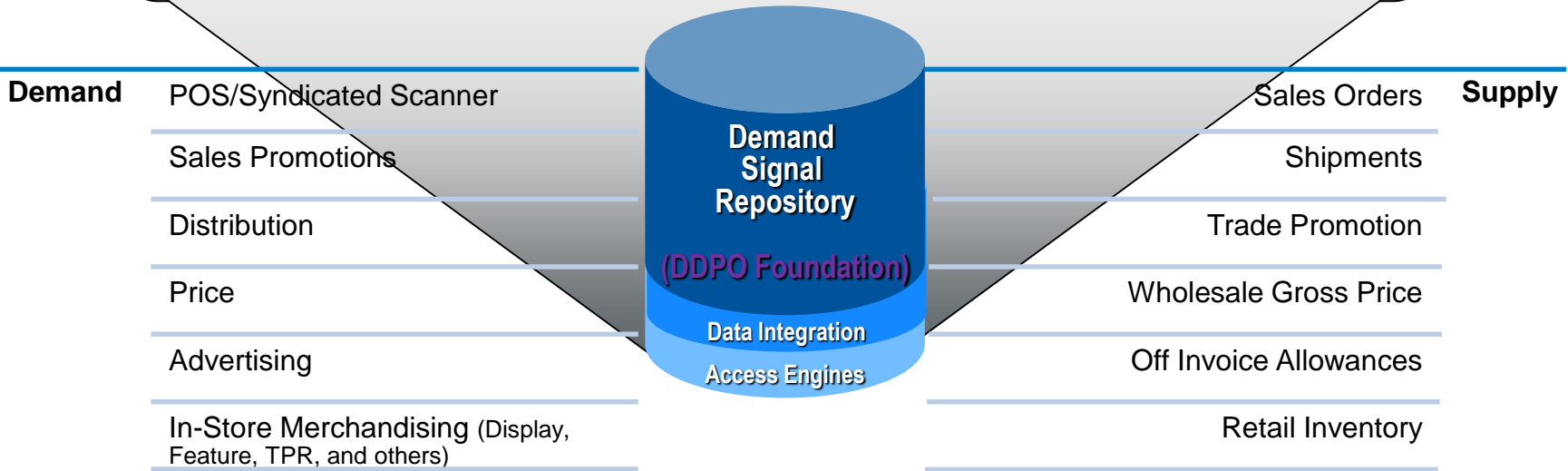
- 2 million forecasts each week for SKU/store combinations
  - (52 weeks on weekly level, based on up to 3 years of data)
- 26,500 forecasts each day on SKU level
  - (52 weeks on daily level, based on up to 3 years of data)
- Forecast is reconciled each day
- Model types: ARIMAX, ESM and pre-made naive models
- Explaining variables
  - Flyer, avis, smuk, jule, uann, x\_kampagne, vareOvergang, forside, familie\_rabat, soendags\_aabent, kamp\_uge\_1, kamp\_uge\_2 and uannon\_periode
- Output is expected sales on SKU/store and SKU level, and the uncertainty of the expected sales

# DEMAND SYNCHRONIZATION

## SOLUTION OVERVIEW

Collaborative Planning

### SAS DEMAND-DRIVEN PLANNING & OPTIMIZATION



## Focus on forecasting process efficiency

- Forecast accuracy is largely a function of the “forecastability” of the demand
- We may never be able to achieve the accuracy desired
- But we can control the process used and the resources we invest

### The “naïve” forecast

- *Performance must always be evaluated with respect to the alternatives*
- The naïve forecast is a baseline of performance against which all forecasting efforts must be compared
- Two commonly used naïve models are:
  - Random Walk
  - Seasonally Adjusted Random Walk
- If you can't beat a naïve forecast, then why bother?

### Forecasting performance evaluation

- Who is the best analyst?

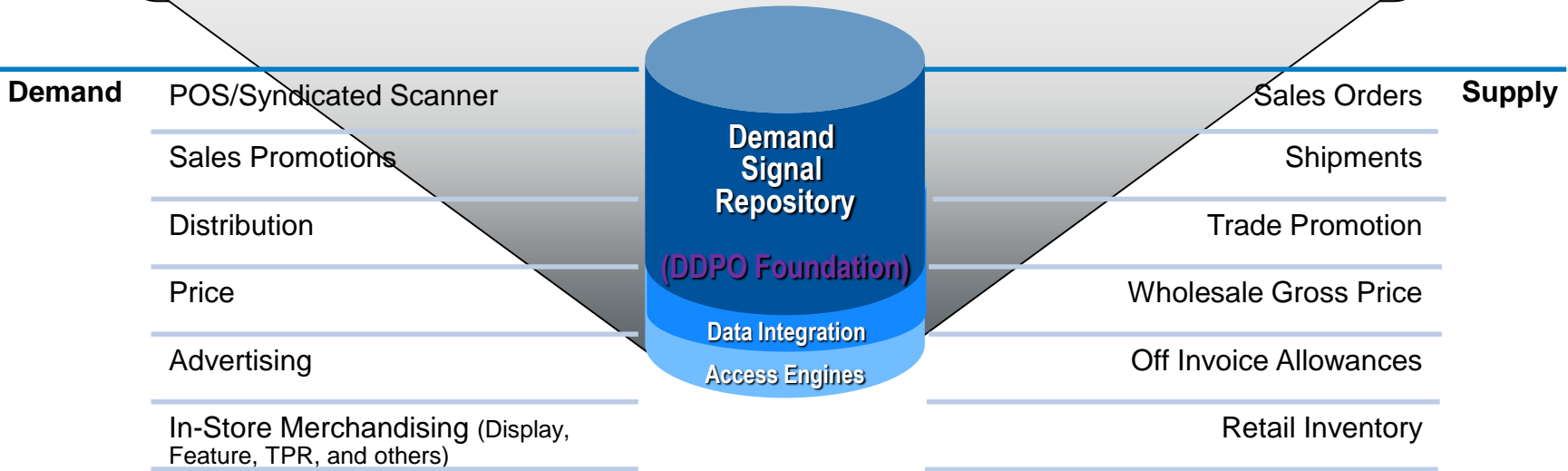
Analyst	Item Type	Item Life Cycle	Seasonal	Promos	New Items	Demand Volatility	MAPE	Naïve MAPE	FVA
A	Basic	Long	No	None	None	Low	20%	10%	-10%
B	Basic	Long	Some	Few	Few	Medium	30%	30%	0%
C	Fashion	Short	Highly	Many	Many	High	40%	50%	10%

# DEMAND SYNCHRONIZATION

## SOLUTION OVERVIEW

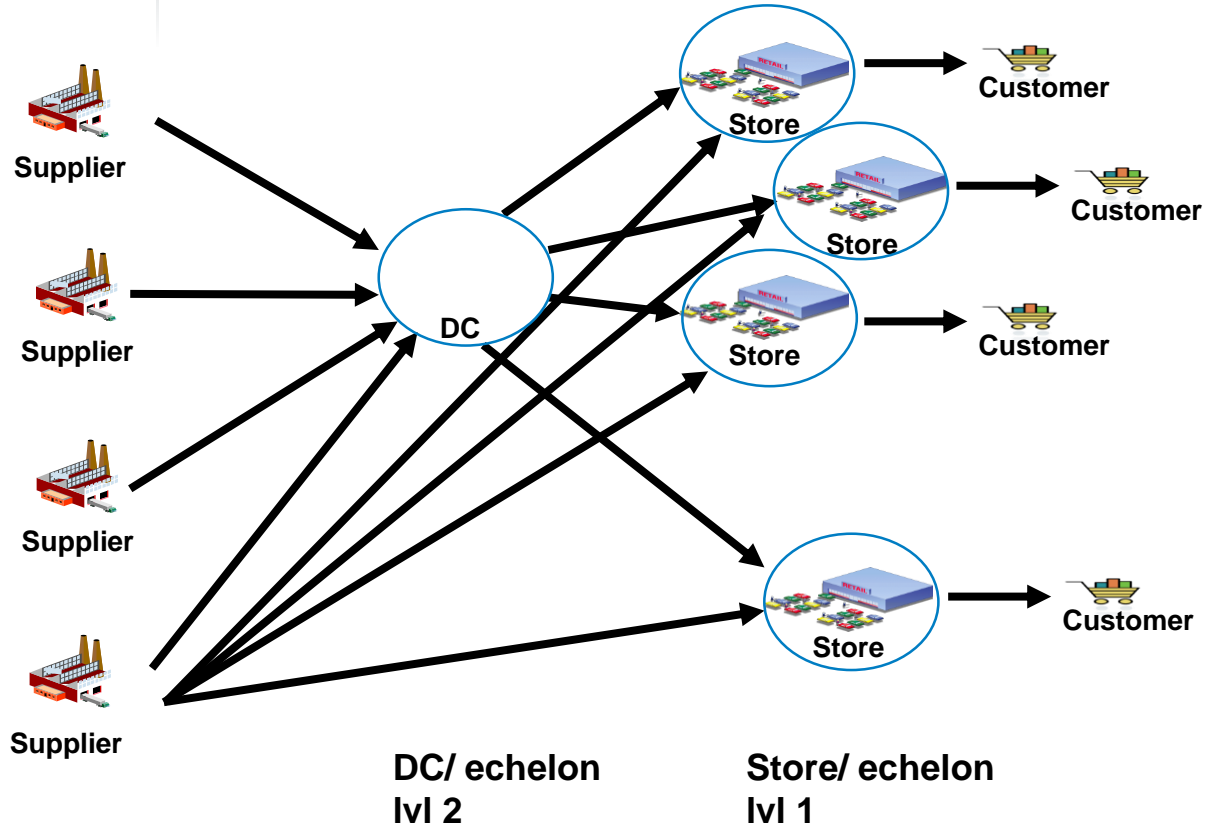
Collaborative Planning

### SAS DEMAND-DRIVEN PLANNING & OPTIMIZATION



# INVENTORY OPTIMIZATION

## TYPICAL NETWORK



### Goal with IO

To find the most optimal reorder levels as to economy and what level should be ordered up to – in other words finding minimum and maximum. This is done based on constrains and demand expectations on SKU level

### Model types

- SS and BS, which are minimizing the cost given the demand and constrains information

### Input variable

- Costs
  - Ordering cost, holding cost and penalty cost
- Demand
  - Expected sales in the total lead time, and the uncertainty of this expected demand
- Constrains
  - Service level, service type (fill rate), batch size and minimum order quantity

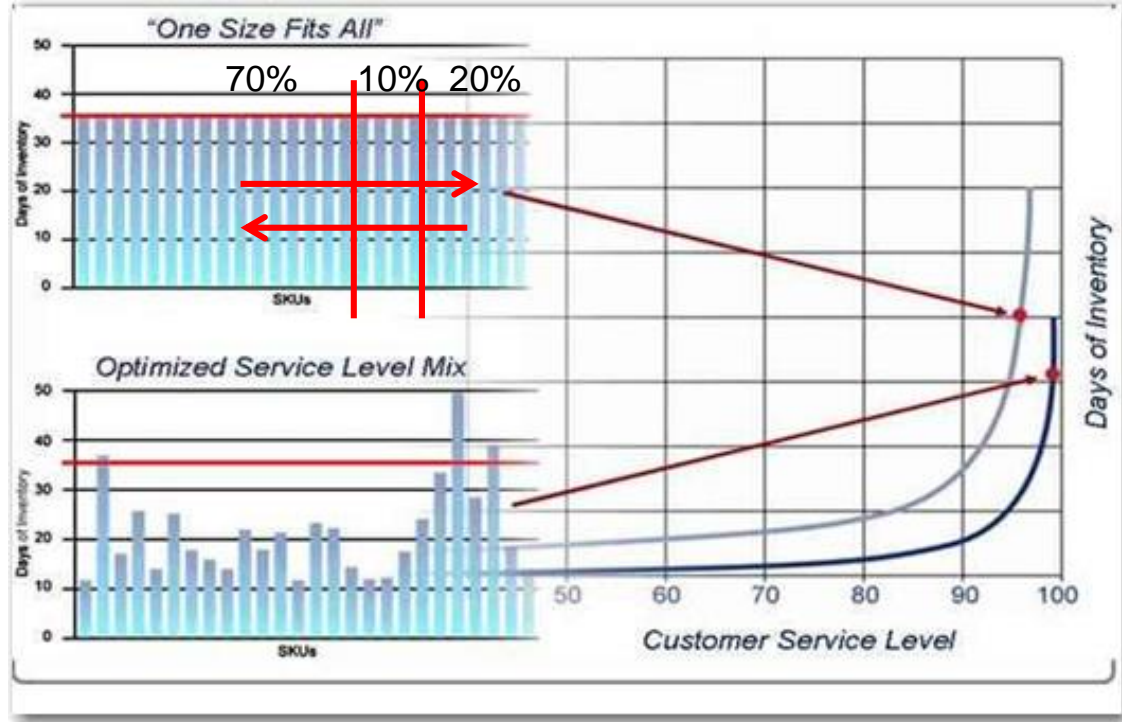
**Combining min./max. with inventory position gives  
the suggested order for the SKU**

# INVENTORY OPTIMIZATION

## INDIVIDUAL REORDER LEVEL AND ORDER UP TO LEVEL

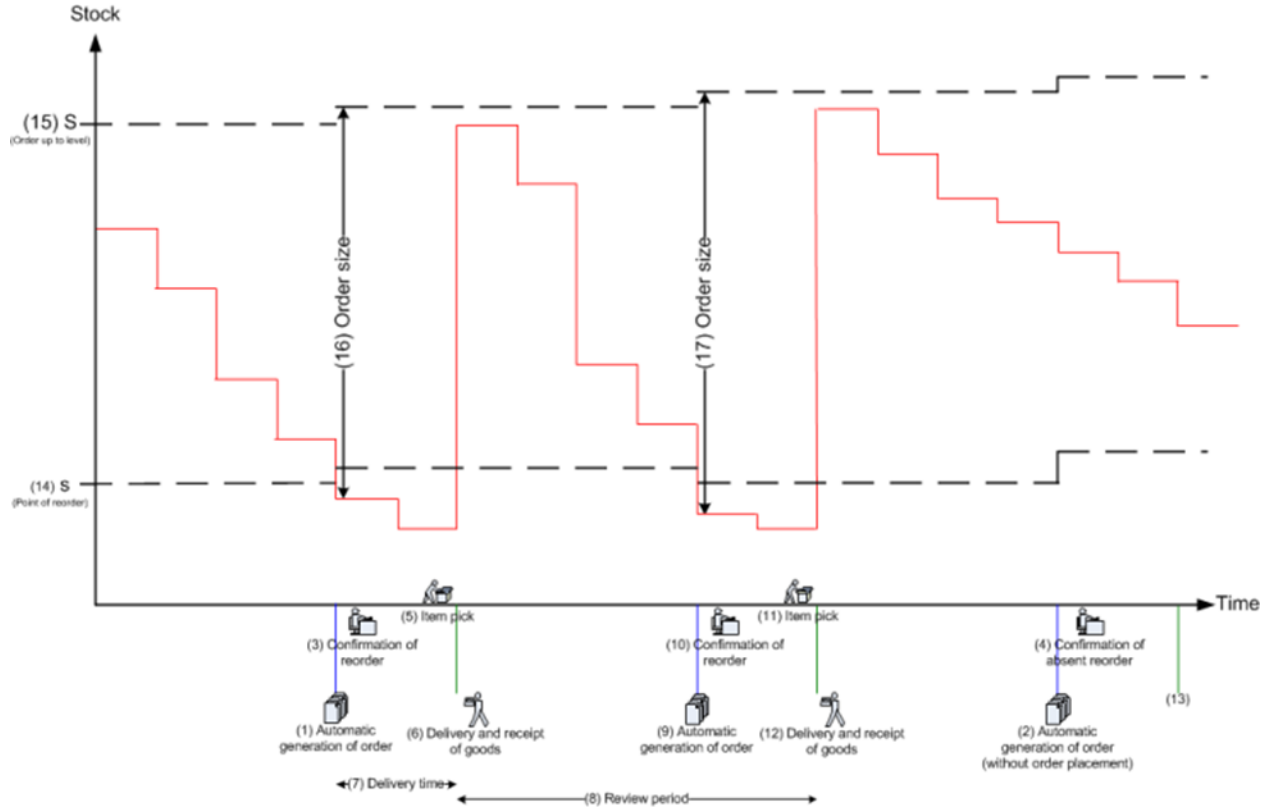
ERP policies

IO policies



# INVENTORY OPTIMIZATION

## INDIVIDUAL REORDER LEVEL AND ORDER UP TO LEVEL



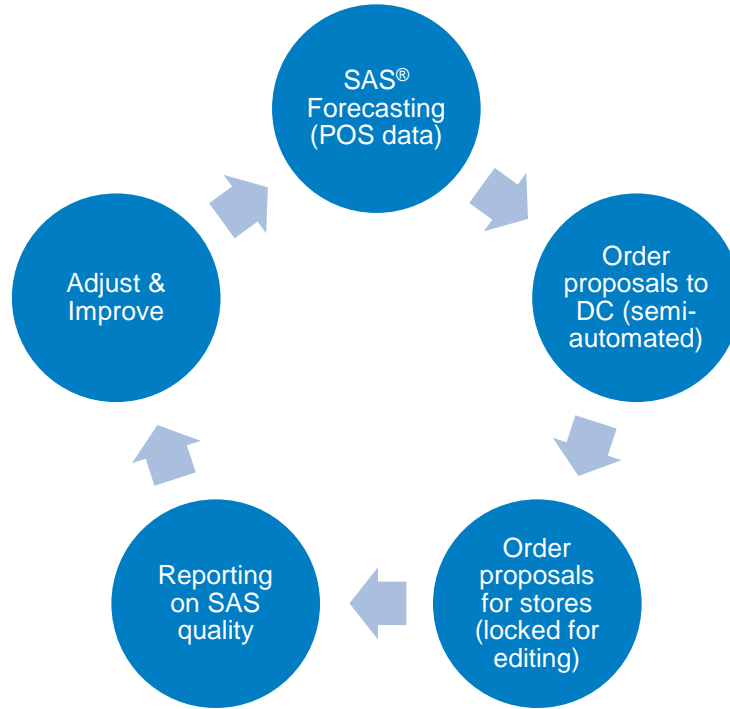
- The system is objective
  - It uses historical information and master data when calculating min./max. instead of being dependent on a person – both with regard to gut feeling and skills
- Automating the creation of order proposals ensures
  - Time spent on generating order proposals is reduced
  - SKUs are not forgotten, and the risk of out-of-stock situations is thus reduced
  - Min. and max. values are always up-to-date
  - Individual reorder level and order up to level, not “one size fits all”

## RESULTS AND TAKE-AWAYS

- Total stock value reduced by 10% to 50%
- Out-of-stock situations reduced with up to 50%
- Man-hours spent on replenishment reduced by 70%
- Facts instead of gut feeling
- Coherent replenishment flows
- Don't forget change management

# RESULTS AND TAKE-AWAYS

## COHERENT REPLENISHMENT FLOWS



# RESULTS AND TAKE-AWAYS

## GETTING THERE



Phase 3 ...

Phase two:  
Increase scope and automation in the process

Phase one:  
Limited scope and creating of the data process, harvesting the low-hanging fruits

# FURTHER READING ABOUT THE TOPIC



**FOR MORE INFORMATION, PLEASE CONTACT:**



**THE  
POWER  
TO KNOW.**

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