Supply Chain Management

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Port of Shanghai (> *43 million TEUs in 2019*)

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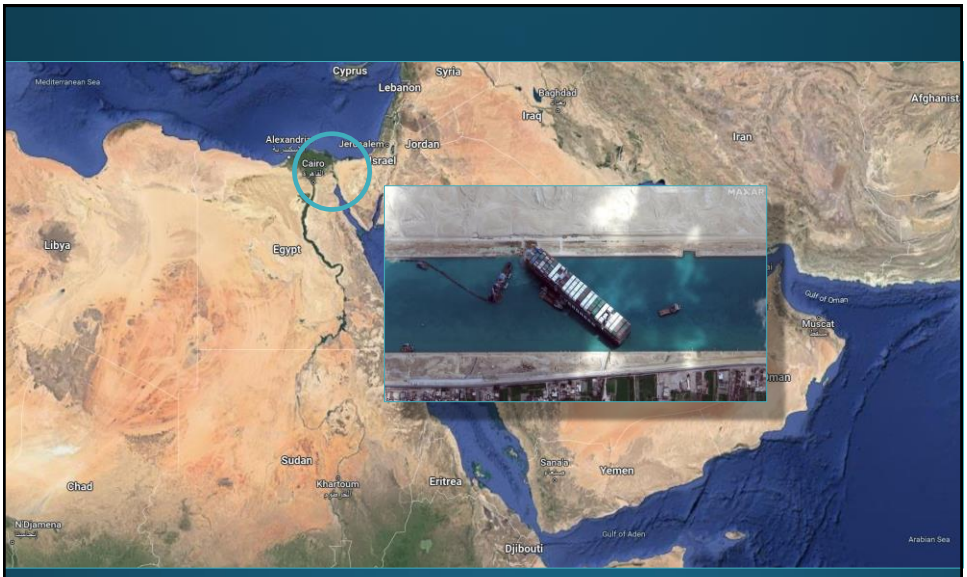

2021 – Evergreen cargo ship lost power – blocked Suez Canal
→ 10% of world's trade goes through it. Average 50 vessels per day.
→ $3 billion worth of cargo a day

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Introduction

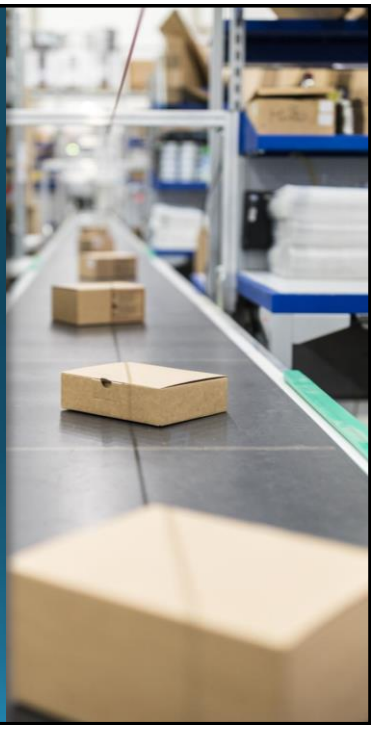
Supply chain management (SCM) is the function of ***planning, organising and optimising the supply chain's activities***.

It consists of two areas

The ***flow of materials, information, money and services*** from raw material suppliers, through factories and warehouses, to the end customers

Supply chains exist *within businesses* and *between/across businesses*

A ***network of facilities*** for procuring materials, transforming raw materials into finished products, and distributing finished produce to customers.



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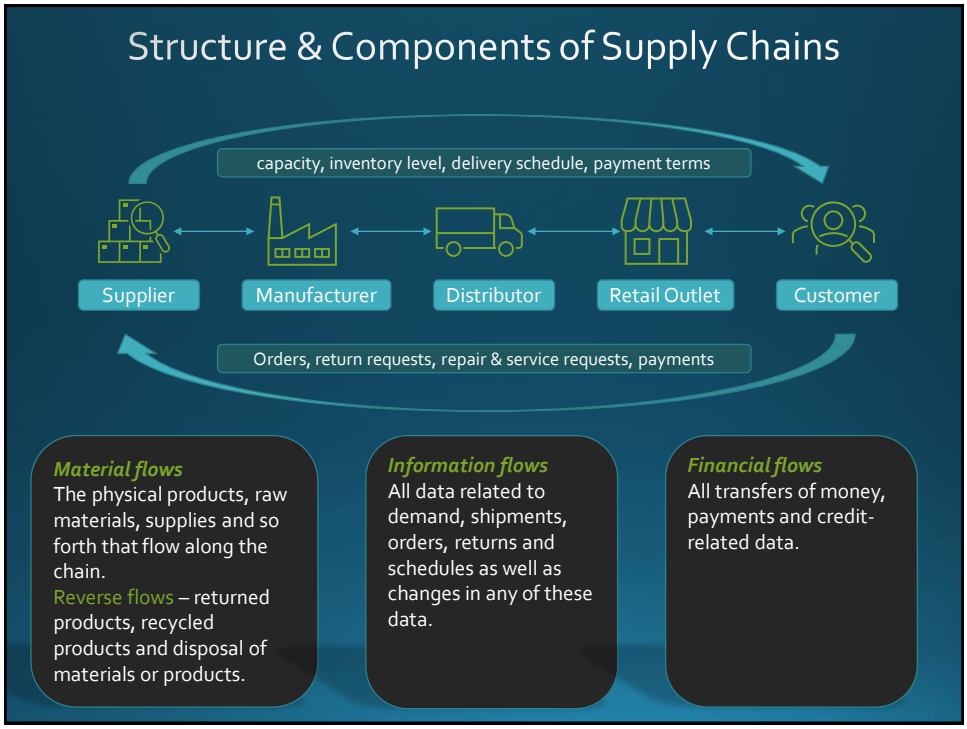
Structure & Components of Supply Chains
capacity, inventory level, delivery schedule, payment terms
Supplier
Manufacturer
Distributor
Retail Outlet
Customer
Orders, return requests, repair & service requests, payments
Material flows
The physical products, raw materials, supplies and so forth that flow along the chain.
Reverse flows – returned products, recycled products and disposal of materials or products.
Information flows
All data related to demand, shipments, orders, returns and schedules as well as changes in any of these data.
Financial flows
All transfers of money, payments and credit-related data.

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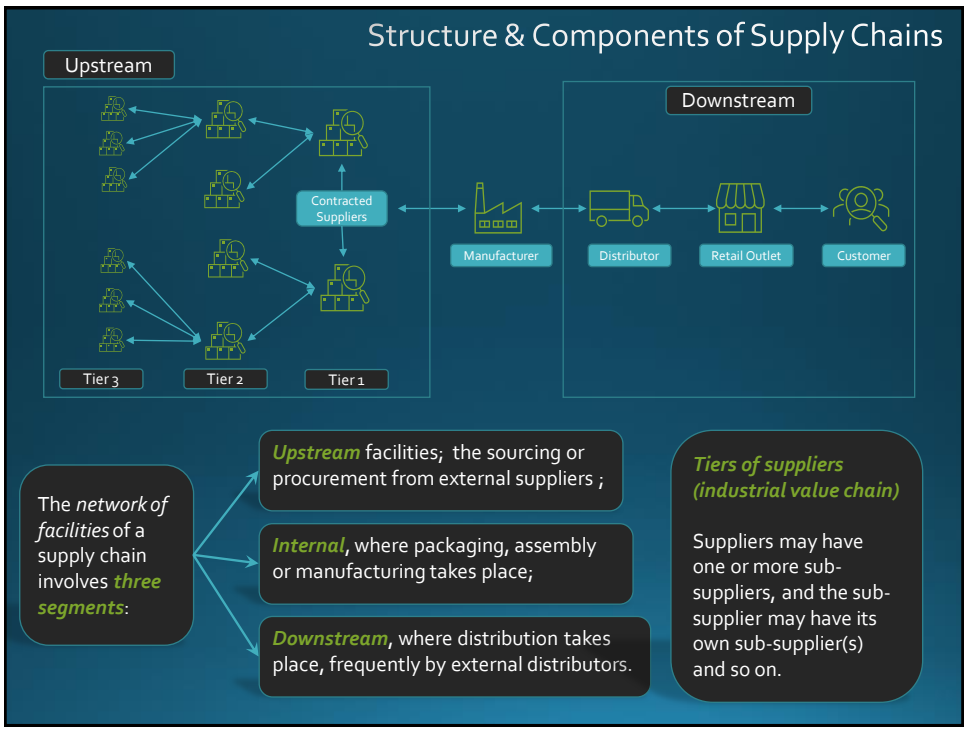
Structure & Components of Supply Chains
Upstream
Contracted Suppliers
Tier 3
Tier 2
Tier 1
Manufacturer
Downstream
Distributor
Retail Outlet
Customer
The network of facilities of a supply chain involves three segments:
Upstream facilities; the sourcing or procurement from external suppliers ;
Internal, where packaging, assembly or manufacturing takes place;
Downstream, where distribution takes place, frequently by external distributors.
Tiers of suppliers (industrial value chain)
Suppliers may have one or more sub-suppliers, and the sub-supplier may have its own sub-supplier(s) and so on.

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Supply Chain Management

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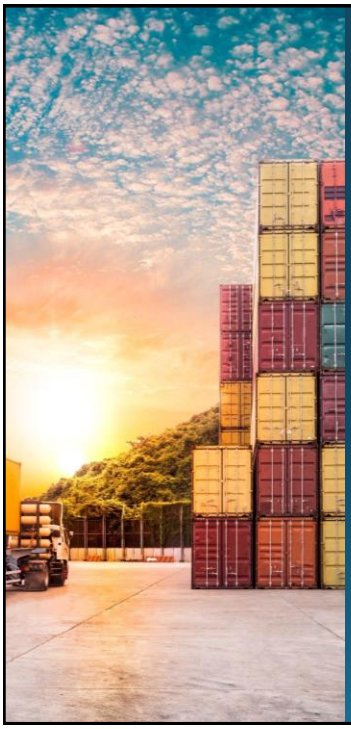

Supply Chain Management
Objectives

What are the objectives of an *efficient supply chain?*

- ✓ The procurement of right products
- ✓ To the right place
- ✓ At the right time
- ✓ In the proper quantity
- ✓ At an acceptable cost

The ultimate goal of any effective supply chain management system is to reduce inventory (with the assumption that products are available when needed)

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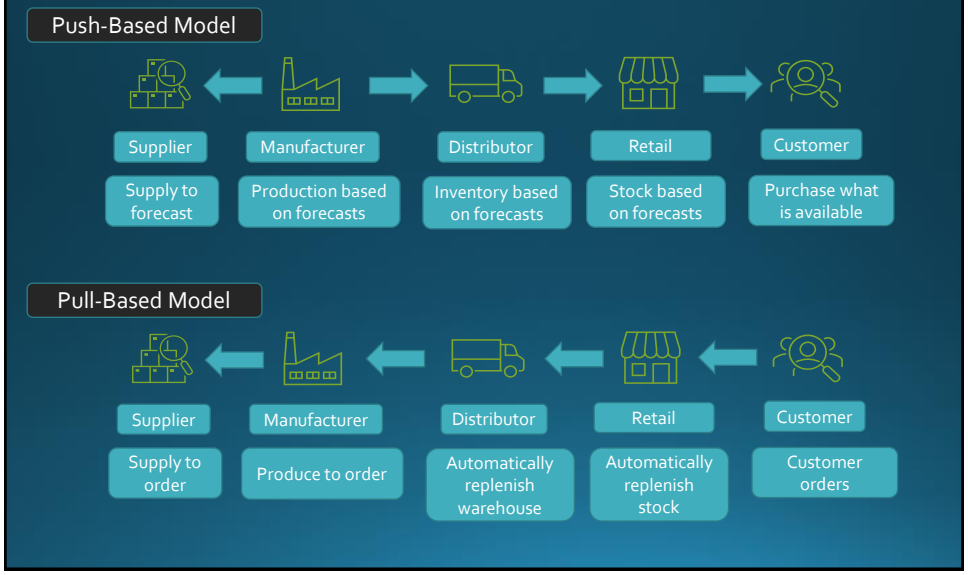
Push V Pull Based Supply Chain Models



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Poor management of supply chains

Some results associated with poor supply chain management

- ***High inventory costs*** - excessive product
- ***Poor customer service*** - not delivering products or services when and where the customers need them.
- ***Poor quality product*** - mismatch between requirement and product delivered
- ***Poor planning capabilities***
- ***Increased cost*** associated with tracking/managing supply chain

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Supply Chain Diversity Challenges

Supply chains involve ***diversity in organisations and technology***:

- These span from small to very large organisations
- Introduces *diversity of processes and IT systems*

Increasingly supply chains are international or ***global*** and this introduces further problems:

- Cultural differences
- Language and currency
- Economic and Political Differences
- Legal issues (Tariffs, trade restrictions)

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Examples of modern supply chain challenges

Tracking the *farm of origin* of food produce

The retail store/consumer may be based in Europe, the manufacturer based in Asia and producer based in Africa or South America

Processing of *returning products*

Products have to be returned through the supply chain to the manufacturing facility

Heavily seasonal/unpredictable demand

E.g. Seasonal demand e.g. Christmas toy demand, weather impacted products (such as fruit), new product launches (latest iPhone etc)

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Typical supply Chain failures

Problems stem ***mainly from two sources***:

Uncertainties due to: demand forecast, delivery times, quality problems in materials and parts that can create production delays;

The ***need to coordinate*** several activities, both internal units and business partners (suppliers/retailers).

Supply chains are often chaotic systems: ***small changes amplify to become major problems***

An issue in one part of the supply chain will lead to problems further down the supply chain

The downstream problems will in turn lead to secondary problems

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Supply Chain Management ***Systems***

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Supply Chain Management Systems
Supply chain management (SCM) - the function of planning, organising and optimising the supply chain's activities.
A supply chain management system should:
be a cross-functional inter-enterprise system
help support and manage the links between a company's key business processes (ERP) and those of its suppliers, customers and business partners (industrial value web)
Challenges similar to those faced in ERP

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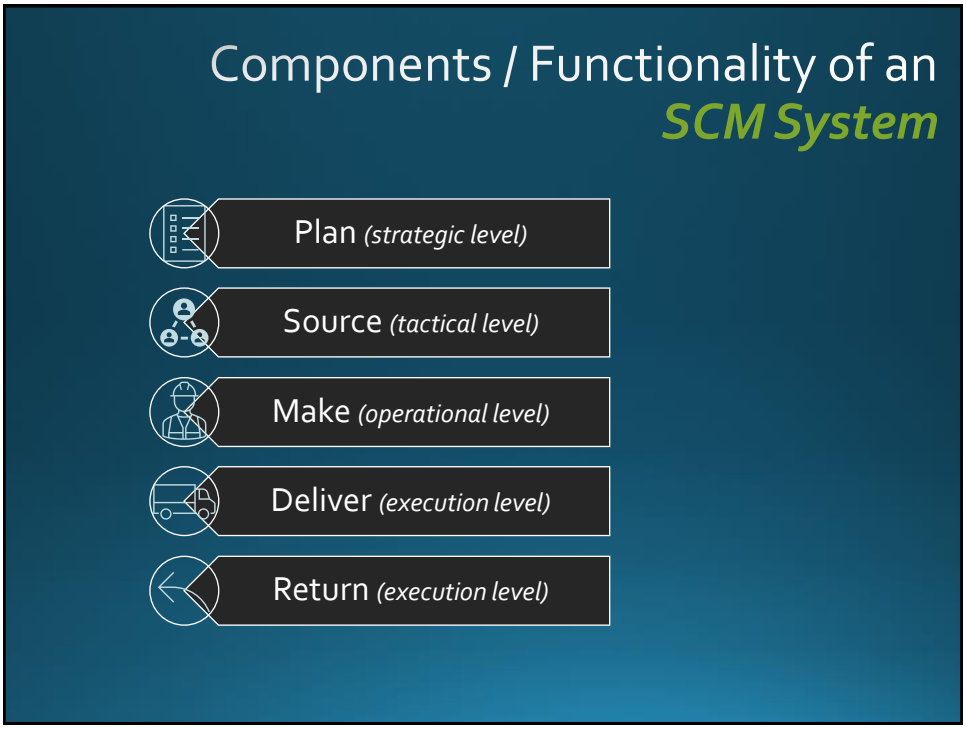
Components / Functionality of an SCM System
Plan (strategic level)
Source (tactical level)
Make (operational level)
Deliver (execution level)
Return (execution level)

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Plan

The strategic portion of SCM.

Companies need a strategy for managing all the resources that go toward meeting customer demand for their product or service.

A big piece of SCM planning is developing a ***set of metrics to monitor the supply chain*** so that it is efficient, costs less and delivers high quality and value to customers.

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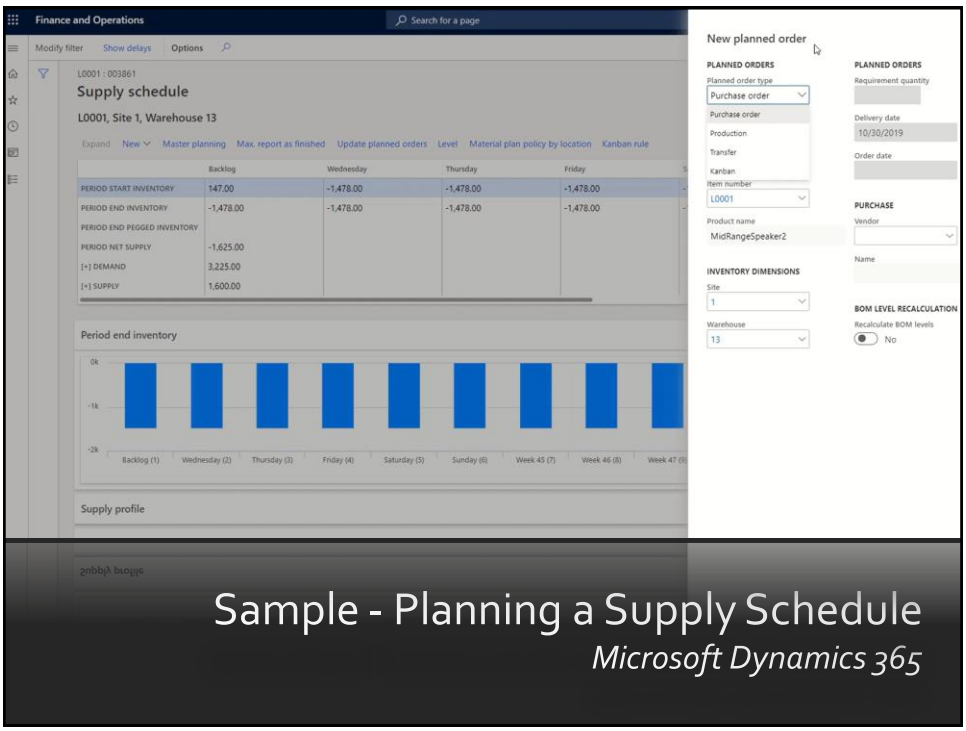

Sample - Planning a Supply Schedule

Microsoft Dynamics 365

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Source

Companies must ***choose suppliers*** to deliver the goods and services they need to create their product.

Therefore, supply chain managers must ***develop a set of pricing, delivery and payment processes*** with suppliers and create metrics for monitoring and improving the relationships.

SCM managers can put together processes for ***managing their goods and services inventory***, including receiving and verifying shipments, transferring them to the manufacturing facilities and authorizing supplier payments.

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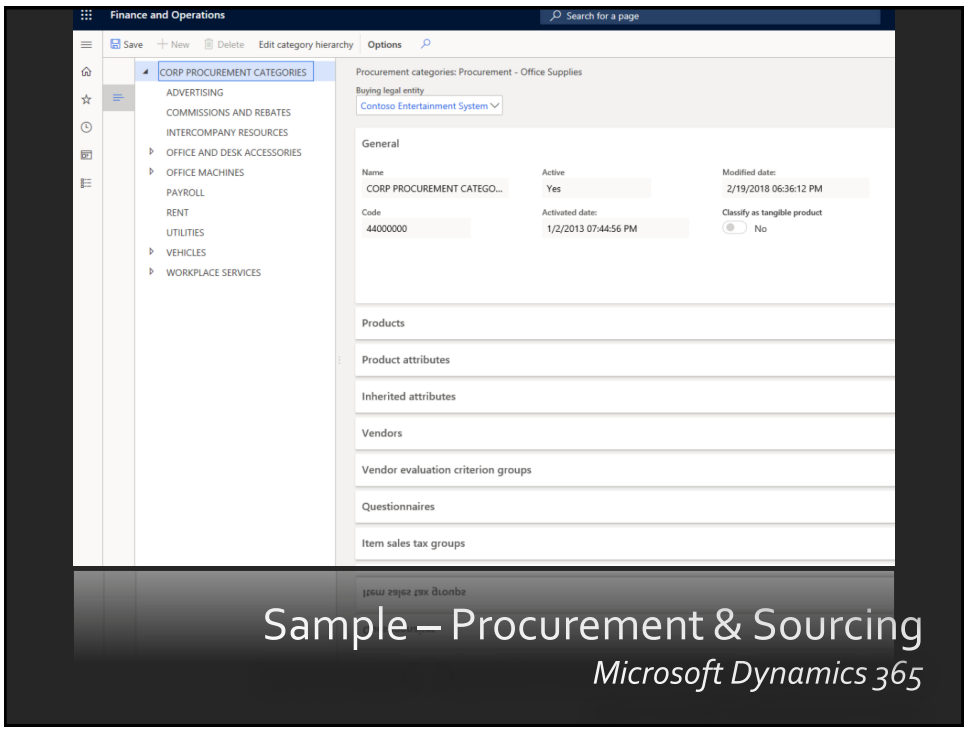

Sample – Procurement & Sourcing

Microsoft Dynamics 365

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Make

The manufacturing step.

Supply chain managers ***schedule the activities*** necessary for production, testing, packaging and preparation for delivery.

This is the most ***metric-intensive portion*** of the supply chain—one where companies are able to ***measure quality levels, production output and worker productivity***.

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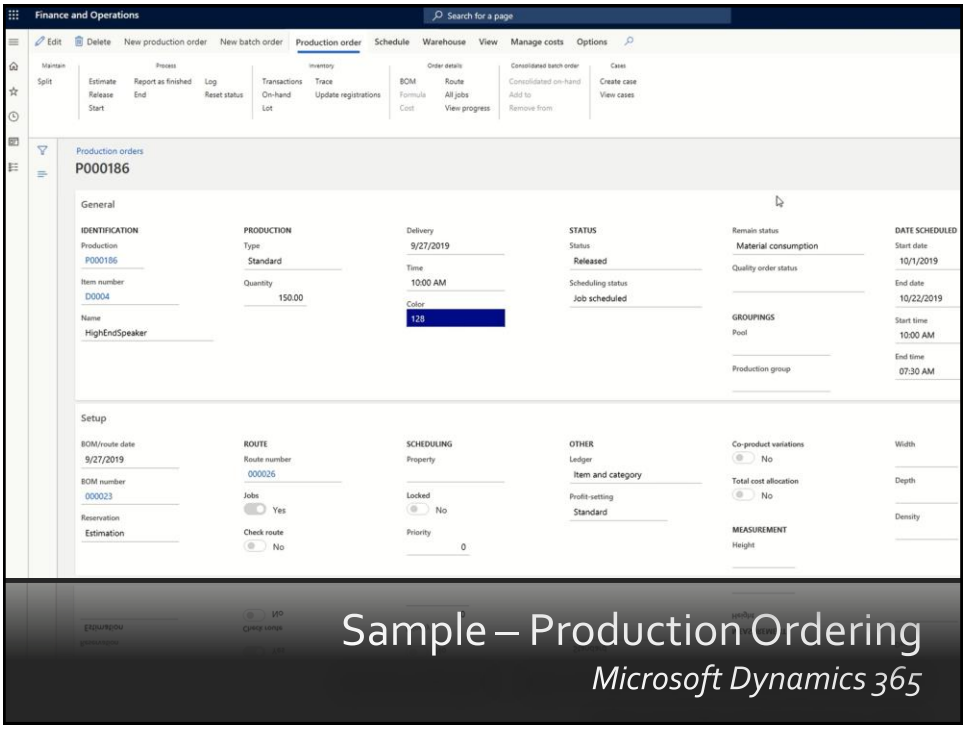

Sample – Production Ordering

Microsoft Dynamics 365

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Deliver

Also may be referred to as logistics

Companies coordinate the receipt of orders from customers

Develop a network of warehouses, pick carriers to get products to customers and set up an invoicing system to receive payments.

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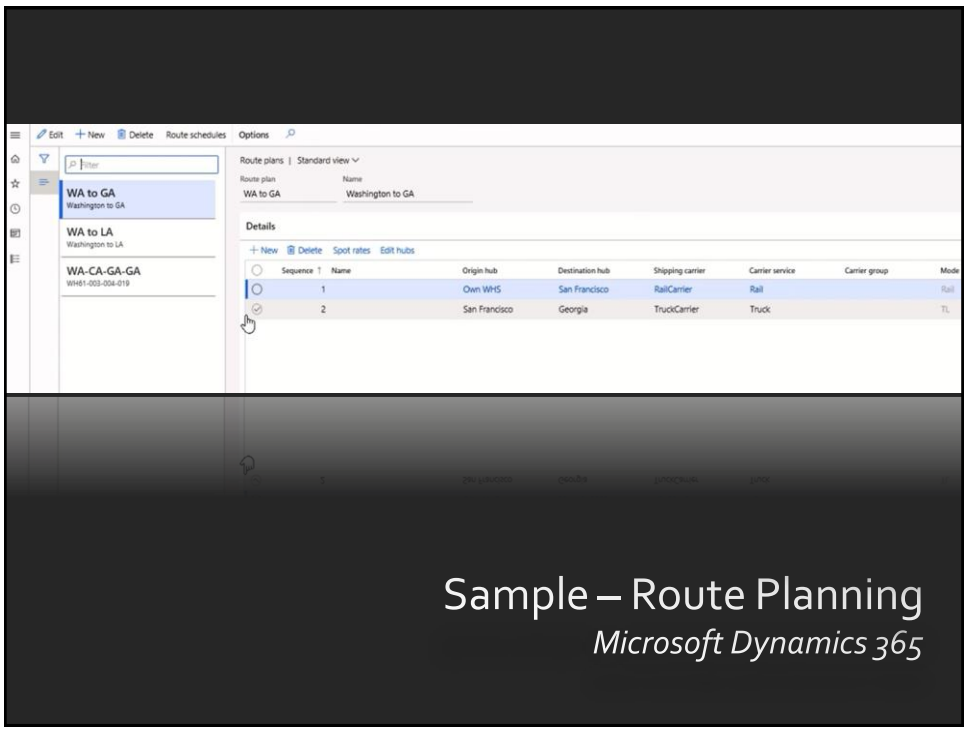

Sample – Route Planning

Microsoft Dynamics 365

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Return

Supply chain planners have to create a responsive and flexible network for receiving defective and excess products back from their customers and supporting customers who have problems with delivered products..

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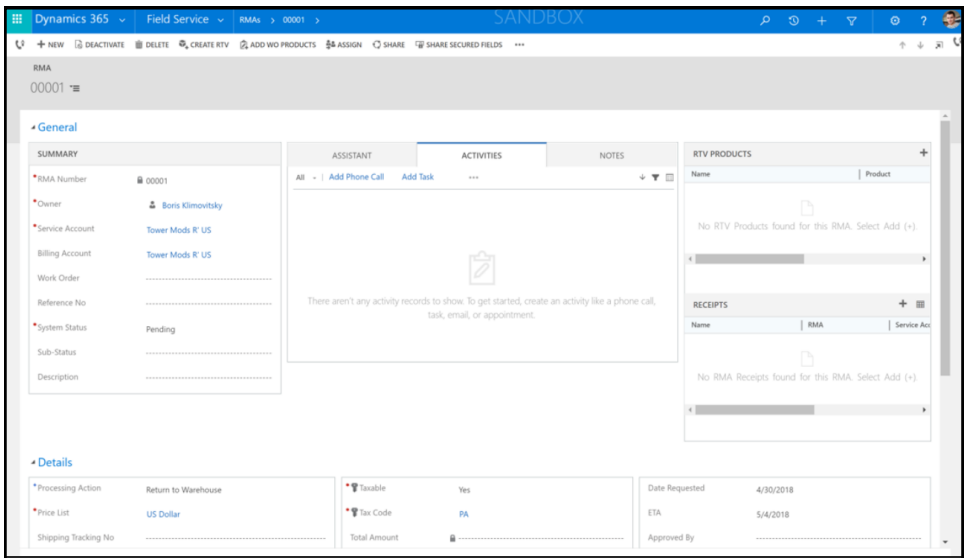

Sample – Return Merchandise Authorisation

Microsoft Dynamics 365

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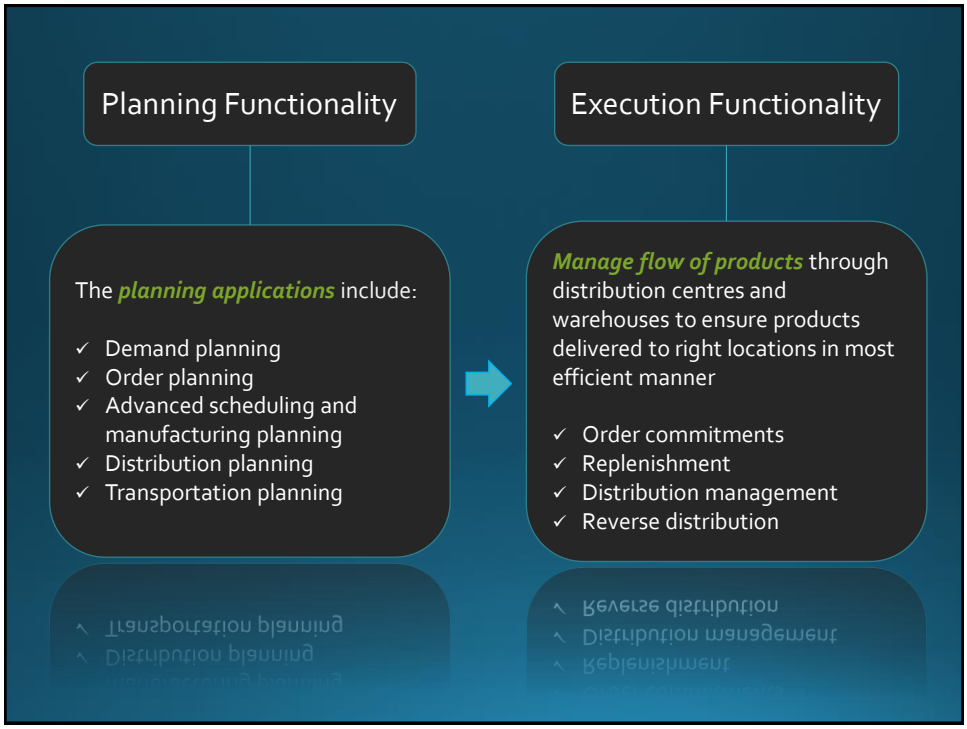

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SCM Architecture & Technology

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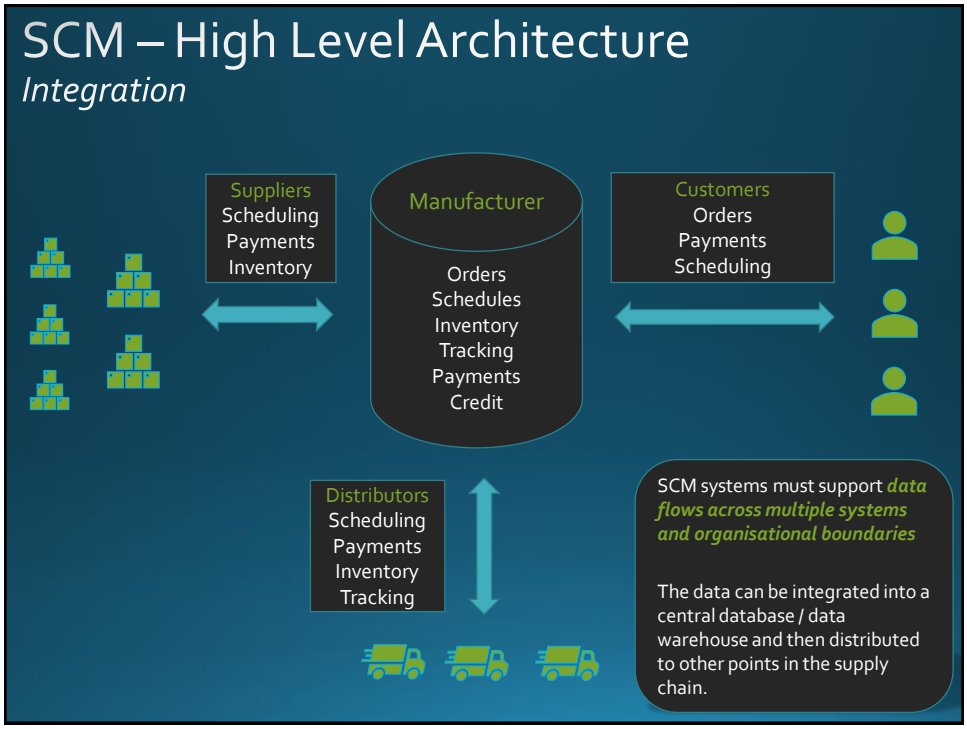
SCM – High Level Architecture
Integration
Suppliers
Scheduling
Payments
Inventory
Manufacturer
Orders
Schedules
Inventory
Tracking
Payments
Credit
Customers
Orders
Payments
Scheduling
Distributors
Scheduling
Payments
Inventory
Tracking
SCM systems must support data flows across multiple systems and organisational boundaries
The data can be integrated into a central database / data warehouse and then distributed to other points in the supply chain.

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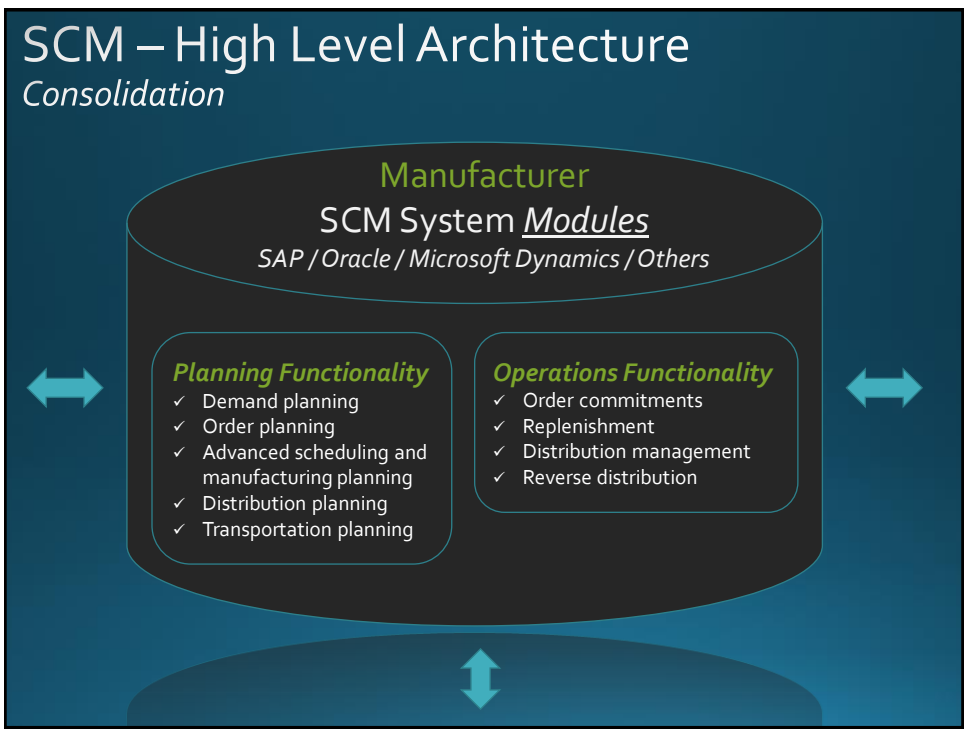
SCM – High Level Architecture
Consolidation
Manufacturer
SCM System Modules
SAP / Oracle / Microsoft Dynamics / Others
Planning Functionality
✓ Demand planning
✓ Order planning
✓ Advanced scheduling and manufacturing planning
✓ Distribution planning
✓ Transportation planning
Operations Functionality
✓ Order commitments
✓ Replenishment
✓ Distribution management
✓ Reverse distribution

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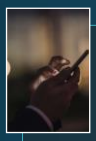
Technology

Out of the box online supplier & customer portals

Allow external stakeholders direct access to the system

On premise integrated desktop apps

Run apps locally on-premise



Out of the box integrated mobile apps

Ready to use mobile phone / tablet apps

Ability to generate new mobile apps

Generate new specific / custom mobile apps

Creation of system business events

Configure / Code business event triggers as hooks

Blockchain, web services for AI, business use and integration

Ability to invoke ML and business services through REST APIs

Data export facilities

Functionality to export data manually or through automation

Messaging systems

Built-in integration with message oriented middleware

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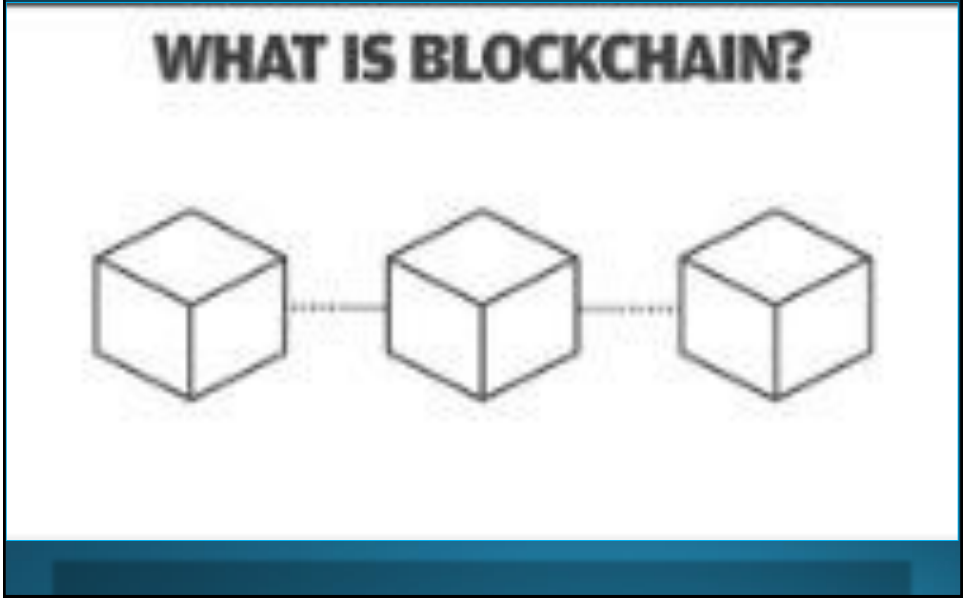
Blockchain: *https://www.youtube.com/watch?v=wnlaePYJGw4*



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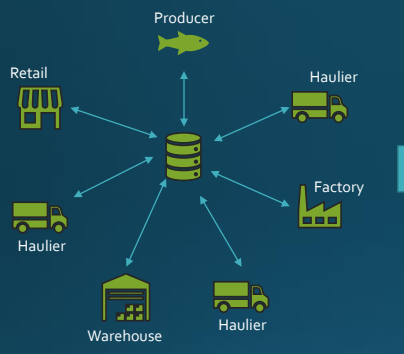
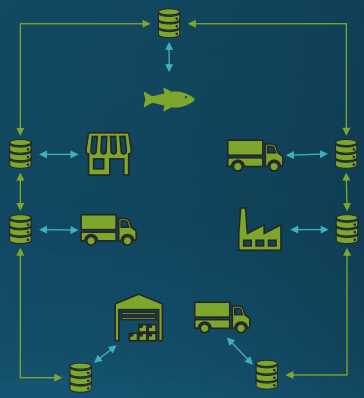
Blockchain – Centralised v De-Centralised





Non Blockchain - Centralised Database

- ✓ A robust way of storing shared data
- ✓ All stakeholders have access and can see up to date and accurate information
- ✓ ***Requires trust*** of database admin and stakeholders

Blockchain Distributed Ledger

- ✓ Each stakeholder has a copy of the ledger (data)
- ✓ Any change at any node is transmitted to all other nodes and must be accepted by consensus
- ✓ Blockchain normally private for SCM

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Blockchain – Implementation

Protocols: How to interact? How to handle transactions?

Bitcoin *(cryptocurrency)*
Ethereum
Hyperledger Fabric

Consensus Algorithms
Proof of Work
Proof of Stake
Proof of Authority

Immutability
Data
Logic (smart contracts)

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Blockchain – Use Case

Supply Chain Management

Multiple collaborating independent parties (a ***consortium*** of enterprises)
Shared data without reliance on a single authority / database
Transparency / Traceability
Business logic execution

Cloud Offerings

Microsoft, IBM, Oracle
Ethereum, Hyperledger Fabric

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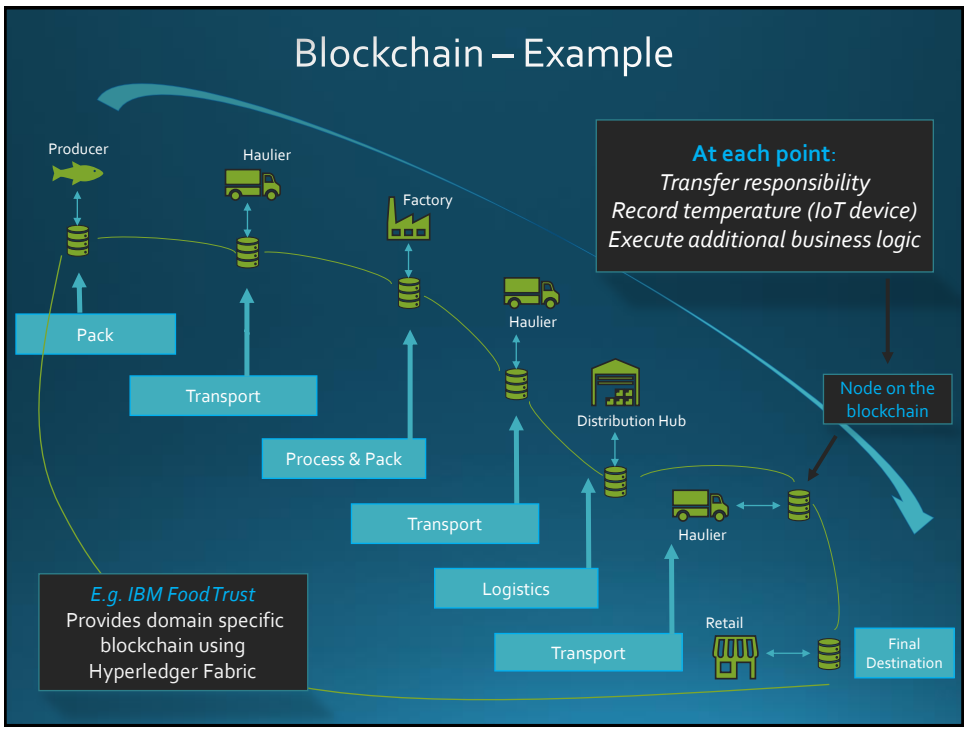
Blockchain – Example



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The Business Benefits, Value and Blockers

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SCM Systems - Business *Benefits*

Visibility

Enhanced visibility - trading partners have the info needed for planning (win/win); e.g. Walmart and its suppliers

Collaboration with Suppliers

When supplies run low, replenish message to supplier who sends goods directly to shelves bypassing warehousing costs

The payoff: Timely and accurate supply chain information is the ability to make or ship only as much of a product as there is a market for. This is the practice known as ***just-in-time manufacturing***, and it allows companies to reduce the amount of inventory that they keep. This can cut costs substantially, since you no longer need to pay to produce and store excess goods

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SCM Systems – Business *Value*

- Matching supply to demand and *reducing inventory levels*
- *Improving delivery service* and speeding product time to market
- Using *assets more effectively*
- *Increasing sales* by assuring availability of products
- *Increased profitability* - Supply chain costs can approach 75% of total operating budgets

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Blockers to the SCM System:
Trust and Resistance

Trust

- Between *trading partners* is NOT the norm
- Fully implemented SCM systems *require high degrees of transparency* between the supply chain participants
- Often moves negotiation away from price and towards cost i.e. The *buyer has visibility of the sellers' costs* and the price is based on an agreed profit margin – not supply/demand dynamics
- This means SCM systems are often *most successful where the supply chain has a dominant participant* who can force co-operation from other participants and pay for the system

  E.g. Tesco, Walmart, large car manufacturers

Resistance

- Competition from traditional communication media, hunches, *human to human interaction*
- And SCM is *similar to ERP* in impact on organisation – and face similar issues related to *organisational readiness*

Cost of implementing the system

- Participants need to determine *who pays*

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Proctor & Gamble Products

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Wal-Mart and Procter and Gamble

- These two companies started collaborating back in the '80s when retailers shared very little information with manufacturers.
- The two giants built a software system that hooked Proctor & Gamble up to Wal-Mart's distribution centres. When Proctor & Gamble's products run low at the distribution centres, the system sends an automatic alert to Proctor & Gamble to ship more products.
- In some cases, the system goes all the way to individual Wal-Mart stores. It lets Proctor & Gamble monitor the shelves through real-time satellite up-links that send messages to the factory whenever a Proctor & Gamble item swoops past a scanner at the Wal-Mart register.

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Wal-Mart and Procter and Gamble

- With this kind of up-to-date information, Proctor & Gamble knows when to make, ship and display more products at the Wal-Mart stores.
- No need to keep products piled up in warehouses awaiting Wal-Mart's call. Invoicing and payments happen automatically too.
- The system saves Proctor & Gamble so much in time, reduced inventory and lower order-processing costs that it can afford to give Wal-Mart "everyday, low prices" without putting itself out of business.

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