Creating the responsive supply chain

Main Title Goes Here….

- Product ‘push’ versus demand ‘pull’
- The Japanese philosophy
- The foundations of agility
- A route-map to responsiveness

Figure 5.1 Agile or lean?

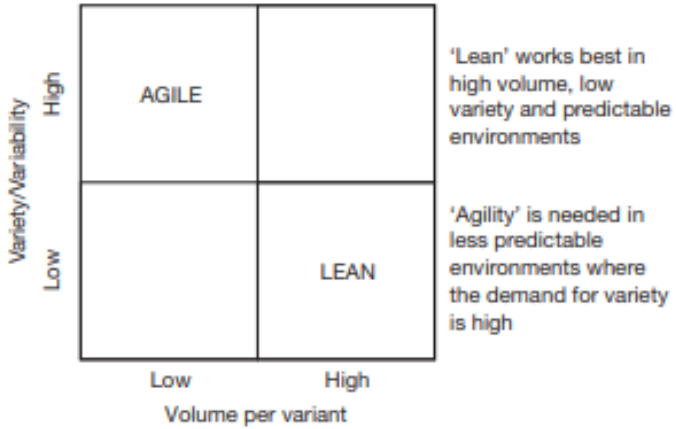


Figure 5.2 Generic supply chain strategies

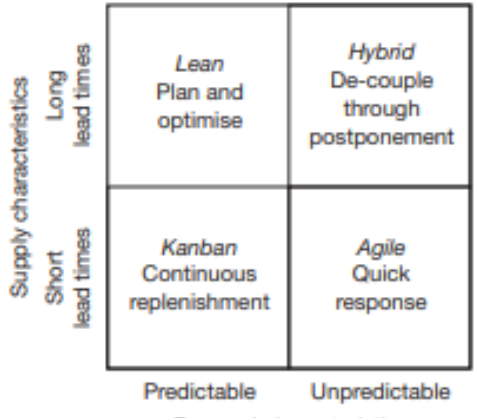


Figure 5.3 The de-coupling point

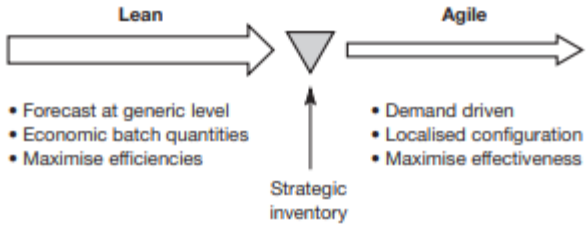
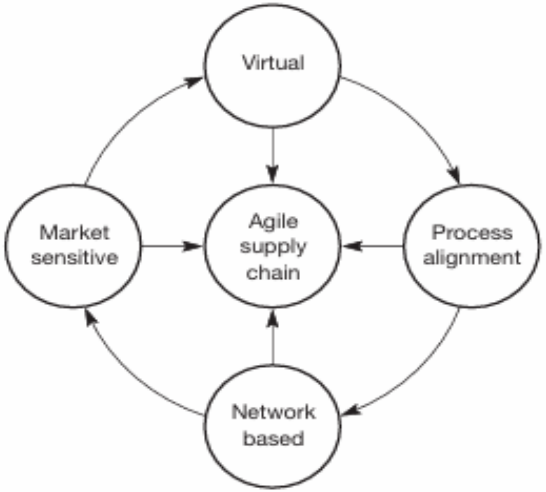


Figure 5.4 The agile supply chain



Product ‘push’ versus demand ‘pull’

- **Push system** makes products based on *forecasts* (guessing demand) to have stock ready, like stocking groceries, while a **Pull system** makes products only when a *real order comes in*, like a custom-built computer, reducing waste but needing faster production. Inventory acts as a **buffer** between stages

  (factory → warehouse → RDC → customer).
- Typical characteristics:
  - Batch production
  - High work-in-progress (WIP)
  - Risk of overstock or obsolescence
- **Key weakness:**
  Forecast errors propagate upstream, leading to excess inventory and inefficient resource use.

Pull System (Just-in-Time)

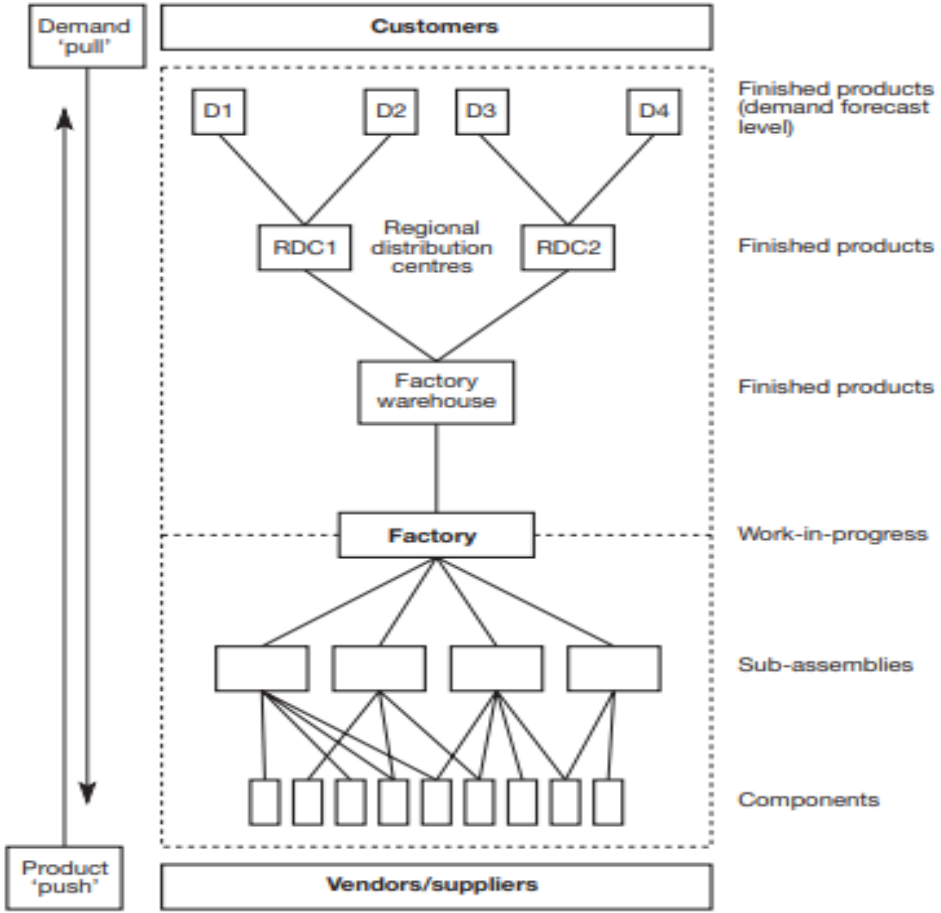
- Activities are **triggered by actual demand** from downstream stages.
- Demand at the customer end **pulls** products and components through the system.
- Inventory is minimized and synchronized with demand.

Core JIT principle:

No activity should take place until there is a downstream requirement.

Strategic implication:
Pull systems improve responsiveness, reduce inventory costs, and expose inefficiencies.

Figure 5.5 'Push' versus 'pull' in the logistics chain



Reorder Point (ROP) Method of Stock Control Concept (Ref PPC)

- Inventory is replenished when stock falls to a predetermined **reorder point**.

Key Elements

- Reorder Point (ROP) = Average demand during lead time + Safety stock
- Lead time: Time between placing and receiving an order
- Order quantity: Often determined using EOQ

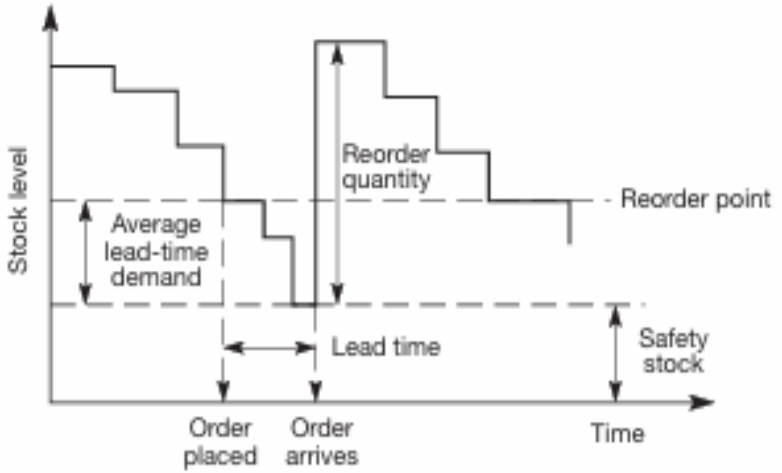
Strengths

- Simple and widely used
- Suitable for **independent demand** items

Limitations

- Assumes stable demand and lead time
- Performs poorly when demand is:
  - Volatile
  - Seasonal
  - Lumpy (discrete large orders)

Figure 5.6 The reorder point method of stock control



Review Period Method of Stock Control

- Inventory is reviewed at **fixed time intervals**.
- Order quantity varies to raise stock up to a **target (replenishment) level**.

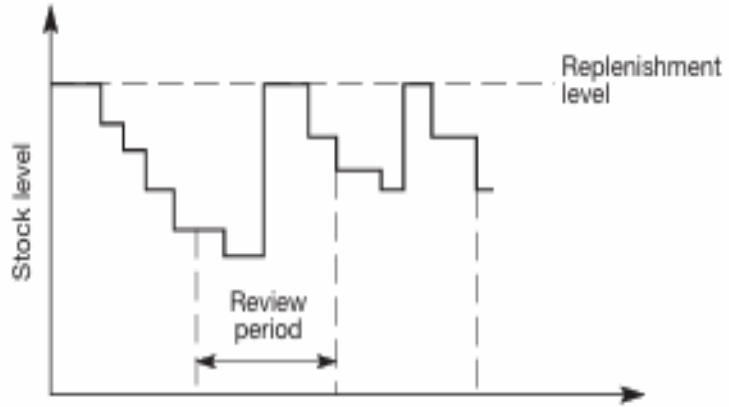
Key Features

- Review period is constant
- Order size is variable
- Common in retail and multi-item environments

Weakness

- Inventory levels fluctuate widely
- Risk of stockouts or excess stock between review periods

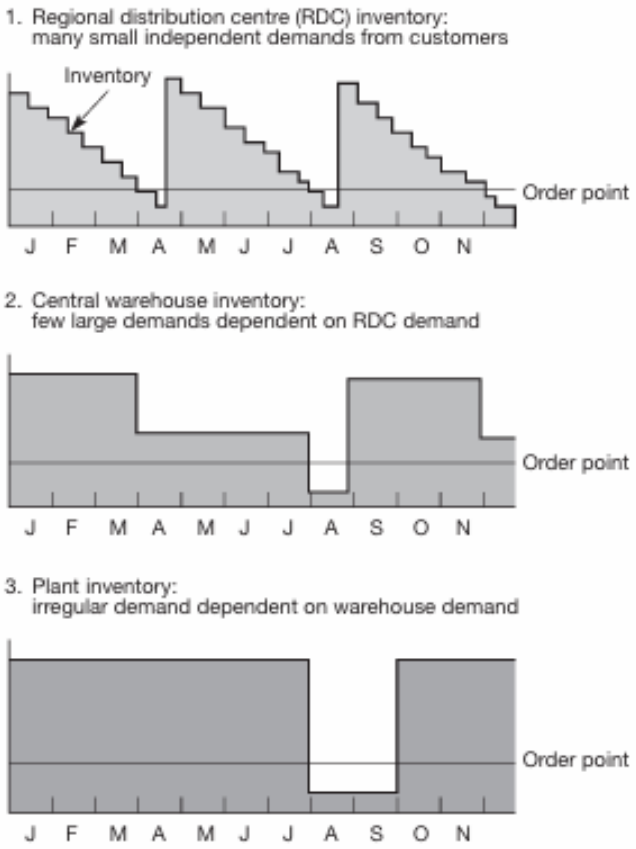
Figure 5.7 The review period method of stock control



Order Point and Dependent Demand

- How **smooth demand downstream becomes lumpy upstream**.
- **RDC inventory**
  - Faces many small, independent customer demands
  - Appears relatively smooth
- **Central warehouse**
  - Demand depends on RDC reorder decisions
  - Larger, less frequent orders
- **Plant**
  - Demand becomes irregular and highly variable
  - Strong batching effect
- Even when final customer demand is stable, the **use reorder points amplifies variability upstream**.
- Whilst independent demand may be forecast using traditional methods, dependent demand must be calculated, based upon the demand at the next level i the logistics chain.

Figure 5.8 Order point and dependent demand



Causes of Uneven Demand at the Plant

- Effect of demand aggregation and batching effects.

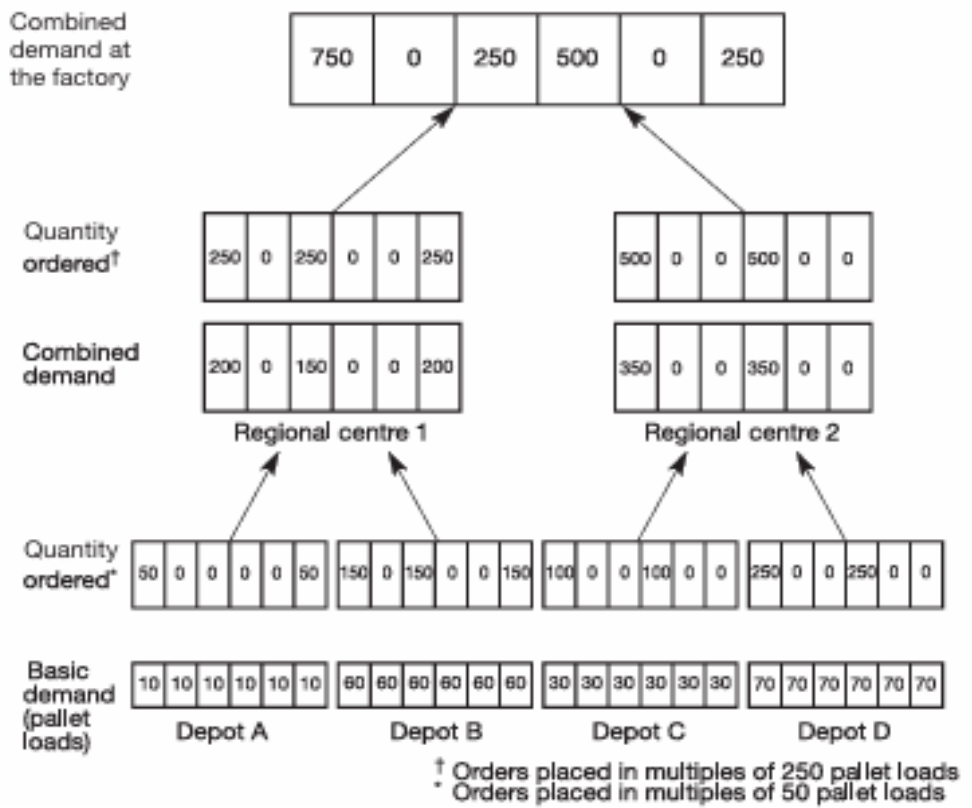
Mechanism

- Depots place orders in **fixed multiples** (e.g., 25 or 50 pallet loads)
- Regional centres aggregate depot orders
- Factory sees:
  - Large spikes
  - Periods of zero demand

Result

- Artificial demand variability
- Poor capacity utilization
- Increased inventory and scheduling inefficiencies
- This phenomenon is closely related to the **bullwhip effect**. (Small changes in consumer demand cause progressively larger fluctuations in orders upstream)

Figure 5.9 Causes of uneven demand at the plant



Basis of Comparison	**Independent Demand**	**Dependent Demand**
Meaning	Demand not directly related to demand for any other item	Demand directly derived from demand for another item
Relationship with other items	Unrelated to other products or components	Dependent on demand for finished goods or parent items
Position in supply chain	Occurs at the **final demand point**	Occurs **upstream** (warehouse, factory, suppliers)
Source of demand	External customers or market	Internal requirements of the supply chain
Nature of demand	Random and uncertain	Deterministic once final demand is known
Planning approach	**Forecasted**	**Calculated**, not forecasted
Typical tools used	Time series forecasting, regression, qualitative methods	BOM, MRP, production schedules
Order pattern	Generally smooth (if market stable)	Often lumpy if poorly coordinated
Inventory implication	Higher safety stock required	Lower safety stock if properly planned
Examples	Retail customer demand, depot demand	Component demand, raw material demand

The Japanese philosophy

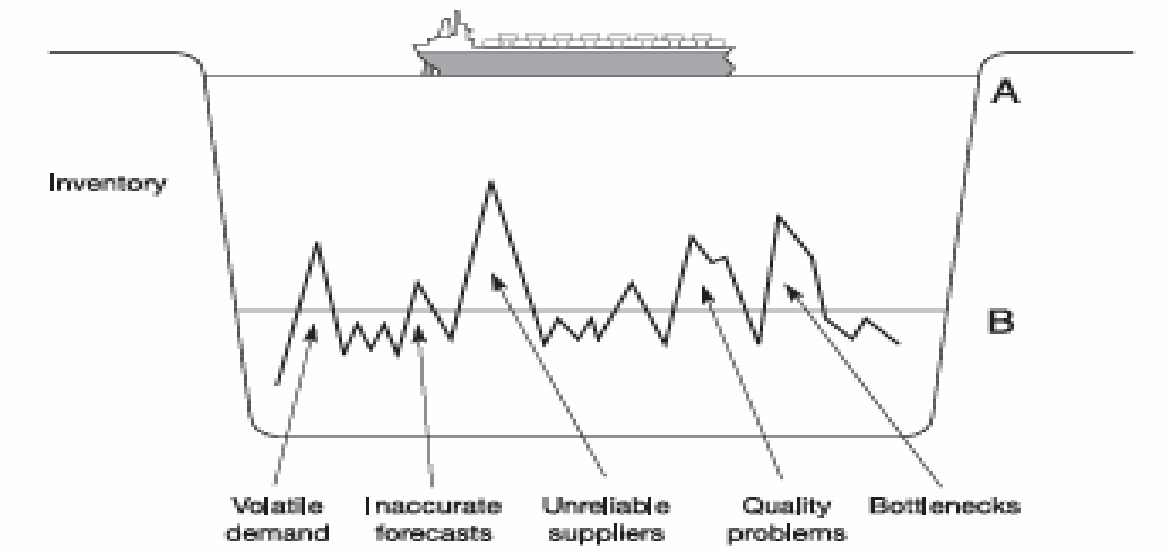
Inventory Hides the Problems

- Japanese operations philosophy views inventory as waste.
- High inventory hides inefficiencies instead of solving them.
- Reducing inventory exposes operational problems.

Why Inventory is Dangerous

- Masks demand variability
- Hides supplier unreliability
- Delays quality problem detection
- Encourages inefficient processes

Figure 5.11 Inventory hides the problems



Element in Diagram	Represents in Business
Water level (Inventory)	Amount of inventory held
Ship	The organization / production system
Rocks below surface	Operational problems
High water level (A)	Excess inventory hiding problems
Low water level (B)	Reduced inventory exposing problems

Kanban: The Tool to Lower the Water Level

What is Kanban?

- A **pull-based control system**
- Originated in Japanese assembly operations
- Uses signals (originally cards) to authorize production or movement

Meaning of “Kanban”

Japanese word for a **signal card** that authorizes replenishment

Kanban Advantages

- Production triggered by actual demand
- Only required quantity produced
- Low inventory levels
- Problems exposed quickly

Kanban as a Pull System

Push System	Pull (Kanban) System
Production based on forecasts	Production based on actual demand
Inventory pushed downstream	Inventory pulled by demand
Problems hidden by buffers	Problems exposed quickly

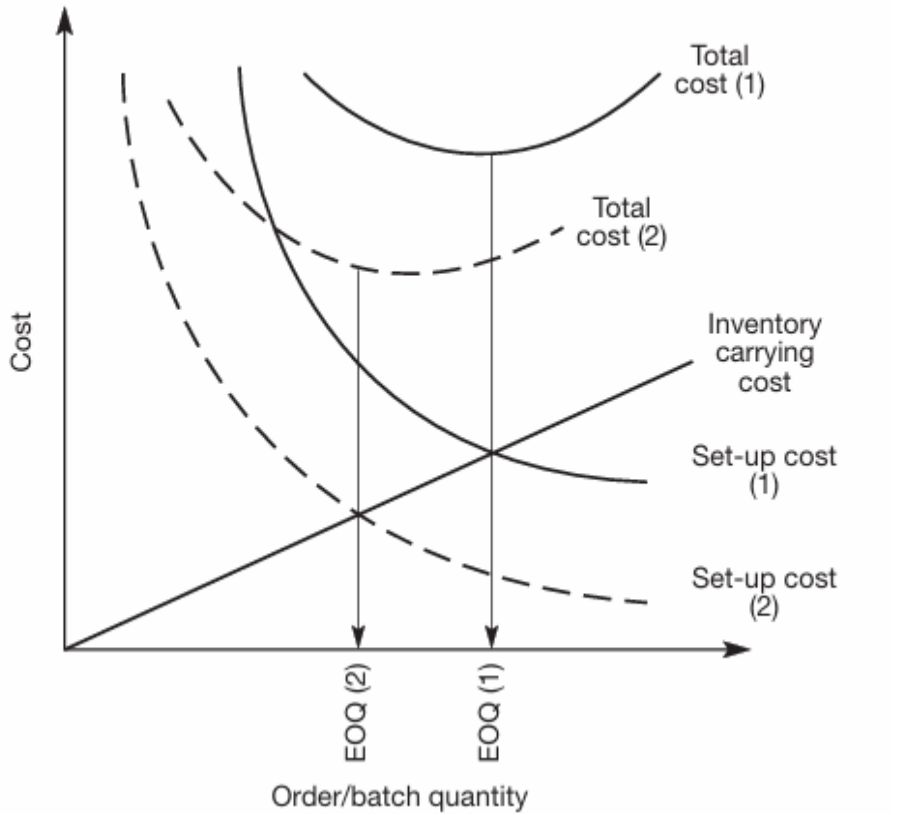
How Kanban Works

1. Final demand triggers production
2. Assembly line pulls only what it needs
3. Each workstation pulls from the previous one
4. No production without a Kanban signal

Reducing Kanban Quantity = Revealing Problems

Action	Result
Reduce Kanban quantity	Lower inventory
Lower inventory	Bottlenecks appear
Bottleneck exposed	Management intervention
Bottleneck removed	Further Kanban reduction

Figure 5.13 Reducing the economic batch/order quantity



Numerical Example – Push System

- Forecast demand = 1,200 units/month
- Actual demand = 1,000 units/month
- Production = 1,200 units
- Ending inventory = 200 units/month
- Inventory builds up and hides demand error

Numerical Example – Pull System

- Actual customer demand = 1,000 units/month
- Production = 1,000 units
- Ending inventory = 0
- Any delay or defect immediately stops production
- Problems become visible

Kanban Reduction Logic

- Reduce Kanban quantity
- Inventory decreases
- Bottleneck appears
- Fix bottleneck
- Reduce Kanban again

Economic Batch Quantity of 1

- Japanese ideal
- Achieved by reducing setup and ordering costs
- Smaller batches become economical
- Supports Just-in-Time (JIT)