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NPTEL ONLINE CERTIFICATION COURSES

IIoT Applications: Inventory Management & Quality Control

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Inventory Management

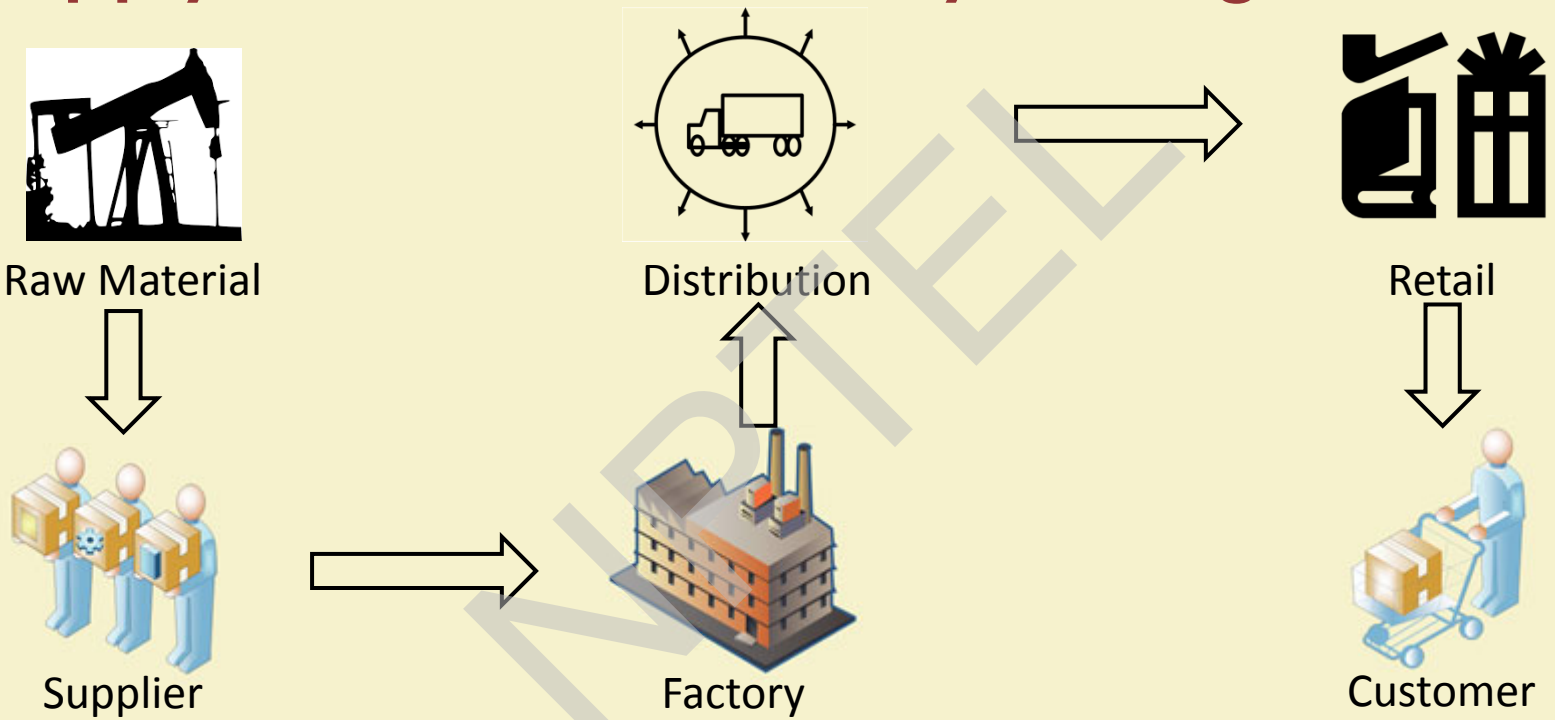
- Inventory

  "a usable but idle resource having some economic value"

  [P. Vrat, Materials Management]

- Inventory Management
  - Activities entailing management of inventory such as:
    - Controlling, overseeing and ordering
    - Storage
    - Determine supply for sale

Supply Chain and Inventory Management



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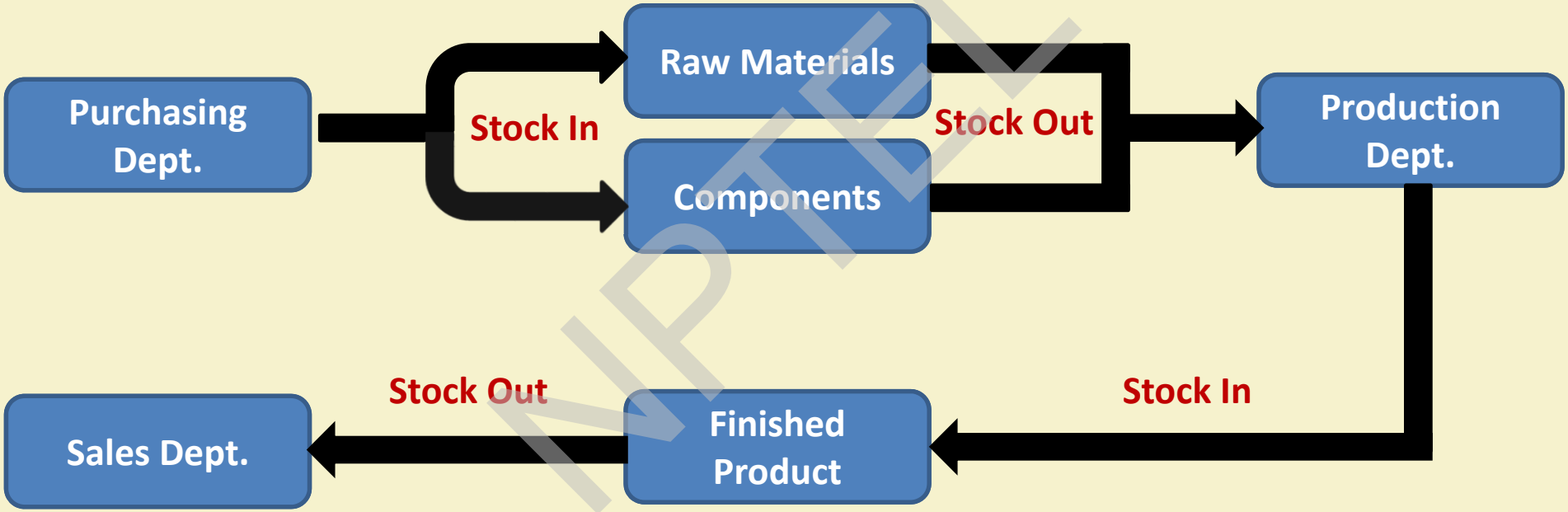
Inventory Management and IIoT



Functions of Inventory Management

- Meet anticipated demand
- Smoothen the production requirement procedure
- Decouple components of the production-distribution system
- Protection against stock outs
- Proper order cycles
- Hedge against price increases or to take advantage of quantity discounts
- Smoothen the flow of operations

Requirements for Effective Inventory Management

- Keep track of the inventory
- Forecast of demand
- Manage lead times and lead time variability
- Estimate inventory holding costs, ordering costs, and shortage costs
- Classification of inventories

Quality Control

- *"system of routine technical activities, to measure and control the quality of the inventory as it is being developed"*

  [IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories]
- Internally maintained by the management to provide product satisfaction to the customers

Objectives:

- Routine and consistent checks
- Ensure data integrity, correctness, and completeness
- Rectify errors and omissions
- Document and archive inventory material and record all QC activities

Radio Frequency Identification Devices (RFID) tags

- Used in an identification system
- Uses Radio waves for communication
- RFID Tagging system consists of:
  - The RFID tag
  - Read/write device
  - Host System
- Two types:
  - Active RFID tags
  - Passive RFID tags
- Finds scope in data collection, processing, and transmission applications

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Passive RFID Tags

- No internal power source
- Relies on ***backscattering***
- Wait for a signal from an RFID reader
- Powered by electromagnetic energy from this signal
- Have shorter range than Active RFID tags
- Small in size and thickness

Active RFID Tags

- Battery powered
- Broadcasts information signal in the form of a ***beacons***
- Have longer range and memory than passive RFID tags
- Bulky and expensive as compared to passive RFID tags

Semi-Passive tags

- Has an onboard battery to power the IC
- But no active transmitter
- Relies on ***backscattering***
- Does not depend on signals from reader for power
- Does not create additional noise

RFID tags over Barcodes

- Barcodes are printed on paper and plastic which makes them vulnerable
- Barcodes need to be on Line of Sight of the readers
- Only one barcode can be read at a time
- Barcodes have less security and hence can be forged
- Barcodes cannot contain any added information

Applications

- Identification of products
- Added information along with ID
- Comprehensive visibility
- Built in GPS
- Warehouse management

Applications (contd.)

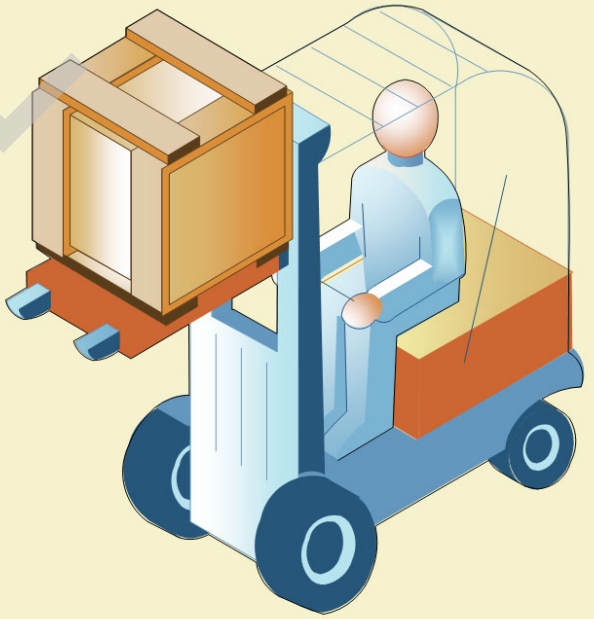
- Added information along with ID:
  - Current storage temperature
  - Weather condition
  - Damage (if any)
  - etc

Applications (contd.)

- Comprehensive Visibility
  - Inventory levels
  - Expiration dates
  - Item location
  - Forecast demand
  - etc

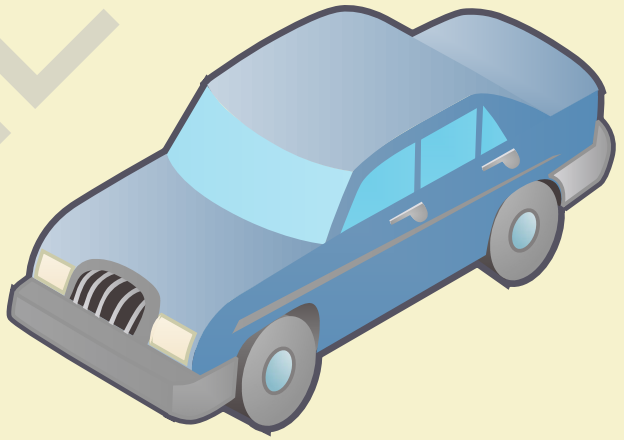
Applications (contd.)

- Warehouse management
  - Shrink, Shortage, Overstock of commodities
  - Identification of efficient areas based on demand



Applications (contd.)

- Similarly in transportation modes
  - Track time and place of congestion
  - Compute delay and alternate routes
  - Commute with efficient time and mode



Problems that can be eliminated

- Data inconsistency
- Staff training expenses
- Human errors
- Data scattering
- Lapse in security
- Slow operation
- Other hidden costs

References

[1] Vrat, P. (2014). Materials Management. Springer.

[2] Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories. (2000). 16th IPCC Plenary, Montreal.

[3] Stevenson, W. J. (2001) Operations Management, 7th Edition. McGraw-Hill Irwin.

Thank You!!