Warehouse Management

IDS 552
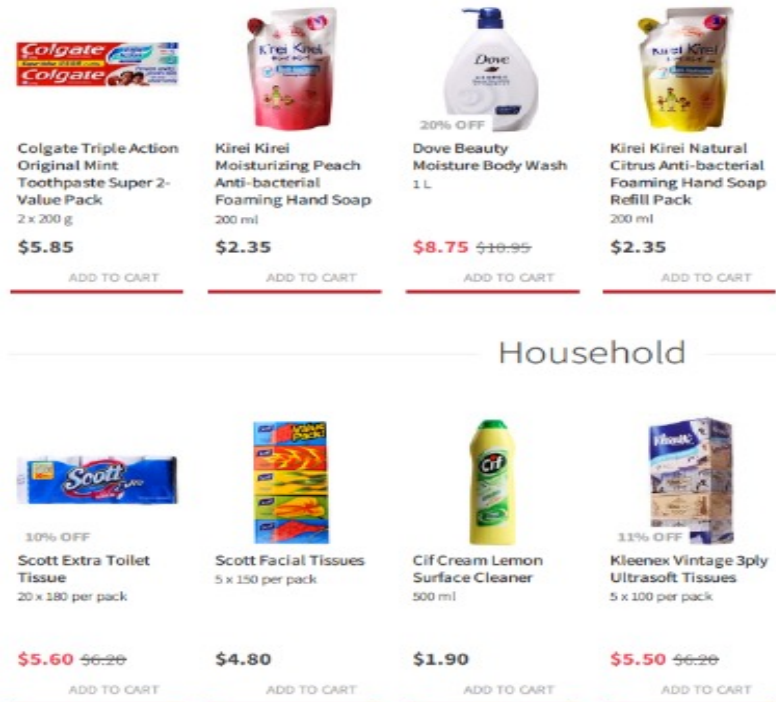
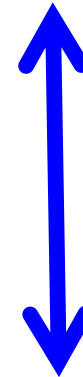Guest Instructor: Parshan Pakiman

Discussion outline

- Warehousing in online retailing

- Warehousing basics

- Decisions:

  – How to select equipment and technology

  – How to store products

  – How to pick and ship products (next class)
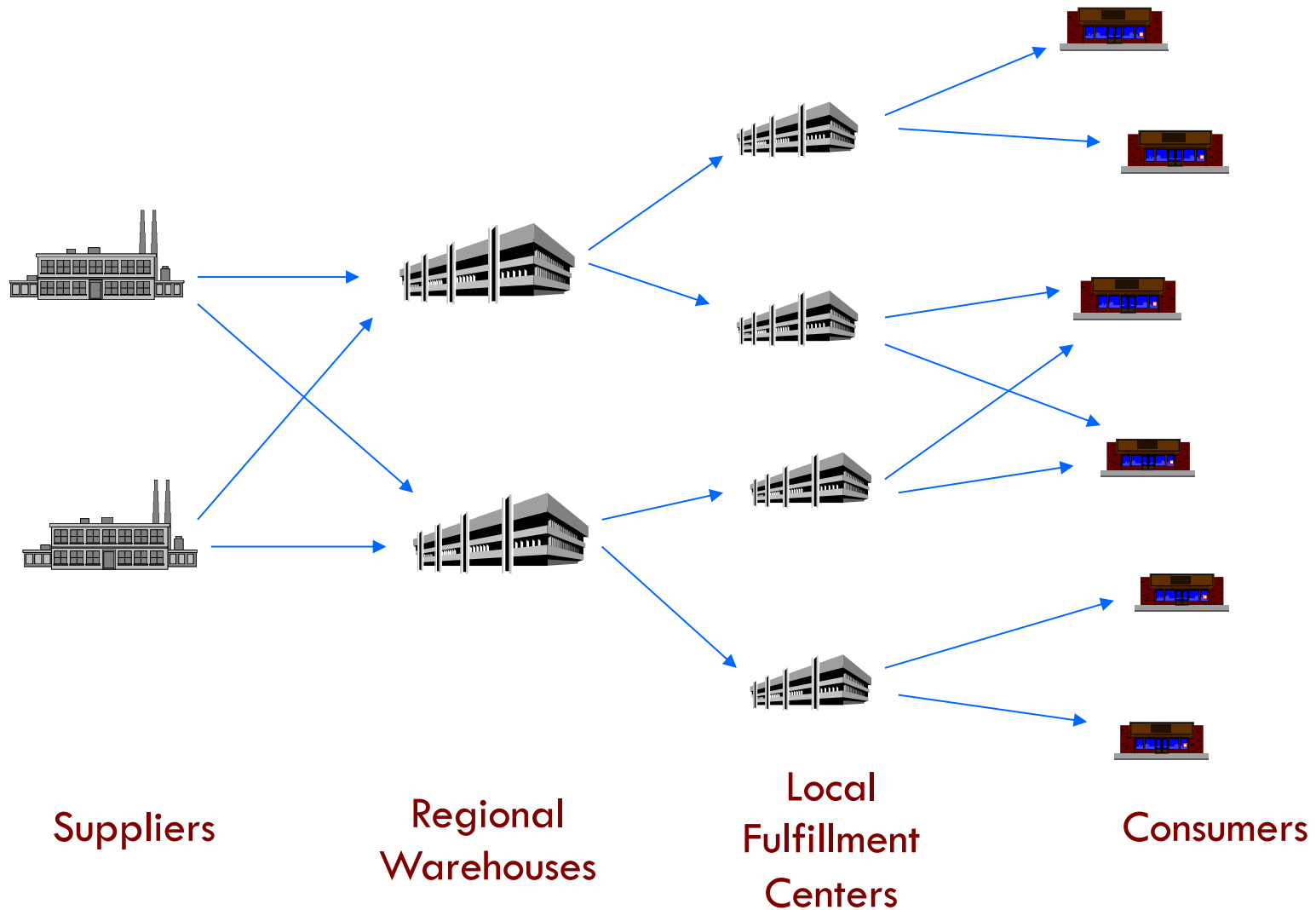
Logistics of online retailing

Household

e-Commerce

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Logistics

Supply chain of online retailing

Suppliers

Regional
Warehouses

Local
Fulfillment
Centers

Consumers

Offline and online demand

The difference between fulfilment for offline and online demands

- Fulfillment for offline demands:

  – Ship products to **retail stores**

  – Smaller number of orders

  – Large quantity for each order

- Fulfillment for online demands:

  – Ship products to **end consumers**

  – Large number of orders
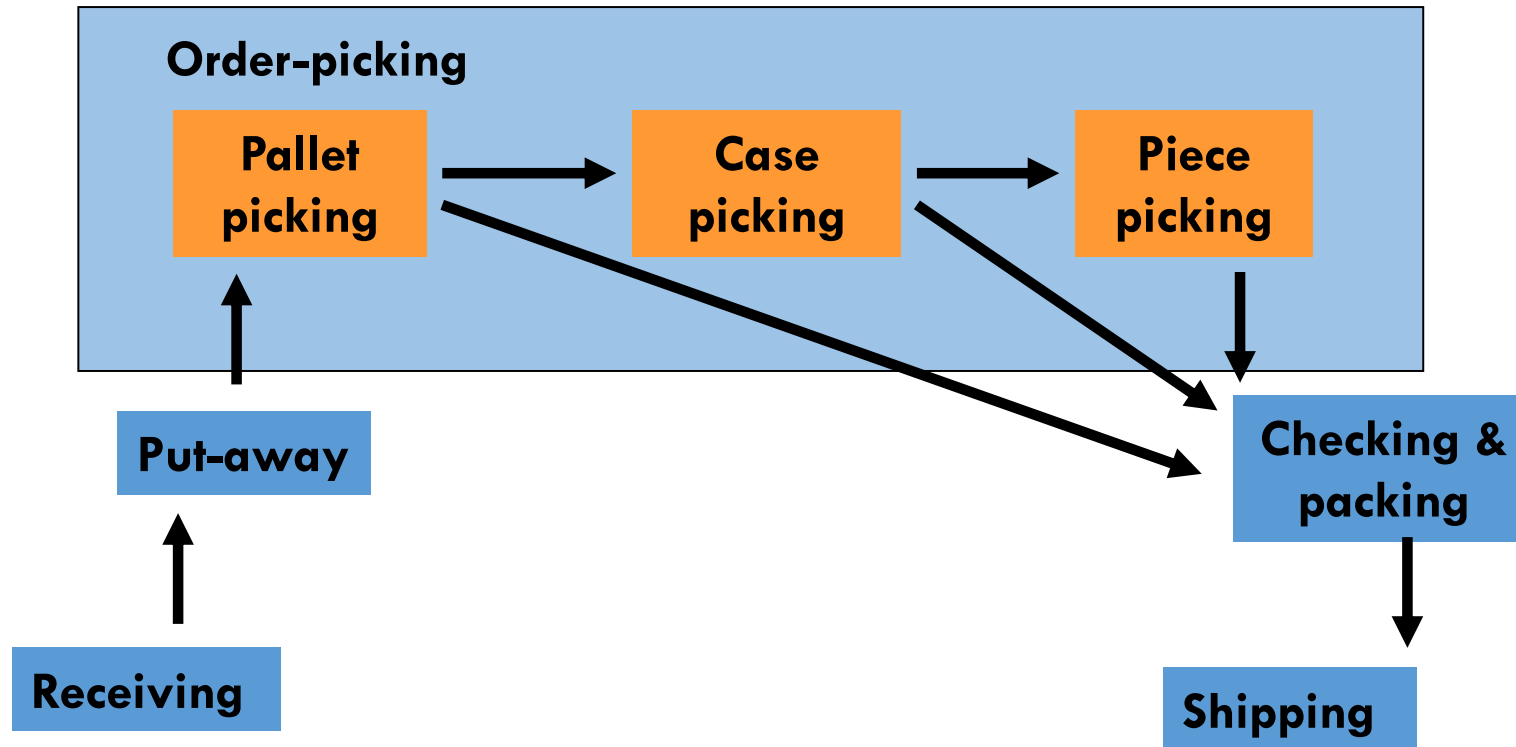
  – Small quantity for each order

Warehousing basics

Types of warehouses

- Retail distribution center

- Service parts distribution center

- E-commerce distribution center (fulfillment center)

- 3rd Party Logistic (3PL) warehouse

- Perishable warehouse

Units of handling
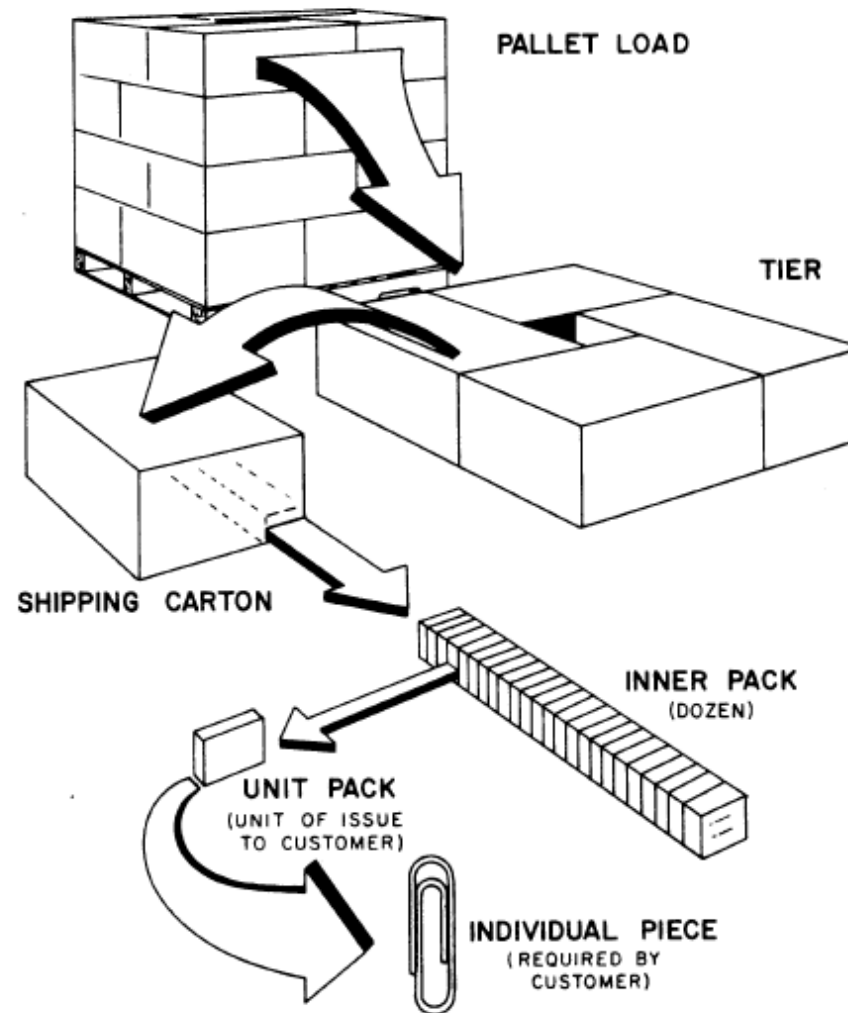
Warehouse operations

Order-picking

Pallet picking → **Case picking** → **Piece picking**

Put-away

Receiving

Checking & packing

Shipping

- Order-picking costs about 55% of the total operating expense.
- Within order-picking, traveling is the most time-consuming.

How to fulfill orders?

How to select equipment and technology

How to store products

How to pick and ship products
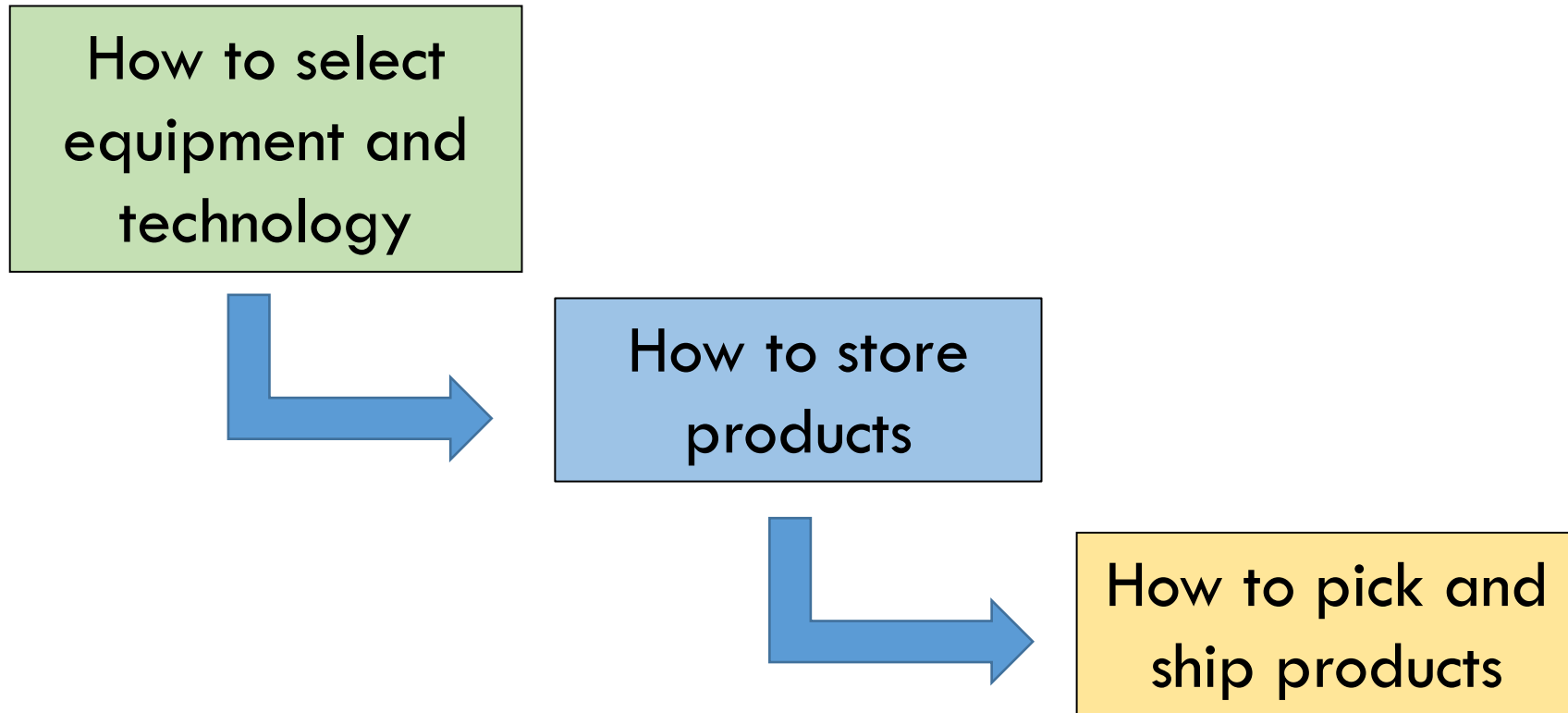
Scenario 1:
Pallet

Scenario 2:
Carton

Scenario 3:
Piece

When does each of these scenarios occur?

Storage equipment

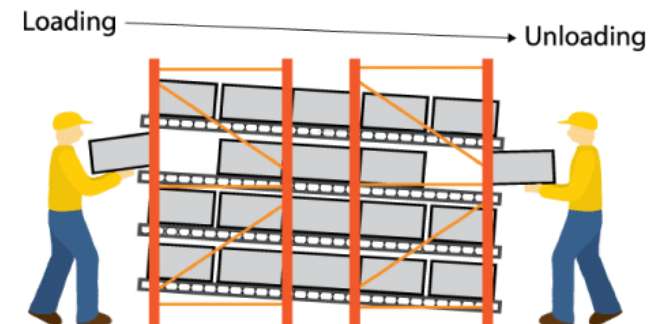## Pallet or case picking

– Pallet racks

  • Bulk storage

Piece picking

– Bin-shelving

  • Slower-moving items

– Gravity flow racks

  • Faster-moving items
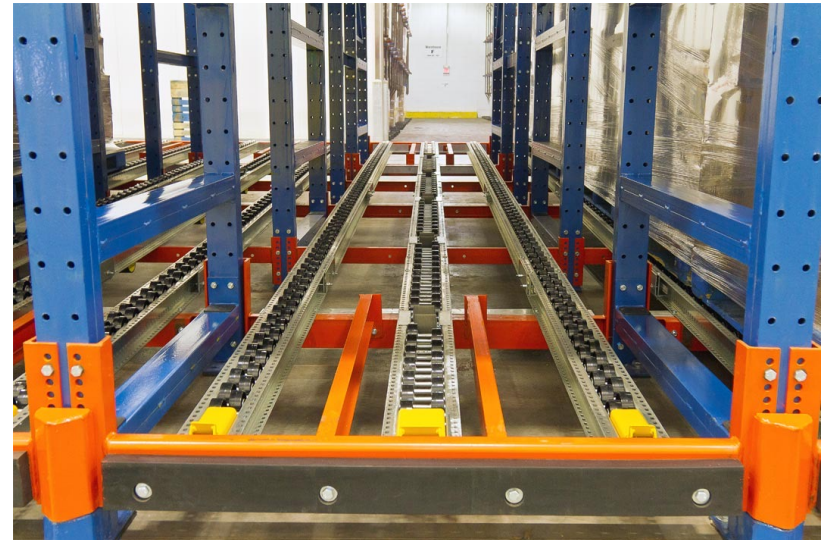

Loading ⟶ Unloading

Single-deep racks

Easily accessible, require more aisle space

Pallet flow racks

- Shelves are tilted with rollers

- Picking and restocking are performed from different aisles

- For high throughput skus

Bin-shelving

Bin-shelving

- Shallow shelves

- Both picking and restocking must be done from the pick face

- Suitable for slower-moving skus

Gravity flow rack

Gravity flow rack

Gravity Flow Rack with a pick-to-light system

Gravity Flow Rack with a pick-to-light system

Gravity flow rack

- Tilted and deep shelves

- One case of a product on the pick face

- High sku density

- Some are supported by a pick-to-light system

- Restock from the back

- Suitable for faster-moving skus

Handling equipment

- Turret Truck (Forklift)

- Order-Picker Truck

- AS/RS

- Conveyor

Turret truck

For very narrow aisles (5 to 7 feet)

Order-picker trucks

Automated storage and retrieval system (AS/RS)

https://www.youtube.com/watch?v=kdVet_UOx30&feature=related

Automated storage and retrieval system (AS/RS)

Conveyors

https://www.youtube.com/watch?v=KgpE1q9s9O0

Conveyors

Conveyors

- Change the economics of travel

- Partition a warehouse into zones

  - Create problems of balancing work among zones

- Store conveyable product far from shipping

- Store non-conveyable product close to shipping

Other technologies

- **High-density storage systems**

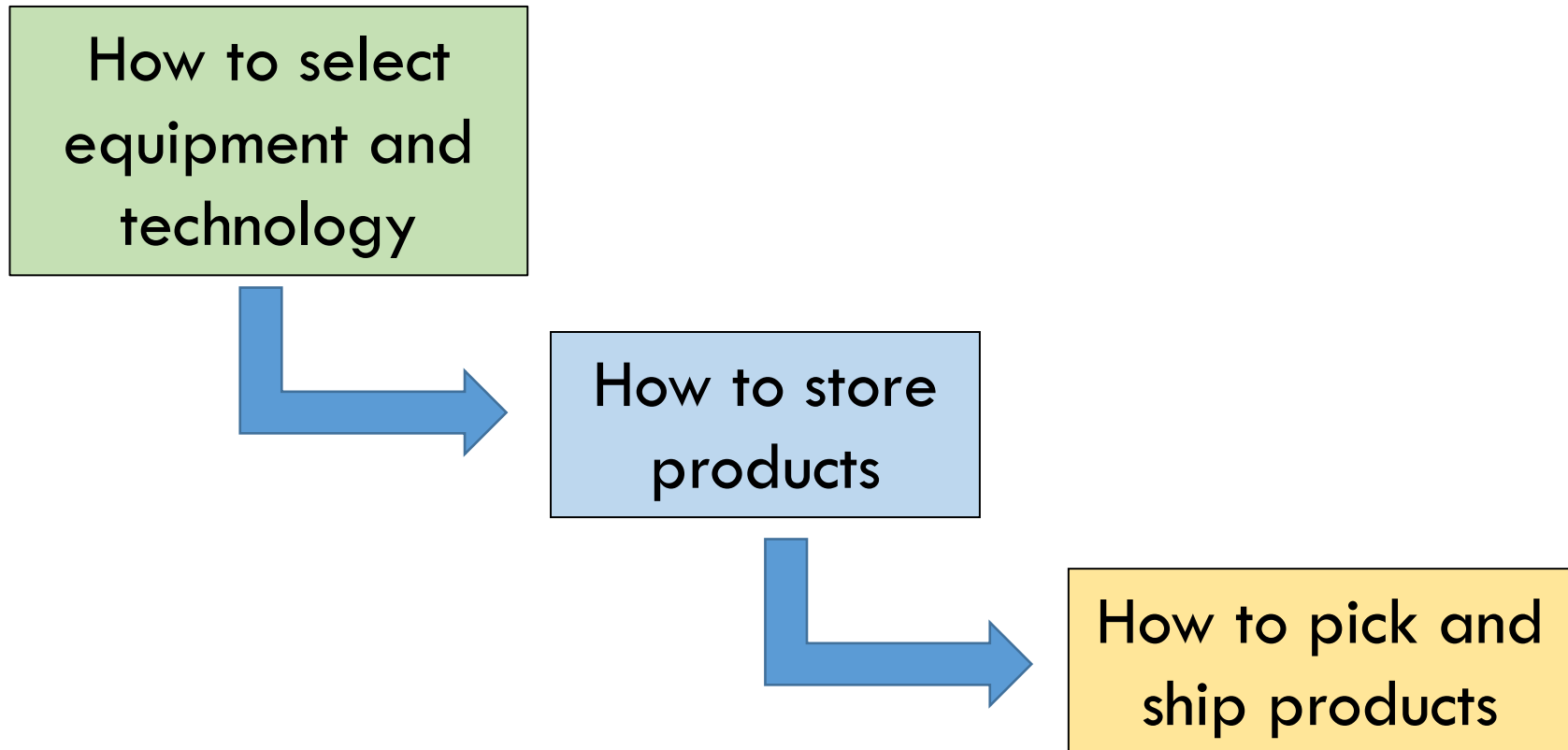 - https://www.youtube.com/watch?v=iyVDMp2bL9c

- **Kiva robots**

  - https://www.youtube.com/watch?v=UtBa9yVZBJM

- **Amazon's drones**

  - https://www.youtube.com/watch?v=Le46ERPMIWU

- **Meijer automation**

  - https://www.youtube.com/watch?v=bn5jjVKhFUs

How to fulfill customer orders?

How to select equipment and technology

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How to store products

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How to pick and ship products
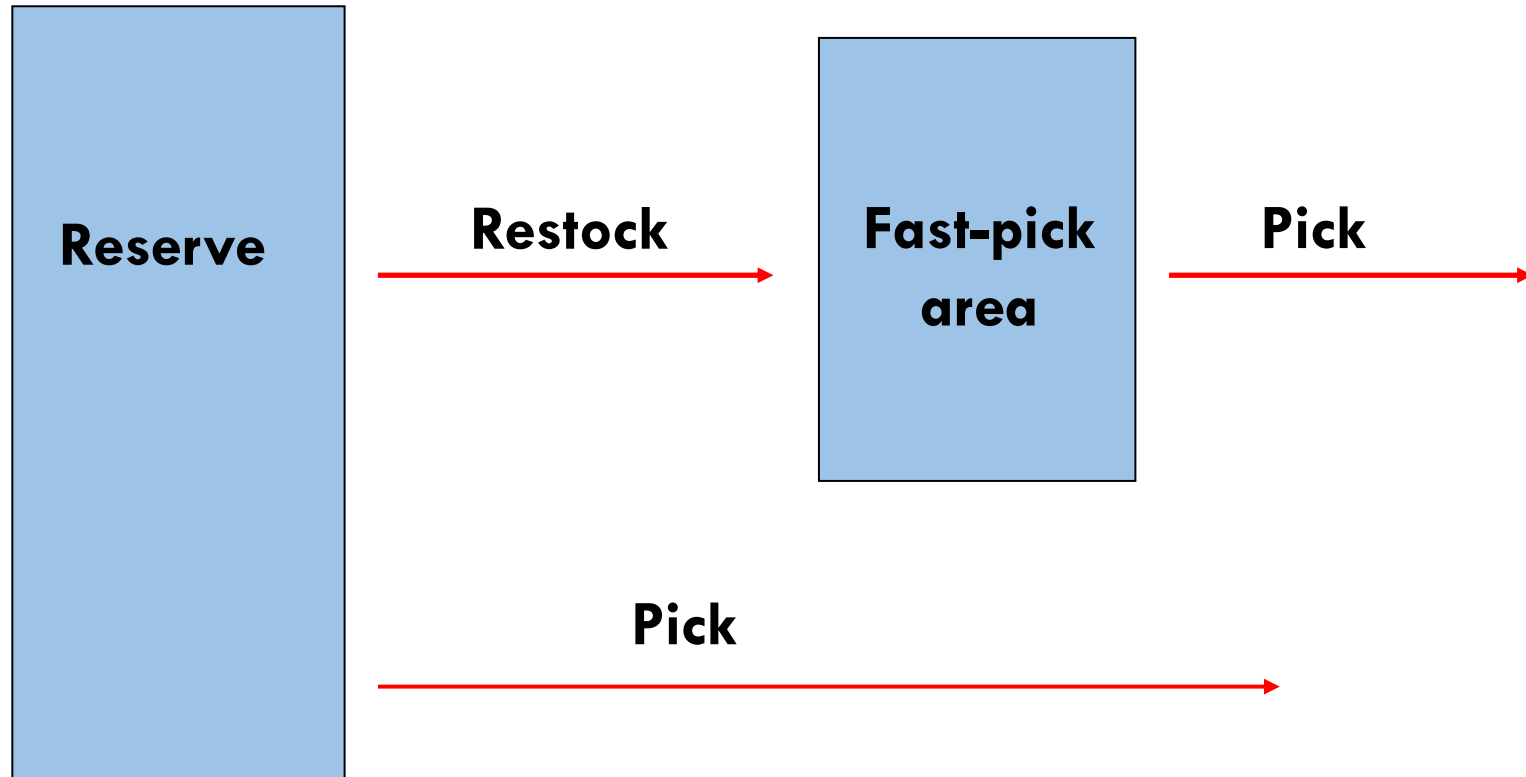
Fast-pick area

Fast-pick area (bottom of rack)

Fast-pick area (pallet flow rack)

Fast-pick area (gravity flow rack)

Summary

- How to fulfill customer orders?

  - How to select equipment and technology?

    - Pallet racks for pallets

    - Bin-shelving for slower-moving items

    - Gravity flow racks for faster-moving items

  - How to store products?

    - Use fast-pick areas to reduce response time

  - How to pick and ship products?