

Warehouse & Distribution Management

WAREHOUSE (RE)DESIGN



GROENEWOUT



Breda, 13-03-2012

Groenewout Ref nr. 9015X012/WD/Id - version 1.0

Wendel Dijker

Profile Groenewout



Founded in 1966, Groenewout provides professional consulting in Logistics and Supply Chains Management.

Our core competence has been sharpened in supply chains optimization and detailed designs of manufacturing-, distribution- and fulfillment centers. We place a great deal of emphasis on both the identification and realization of feasible opportunities.

Our consulting service portfolio

SUPPLY CHAINS & LOGISTICS CONSULTING:

Strategical	<ul style="list-style-type: none"> • Feasibility studies • Warehouse tendering for building, logistics & IT 	<ul style="list-style-type: none"> • Distribution Network Studies • Global sourcing • Non Product Related Purchasing (NPR) 	<ul style="list-style-type: none"> • Organizational - & functional design • Business process (re-)design • Key Performance Indicators (KPI's)
Tactical	<ul style="list-style-type: none"> • Warehouse (lay-out) design • Plant (lay-out) design • Lean warehousing • Insourcing / out-sourcing warehousing 	<ul style="list-style-type: none"> • Transport tendering • Service Level Agreements (SLA) • Insourcing / out-sourcing transport • Benchmarks 	<ul style="list-style-type: none"> • Sales & Operations Planning (S&OP) • Production planning • Collaborative Planning, Forecasting & Replenishment
Operational	<ul style="list-style-type: none"> • Loss Prevention & Security (LP&S) • Facilities electrical, HVAC & temperature engineering 	<ul style="list-style-type: none"> • Location studies & site selections 	<ul style="list-style-type: none"> • IS selection & implementation (WMS/TMS/APS) • Inventory Mgt.
Materials Mgt.		Physical Distribution	Supply Chains Mgt.

Our consulting methodology



MULTI-DISCIPLINARY

Groenewout's team consists of highly qualified business consultants with unique, complementary disciplines.

HANDS-ON

More than 40 years of experience in operational environments & implementation processes.

INDEPENDENT

Groenewout has no formal obligations towards suppliers or contractors whatsoever and always gives an independent advice, keeping the interest of the client as a first priority.

INTEGRITY

Groenewout highest value is integrity, externally towards client organizations and their employees and internally towards Groenewout employees.

PROFESSIONAL

- **Quantifiable:** Quantification is the basis for our advice.
- **Quality:** Highly qualified professionals with more than 150 years of logistics experience.
- **Leading edge expertise:** Groenewout strives to maintain a leading position as a Logistics and Supply Chains Management specialist, creating a continuous learning environment to develop the organization and the individual.

Quality measured by our clients

(Fine) Chemicals



Healthcare



Electronics



3rd-Party Logistics Service Providers

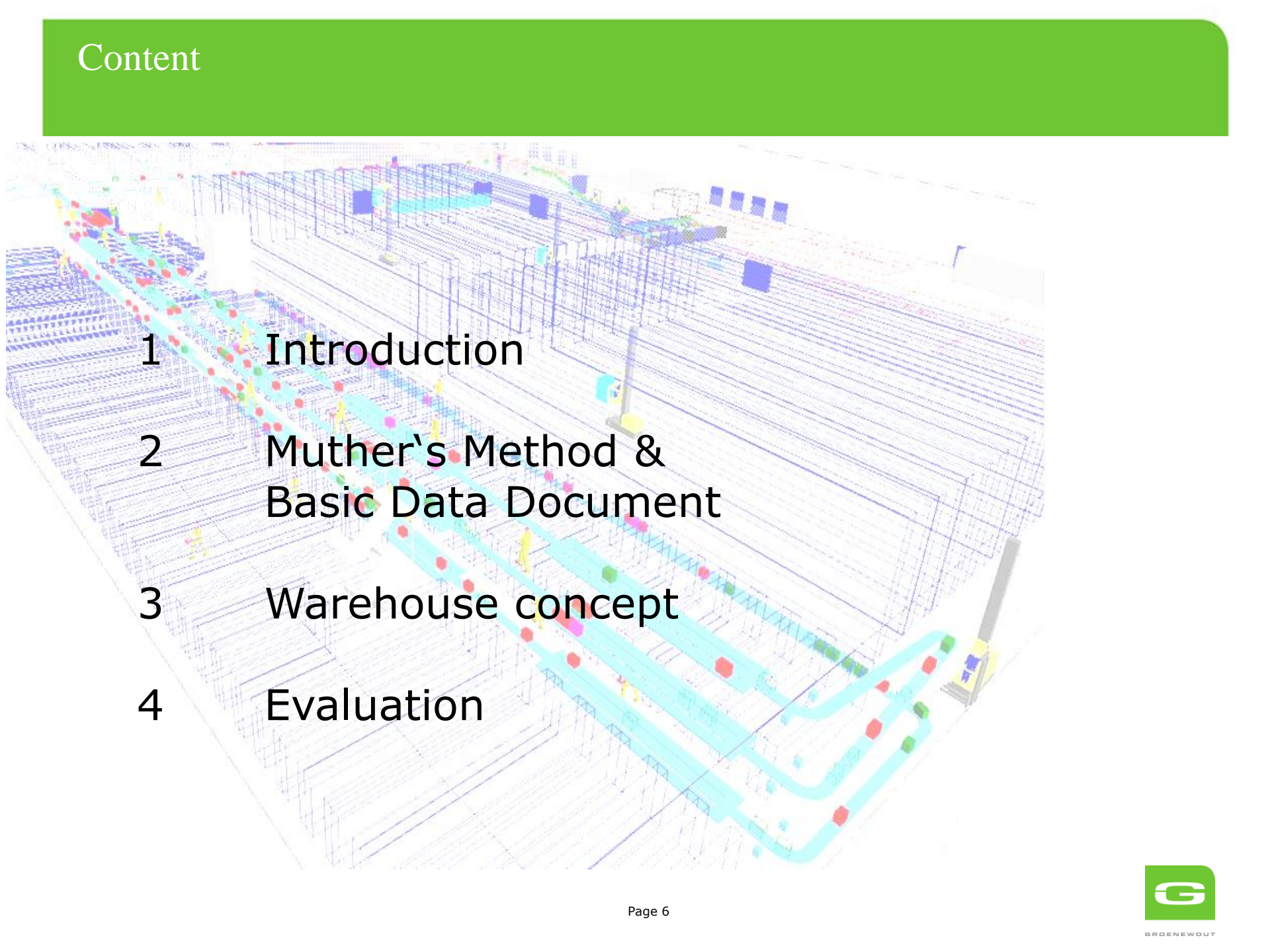


Fast Moving Consumer Goods



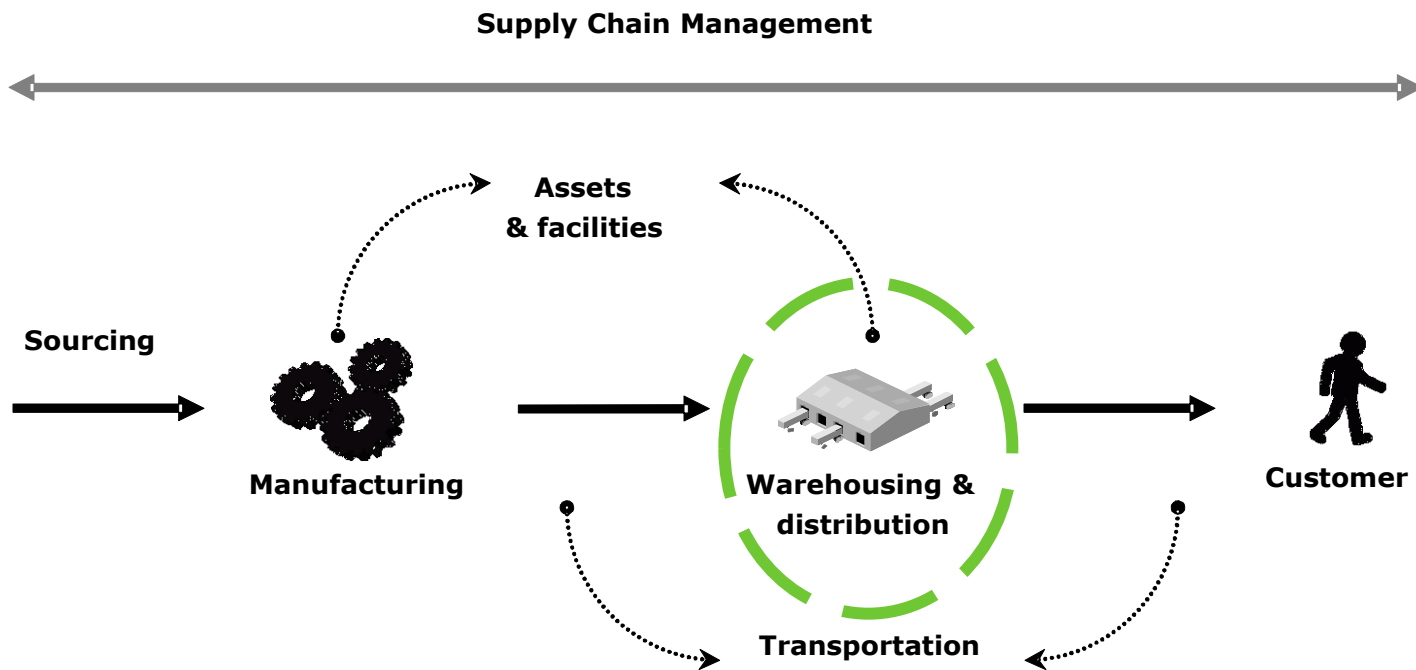
And many other industries



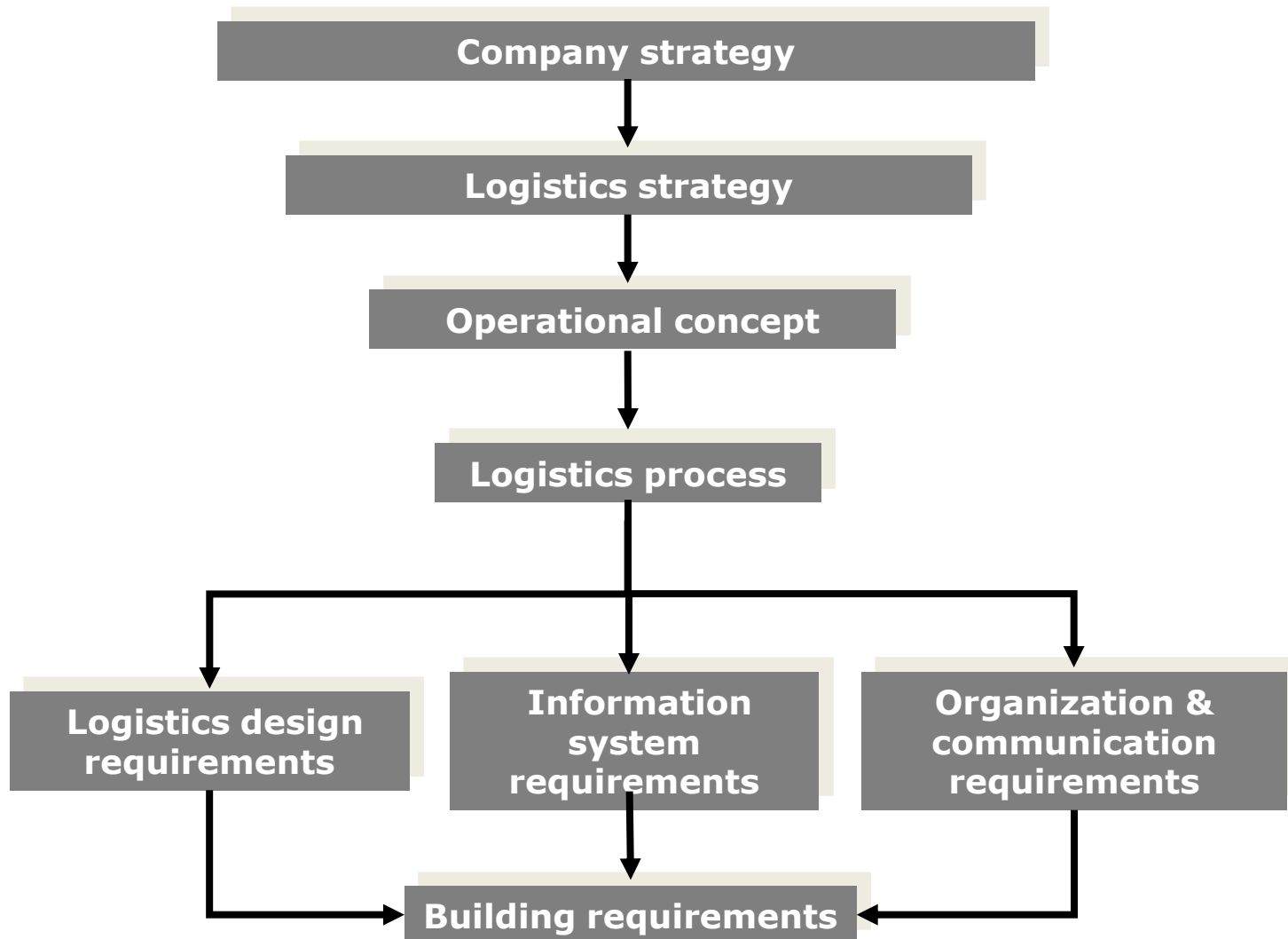
- 
- 1 Introduction
 - 2 Muther's Method & Basic Data Document
 - 3 Warehouse concept
 - 4 Evaluation

1 Introduction (1)

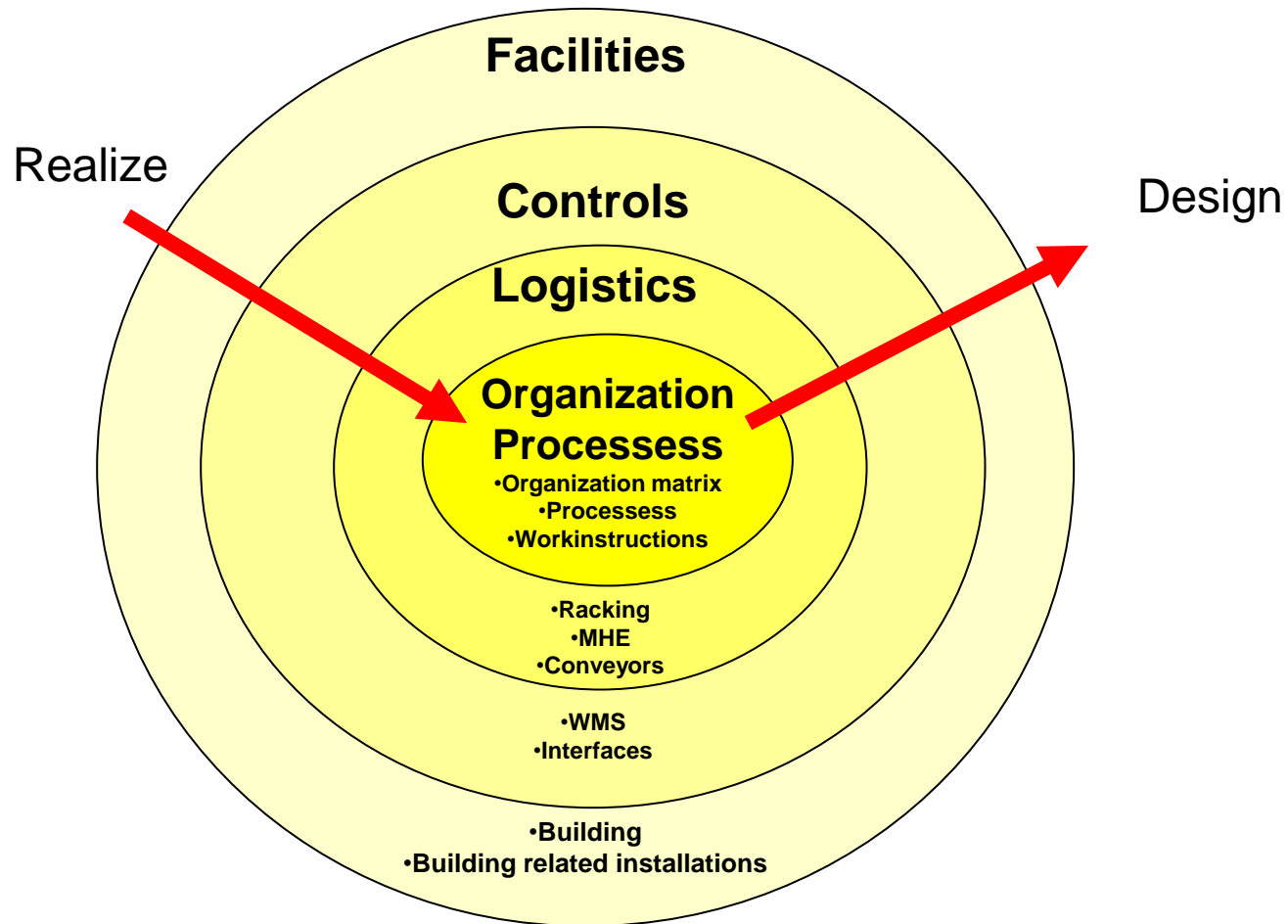
Supply Chain Structure



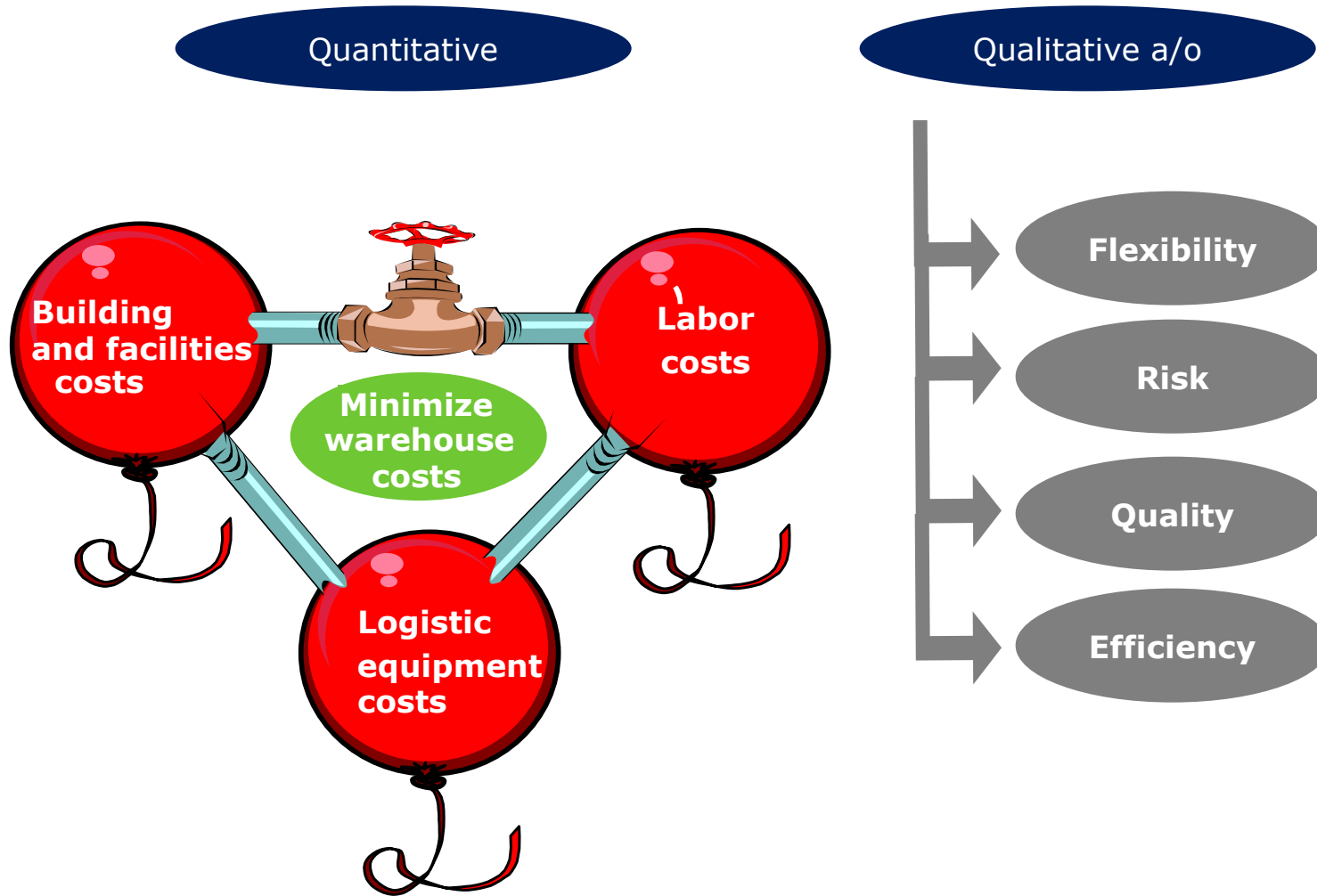
1 Introduction (2)



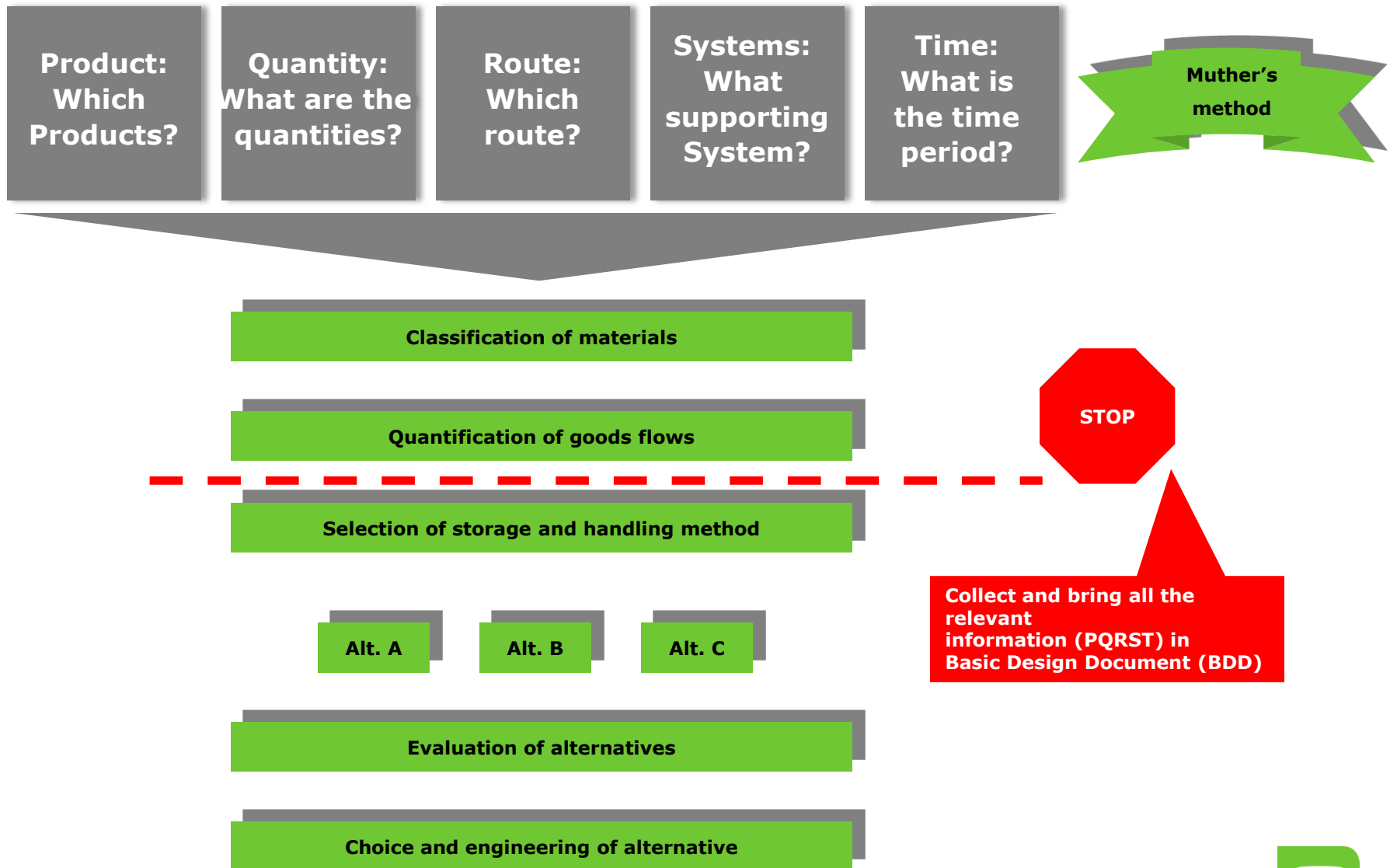
1 Introduction (3)



1 Introduction (4)



2 Muther's Method & Basic Data Document Approach

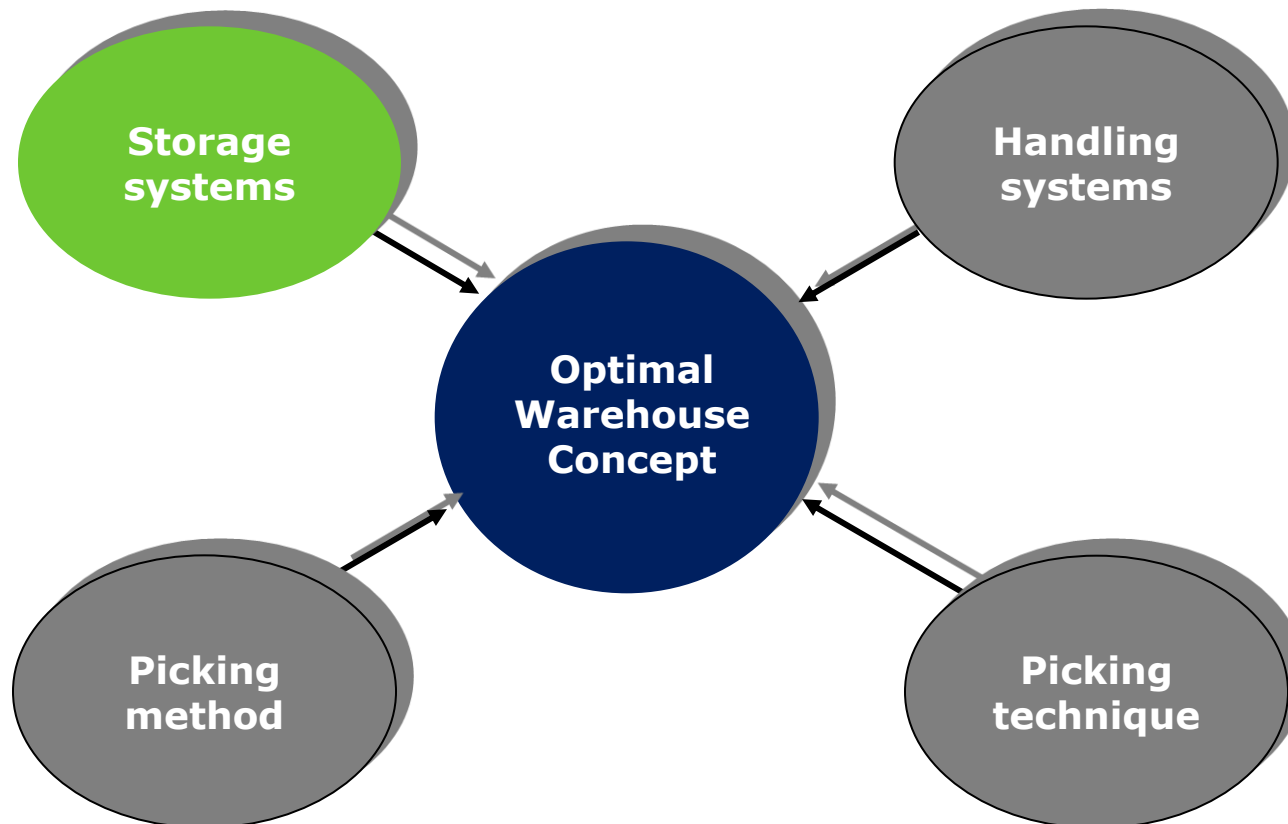


3 Warehouse Concept

Main Topics

- A Storage Systems
- B Handling Systems
- C Overview
- D Order Picking Method
- E Order Picking Techniques
- F IT

3A Storage Systems



3A Storage Systems

General

Storage systems can be divided into systems for:

- Pallet items
- Small items
- Long goods
- Others

3A Storage Systems

Pallet Items (1)



Block stacking



3A Storage Systems

Pallet Items (3)



Pallet racking - Wide aisles

3A Storage Systems

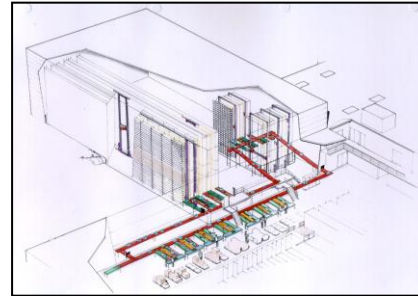
Pallet Items (2)



Pallet racking - Narrow aisles

3A Storage Systems

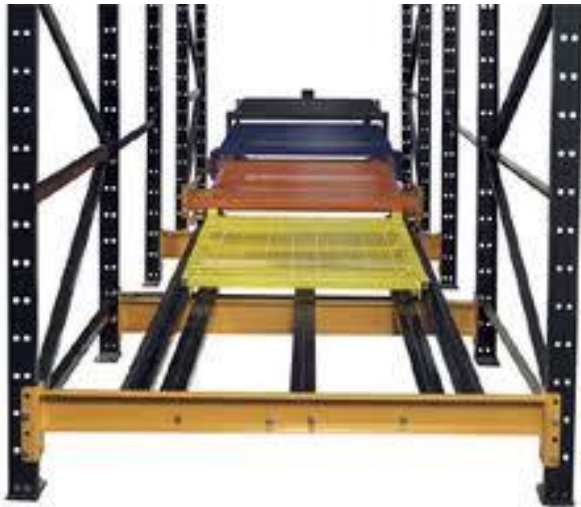
Pallet Items (4)



ASRS or Pallet retrieval

3A Storage Systems

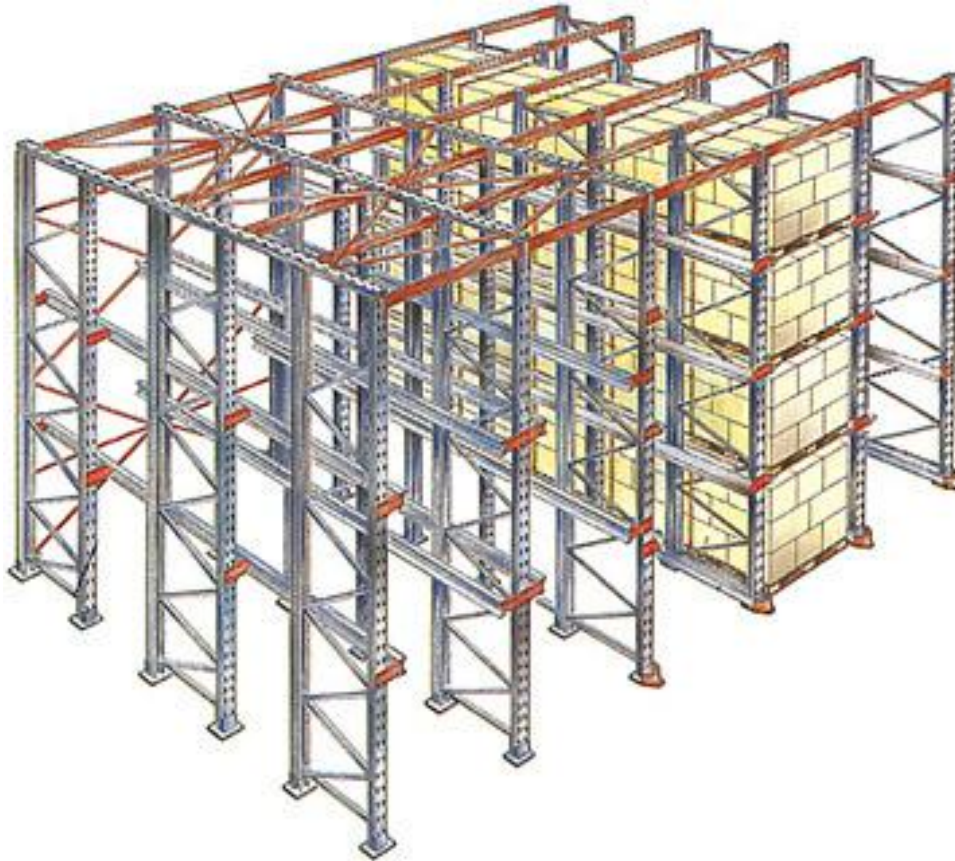
Pallet Items (5)



Pallet flow racking / push back racking

3A Storage Systems

Pallet Items (6)

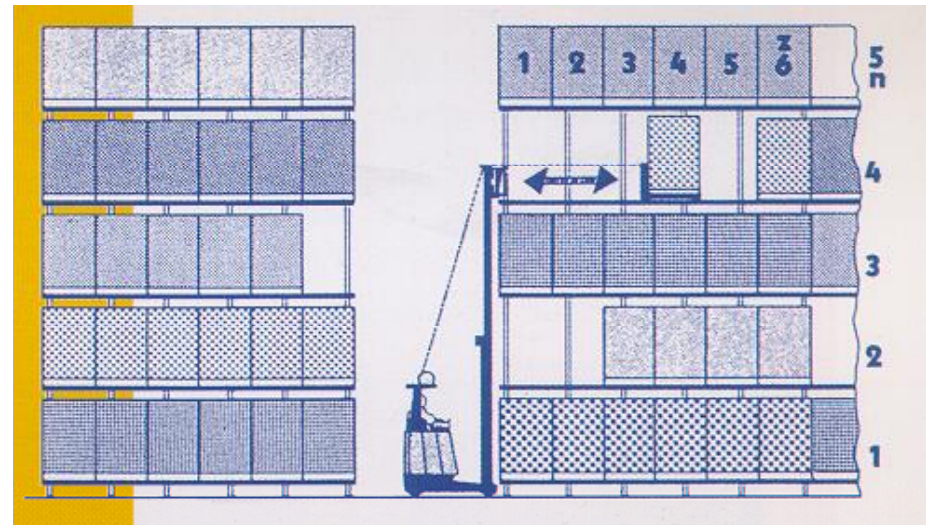
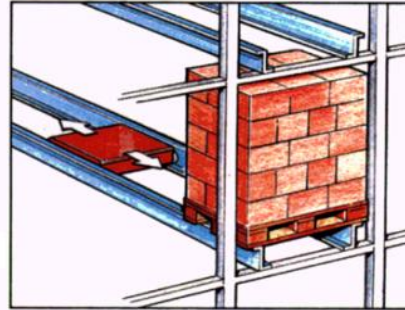
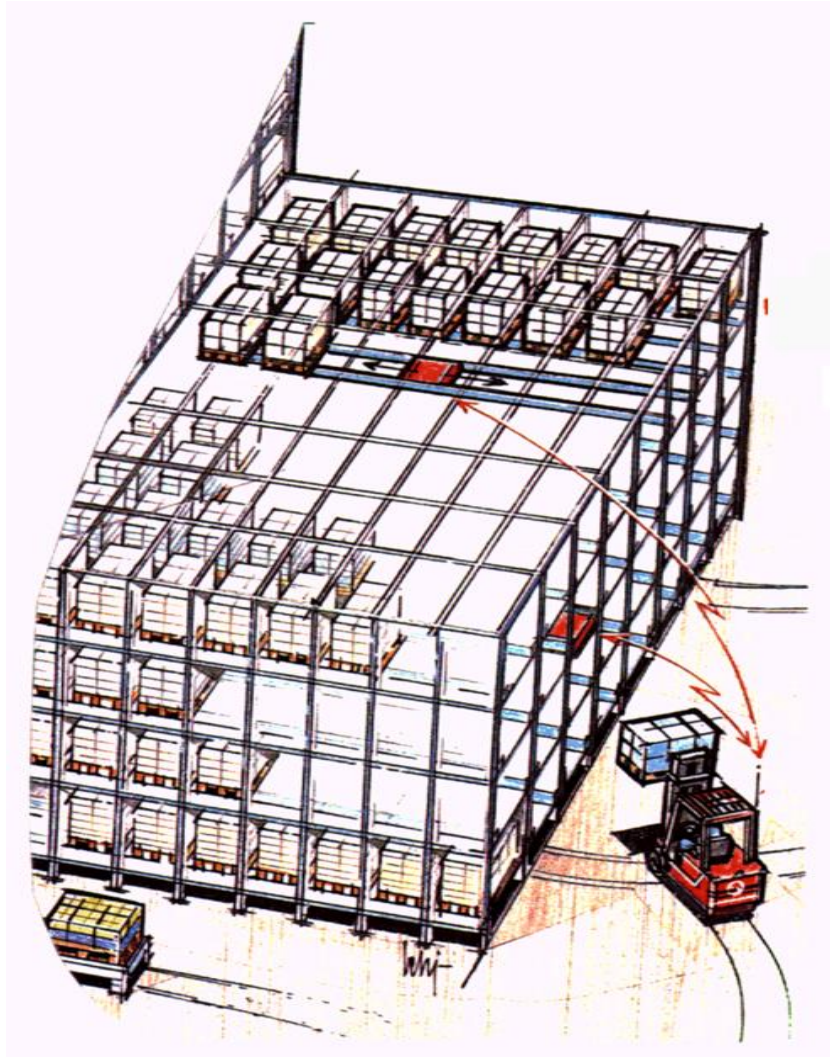


Drive-In racking



3A Storage Systems

Pallet Items (7)



Pallet racking with satellite

3A Storage Systems

Pallet Items (8)



Movable racking

3A Storage Systems

Small Items (1)



Static Shelving

3A Storage Systems

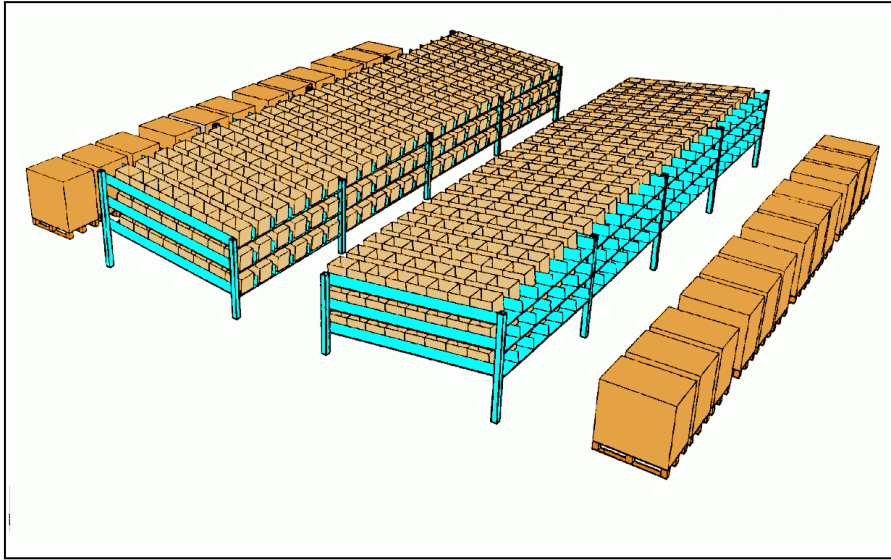
Small Items (2)



Dynamic shelving

3A Storage Systems

Small Items (3)



Case flow racking



3A Storage Systems

Small Items (4)



Mini load



Picking
Tray
System

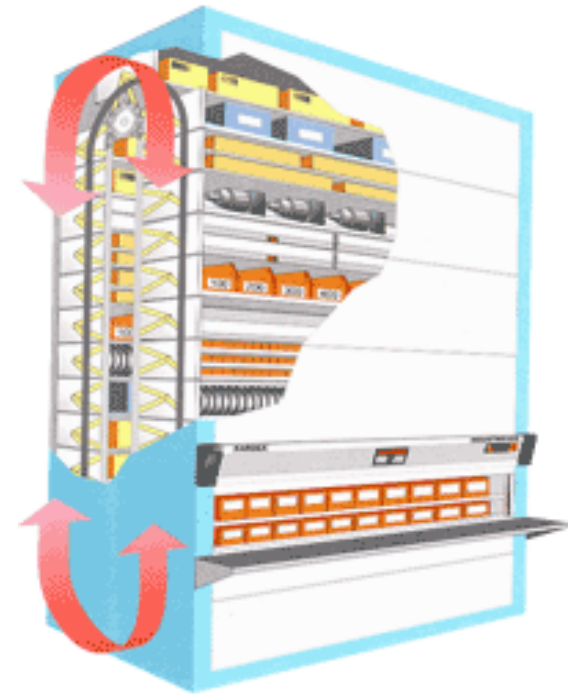


3A Storage Systems

Small Items (5)



Paternoster/lift



3A Storage Systems

Long Items (1)



Block stacking



3A Storage Systems

Long Items (2)



Block stacking



3A Storage Systems

Long Items (3)

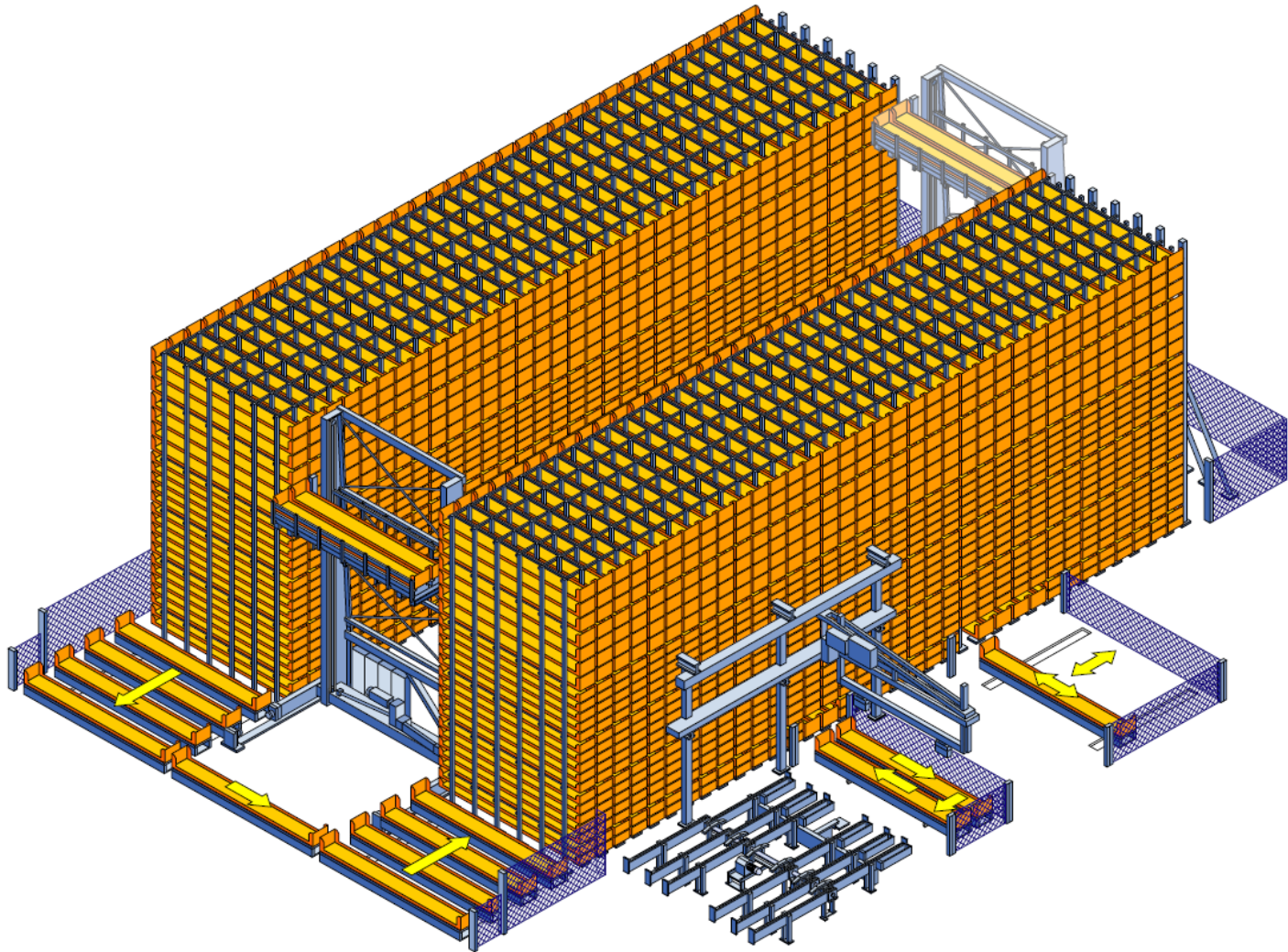


Cantilever racking



3A Storage Systems

Long Items (4)



Automated system with cassettes

3A Storage Systems

Long Items (5)



Vertical stacking on pins



3A Storage Systems

Summary (1)

Storage systems can be divided into systems for:

- Pallets
- Small items
- Long goods
- Other:
 - Hanging garments (see pictures)
 - Odd sizes, like
 - Bikes
 - Seats, couches
 - ...



3A Storage Systems

Summary (2)

storage system	Stock per article			Number of articles			Space utilization			orderline / stock rate			Investment			Storage unit			Flexibility		
	L	A	H	L	A	H	L	A	H	L	A	H	L	A	H	L	A	H	L	A	H
Block stack																					
Wide aisles																					
Narrow aisles																					
AS/RS pallets																					
Pallet flow racks																					
Shelves																					
Case flow racks																					
Mini-load																					
Paternoster																					
Carrousel																					

L

Low

A

Average

H

High

Categorization and criteria storage systems

3A Storage Systems

Summary (3)

High level comparison pallet systems

Storage Systems



Picking Systems

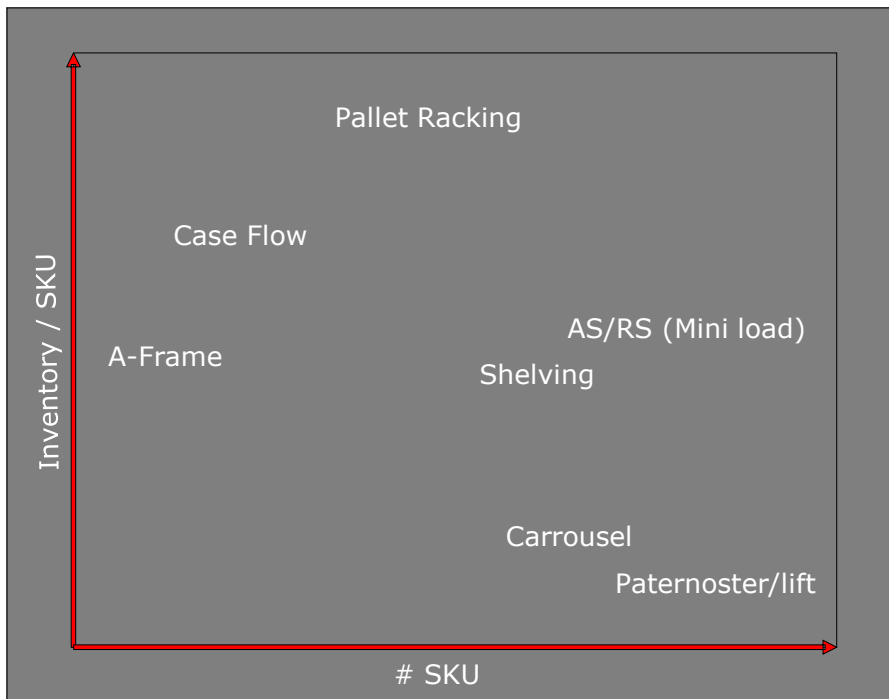


3A Storage Systems

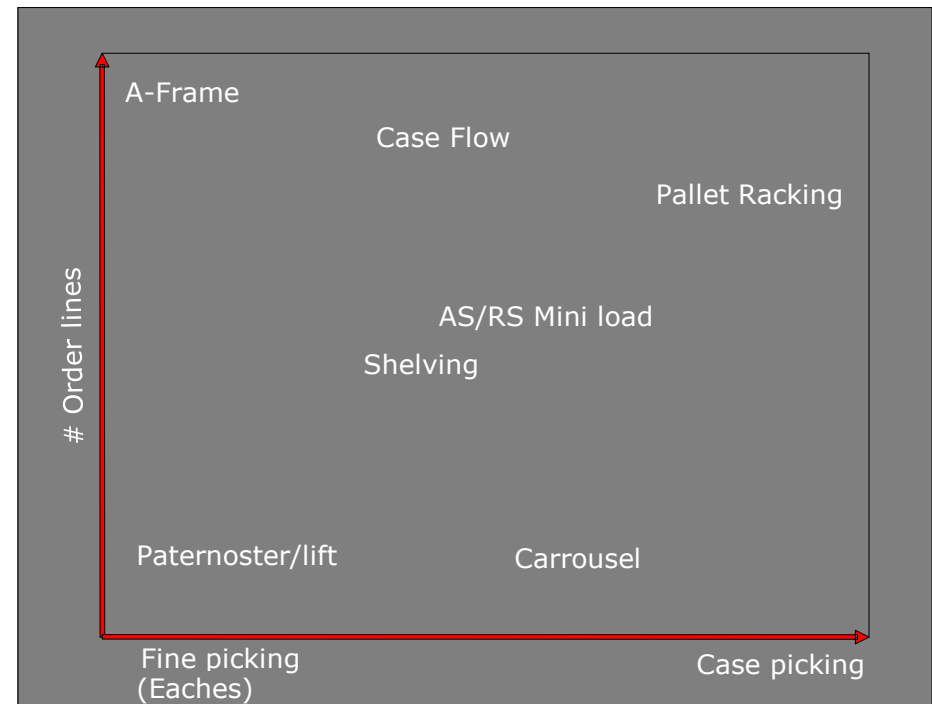
Summary (4)

High level comparison small article systems

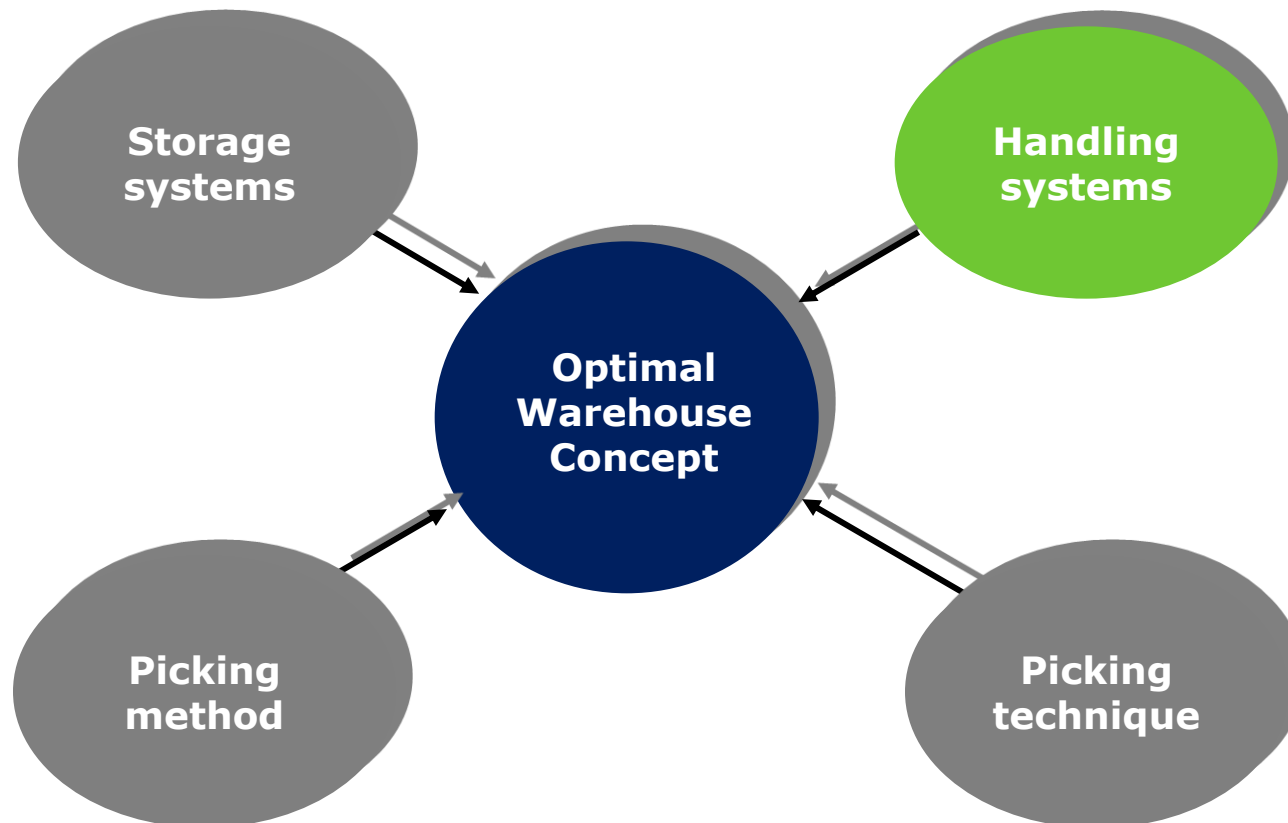
Storage Systems



Picking Systems



3B Handling Systems (1)



3B Handling Systems (2)



Hand Pallet Truck



Electrical Pallet Truck



3B Handling Systems (3)



Pick cart with P-t-L system



Customized pick cart



3B Handling Systems (4)



Roll container/ Dolly



3B Handling Systems (5)



Forklift truck



3B Handling Systems (6)



Horizontal order pick truck

3B Handling Systems (7)



Vertical order pick truck



3B Handling Systems (8)



Reach truck



3B Handling Systems (9)



Combi truck or high bay truck



3B Handling Systems (10)



Conveyor systems

3B Handling Systems (12)



Mini load cranes (ASRS)



3B Handling Systems (13)



Pallet cranes (ASRS)



3B Handling Systems (14)



Side loaders

3B Handling Systems (15)



AGV (Automated Guided Vehicle)



3C Overview

Characteristics for main concepts

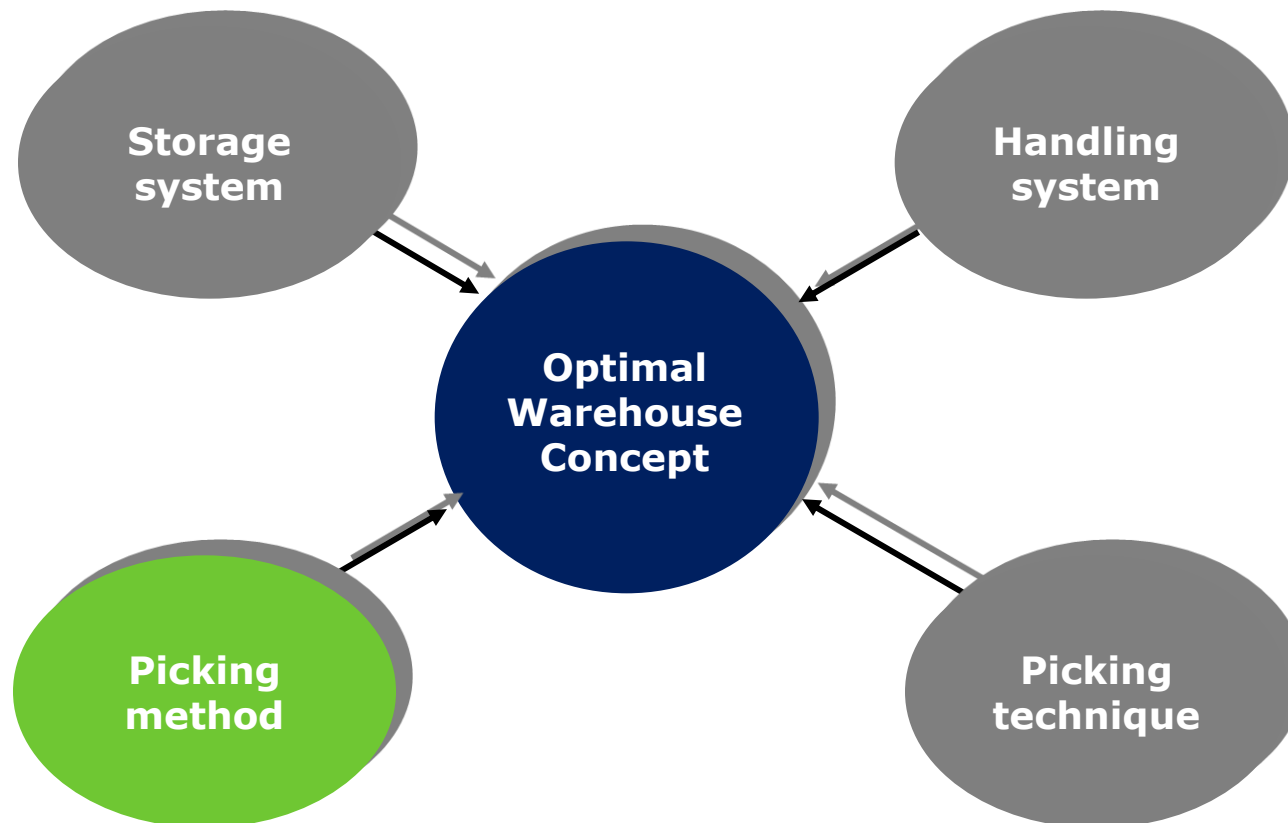
<div> <div></div> <div></div> <div></div> </div>			Cost for Space			Labour cost			Equipment cost		
			L	A	H	L	A	H	L	A	H
Blockstack	Floor	Forklift truck									
Wide aisles	Pallet racking	Reachtruck									
Narrow aisles	Pallet racking	Combtruck									
AS/RS	Pallet racking	SBA									
Pallet flow racks	Pallet flow racks	Orderpick truck									
Pallet flow racks ptb	Pallet flow racks	Pick-to-belt									
Shelves	Shelves	Trolley									
Shelves ptt	Shelves	Pick-to-tote									
Case flow racks	Case flow racks	Trolley									
Case flow racks ptt	Case flow racks	Pick-to-tote									
Miniload	Case racking	Miniload crane									

L Low

A Average

H High

3D Picking Method (1)



Picking methods

- Pick cart, roll container
- Electrical pallet trucks, 1 or more pallets
- (horizontal/vertical) order pick trucks, combi trucks
- Pick-to-belt
- Pick-to-tote
- Pick-to-shipping box

3D Picking Method (3)



Pick cart



3D Picking Method (4)



Roll container/ Dolly



3D Picking Method (5)



Vertical order pick truck



Horizontal order pick truck



3D Picking Method (6)



Combi truck



3D Picking Method (7)



Conveyor belt: pick-to-belt



3D Picking Method (8)



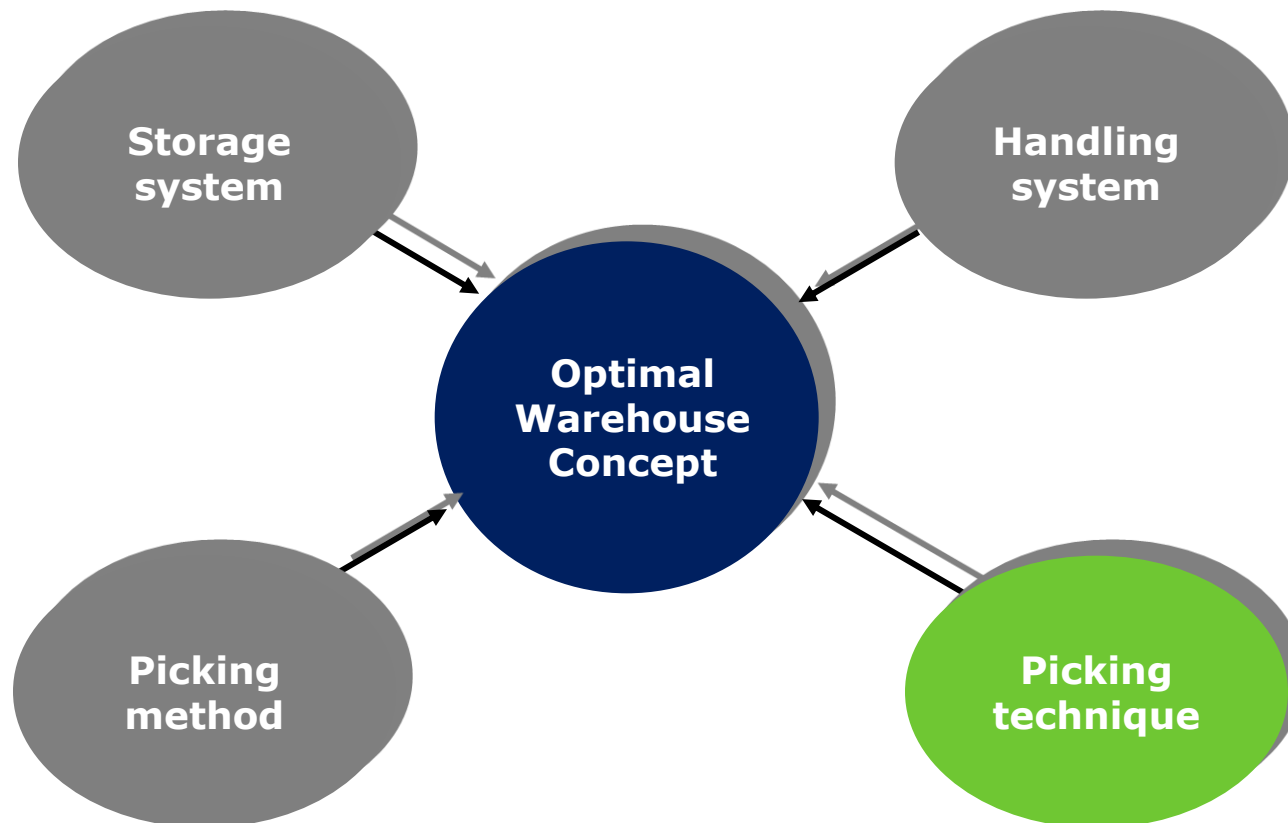
Roller conveyor: pick-to-tote (zone picking)

3D Picking Method (9)



Roller conveyor: pick-into-shipping box (zone picking)

3E Picking Techniques (1)



3E Picking Techniques (2)

- Paper pick list
- Collo-labels
- Goods-to-Man
- RF and scanning
- Pick-to-Light
- Voice Recognition
- Full automated picking (A-frame)

3E Picking Techniques (3)

Handling concepts

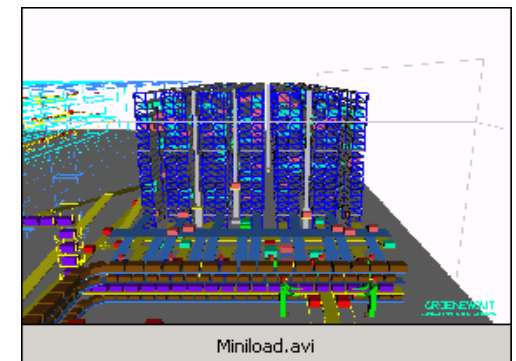
- Man-to-goods (e.g. wide aisles, narrow aisles)
- Goods-to-man / automatic storage (e.g. AS/RS, paternoster)
- Goods-to-man / hybride (e.g. pick-to-tote/carton, pick-to-belt)

Advantages goods-to-man vs. man-to-goods

- Higher productivities
- Less picking errors
- Better space utilization
- Ergonomic working stations

Disadvantages goods-to-man vs. man-to-goods

- Higher investments
- Less flexibility
- Limited capacity



3E Picking Techniques (4)



Multi-order picking (sort-while-picking) by P-t-L on pick cart

3E Picking Techniques (5)



RF picking & scanning

3E Picking Techniques (6)



Pick-to-Light

3E Picking Techniques (7)

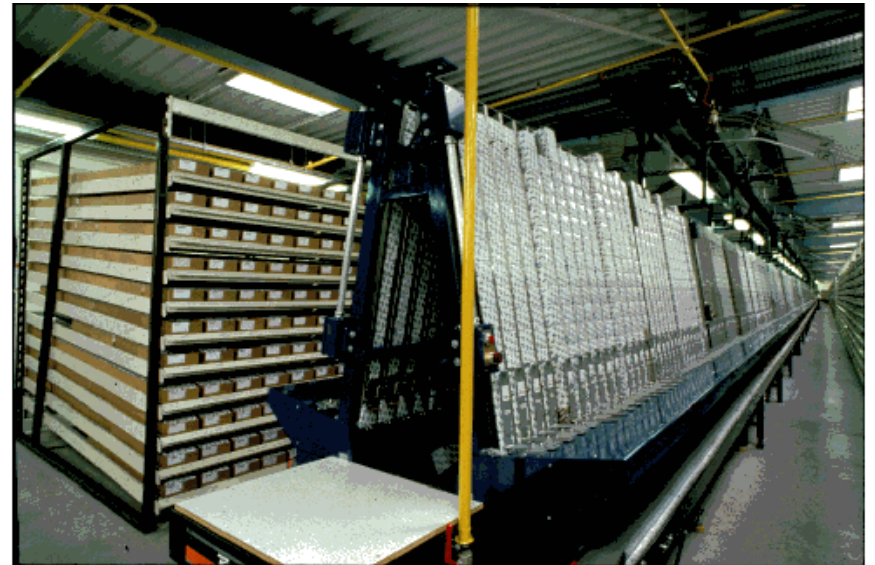


Voice Recognition

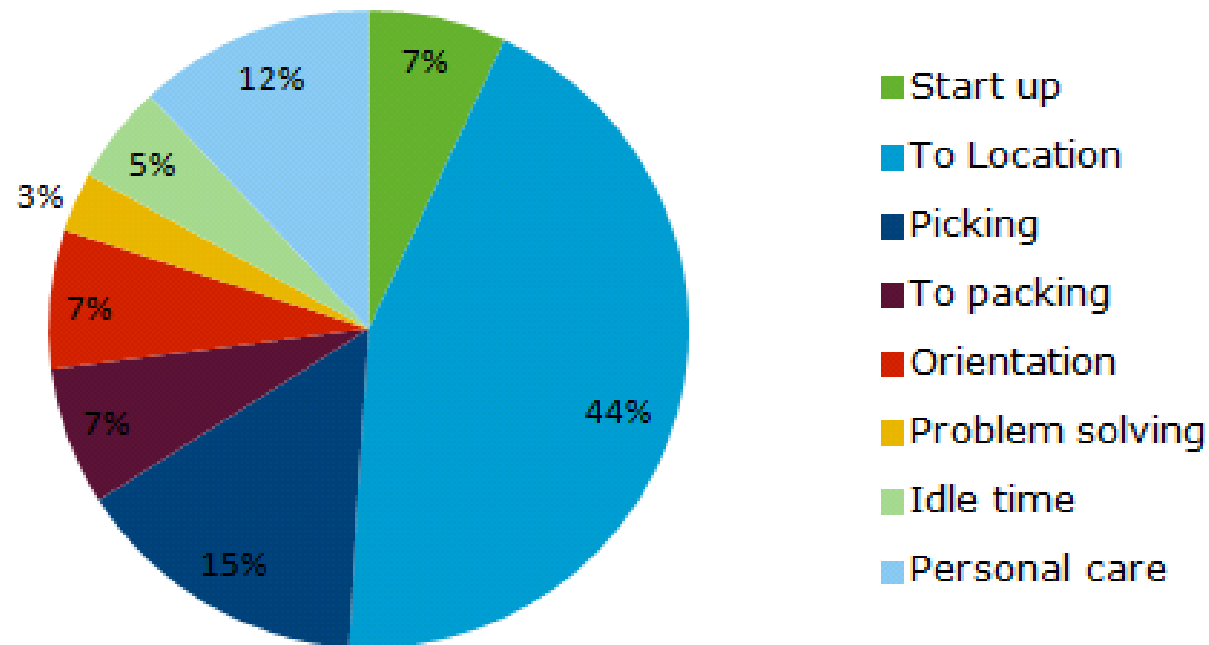
3E Picking Techniques (8)



A-frame



3E Picking Techniques (9)



3E Picking Techniques (10)

			Cost for Space			Labour cost			Equipment cost		
			L	A	H	L	A	H	L	A	H
Blockstack	Floor	Forklift truck									
Wide aisles	Pallet racking	Reachtruck									
Narrow aisles	Pallet racking	Combitruck									
AS/RS	Pallet racking	SBA									
Pallet flow racks	Pallet flow racks	Orderpick truck									
Pallet flow racks ptb	Pallet flow racks	Pick-to-belt									
Shelves	Shelves	Trolley									
Shelves ptt	Shelves	Pick-to-tote									
Case flow racks	Case flow racks	Trolley									
Case flow racks ptt	Case flow racks	Pick-to-tote									
Miniload	Case racking	Miniload crane									

L

 Low

A

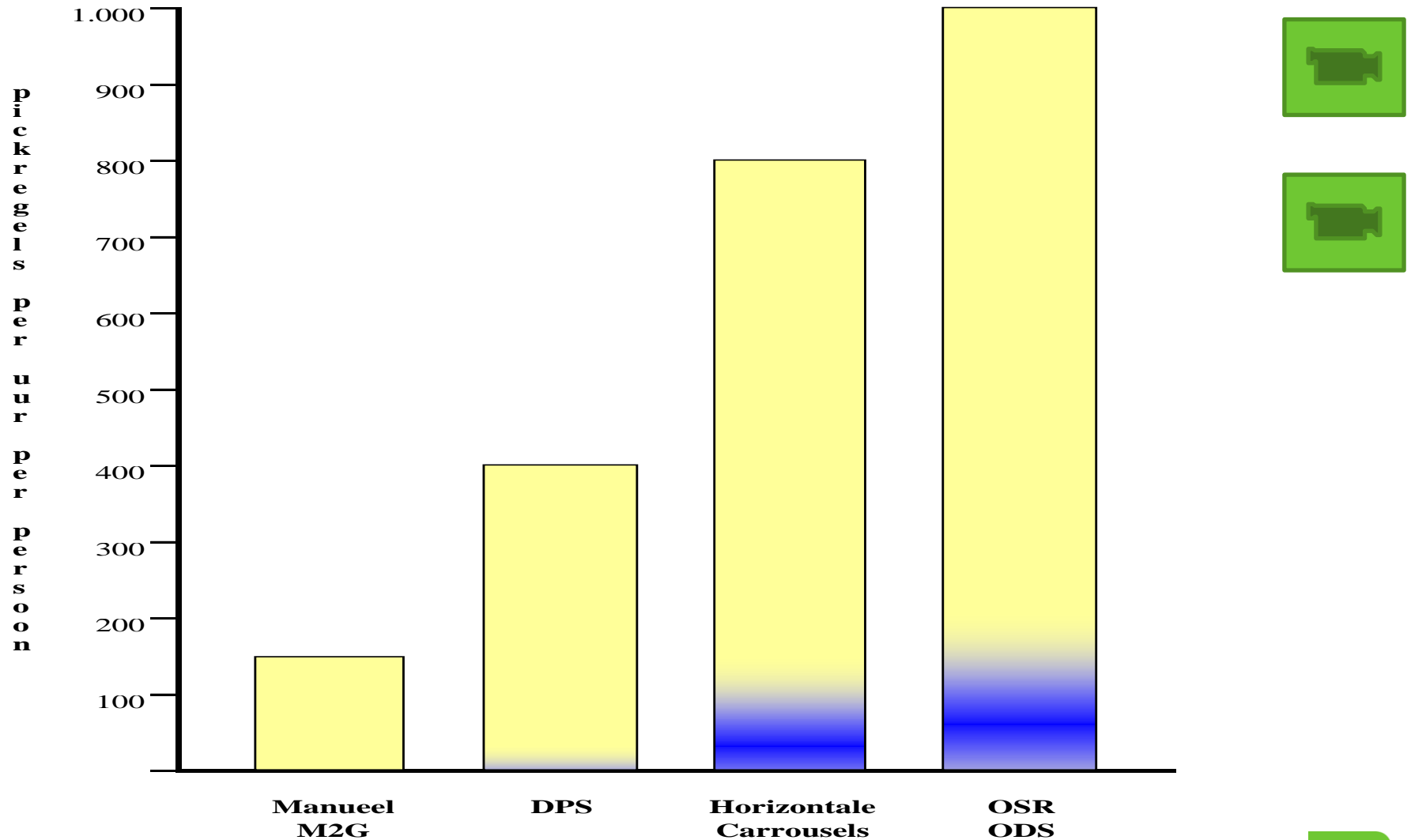
 Average

H

 High

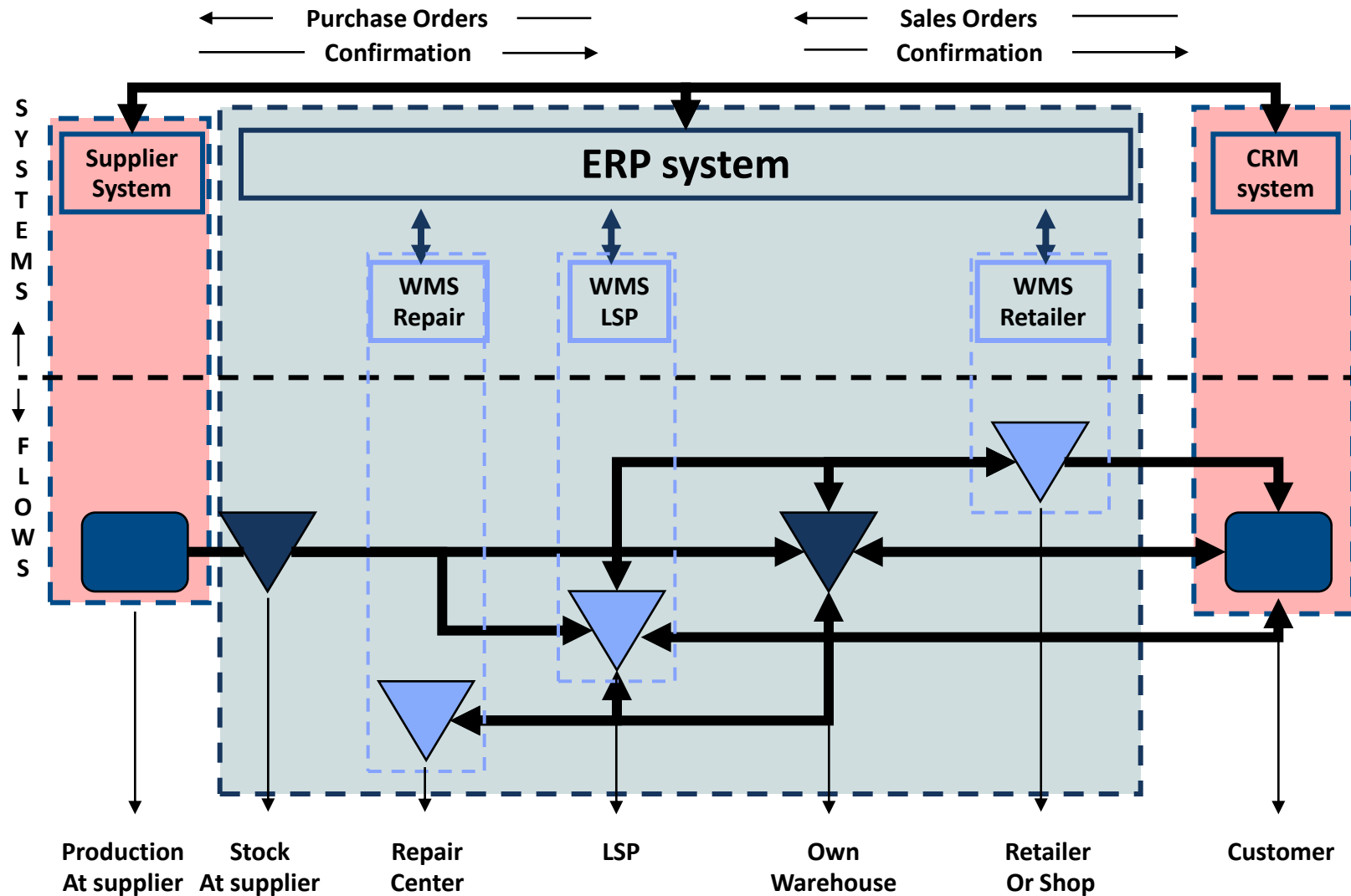
Focus off integrated systems like Direct Picking System, Order Distribution System, Order Storage and Retrieval en Horizontale Carroussels with sufficient volume

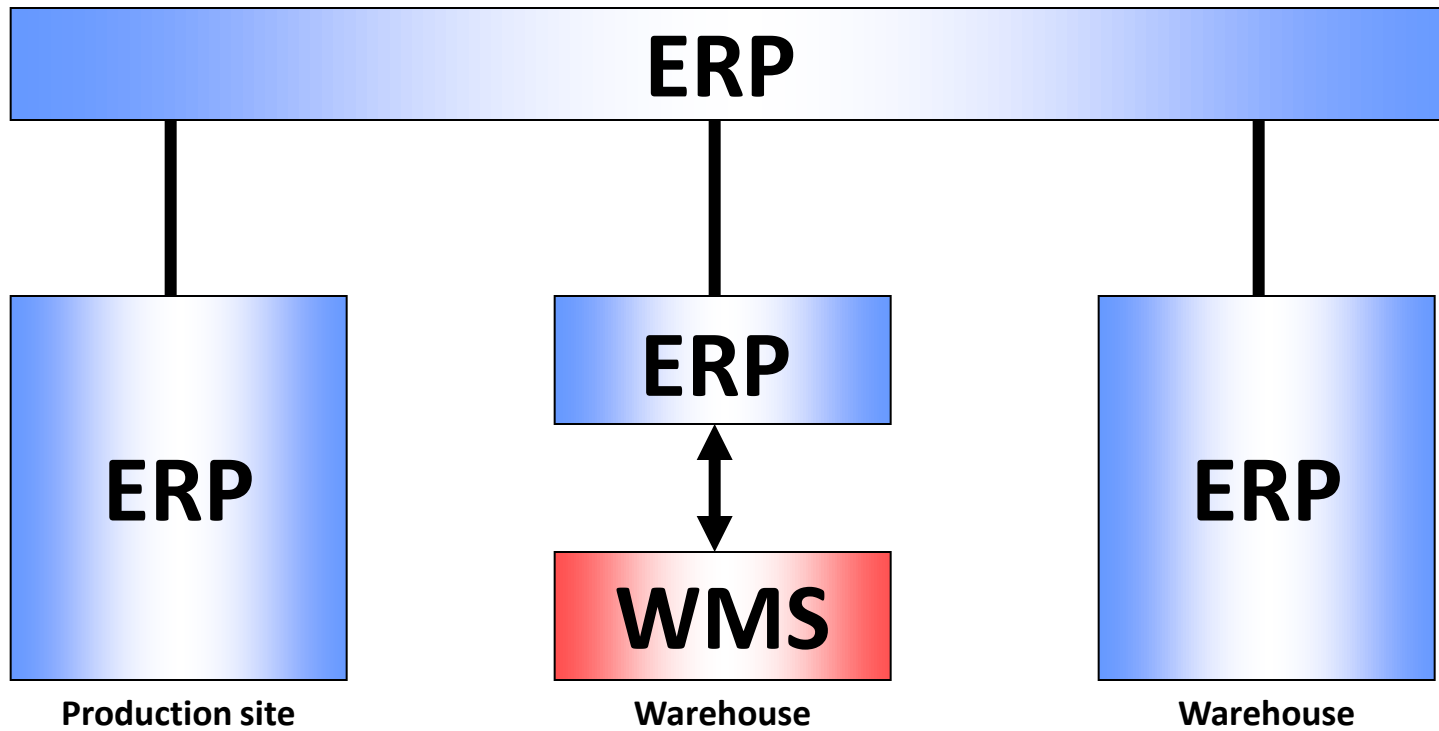
3E Picking Techniques (11)

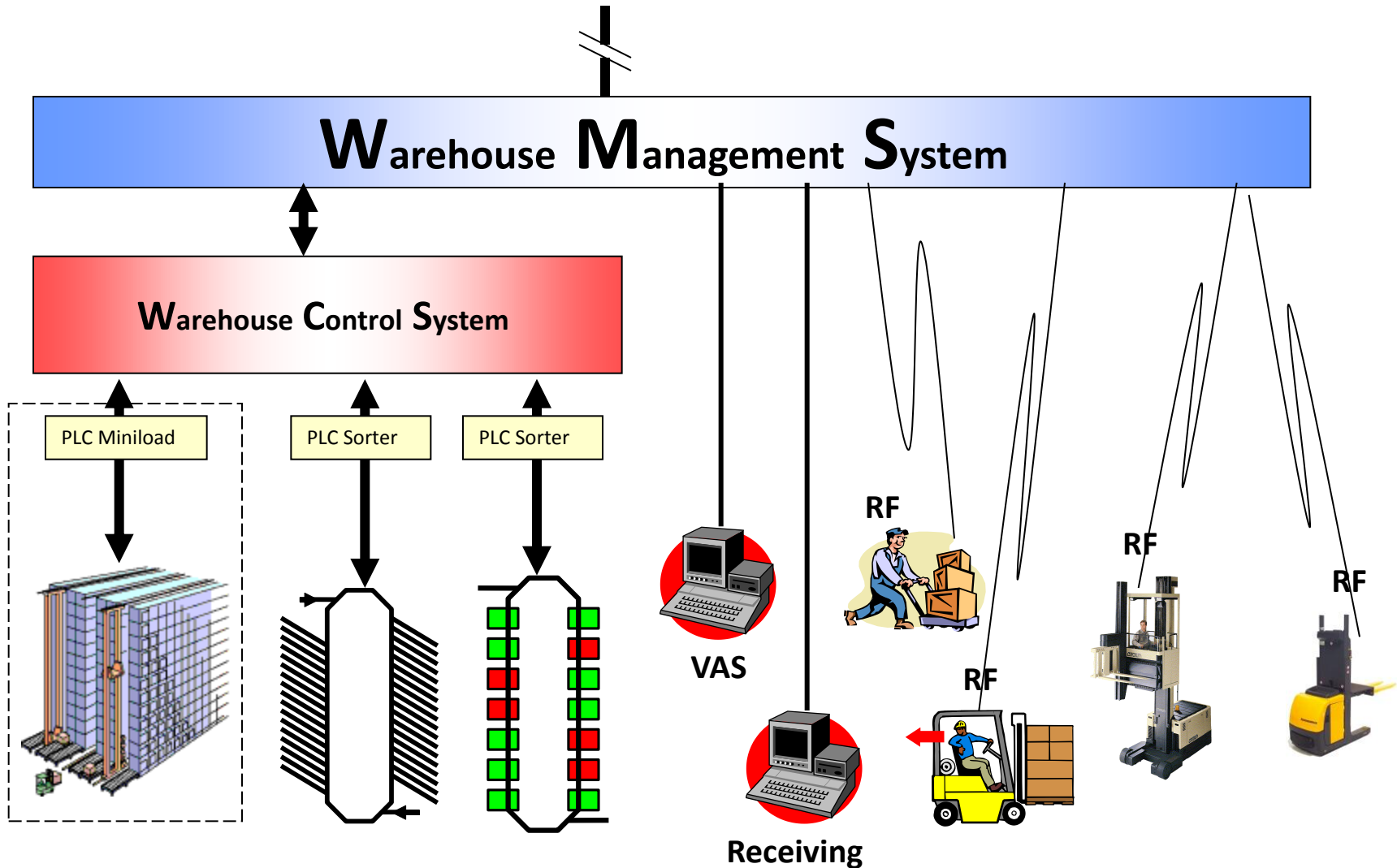


3F IT

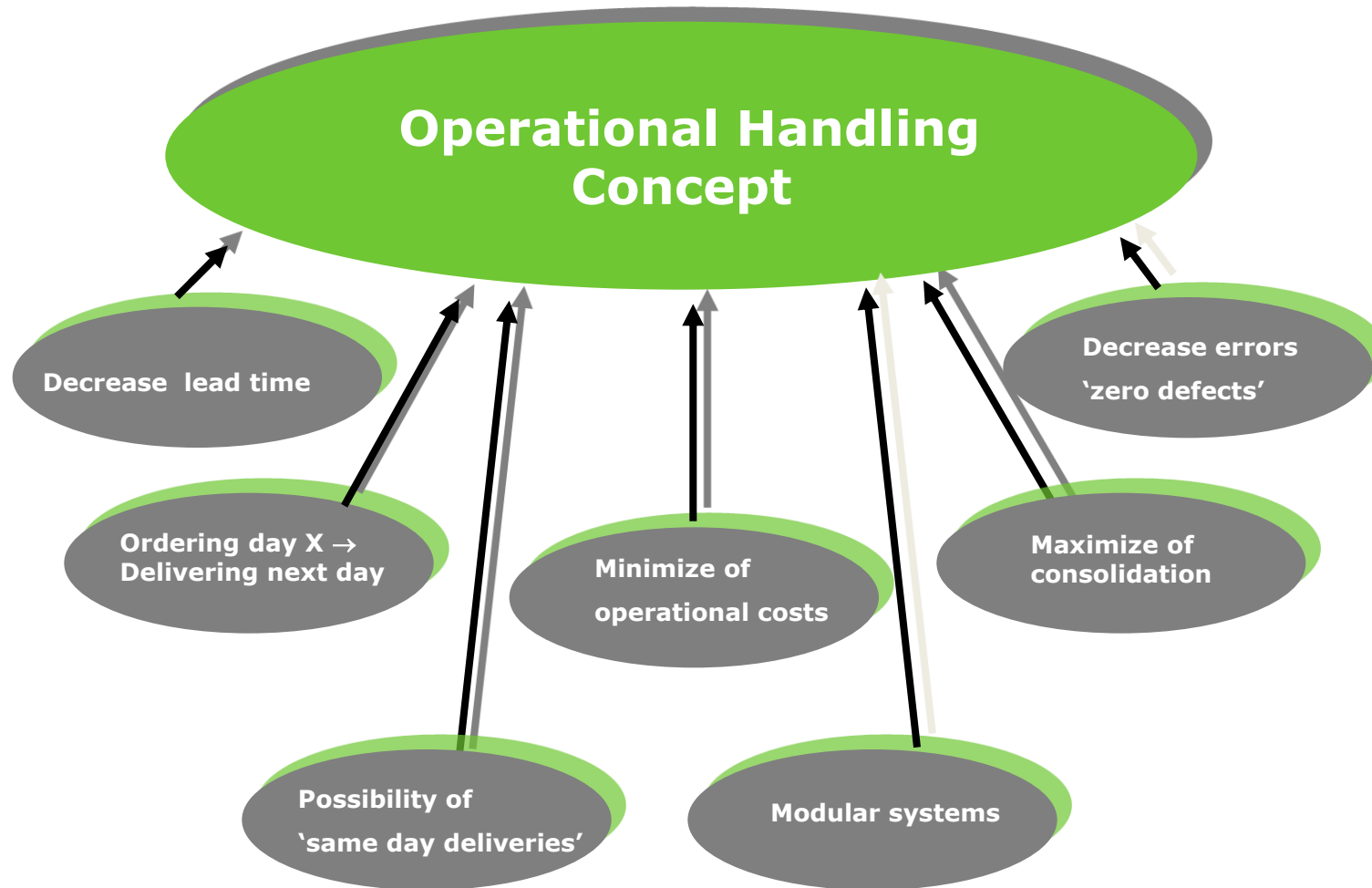
General concept (1)



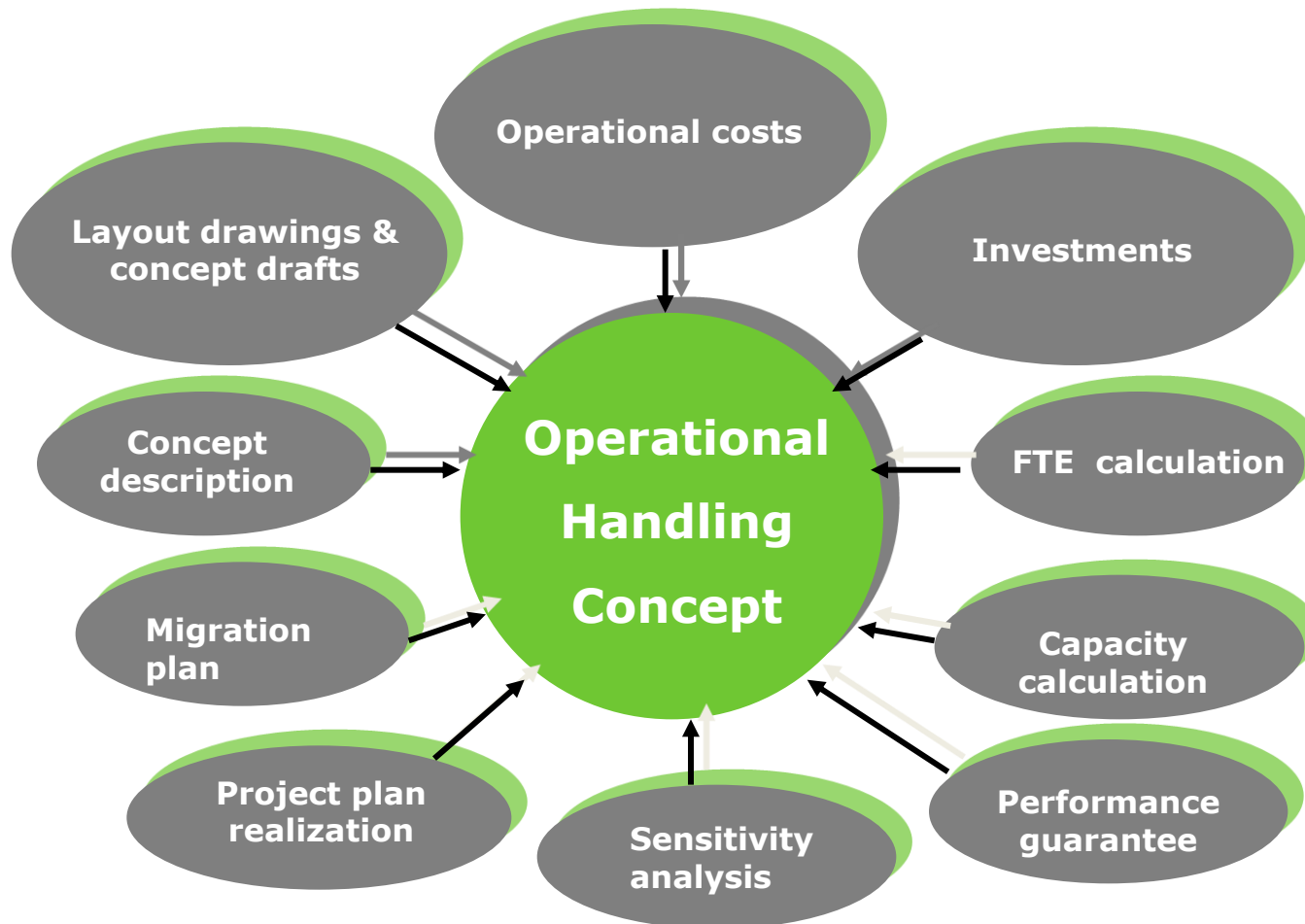




4 Evaluation (1)



4 Evaluation (2)



4 Evaluation (3)

Financials		Logistics performance			
<ul style="list-style-type: none">• Investments (CAPEX)• Operational costs (OPEX)• ROI• ...		<ul style="list-style-type: none">• Conceptual concept• Headcount• Reliability• Flexibility•			
Requirements		Risk			
<ul style="list-style-type: none">• Fullness• Conformities basic data• ...		<ul style="list-style-type: none">• Sensitivity• Techniques dependency• Fall back scenario's• Risk of execution• Timeline of realization• ...			
Criteria	Weighted factor	Score per concept			
		1	2	3	4
Financials	..				
Logistics performance	..				
Risk	..				
Requirements	..				
...					
Total Score		100%			

DRIVEN BY KNOWLEDGE