Online tananyag

Interdiszciplináris tudományok

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26.

Business logistics

DUNAÚJVÁROSI EGYETEM
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Table of Content

Lecture 10

LOGISTIC PERFORMACE MEASUREMENT

Lecture 11

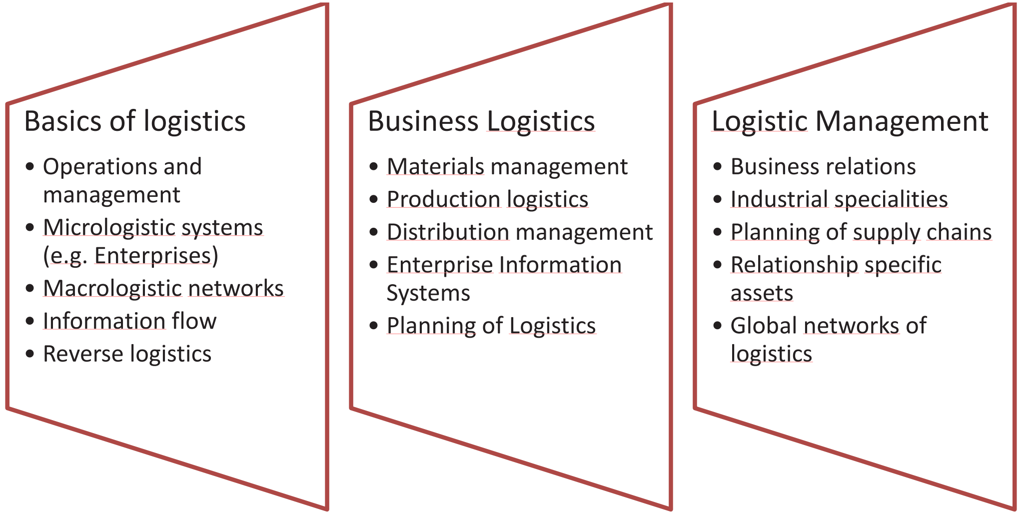
PLANNING OF BUSINESS LOGISTICS PROCESSES

INTRODUCTION TO THE COURSE

Welcome to the course of Business Logistics. This course is a part of the Specialization for Logistics in Technical Manager Bachelor Training Program of College of Dunaújváros. As the second logistic related subject of the specialization, its prerequisite knowledge are placed in the Enterprise Management course and in Basics of Logistics. Dear Students, if you are join to this course without knowing the related prerequisite subjects, it will be hard to understand the deeper relationships between the effects and their causes, which we have no time to detail in Enterprise Management or in Basics of Logistics level.

Of course, this course is a prerequisite foundation of a next course organized around the management of the logistics. Next figure shows the closely related logistic area of the Business Logistics and their major topics. You can see, that as your progress in your logistic study forwards, you will learn more specialized issues of logistics from wide basics to managerial issues of logistic management. The presentation shapes of the subjects try to show this relationship between the specialization levels related to each of the logistic subjects.

Business Logistics and its related areas



Moreover, there are further related subjects, like Production Planning 1 subject or SAP Logistics Application Project, which can extend your logistic studies with the area of management production management related to the production logistics and with the Enterprise
Resource Planning System, as the core component of the business logistic information systems.

The further list gives you a short overview about the main topics of the business logistics involved into this course. It is a little bit deep dive, but I hope, extended with a lot of practical tasks your view about the internal logistic issues of an enterprise extends to help you further work on this area. Good luck!

Short course overview:

- Introduction and Management
  - The strategic role of the business logistics
  - The structure and the components of the business logistics
  - The place of the Logistic management in the business management

- Main Sub processes
  - Procurement Processes
  - Production Logistics
  - Distribution Processes

- Inventory Management
  - Warehousing structures
  - Connection of procurement and warehousing
  - Inventory types, models and optimization methods

- Information Flow and Systems
  - Logistic Information Systems
  - Production Planning and Scheduling
  - Supplier and Customer Relationship Management

- Performance Measurement
  - General Role of Performance Measurement
  - Measurement in the logistic processes
  - Indicators

- Planning Processes
  - Green-field planning
  - Re-engineering processes

INTRODUCTION TO THE COURSE

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Business Logistics and
its prerequisite knowledge

Entepise
Management

Basics of
logistics

Business
Logistics

Business Logistics and its related areas

Basics of logistics
- Operations and management
- Micrologistic systems – e.g. Enterprises
- Macrologistic networks
- Information flow
- Reverse logistics

Business Logistics
- Materials management
- Production logistics
- Distribution management
- Information systems
- Planning

Logistic Management
- Business relations
- Industtrial specialities
- Planning of supply chains
- Relationship specific assets
- Global network

The course overview

Intorduction and Management	• The strategic role of the enterprise logistics • The structure and the components of the enterprise logistics • The place of the Logistic management in the enterprise management
Main Subprocesses	• Procurement Processes • Production Logistics • Distribution Processes
Inventory Management	• Warehousing structures • Connection of procurement and warehousing • Inventory types, models and optimisation methods
Information Flow and Systems	• Logistic Information Systems • Production Planning and Scheduling • Supplier and Customer Relationship Management
Performace Measurement	• General Role of Performance Measurement • Measurement in the logistic processes • Indicators
Planning Processes	• Analysis – Prepare • Green-field planning • Re-engineering processes

Lecture 1

LECTURE I – INTRODUCTION TO BUSINESS LOGISTICS

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LECTURE I – INTRODUCTION TO BUSINESS LOGISTICS

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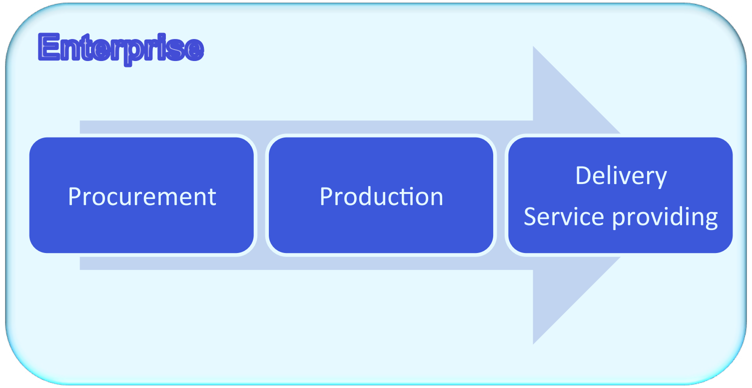
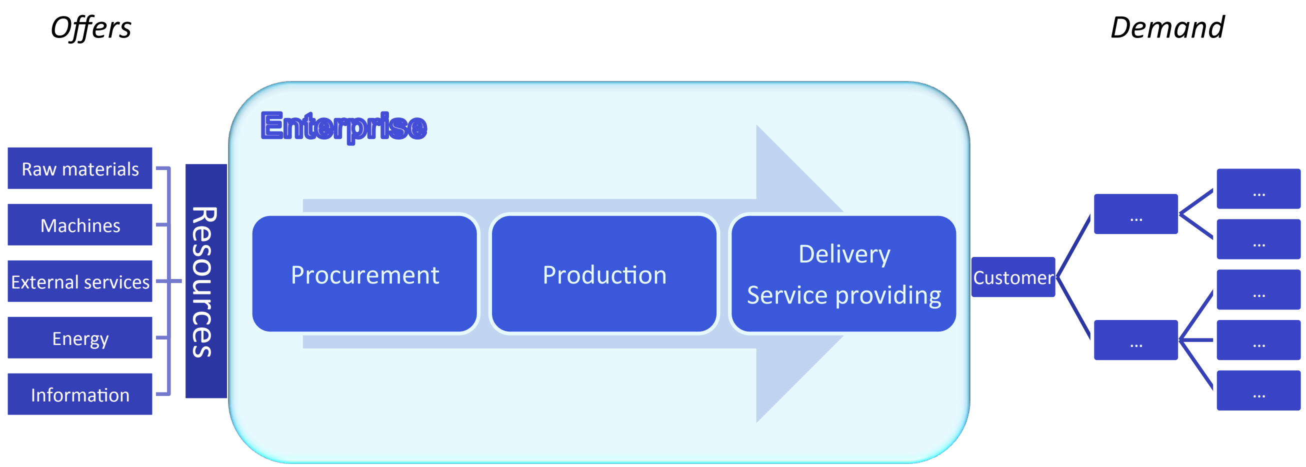
Business Logistics

Business logistics is a micrologistic process within an enterprise from customer order through the procurement of required materials, resources and services to the customer fulfilment.



Business Logistics



1.1. What is the logistics of an enterprise?

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LECTURE I – INTRODUCTION TO BUSINESS LOGISTICS

1.1. What is the logistics of an enterprise?

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Major fields

Procurement

- Lookup
- Tendering
- Scheduling
- Supply receipt
- Warehousing

Production

- Materials handling
- In-process storage
- Process-end packaging

Sales and Dsitribution

- Finished goods warehousing
- Shipment
- Goods return handling
- Customer services

Recycling logistics

- Collecting
- Sorting
- Packaging
- Storage
- Internal tranportation
- External transport scheduling

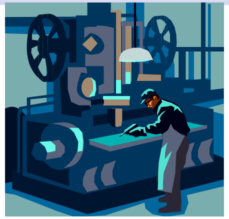
The role of Logistics in Value Creation

Value creation

- Added value by production
- Market driven
- Professionality

Logistics

- Physical distances
- Scheduling
- Availabilty

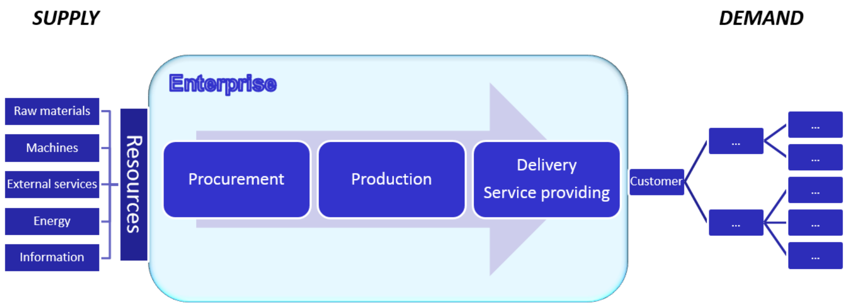





1.1. What is the logistics of an enterprise?

Definition of Business Logistics: Business logistics is a micro-logistic process within an enterprise from customer order through the procurement of required materials, resources and services to the customer fulfilment. Its external and internal relationships and involved organizations are presented on the next figure at business partnership approach.

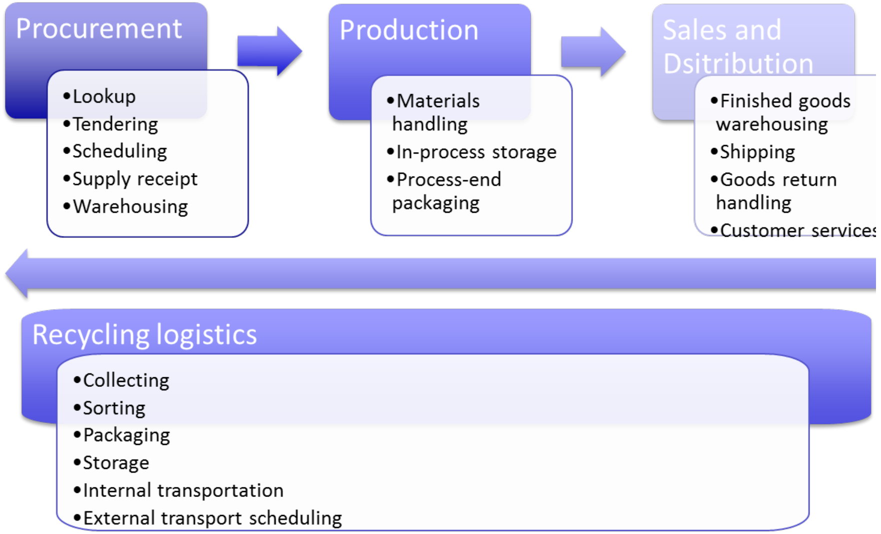
External and internal relationships and involved organizations of Business Logistics



In this figure, you can notice, that as in the logistics at system approach, the partner businesses and the major logistic organizational units of the enterprise are connected to each other in source-sink, sender-destination, or moreover supplier-customer relationship. It is important, because all of the participants in the whole chain should work as its customer requires. At the end of the chain is the customer. Or there is somebody in the logistic chain over the customers? Or another question: where is the beginning of the chain? The Basics of Logistics course introduced you to this question, and the Logistic Management course tells the detailed answer. But this course focuses onto the internal organization units and the Tier-1 partners of the company.

Let's start with the internal issues! The major fields of the Business Logistics are the three major area of logistic sub-organizations in the company internal supply chain, the procurement logistics, the production logistics and the distribution logistics, extended with the environmental-friendly recycling logistics. Next figure shows the major tasks of these sub-organizations primarily at logistic execution approach.

Major tasks of sub-organizations of business logistics



These tasks have got the major logistic role in enterprise's value creation, because there are natural, physical differences between the customer demand and the value output of the company, namely and primarily in time and in physical distance. So the logistics has got the strategic and operative role to bridge this. In the Basics of Logistics, we discussed, that this bridging activity takes cost, and somebody has to pay it. But who? Our company? Or our customer? Your answer: …? And this is only one task in Business Logistics.

Features of the value creation and related logistics

Value creation	Logistics
• Added value by production • Market driven • Professionality	• Physical distances • Scheduling • Availabilty

Self-tests
1.1.1.

What is the sequential order material flow in internal logistic sub-organization?

1. Procurement logistics

2. Production logistics

3. Distribution logistics

4. Recycling logistics

1.1.2.

Choose the true statement!

– The business logistics has got the role in transportation the raw materials to the enterprise's suppliers who will produce the finished goods for the company.

– Business logistics is a macro-logistic process between enterprises and works from customer order through the procurement of required materials, resources and services to the customer fulfilment.

– The logistics has got the strategic and operative role to bridge the customer demand and the company's output in time and in physical distance.

1.1.3.

Choose the features related to the Value creation of a company!

– Added value by production

– Market driven

– Professionalism

– Physical distances

– Scheduling

– Availability

1.1.4.

Select the activities of Recycling Logistics in Business Logistics!

Lookup

Tendering

Scheduling

Supply receipt

Warehousing

Materials handling

In-process storage

Process-end packaging

Finished goods warehousing

Shipping

Goods return handling

Customer services

<u>Collecting</u>

Sorting

Packaging

Storage

Internal transportation

External transport scheduling

1.1.5.

Select the activities of Production Logistics!

Lookup

Tendering

Scheduling

Supply receipt

Warehousing

Materials handling

In-process storage

Process-end packaging

Finished goods warehousing

Shipping

Goods return handling

Customer services

Collecting

Sorting

Packaging

Storage

Internal transportation

External transport scheduling

1.2. The strategic role of the enterprise logistics

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1.2. The strategic role of the enterprise logistics

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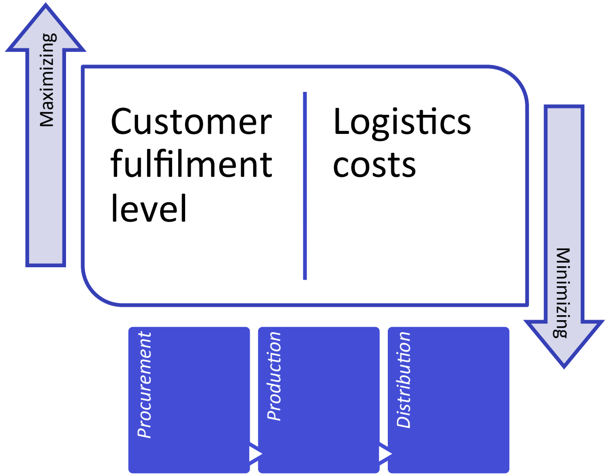
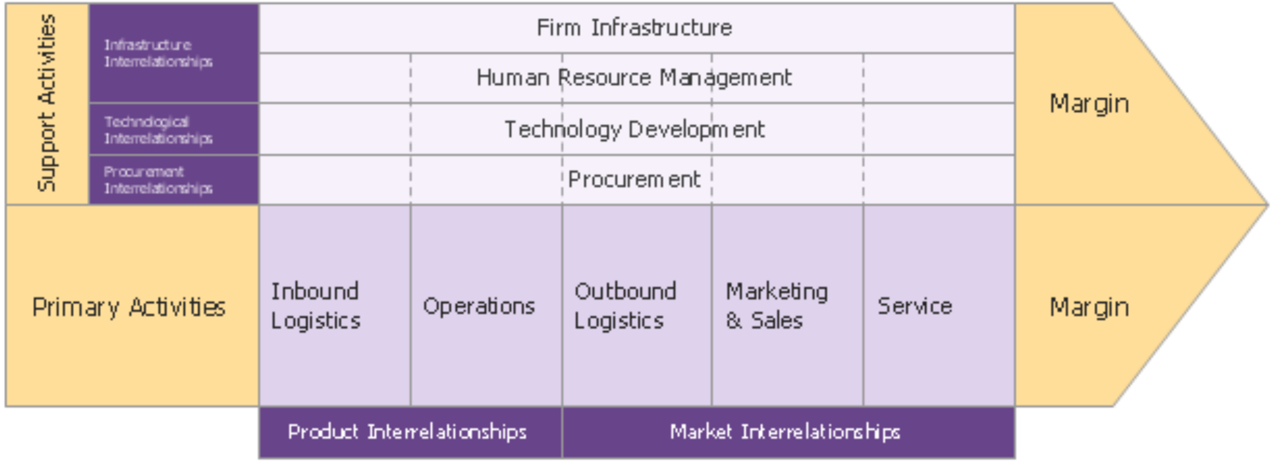
Connection between the customer satisfaction and the logistic

Marketing defines a customer fulfilment level

Logistics has to provide it for adequate costs



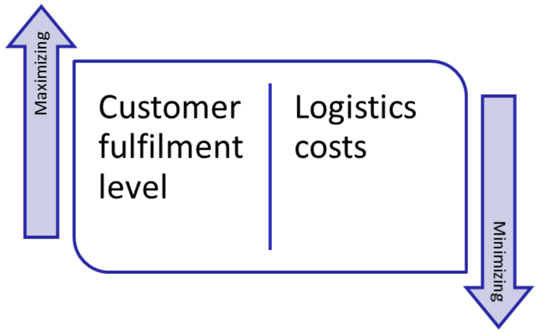
Porter Value Chain Concept



1.2. Strategic role of business logistics

The strategic role of the business logistics covers majorly the customer fulfilment and the caused logistic costs. In the basics of Logistics we discussed the relationship between the customer satisfaction and the logistic, which presented for you, that near a customer fulfilment level, we can minimize the logistics cost, but we cannot exceed this minimum cost level, without hurting the customer fulfilment level. This customer fulfilment level should be defined on strategic level, because it really influences the competitiveness of the company and its profitability. More customer can be resulted, and it is always cheaper to hold a customer than get a new one. And the customer fulfilment is directly provided on one hand by the logistics.

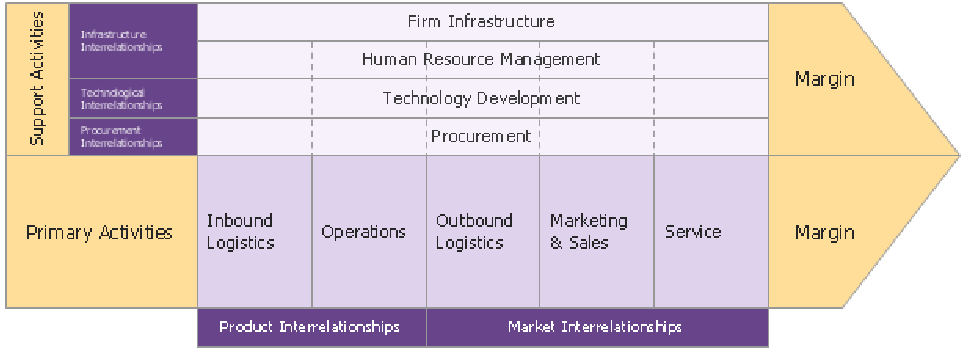
Connection between the customer satisfaction and the logistic



So the Marketing defines a customer fulfilment level on strategic level. And logistics has to provide it for adequate costs. If we analyze this profitability related to the customer fulfilment in Porter Value Chain Concept detailed by Conceptdraw, we can see that the primary activities contain all of the logistic activities, except the procurement, which is a support activity.

The outbound logistics is a market interrelationship, on one hand through forwarding the products and services to the customer, and of course on other hand to the company, from the suppliers.

Porter Value Chain Concept detailed by Conceptdraw



Source: http://conceptdraw.com/

The infrastructure interrelationship group have got two element, the building infrastructures and the Human resources, and the technology and the procurement interrelationships have got one distinct element.

Self-test
1.2.1.

Choose the elements of Market interrelationship in Porter Value Chain!

<u>Marketing and Sales</u>

<u>Outbound logistics</u>

<u>Service</u>

Operations

Inbound Logistics

1.2.2.

Choose the correct statement!

The customer fulfilment level depends on operation costs.

The increasing of customer fulfilment level is a tactical decision.

Th<u>e increasing of customer fulfilment level is a strategic decision.</u>

Both type of logistics in Porter Value Chain concept are market interrelationship.

1.2.3.

Choose the support activities from the list in Porter Value Chain concept!

Logistics

<u>Procurement</u>

Sales

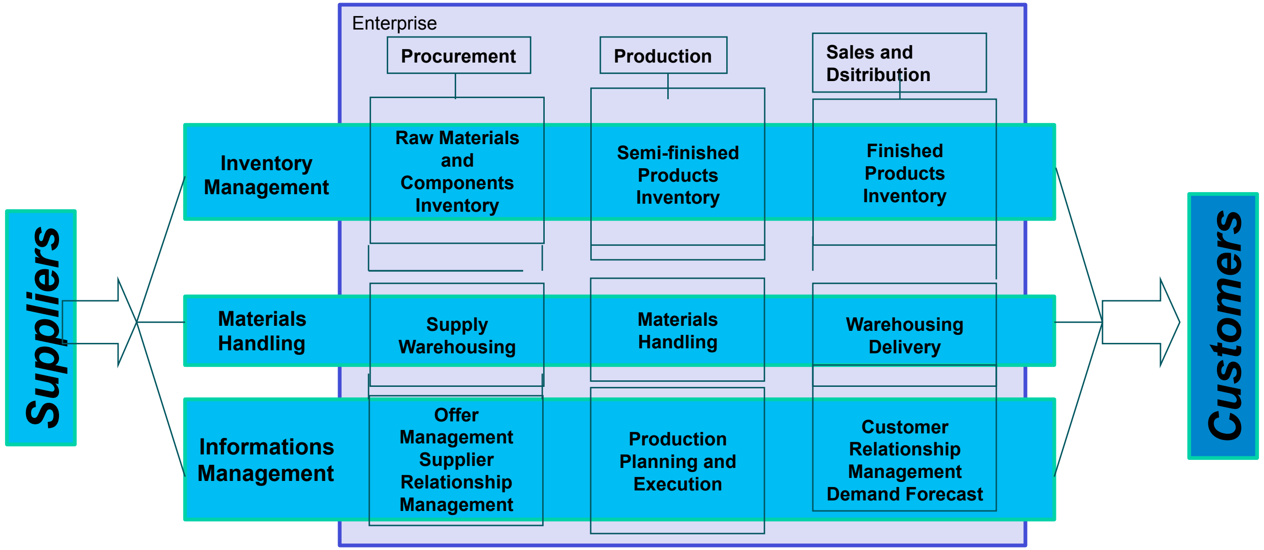
<u>Human Resource Management</u>

Services and Operations

<u>Technology development</u>

1.3. The structure and the components of the enterprise logistics

The Complex Logistics System of an Enterprise



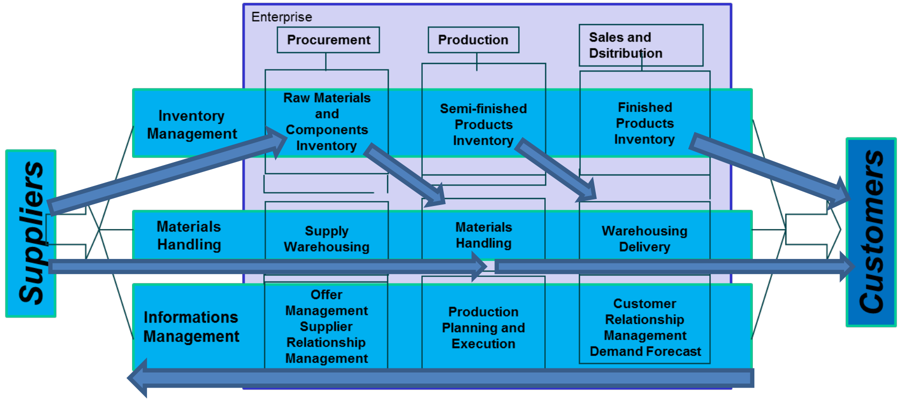
The material flow in the Enterprise Logistic System

	Procurement	*Supply*	*Sales*
Demand	Requirements of Production	Production	Customer Orders
Output	Goods Issue for Production	Finished Goods Receipt	Delivery
Inventory	Raw materials Input items	Semi-finished Goods In-process inventory	Finished Goods
Input	Suppliers deliveries	Raw materials Semi-finished goods	Finished Goods
Requirements	Suppliers market	Production availability Supply market	Production availabilities
Orders (instrutions)	Order submission to the Suppliers	Production orders, Requests for Materials	Production and Purchase Orders

1.3. Structure and components of business logistics

The structure the logistic system of an enterprise follows its internal supply chain from procurement to distribution and the main activity groups of inventory management and materials and information handling. In the system the warehouses have got special role to make the material flow seamless and safe, avoiding the value creating and service providing from material leak at any stages. As the material goes through the enterprise logistic division, its condition changes or transforms from raw material to finished goods. Opposite with this direction, the customer order information is converted to production plans and operations scheduled to hold the delivery deadline asked in customer orders. From the operations plan the raw-material requirement can be calculated and the missing part of the inventory can be ordered from the suppliers.

The Complex Logistics System of an Enterprise



The process in a stage is controlled by the demand of the next stage, based on the available inventory. The output is the result of the logistic or production function, like raw materials of procurement, finished goods of the production and delivery or customer fulfilment of the sales and distribution. For control the right material flow, orders are flowing from customers to the suppliers. The customer orders are fulfilled basically from the finished goods inventory or directly from the production system, or can result production orders and raw material purchase orders. The production requests for raw materials from inventory, and the procurement order the missing parts of the inventory. These information flow steps have to do in time according to the lead time of purchase and production.

The following table summarize the inputs and outputs of these stages after each other, so you can compare them with each other.

The material and information flow structure in the logistic system of an enterprise

	Procurement	Production	Sales and distribution
Demand	Requirements of Production	Production	Customer Orders
Output	Goods Issue for Production	Finished Goods Receipt	Delivery
Inventory	Raw materials Input items	Semi-finished Goods In-process inventory	Finished Goods
Input	Suppliers deliveries	Raw materials Semi-finished goods	Finished Goods
Requirement's origin	Suppliers market	Production availability Supply market	Production availabilities
Orders (instructions)	Order submission to the Suppliers	Purchase orders Requests for Materials	Production orders Purchase Orders

There are two reasons for creating a purchase order:

– in case of pull planning principle the procurement has to order the materials missing to the production of finished goods missing from the finished goods inventory,

– in case of push planning principle, the production is planned based on sales and consumption forecasts, and in this case the raw material purchase orders are created passed on production orders originating from production plans.

LECTURE I – INTRODUCTION TO BUSINESS LOGISTICS

1.3. e-Procurement and e-Bidding

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3.3. e-Procurement and e-Bidding

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e-Procurement systems

- Electronical procurement system integrated sourced by the information systems of suppliers and vendors, but into the enterprise resource planning system.
- Like webshops of the suppliers integrated into the ERP system, not only individual, isolated webshops.

e-Procurement systems

- ✓ Faster, more efficient, easy-to-reach and to use
- ✓ Less individual purchase event of smaller amounts
- ✓ Central system for price, quality and condition comparison.
- ✓ Integration and connection point of external web-based marketplaces
- ✓ Highly reduces the unit prices and additional costs.
- ✓ Less administration in both side (buyer-seller win-win)

3

e-Procurement sytems

Electronical catalogs

- ✓ Items and goods in on-line databases available to connect into and refresh in ERP system
- ✓ Primarally for standard products, e.g. tools, general materials, office supplies, furnitures, computers and parts
- ✓ It places the purchasing and goods receipt into the organisational units of the company

E-Bid systems

- ✓ Electronical tendering system for reach the lowest price by the buyer
- ✓ Buyer starts the tender and does not acts during the price race of invited suppliers
- ✓ Better price for the buyer
- ✓ No negative impact between the seller and buyer

E-Marketplaces

- ✓ Common web-based information system for trading in a segment of the market or an industry.
- ✓ Available for open use as individual marketplace for smaller enterprises and own use of a larger company.

World's largest e-Procurement network

- 15+ years of cloud spend
- 40+ million Annual Purchase Order
- 1.5 million Trading Partners
- In 190 Countries
- 65+ million Annual Invoices
- $450B In Annual Commerce

BUY:

- Supplier Discovery, Strategic Sourcing & Contracting
- Procurement & Order Collaboration

MANAGE CASH

- Collaborative Invoice to Pay
- Dynamic Discounting, Supply Chain & Receivables Financing

SELL

- Marketing, Sales, Servicing & Fulfillment
- Bill Presentment & Payment

Lecture 2

II. THE MANAGEMENT OF THE ENTERPRISE LOGISTICS

2.1. The connection of the enterprise competitiveness and the logistics

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II. THE MANAGEMENT OF THE ENTERPRISE LOGISTICS

1. The connection of the enterprise competitiveness and the logistics

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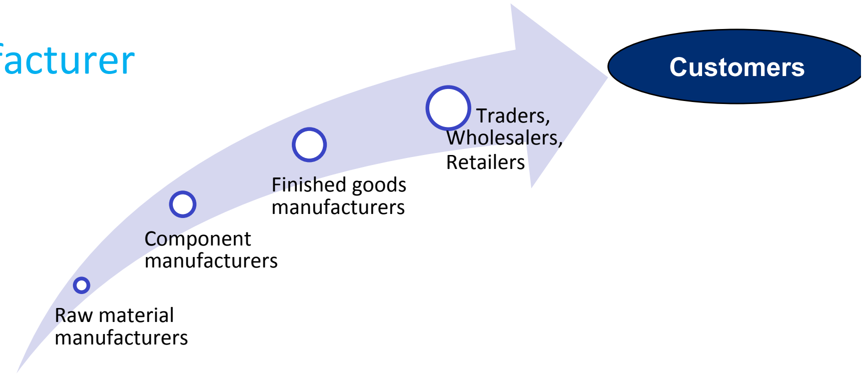
Management issues of business logistics

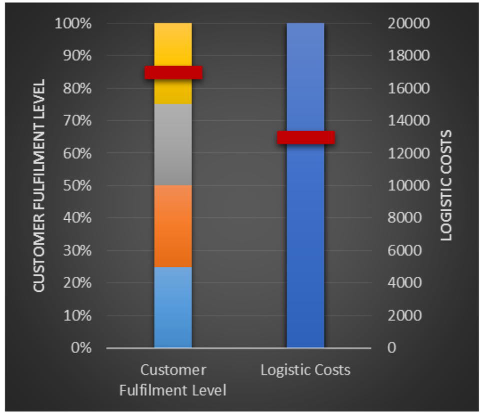
Type or role of businesses:

- Raw material or component manufacturer
- Finished goods manufacturer
- Distributor
- Retailer
- Customer

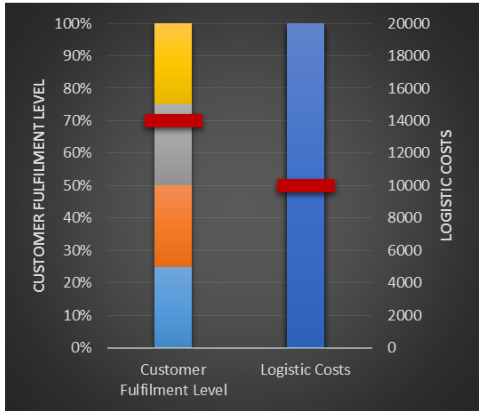


Goals of logistics to help the business strategy

Minimizing the costs to the predefined customer fulfilment level



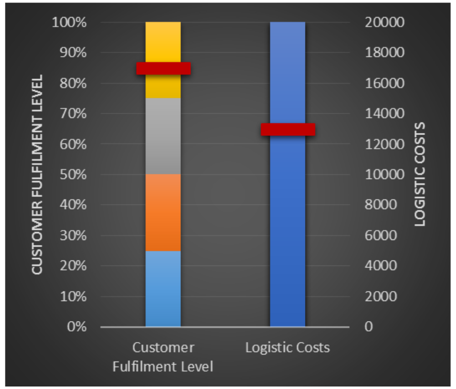
Maximizing the fulfilment level at the enabled logistic costs

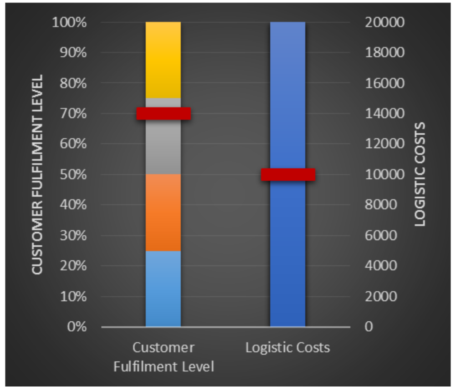


2.1. The connection of the enterprise competitiveness and the logistics

As we in the Basics of Logistics course discussed, the logistic expenses used to fulfil the logistic requirements, like right material at the right place in the right time, raise the unit price of the product or the service. Therefore, one of the key of the enterprise competitiveness is the proper logistic services and the optimized material flow. And the other key is the right customer fulfilment. But these are opposite goals.

Cost optimization opportunities in logistics



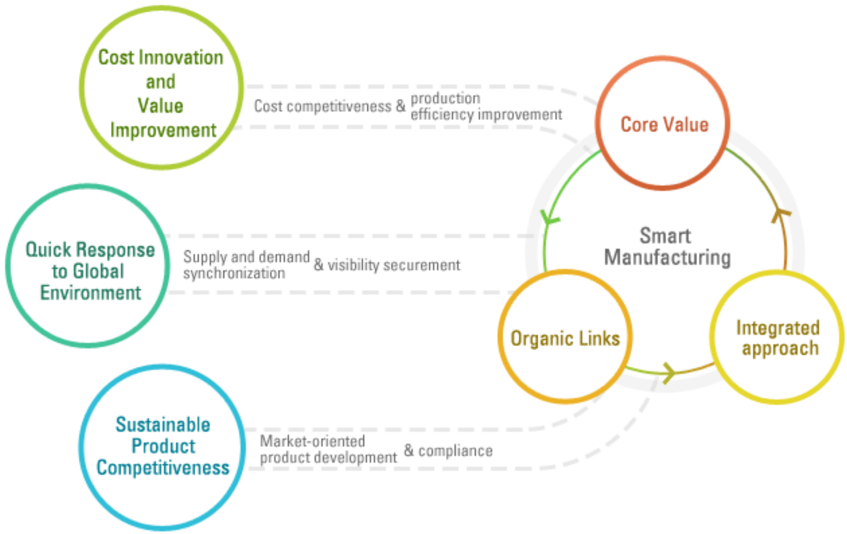


Source: Basics of Logistics, Hunline, 2015.

We can lower the logistic costs, but it can limit the customer fulfilment level in many aspects. Or we can increase the customer fulfilment, but it raises the related costs. At all, to win a new customer, it takes many-many times more cost, than to hold a customer with the right customer fulfilment. Therefore, the customer fulfilment level is a key factor in the business, and physically, the logistics can provide it with appropriate infrastructure, information system and accurate planning and controlling processes. The problem is the complexity of the business and its processes depending highly on the market environment.

The figure of Samsung SDS's smart manufacturing solution shows the related market factors influencing the logistics perfectly.

Samsung SDS's smart manufacturing solution



Source: http://www.sdse-samsung.com/serviceline/SmartManufacturing.htm

This solution names the quick response near to the supply and demand synchronization, which is the key function of the logistics and the supply chain management. This solution is primarily an information system solution, which shows the importance of the logistic information in the enterprise competitiveness. Just for example you can visit the website of this solution to see, how the fields of the logistics are connected to each other and to the business management in a total enterprise information system. (You can discover differences between standard enterprise resource planning system methodologies of course, but the major fields are the same.)

Remember to the Porter Value Chain Concept: at least 10 different fields are working together in the enterprise to perform the right customer fulfilment, like:

– Marketing

– Sales and distribution

– Production

– Services

– Materials Management

– Development

– Quality assurance

– Financial Management

– Human Resource Management

– Asset and infrastructure management

– IT services

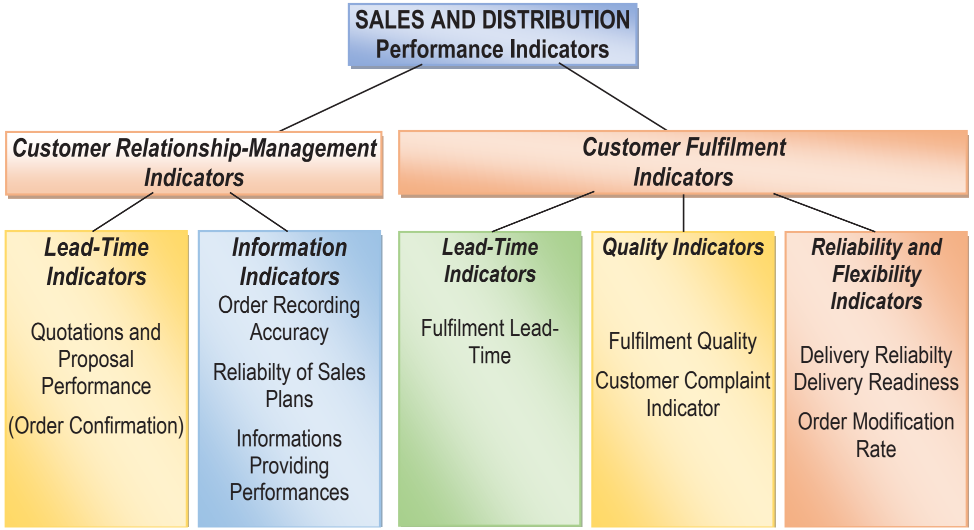
Some of them are cross functional organizational units, others are co-operating as an internal supply chain. These organizational units should work together, but lot of them have got different performance targets, which – as we previously mentioned – collide with each other. So the role of the logistics is to optimize the material flow at all of the departments of the enterprise, moreover at all of the locations and at the tier-1 partners in the supply chain. To do this, the borders between the departments should be built down based on trust, co- operation and wider view of business targets. And the right distribution of the enterprise resources and the valuation of the performance should be based on this principle, as well.

Sometimes, these factors are much managerial issues than optimization issues. The common targets, tolerance, common thinking and working as one big team are important aspects.

2.2. Customer Satisfaction Level and the Key Performance Indicators of the enterprise

The logistic area in and enterprise closest to the customer fulfilment is the Sales and distribution. In the Basics of Logistics we summarized the indicators related to this field of business logistics, but the harder issue is, how we can measure these indicators, what the base values for the calculation are, and where they originate from. There can be identified two groups of indicators in the field of the Sales and Distribution, the performance indicators of the Customer Relationship Management, and the indicators of the Fulfilment issues. The first group measures only the speed and the accuracy of the sales quotation request and order confirmation processes, or additional information providing processes. The second group measures the execution performance, which measures the material flow and its characteristics in the customer fulfilment process. But both of them are important to the customer fulfilment level.

Sales and Distribution Performance indicators



Source: Basics of Logistics, Hunline, 2015.

In a study in 2013, I have discussed this question in case small and medium size businesses. This examination used the SAP Business One standard system and looks after, that the basic values are naturally stored in an enterprise resource planning system, or we have to extend the standard system with additional data acquiring processes.

For example the following performance indicators can be measured:

– Lead time of quotation: based on Date of Request for Quotation and Quotation date

– Quotation closing rate or Quotation closing time: based on Sales Orders date

– Delivery readiness rate: based on Difference between offered delivery time and requested delivery time

– Delivery lead time and its variance or On-time delivery rate: based on Delivery note date

– Delivery quality: on one hand based on the Goods return and additionally AS credit memo related to the faulty delivery

The origin of the above mentioned data are the records about the physical material flow, as a delivery is started, or a sales document is created. These are created during the execution of the sales and distribution process, and are available later for performance measurement. Of course, complex indicators could require additional information, as well.

II. THE MANAGEMENT OF THE ENTERPRISE LOGISTICS

2.3. The place of the Logistic management in the enterprise management

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II. THE MANAGEMENT OF THE ENTERPRISE LOGISTICS

3. The place of the Logistic management in the enterprise management

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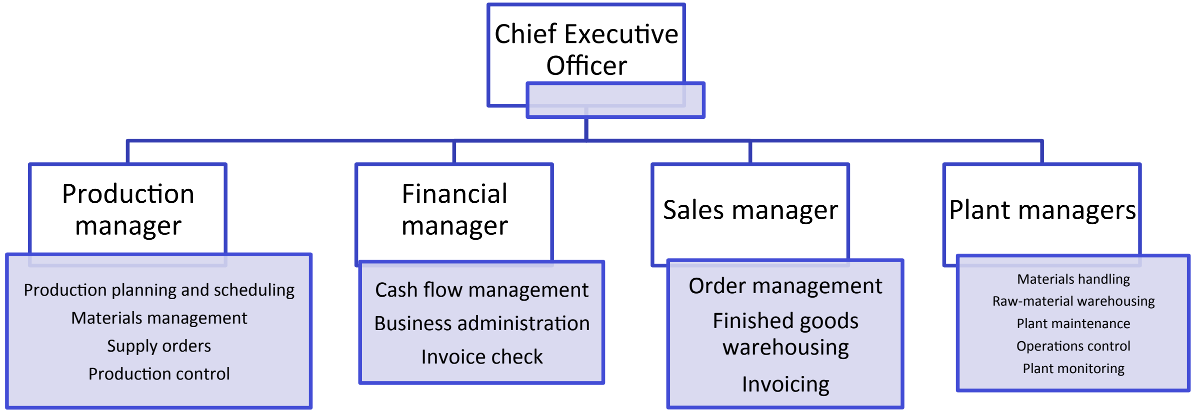
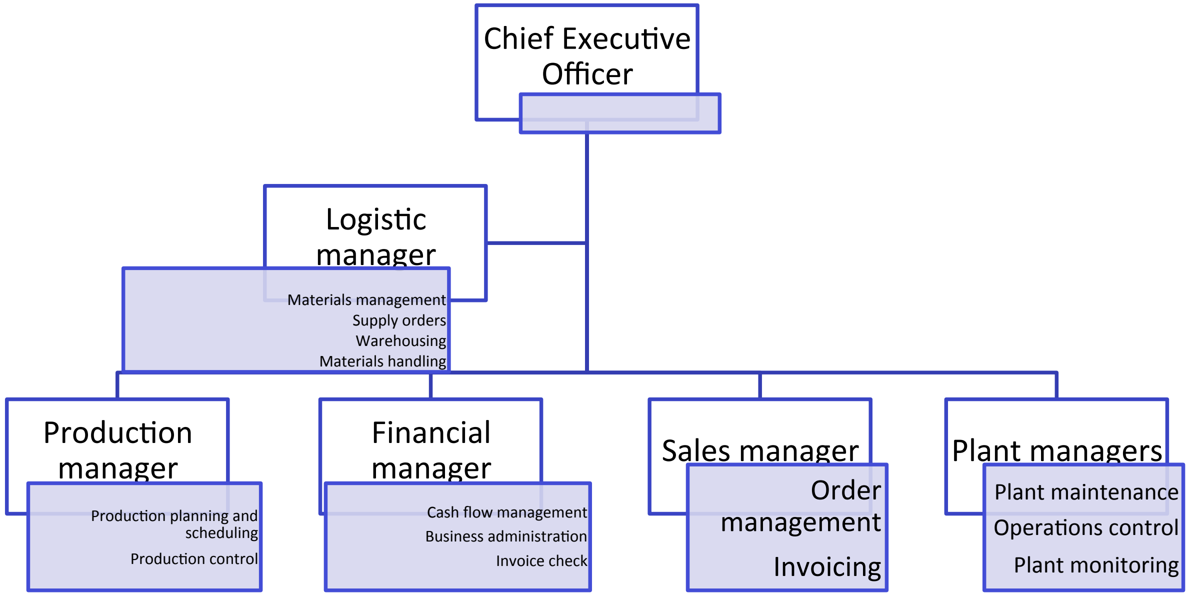
Functional organization with scattered logistic functions



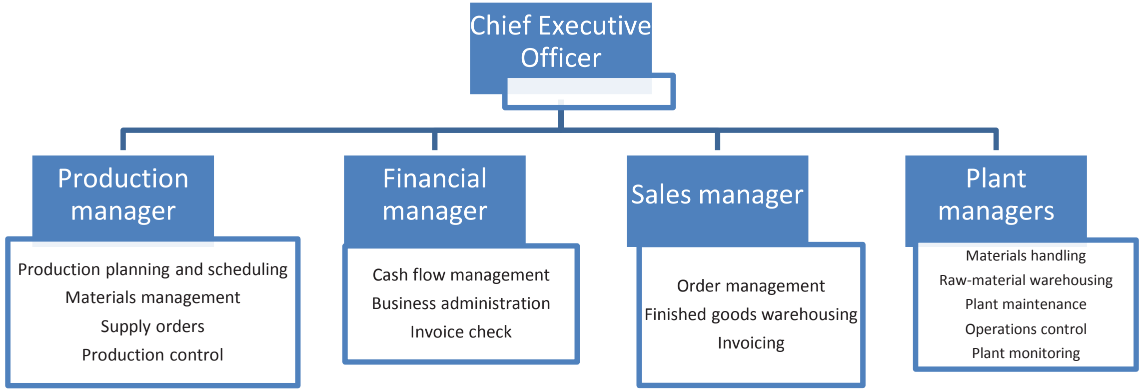
Functional organization with centralized logistic management functions



2.3. The place of the Logistic management in the enterprise management

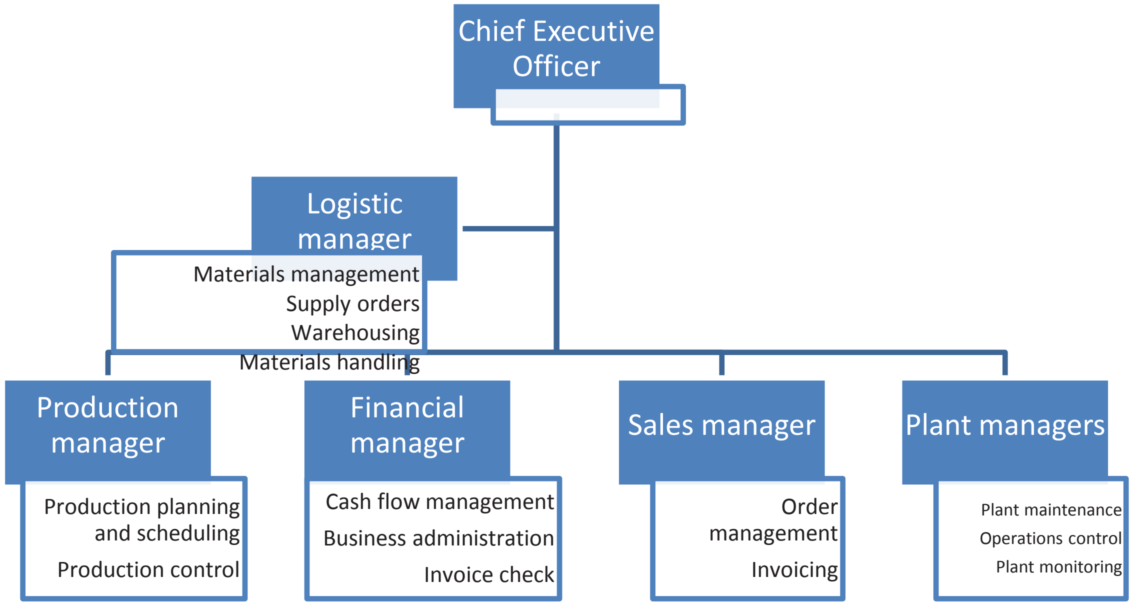
The management of the logistics in an enterprise is a key factor. Its role is mandatory in running the business at efficient level at logistic approach. The placement of the logistic management is hard to optimize. The enterprise is divided for more organizational unit based on the nature of the activity groups. In a classic functional organization structure of the enterprise, the logistic functions could be scattered between the functional fields.

Functional organization with scattered logistic functions



These logistic management functions are collected today under the Logistic manager, who is responsible for the resource planning, execution and logistic services.

Functional organization with centralized logistic management functions



In case of a divisional organization, this management function can be centralized or placed to each division, but there are a lot of multinational company, where a hybrid version can be used for co-operation between the central logistic department and the national company's or subsidiary's logistic departments.

Lecture 3

LECTURE III – PROCUREMENT

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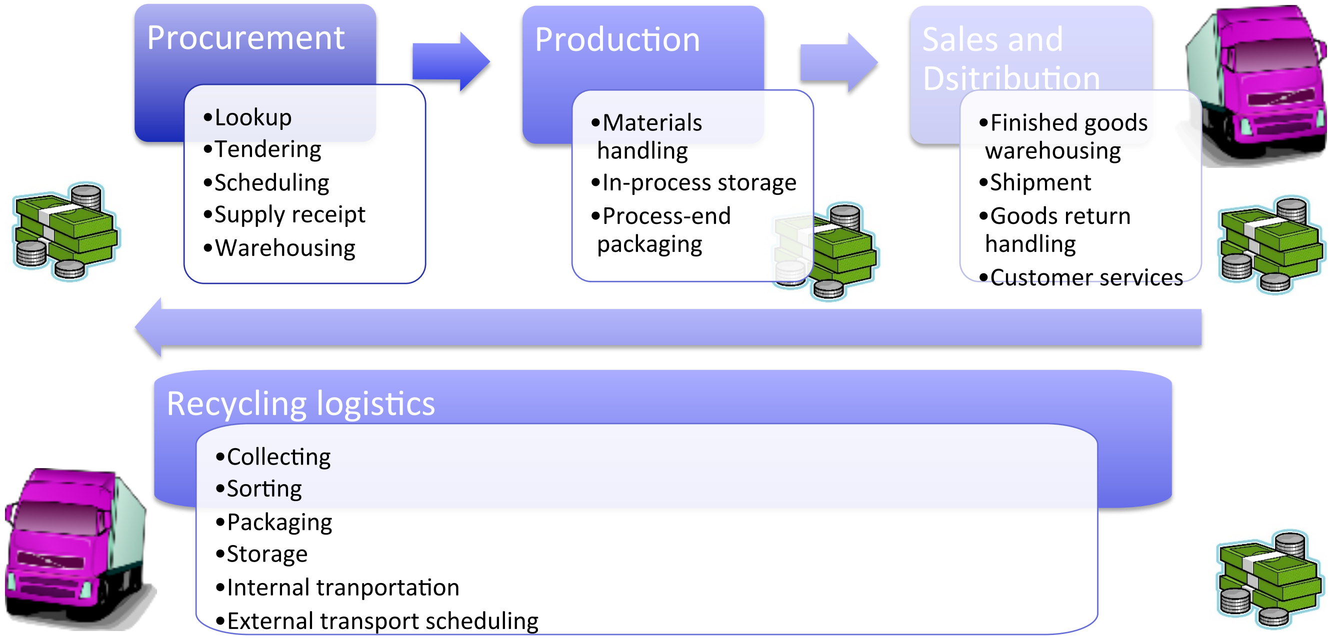
Major fields



What is the enterprise procurement and the Procurement in Business Logistics

Task: providing the raw materials, auxiliaries, fuel, energy, parts, components, semi-finished products required by the enterprise added value and manufacturing, service providing.

In other word the supplies have to be available and to be placed into standby
as the Bill of „Rights" of Procurement Logistics orders

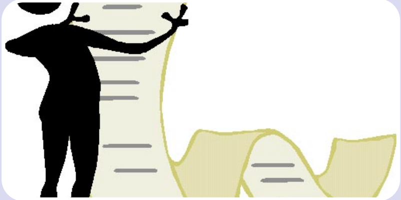
- ✓ the Right materials
- ✓ in the Right quantity
- ✓ at the Right time
- ✓ to the Right place
- ✓ In the right quality level and consition

Its role: 55-85% percent of the expenses of the manufacturing enterprises take the supply and procurement costs.

Complexity of procurement targets

- Solve market competition factors:
  - Flexibility to meet customer requirements.
  - Turnaround, lead time.
- Achieve optimal product quality:
  - the purchaser can get an increasing role in the specification of the product
  - proactive procurement: product development begins during the consultation with the supplier
- Total cost minimization:
  - lowest purchase price not enough
  - for integrated logistics costs of smaller or larger segments of the supply chain
- The optimal inventory level:
  - According to the procurement and inventory corporate objectives
  - reduce stock-keeping costs and working capital

Procurement tasks



Market research and analysis
Supplier negotiaton
Supplier selection
Procurement organization types
Warehouse systems

Whole procurement coordination
Preparing the purchase order
Transmit purchase orders to the supplier
Registration of purchase order confirmations

Summary of purchase requisitions
Scheduling of supply
Liaison with suppliers
Receiving incoming goods
Notification of acceptanceRecording goods receipt

New trends of procurement

Transition from buying to procurement: Proactive procurement

- Company look for appropriate product more than choose products from the supplier offer
- if appropriate product are not found, then choose a supplier of a similar product and try to cooperate in developing the appropriate product in strategic partnership

Outsourcing Make or Buy

- lean production: defining component, activity focused on brand character
- the rest you buy, the better for you
- not decisive actions, not essential to subcontract, who more competent and performs better.

New trends in procurement

Computer-based, automated processes, information acquisition, administration and communication

Exploration supply market:

- With continuous research for better solutions
- With product development, exploration

Collaboration and integration with other departments:

- With users
- With Carriers, Freight forwarder
- With financial department

On-line supply freight tracking

Requirements from procurement

In Right quality: for quality expected by customers and the production, manufacturing, service providing

In Appropriate amount: to ensure smooth and seamless supply of production and service providing at all times

At the Right time:

- negative effects of late delivery (supply disruption)
- Negative effects of earlier delivery (jam at receiving docks)

At the Right: eg. Warehouse, storage facility or direct to the production line

At Optimal cost: No minimum purchase cost or price, but the minimum total cost of logistics

Lecture content

- Procurement strategies and tactics
- Supplier selection and negotiation
- e-Procurement and e-Bidding
- Assignment: Procurement at an enterprise

3.1 Introduction to the procurement

The task of the enterprise procurement and the Procurement in Business Logistics is to provide the raw materials, auxiliaries, fuel, energy, parts, components, semi-finished products required by the enterprise added value and manufacturing, service providing. In other word the supplies have to be available and to be placed into standby as the Bill of „Rights" of Procurement Logistics orders:

– the Right materials

– in the Right quantity

– at the Right time

– to the Right place

– In the right quality level and conditions

So the major fields of the procurement are the Materials Management including the Inventory Management and material Replenishment of consumed quantities. 55- 85% percent of the expenses of the manufacturing enterprises take the supply and procurement costs.

The Logistic Requirements means in case of procurement, that the replenishment have to arrive in Right quality as it expected by the production, manufacturing, service providing processes influencing the customer fulfilment processes. Moreover, the appropriate amount is also important to ensure smooth and seamless supply of production and service providing at all times, but the over-deliveries result additional needless costs, therefore the right quantity should be delivered by the suppliers.

The Right time ensures also the seamless material flow to the processes, negative effects are caused by late delivery as supply disruption and by earlier delivery, which could cause jam at receiving docks, not only additional inventory holding cost.

Right Place means a proper location, warehouse, storage facility or direct to the production line, bridging the physical distance between the supplier location and the point of supply receiving.

Optimal cost means not only the minimum purchase cost or price, but the minimum of the total logistic costs.

We can summarize the complexity of procurement targets as:

- Solve market competition factors:
  - flexibility to meet customer requirements,
  - turnaround, lead time.
- Achieve optimal product quality:
  - the purchaser can get an increasing role in the specification of the product,
  - proactive procurement: product development begins during the consultation with the supplier.
- Total cost minimization:
  - lowest purchase price not enough,
  - for integrated logistics costs of smaller or larger segments of the supply chain.
- The optimal inventory level:
  - according to the procurement and inventory corporate objectives, o reduce stock-keeping costs and working capital.

The procurement tasks can be classified as:

- Strategic issues
- Market research and analysis

– Supplier negotiation

– Supplier selection

– Procurement organization types

– Warehouse systems

– Tactical planning tasks

– Whole procurement coordination

– Preparing the purchase order

– Transmit purchase orders to the supplier

– Registration of purchase order confirmations

– Operational tasks

– Summary of purchase requisitions

– Scheduling of supply

– Liaison with suppliers

– Receiving incoming goods

– Notification of acceptance

– Recording goods receipt

In the procurement, new trends are came into general use in the years of 2000, like: Transition from buying to procurement:

Proactive procurement

– Company look for appropriate product more than choose products from the supplier offer

– if appropriate product are not found, then choose a supplier of a similar product and try to cooperate in developing the appropriate product in strategic partnership

Outsourcing and Make or Buy

– lean production: defining component, activity focused on brand character,

– the rest you buy, the better for you,

– not decisive actions, not essential to subcontract, who more competent and performs better.

Computer-based, automated processes, information acquisition, administration and communication.

Exploration supply market:

– With continuous research for better solutions.

– With product development, exploration. Collaboration and integration with other departments:

– With users.

– With Carriers, Freight forwarder.

– With financial department.

On-line supply freight tracking.

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3.1. Procurement strategies and tactics

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1. Procurement strategies and tactics

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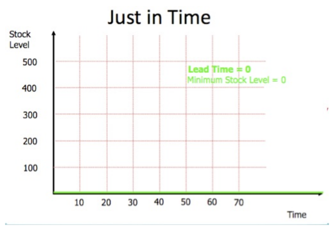
Procurement strategies and tactics

- Establish an exclusive o a wide group of suppliers
- Establishing joint business venture or strategic partnership
- Using standard or own designed components, sub-assemblies
- Specifying Just-in-Time supply or warehousing
- Make or buy



Supplier Evaluation Requirements

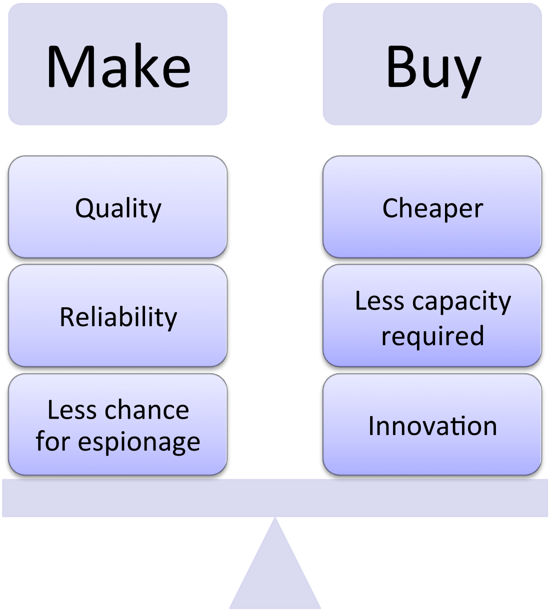
- ✓ Standard criteria and same weighting numbers
- ✓ Transparency, clarity (initial data, in units)
- ✓ Objectivity
- ✓ Target oriented, appropriate statements in appropriate detail level
- ✓ Feedback to the rated suppliers for increasing competition between suppliers
- ✓ Continuous measurement, updating of stored date

Just-in-Time supply or Warehousing

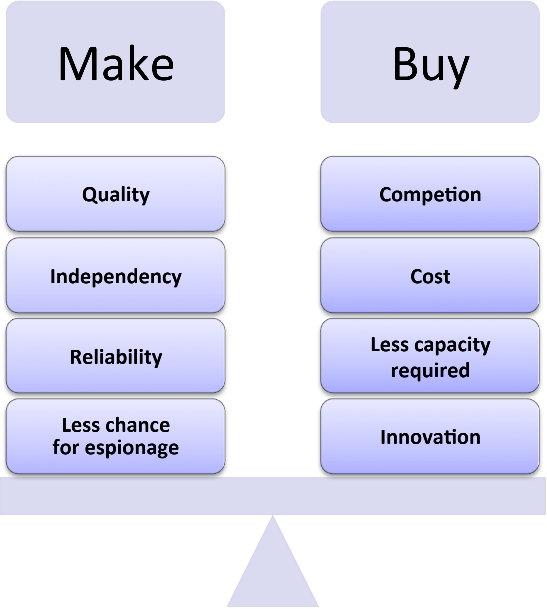
Procure-to-Stock
High availability
Periodical planned deliveries
Easy-to-manipulate the market
Higher buying quantity – lower prices
High costs, bad cash-flow!
Higher risk of demand dissapearing

Just-inTime supply
High supply risk and low costs
Seamless cash-flow
Daily supply
Higher transportation costs
Strong penalty conditions

Make or buy decisions



Reasons for Make or for Buy



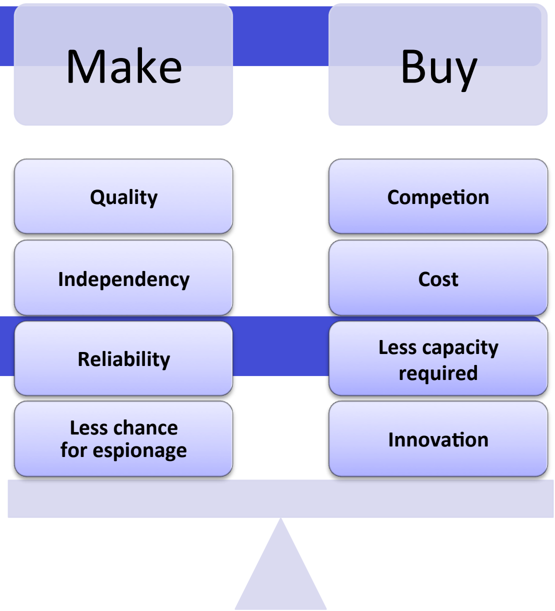
Results of deciding to buy the component

For Company:

- more current information,
- higher administration,
- staff relocation,
- Requirements for new construction,
- Aligning the manufacturing and assembly processes,
- Supply risk / dependence, know-how transfer,
- greater demands on the logistics procurement.

For the Logistics:

- greater disposition expense,
- greater coordination effort,
- reduction in warehouse areas,
- a decrease in shipments within the company,
- reorganization of the quality system,
- increases the possibility of JIT delivery.



Using standard or own designed components, sub-assemblies

Standard components, sub-assemblies
Lower costs, less development costs
Higher dependencies
Less competition for innovation
Less external innovation capacity

Own designed components, sub-assemblies
Higher development costs
Less dependencies
Less competition for innovation
Less external innovation capacity

Direct or indirect supply

Direct supply
Purchase directly from the producer
Producer is in strong negotiation position
Joint procurement groups

Indirect supply with Wholesaler
More offered products
Logistic costs at Wholesaler
Shorter supply lead time
Supply from stock
Higher margin at the wholesaler

Local or foreign supplier

Local supplier
Short distance transportation
More safety in short distance
Less administration
Easy-to-communicate
Shorter supply offer
Higher unit cost

Foreign supplier
Lower unit cost available
Higher supply offer
Higher transportation cost and risks
Foreign language dependency
More administration required

3.1. Procurement strategies and tactics

1. Number of suppliers

– Exclusive group of suppliers
- – Less robustness
- – Easy to manage
- – Less competition
- – Strong dependeny
- – Wide group of suppliers
- – More robustness
- – Hard to manage
- – More competitive
- – Weak dependeny

2. Just-in-Time supply or Warehousing

– Warehousing and Procure-to-Stock

- – High availability
- – Periodical planned deliveries
- – Easy-to-manipulate the market
- – Higher buying quantity – lower prices
- – High costs, bad cash-flow!
- – Higher risk of demand dissapearing
- – Just-inTime supply
- – High supply risk and low costs
- – Seamless cash-flow
- – Daily supply
- – Higher transportation costs
- – Strong penalty conditions

3. Make or Buy decisions

Reasons for Make

– Less chance for espionage

– Reliability

– Independency

– Quality

Reasons for Buy

– Innovation

– Less capacity required

– Cost

– Competion

Results of deciding to buy the component

– For Company:

– more current information,

– higher administration,

  – staff relocation,

  – requirements for new construction,

  – aligning the manufacturing and assembly processes,

  – supply risk / dependence, know-how transfer,

  – greater demands on the logistics procurement.

– For the Logistics:

  – Larger disposition expense,

  – more coordination effort,

  – reduction of warehouse infrastructure,

  – reduced shipments within the company,

  – reorganization requirement of the quality system,

  – larger possibility for JIT delivery.

4. Using standard or own designed components, sub-assemblies:

– Standard components, sub-assemblies

- – Lower costs, less development costs
- – Higher dependencies
- – More competition for innovation
- – More external innovation capacity

– Own designed components, sub-assemblies

- – Higher development costs
- – Less dependencies
- – Less competition for innovation
- – Less external innovation capacity

5. Direct or indirect supply

– Direct supply

– Purchase directly from the producer

– Producer is in strong negotiation position

– Joint procurement groups

– Indirect supply with Wholesaler

- More offered products
- Logistic costs at Wholesaler
- Shorter supply lead time
- Supply from stock
- Higher margin at the wholesaler

6. Local or foreign supplier

– Local supplier

– Short distance transportation

– More safety in short distance

– Less administration required

– Easier communication

– Shorter supply offer

– Higher unit cost

– Foreign supplier

– Lower unit cost available

– Higher supply offer

– Higher transportation cost and risks

– Foreign language dependency

– More administration required

7. Centralized or decentralized purchase processes

– Centralized purchase processes

– Coordinated purchase process

– High competence in supplier market

– Reduced expenses

– Longer lead time

– Accurate information

– Accurate process tracking

– Centralized performance measurement

– Indirect connection between the supplier and the user

– Decentralized purchase processes

– Individual purchase steps

– High competence in quality and technological knowledge

– Direct connection between the supplier and the user

– Short lead time

– Higher expenses

– Accurate information

– Difficult process tracking and performance measurement

– Redundant processes and low efficiency

Calculation of order quantities of each of the materials to be purchased:

We can calculate the $\mathbf{q_{Mij}}$ **order quantity** based on the $\mathbf{q_{ij}}$ **expected mean value** and its $\boldsymbol{\sigma_{ij}}$ **standard deviation** corrected with the $\boldsymbol{\phi_{ij}}$ **uncertainty factor:**

$$q_{Mij} = \overline{q}_{ij} + \varphi_i \cdot \sigma_{ij} \,,$$

where i identifies the material and j identifies its consumer at the company.

Total order quantity of material i at centralized procurement is:

$$q_{Mi} = \sum_{j=1}^{p} \bar{q}_{ij} + \varphi_i \cdot \sum_{j=1}^{p} \sigma_{ij},$$

but total order quantity of material i at centralized procurement is

$$q_{Mi} = \sum_{j=1}^{p} \bar{q}_{ij} + \varphi_i \cdot \sqrt{\sum_{j=1}^{p} \sigma_{ij}^2}.$$

So the uncertainty resulted by the standard deviation of order quantities can be equalized by the centralized procurement of requirements of consumers at the company.

LECTURE III – PROCUREMENT

3.2. Supplier selection and negotiation

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LECTURE III – PROCUREMENT

2. Supplier selection and negotiation

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Supplier Evaluation Criteria

- ✓ Offer price
- ✓ Undertaken delivery time
- ✓ Product quality
- ✓ Certificates, references
- ✓ Offered number of goods
- ✓ Geographical distance
- ✓ Additional logistics services:
  - ✓ packaging, unit load building, picking, labelling, customs administration, insurance
- ✓ Possible modes of transport, transportation quality, estimated shipping cost

Supplier Evaluation Requirements

- ✓ Standard criteria and same weighting numbers
- ✓ Transparency, clarity (initial data, in units)
- ✓ Objectivity
- ✓ Target oriented, appropriate statements in appropriate detail level
- ✓ Feedback to the rated suppliers for increasing competition between suppliers
- ✓ Continuous measurement, updating of stored date

e-Procurement sytems

Electronical catalogs

- ✓ Items and goods in on-line databases available to connect into and refresh in ERP system
- ✓ Primarally for standard products, e.g. tools, general materials, office supplies, furnitures, computers and parts
- ✓ It places the purchasing and goods receipt into the organisational units of the company

E-Bid systems

- ✓ Electronical tendering system for reach the lowest price by the buyer
- ✓ Buyer starts the tender and does not acts during the price race of invited suppliers
- ✓ Better price for the buyer
- ✓ No negative impact between the seller and buyer

E-Marketplaces

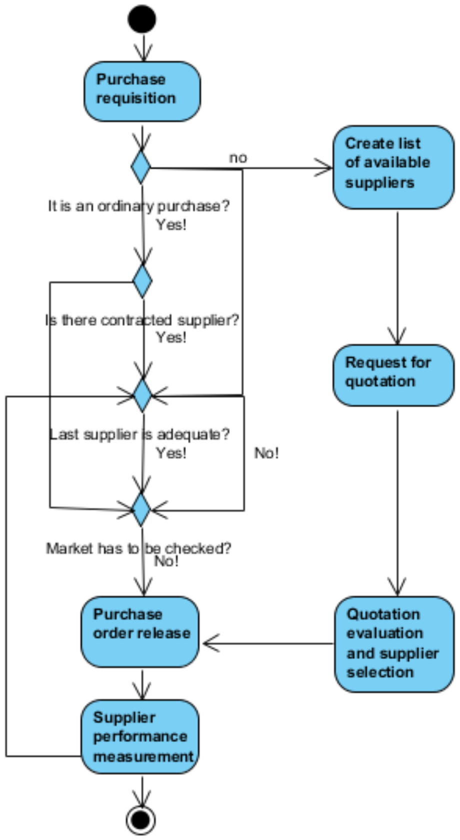
- ✓ Common web-based information system for trading in a segment of the market or an industry.
- ✓ Available for open use as individual marketplace for smaller enterprises and own use of a larger company.

4

Decision graph of purchase activity

Decision makers:

- Purchaser make decisions:
  - In case of repeated or routine purchase processes
  - In case of purchase conditions
- The consturtor engineer and process engineer make decisions
  - In case of first purchase
  - In case of product quality conditions



A JIT követelményei

Beszállítókkal szembeni követelmények
csak igényelt mennyiség gyártható többlettermelés tilos
állandó minőség biztosítása

Szállítmányozókkal szembeni követelmények
gyakoribb, pontosabb szállítások
kisebb tételmennyiségek
csökkenteni kell az árusérülés valószínűségét, növelni a szállítmányozás megbízhatóságát
növelni kell a szállítási szolgálgatás elérhetőségét, rendelkezésre állását

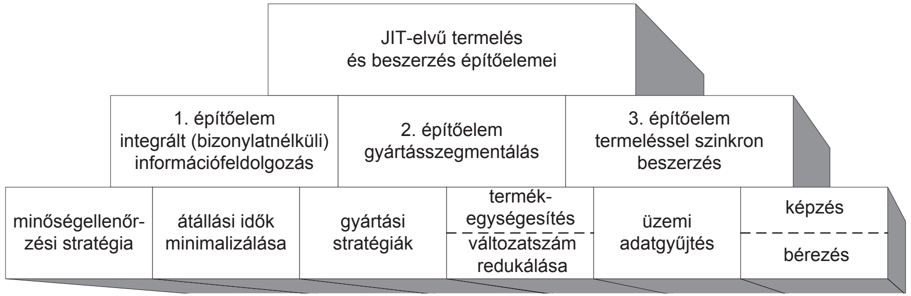
JIT a termelésben
megmunkálás előtti és alatti várakozási időt csökkenteni kell
folyamatok átbocsátó-képességének harmonizálása
gyors átállás, rugalmas termelés
folyamatok csoportosítása

A JIT követelményei

Partnerszerű együttműködés a beszállító és a felhasználó között a határidő (ütemidők), a mennyiség, minőség tekintetében

Beszállítók számának redukálása: a szükséges szoros kapcsolat csak viszonylag kevés beszállítóval tartható fenn

Pontos információk, gyors információtovábbítás



26/89

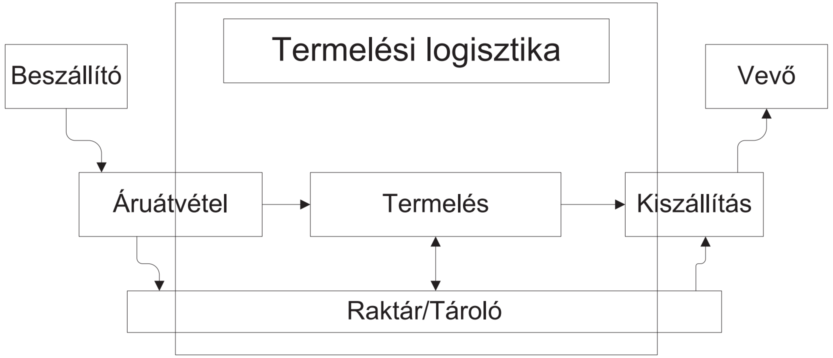
Előnyök és hátrányok

állandó minőség
takarékoskodás az erőforrásokkal
hosszú távú beszállítói kapcsolat, jobb beszállítói elkötelezettség
alacsonyabb készlettartási költségek
magasabb fajlagos szállítási költségek

Mely alkatrészeket célszerű a JIT-elvű beszállításba bevonni?

Nagy térfogatú alkatrészek
Nagy értékűek
Nagy mennyiségben kerülnek beépítésre
Sokféle terméknél fordulnak elő
Kicsi a beszerzés kockázata
Rövid a gyártási idő a beszállítónál
A termékcsoportok gyártása, amelybe az alkatrészek beépíthetők jól szegmentálható legyen
Saját gyártásban készülő alkatrészek, szerelvények jelentős része

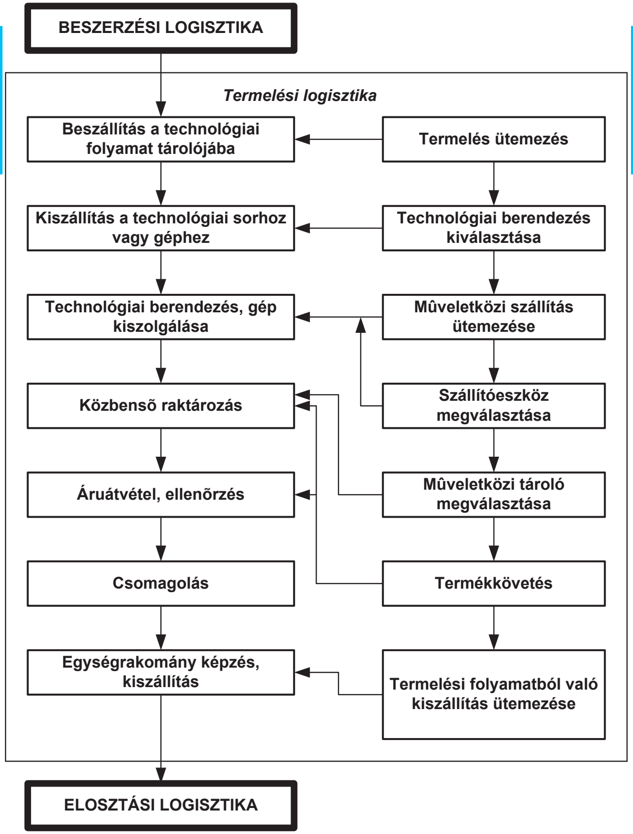
Termelési logisztika



A termelési folyamat során az anyagáramlást biztosító főbb feladatok:

- vállalaton belüli rakodási, szállítási, tárolási feladatok,
- üzemen belüli, üzemrészek és technológiai egységek közötti rakodási, szállítási, tárolási feladatok,
- műveletek között anyagáramlási és munkahelyi anyagkezelési feladatok

2008-09. 2. DFAx-VE-641



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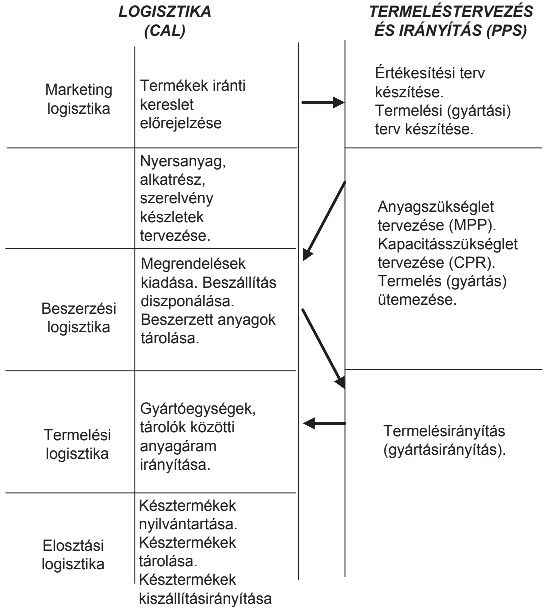
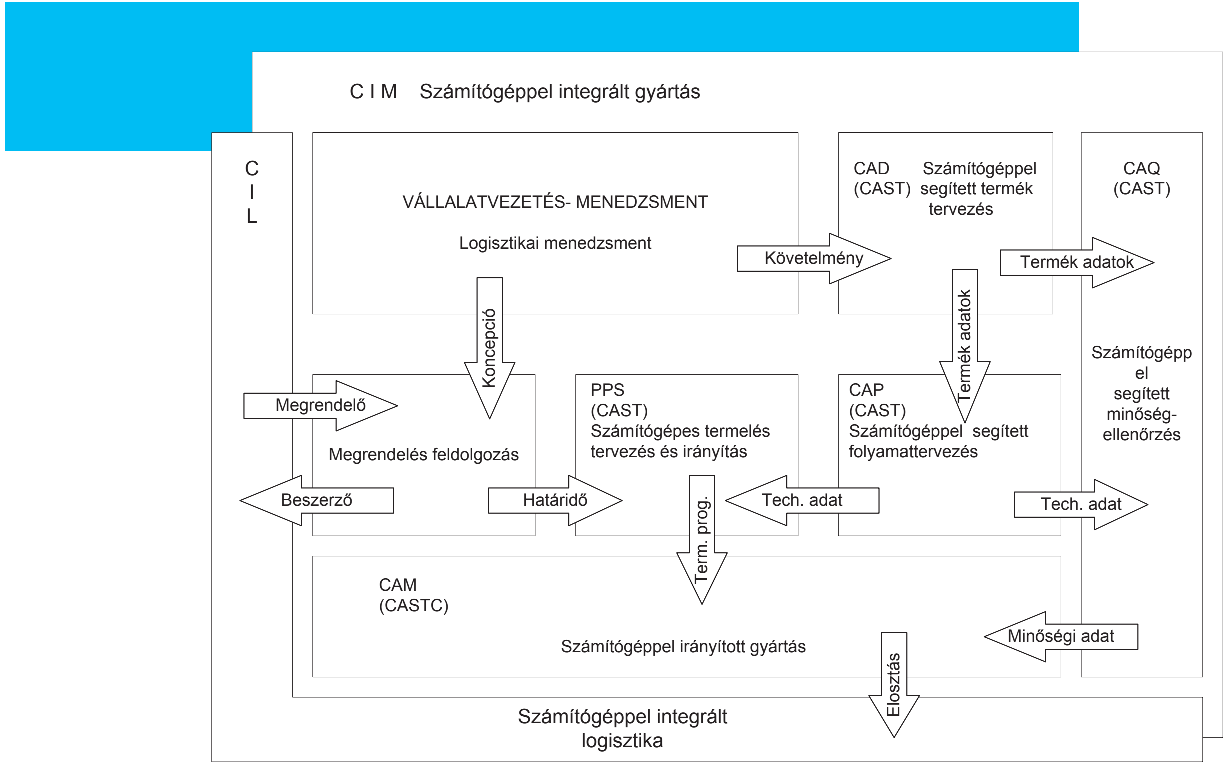
30/31

Termeléstervezés és irányítás (PPS) és a logisztika (CAL) közötti kapcsolatok





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32/22

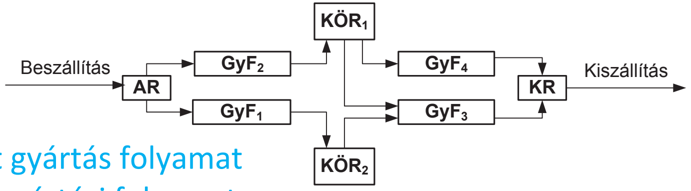
4. Termelési folyamatok, gyártási struktúrák

- Termelési folyamatok változatai
  - Folyamatos gyártás
    - Megszakítás nélküli
    - Megszakításos
  - Diszkrét gyártási folyamat
  - Vegyes gyártási folyamat
- Gyártási struktúrák
  - Műhely rendszerű gyártás
  - Merev gyártósorok
  - Rugalmas gyártórendszerek
  - Folyamatorientált gyártás
  - Termékorientált gyártósorok
  - Szegmentált gyártás
  - Szigetszerű gyártórendszerek

Termelési folyamatok strukturálódása

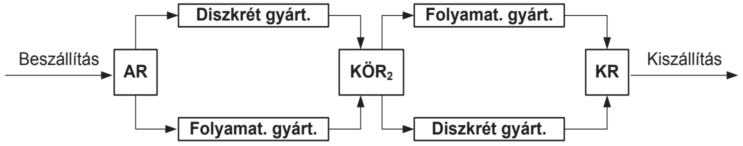
Megszakítás nélküli folyamatos gyártás

Megszakításokkal folyó folyamatos gyártás



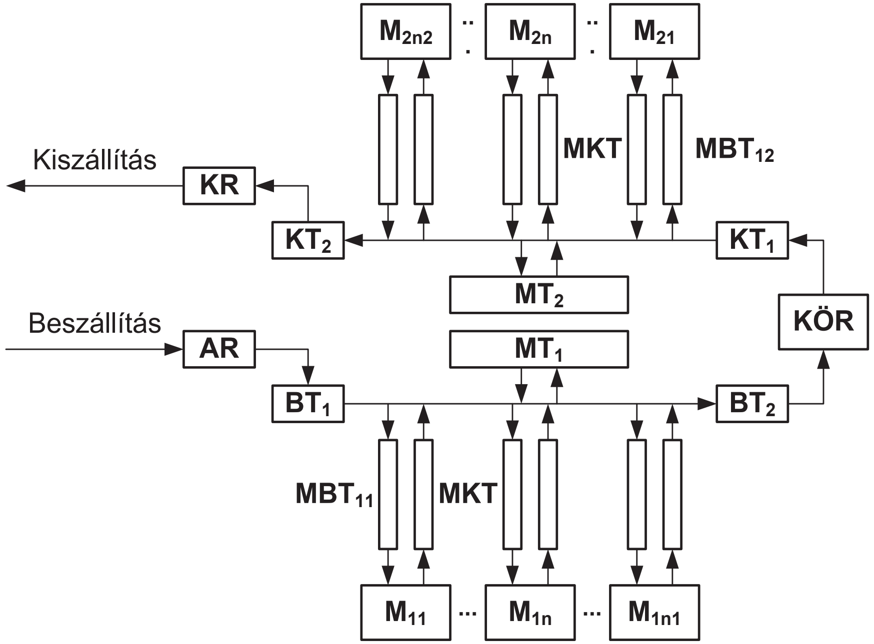
Diszkrét gyártás folyamat

Vegyes gyártási folyamat



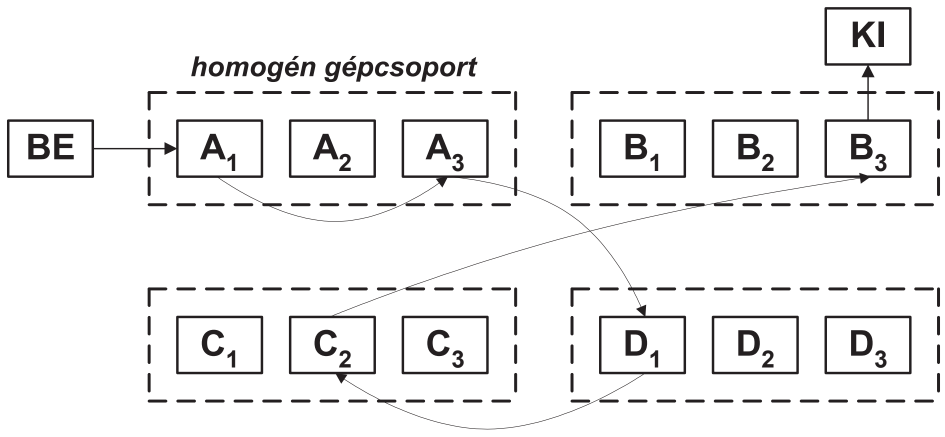
34/26

Diszkrét gyártási folyamat



35/26

Műhely rendszerű gyártás



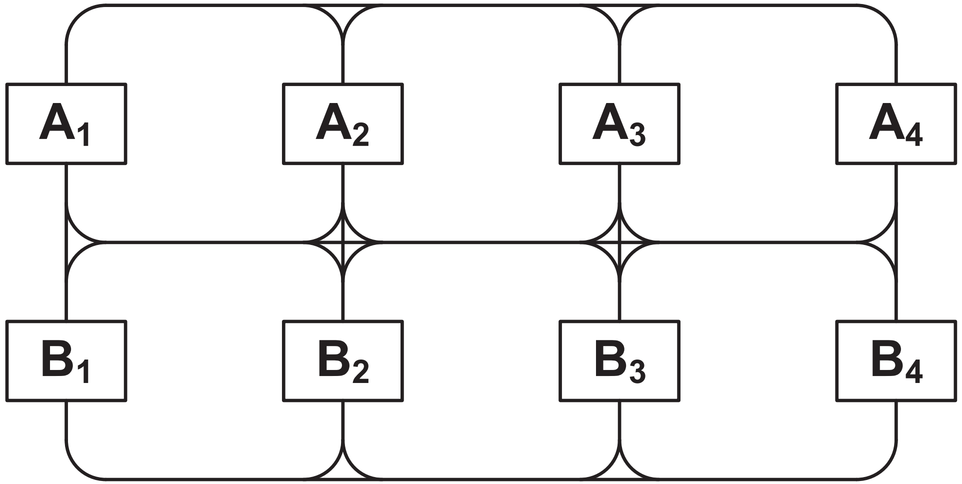
36/26

Merev gyártósorok

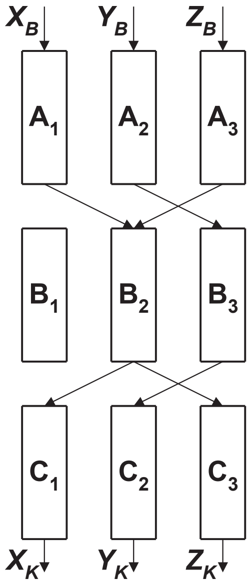
$$\mathrm{BE} \rightarrow A_1 \rightarrow A_2 \rightarrow A_3 \rightarrow A_4 \rightarrow A_5 \rightarrow \mathrm{KI}$$

$$\mathrm{BE} \rightarrow B_1 \rightarrow B_2 \rightarrow B_3 \rightarrow B_4 \rightarrow \mathrm{KI}$$

Rugalmas gyártórendszerek



Folyamatorientált gyártás

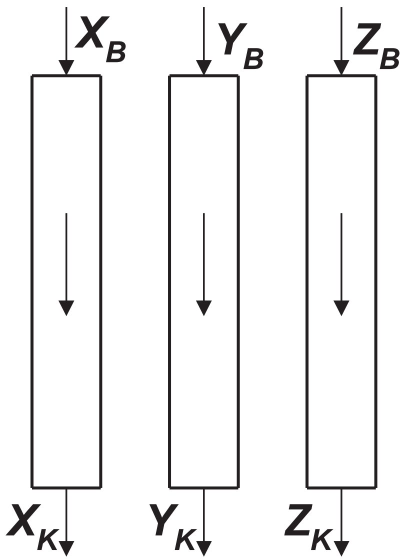


A_1; A_2; A_3
az A folyamat változata

pl. X termék: A_1; B_2; C_1
részfolyamatokon fut át

39/26

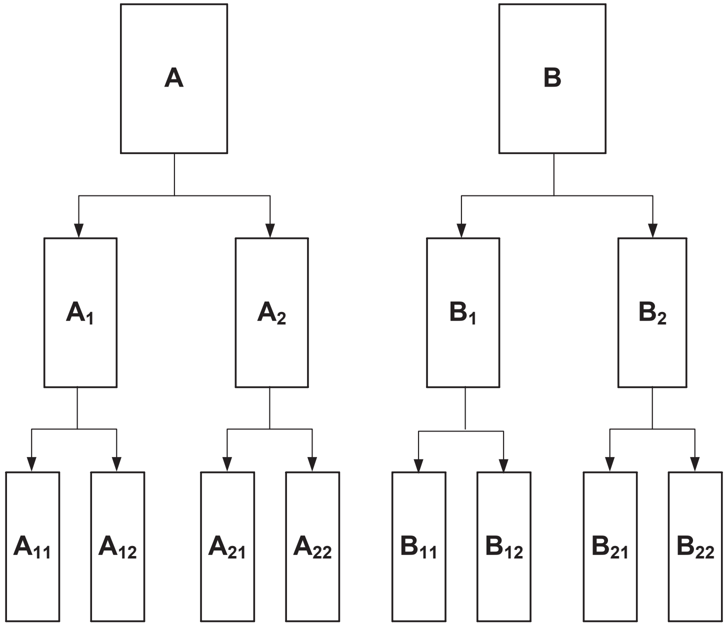
Termékorientált gyártósorok



Egy termékcsalád, egy gyártósoron fut át

40/26

Szegmentált gyártás



Gyártási struktúrák jellemzői

	MŰHELY RENDSZERŰ GYÁRTÁS	MEREV GYÁRTÓSOROK	RUGALMAS GYÁRTÓRENDSZER	FOLYAMATORIENTÁLT GYÁRTÓRENDSZER	TERMÉKORIENTÁLT GYÁRTÓRENDSZER	SZEGMENTÁLT GYÁRTÁS
GÉPCSOPORTOK	Homogén	Egy soron egyidejűleg egyféle termék	Egy soron egyidejűleg sokféle termék	Jellegzetes technológiai részfolyamatok sorozata	Egy soron egy termékcsalád	A fokozatok mentén egyre növekvő rugalmasság
GÉPEK ELRENDEZÉSE	Szétszórt	Technológiai sorrendnek megfelelően	Nem lehet technológiai sorrendnek megfelelően	Technológiai sorrendnek megfelelően	Technológiai sorrendnek megfelelően	Technológiai sorrendnek megfelelően
ANYAGÁRAMLÁSI PÁLYÁK	Kereszteződnek	Egy irányú, egy utas	Az egyes relációk között több út is lehetséges	Távolságok részfolyamatok belül rövidek, kívül jelentősek lehetnek	Rövid, egyirányú utak	Egyirányú, kereszteződések, szegmensek között hosszú lehet
ANYAGÁRAMLÁSI ESZKÖZÖK KIHASZNÁLTSÁGA	Rossz	Csak a végpontoknál, optimalizálható	Számítógéppel optimalizálható	Számítógéppel optimalizálható	Számítógéppel optimalizálható	Számítógéppel optimalizálható
TERMÉKKÖVETÉS	Bonyolult	A termék követhető	Jól követhető	Jól követhető	Jól követhető, jól érvényesíthető a termékfelelősség	Jól követhető
MŰVELETKÖZI TÁROLÁS IGÉNYE	Nagy	Nem szükséges	Van	Részfolyamatokon belül nem kell, közte kell	Minimális	Szegmensek között
MŰVELETI IDŐK	Eltérőek	Azonosnak kell lennie a soron belüli egymást követő technológiai helyeknél	Eltérőek	Eltérőek is lehetnek	Azonos a soron belüli egymást követő technológiai helyeknél	Szegmensen belüli technológiai helyeken azonos
ÁTFUTÁSI IDŐK	Hosszú	Rövid	Terméktől, munkaigénytől függ	Részfolyamatokon belül rövid, közte jelentős várakozás lehet	Rövid	Rövid, de nagy fokú összehangolást igényel.
ÁTÁLLÁSI IDŐK ÚJ SOROZAT ESETÉN	Nagy	Merevség miatt nagyon nagy és költséges	Kicsi, szoftveresen megoldható	Rövid	Egy-egy család termékei között kicsi	Minimalizálható
SOROZATNAGYSÁG	Kicsi, egyedi gyártás	Tömeggyártás	Kis sorozat esetén is gazdaságos	Közepes és nagy	Közepes és nagy	A fokozatok mentén előrehaladva csökken
ÜTEMESSÉG	Nem biztosítható				Rugalmasan tartható	

42/26

A logisztikai vevő kiszolgálások

A vevő az, aki számára érték a tevékenységem vagy termékem.
A logisztikai célfüggvény:

$$L_T = f(V_{sz}, K_L)$$

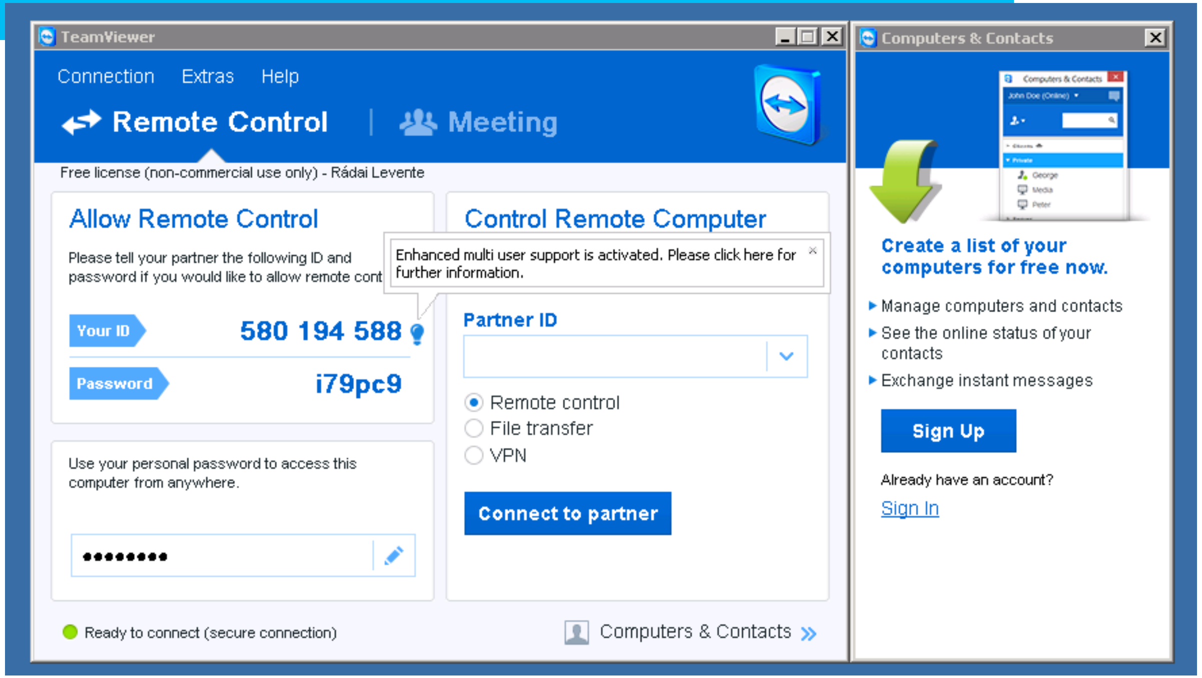
ahol: L_T a logisztikai teljesítmény,
V_{sz} a vevőkiszolgálási szint és
K_L az összes logisztikai költség együttes szintje.

Logisztikai rendszer tervezése

Vállalati stratégia kidolgozása (logisztikai vonatkozások)
Külső érintettek (beszállítók, vevők) igényeinek meghatározása
Részletes tervezés

- üzemelrendezés
- készletezés, tárolás
- anyagmozgatás, szállítás
- folyamat szabályozás
- információs rendszer
- szervezet

- Integráció (marketing, termelés…)
- Logisztikai teljesítmény mérési rendszerének kidolgozása (visszacsatolás)


TeamViewer
Connection
Extras
Help
Remote Control
Meeting
Free license (non-commercial use only) - Rádai Levente
Allow Remote Control
Please tell your partner the following ID and password if you would like to allow remote cont
Your ID
580 194 588
Password
i79pc9
Use your personal password to access this computer from anywhere.
Control Remote Computer
Enhanced multi user support is activated. Please click here for further information.
Partner ID
Remote control
File transfer
VPN
Connect to partner
Ready to connect (secure connection)
Computers & Contacts
Computers & Contacts
Create a list of your computers for free now.
Manage computers and contacts
See the online status of your contacts
Exchange instant messages
Sign Up
Already have an account?
Sign In

3.2. Supplier selection and negotiation

Supplier Evaluation Criteria:

– Offer price

– Undertaken delivery time

– Product quality

– Certificates, references

– Offered number of goods

– Geographical distance

– Additional logistics services: packaging, unit load building, picking, labelling, customs administration, insurance

– Possible modes of transport, transportation quality, estimated shipping cost

Supplier Evaluation Requirements

– Standard criteria and same weighting numbers

– Transparency, clarity (initial data, in units)

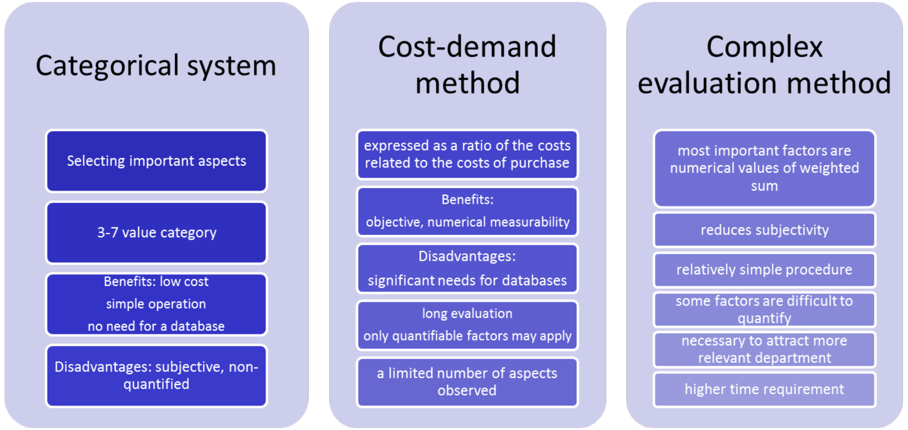
– Objectivity

– Target oriented, appropriate statements in appropriate detail level

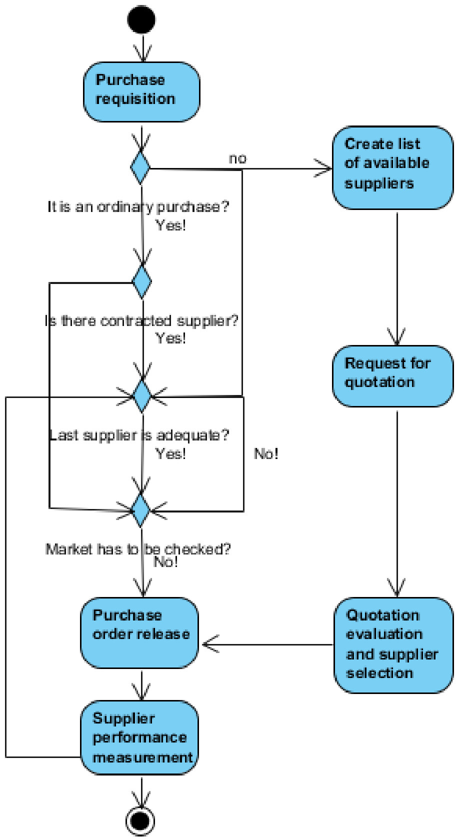
– Feedback to the rated suppliers for increasing competition between suppliers

– Continuous measurement, updating the indicators

Supplier evaluation methods



A possible decision algorithm of purchase activity



Decision makers can be the designer engineer and/or the process engineer to evaluate the quality conditions in suppliers quotations in case of for example of first purchase of a new component. Or the purchaser can make the decisions in case of repeated or routine purchase processes or specifying the purchase conditions.

3.3. e-Procurement and e-Bidding

Role of the Supplier Relationship Management systems

– Automate the determination of the supply sources

– Support the procurement processes with transaction automation and information source integration.

– Support the close collaboration with the suppliers

– Manage and optimize the entire Procure-to-Pay process cycle.

– Available to maintain strategies to optimize the supplier discovery and selection.

Additional SRM functionalities of Supplier Relationship Management systems

Additional functionalities are coming from the software development opportunities, which can provide the computer-based management of the related business processes, like contract and order management, online connected external and internal catalogs via standard data connections and single, individual buying of cheaper products required individually by the organization's stuff.

These could be:

– Centralized Contract and Order Management

– On-line Catalog Management

– Employee Self-Service Procurement

– Operational Sourcing

E-Procurement systems

Electronic procurement system integrated into the enterprise resource planning systems of suppliers and vendors and sourced by these information systems. Like web shops of the suppliers integrated into their ERP systems, these systems are used by the buyer companies not only as individual, isolated external web shops, but are integrated into the buyer's ERP systems via standard data connection or sometimes through remote function call methods, which provide higher performance.

Benefits:

– Faster, more efficient, easy-to-reach and to use

– Less individual purchase event of smaller amounts

– Central system for price, quality and condition comparison.

– Integration and connection point of external web-based marketplaces

– Highly reduces the unit prices and additional costs.

– Less administration in both side (buyer-seller win-win)

Major types of e-Procurement systems

– Electronic catalogs

  – Items and goods in on-line databases available to connect into and refresh in ERP system

  – Primarily for standard products, e.g. tools, general materials, office supplies, furniture, computers and parts

  – the contained catalog informations can be referenced or copied automatically into the purchasing and goods receipts and into other applied purchasing documents

– E-Bid systems

 – Electronic tendering system for reach the lowest price by the buyer

 – Buyer starts the tender and does not acts during the price race of invited suppliers

 – Better price for the buyer

 – No negative impact between the seller and buyer

– E-Marketplaces

– Common web-based information system for trading in a segment of the market or an industry.

– Available for open use as individual marketplace for smaller enterprises and own use of a larger company.

Example: Ariba Network – the World's largest e-Procurement network

– 15+ years of cloud spend

– 40+ million Annual Purchase Order

– 1.5 million Trading Partners

– In 190 Countries

– 65+ million Annual Invoices

– $450B In Annual Commerce

Functionality:

1. BUY:

   – Supplier Discovery, Strategic Sourcing & Contracting

   – Procurem ent & Order Collaboration

2. MANAGE CASH

   – Collaborative Invoice to Pay

   – Dynamic Discounting, Supply Chain & Receivables Financing

3. SELL

   – Marketing, Sales, Servicing & Fulfillment

   – Bill Presentment & Payment

Lecture 4

LECTURE IV – PRODUCTION LOGISTICS

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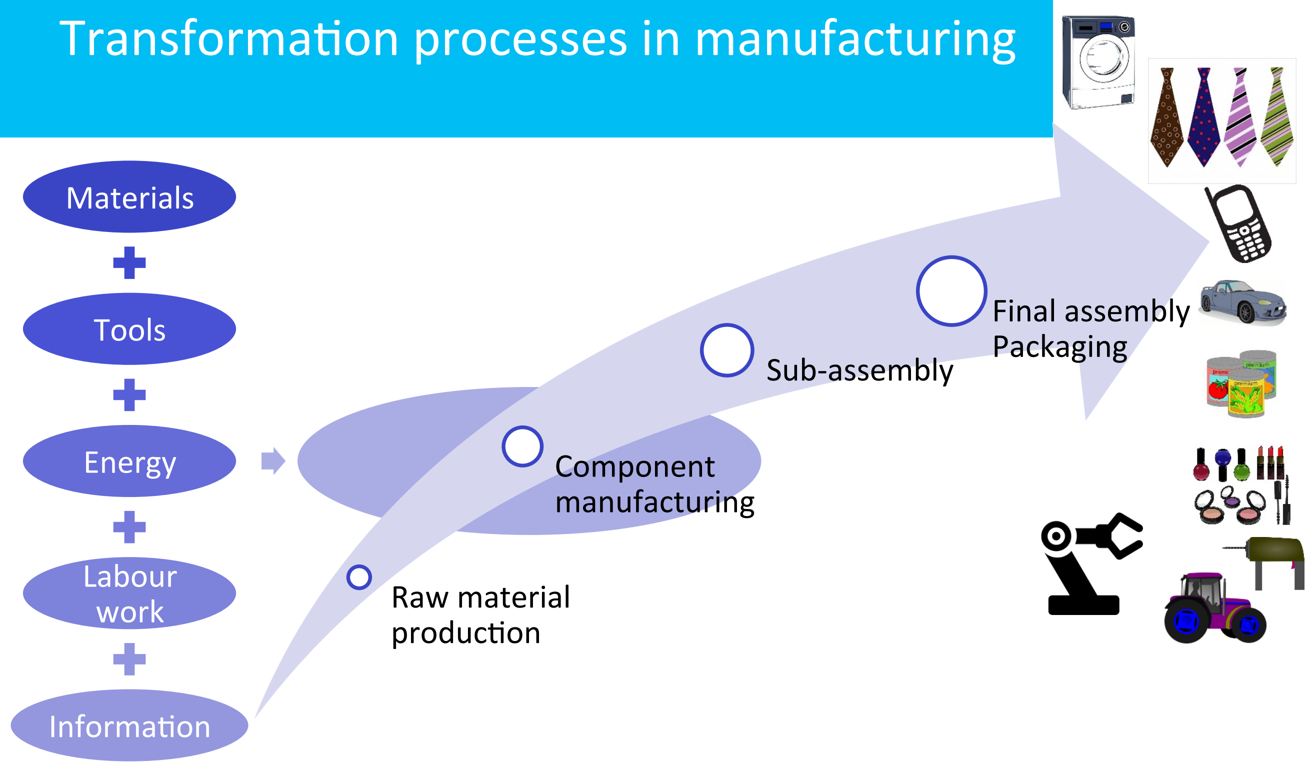
LECTURE IV – PRODUCTION LOGISTICS

MAGYARORSZÁG MEGÚJUL
A projekt az Európai Unió támogatásával valósul meg.

Transformation processes in manufacturing



Major fields

Procurement

- Lookup
- Tendering
- Scheduling
- Supply receipt
- Warehousing

Production

- Materials handling
- In-process storage
- Process-end packaging

Sales and Dsitribution

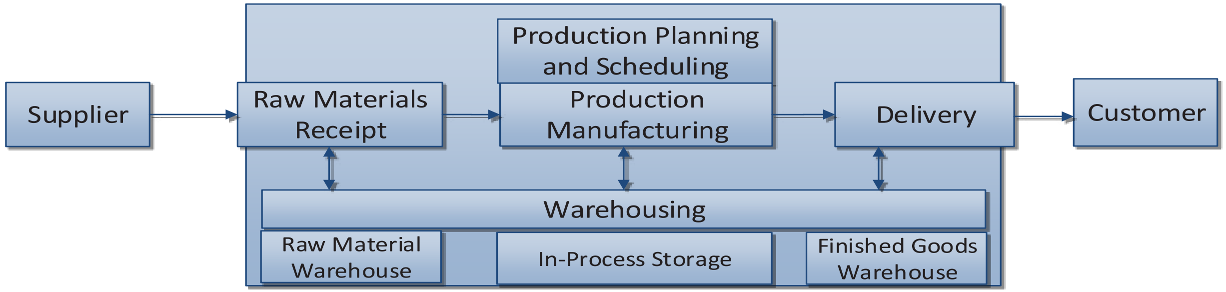
- Finished goods warehousing
- Shipment
- Goods return handling
- Customer services

Recycling logistics

- Collecting
- Sorting
- Packaging
- Storage
- Internal tranportation
- External transport scheduling

Tasks of production logistics

- Internal transportation between the production locations and raw material warehouses or JIT receiving zones (buffers)
- Internal transportation between the production locations and finished goods warehouses or JIT delivery zones (buffers)
- In-process materials handling between the technology lines and machines
- Materials handling at the machines and work stations
- In-process storage



Lecture content

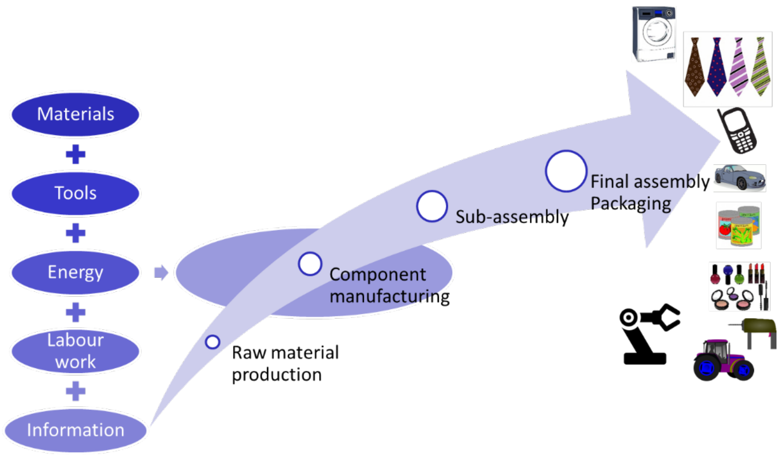
Features of production systems in logistic approach

- Layout
- Routes
- Materials Handling Utilization
- Product Tracking
- In-process Storage

Connection and conflicts between production systems and logistics

- Cycle Times Of Operations
- Lead Times
- Switch Times
- Lot Sizes
- Holding The Tact Times

Introduction to the procurement
Transformation processes in manufacturing



Major fields

– Materials handling

– In-process storage

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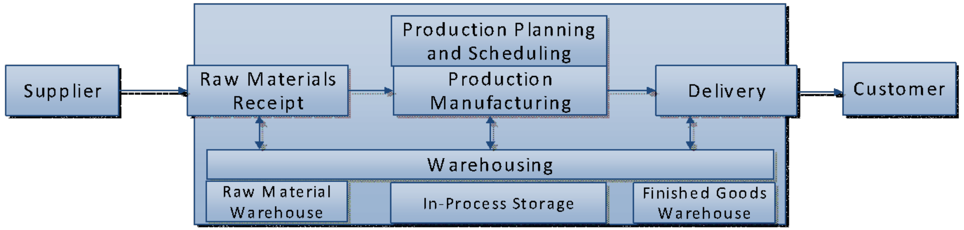

– Features of production systems in logistic approach

Layout

Routes

Materials Handling Utilization

Product Tracking

In-process Storage

– Connection and conflicts betweenproduction systems and logistics

Cycle Times Of Operations

Lead Times

Switch Times

Lot Sizes

Holding The Tact Times

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Major fields

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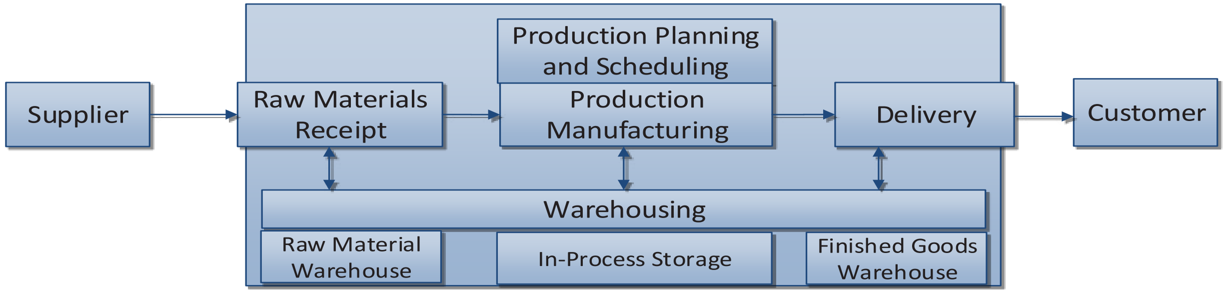

Lecture content

Features of production systems in Logistic Approach

- Layout
- Routes
- Materials Handling Utilization
- Product Tracking
- In-process Storage

Connection And Conflicts between Production Systems And Logistics

- Cycle Times Of Operations
- Lead Times
- Switch Times
- Lot Sizes
- Holding The Tact Times

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4.1. Features of production systems from the viewpoint of logistics

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1. Features of production systems
from the viewpoint of logistics

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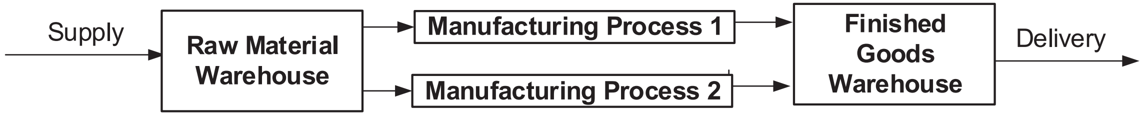
Production processes and manufacturing structures in logistics approach

- Continuous production process: the manufacturing operations of the product are executed directly after each other in predefined sequence without any interruption.

Manufacturing structures:

- Rigid manufacturing lines
- Process-oriented manufacturing systems
- Product-oriented manufacturing lines
- Segmented manufacturing systems



Production processes and manufacturing structures in logistics approach

Continuous production process:
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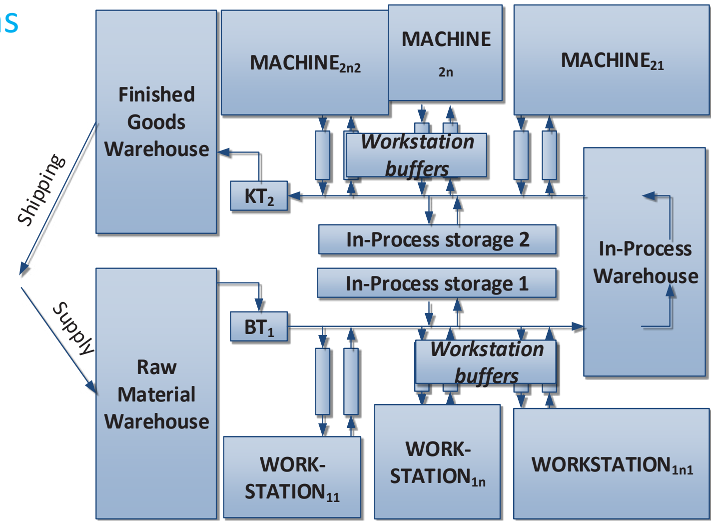


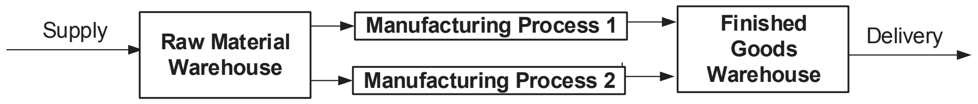
Manufacturing structures:

- Shopfloor manufacturing system
- Flexible manufacturing systems

4.1. Features of production systems from the viewpoint of logistics

Production processes and manufacturing structures in logistics approach:

– Continuous production processes: the manufacturing operations of the product are executed directly after each other in predefined sequence without any interruption.



Continuous manufacturing structures:

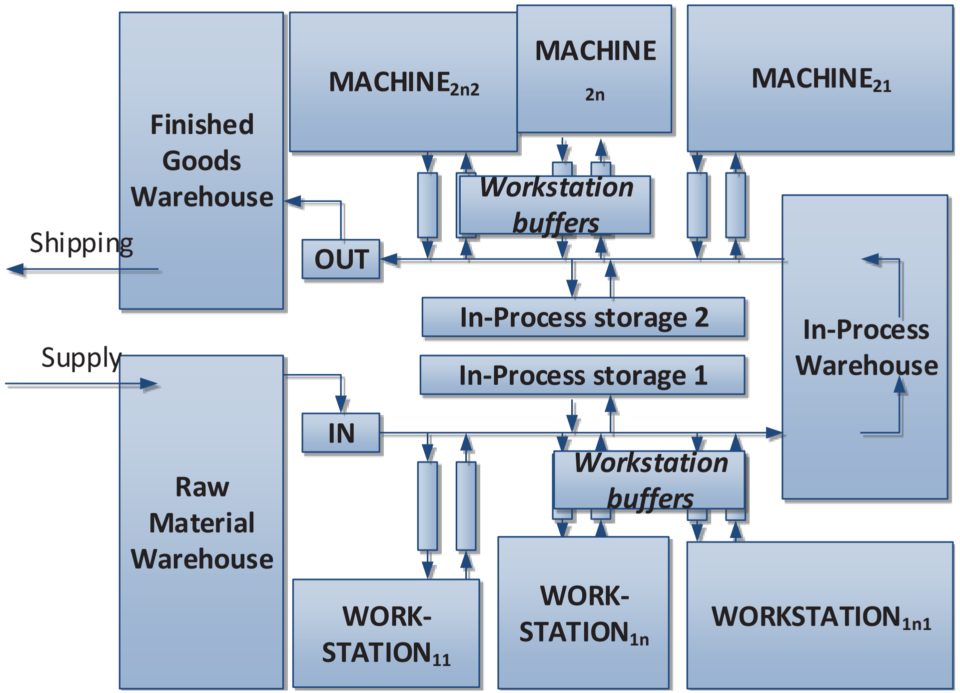
– Rigid manufacturing lines

– Process-oriented manufacturing systems

– Product-oriented manufacturing lines

– Segmented manufacturing systems

– Discrete production processes: The components of the products can be manufactured parallel with each other. The manufacturing operations are interrupted for materials handling and waiting for available machines. Therefore more products can be manufactured in same system.



Discrete manufacturing structures

– Shop floor manufacturing system

– Flexible manufacturing systems

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4.2. ConnecHon and conflicts between production systems and logistics

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2. Connection and conflicts between production systems and logistics

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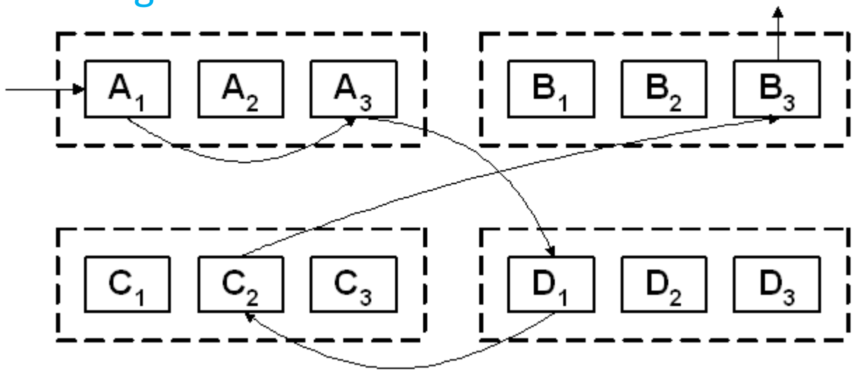
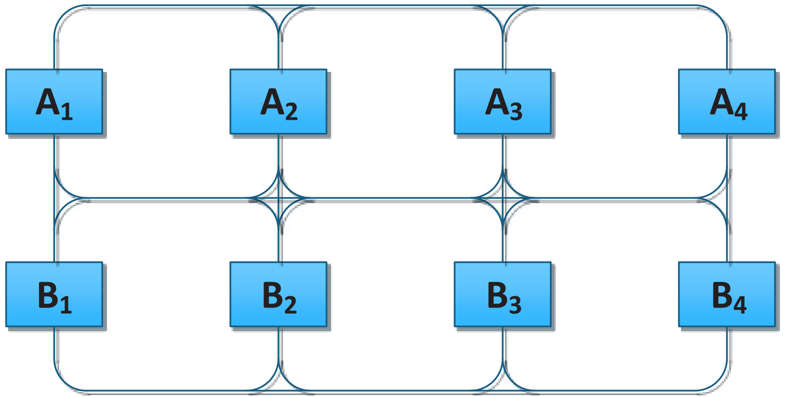
Shopfloor manufacturing system

- More homogenious machine group for
- more type of products with
- different and same operations and components
- Different operation time
- Long lead times
- Complex manufacturing routes



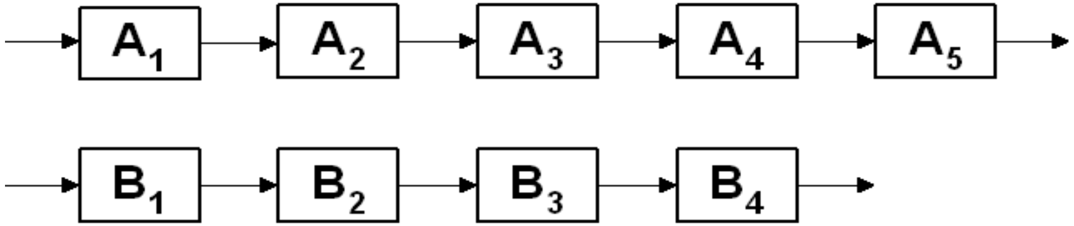
Flexible manufacturing systems

- ✓ Wide variety of products
- ✓ Palalell component manufacturing opportunity

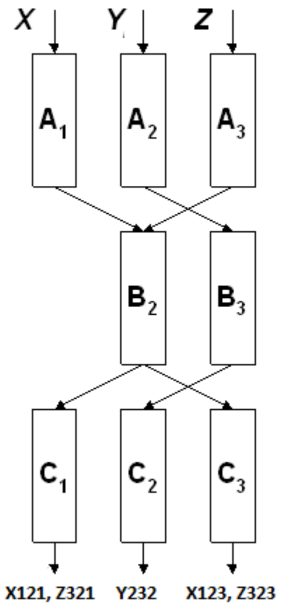


Rigid mass production lines

- One line for each type of products
- ✓ Machines are placed according to the operation sequence
- ✓ Operations cycle times are synchronized
- ✓ Short lead time
- Not flexible

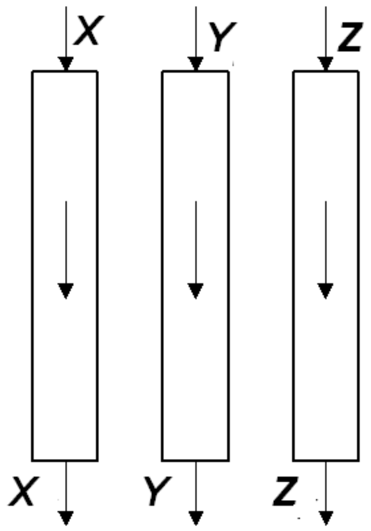


Process-oriented manufacturing systems



- ✓ The whole manufacturing process is divided to more subprocesses for different appropriate technologies.
- ✓ Different products are created on different routes of subprocesses.
- ✓ The operations within the subprocesses are synchrnized.
- ✓ Between the subprocesses, queuing, waiting and storage is required.

Product-oriented manufacturing lines

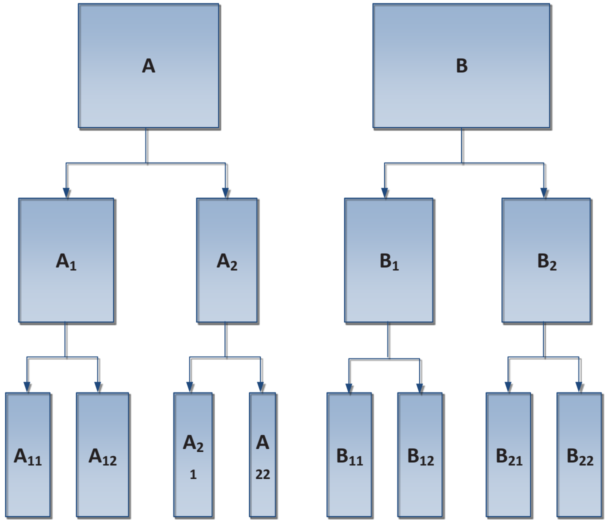


- ✓ One line for each product type (family)
- ✓ More variants for each product type (family)
- ✓ Machine placement according to the operations sequence
- ✓ Synchronized cycle times

13/26

Segmented manufacturing

- ✓ The initial section runs with large lot size
- ✓ From stage to stage, the lot sizes are divided between the product types or variants
- ✓ The cycle times have to synchronize with each other
  - ✓ To minimize the lead time
  - ✓ To minimize the stocks between the stages



Characteristics of manufacturing systems

Oszlop1	SHOPFLOOR MANUFACTURING SYSTEM	FLEXIBLE MANUFACTURING SYSTEMS	RIGID MASS PRODUCTION LINES	PROCESS ORIENTED MANUFACTURING LINES	PRODUCT ORIENTED MANUFACTURING LINES
MACHINES	Homogenous	Different type for same or different products	Each line produces different product	Each line perform different technological subprocesses	Each line produces different product family
LAYOUT	Scattered	Optimized	In technological sequence	In technological sequence	In technological sequence
ROUTES	Crossing, long	Crossing, Multiway between locations, can be long	Short, One way	Short, One way	Short, One way
MATERIALS HANDLING UTILIZATION	Low	High, optimized	Optimization available only at the endpoints of the lines	Available to optimize	Available to optimize
PRODUCT TRACKNG	Difficult	Fine	Fine	Fine	Fine
IN-PROCESS STORAGE	Large	Optimized	Not necessary	Only between the subprocesses	Minimum
CYCLE TIMES OF OPERATIONS	Diffierent for each product type and related operations	Diffierent for each product type and related operations	Synchronized	Synchronized within the subprocesses, but can be different between them	Synchronized
LEAD TIMES	Long	Optimized	Short	Short within the subprocesses, but can be long between them	Short, One way
SWITCH TIMES	Long	Short, automated	Long with high expenses	Short	Short between product of the same product family
LOT SIZES	Small, or unique products	Small or medium-sized	Large batches for mass production	Medium-size and large	Medium-size and large
HOLDING THE TACT TIMES	Not available	Flexible	Available	Flexible	Flexible

4.2. Connection and conflicts between production systems and logistics

Shopfloor manufacturing system

– More homogeneous machine group for

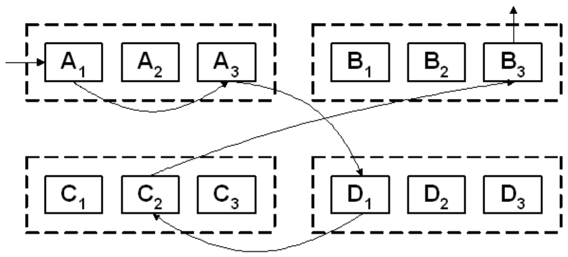
– more type of products with

– different and same operations and components

– Different operation time

– Long lead times

– Complex manufacturing routes

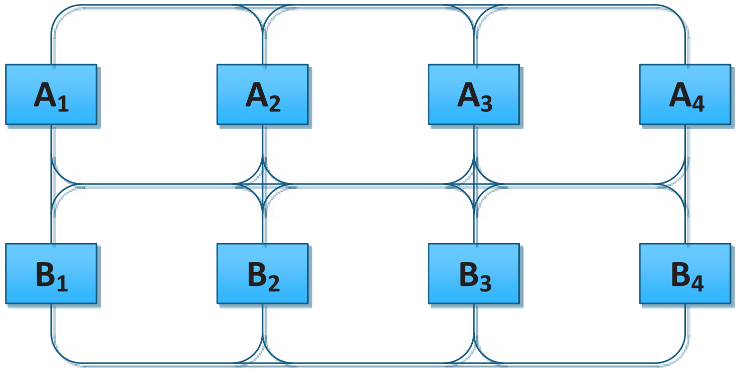


In summary: it can manufacture a wide variety of products, but the efficiency is low, and its logistics is very complex.

Flexible manufacturing systems

– Wide variety of products

– Palalell component manufacturing opportunity



In summary: it is very flexible and efficient in manufacturing wide variety of products in small or medium batch sizes, as well, the logistics is clear and efficient, but these systems are very expensive.

Rigid mass production lines

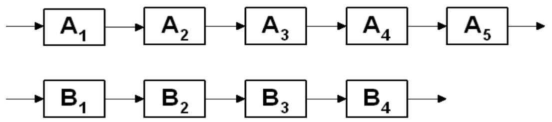
– One line for each type of products

– Machines are placed according to the operation sequence

– Operations cycle times are synchronized

– Short lead time

– Not flexible



In summary: each line can be used only for one product, but the efficiency is at maximum level. Best for mass production in very large quantities.

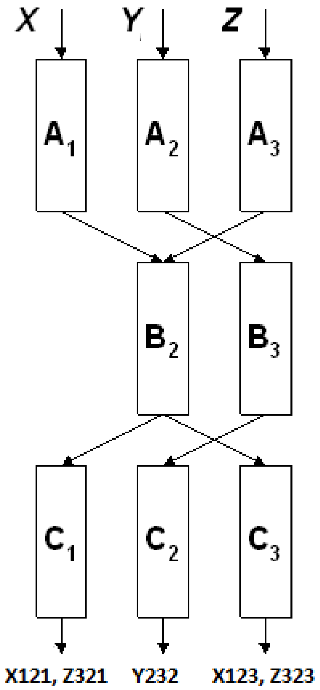
Process-oriented manufacturing systems

– The whole manufacturing process is divided to more subprocesses for different appropriate technologies.

– Different products are created on different routes of subprocesses.

– The operations within the subprocesses are synchrnized.

– Between the subprocesses, queuing, waiting and storage is required.



In summary: more similar products are available in efficient manufacturing system wih changing batch sizes.

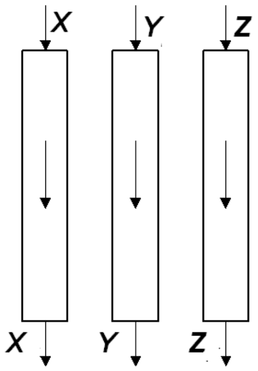
Product-oriented manufacturing lines

– One line for each product type (family)

– More variants for each product type (family)

– Machine placement according to the operations sequence

– Synchronized cycle times



In summary: more similar products are available in efficient manufacturing system wih changing batch sizes.

Segmented manufacturing

– Similar to the oriented production types, but initial section runs with large lot size

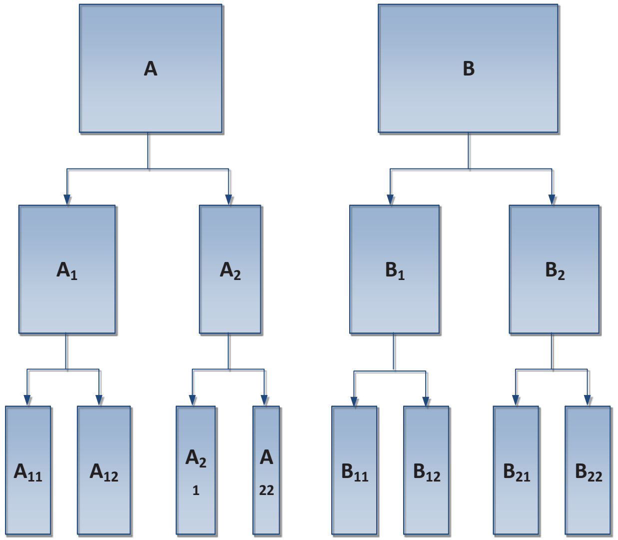
– From stage to stage, the lot sizes are divided between the product types or variants

– The cycle times have to synchronize with each other:

  – To minimize the lead time

  – To minimize the stocks between the stages

Batch sizes in the stages of process oriented manufacturing systems



In summary: more similar products are available in efficient manufacturing system wih changing batch sizes.

Characteristics of manufacturing systems

Manufacturing system / Feature	SHOPFLOOR MANUFACTURING SYSTEM	FLEXIBLE MANUFACTURING SYSTEMS	RIGID MASS PRODUCTION LINES	PROCESS ORIENTED MANUFACTURING LINES	PRODUCT ORIENTED MANUFACTURING LINES	SEGMENTED MANUFACTURING SYSTEM
MACHINES	Homogenous	Different type for same or different products	Each line produces different product	Each line perform different technological subprocesses	Each line produces different product family	From the initial segment to the finishing segment the flexibility increases
LAYOUT	Scattered	Optimized	In technological sequence	In technological sequence	In technological sequence	In technological sequence
ROUTES	Crossing, long	Crossing, Multiway between locations, can be long	Short, One way	Short, One way	Short, One way	Short, One way
MATERIALS HANDLING UTILIZATION	Low	High, optimized	Optimization available only at the endpoints of the lines	Available to optimize	Available to optimize	Available to optimize
PRODUCT TRACKNG	Difficult	Fine	Fine	Fine	Fine	Fine
IN-PROCESS STORAGE	Large	Optimized	Not necessary	Only between the subprocesses	Minimum	Required between process segments
CYCLE TIMES OF OPERATIONS	Diffierent for each product type and related operations	Diffierent for each product type and related operations	Synchronized	Synchronized within the subprocesses, but can be different between them	Synchronized	Synchronized within the process segments
LEAD TIMES	Long	Optimized	Short	Short within the subprocesses, but can be long between them	Short, One way	Short, but depending on the segment synchronization
SWITCH TIMES	Long	Short, automated	Long with high expenses	Short	Short between product of the same product family	Can be minimized
LOT SIZES	Small, or unique products	Small or medium-sized	Large batches for mass production	Medium-size and large	Medium-size and large	Smaller and smaller as
HOLDING THE TACT TIMES	Not available	Flexible	Available	Flexible	Flexible	Flexible

LECTURE IV – PRODUCTION LOGISTICS

4.3. Integrated planning methods

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LECTURE IV – PRODUCTION LOGISTICS

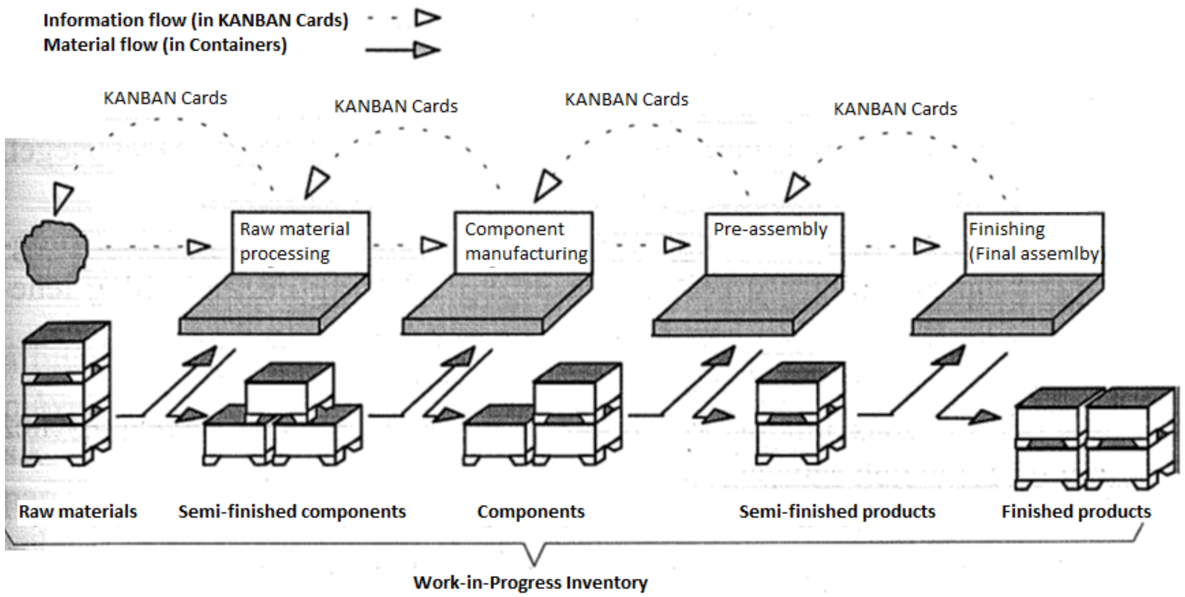
3. Integrated planning methods

MAGYARORSZÁG MEGÚJUL
A projekt az Európai Unió támogatásával valósul meg.

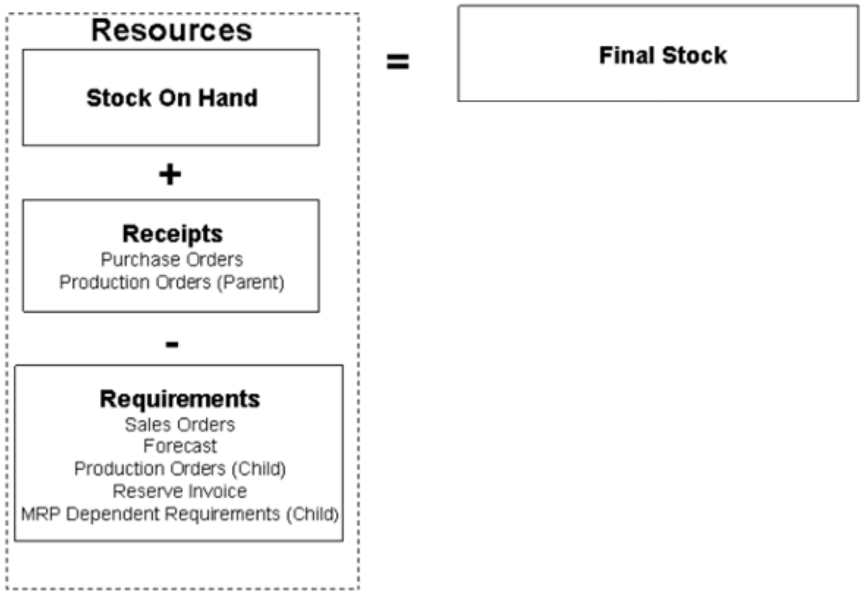
Kanban

- Kanban originates from Japan, the word means Card Signal.
- Application area is the Work-in-Progress minimization within the manufacturing process
- The signal is attached to a bin or container used to transport the supply from the source workstation to the user workstation
- If a container emptied, it or its card is sent back to the source. So the source start to produce to fill up the empty container.
- Therefore the soruce workstations can work only in case of use of finished products from the containers.
- The machines in the technology line are attached to each other through Kanban Circles.
- The empty KANBAN containers pull the production of the sources.
- The source can start the production only if the finished materials are run out.

KANBAN circles and flow within a production line

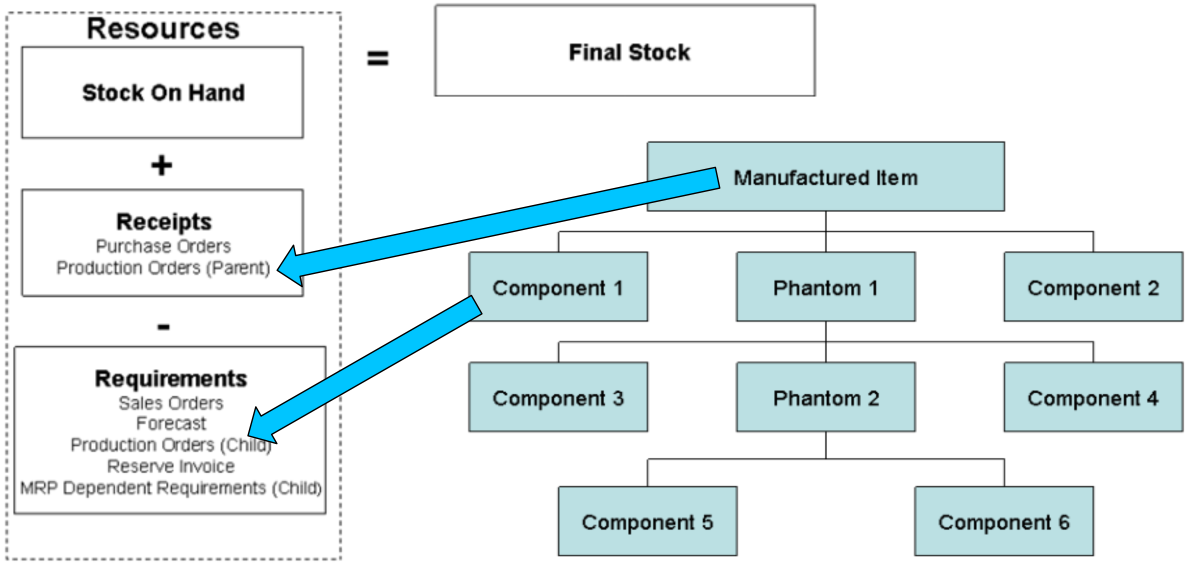


Material Requirement Planning



Source: help.sap.com/sapbusinessone

Material Requirement Planning



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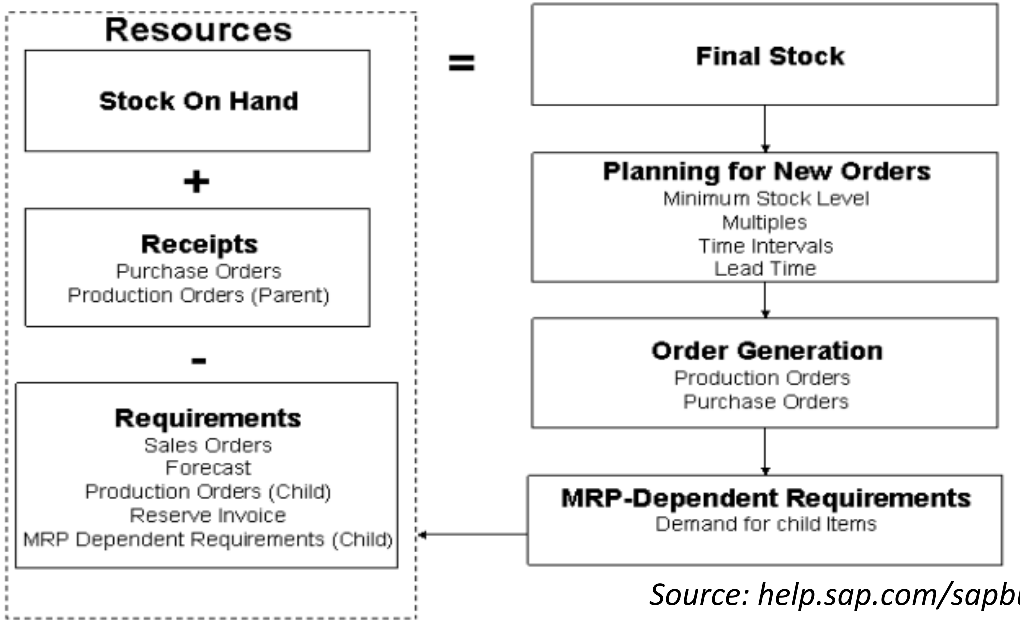
Material Requirement Planning

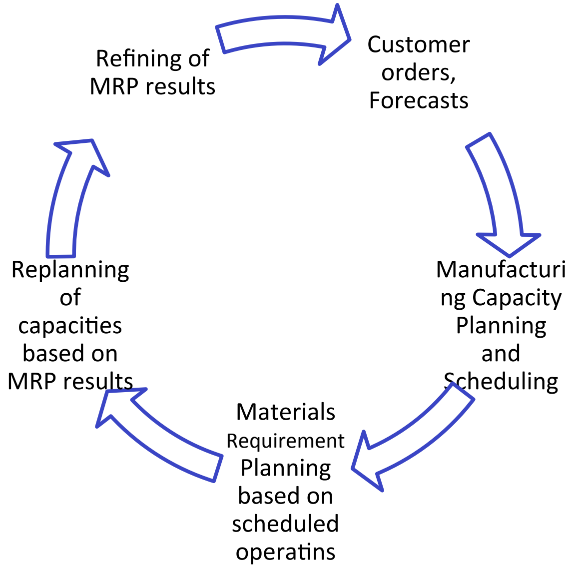


Source: help.sap.com/sapbusinessone

Results

Material/Product			Period#0	Period#1	Period#2	Period#3	Period#4	Period#5	Period#6
Finished bike	1	Gross requirement		10	20	30	15	6	9
batch size (pcs)	10	Stock		5	5	5	5	0	4
lead time	1	Net requirement		5	15	25	10	6	5
		Arriving quantity		10	20	30	10	10	10
		Amount to be ordered	10	20	30	10	10	10	10
Seat unit	1	Gross requirement	10	20	30	10	10	10	10
batch size (pcs)	5	Stock	10	0	0	10	0	10	0
lead time	0	Net requirement	0	20	30	0	10	0	10
		Arriving quantity	0	20	40	0	20	0	20
		Amount to be ordered	0	20	40	0	20	0	20
Brake unit	2	Gross requirement	20	40	60	20	20	20	20
batch size (pcs)	20	Stock	10	10	10	10	10	10	10
lead time	0	Net requirement	10	30	50	10	10	10	10
		Arriving quantity	20	40	60	20	20	20	20
		Amount to be ordered	20	40	60	20	20	20	20
Rope set	1	Gross requirement	20	40	60	20	20	20	20
batch size	-	~~Stock~~	-	0	0	0	0	0	0
lead time	0	Net requirement	20	40	60	20	20	20	20
		Arriving quantity	20	40	60	20	20	20	20
		Amount to be ordered	20	40	60	20	20	20	20

Manufacturing Resource Planning



- Only running material requirement planning does not meet the available manufacturing capacities
- First schedule the operations
- Based on the scheduling plan the material requirements
- Reschedule if the materail supply scheduling cannot meet with the operations scheduling

4.3. Integrated planning methods

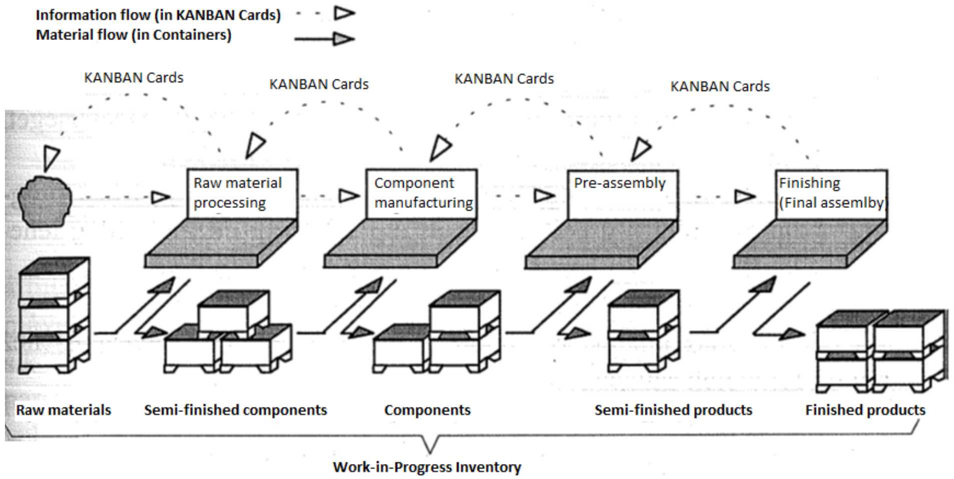
Kanban

Kanban originates from Japan, the word means Card Signal. Application area is the Work-in-Progress stock minimization within the manufacturing process without any material leaks.

The signal is attached to a bin or container used to transport the supply of a material from the source workstation to the user workstation. If a container emptied, it or its card is sent back to the source. So the source start to produce to fill up the empty container. Therefore the source workstations can work only in case of use of finished products from the containers.

The machines in the technology line are attached to each other through Kanban Circuits. The empty KANBAN containers pull the production of the sources.

KANBAN circuits and flow within a production line



Source: Béla Kulcsár – Industrial Logistics, LSI Training Centre, 1998, ISBN 963 577 242 4

The source can start the production only if one of the finished material's Kanban Bin got empty. The number of the Kanban bins in a Kanban circuit is optimized based on manufacturing and transportation lead-time.

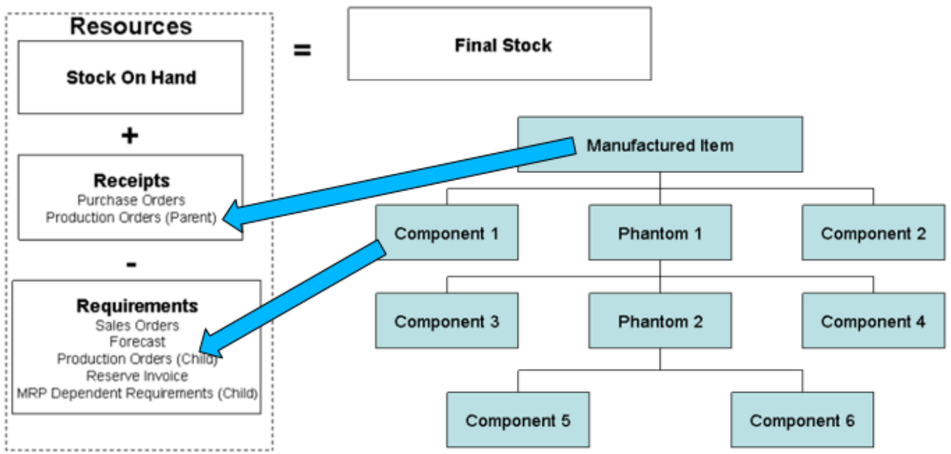
Important requirement of the application of Kanban system is, that in the manufacturing process, there must not be any disturbance, especially cannot occur random scrap or machine failure or malfunction.

The basics of Kanban circuits is simple, but their complexity raises fast, if a workstation has to produce more type of products, because in this case more Kanban bins are required.

Material Requirement Planning

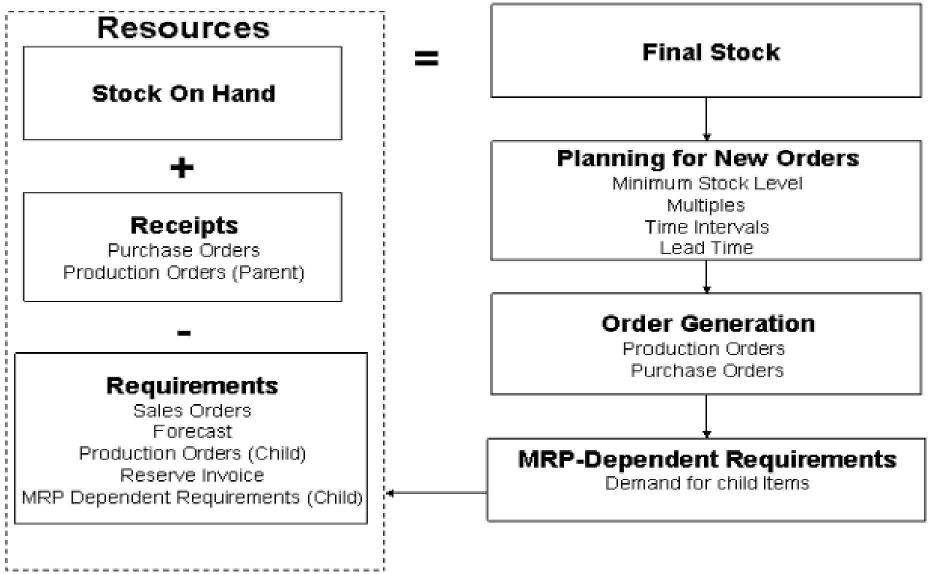
Based on known finished product consumption – as the sales plans and known customer orders tell –, the so called MRP, (MRP1), or material requirement planning provides periodical information of required quantities of product items missing from the stock in each period. Furthermore – and this makes the calculation really complex –, based on the bill of materials of the required products, the requirements of the raw material and component quantities can be calculated from period to period, as well. The MRP is one of the basic technics of ERP systems and production planning systems, and widely used in these software applications.

Next figure shows the general input information of MRP and a skeleton for the Bill of Materials in tree form:



Source: help.sap.com/sapbusinessone

Calculating the materials requirements is running from period to period. It is important, that period lengths are related to the batch sizes, lead times or supply periods of orders. The result information types are summarized on next figure and can organized best into table.



Source: help.sap.com/sapbusinessone

Result of an MRP run

Material/Product			Period#0	Period#1	Period#2	Period#3	Period#4	Period#5	Period#6
Finished bike	1	Gross requirement		10	20	30	15	6	9
batch size (pcs)	10	Stock		5	5	5	5	0	4
lead time	1	Net requirement		5	15	25	10	6	5
		Arriving quantity		10	20	30	10	10	10
		Amount to be ordered	10	20	30	10	10	10	10
Seat unit	1	Gross requirement	10	20	30	10	10	10	10
batch size (pcs)	5	Stock	10	0	0	10	0	10	0
lead time	0	Net requirement	0	20	30	0	10	0	10
		Arriving quantity	0	20	40	0	20	0	20
		Amount to be ordered	0	20	40	0	20	0	20
Brake unit	2	Gross requirement	20	40	60	20	20	20	20
batch size (pcs)	20	Stock	10	10	10	10	10	10	10
lead time	0	Net requirement	10	30	50	10	10	10	10
		Arriving quantity	20	40	60	20	20	20	20
		Amount to be ordered	20	40	60	20	20	20	20
Rope set	1	Gross requirement	20	40	60	20	20	20	20
batch size	-	~~Stock~~	-	0	0	0	0	0	0
lead time	0	Net requirement	20	40	60	20	20	20	20
		Arriving quantity	20	40	60	20	20	20	20
		Amount to be ordered	20	40	60	20	20	20	20

Gray cells show the input information, like stock at the beginning of the planned period, gross requirements of Finished products are in second row. These quantities pull the requirements.

Net requirement = Gross requirement – Stock

Arriving quantity = Net requirement rounded up to the Batch Size

Amount to be ordered = Order quantity in the period to meet the arrival requirements in next periods regarding to the supply lead-time. (We have to order the Arriving quantity so earlier as much long is the lead time of the material supply or product manufacturing.)

(Opening, remaining) Stock of next period = Arriving quantity – Net requirement

Note, that if the batch size is 1, then we can order exactly the required quantity, so there will not be any remaining quantity from the batch.

Additional conditions:

– maximum order quantities coming from manufacturing, supply, transportation or warehousing capacity limitations,

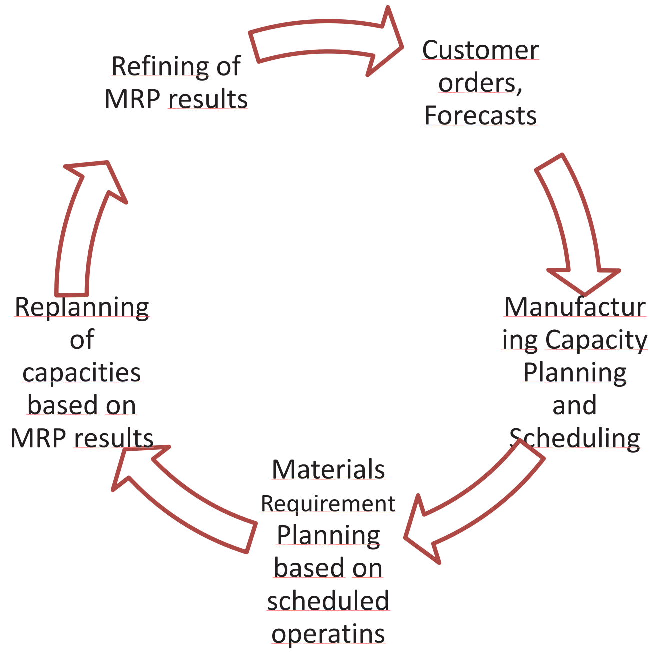
– minimum order quantity, like minimum 2, or more batch can be ordered to optimize the additional, transactional type expenses or resource, machine capacity utilization up to 100%.

The example shows only one product, and only few components of it. Now, think in a factory producing hundreds of products, where there are common raw materials, components and semi-finished sub-assembly parts on many-many levels of bill of materials. It is really hard to calculate the material requirement without computer application. The start of the efficient computer based manufacturing resource planning was in 1970’s.

Manufacturing Resource Planning

Only running material requirement planning does not meet the available manufacturing capacities. For this purpose, first the manufacturing operations related to the production plans should be scheduled, based on the available free manufacturing capacity, and based on this scheduling plan, can be the material requirements calculated in timeline. If the material supply scheduling cannot meet with the manufacturing operations scheduling, then rescheduling of operations is required based on the material supply plan, but after the operations rescheduling, the materials supply should be adjusted to it.

The manufacturing resources involve the materials as well, therefore it is abbreviated to MRP2 and material requirement planning is abbreviated as MRP1. Note, that MRP2 contains MRP1, as well.



In short summary:

– Only running material requirement planning does not meet the available manufacturing capacities

– First schedule the operations

– Based on the scheduling plan the material requirements

– Reschedule if the material supply scheduling cannot meet with the operations scheduling

Lecture 5

LECTURE V – WAREHOUSING AT THE ENTERPRISES

5.1. Warehouse structures

Business Logistics
College of Dunaújváros

LECTURE V – WAREHOUSING AT THE ENTERPRISES

1. Warehouse structures

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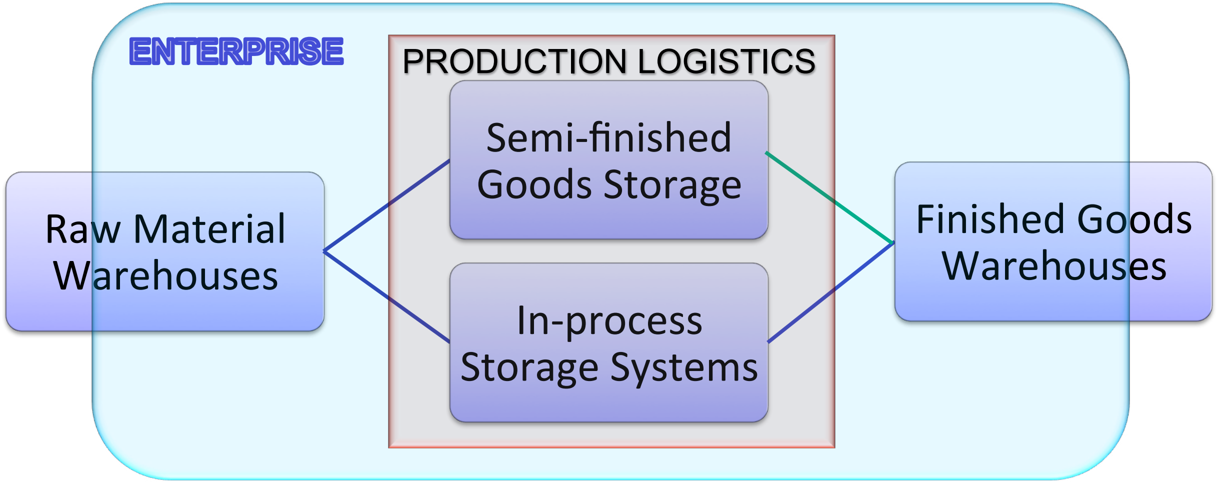
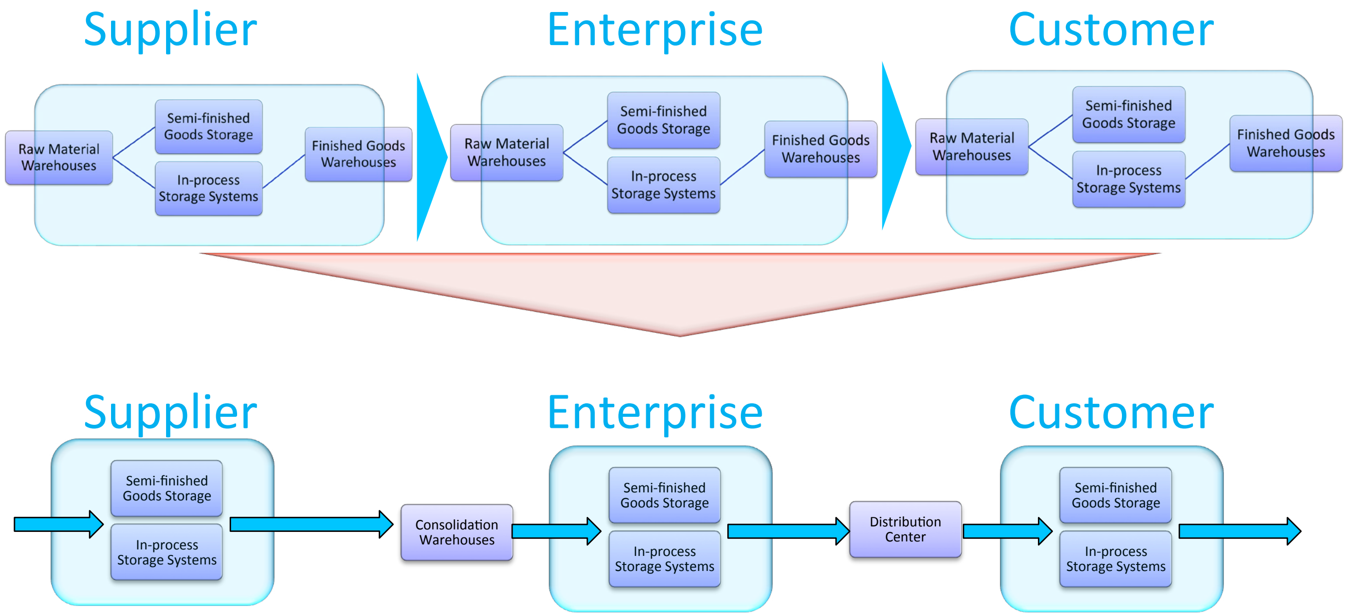
Warehouses within the enterprise



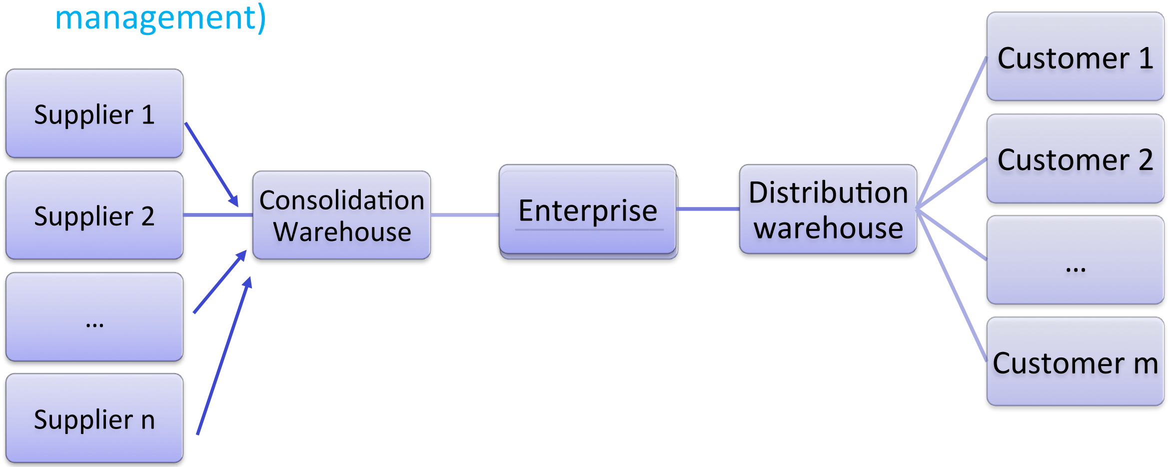
Warehouses within the enterprise



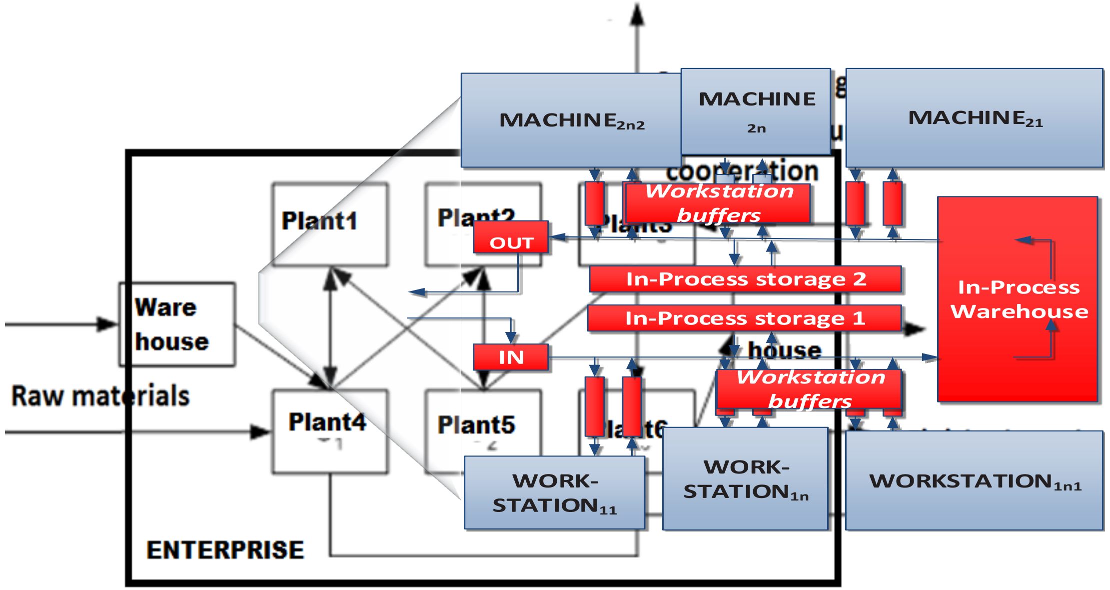
Benefits

Replace smaller on-site warehouses by central distribution centres:

- Less small, low efficient storage capacity
- One large, high efficient warehouse
- Centralised transport and additional services (packaging, sorting, management)

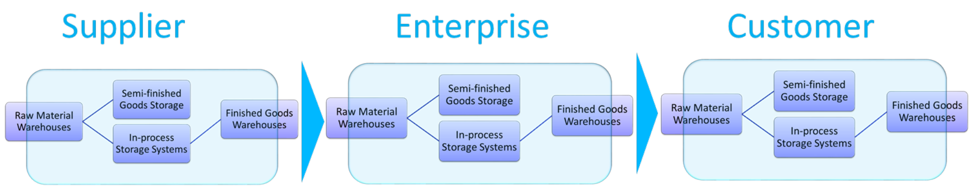


Warehouses and storages within the production processes

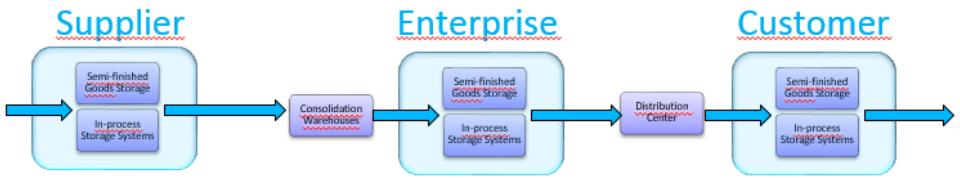


5.1. Warehouse structures

Classic warehouses within the enterprise



Single warehousing between the supplier's and customer's processes



Benefits

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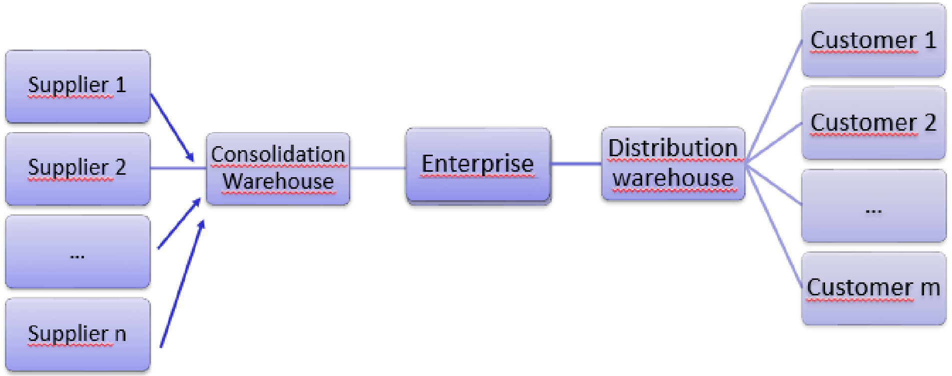
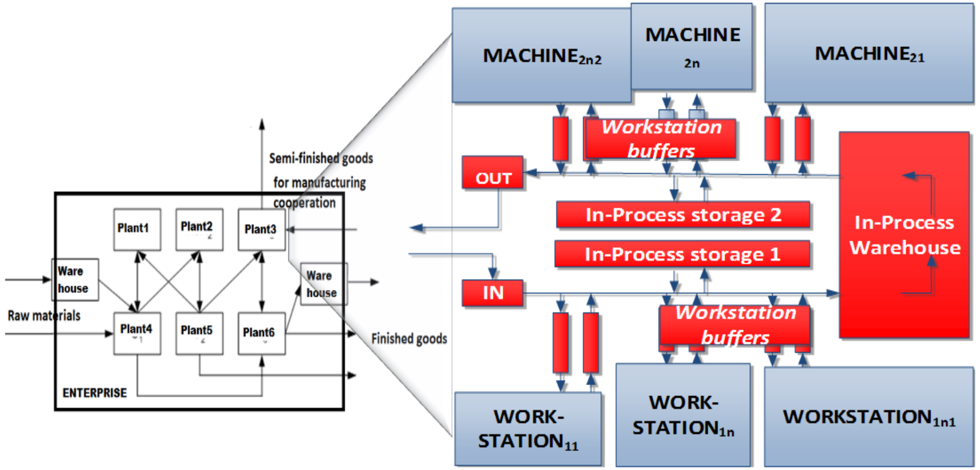


Warehouses and storages within the production processes:

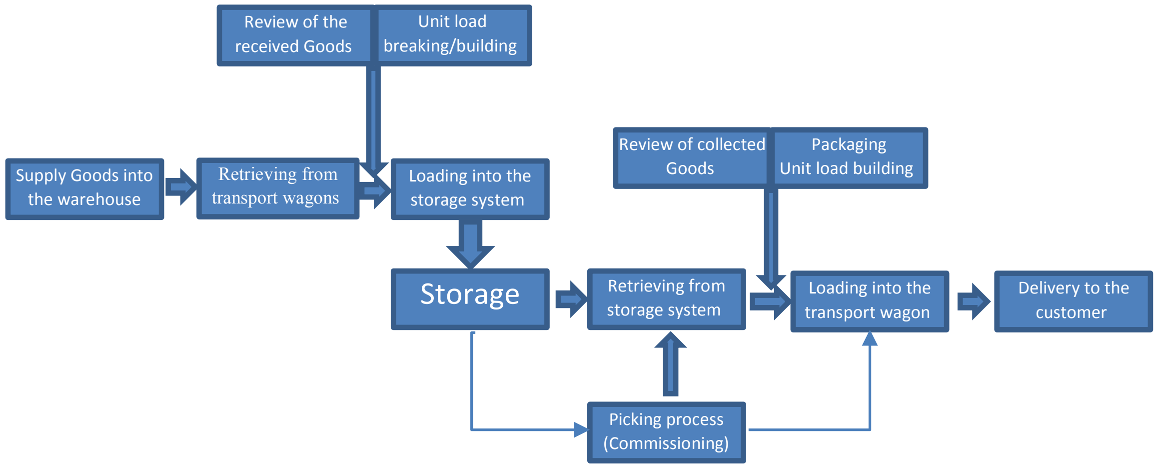
- Workstation buffers
- In-process storage
- In-Process warehouses
- IN (Input buffer zone)
- OUT (Output buffer zone)
- Machine buffer storages



5.2. Theoretical questions and practical solutions

What are the general warehousing processes in the business logistics?

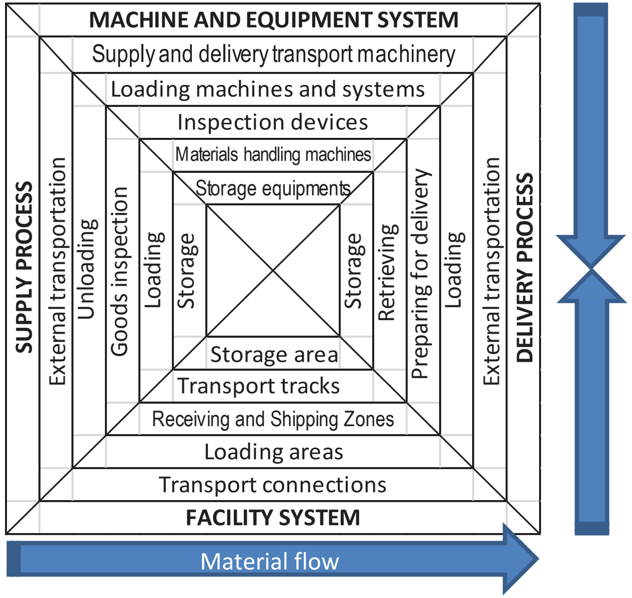
General warehouse processes



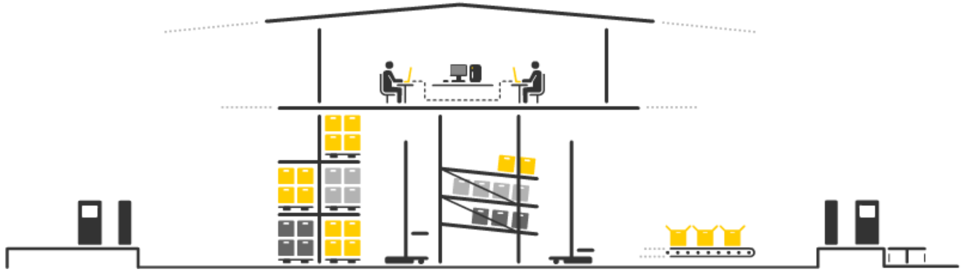
What warehouse technology components are necessary in the warehousing in business logistic processes?

The next figure collects the steps of the warehousing processes from supply to delivery to the customer and the related components of the necessary facility component and machinery and equipments.

System of warehouse technology



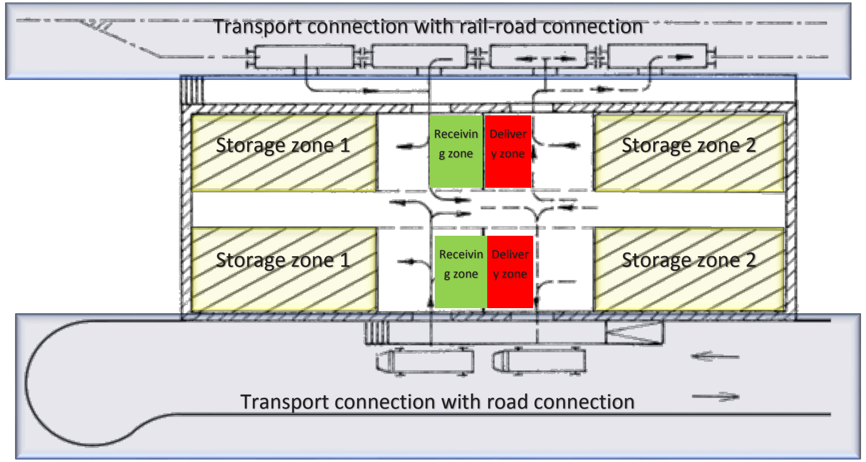
An illustration of warehouse technologies



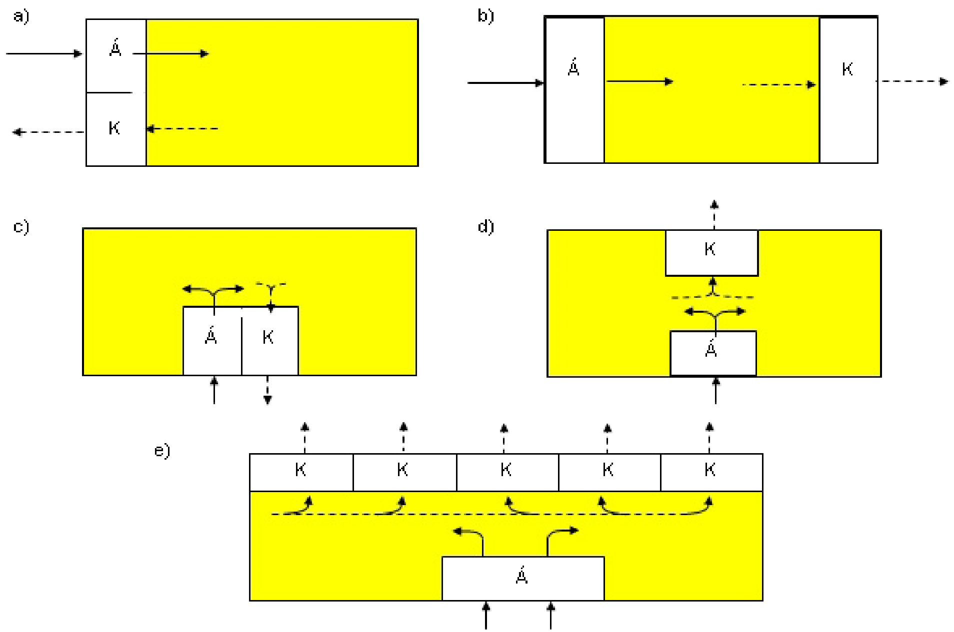
Source: An inside look at a storage facility, DHL Logbook, 2008, https://www.dhl-discoverlogistics.com/cms/en/course/tasks_functions/warehouse/stations.jsp

How the facility and storage layouts can be designed?

Example for a warehouse



General facility layout types

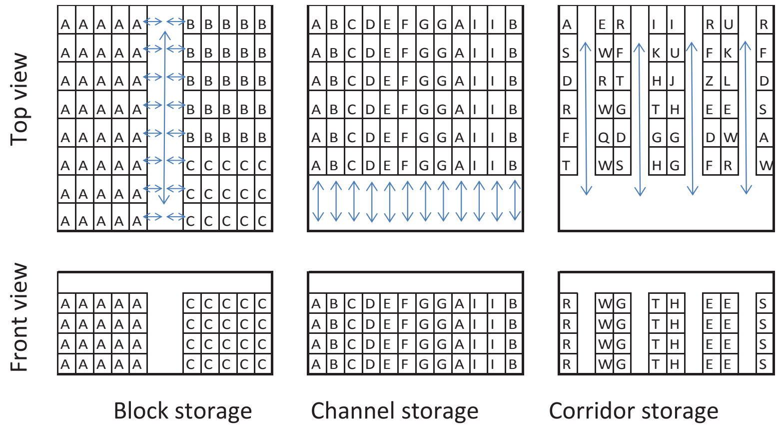


a.) head layout , b.) pass-through layout, c.) single side layout, d.) double side,

e.) double side decentralized layout

Receiving zone = A, Delivery zone (K)

General storage layout types



What type of storage technics and warehousing materials handling systems can be used for the optimal warehousing processes?

General storage technics and warehousing materials handling

Storage units			Individual goods		Unit loads		
Storage technology	Block storage	Aisle storage	Aisle rack storage	Drive-in and Drive-through Rack Storage	FIFO Flow Rack Storage	Mobile Rack Storage	Rotating Rack Stoage
Materials Handling		Manual or Hand Devices	Fork-Lift Trucks	Cranes	Loading and Retrieving Machines	Special (additional transport systems)	

Additional reading suggestion: An inside look at a storage facility, Discover Logistics, DHL Logbook – in Cooperation with Darmstadt University, 2008, https://www.dhl- discoverlogistics.com/cms/en/course/tasks_functions/warehouse/stations.jsp

What are the solutions of warehouse management, information flow and product identification?

Tasks of WMS:

- Managing the warehouse processes:
  - Control of basic processes: supply, delivery, order picking, loading and retrival, inside materials handling and managing inventory strategies.
- Directly responsible for:
  - efficient operation of warehouse
  - hold the deadlines defined by customers.

WMS database:

Collects and records the information of materials flow processes and provides data for control operations in materials flow of warehouse.

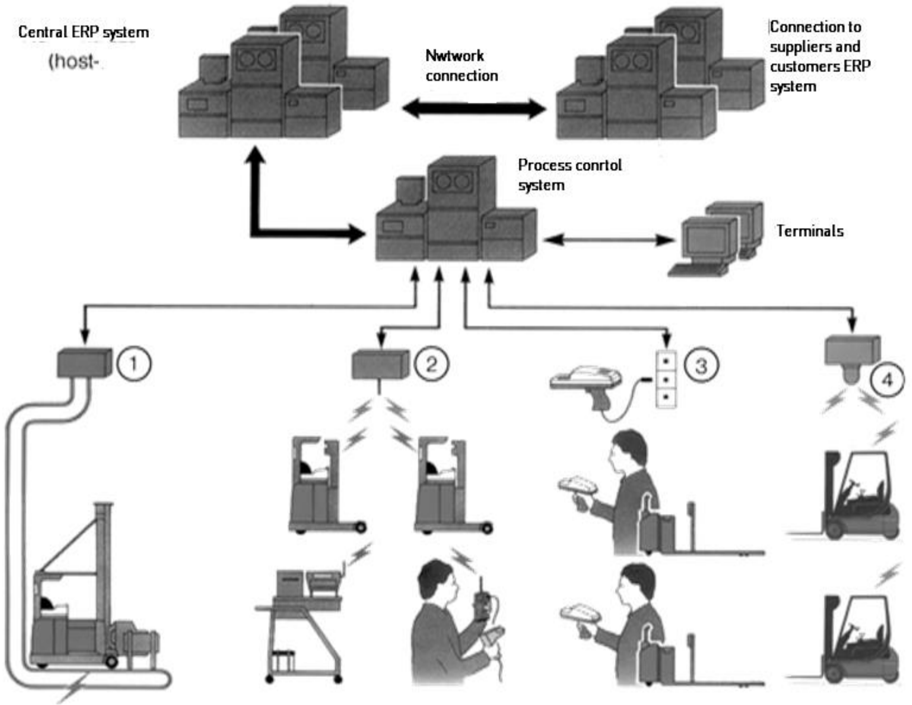
General Data:

- Goods, products, cargo master data
- Identification of store positions, storage cells
- materials flow processes data:
  - Inventory supply control
  - Cargo arrival administration
  - Inside materials handling operations control and log
  - Retrieval from storage
  - Preparing delivery
- Empty storage capacity
- Inventory status

Techniques in information flow:

- On-line/off-line/batch data transmission:
  - RF
  - IR
  - Wired (offline)
- Terminals:
  - Fix
  - mobil
  - On-board
- Product IDentification techniques:
  - Bar Code
  - RFID

Example for the structure and information flow of a WMS



Legend:

1: wired data connection

2: RF data tramsmission (Wi-Fi)

3: plugged off-line data transmission (upload-retrieve)

4: Infrared data transmission

Stations in the warehouse

An inside look at a storage facility

Modern warehouses are equipped with all sorts of technical equipment that enables goods to be efficiently stored. This equipment includes operator-less conveyor systems that move through various warehouse zones as though they were guided by an invisible force or stock pickers who select products from the pick locations in racks based upon instructions they receive on headsets from a central computer. The following graphic and detailed explanations provide insights into the most important processes in a warehouse.

Stations in the warehouse

From receiving to shipping

Goods that arrive in the warehouse are accepted by receiving and prepared for storage. This includes unloading and identifying incoming goods. Identification is usually done by scanning a barcode attached to the good. However, new innovative technologies like RFID allow for contactless scanning of goods. As a result, the contents of a whole pallet can be read at once by the radio signal emitted by RFID chips as soon as the shipment passes a gate or similar checkpoint. But this method of identification is relatively more expensive than the barcode and is less used.

After being inspected at receiving, the goods are prepared for storage. In this process, they may be placed onto the appropriate load-carrying device such as pallets or into parts containers or repacked. The time the goods spend at receiving should be as short as possible. The receiving area for incoming shipments where goods that will be stored are processed is often called the I Point, or information point.

In theory, there are two types of warehouses: single-line stores and order-picking warehouses – but in reality, many warehouses combine these two activities.

Single-line stores are designed to store and retrieve identical units of the same type of good. For instance, a pallet of goods will be placed in storage, and the complete pallet will be retrieved again. Due to the great similarity of activities, single-line stores can be highly automated. Since movement processes are greatly simplified, space can be used very efficiently. The single-line store is also called a reserve warehouse if units are not sent directly to shipping but are placed in an order-picking warehouse instead. Reserve warehouses are used to store large volumes and units of goods for a relatively long time.

In general, small quantities and units of goods are stored for shorter periods in the order-picking warehouse. This warehouse area carries out movement processes that are used to consolidate or break down the flow of goods, the picking. This means the goods do not leave the storage area in the state in which they were stored. To keep the time required for manual picking to a minimum, efficient picking procedures and short transport routes must be considered in the organization of the order-picking warehouse. Order-picking warehouses also frequently rely on modern technologies such as pick-by-light and pick-by-voice , which not only make the order picker's job easier but also increase productivity and accuracy.

In the packing station, the picked order is consolidated into a unit for shipment, which can also involve a transfer to another internal station.

Shipping involves both the dispatch of goods to the recipient and delivery-related activities. This includes receipt of the goods from the packing station, set-up of interim storage sites that extend back to pick-up, arrangements for pick-up vehicles and loading. Transport-related processes are the primary job of shipping. Goods stay in shipping for lengthy transition periods only in extraordinary cases.

In addition, warehousing and means of conveyance used in the warehouse must be directed and coordinated. This is the job of the warehouse management, which forms the interface between the logistics subsystem warehouse and the logistics subsystem order processing [1].

Warehouse technology

Business trends have a strong impact on intralogistics , i.e., the material flow within a business operation and, thus, the technology associated with the warehouse. These trends include the accelerating pace of innovation, the increasing individual nature of customers' requirements, the growing diversity of product variations and the extreme volatility of the order inflow.

The main task of conveyor technology is to transport, store, pick and handle goods. Increasingly, discussions are centering on solutions that can combine all conveyor equipment and systems in an efficient way that uses a minimum amount of time. This will enable conveyor technology to be flexibly adapted to different types of shipped goods.

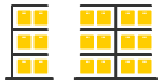
Ground conveyors are used today in many industries. Their flexibility allows them to be adjusted to the appropriate job with little effort. They are much easier to adapt to configuration changes or system expansion than automated conveyors [2].

But the basis for these systems remains the warehouse technology with its storage racks, means of conveyance and picking systems.

Storage racks

Products can be stored in all sorts of ways in modern warehouses. Key criteria that apply here are not only which product is to be stored but also how quickly it must be available again. Shelf-type racks and space-saving storage carousels are frequently used for such things as non-palletized small parts, while pallet-racking systems are particularly suited for large quantities of items.

Here, just like drive-in racks and drive-through racks , transport-related processes for storing heavy, bulky goods are used. A distinction is also drawn among drive-through racks that are primarily used for picking. Push-back racks are designed for infrequently needed products, and high-bay racks are frequently employed by industrial and retail companies [1].

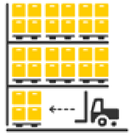


Rackings

Rackings are frequently used to store non-palletized goods, small parts or bulky items. Generally speaking, they are suited for storing small to medium quantities of goods involving a large number and wide array of items.

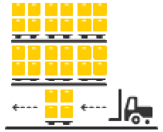
Pallet racks

Pallet racks store pallets or stillages. They are used to store small to large quantities involving a large number of goods or assortments of goods.



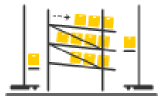
Drive-in racks

Drive-in racks are used to store large quantities involving a small number of heavy items. They are also suited for fragile goods and non-stackable load units.



Drive-through racks

Just like drive-in racks, drive-through racks are used to store large quantities involving a small number of heavy items - as well as fragile goods and non-stackable load units.

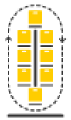


Flow-through racks

Flow-through racks are frequently used for picking in distribution warehouses. Medium quantities involving small and intermediate-range numbers of items are stored on the racks.

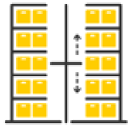
Push-back racks

Push-back racks are primarily used to store items that are infrequently needed. Special areas of use are archiving records, documents or electronic data carriers. Medium quantities involving intermediate-range and large numbers of items are stored in push-back racks. They are also frequently used in freezer warehouses.



Storage carousels

Storage carousels are frequently used for small-parts storage systems, replacement-parts storage, tool storage, pharmaceuticals storage or document storage. Small to medium quantities involving intermediate-range to large numbers of items are stored in storage carousels for picking purposes.



High-bay racks

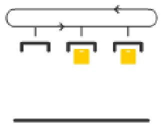
High-bay racks are most frequently found at industrial and retail companies. They store small to large quantities involving large numbers of items or assortments.

Storage racks

Source: Materialflusssysteme. Förder- und Lagertechnik I Hompel / Jünemann 2007

Means of conveyance

Various work-saving means of conveyance can be used to efficiently move products in the warehouse as well as to store and retrieve products. On one hand, these means of conveyance include permanently installed systems such as overhead conveyor systems , cranes , wheel conveyors and electric trolley conveyors . On the other hand, they encompass such unattached means of conveyance as forklift trucks , forklifts and automatic-guided transport systems . Special storage and retrieval equipment is also available. It simplifies warehousing and retrieval in things like pallet-rack, high-bay-rack or tank-rack storage.

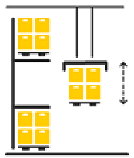


Overhead conveyor system

Overhead conveyor systems are frequently used in machinery and installation manufacture and in fashion warehouses. They transport items between production segments and can perform jobs in the manufacturing process as well - including cooling and drying. They can also be used as safety stocks.

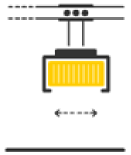
Wheel conveyor

Wheel conveyors are used widely because of their simple design, their robustness, and their low investment and operating costs. They are only suited for the transport of goods that have a solid, even surface. Otherwise, operations cannot be carried out smoothly. Wheel conveyors are frequently used at the front end of the warehouse, and in production for jobs related to the loading and unloading of road vehicles, rail cars, ships and airplanes.



Crane

Cranes are used to serve warehouses and to supply and dispose of equipment and facilities used in production. Typical tasks are warehouse operations and transport of goods.



Electric trolley conveyor

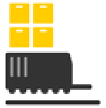
Electric trolley conveyors can be used in all areas of a company, from the receiving area, warehouse and picking area to shipping. Their main area of use is for short trips requiring little to mid-range throughput that can be covered quickly. They are frequently used in the electronic, textile and food industries as well as in vehicle-body assembly in the automotive industry.

Forklift trucks

Forklift trucks facilitate ground transport of horizontally stacked goods throughout a business operation. They are particularly suited for short trips and mid-range transport frequency. Favored areas of use are between workstations and in confined spaces - including the loading and unloading of containers, trucks and rail cars.

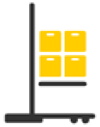
Forklifts

Forklifts combine the horizontal transport of goods with stacking jobs. They are used to move goods onto load-carrying devices like pallets, wire-mesh boxes or individual parts. Favored areas of use are storing and retrieving pallets in rack storage.



Operatorless transport system

Operatorless transport systems are frequently used to move large loads and trailing loads with a low to medium throughput over short to medium distances. In such facilities as production operations and product distribution centers, they are used in irregular horizontal and vertical transports in the areas of receiving, production, warehousing, the front end of the warehouse and shipping.



Storage and retrieval system

Storage and retrieval systems are used in pallet-rack, high-bay-rack or tank-rack warehouses to store and retrieve goods placed on load-carrying devices that have been standardized to the largest extent possible, including pallets, wire-mesh boxes and containers.

Means of conveyance

Source: Materialflusssysteme. Förder- und Lagertechnik I Hompel / Jünemann 2007

Picking systems

The question that arises especially in large warehouses is: Where is a specific item located among the maze of shelves? Modern order-picking systems assist stock pickers by showing them the location of the goods. The systems include the use of light signals (pick-by-light) or even information transmission by headset (pick-by-voice).

In this process, the information “Row 14, Position 2” is passed to the picker over the headset. As a result of this communication, the worker learns about the optimal path to the pick location and the pick list . He then identifies the storage shelf and parts of the EAN code for the items stored there, possibly including the code’s last two digits. If the item number matches, this system then informs the picker over the headset how many items need to be picked. The picker takes the goods from the shelf, checks the quantity and receives an “OK.” This procedure is repeated until the prescribed stack height is reached or an order is completely filled.

A new addition to this order-picking system is pick-by-vision . With this technology, the picker receives information through data goggles. This system is only in the prototype phase at the moment.

Picking list

The picking list is the traditional management and information instrument used in manual picking processes.

Pick-by-light

Pick-by-light is frequently used to pick fast-selling items. The system is especially useful to companies with small product quantities.

Pick-by-voice

Pick-by-voice is primarily used for picking. The system is also useful in quality control as well as in packing and shipping - e.g., for communicating the carton size to be used. These systems are well suited for those areas where workers need to be able to use both hands for picking purpose due to safety concerns.

Pick-by-vision

Pick-by-vision is only a research prototype at the moment. Application areas are picking of fast- and slow-selling items. The system is an alternative to pick-by-voice and pick-by-light.

Picking systems

Recommended reading

Integrierte Materialwirtschaft und Logistik I Wannenwetsch 2004

World-Class Warehousing and Materials Handling I Frazelle 2002

Warehouse Management: Automation and Organisation of Warehouse and Order Picking Systems I ten Hompel / Schmidt 2006

References

[1] Logistiksysteme I Pfohl 2004

[2] Die Fördertechnik I Günthner / Boppert 2004. In: Entwicklungspfade und Meilensteine moderner Logistik I Prockl / Bauer / Pflaum / Müller-Steinfahrt (Hrsg.)

URL

http://www.dhl-discoverlogistics.com/cms/en/course/tasks_functions/warehouse/stations.jsp

LECTURE V – WAREHOUSING AT THE ENTERPRISES

5.3. Connection of procurement and warehousing

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LECTURE V – WAREHOUSING AT THE ENTERPRISES

3. Connection of procurement and warehousing

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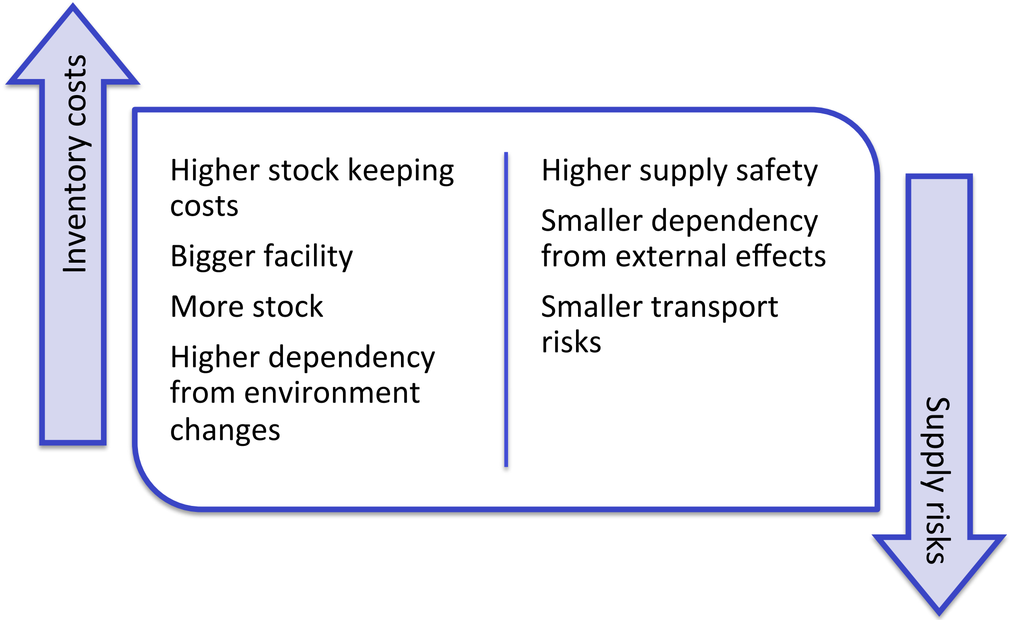
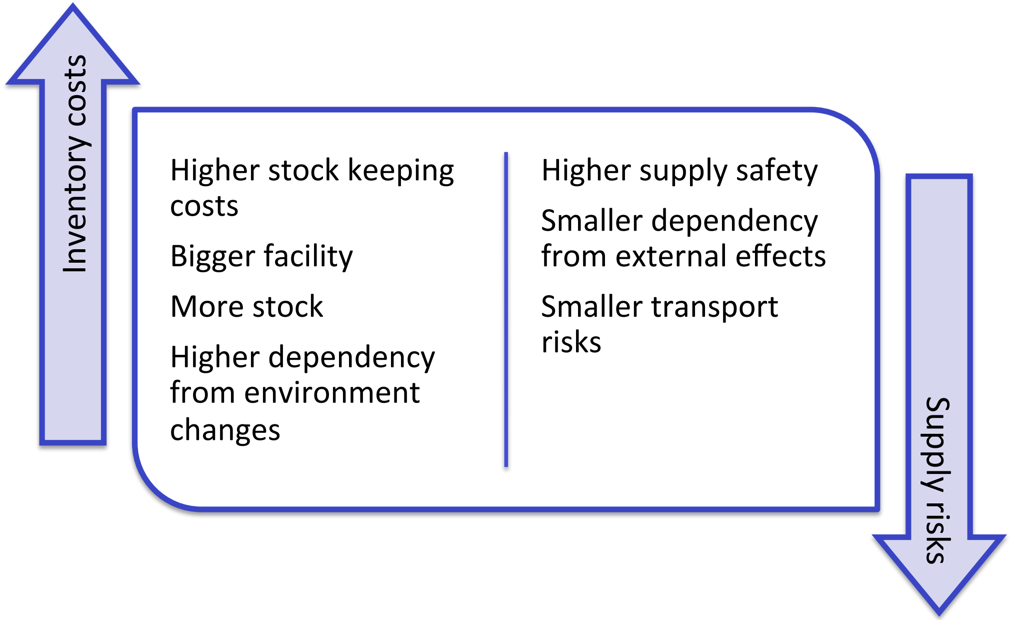
Risks and costs of raw material warehousing



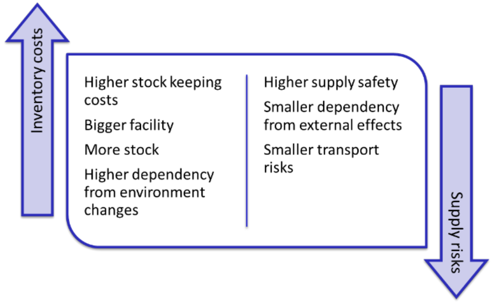
Risks and costs of finished goods warehousing



5.3. Connection of procurement and warehousing

The warehousing and stock keeping results seamless material flow in any stages and routes in business logistics, but the resulted safety takes several expenses.

Results of using warehousing in business logistics



Risks and costs of raw material warehousing:

Higher inventory costs through:

– higher stock keeping costs,

– bigger facility requirements,

– more stock on hand,

– higher dependency from customer market changes.

but results smaller supply risks because of:

– higher supply safety,

– smaller dependency from external effects

– smaller transport risks

Risks and costs at finished goods warehousing:

Same higher inventory costs:

– Higher stock keeping costs

– Bigger facility

– More stock

– Higher dependency from customer market changes

Smaller risks in delivery:

– Higher **delivery readiness**

– **Faster delivery lead-time, shorter sales cycle**

– Smaller dependency from slower production processes

– Smaller risks because of problems in production processes, like machine breakdowns, malfunctions, input material leaks.

Lecture 6

LECTURE VI – INVENTORY MANAGEMENT

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LECTURE VI – INVENTORY MANAGEMENT

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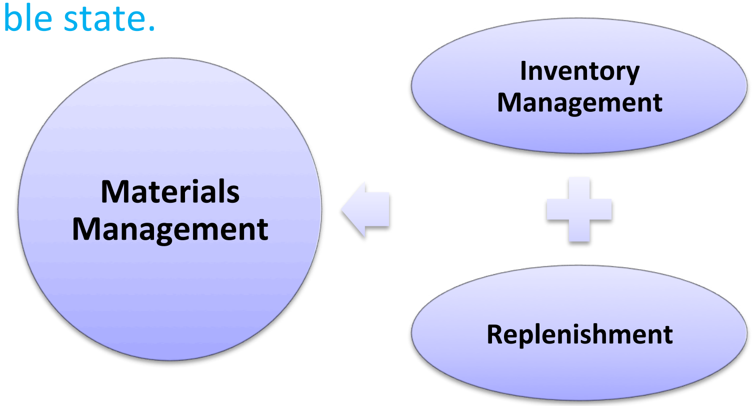
Inventory management and the Inventory system

Inventory in economical approach: a physical resource that a firm holds in stock with the intent of selling it or transforming it into a more valuable state.



Inventory System: methods and controls to manage the inventory size and the replenishment quantites.

Reasons and cons for inventories

Inventory costs:
Higher risks of inventory obsolence
Changed customer orders results remaining stocks
Heavy cash-flow

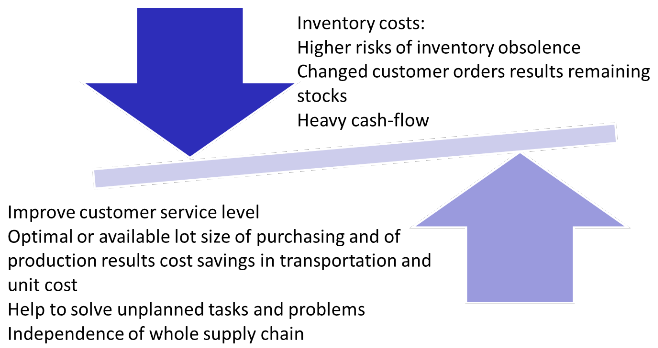
Improve customer service level
Optimal or available lot size of purchasing and of production results cost savings in transportation and unit cost
Help to solve unplanned tasks and problems
Independence of whole supply chain

Introduction to the Inventory management

Inventory in economical approach: a physical resource that a firm holds in stock with the intent of selling it or transforming it into a more valuable state.

Inventory System: methods and controls to manage the inventory size and the replenishment quantities.

Reasons and cons for inventories



– Inventory costs:

- – Higher risks of inventory obsolesce
- – Changed customer orders results remaining stocks
- – Heavy cash-flow

Benefits of inventories:

– Improve customer service level

– Optimal or available lot size of purchasing and of production results cost savings in transportation and unit cost

– Help to solve unplanned tasks and problems

– Independence of whole supply chain

LECTURE VI – INVENTORY MANAGEMENT

6.1. Inventory types

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LECTURE VI – INVENTORY MANAGEMENT

1. Inventory types

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Inventory types at the enterprises

- Trading goods
- Inventories of production:

- Maintenance, Repair and Operating (MRO) materials

Functional types of Inventory

- Buffer stock: short term safety stock or stocks at temporary storage zones
- Transit stock: moving stock in external transportation
- Seasonal stocks: prepared or remaining because of seasonal consumption effects
- Speculative stocks: keeping or purchasing for market position and price influence
- Lot Sizing or Cycle stocks
- Locked stocks of finished products: need to be repaired before delivering to the customers

6.1. Inventory types

Inventory types at the enterprises

– Trading goods

– Inventories of production:

  – Raw Materials

  – Works-in-Process Inventory (WIP)

  – Semi-finished goods

  – Finished Goods

– Maintenance, Repair and Operating (MRO) materials

Functional types of Inventory

– Buffer stock: short term safety stock or stocks at temporary storage zones

– Transit stock: moving stock in external transportation

– Seasonal stocks: prepared or remaining because of seasonal consumption effects

– Speculative stocks: keeping or purchasing for market position and price influence

– Lot Sizing or Cycle stocks

– Locked stocks of finished products: need to be repaired before delivering to the customers

LECTURE VI – INVENTORY MANAGEMENT

6.2. Inventory models

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LECTURE VI – INVENTORY MANAGEMENT

2. Inventory models

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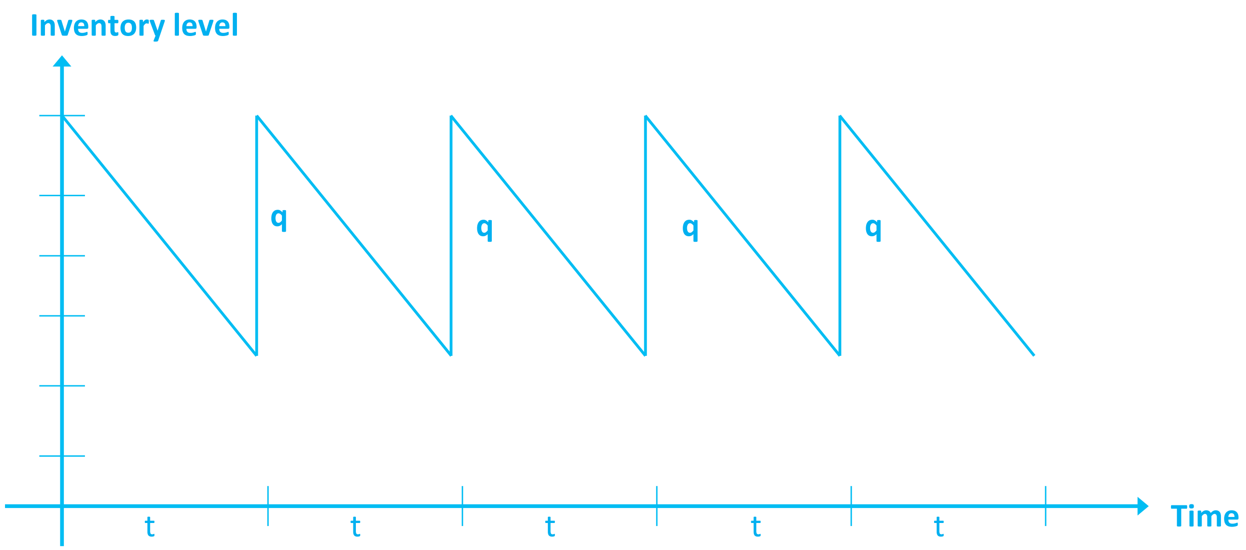
Sawtooth model – Constant Replenishment Inventory modell



Constant Periodical Replenishment Inventory Model

Standard model for replenishment of inventory at constant consumption level

Characteristics:

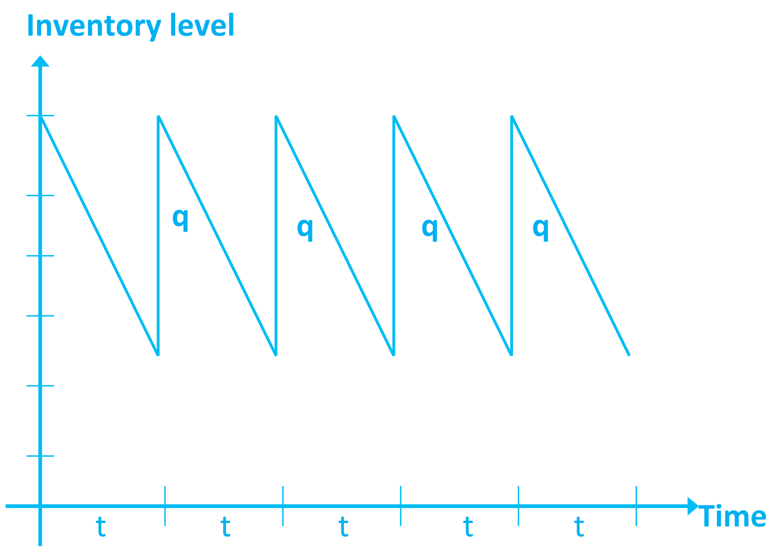
- Constant consumption!
- Constant order quantity
- Equal replenishment intervals

Benefits:

- inventory level tracking is not required

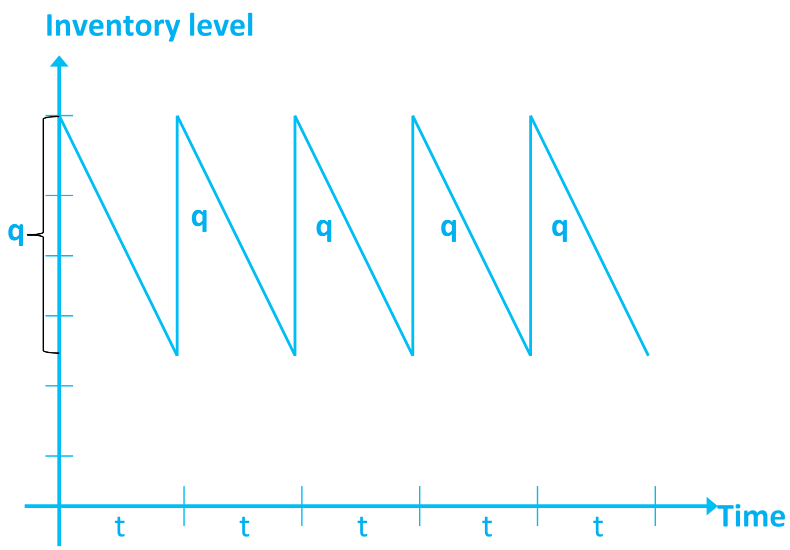
Disadvantages!

- ***Constant, unflexible in case of changing cosumption***
- ***Do not follow the consumption***



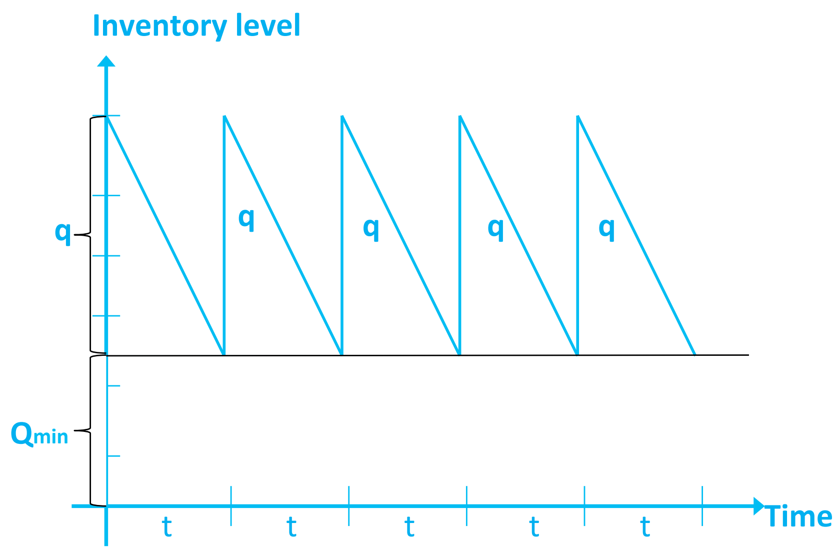
Constant Periodical Replenishment Inventory Model

Parameters:
q=equal order quantity



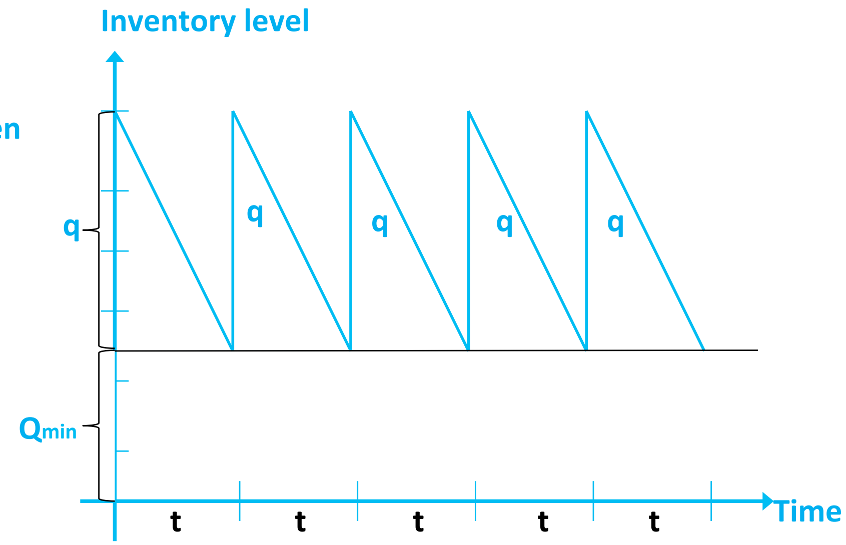
Constant Periodical Replenishment Inventory Model

Parameters:
q=equal order quantity
Qmin=safety inventory level



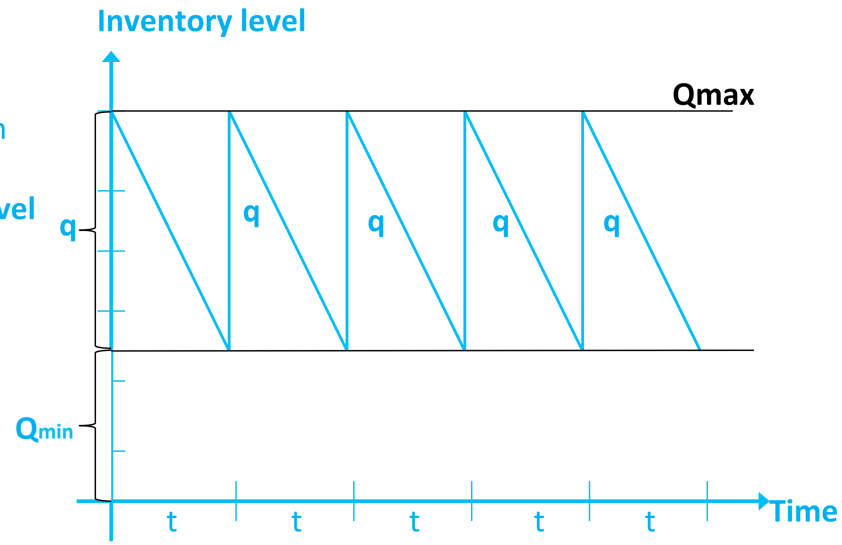
Constant Periodical Replenishment Inventory Model

Parameters:
Qmin=safety inventory level
q=equal order quantity
t=equal time intervals between replenishment



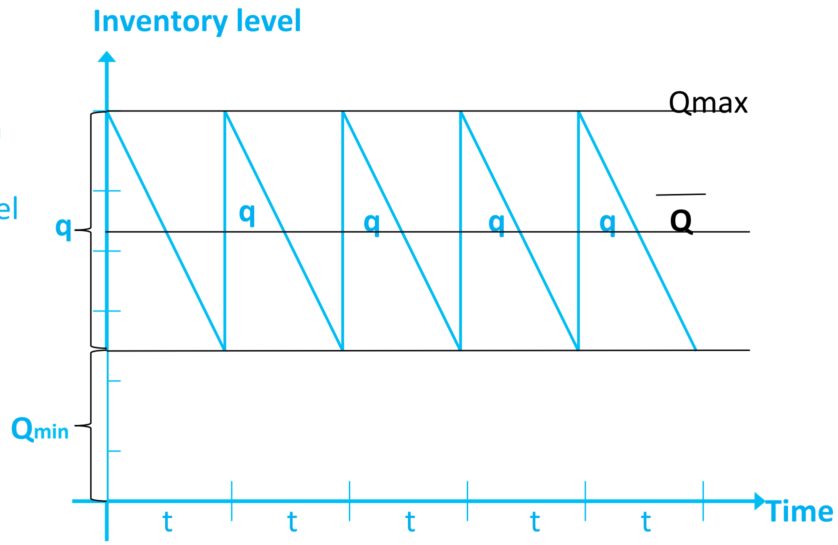
Constant Periodical Replenishment Inventory Model

Parameters:
Qmin=safety inventory level
q=equal order quantity
t=equal time intervals between replenishment
Qmax=maximum inventory level reached at these parameters



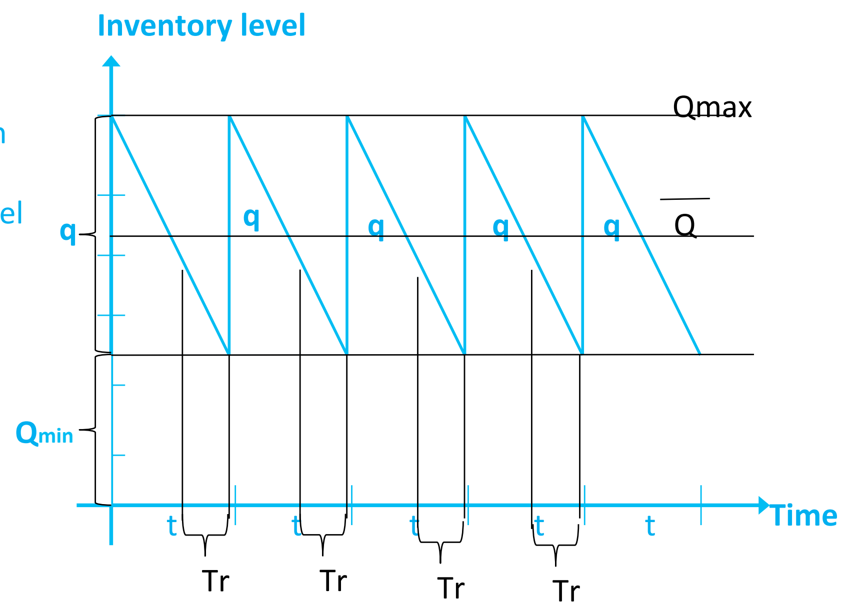
Constant Periodical Replenishment Inventory Model

Parameters:
Qmin=safety inventory level
q=equal order quantity
t=equal time intervals between replenishment
Qmax=maximum inventory level reached at these parameters
$\overline{Q}$=inventory level mean value depending on Qmin and on q.



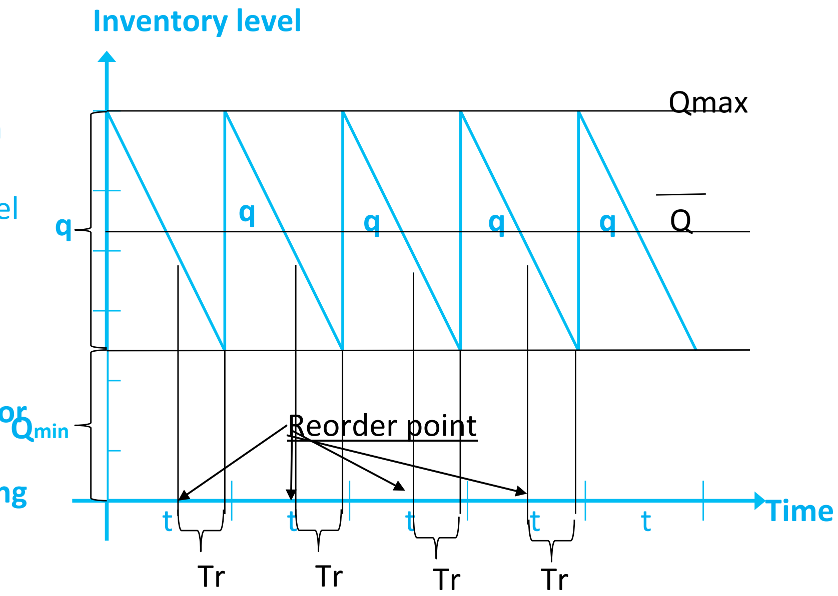
Constant Periodical Replenishment Inventory Model

Parameters:
Qmin=safety inventory level
q=equal order quantity
t=equal time intervals between replenishment
Qmax=maximum inventory level reached at these parameters
$\overline{Q}$=inventory level mean value depending on Qmin and on q.
Tr=order shipping lead time



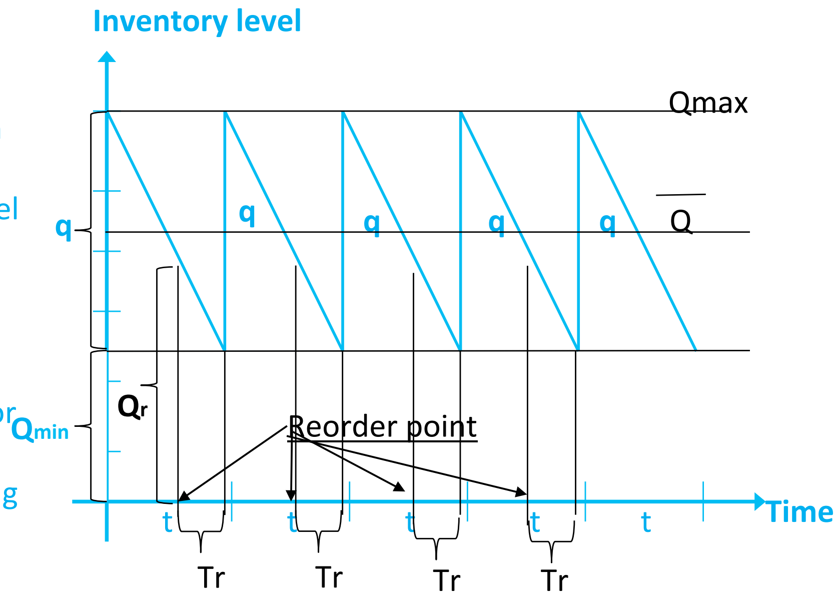
Constant Periodical Replenishment Inventory Model

Parameters:
Qmin=safety inventory level
q=equal order quantity
t=equal time intervals between replenishment
Qmax=maximum inventory level reached at these parameters
$\bar{Q}$=inventory level mean value depending on Qmin and on q.
Tr=order shipping lead time
Reorder points: last deadline for reordering to get the replenishment in time according to the interval t.



Constant Periodical Replenishment Inventory Model

Parameters:
Q_{min}=safety inventory level
q=equal order quantity
t=equal time intervals between replenishment
Q_{max}=maximum inventory level reached at these parameters
$\overline{Q}$=inventory level mean value depending on Q_{min} and on q.
Tr=order shipping lead time
Reorder points: last deadline for reordering to get the replenishment in time according to the interval t.
Q_r=Inventory at reorder point



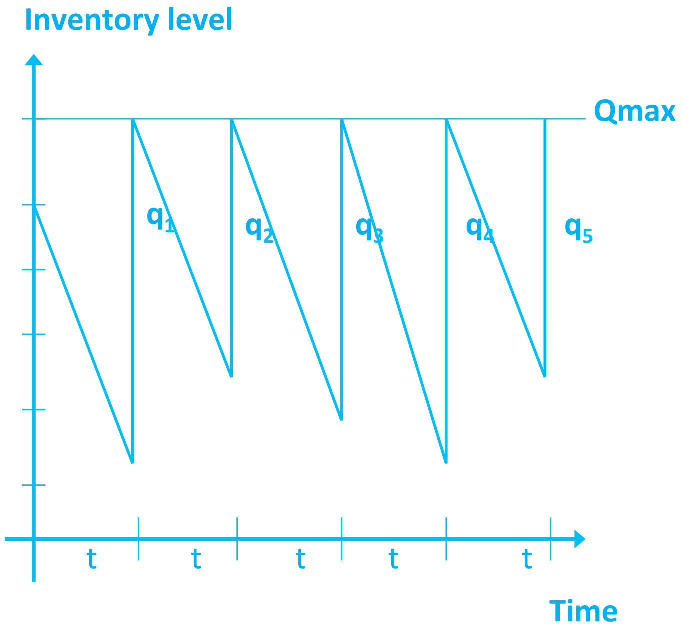
Problems

Constant model is nice but unavailable in real World!
Consumption intensity is generally changing (very fast)!
Suppliers can specify the replenishment interval.
Fixed transaction cost of the replenishment can be high
Inventory costs can be high according to the purchased unit price in the stock and the mean value of the inventory level according to the safety stock.

→We should use flexible inventory models.

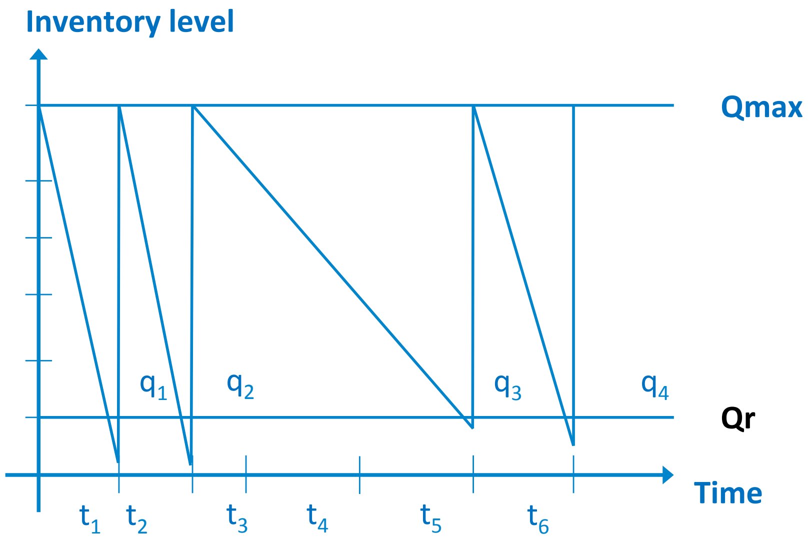
Cyclic inventory model

Reorder to the maximum inventory level (Qmax)
Parameters:
qi=periodically reordered quantity calculated based on the current consumption
t=equal replenishment intervals
Requires inventory level tracking!
Use at constant replenishment periods specified by the supplier!



Mitigated model

Reorder to the Qmax maximum inventory level if the inventory level reaches the **Qr** reorder inventory level
Characteristics:
Requires strickt inventory level tracking
Inventory can run out if consumption intensity changes after reaching the reorder point!
Use at high fixed replenishment transaction costs!



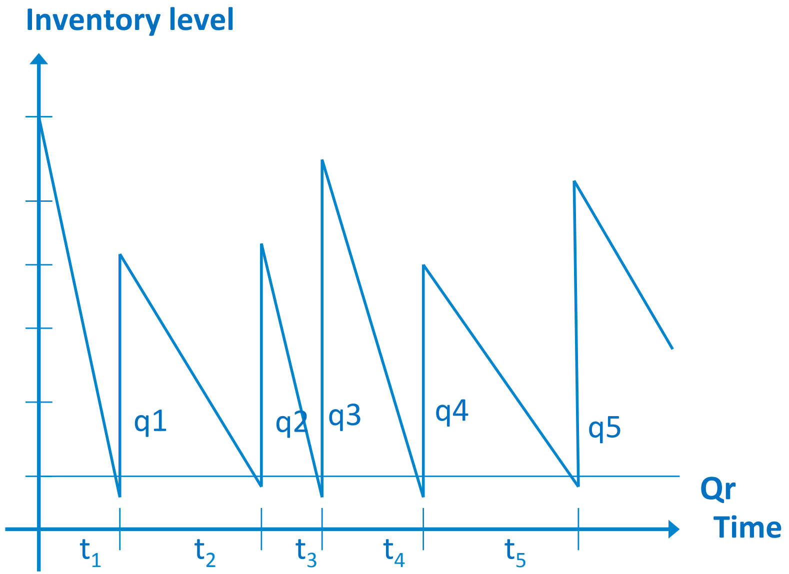
Double-store inventory model

Reorder at reaching **Qr** level.

Parameters:
qi=actual reordered quantity
ti=actual replenishment interval

Requires inventory level tracking

Result of MRP1 and consuption based planning.



Summary of major inventory models

Major Inventory Models		Ordered Quantity	
		Constant quantity	Variable quantity
Order period	Constant interval	Constant Replenishment model	Cyclic model
	Variable interval	Mitigated model	Double-store model

6.2. Inventory models

Saw tooth model – Constant Replenishment Inventory model

Constant Periodical Replenishment Inventory Model

Standard model for replenishment of inventory at constant consumption level

Characteristics:

– Constant consumption!

– Constant order quantity

– Equal replenishment intervals

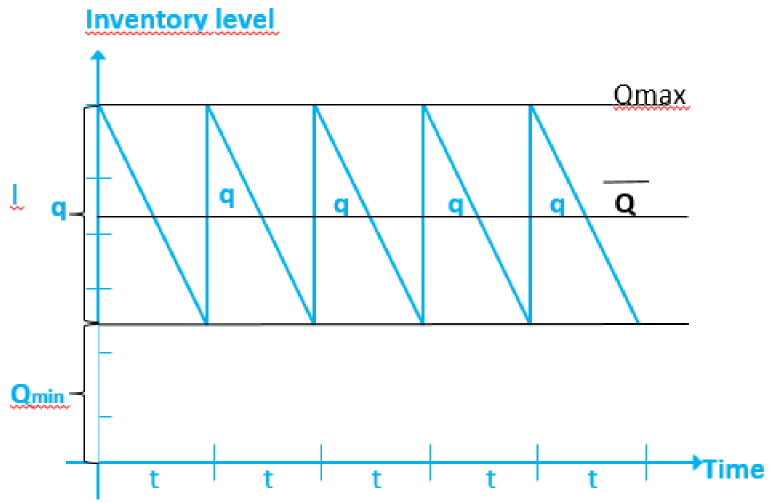
Benefits:
– inventory level tracking is not required

Disadvantages!

– Constant, inflexible in case of changing consumption

– Do not follow the consumption

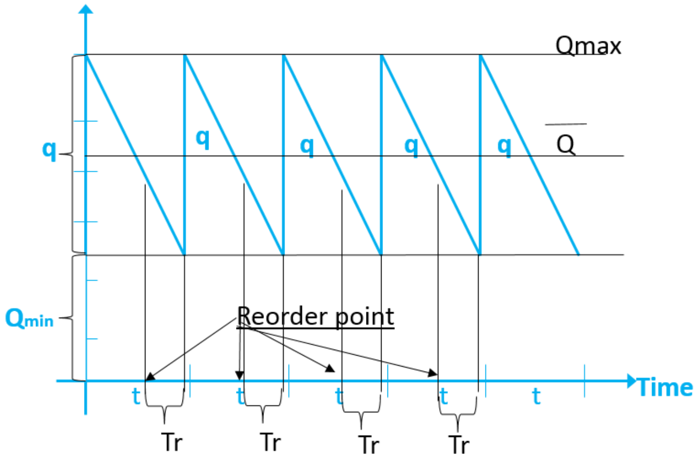
Constant Periodical Replenishment Inventory Model



Parameters:

Qmin=	safety inventory level (or Safety Stock, SS in short)
q=	equal order quantity
t=	equal time intervals between replenishment
Qmax=	maximum inventory level reached at these parameters
Q=	inventory level mean value depending on Qmin and on q.

An important point of an inventory model: **Reorder points**, the last deadline for reordering to get the replenishment in time according to the interval t.
Tr=order shipping lead time
Qr=Inventory at reorder point



Problems:

Constant model is nice but unavailable in real World!

Consumption intensity is generally changing (very fast)!

Suppliers can specify the replenishment interval.

Fixed transaction cost of the replenishment can be high

Inventory costs can be high according to the purchased unit price in the stock and the mean value of the inventory level according to the safety stock.

Therefore we should use flexible inventory models.

Types of major inventory models

Major Inventory Models		Ordered Quantity	
		Constant quantity	**Variable quantity**
Order period	**Constant interval**	Constant Replenishment model	Cyclic model
	Variable interval	Mitigated model	Double-store model

Cyclic inventory model

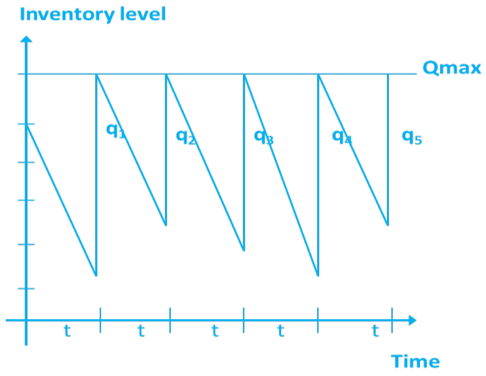
Reorder to the maximum inventory level (Qmax)

Parameters: qi=periodically reordered quantity calculated based on the current consumption

t=equal replenishment intervals

Requires inventory level tracking!

Use at constant replenishment periods specified by the supplier!



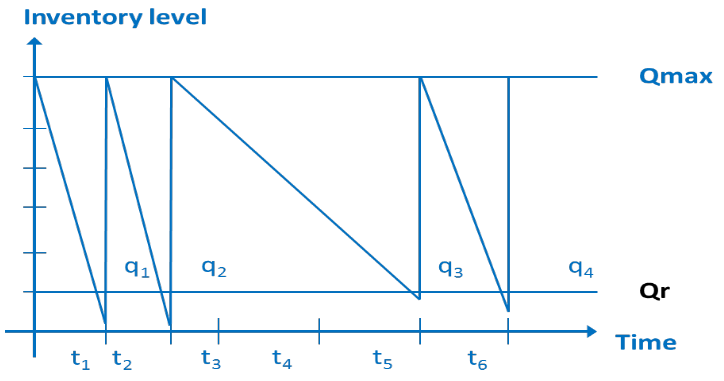
Mitigated model

Reorder to the Qmax maximum inventory level if the inventory level reaches the Qr reorder inventory level Characteristics:

Requires continuous inventory level tracking

Inventory can run out if consumption intensity changes after reaching the reorder point!

Use at high fixed replenishment transaction costs!



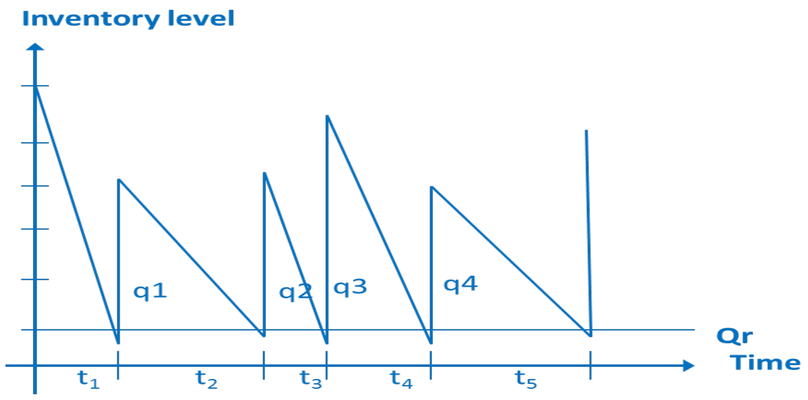
Double-store inventory model

Reorder at reaching **Qr** level.

Parameters: qi=actual reordered quantity ti=actual replenishment interval

Requires inventory level tracking

Result of MRP1 and consumption based planning.



LECTURE VI – INVENTORY MANAGEMENT

6.3. Inventory optimisation methods

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LECTURE VI – INVENTORY MANAGEMENT

3. Inventory optimisation methods

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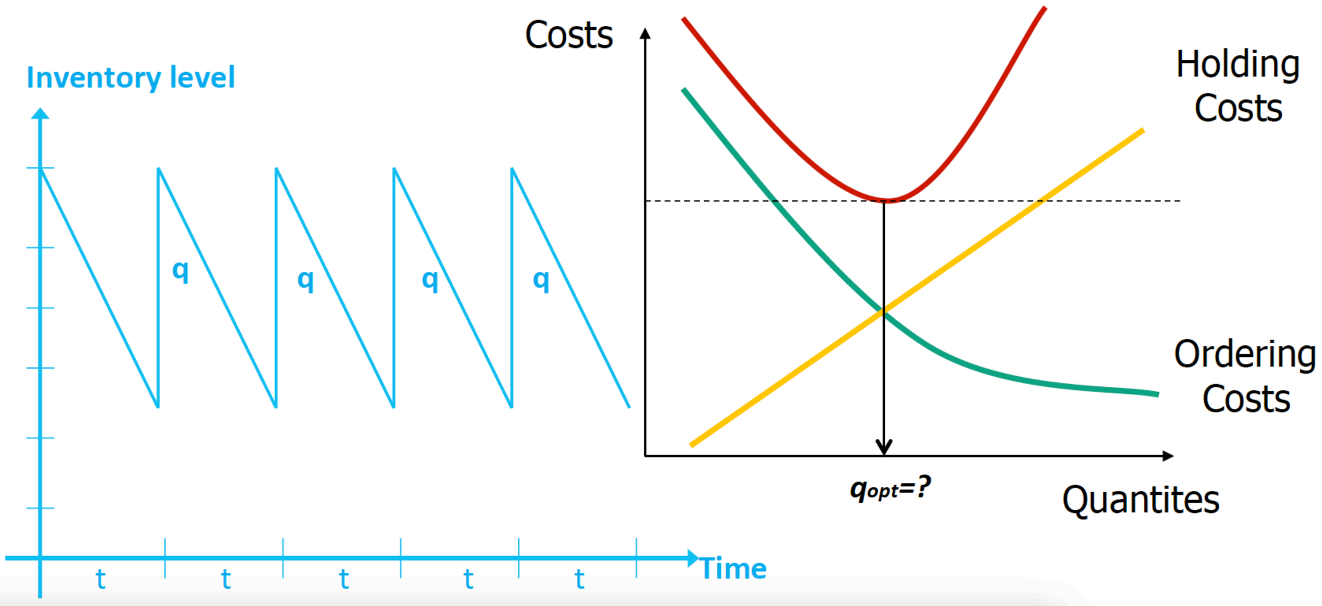
Marginal Analysis of parameters of inventory model (t, q)



Economic Order Quantity Model

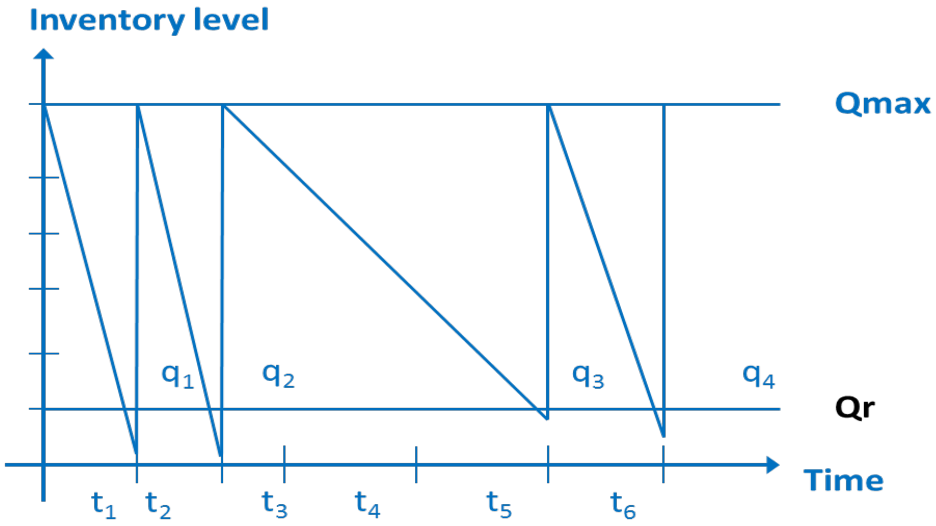
Characteristics (Constraints):
Deterministic model as the parameters are constant

- Requirement is constant
- Replenishment intervals are constant
- Reorder quantity is constant

Cost function: $C = C_S + C_T \rightarrow \min$
Where: C_T = Total tranzactional cost (like fixed transportation costs, administration costs)
C_S = Total storage costs

Optimization is related to a planning horizon.

Use at high fixed replenishment transaction costs!



Double-store inventory model

Example

Total (=Q)	6 000, pcs					
Average Req	300, db					
Transaction cost		100000,00	€	T=20 weeks		
Specific storage cost		50,00	€/SKU/week	qopt	n	topt
Results:				1 095,45 pcs	5,48 pcs	3,65 week
Safety stock level		200, pcs				
Qmax		1 295,45 pcs				
Qavg		647,72 pcs				

Enhanced Efficient Order Quantity Model: EOQM extended with inventory costs

Procurement costs
- Order processing
- Shipping
- Handling

Carrying Costs
- Capital (opportunity) costs
- Inventory risk costs
- Space costs
- Inventory service costs

Out-of-Stock Costs
- Lost sales revenue
- Back-order cost

ABC Classification of Inventory Items

A Items: very tight control, complete and accurate records, frequent review

B Items: less tightly controlled, good records, regular review

C Items: simplest controls possible, minimal records, large inventories, periodic review and reorder

Example

Material ID	Annual consumption	Unit cost	Annual value
1	1300	3,2	4160
2	250	4,1	1025
3	2400	0,6	1440
4	6000	0,36	2160
5	240	21,1	5064
6	480	6,05	2904
7	1080	3,95	4266
8	620	41,6	25792
9	800	14,8	11840
10	120	48,4	5808
Total		100%	64459

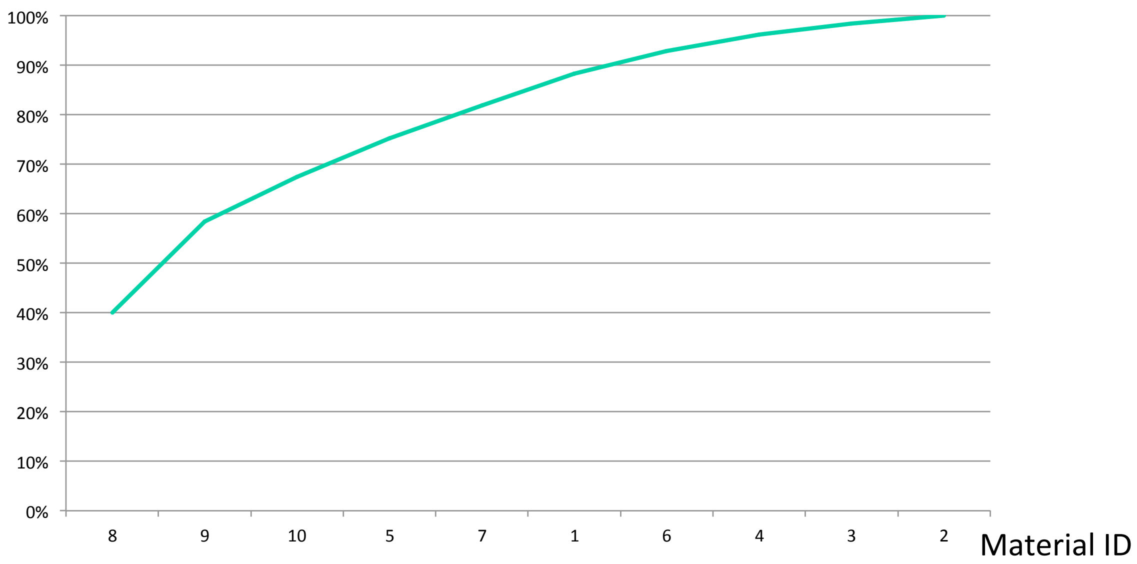
Example after sorting

Material ID	Annual consumption	Unit cost	Annual value
8	620	41,6	25792
9	800	14,8	11840
10	120	48,4	5808
5	240	21,1	5064
7	1080	3,95	4266
1	1300	3,2	4160
6	480	6,05	2904
4	6000	0,36	2160
3	2400	0,6	1440
2	250	4,1	1025
Total		100%	64459

Example with the cumulated and relative values

Material ID	Annual consumption	Unit cost	Annual value	Cumulated value	Relative annual value
8	620	41,6	25792	25792	40%
9	800	14,8	11840	37632	58%
10	120	48,4	5808	43440	67%
5	240	21,1	5064	48504	75%
7	1080	3,95	4266	52770	82%
1	1300	3,2	4160	56930	88%
6	480	6,05	2904	59834	93%
4	6000	0,36	2160	61994	96%
3	2400	0,6	1440	63434	98%
2	250	4,1	1025	64459	100%
Total		100%	64459		

Result of ABC order based on total value of consuption of materials



Basic questions and answers

High value of product: JIT or consumption based replenishment

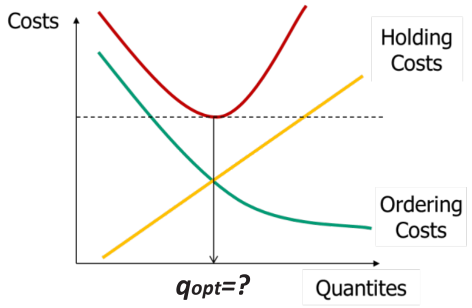
High administration costs: fill up to the maximum level.

High stock-keeping costs with high demand for supply safety: consumpltion-based replenishment

6.3. Inventory optimization methods

Marginal Analysis of parameters of inventory model (t, q)

Economic Order Quantity Model



Characteristics (Constraints):

Deterministic model as the parameters are constant:

– Requirement is constant

– Replenishment intervals are constant

– Reorder quantity is constant

Cost function: $C = C_S + C_T \rightarrow \min$

$$C_S = \frac{q}{2} \cdot T \cdot c_S$$

$$C_T = \frac{Q}{q} \cdot c_T$$

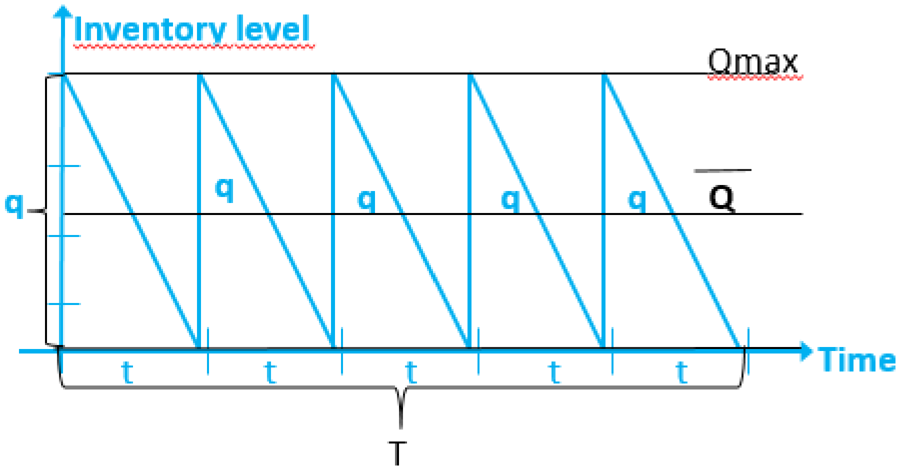
Where: C_T = Total transactional cost (like fixed transportation costs, administration costs)

C_S = Total storage costs

Optimization is related to a planning horizon.

Input parameters:

- c_t = specific transaction cost: cost/transaction.
- c_S = specific storage cost: cost/SKU/time unit
- T = Length of the Planning Horizon
- Q = Total consumption planned in T



$$q_{opt} = \sqrt{\frac{2 \cdot Q \cdot c_T}{c_S \cdot T}}$$

$$n = \frac{Q}{q_{opt}} = \frac{T}{t_{opt}}$$

Example

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– Space costs

– Inventory service costs

Out-of-Stock Costs

– Lost sales revenue

– Back-order cost

ABC Classification of Inventory Items

ABC classification classifies the things based on their significant features into three groups signed with A, B, C. The basic principle is that only a few things are significant based on the examined feature. In logistics, we can use for several material classification to identify the smaller group of materials, which is most significant for example for the turnover, for the annual income. For this A class group we choose the best and most suitable strategy in case of placement in warehouse or in case of procurement or customer service level. But we can analyze the customers on this way, as well. The result can be drawed into Pareto Chart.

A Class Items (20%): very tight control, complete and accurate records, frequent review.

B Class Items (40%): less tightly controlled, good records, regular review.

C Class Items (40%): simplest controls are enough, minimal records, large inventories, periodic review and reorder with the least labor work allocation. (We will not spend a lot of time with these items, because they are least significant for performance or for income or for profit.)

Example

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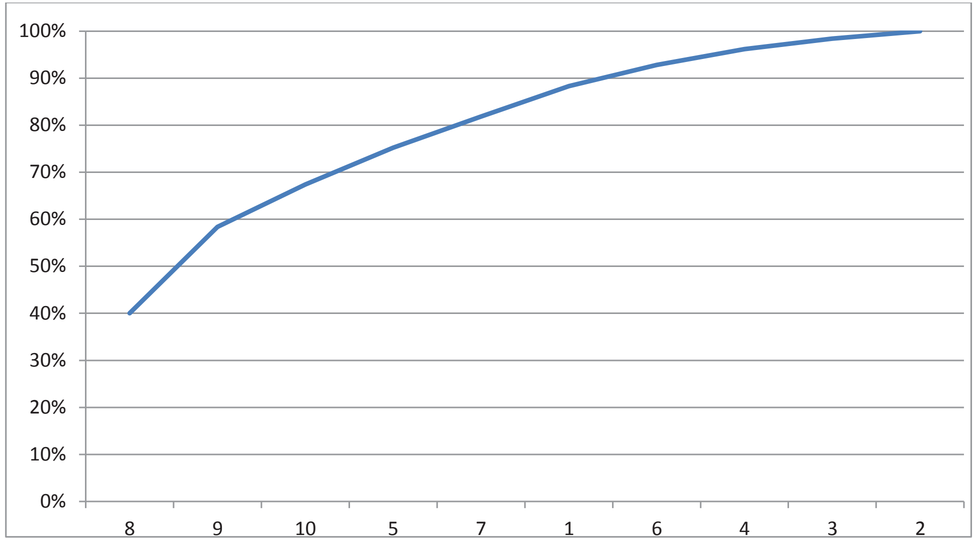

Basic questions and answers

High value of product: JIT or consumption based replenishment.

High administration costs: fill up to the maximum level.

Lecture 7

LECTURE VII – DISTRIBUTION PROCESSES

7.1. Role and questions of the distribution logistics

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LECTURE VII – DISTRIBUTION PROCESSES

1. Role and questions of the distribution logistics

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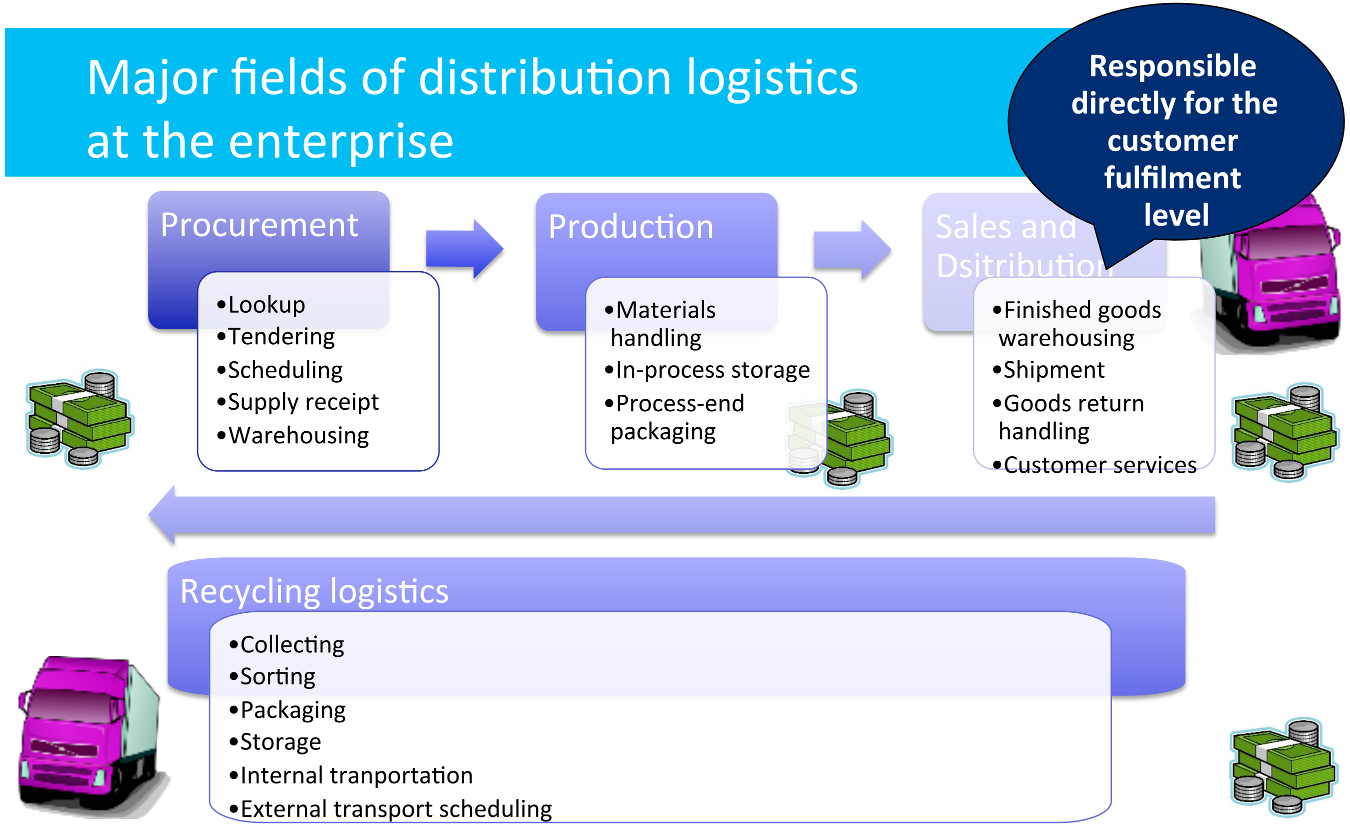
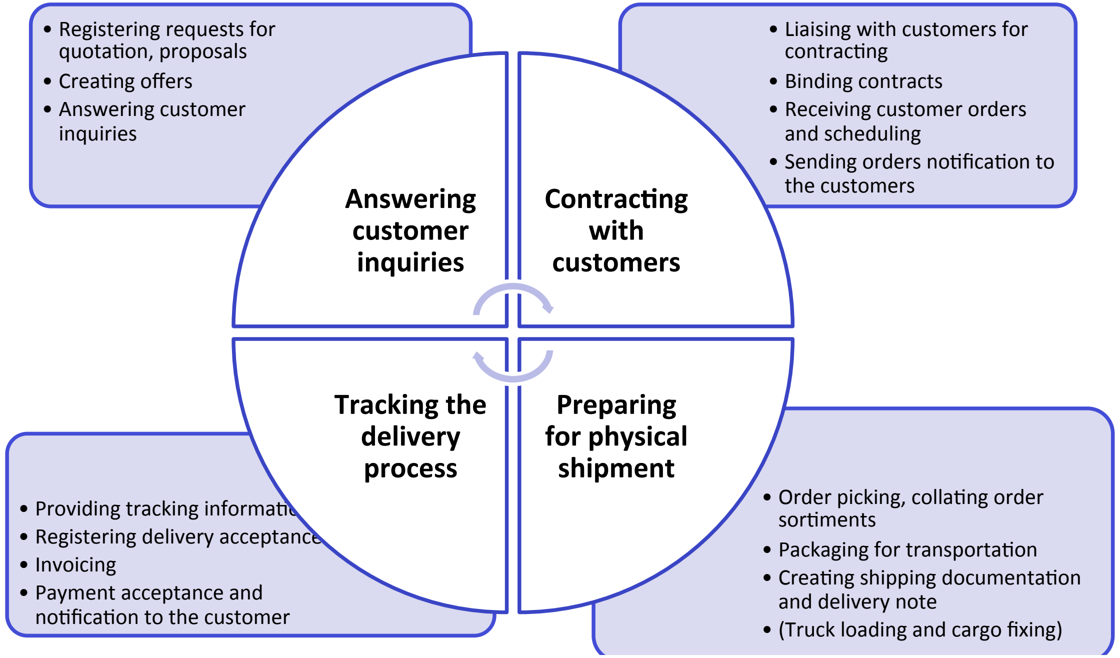

Major fields of distribution logistics at the enterprise
Responsible directly for the customer fulfilment level
Procurement
•Lookup
•Tendering
•Scheduling
•Supply receipt
•Warehousing
Production
•Materials handling
•In-process storage
•Process-end packaging
Sales and Dsitribution
•Finished goods warehousing
•Shipment
•Goods return handling
•Customer services
Recycling logistics
•Collecting
•Sorting
•Packaging
•Storage
•Internal tranportation
•External transport scheduling

Standard customer fulfilment process at the enterprise



Additional customer service activities

- Transport vehicle selection
- Route management and optimization
- Complaint management:
  - Returning goods handling, replacement of faulty goods:
    1. Receiving goods return orders
    2. Managing goods return transfer
    3. Replacement delivery of faulty delivery
    4. Creating related documents:
       - Managing inventory and G/L accounting
       - Correcting invoices
  - Warranty services

Customer Relationship Management

Integrated customer-oriented network based computer application system
Connected to or integrated into the Enterprise Resource Planning system

Target: maximum customer satisfaction at maximum profit

- optimization of customer fulfilment and related business processes
- increasing the efficiency of the organization
- manage processes with network based computer application

Integrated CRM components:

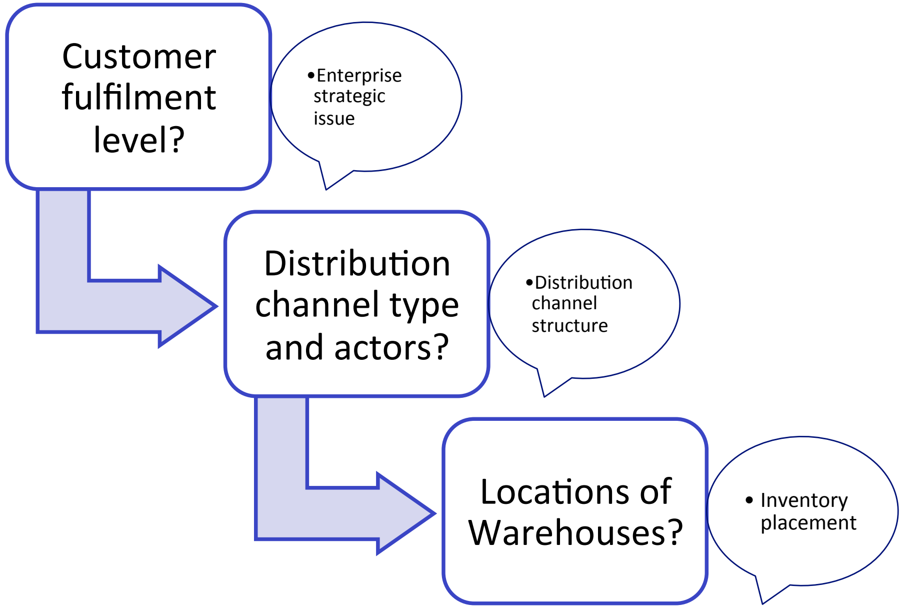
Collaborative CRM: IT tools more than allow cutomers to contact with the company

- Support to manage and simplfy the liaison with the customers
- Help to recognize the customer requirements

Analytical CRM: process and analyse the customer requirements and cooperation

Operative: automate the customer fulfilment processes in scope of sales process, customer services and complaint management.

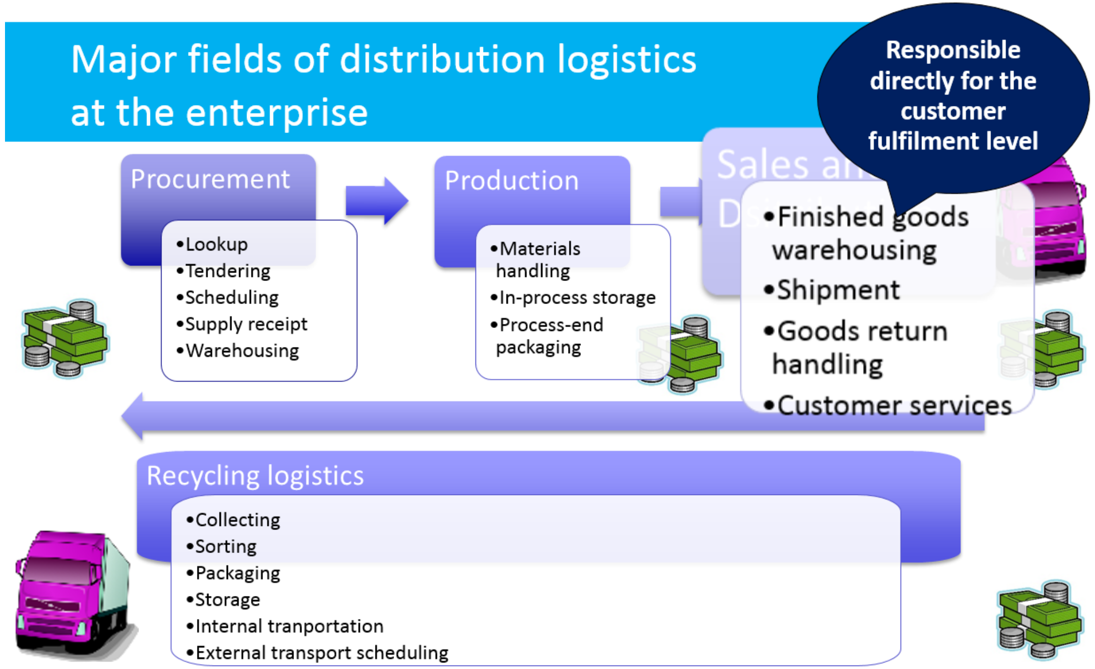
Issues of distribution of enterprise products



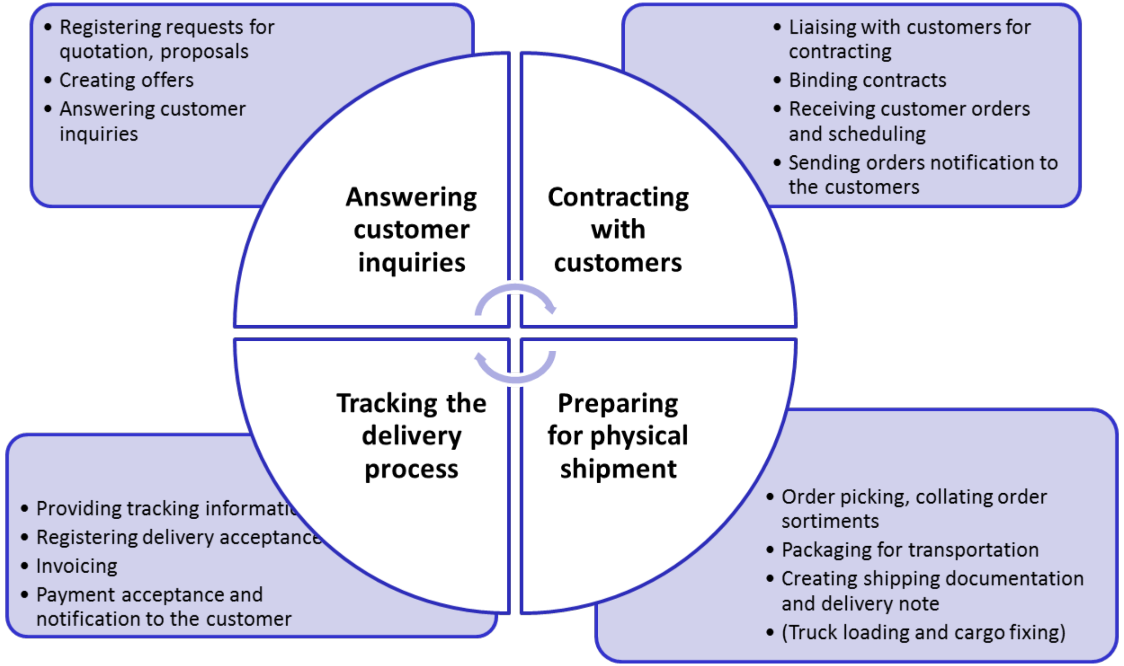
7.1. Role and questions of the distribution logistics

The distribution logistics is responsible directly for the customer fulfilment level in the business processes, therefore the activities have to plan and executed in strict co-operation with the customers.

Major fields of distribution logistics at the enterprise



Standard customer fulfilment process at the enterprise



Additional customer service activities

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– Route management and optimization

– Complaint management:

  – Returning goods handling, replacement of faulty goods:

    – Receiving goods return orders

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Customer Relationship Management Systems

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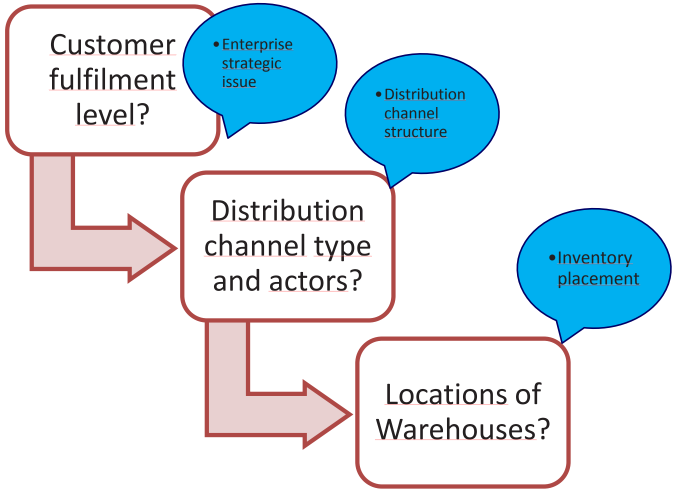

LECTURE VII – DISTRIBUTION PROCESSES

7.2. Distribuzion channels and logistic features

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LECTURE VII – DISTRIBUTION PROCESSES

2. Distribution channels and logistic features

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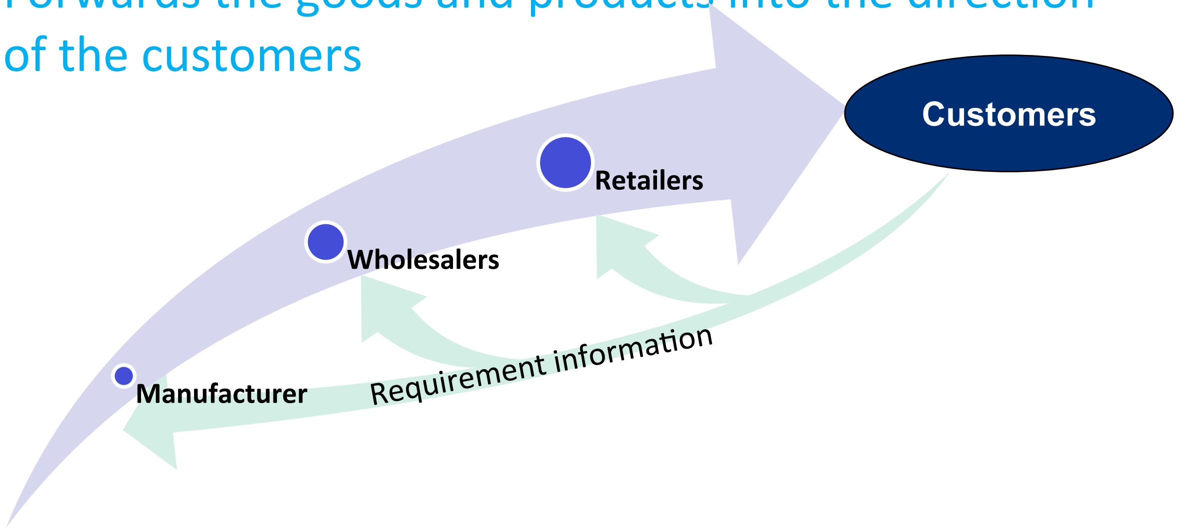
Role of distribution over the enterprise

- Collect the requirement information
- Forwards the goods and products into the direction of the customers



Distribution channel and its actors

DISTRIBUTION CHANNELS

Organizations co-operating in product and service forwarding to the customers for profit.

Primary channel actors

own the products and goods temporarely in the distribution process undertaking the financial risk of stock-keeping in vertical co-operation for profit

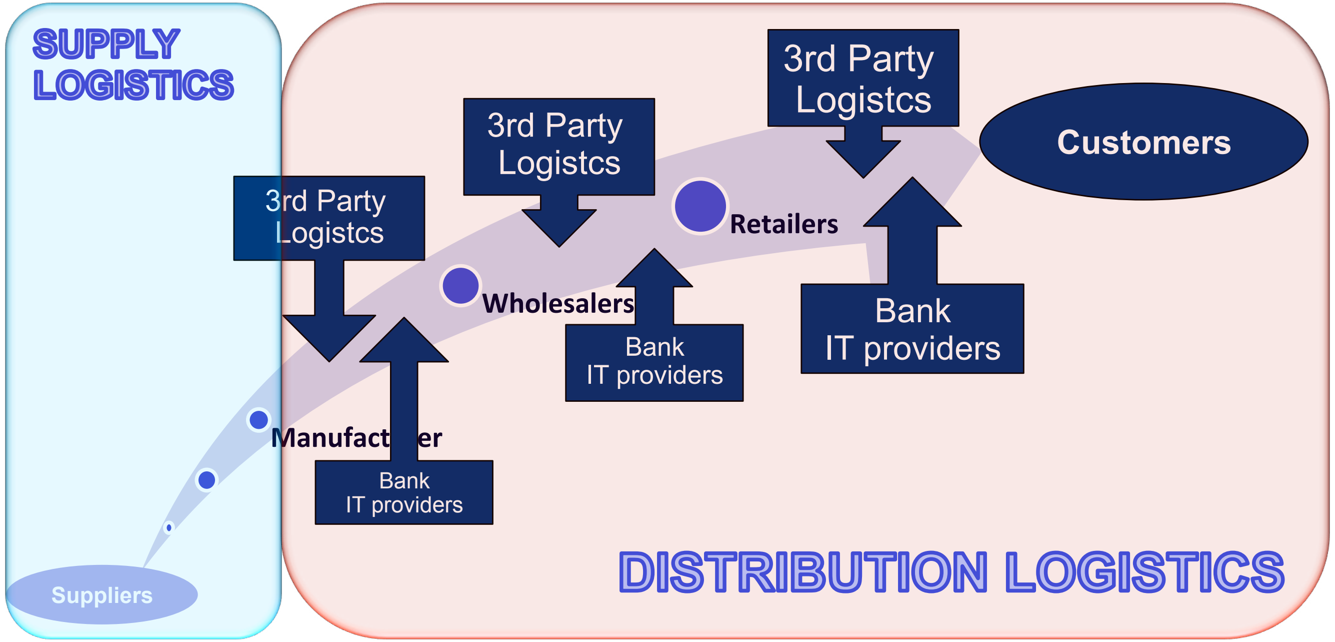
- Wholesalers
- Retailers

Secondary channel actors

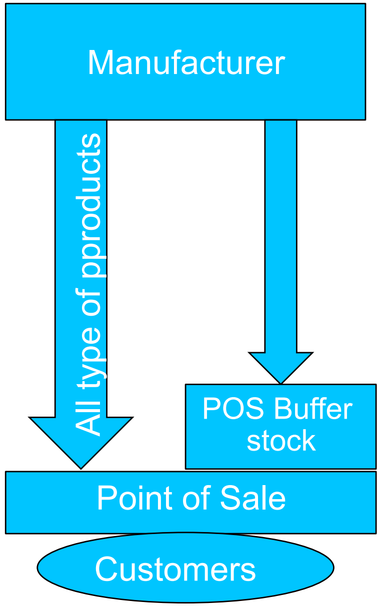
- Financial institutions
- 3rd Party Logistics
- IT service providers

special organizations providing special services required by the distribution processes. They do not own the stocks and undertake the risk only for keeping the values

Role of distribution over the enterprise



Distribution types: direct distribution



Direct distribution

Manufacturers delivery products directly from its central warehouse of production organization without any primary distribution channel actor.

Warehouses are

- On-premise finished goods warehouse
- Buffer stock at the Point of Sale

Results less inventory stages with less costs
Whole product sortiment of the manufacturer is available

Point of Sale could be the **webshop** of the manufacturer.

Distributon type: indirect distribution

Resons for indirect distribution:

- Long distance between manufacturer and its customers
- Large number of customers ordering small quantities in a transactions
- Slow moving products

Benefits:

- order size optimization
- transport consolidation
- use common warehousing and logistic resources
- Common replenishment methods

Better for fast moving products

- high number of customers
- products consumed in small quantites but in large total amount

Subtype:

- Single stage distribution struture
- Multi stage distribution struture
- Multi stage distribution struture with cross-docking stations

Refer to the warehousing structures in Basics of Logistics Course

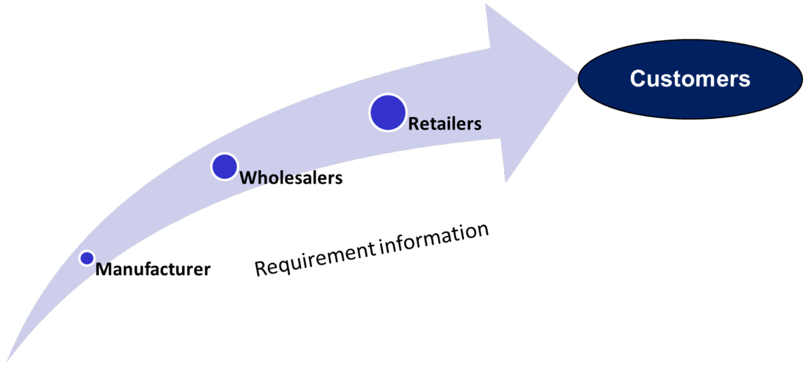
7.2. Distribution channels and logistic features

Role of distribution over the enterprise

– Collect the requirement information

– Forwards this information to the manufacturers and to the suppliers

– Forwards the goods and products into the direction of the customers



A distribution channel is a group of organizations co-operating in product and service forwarding to the customers for profit.

– Primary channel actors own the products and goods temporarily in the distribution process undertaking the financial risk of stock-keeping in vertical co-operation for profit, like:

– Wholesalers: buy products from the manufacturers and sell them to the retailers in larger quantities for own price margin.

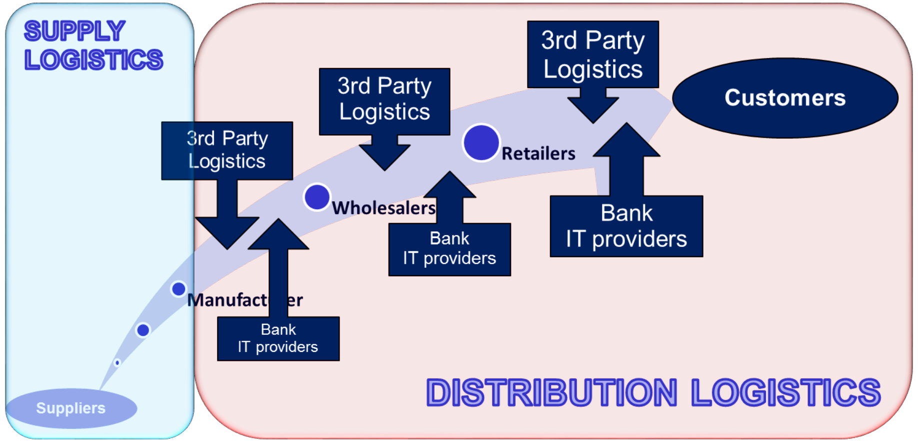
– Retailers: sell products for the end-consumers in smaller quantities.

– Secondary channel actors are special organizations providing special services required by the distribution processes. They do not own the stocks and undertake the risk only for keeping the values, like:

– Financial institutions: provide bank loans for financing the inventories and other expenses until the products are sold and customer payments arrives.

– 3rd Party Logistics: do the logistic tasks, especially transportation and warehousing, but any other necessary logistic operations, as external services, and for salary/payment.

– IT service providers: provides the IT infrastructure (hardware and mostly software as well) to help connect the primary and secondary channel actors involved into the distribution process.



Distribution types

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Manufacturers deliver products directly from its central warehouse of production organization without any primary distribution channel actor.

Warehouses are:

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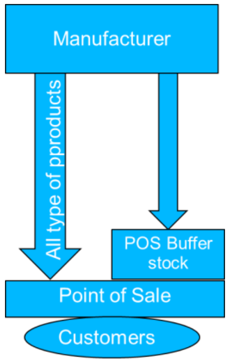
Point of Sales could be the **web shop** of the manufacturer.



2. Indirect distribution

Reasons for indirect distribution:

– Long distance between manufacturer and its customers

– Large number of customers ordering small quantities in a transactions

Benefits:

– order size optimization

– transport consolidation

– use common warehousing and logistic resources

– common replenishment methods

Subtypes:

– Single stage distribution structure

– Multi stage distribution structure

– Multi stage distribution structure with cross-docking stations

Refer to the warehousing structures in Basics of Logistics Course

LECTURE VII – DISTRIBUTION PROCESSES

7.3. Methods in distribution

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LECTURE VII – DISTRIBUTION PROCESSES

3. Methods in distribution

Methods used generally in distribution systems

Multi-stage Distribution Requirement Planning (DRP)

- Planning based on final consumer independent requirements
- Work like the Material Requirement Planning system but without Bill of Materials
- Maintain cumulative lead times for multiple distribution stages

Route planning and scheduling for destination opening periods

- Arrival is important according to the opening hours of the destination business
- Planning and scheduling is based on:
  - Deliveries into the same region
  - Vehicle capacity of available type
  - Efficient routes related to the distribution regions and districts.

7.3. Methods in distribution

Multi-stage Distribution Requirement Planning (DRP)

– Planning based on final consumer independent requirements

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LECTURE VII – DISTRIBUTION PROCESSES

7.4. Fleet and transportation management

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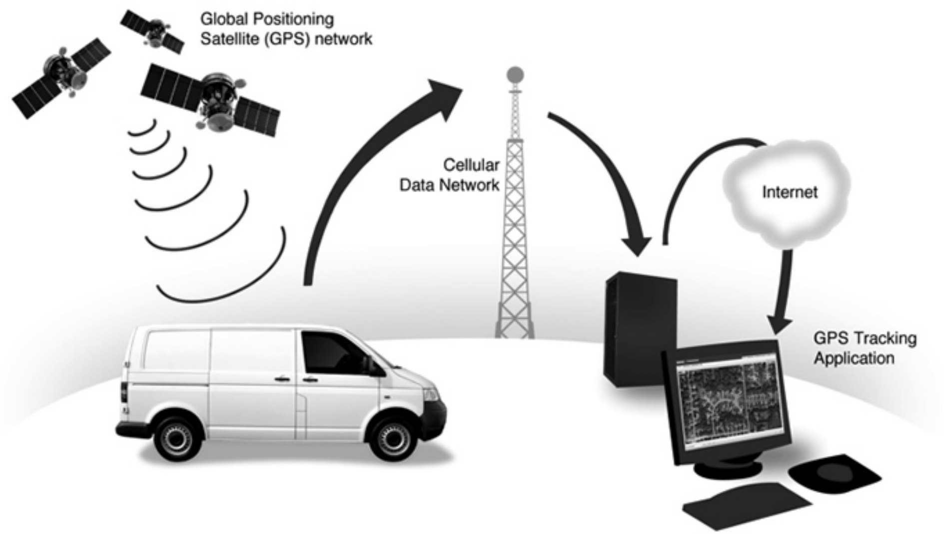
LECTURE VII – DISTRIBUTION PROCESSES

4. Fleet and transportation management

Fleet tracking for fleet management



Source: http://www.mgfleetsolutions.com/live-gps-tracking.html

Benefits

Benefits:

- ✓ Security of cargo
- ✓ Security of vehicle
- ✓ Information about the vehicle position for:
  - Reroute
  - Add destination of urgent delivery order
  - Inform receivers of late for re-schedule
- ✓ Security of vehicle driving

Additional extendsions:

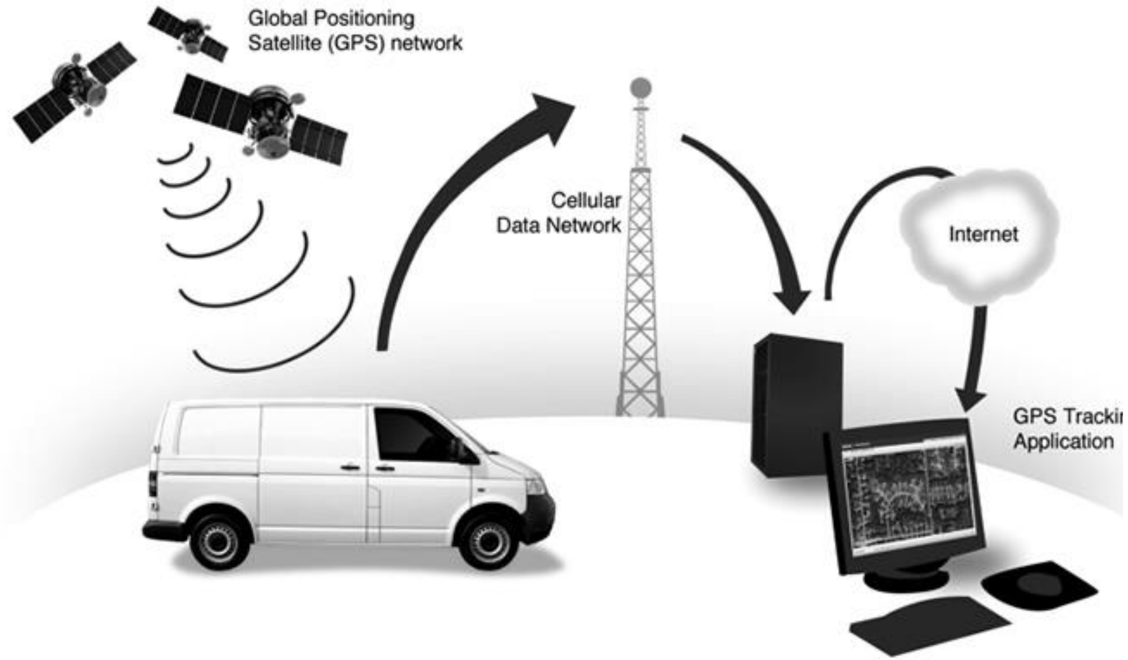
- Fuel consumption sensor
- Alarm and lock system monitoring
- Cargo bay door monitoring
- Memory card access monitoring

Additional services:

- API and Data connection to the fleet tracking services
- Extended vehicle monitoring and help desk service provided by international transport security service

7.4. Fleet and transportation management

Componens of the fleet tracking systems



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Lecture 8

LECTURE VIII – WASTE HANDLING AND RECYCLING

8.1. Recycled raw materials, components

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LECTURE VIII – WASTE HANDLING AND RECYCLING

1. Recycled raw materials, components

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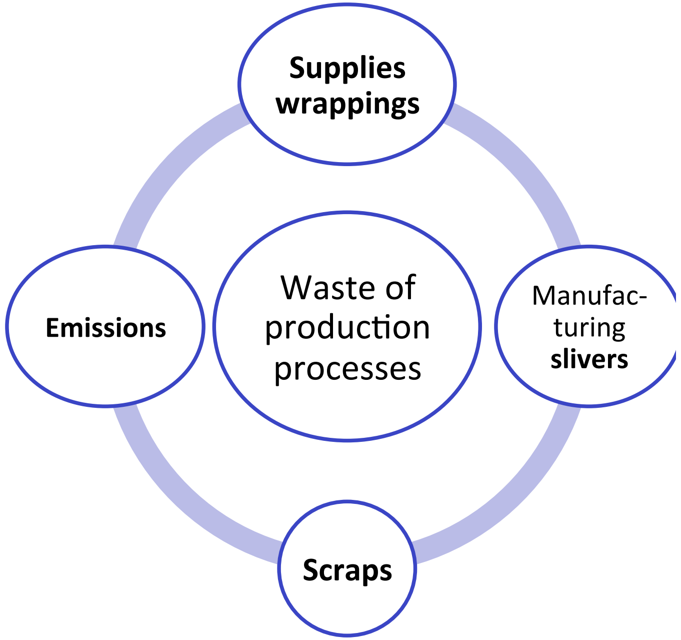
Manufacturing reverse logistics at a company

Reusable materials:

- Unit load devices, like pallettes
- Shavings, sliver, lubricants
- Work piece scraps

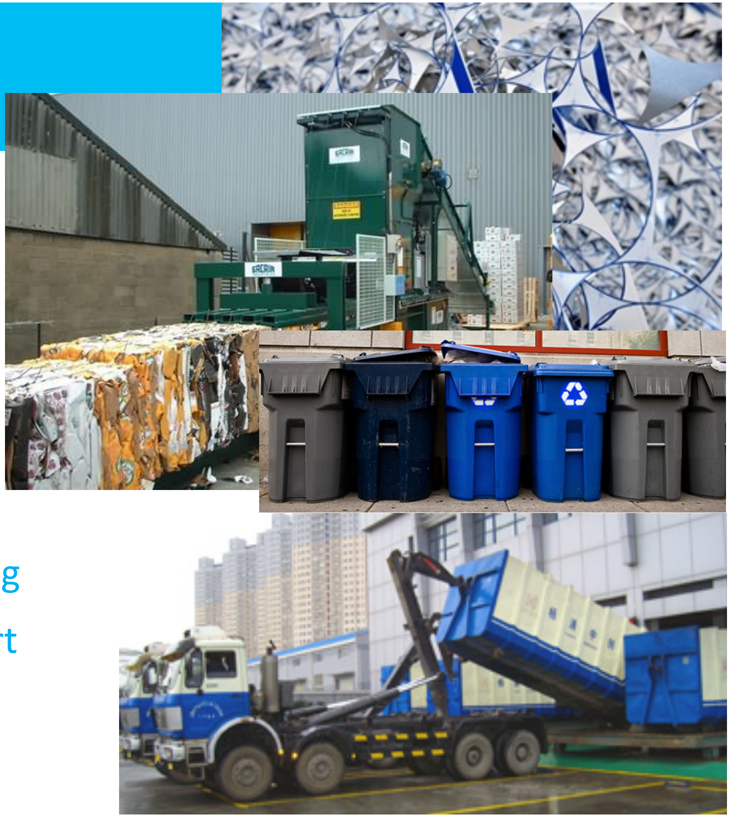
Materials to be recycled according to the legal regulations:

- Supply wrappings
- Hazardous materials
- Technological water
- Remaining energy

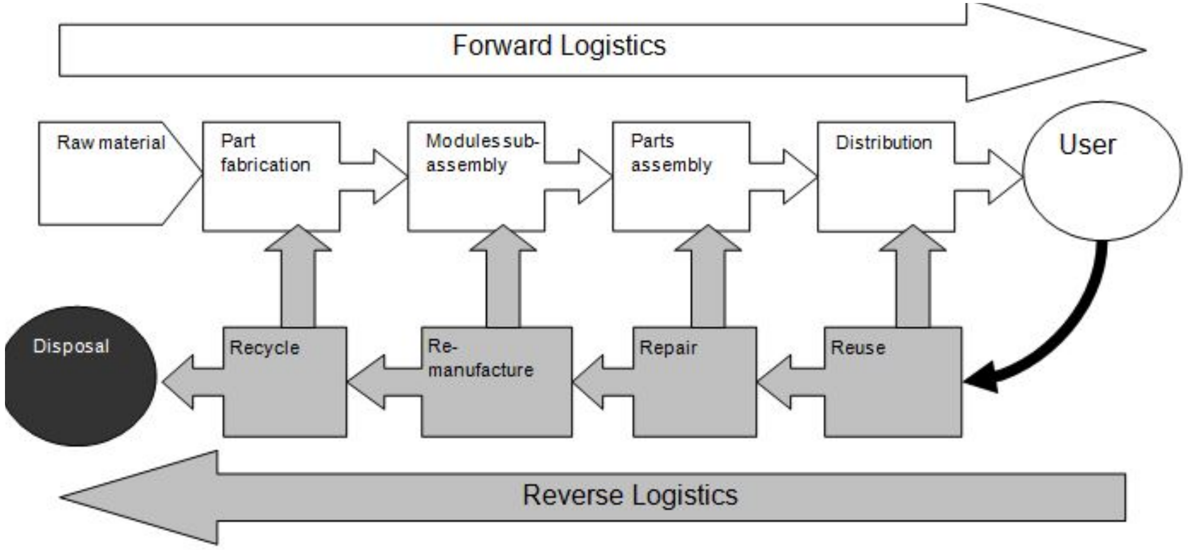


System components and operations

- Work station storages
- Transportation to central recycling storages
- Sorting (if needed)
- Packaging and labelling
- Administration! (ISO 14001)
- External transport scheduling
- Loading to external transport machine



Reverse logistics



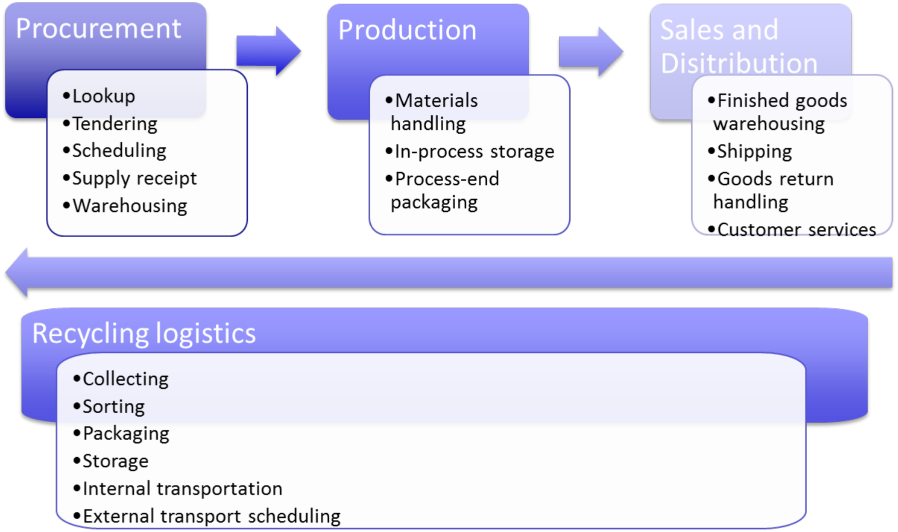
Recycling technologies of unusable remaining materials

Source: http://www.veoliawaterorganicsrecycling.co.uk/sustainable-outlets/

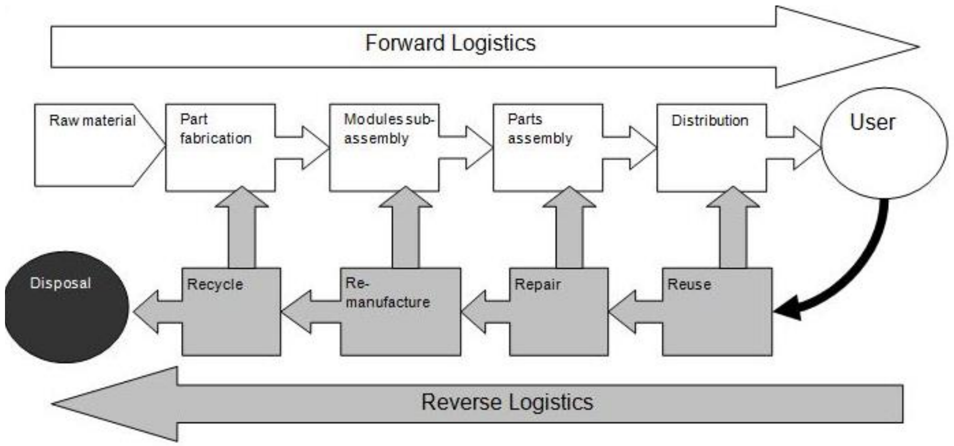
8.1. Recycled raw materials, components

The reverse logistics means all the logistic processes after selling and delivering the finished product to the final consumer, especially collecting for recycling after its lifecycle. It is

The reverse logistics within the enterprise



Reverse logistics processes



Manufacturing reverse logistics at a company

Reusable materials:

– Unit load devices, like palettes

– Shavings, sliver, lubricants

– Work piece scraps

Materials to be recycled according to the legal regulations:

– Supply packaging materials

– Hazardous materials

– Technological water

– Remaining energy

System components and operations

– Work station storages

– Transportation to central recycling storages

– Sorting (if needed)

– Packaging and labelling

– Administration! (ISO 14001)

– External transport scheduling

– Loading to external transport machine

Recycling technologies of unusable remaining materials

Source: http://www.veoliawaterorganicsrecycling.co.uk/sustainable-outlets/

LECTURE VIII – WASTE HANDLING AND RECYCLING

8.2. Packaging recycling

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LECTURE VIII – WASTE HANDLING AND RECYCLING

2. Packaging recycling

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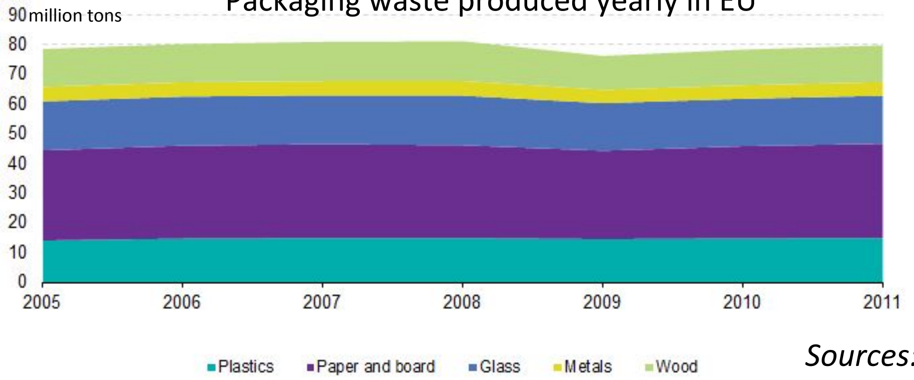
Trends in packaging waste

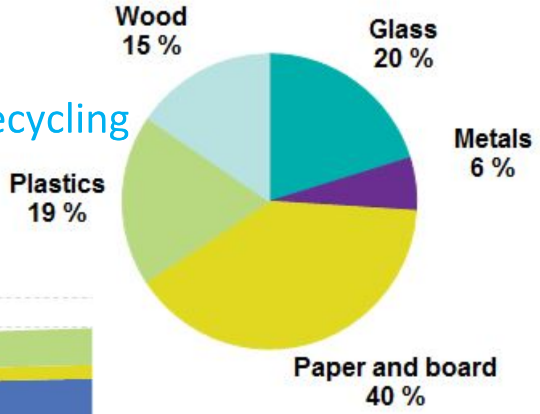
→Higher product charges

→Development of reverse logistics and recycling

→Multi-way packaging tools

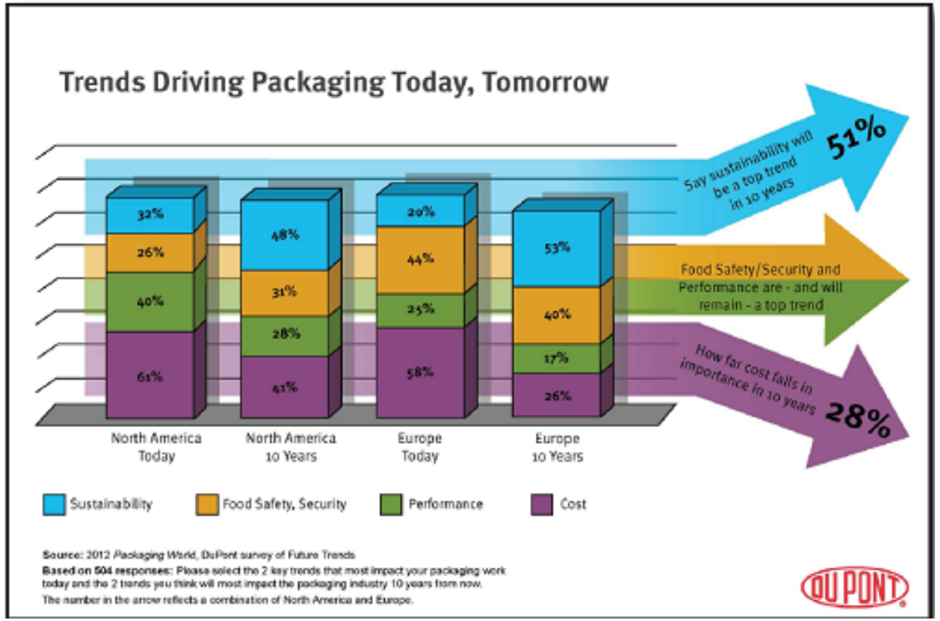
Packaging waste produced yearly in EU





Share of materials in packaging waste in EU (2013)

Sources: EuroStat 2013 (ec.europa.eu)



Source: http://news.thomasnet.com/imt/2012/11/05/

System components and operations of packaging recycling

- Easier because of its source as packaging of supplies
- Easier to centralize the used packaging storages
- Cause less in-site transportation
- In-site recycling opportunities
- Forces of using Multi-way packaging:
  - Pallets, boxes, rolley carts
  - General use instead of direct reverse transportation
  - RFId tracking of utilization and of ownership

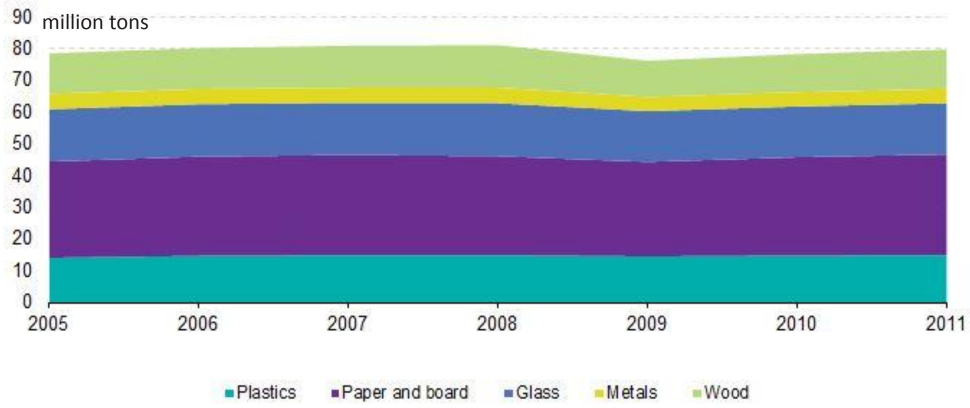
Terracycle products from waste of wrappings

Source: www.terracycle.com

8.2. Packaging recycling

Trends in packaging waste

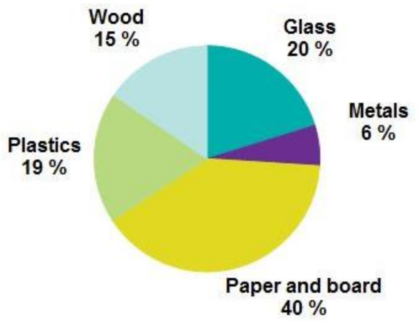
Packaging waste produced yearly in EU 2005–2011



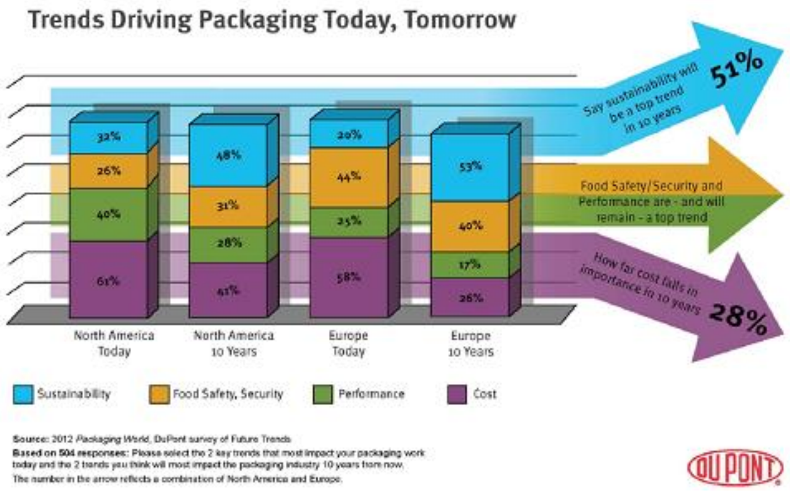
Sources: EuroStat 2013 (ec.europa.eu)

Conclusion: Continuous increasing except in years of global economic crisis

Share of materials in packaging waste in EU (2013)



Sources: EuroStat 2013 (ec.europa.eu)



Source: http://news.thomasnet.com/imt/2012/11/05/

Results of trends:

- Higher product charges for helping the used product collecting processes in reverse logistics
- Development of reverse logistics and recycling
- Multi-way packaging tools

System components and operations of packaging recycling:

- Easier because of its source as packaging of supplies
- Easier to centralize the used packaging storages
- Cause less in-site transportation
- In-site recycling opportunities
- Forces of using Multi-way packaging:
  - Pallets, boxes, roller carts
  - General use instead of direct reverse transportation
  - RFId tracking of utilization and of ownership

Terracycle products from waste of packaging:

Source: www.terracycle.com

Lecture 9

LECTURE IX – INFORMATION FLOW AND PLANNING SYSTEM

9.1. Information technologies in business logistics

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LECTURE IX – INFORMATION FLOW AND PLANNING SYSTEM

1. Information technologies in business logistics

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Information technologies in business logistics

ORGANIZATIONAL ROLE	PLANNING APPLICATIONS	EXECUTION APPLICATIONS
INTER-ORGANIZATIONAL TECHNOLOGIES	Collaborative Planning, Forecasting and Replenishment (CPFR)	Electronic Data Interchange (EDI) CRM SRM Vendor-managed Inventory (VMI)
INTRA-ORGANIZATIONAL TECHNOLOGIES	ERP systems MRP2 systems MRP1	Warehouse Management Systems (WMS)

9.1. Information technologies in business logistics

ORGANIZATIONAL ROLE	PLANNING APPLICATIONS	EXECUTION APPLICATIONS
INTER-ORGANIZATIONAL TECHNOLOGIES	Collaborative Planning, Forecasting and Replenishment (CPFR)	Electronic Data Interchange (EDI) CRM SRM Vendor-managed Inventory (VMI)
INTRA-ORGANIZATIONAL TECHNOLOGIES	ERP systems MRP2 systems MRP1	Warehouse Management Systems (WMS)

LECTURE IX – INFORMATION FLOW AND PLANNING SYSTEM

9.2. Production Planning and Scheduling Systems

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LECTURE IX – INFORMATION FLOW AND PLANNING SYSTEM

2. Production Planning and Scheduling Systems

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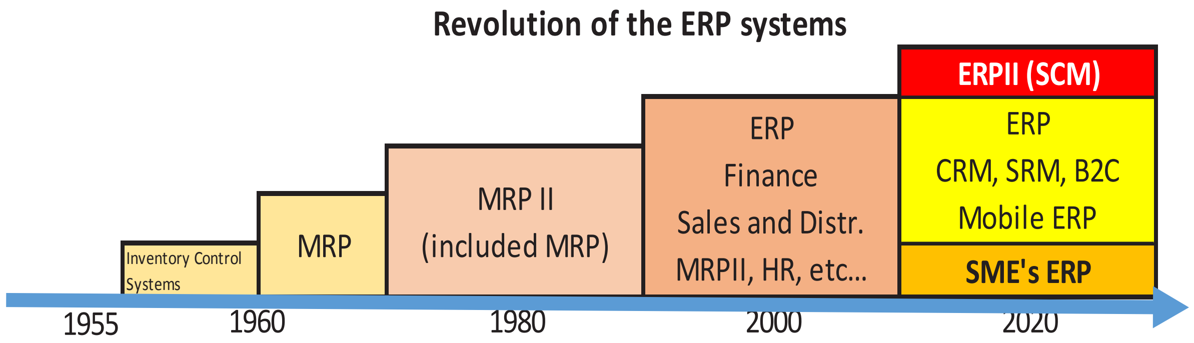
Information technologies for enterprises

ORGANIZATIONAL ROLE	PLANNING APPLICATIONS	EXECUTION APPLICATIONS
INTER-ORGANIZATIONAL TECHNOLOGIES	Collaborative Planning, Forecasting and Replenishment (CPFR)	Electronic Data Interchange (EDI) SRM, CRM Vendor-managed Inventory (VMI)
INTRA-ORGANIZATIONAL TECHNOLOGIES	ERP systems MRP2 systems MRP1	Warehouse Management Systems (WMS)

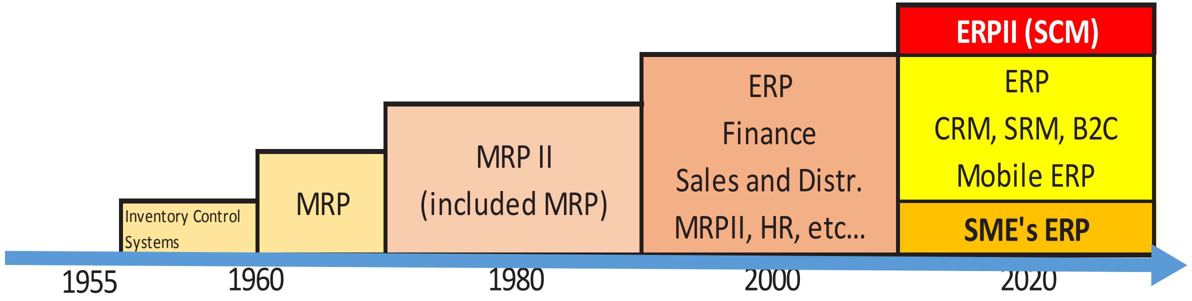
From Inventory Control Systems to the ERP2 model



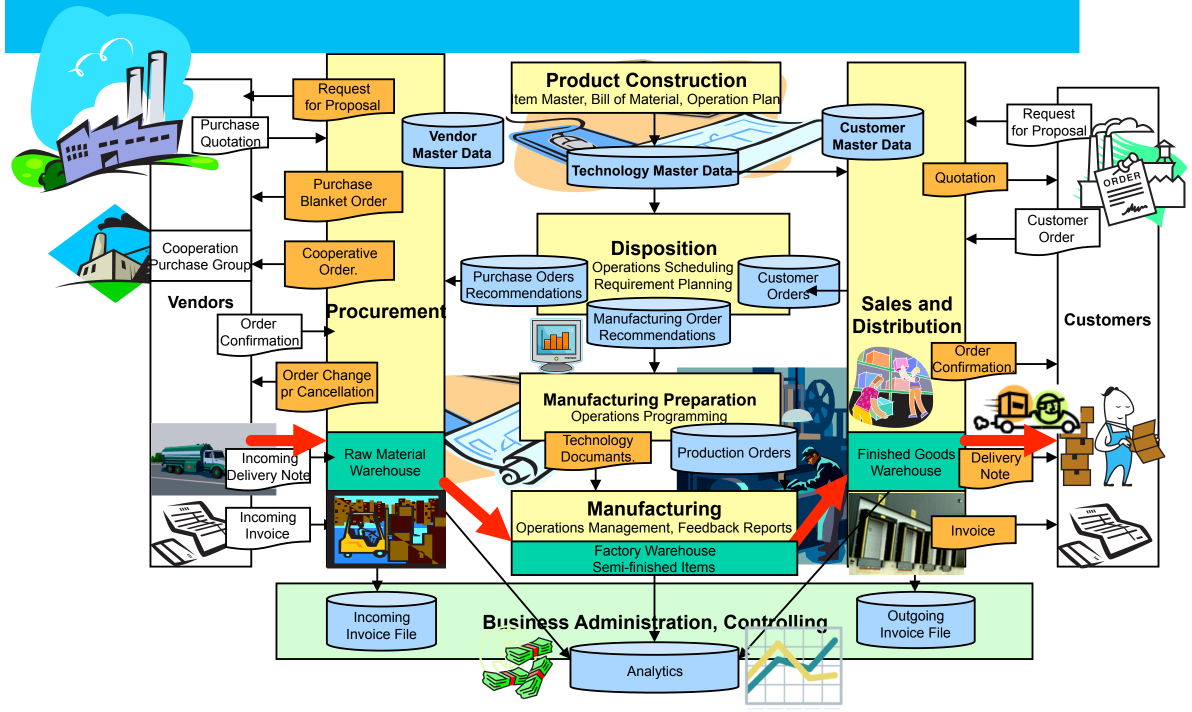
Production planning in ERP systems

1. IR = Inventory Control Systems
2. MRP = Material Requirement Planning Systems (MRP1)
3. MRPII = Manufacturing Resource Planning Systems
4. PPS = Production Planning and Scheduling Systems
5. PPS = Produktion Plannung und Steuerung Systeme = PPC systems
6. ERP systems = Enterprise Resource Plannning Systems
7. ERP2 systems = Extended Resource Planning Systems for Supply Chains

Revolution of the ERP systems



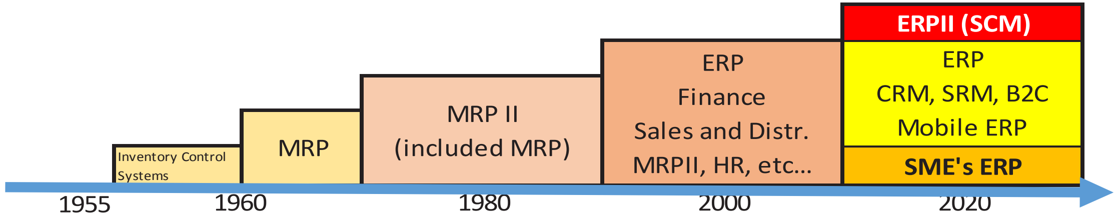
Logistic information flow processes in ERP



9.2. Production Planning and Scheduling Systems

From Inventory Control Systems to the ERP2 model

Revolution of the ERP systems



Production planning in ERP systems

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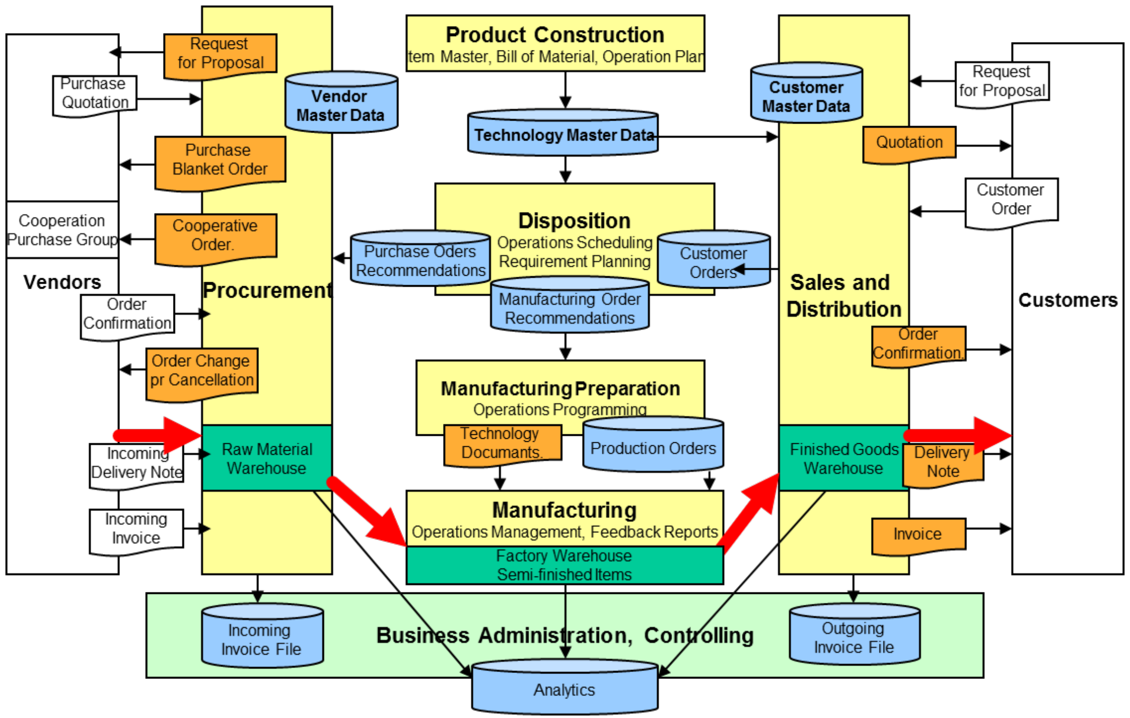
Logistic information flow processes in ERP systems



LECTURE IX – INFORMATION FLOW AND PLANNING SYSTEM

9.3. From EDI to „Netweaver”

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LECTURE IX – INFORMATION FLOW AND PLANNING SYSTEM

3. From EDI to „Netweaver”

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Information technologies for supply chains

ORGANIZATIONAL ROLE	PLANNING APPLICATIONS	EXECUTION APPLICATIONS
INTER-ORGANIZATIONAL TECHNOLOGIES	Collaborative Planning, Forecasting and Replenishment (CPFR)	Electronic Data Interchange (EDI) Supplier and Customer Relationship Management (SRM, CRM) Vendor-managed Inventory (VMI)
INTRA-ORGANIZATIONAL TECHNOLOGIES	ERP systems MRP2 systems MRP1	Warehouse Management Systems (WMS)

Electronic Data Interchange

In 1980's bilateral Electronical Data Interchange was applied between the ERP systems of the companies interchanging a large amount of business transaction documents.

EDI standards are **common languages** for computer-based ERP and business administration systems.

Major EDI standards: EDIFACT, GS1 eCom,…

Provides high security through off-line messaging methods using external message boxes.

Data security provided by assymetric digital keys used for digital signatures and encryption.

Vendor Managed Inventory (VMI)

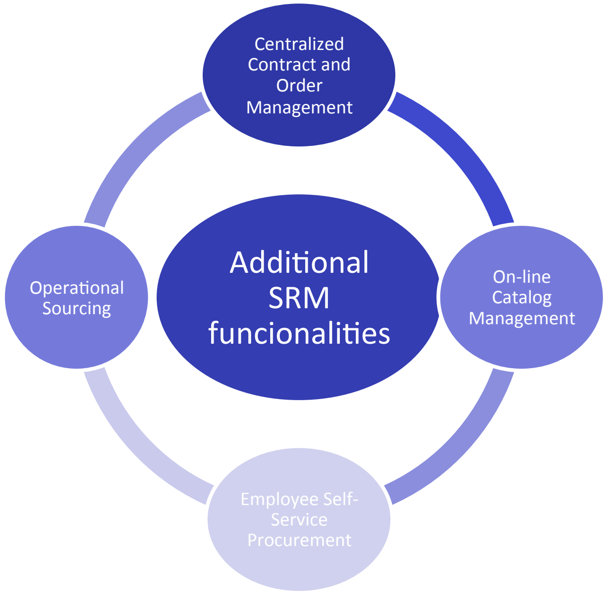
When Vendors controls the replenishment of the customer inventory before it rut out from stock.

Methods:

- Total VMI: full vendor control over customer entire inventory
- Partial VMI: only the replenishment of non-critical materials are managed by vendors
- Single-vendor or Multi-vendor method.
- Special case: 3rd Party Inventory and Materials Handling Management.
- Classical consignation inventory method: it is purchased only in case of using it.

Supplier Relationship Management

- ✓ Automate the determination of the supply sources
- ✓ Support the prcurement processes with transaction automation and information source integration.
- ✓ Support the close collaboration with the suppliers
- ✓ Manage and optimize the entire Procure-to-Pay process cycle.
- ✓ Available to maintain strategies to optimize the supplier discovery and selection.



Customer Relationship Management

Integrated customer-oriented network based computer application system
Connected to or integrated into the Enterprise Resource Planning system

Target: maximum customer satisfaction at maximum profit

- optimization of customer fulfilment and related business processes
- increasing the efficiency of the organization
- manage processes with network based computer application

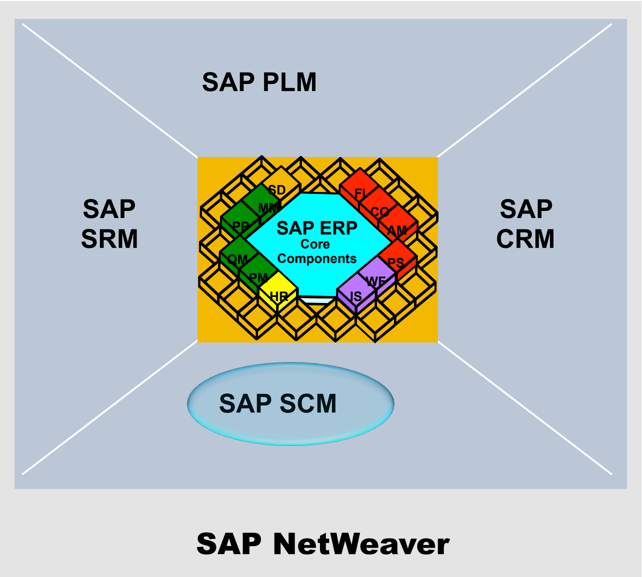
Integrated CRM components:
Collaborative CRM: IT tools more than allow cutomers to contact with the company

- Support to manage and simplfy the liaison with the customers
- Help to recognize the customer requirements

Analytical CRM: process and analyse the customer requirements and cooperation
Operative: automate the customer fulfilment processes in scope of sales process, customer services and complaint management.

Collaborative Planning, Forecasting and Replenishment (CPFR)

- Response and Supply Management
- Sales, Inventory, and Operations Planning
- Transportation and Warehouse Management
- Demand Management and Supply Planning
- Manufacturing Network Collaboration
- Production Planning and Scheduling



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9.3. From EDI to „Netweaver”: Information technologies for supply chains

Electronic Data Interchange

In the first phase, in 1980’s bilateral Electronic Data Interchange was applied between the ERP systems of the companies interchanging a large amount of business transaction documents. EDI standards are **common languages** for computer-based ERP and business administration systems. Major EDI standards are EDIFACT, GS1 eCom, ALE iDOC, etc, but there are new developments, as well, supported by European Union Framework Programs. (The latest results: Martin Šeleng, Štefan Dlugolinský, Martin Tomašek, Karol Furdík, Ladislav Hluchý, Lightweight Semantic Approach for Enterprise Interoperability Issues, Institute of Informatics, Slovak Academy of Sciences, Dúbravská cesta 9, 845 07 Bratislava, Slovakia, In IEEE 19th International Conference on Intelligent Engineering Systems, Budapest, Hungary) It provides high security through off-line messaging methods using external message boxes and Data transmission security is provided by asymmetric digital keys used for digital signatures and encryption.

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Collaborative Planning, Forecasting and Replenishment (CPFR)

Components:

– Response and Supply Management

– Sales, Inventory, and Operations Planning

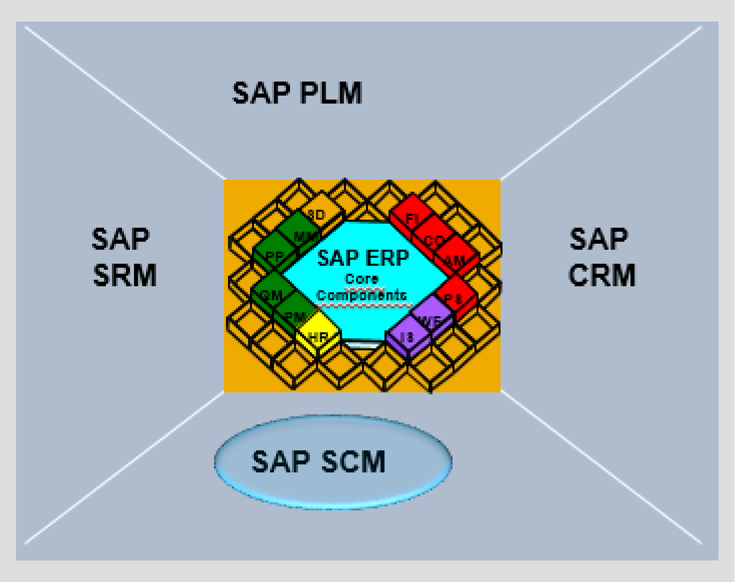
– Transportation and Warehouse Management

– Demand Management and Supply Planning

– Manufacturing Network Collaboration

– Production Planning and Scheduling

An example: Supply Chain Management and other applications in SAP Business Suite based on the ERP Core Components (Materials Management, Production Planning, Sales and Distribution, Plant Maintenance, Quality Management, Human Resource Management, Financial Accounting, Controlling, Asset Management, Project System, Workflow management, Special Industrial Solutions)



Source: scn.sap.com

Lecture 10

X. LOGISTIC PERFORMACE MEASUREMENT

10.1. General role and methods of performance measurement

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X. LOGISTIC PERFORMACE MEASUREMENT

1. General role and methods of performance measurement

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General role of performance measurement in logistics

The logistic processes are flowing within the company and between the company's partners, customers and suppliers.

It is important to know the performance of these processes:

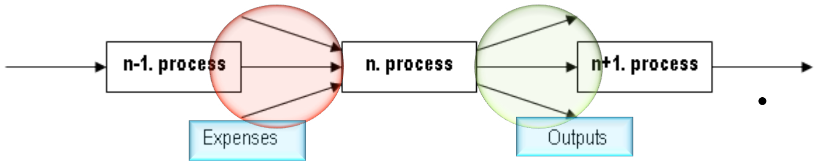
- To check the level of them
- To control the expenses
- Calculate the utilization and possible reserves

Generally to get a performance view about the logistic processes

Recap: Characteristics of measurement in logistics

Measurement points:

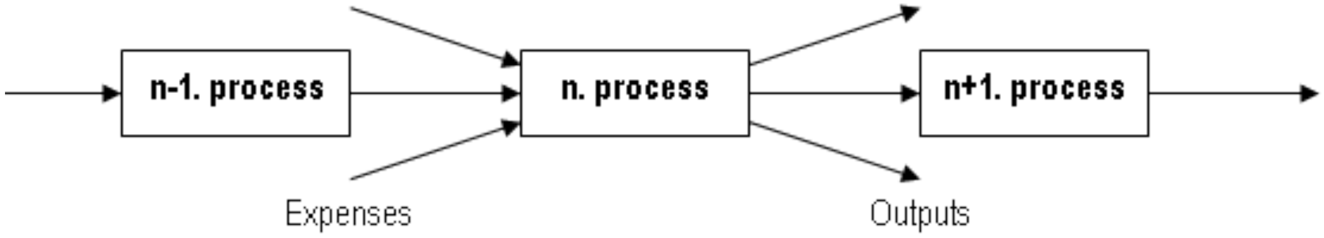
- Connection points of the logistic system components or processes:
- Between machines, objects at loading operations
- Between companies at delivery activities



Measurement numbers:

- Expenses, inputs:
  - Material, capacity usage, human resource labor work, energy, information
- Transformation factors:
  - Lead time, capacity, inventory level
- Outputs:
  - Delivered, produced, transformed, transported quantities, amounts, volumes
  - Provided information

Logistic performance measurement in the business logistics



Supplier evaluation

- Costs
- Reliability
- Lead time
- Quality
- Flexibility

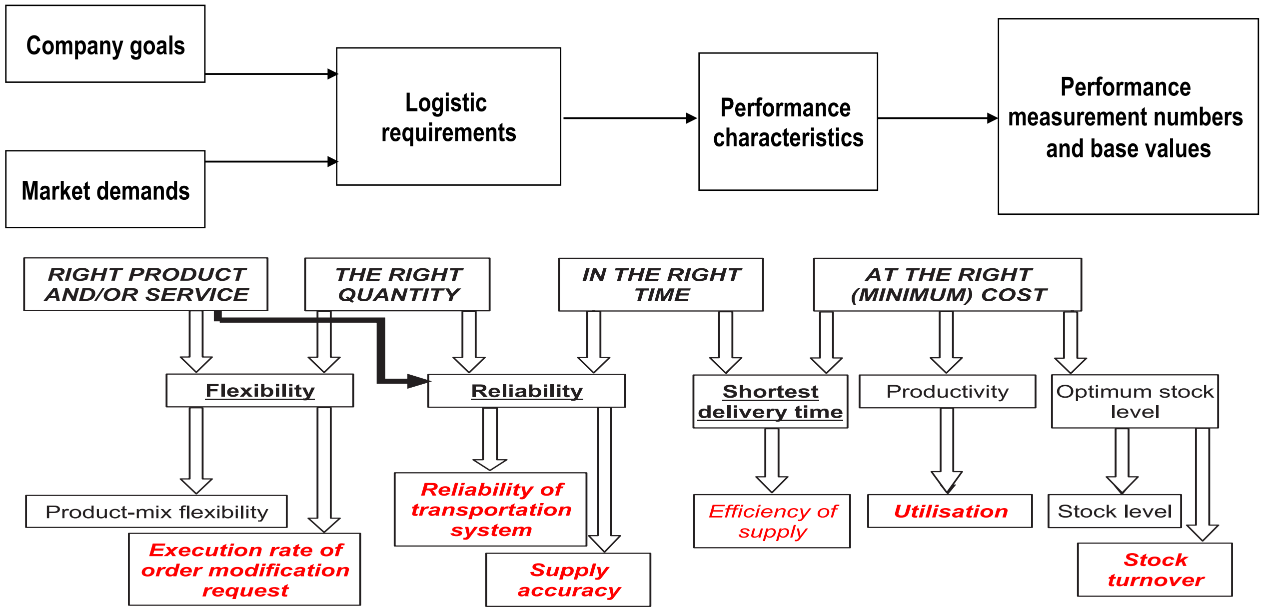
Inbound logistics performance

- Costs
- Reliability
- Lead time
- Quality
- Flexibility

Customer service level

- Cost
- Reliability
- Lead time
- Quality
- Flexibility

Creating logistic measurement numbers



10.1. General role and methods of performance measurement

The logistic processes are flowing within the company and between the company's partners, customers and suppliers.

It is important to know the performance of these processes:

– To check the level of them

– To control the expenses

– Calculate the utilization and possible reserves

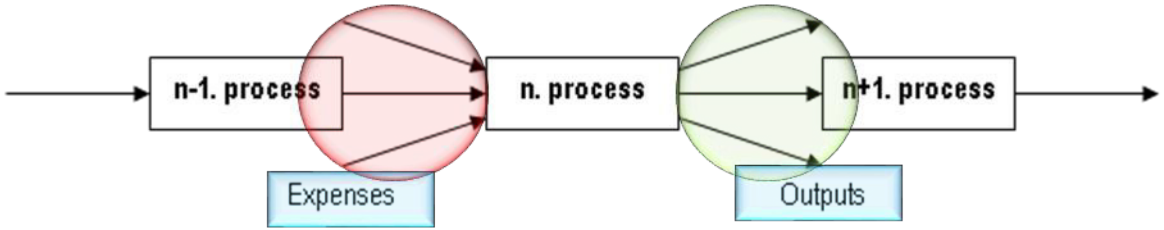
– Generally to get a performance view about the logistic processes

Characteristics of measurement in logistics

Measurement points are always the connection points of the logistic system components or processes:

– Between machines, objects at loading operations

– Between companies at delivery activities and shipping points in them



Measurement numbers:

1. Expenses, inputs: Material, capacity usage, human resource labor work, energy, information

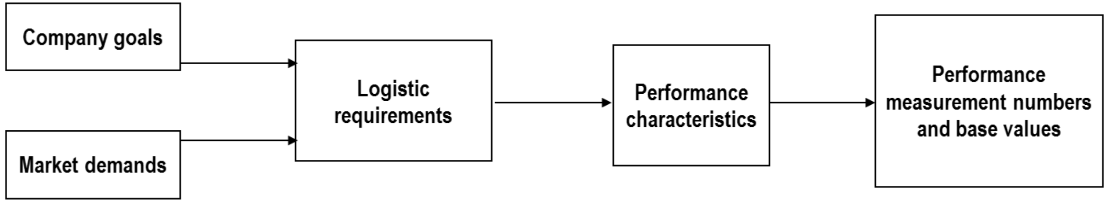
2. Transformation factors: Lead time, capacity, inventory level

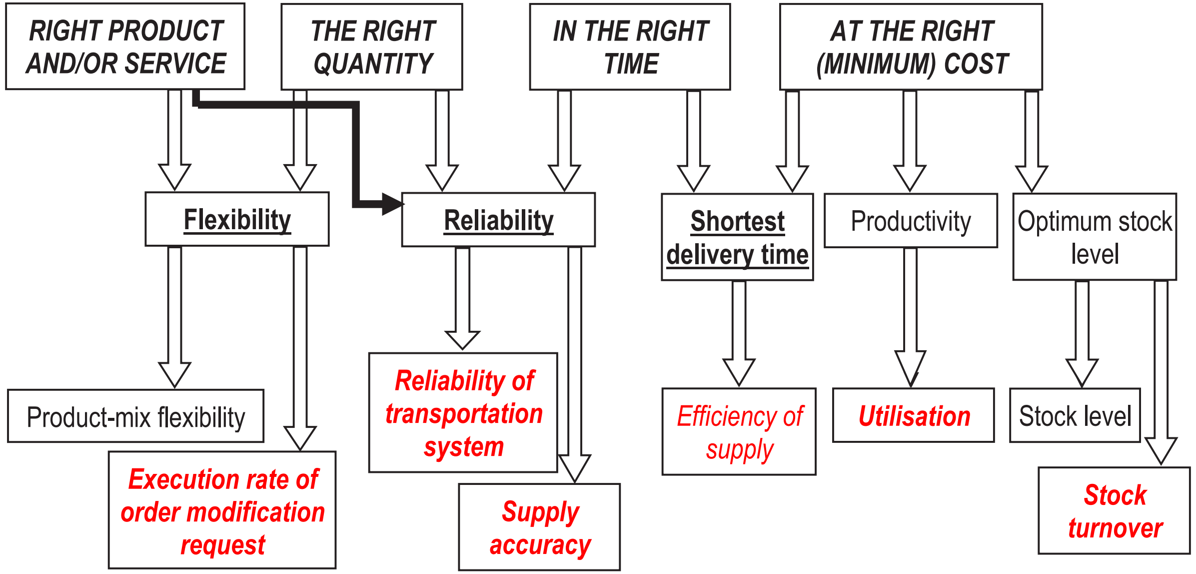
3. Outputs: Delivered, produced, transformed, transported quantities, amounts, volumes, Provided information

Logistic performance measurement in the business logistics

Supplier evaluation	Inbound logistics performance	Customer service level
• Costs • Reliability • Lead time • Quality • Flexibility	• Costs • Reliability • Lead time • Quality • Flexibility	• Cost • Reliability • Lead time • Quality • Flexibility

Creating logistic measurement numbers from company goals and market demand:





X. LOGISTIC PERFORMACE MEASUREMENT

10.2. Multiple measurement numbers

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X. LOGISTIC PERFORMACE MEASUREMENT

2. Multiple measurement numbers

Creating multiple measurement numbers

The performance measurement numbers can be used individually
But in case of analyzing multiple features and their measurement numbers

The simpler form of multiple measurement numbers is the weighted sum
Method:

1. specify the weights for each of the measurement numbers to be applied
2. Take care the total of the weights, it should be 1.
3. Multiply the value with its weight
4. Calculate the total value of the weighted values

Criteria of measurement numbers to be applied together:

1. Same measurements unit
2. Values should be in the same range
3. The numerical values indicate higher quality in the same direction.

(If this is not true, then the measurement number should be converted to

Example

	Price	Accurate delivery	Quality	Packaging level	TOTAL
Importance (Weight)	4	3	2	1	10
Supplier 1	10000 €	9 from 10 times	1 problem from 10 times	2	
Supplier 2	10800 €	20 from 20 times	no problem from 20 times	3	
Supplier 3	10500 €	9 times from 10	1 problem from 10 times	4	

Example

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Evaluation					
Supplier 1	100%	90%	90%	50%	
Supplier 2	93%	100%	100%	75%	
Supplier 3	95%	90%	90%	100%	

Example

	Price	Accurate delivery	Quality	Packaging level	TOTAL
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Evaluation					
Supplier 1	100%	90%	90%	50%	
Supplier 2	93%	100%	100%	75%	
Supplier 3	95%	90%	90%	100%	
Weighted values	40%	30%	20%	10%	*100%*
Supplier 1	40%	27%	18%	5%	**90,00%**
Supplier 2	37%	30%	20%	8%	**94,54%**
Supplier 3	38%	27%	18%	10%	**93,10%**
Average					**92,54%**

Source: Némon-Vörösmarty: Logisztika - Workbook, KIT, 2006

10.2. Multiple measurement numbers

Why use us multiple measurement numbers in logistics? The performance measurement numbers can be used individually, but in case of analyzing multiple features and their measurement numbers.

The simpler form of multiple measurement numbers is the weighted sum, and its method is the following:

– specify the weights for each of the measurement numbers to be applied regarding to that the total of the weights should be 1,

– multiply the value with its weight,

– calculate the total value of the weighted values.

Criteria of measurement numbers to be applied together:

– Same measurement unit.

– Values should be in the same range.

– The numerical values indicate higher quality in the same direction. (If this is not true, then the measurement number should be converted to change the direction of better vaule.)

An example:

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Evaluation:

Evaluation					
Supplier 1	100%	90%	90%	50%	
Supplier 2	93%	100%	100%	75%	
Supplier 3	95%	90%	90%	100%	

Weighted values:

Weighting factors:	40%	30%	20%	10%	*100%*
Supplier 1	40%	27%	18%	5%	**90,00%**
Supplier 2	37%	30%	20%	8%	**94,54%**
Supplier 3	38%	27%	18%	10%	**93,10%**
Average					**92,54%**

Source: Némon–Vörösmarty: Logisztika – Workbook, KIT, 2006.

10.3. Measurement of the logistic modules

Performance Indicators of Procurement Logistics

The performance indicators of procurement logistics can be applied for the processes of supply chain following each-other at their connection locations between each-other. There are two major groups of procurement performance indicators:

– performance indicators of procurement processes,

– indicators of service level of suppliers or vendors:

 – quality indicators,

 – indicators related to reliability and flexibility of suppliers.

Procurement Logistics Performance Indicators

- ***Lead-time indicators***
  - Supplier Quotation Providing
  - Supplier Order Notification
  - Supply Lead-time
  - Information Providing
- ***Quality Indicators***
  - Quality of Supplied Materials
  - Material Complainment Rate
  - Information and Document Accuracy
- ***Reliability and Flexibility Indicators***
  - Supply Reliability
  - Supply Delivery Readiness
  - Delivery On-time Rate
  - Order Modification Availablity

The indicators are available to use for several different data groups and dimensions:

– for different time periods,

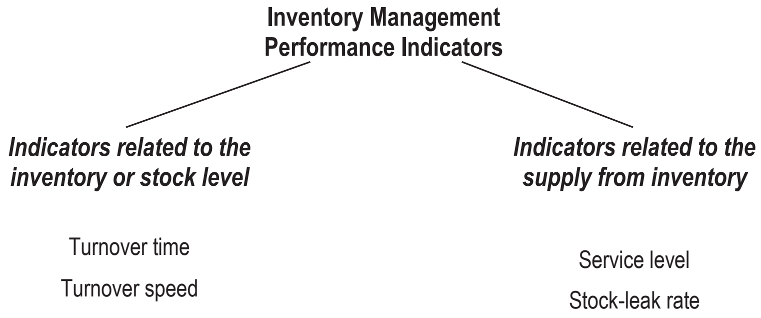
– for individual materials or for material groups,

– for orders or order series,

– for individual suppliers or for groups of suppliers.

The indicators of the procurement of the enterprise correspond to the sales and distribution indicators of the supplier of the enterprise as the previous station (source) in the supply chain. The goal of the supplier is the most efficient supply service to the customer (in this case the enterprise), therefore it is useful to use the same performance indicators on supplier's sales and distribution side and on the connected procurement side of the enterprise. Using the same indicators, it is enough to measure on one side as there is trust between the supplier's SD organization and enterprise's procurement organization. The optimal case is, if the customer's procurement organization measures the supply performance and forwards the evaluation to the supplier, who trusts these information.

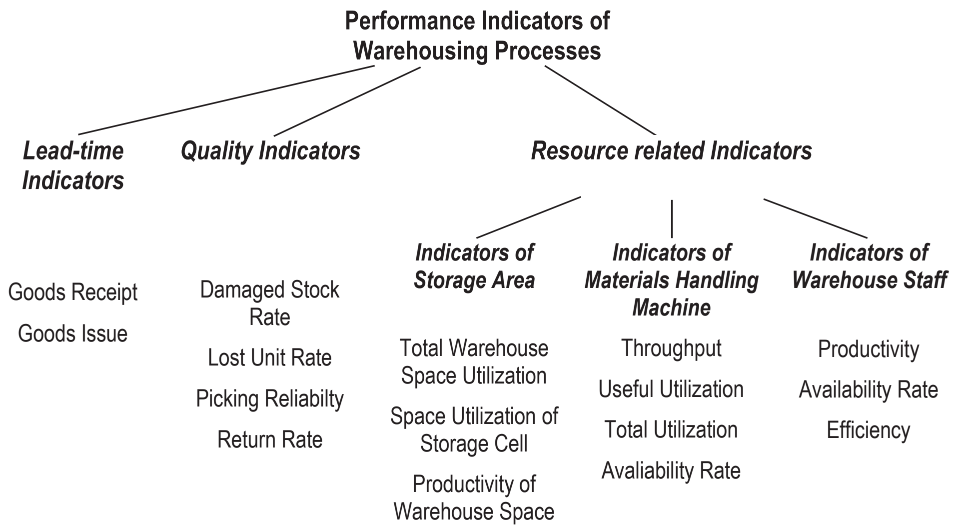
Performance Indicators of Inventory Management



These indicators can be measured for individual materials or for bigger material groups.

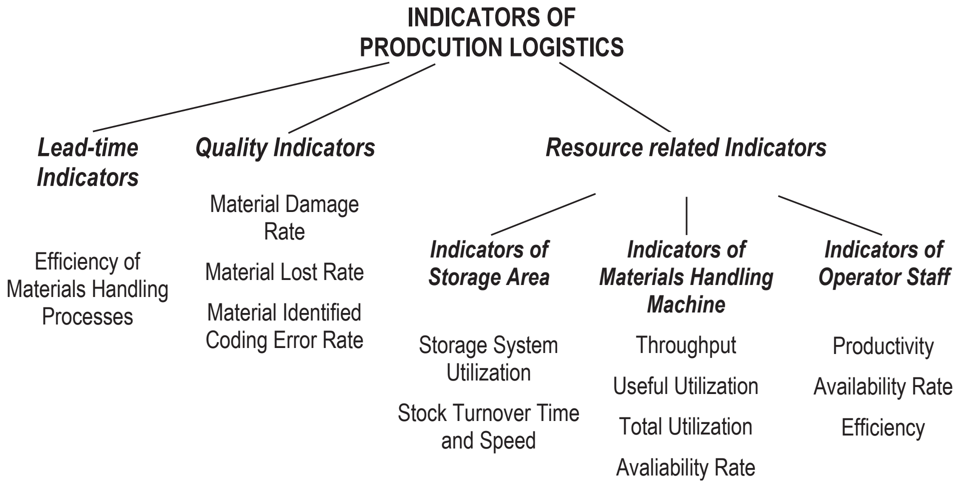
Warehousing Performance Indicators

In case of warehousing there are a lot of indicators, because there are more sub-processes and different resources in the warehousing processes from replenishment through internal materials handling to the picking and preparation to shipment.



Performance Indicators in Production Logistics

The main groups are related to the quality keeping feature, lead-times, resource utilization, like storage equipment, materials handling and packaging, unit load handling machines.



Sales and Distribution Performance Measurement

In the previous lessons, we discussed the Sales and Distribution Performance Indicators related to the Customer Fulfilment Level and to the Customer Satisfaction issues. Here, we have only recap and mention that these indicators can be synchronized with the customer's procurement performance measurements, moreover can be used commonly, trusted the measurements of the customer's procurement department.

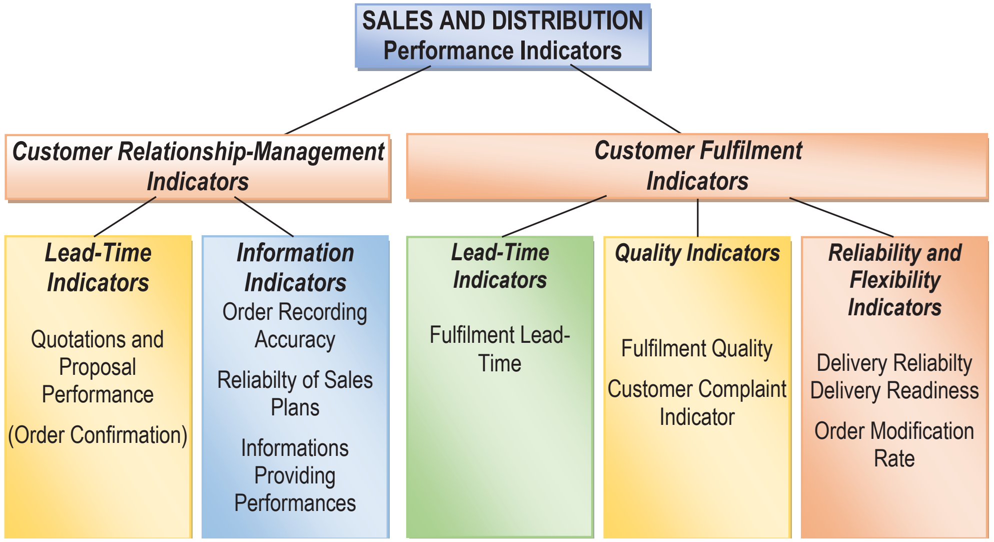
Basically there are two major indicator groups based on the major groups of the Sales and Distribution processes:

– management of customer relationships,

– customer fulfillment indicators .

On other hand, because of the common connection point, the customer fulfillment indicators are similar to the indicators of procurement, and there are common sub-groups, like *Lead-Time, Quality and Reliability and Flexibility.*

Sales and Distribution Performance Indicators



Lecture 11

XI. PLANNING OF BUSINESS LOGISTICS PROCESSES

11.1. Green-field planning

HUNline
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ÚJ SZÉCHENYI TERV

Business Logistics
College of Dunaújváros

XI. PLANNING OF BUSINESS LOGISTICS PROCESSES

1. Green-field planning

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Planning without infrastructure limitations

The major field of logistics is the materials flow. Therefore the planning approach is the material flow to the customers of the materials from the sources.

customer requirement
- required material flow
- for the right customer fulfilment.

analysis of supply opportunities
- Suppliers
- Material offers
- Availabilities
- Cycle times, lot sizes

Information flow
- connect the source and the sink point
- with proper information flow
- and its scheduling.

Material flow
- Logistic processes
- Technological processes.

Select machines for technology
- resources
- machines into the.

Materials handling systems and machines

Specify the required machines for material flow

Inventory points and levels
- Specify the required inventory levels in the entire materials flow system
- Insert the required storage components.

Operating
- Create guidelines and strategies
- Create operation algorithms
- Test the system

Planning without infrastructure limitations

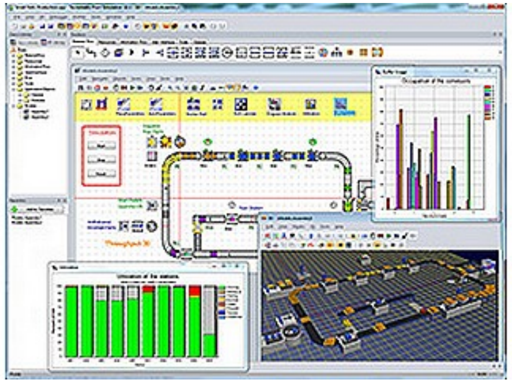
1. First step: analyse of customer requirements and required material flow for the right customer fulfilment.
2. Second: analysis of supply opportunities
3. Third: connect the source and the sink point with proper information flow and its scheduling.
4. Define the material flow and required technological processes.
5. Insert the resources and machines into the technological processes.
6. Specify the required materials handling systems and machines.
7. Specify the required inventory levels in the entire materials flow system and Insert the required storage components.
8. Create operational algorithms and strategies.
9. Test the plan

Additional techniques

1. Create variants
2. Use discrete-event computer simulation for evaluation
3. Compare them to choose the optimal variant

Strategies and operational parameters can be optimized, as well:

- Batch and lot sizes
- Cycle times
- Operation scheduling
- Inventory levels

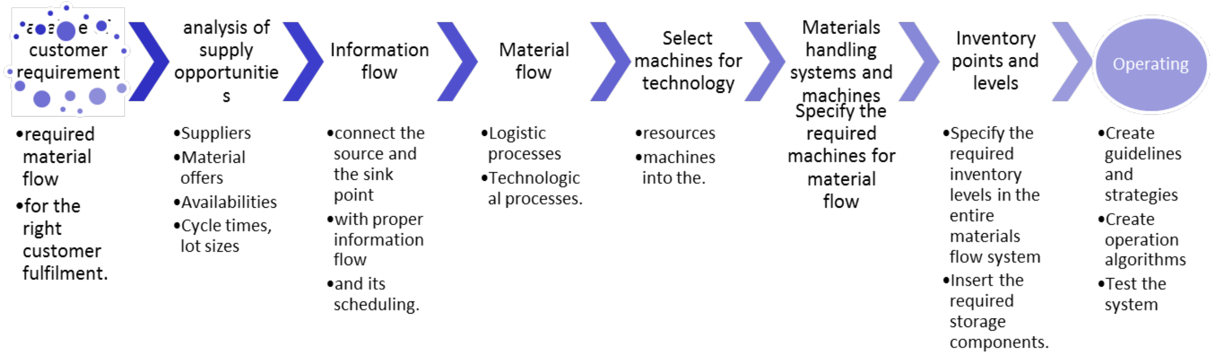


Source: http://www.dpaonthenet.net/article/52177/

11.1. Green-field planning

Planning without infrastructure limitations

Planning without infrastructure limitations



Planning without infrastructure limitations

– First step: analyze of customer requirements and required material flow for the right customer fulfilment.

– Second: analysis of supply opportunities

– Third: connect the source and the sink point with proper information flow and its scheduling.

– Define the material flow and required technological processes.

– Insert the resources and machines into the technological processes.

– Specify the required materials handling systems and machines.

– Specify the required inventory levels in the entire materials flow system and

Insert the required storage components.

– Create operational algorithms and strategies.
– Test the plan

Additional techniques

– Create variants

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Strategies and operational parameters can be optimized, as well:

– Batch and lot sizes

– Cycle times

– Operation scheduling

– Inventory levels

XI. PLANNING OF BUSINESS LOGISTICS PROCESSES

11.2. Re-engineering

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XI. PLANNING OF BUSINESS LOGISTICS PROCESSES

2. Re-engineering

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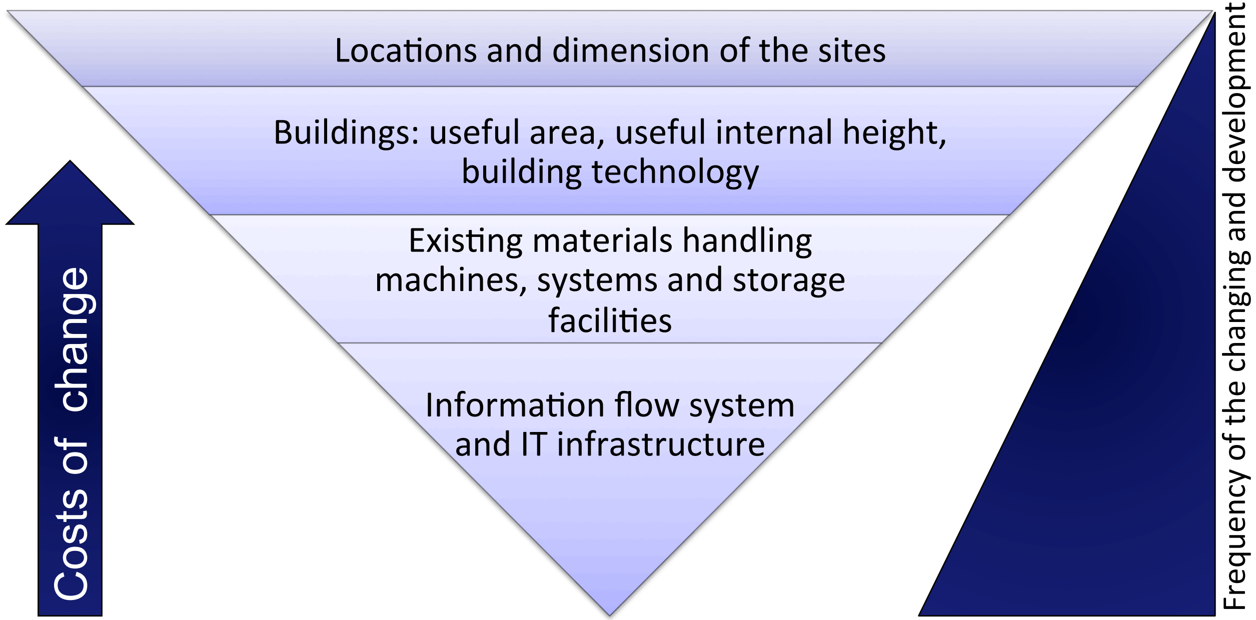
Why should we re-engineering the existing logistic systems

- Changing tasks based on chaniging environment
- New technologies, new machines, better availabilities of cutting edge technologies
- Changing of strategic targets
- Financial issues

Limitations in case of existing systems



Planning without infrastructure limitations

1. Analyse the existing situation:
    1. Customer requirements and required material flow for the right customer fulfilment.
    2. Changes in supply opportunities
    3. Information flow and its scheduling.
2. Analyse the available resources and infrastructure
    1. Technology and infrastructure
    2. Building and site
    3. Available transport connections
    4. Materials handling systems, machines a storage facilities
3. Redefine the material flow and required technological processes.
4. Select the resources and machines needed to be replaced
5. Insert new resources and machines.
6. Optimize the required inventory levels in the entire materials flow system and determine the required storage components. Replace the unadequate with new storage components.
7. Optimize the operational algorithms and strategies.
8. Test and evaluate the plan version.
9. Compare the plan versions and select the optimal.

11.2. Re-engineering

Re-engineering is the planning of modification of existing and operating systems, which were previously designed and operated for purposes in a certain technical and economic environment, which was changed, so are not existing anymore. By re-engineering, the existing, but not optimal system will be able to operate optimally again, in the changed environment.

Why should we re-engineering the existing logistic systems

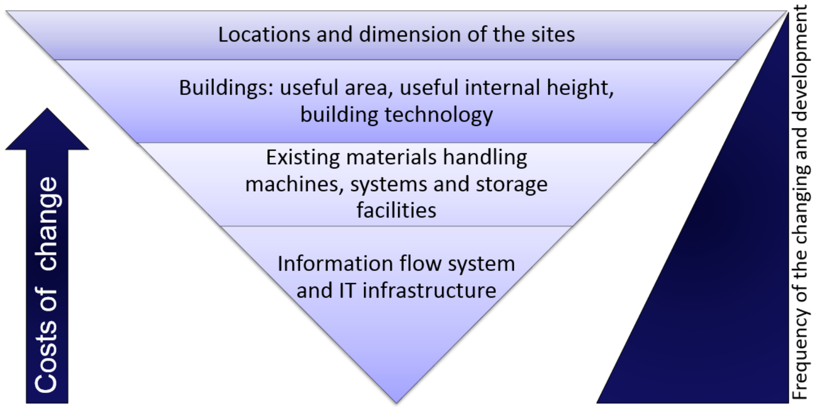
– Changing tasks based on changing environment

– New technologies, new machines, better availabilities of cutting edge technologies

– Changing of strategic targets

– Financial issues

Limitations in case of existing systems



Planning without infrastructure limitations

– Analyze the existing situation:

– Customer requirements and required material flow for the right customer fulfilment.

– Changes in supply opportunities

– Information flow and its scheduling.

– Analyze the available resources and infrastructure

– Technology and infrastructure

– Building and site

– Available transport connections

– Materials handling systems, machines a storage facilities

– Redefine the material flow and required technological processes.

– Select the resources and machines needed to be replaced

– Insert new resources and machines.

– Optimize the required inventory levels in the entire materials flow system and determine the required storage components. Replace the unadequate with new storage components.

– Optimize the operational algorithms and strategies.

– Test and evaluate the plan version.

– Compare the plan versions and select the optimal.