Online tananyag

Interdiszciplináris tudományok

Sorozatszerkesztő: Dr. Balázs László

25. *Basics of logistics*

DUNAÚJVÁROSI EGYETEM
UNIVERSITY OF DUNAÚJVÁROS

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Introduction to the Course

I. INTRODUCTION TO LOGISTICS

1. What is the logistics?

The logistics is the science of logical operating material flow processes which material flow processes are included into every industrial, material processor and commerce processes. Furthermore it is the science of cost and work optimisation of material flow in a global network.

It is everywhere and influence the cost of products and service as well. Why? Because these economic goods, materials, products and services are just not at the geographical point of its customers which customers could be and industrial partner or a buyer in a mall, shop or its home.

2. History of logistics

Where was it started? In military... Because armies need a big amount of supplies: munitions, weapons, food, drinks, fuel for movement, etc.

3. The definition of logistics by US Council of Logistics and today Inner logistics and outer logistics

Logistic services

SCM and SCN

E-Commerce and e-Logistics (Example: Alticor Global System)

4. The role of the Customer Satisfaction Level and Key Performance Indicators of Logistics The key: Costs of logistic operations

production, service: raw materials, equipments, tools, workers, employees, business administration

Inner logistics: inner material movement, unit load handling, storage and order picking, garbage handling

Outer logistics: proceurement process and administration, packaging and unit load building, transportation

logistic services: result - product, service – transportation, storage and order picking, packaging, transportation

II. LOGISTIC SYSTEM, PROCESS AND STRATEGY

1. The system of logistics

2. Processes and operations

3. Improvement principles

4. The strategic issues of logistics

III. TOOLS OF LOGISTICS

1. Materials handling and loading systems

2. Storage systems

3. Transport systems

4. Logistic information systems

5. Logistic management

6. Logistic process improvement methods

IV. THE TASKS OF INNER LOGISTICS

1. Distribution logistics

2. Production logistics

3. Procurement

4. Recycling

V. THE GLOBAL NETWORK OF LOGISTICS IN DETAILS

1. Logistics of production company

2. Supply chains and networks

3. Logistics of service oriented enterprises

4. Logistic services and international forwarding

5. E-commerce served by e-logistics

6. Recycling logistics

7. City logistics

Introduction to the Course (ppt)

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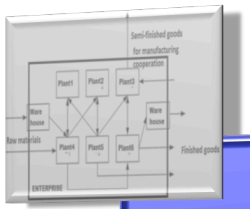
Basics of Logistics
College of Dunaújváros

Introduction to the Course

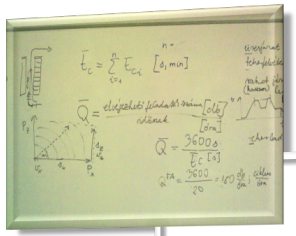
MAGYARORSZÁG MEGÚJUL
A projekt az Európai Unió támogatásával valósul meg.

About the Course



Theoretical course

- system structures and components
- operating methods
- management tools and methods

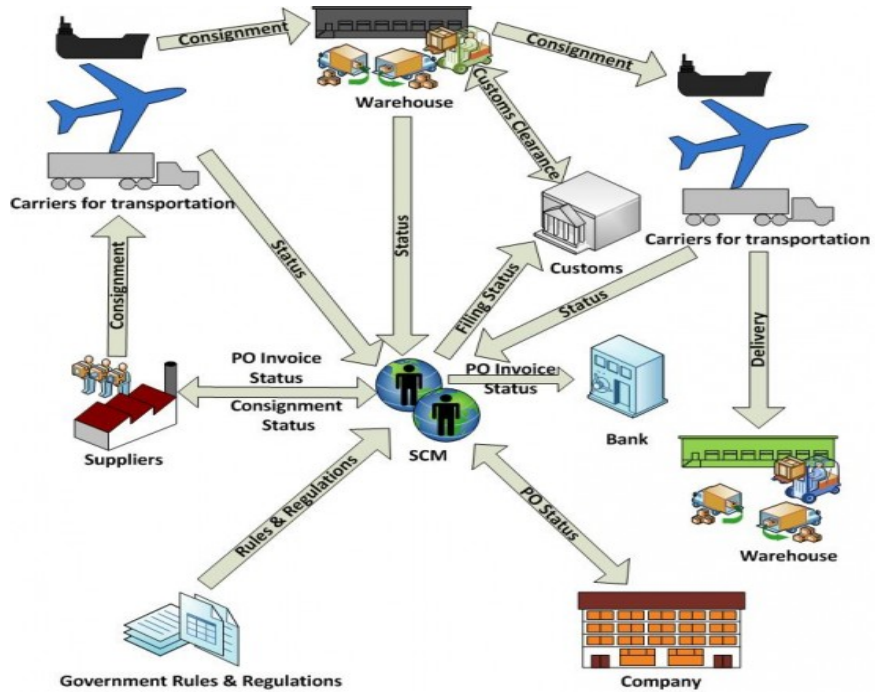


Practical course

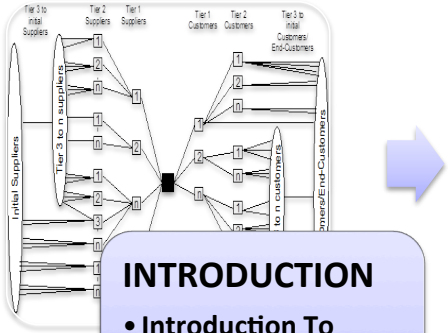
- mathematical methods
- examples, case studies

Logistics Requirements

1. Right place
2. Right time
3. Right material
4. Right amount
5. Right source
6. Right cost
7. Right equipment

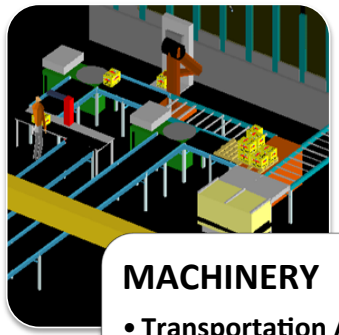


Roadmap of Basics of Logistics Course



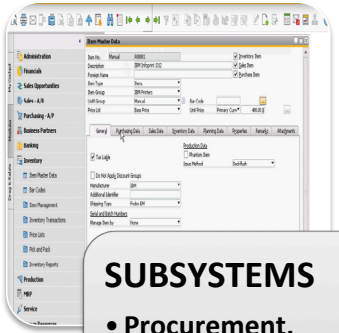
INTRODUCTION

- Introduction To Logistics
- Logistic System And Processes
- Logistic Strategy



MACHINERY

- Transportation And Materials Handling Systems
- Forwarding And Its Documents
- Installations And Machines In Logistics



SUBSYSTEMS

- Procurement, Production Logistics, Distribution
- Reverse Logistics
- E-Logistics
- Logistic Information System

LECTURE 1.

Lecture 1. Introduction to Logistic (ppt)

1.1 What is the Logistics?

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INTRODUCTION TO LOGISTICS

1. What is the Logistics?

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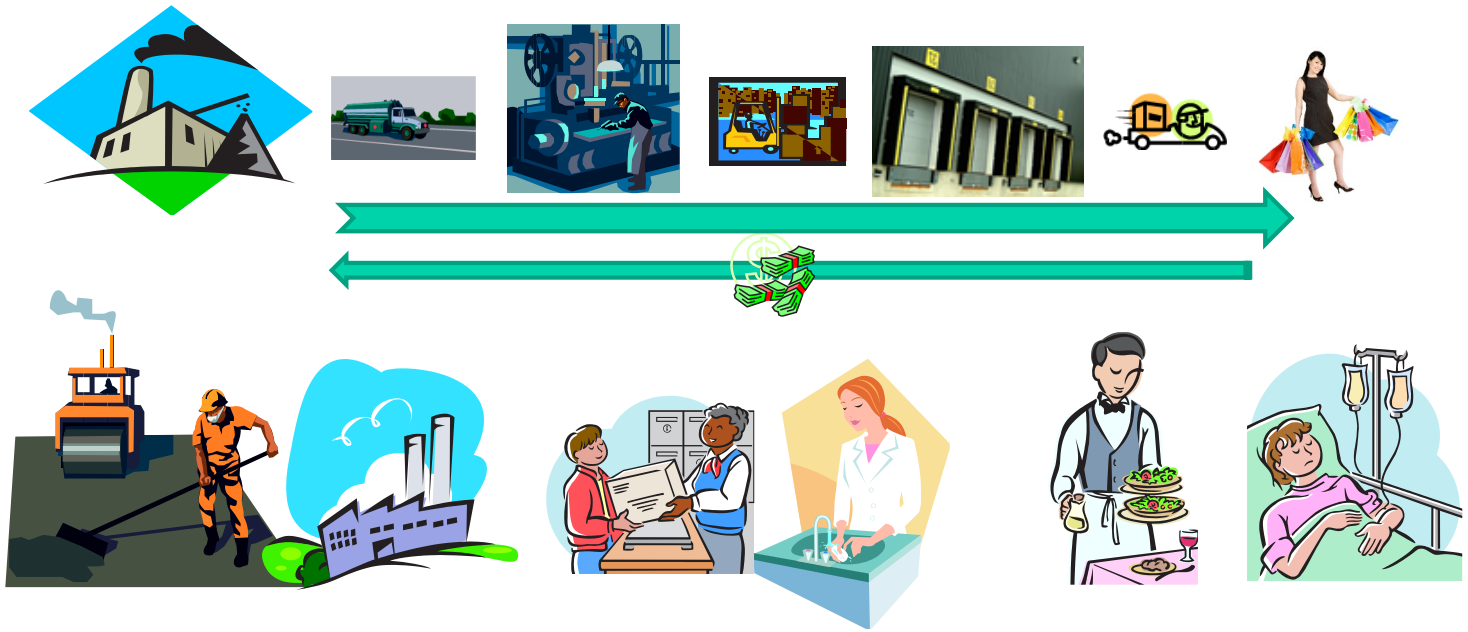
Objectives of Logistics

„Science of the efficient materials movement”




Finland
Norway
Sweden
Baltic Sea
Estonia
Lithuania
Russia
Denmark
North Sea
Ireland
United Kingdom
Latvia
Atlantic Ocean
Rotterdam
Holland
Belarus
Germany
Poland
Belgium
Czech Republic
Ukraine
France
Slovakia
Austria
Hungary
Moldova
Switzerland
Slovenia
Croatia
Romania
Bosnia
Constantza
Black Sea
Italy
Adriatic Sea
Yugoslavia
Bulgaria
Spain
Portugal
Albania
Macedonia
Mediterranean Sea
Aegean Sea
Turkey
Greece
944 nM
Syria
Morocco
Algeria
3373 nM
Cyprus
Lebanon
Tunisia
Israel
Libya
Jordan
Egypt
Port Said

Questions?

?

What is with the truck utilisation?

?

How much amount of materials or products is expedient to order or transport?

?

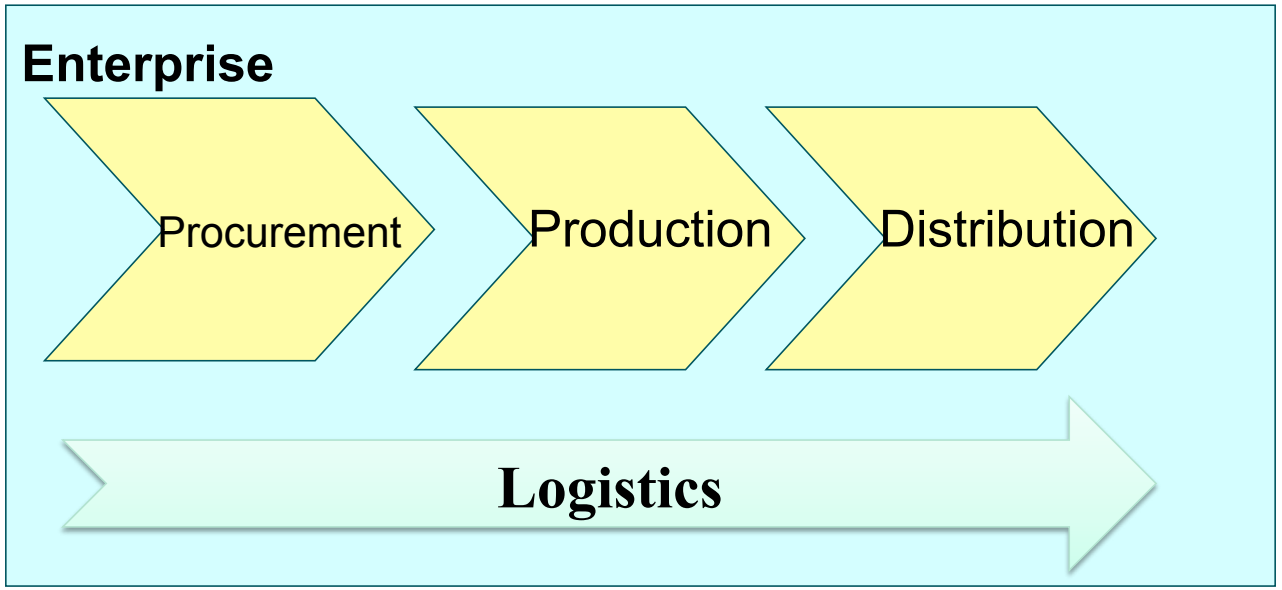
What should we do, if the materials are not available in the required time?

Simple questions + **Complex systems** = **Complex answers required**

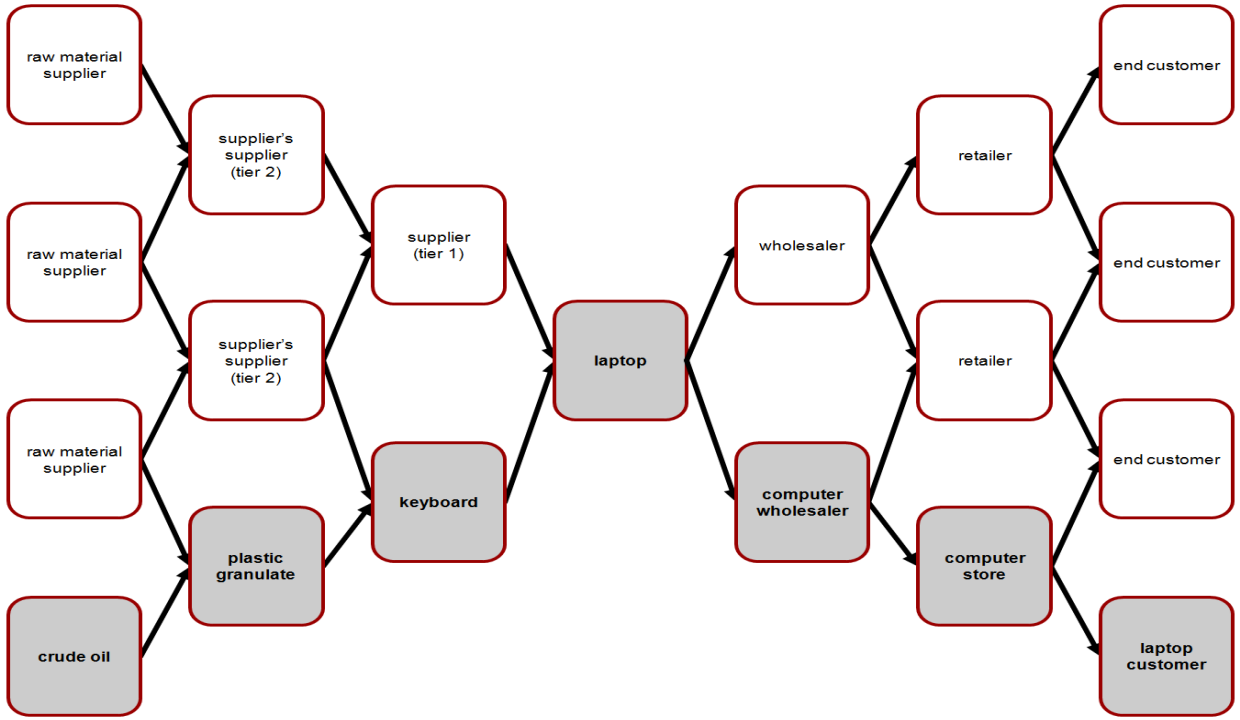
The Council of Logistics Management defines the logistics as

"Logistics is the process of planning, implementing and controlling the efficient, effective flow and storage of raw materials, in-process inventory, finished goods, services, and related information from point of origin to point of consumption (including inbound, outbound, internal, and external movements) for the purpose of conforming to customer requirements."

General Logistic Processes in Enterprises



Supply chains and networks



Introduction to Logistic (ppt)
1.2. The history of logistics

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INTRODUCTION TO LOGISTICS

2. The history of logistics

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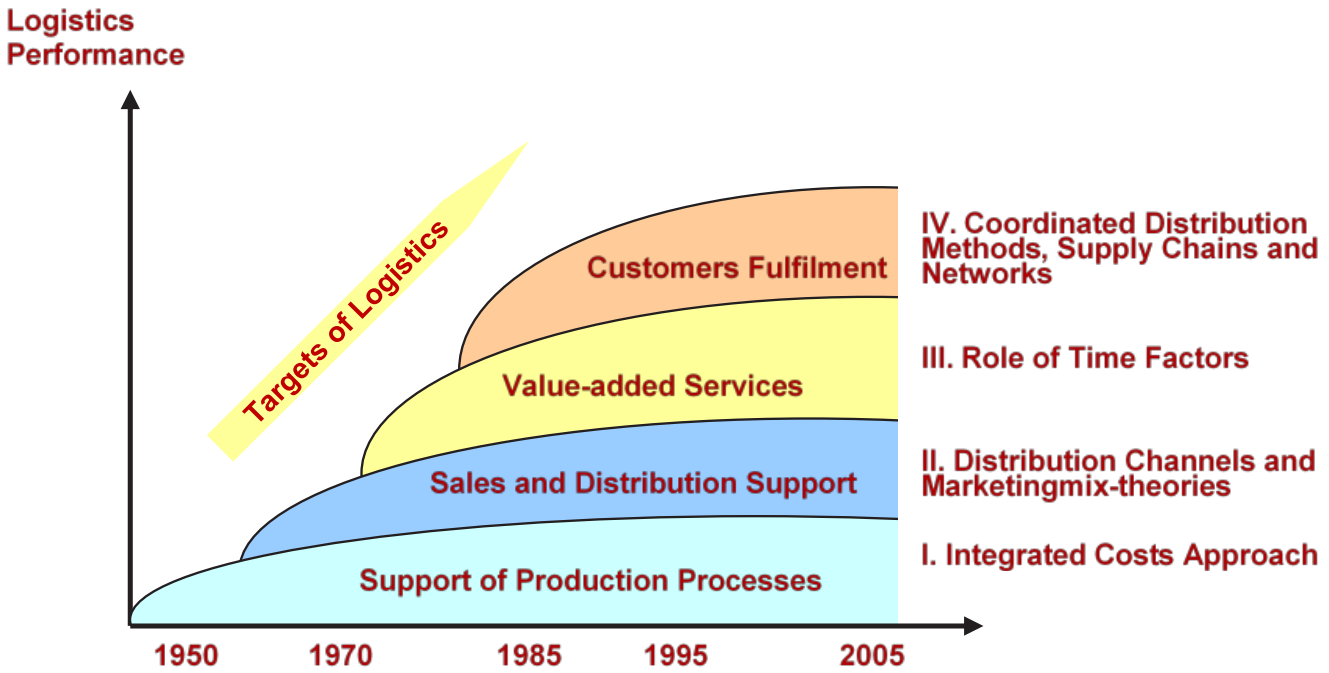
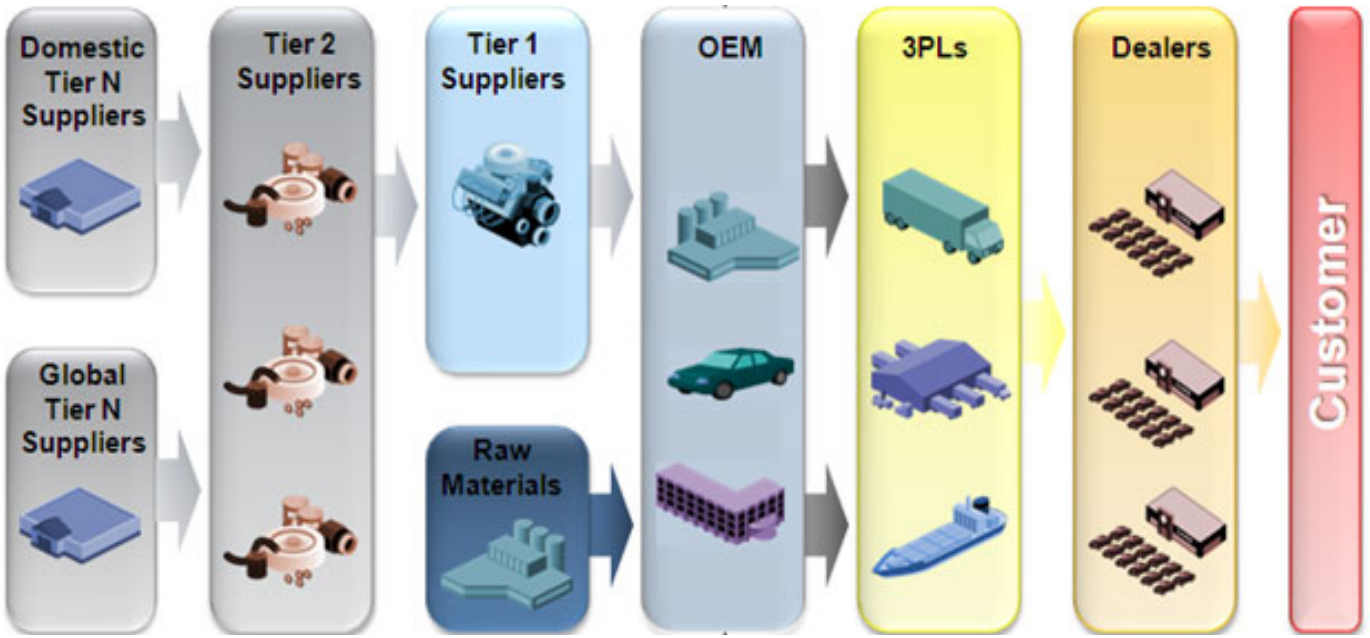
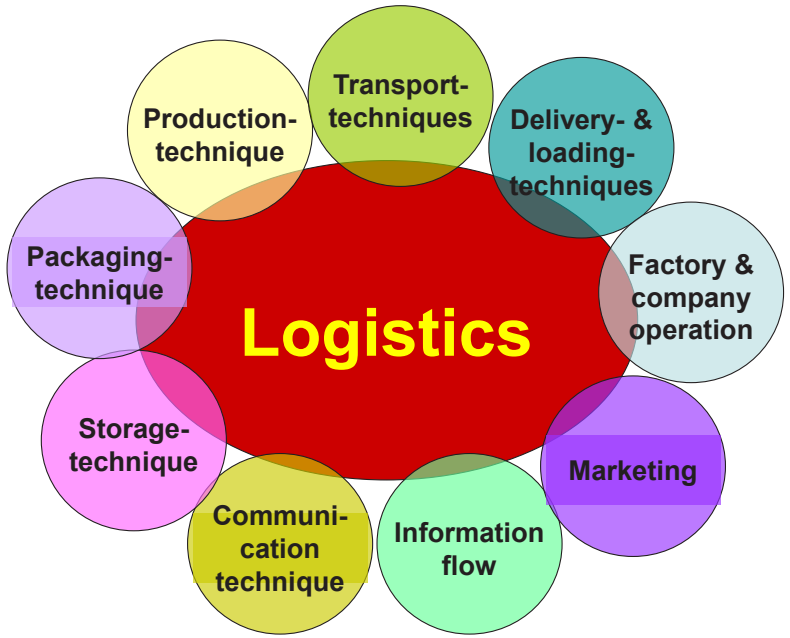
Evolution of Logistics



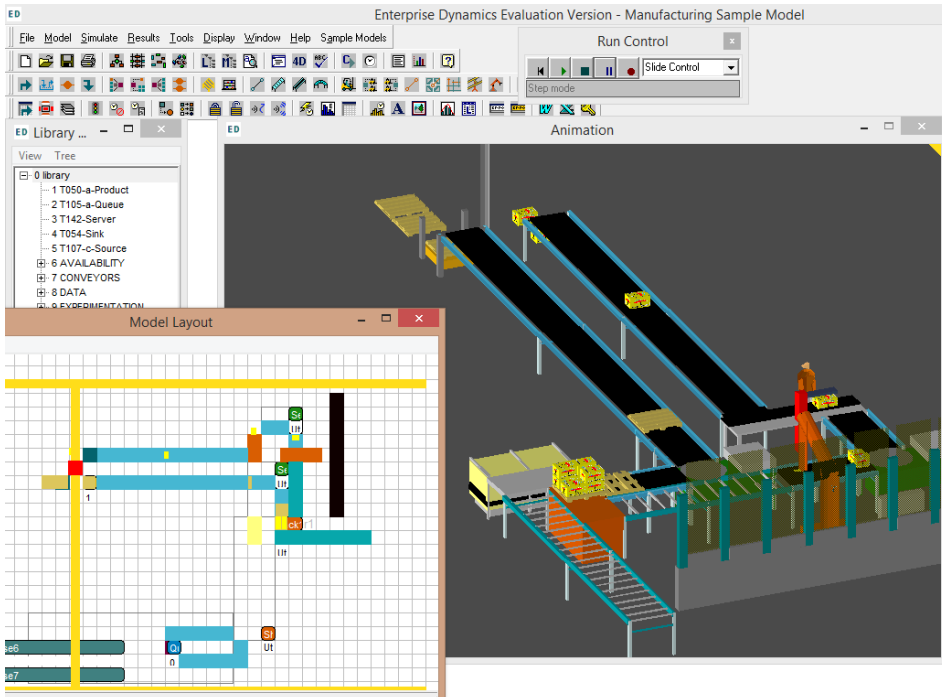
Participant companies in a supply chain



Major areas related to logistics



Logistic system optimization with discrete-event computer simulation



Introduction to Logistic (ppt)
1. 3. The logistics today

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INTRODUCTION TO LOGISTICS

2. The logistics today

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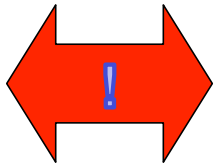
The logistics today

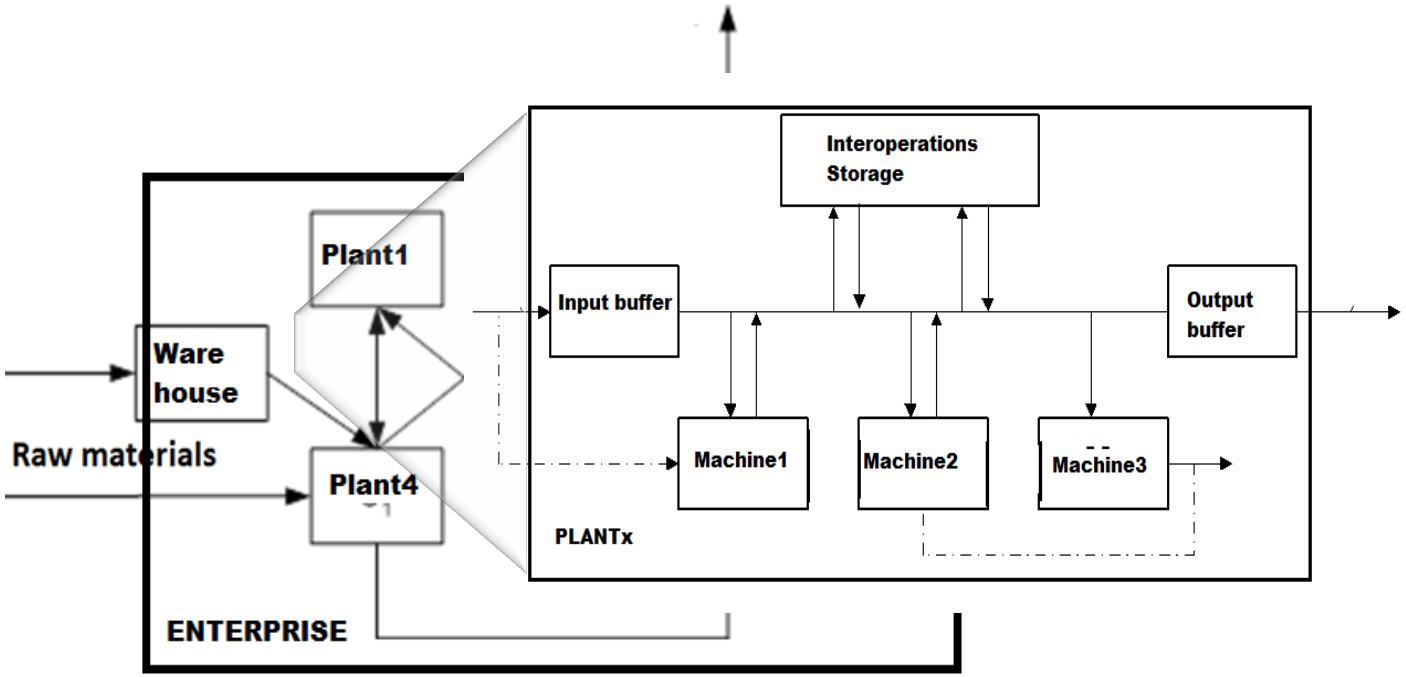
Optimum:

- Zero lost time
- Zero lost money
- Zero empty run
- Zero Stock



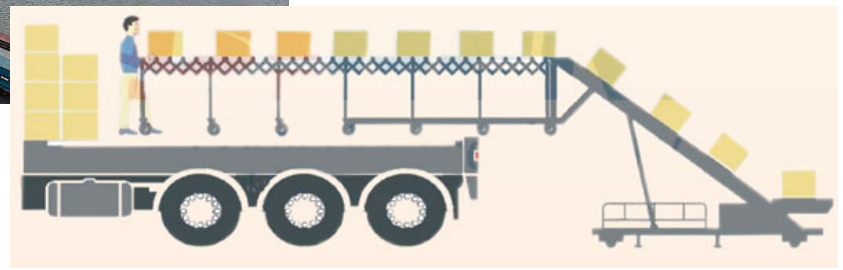
- Demand of End-customers for products
- Lot of participants in production and distribution
- Distance

Inner and outer logistics



Inner and outer logistics
Transportation

Inner and outer logistics
Loading Systems



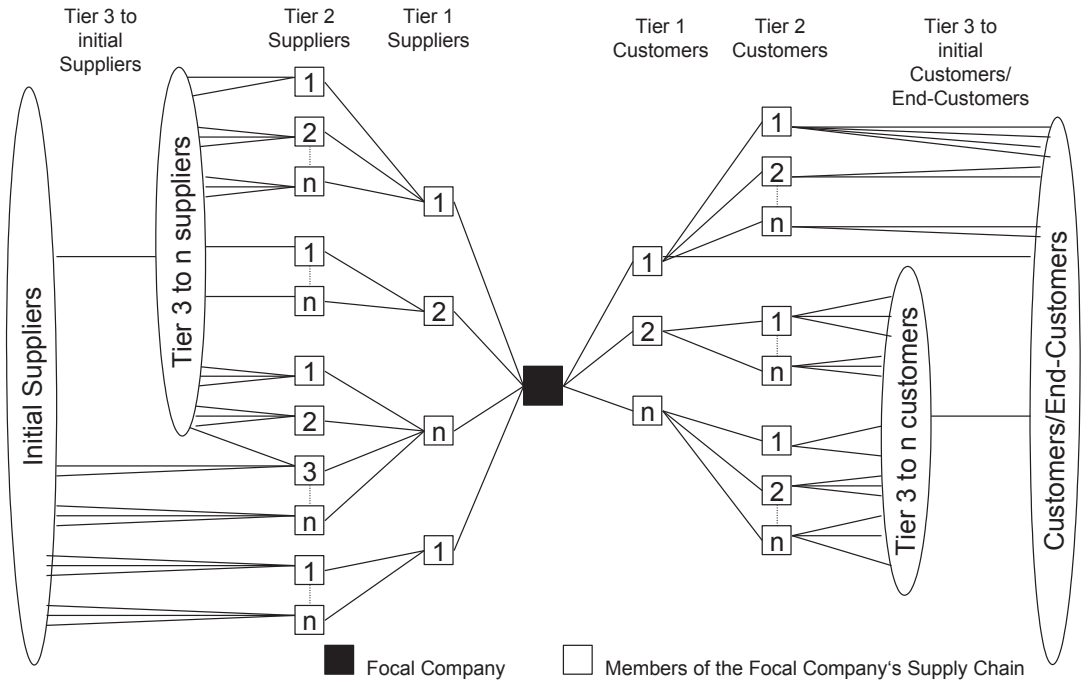
3rd party logistics

- Efficiency improvement
- Quality improvement
- Cost reduction

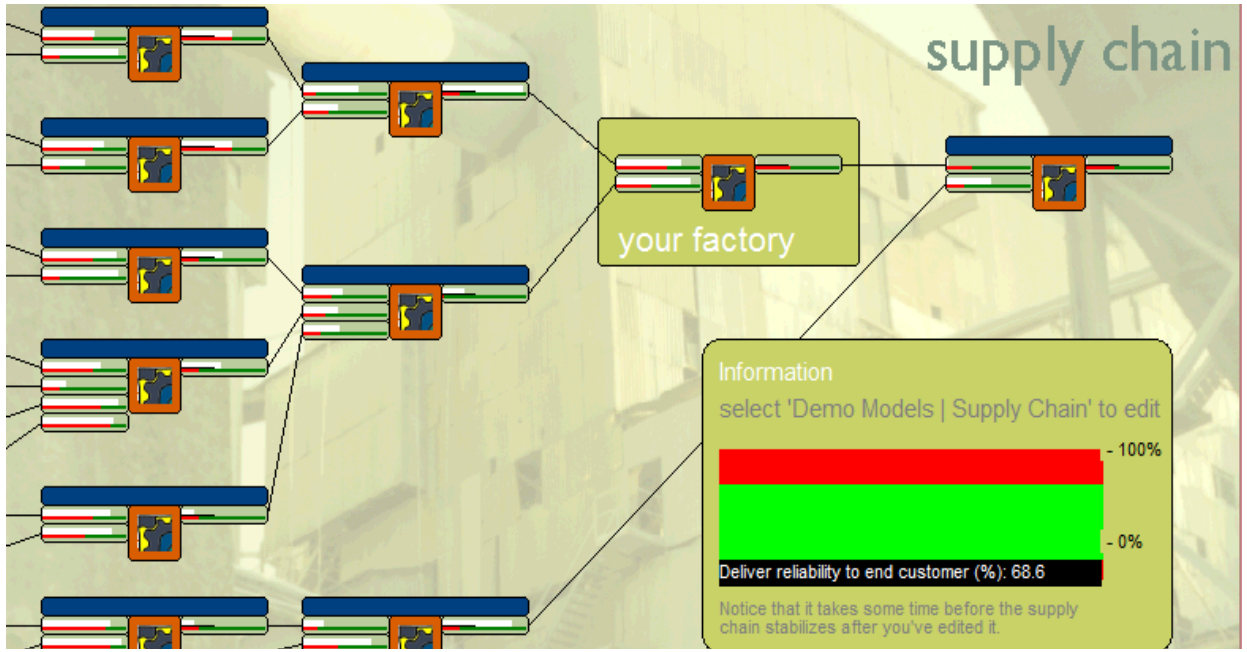
in

- Transportation
- Warehousing
- Loading, labelling, etc.

Supply Chains and Supply Networks

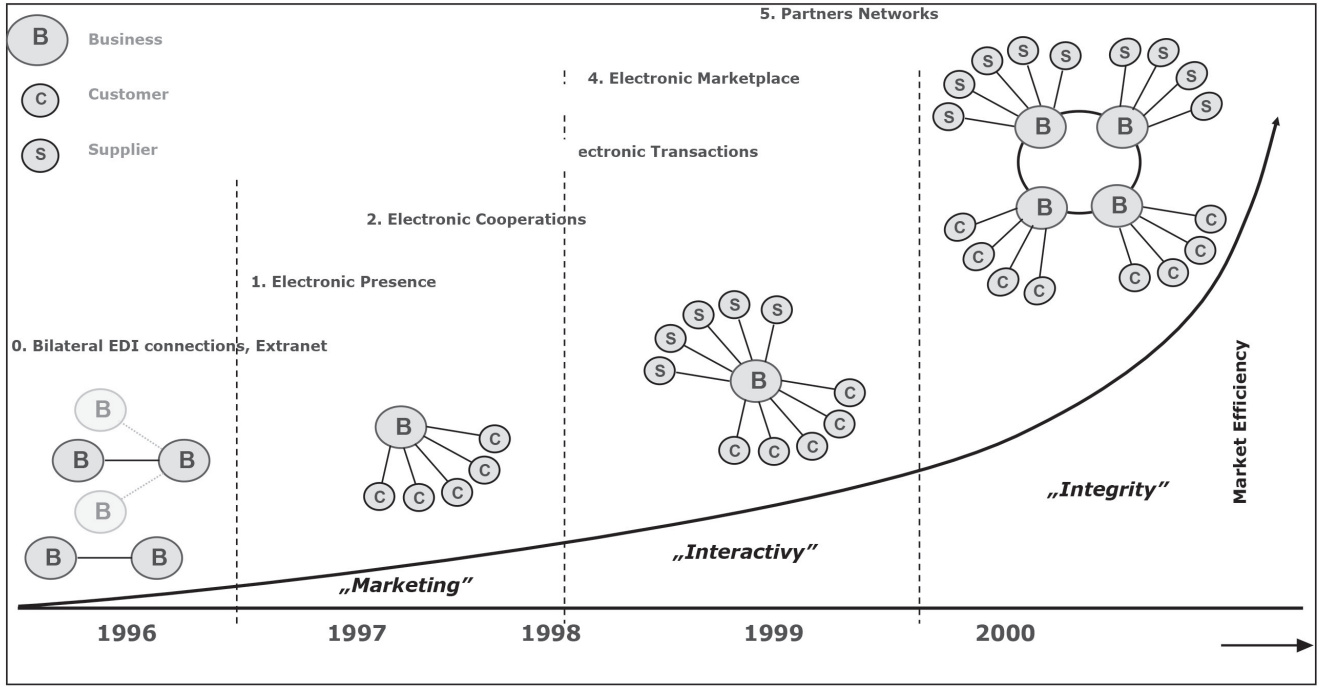


Supply Chains and Supply Networks

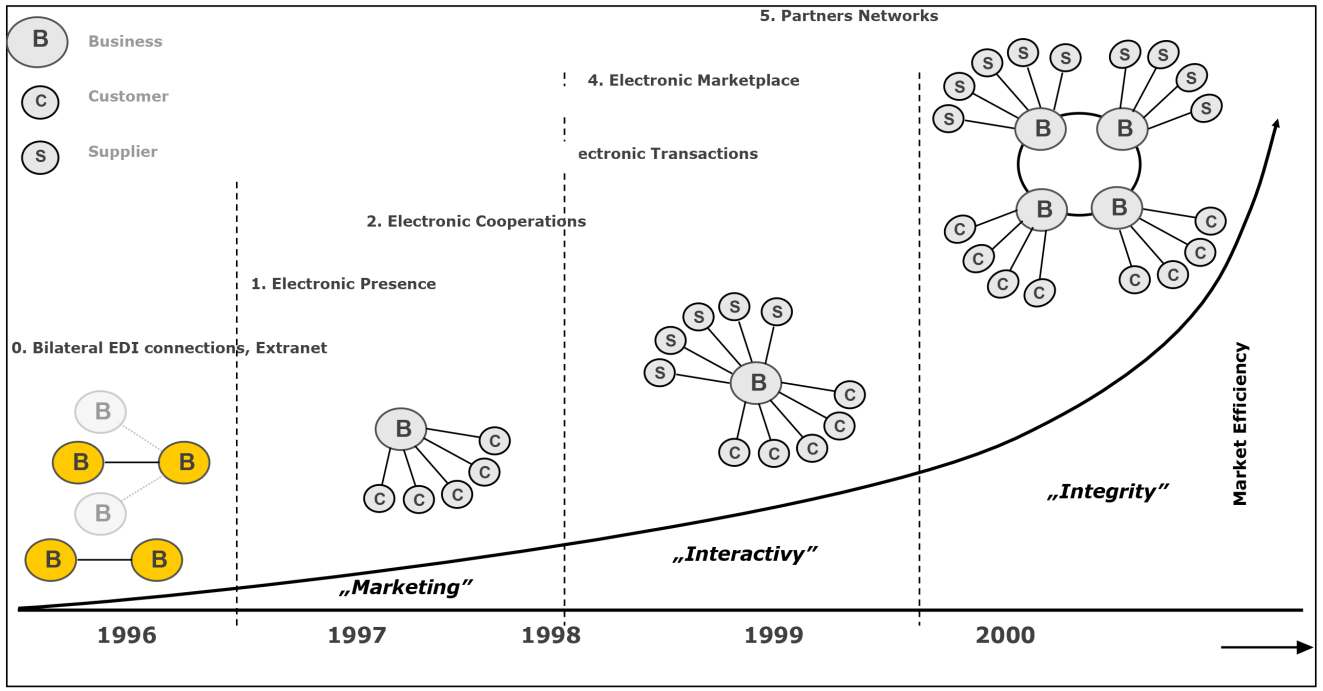


Source: Sample Model in Enterprise Dynamics 2001

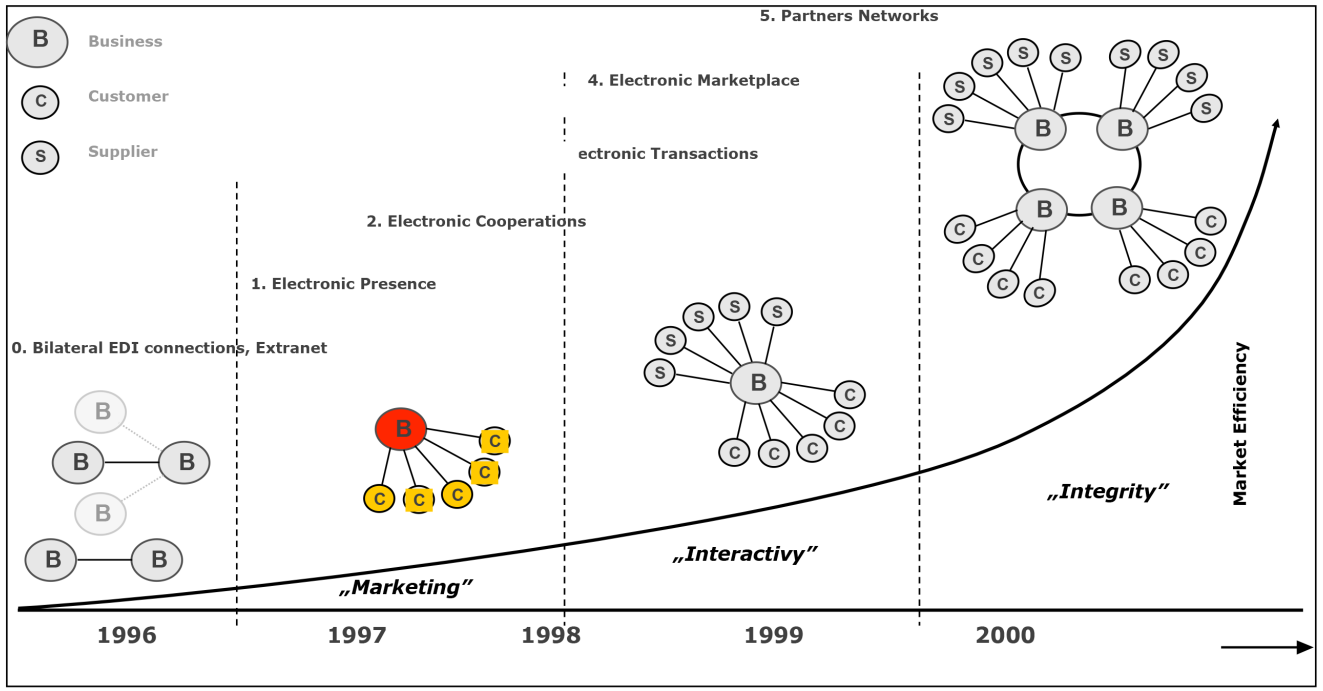
E-Commerce and E-Logistics



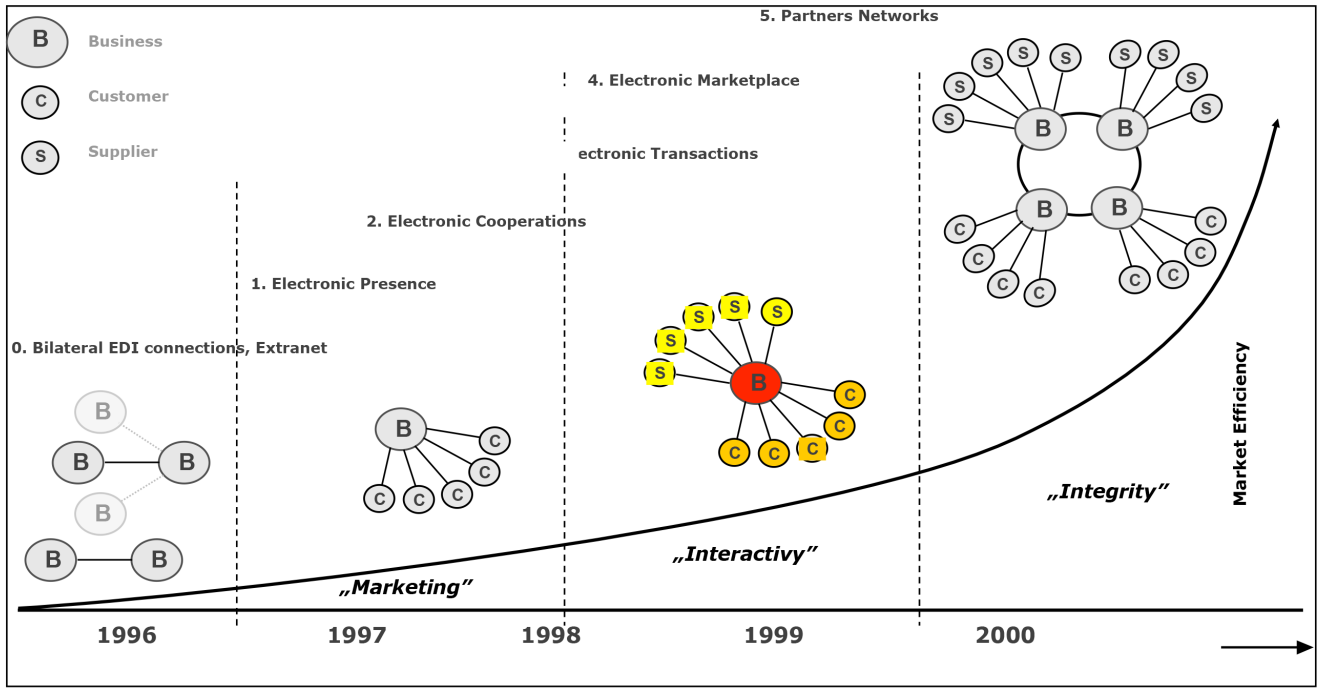
E-Commerce and E-Logistics



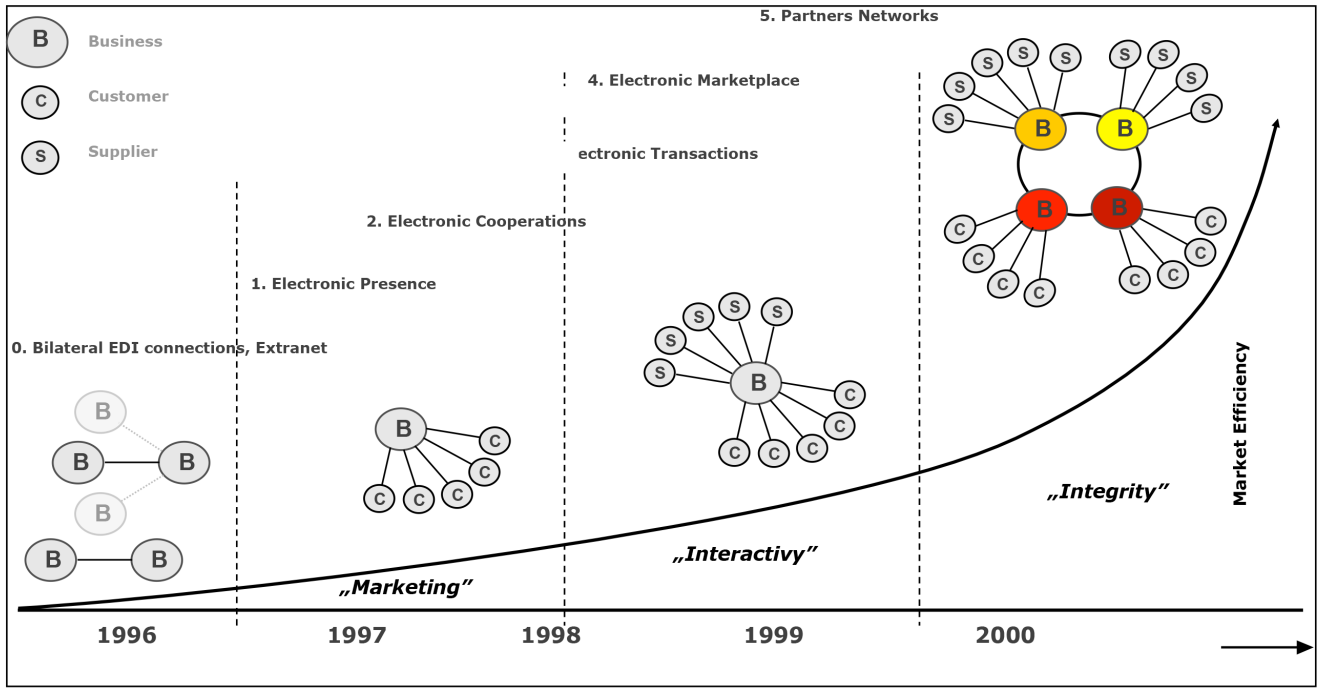
E-Commerce and E-Logistics



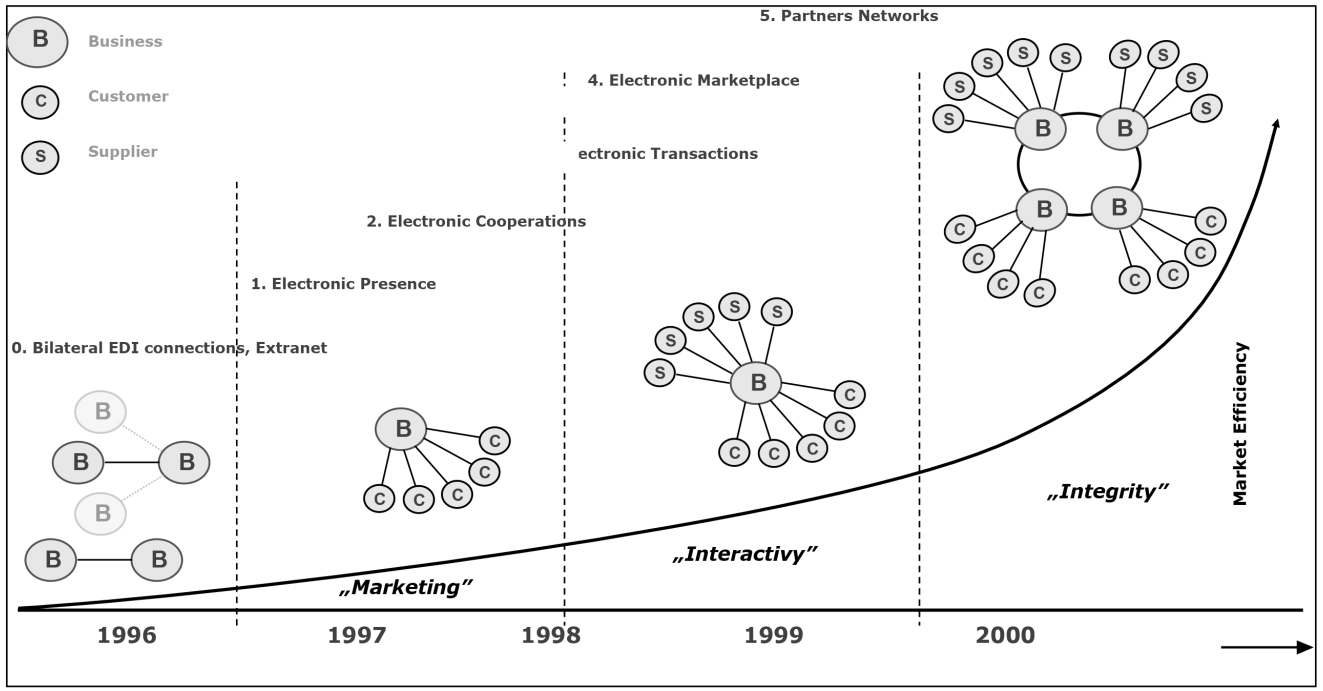
E-Commerce and E-Logistics



E-Commerce and E-Logistics



E-Commerce and E-Logistics



LECTURE 2.

LOGISTICS SYSTEMS AND PROCESSES
2.1. The system of logistics

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LOGISTICS SYSTEMS AND PROCESSES

2.1. The system of logistics

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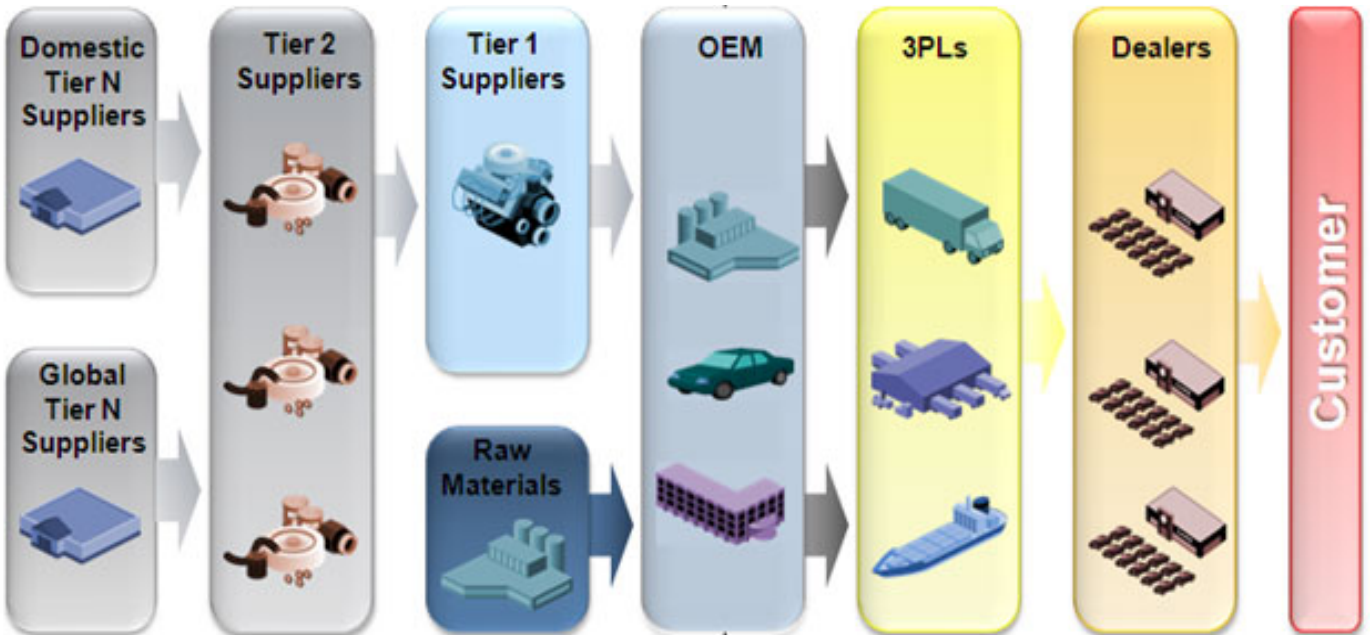
System approach in Logistics



The role of the logistics

the Right **product**, **information** and **services**

in the Right quantity

in the Right condition

to the Right place

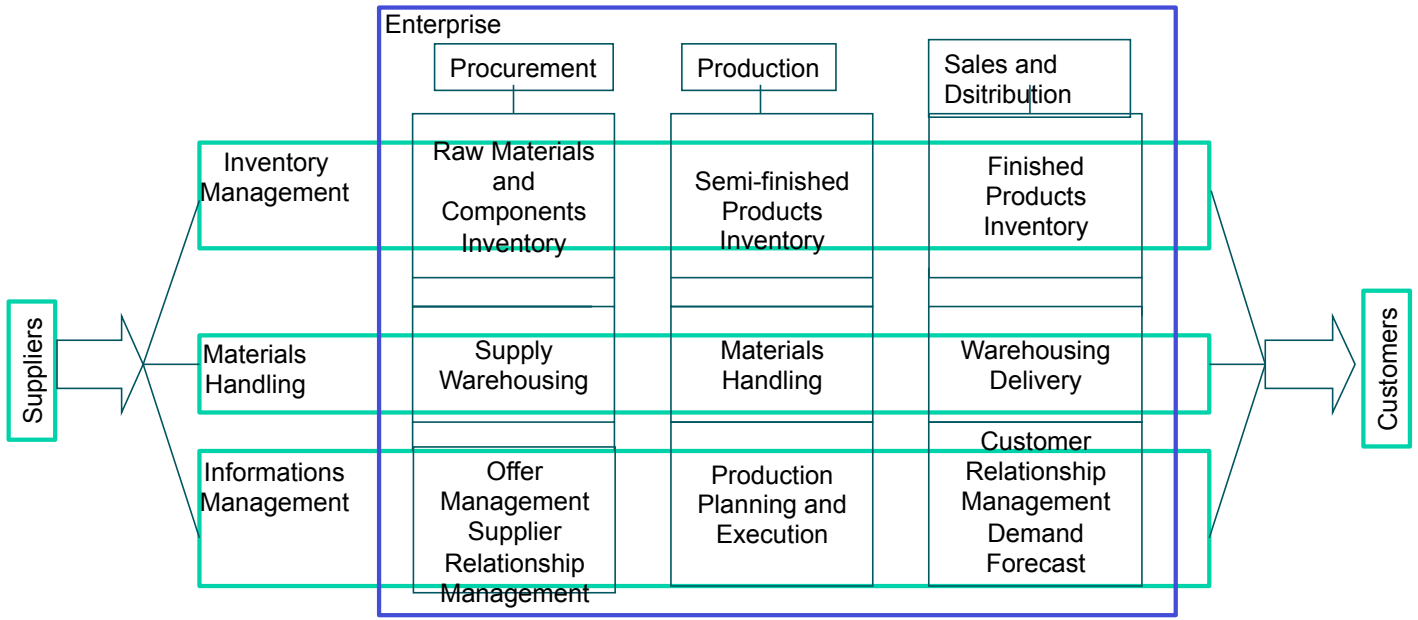
at the Right time

for the Right customer

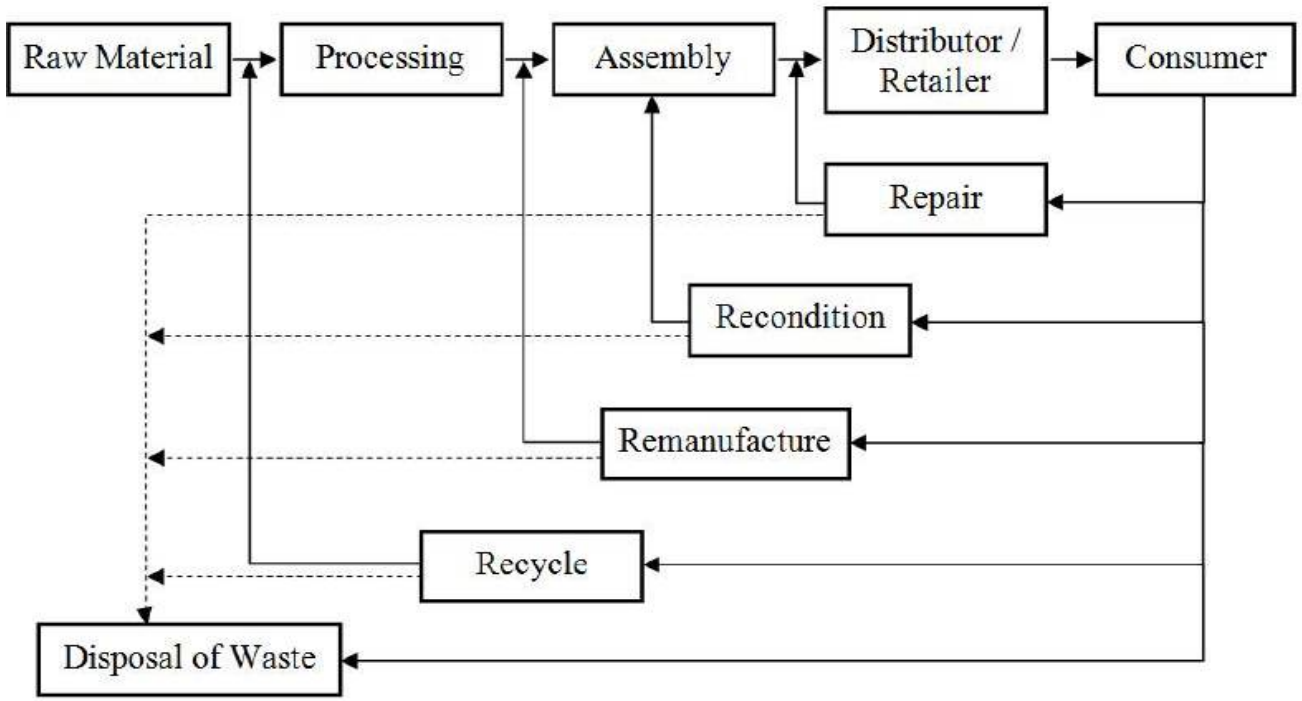
at the Right cost

„7R”s

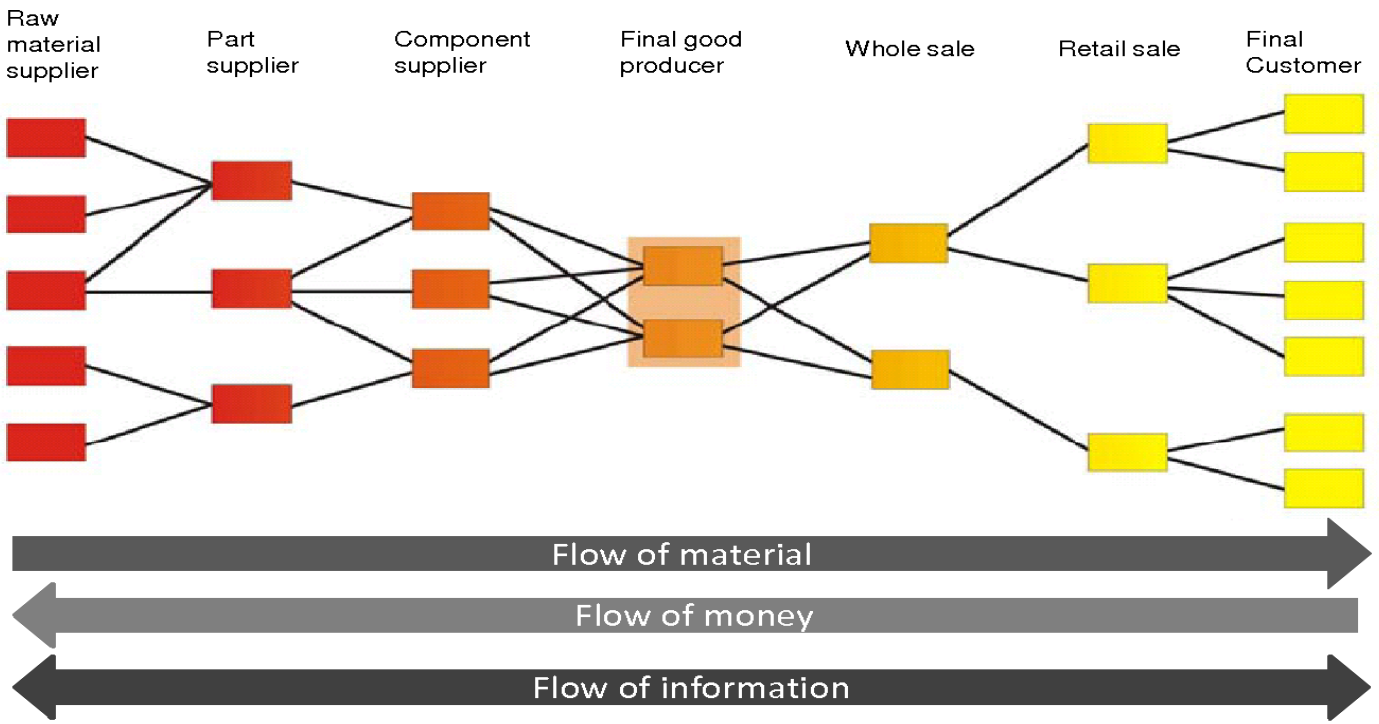
The Complex Logistics System of an Enterprise



Recycling Logistics Processes



Logistic Information Flow



LOGISTIC SYSTEMS AND PROCESSES
2.1.1. Basic Logistic Operations

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LOGISTIC SYSTEMS AND PROCESSES

2.1. Basic Logistic Operations

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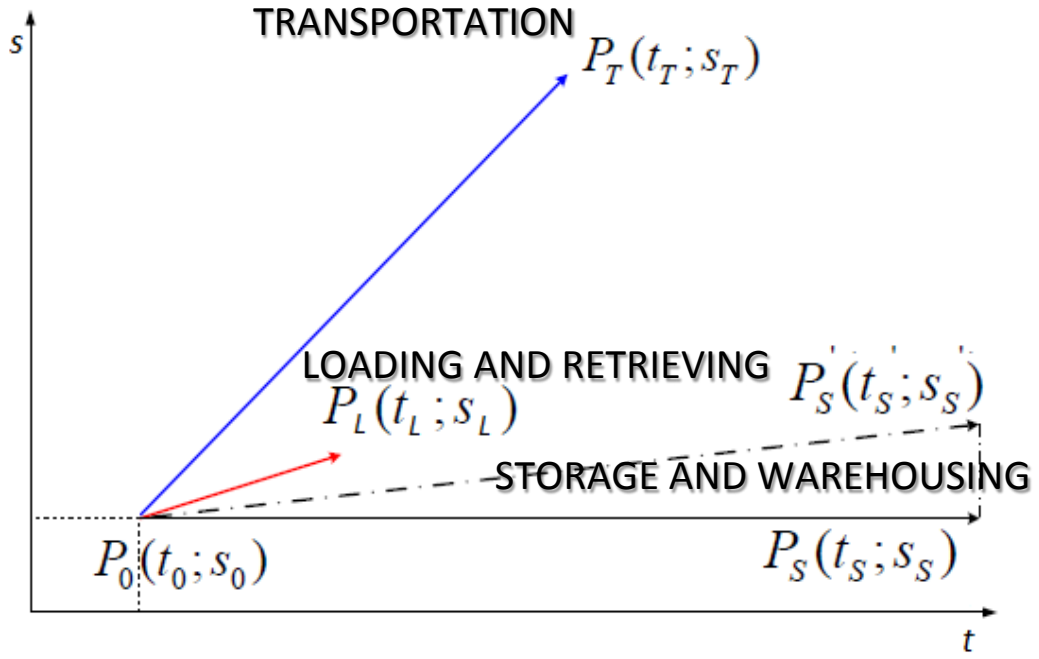
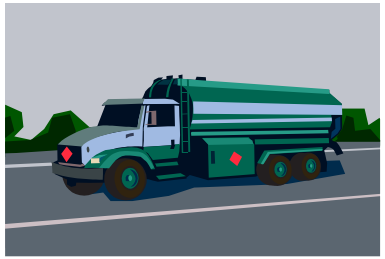
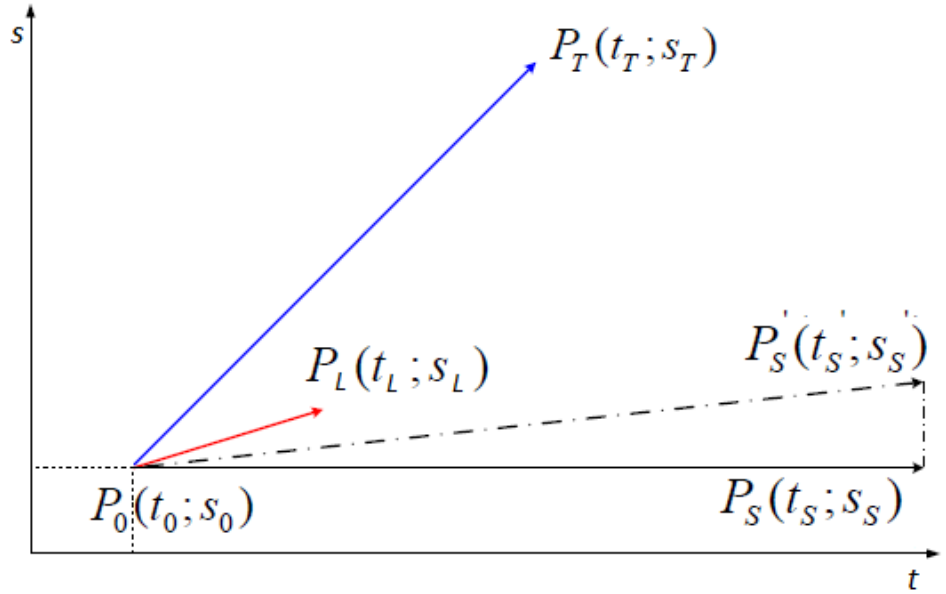
Basic logistic operations





Time-Distance Chart of Basic Logistic Operations



$$\Delta s_s = s_s - s_0$$
$$\Delta t_s = t_s - t_0$$
$$\Delta s_L = s_L - s_0$$
$$\Delta t_L = t_L - t_0$$
$$\Delta s_T = s_T - s_0$$
$$\Delta t_T = t_T - t_0$$

$$\Delta t_T << \Delta t_S \quad , \quad \Delta s_L << \Delta s_T \quad , \quad \Delta t_L << \Delta t_T$$

INTRODUCTION TO LOGISTICS
2.2. The logistic operations

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Lecture 2.

INTRODUCTION TO LOGISTICS

2. The logistic operations

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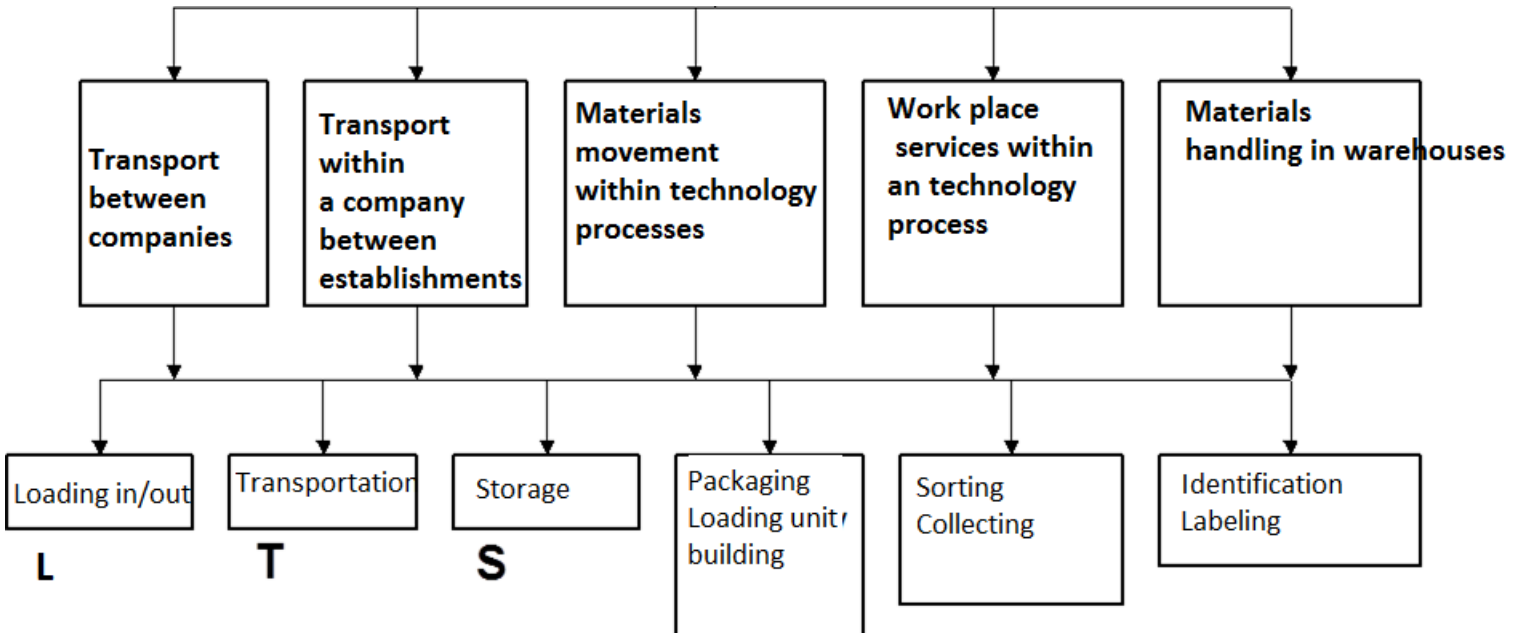
Enterprise logistic operations



INTRODUCTION TO LOGISTICS
2.2.1. The logistic operations

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LOGISTIC SYSTEMS AND PROCESSES

2.2. Additional Logistic Operations

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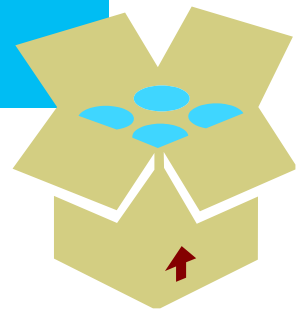
Packaging

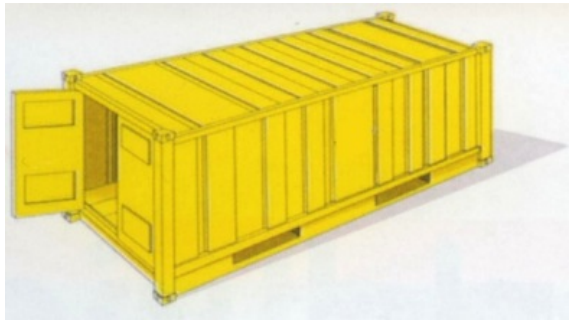
- avoid the material from the environmental effects
- avoid the environment from the materials
- make available the batch materials handling
- provide information about the goods
- marketing and advertisement surface

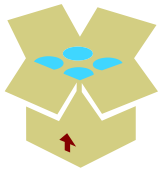


Unit-load building and breaking

Standardized packaging devices

- Boxes
- Pallets
- Containers



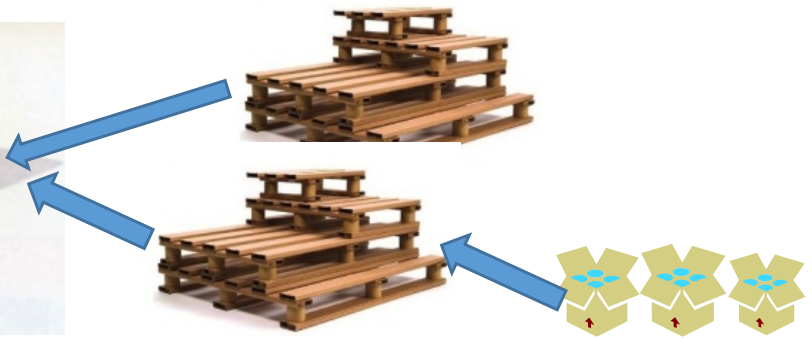


Unit-load building and breaking

Standardized packaging devices

- Boxes
- Pallets
- Containers

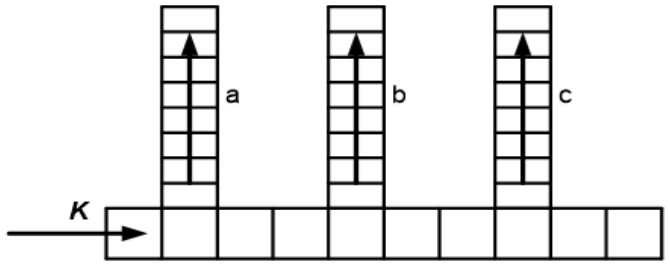
Multi-level unit-load building



Sorting and Collecting

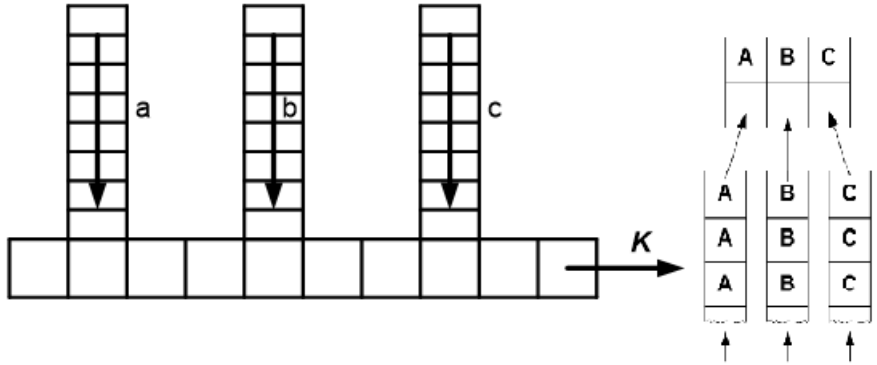
Sorting:

- Single source
- Multiple sinks



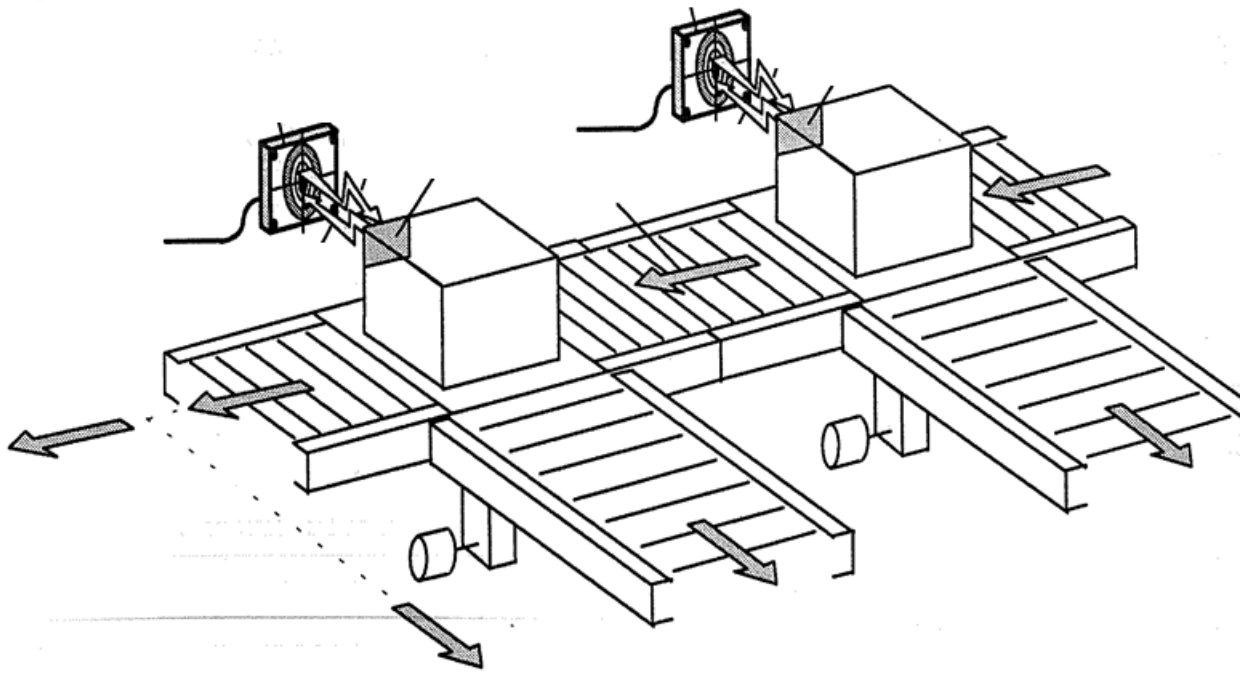
Collecting:

- Multiple source
- Single sink



Roller conveyor for sorting and collecting boxed goods

Labelling and identification



LECTURE 3.

LECTURE III – LOGISTIC STRATEGY
3.1. The strategic issues of logistics

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ÚJ SZÉCHENYI TERV

Basics of Logistics
College of Dunaújváros

LECTURE III – LOGISTIC STRATEGY

3.1. The strategic issues of logistics

MAGYARORSZÁG MEGÚJUL

A projekt az Európai Unió támogatásával valósul meg.

Strategic issues of logistics

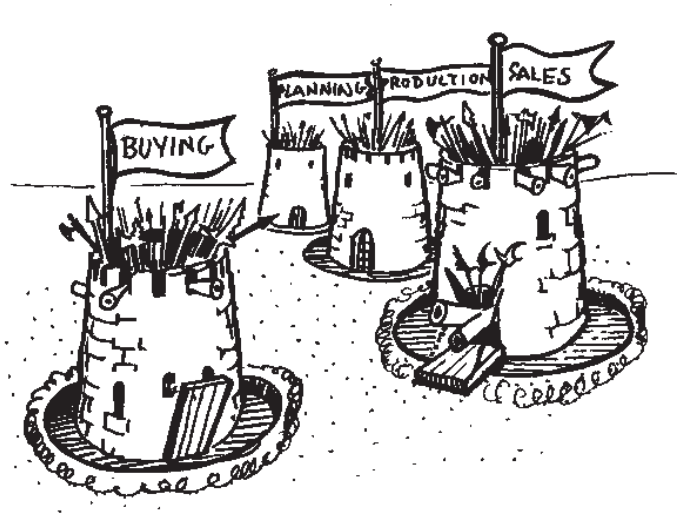
Strategic role in:

- Right customer fulfilment
- Cost efficiency

With synchronizing organizations logistic processes

Centralized logistic functions

Decentralized logistic functions



Source: SAP University Alliances – Introduction to ERP Systems with GBI

LECTURE III – LOGISTIC STRATEGY
3.1.1. Management of the Logistics

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LECTURE III – LOGISTIC STRATEGY

3.1.1. Management of the Logistics

MAGYARORSZÁG MEGÚJUL
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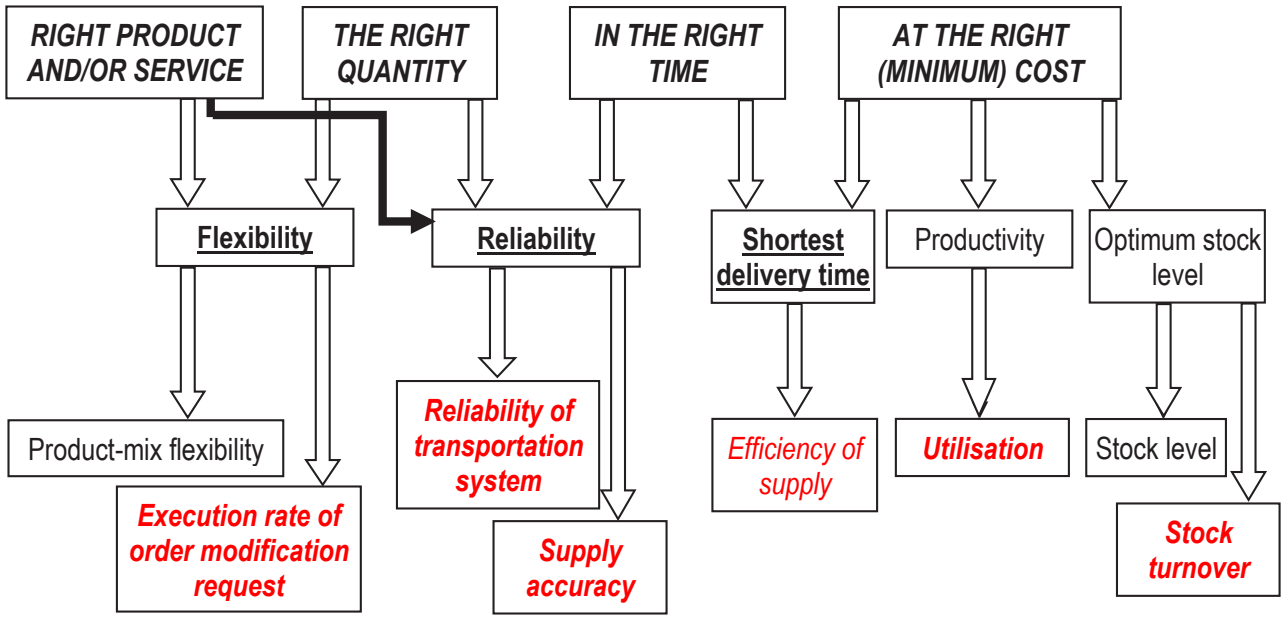
Logistic Management levels:

- **Organizing** and **planning** of optimal logistic processes
- **Control** of logistic operations

Logistic system levels:

1. Strategic level
2. Tactical planning level
3. Operation execution level

Logistic requirements and daily objectives



LECTURE III – LOGISTIC STRATEGY
3.1.2. Chief Logistics Officer

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LECTURE III – LOGISTIC STRATEGY

3.1.2. Chief Logistics Officer

MAGYARORSZÁG MEGÚJUL

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Chief Logistics Officer

Top management function

Responsible:

- for Customer fulfilment
- for Materials management
- for optimal work of the whole logistics
- for logistic cost
- for Logistic controlling

LECTURE III – LOGISTIC STRATEGY
3.2.1. The stategic level

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LECTURE III – LOGISTIC STRATEGY

3.2.1. The stategic level

MAGYARORSZÁG MEGÚJUL

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támogatásával valósul meg.

The stategic level of logistic management

1. Creating logistic concept according to the company and market objectives
2. Logistic system planning to the capacity requirements:
    1. System components
    2. Locations
    3. Material flow channels
    4. Information system components
3. Controlling system and Logistic performance measurement
4. Creating the logistic organization from top level down to operative level:
    1. Procurement organization
    2. Sales organization
    3. Warehouses
    4. Recycling organizations

LECTURE III – LOGISTIC STRATEGY
3.2.2. The tactical level

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LECTURE III – LOGISTIC STRATEGY

3.2.2. The tactical level

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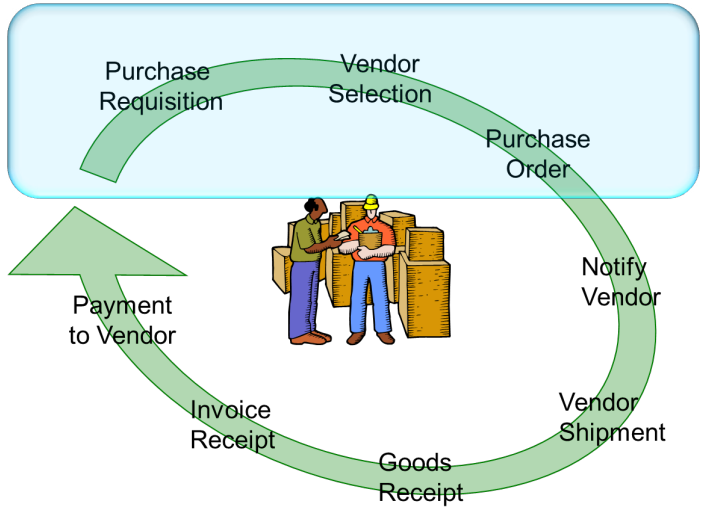
Procurement tactical level

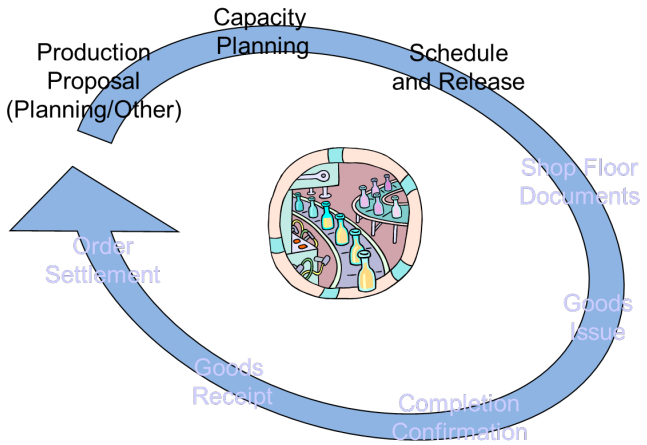
- Planning of centralized procurement processes
- Make-or-Buy decisions
- JIT optimization
- Outsourcing decisions
- Choosing procurement methods
- Performing tenders to choose the supplyers
- Contract management
- Supply scheduling and order releasing
- Decisions about the supply transportation and warehousing methods and parameters



Source: SAP University Alliances – Introduction to ERP Systems with GBI

Production tactical level

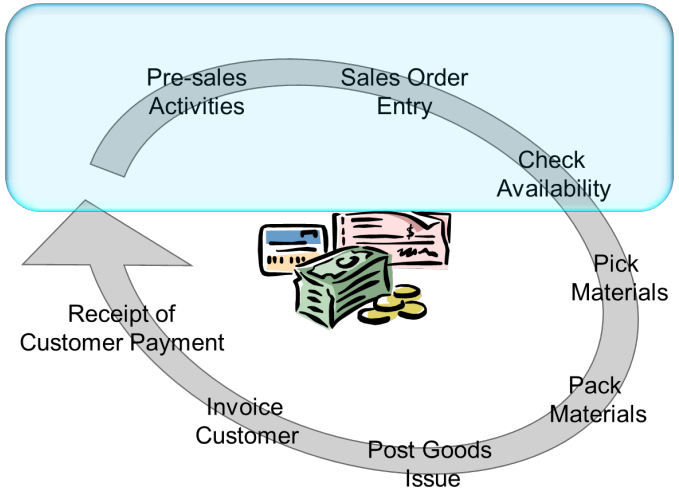
- Planning of materials flow
- Planning the materials handling
- Planning of information flow and control system
- Creating operating strategies
- Updating of operating parameters



Source: SAP University Alliances – Introduction to ERP Systems with GBI

Sales and distribution tactical level

- Determination of demands
- Distribution Resource Planning
- Contract management
- Register the customer orders
- Delivery scheduling
- Distribution route planning
- Decisions about the supply transportation and warehousing methods and parameters



Source: SAP University Alliances – Introduction to ERP Systems with GBI

LECTURE III – LOGISTIC STRATEGY
3.2.3. The operational level

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LECTURE III – LOGISTIC STRATEGY

3.2.3. The operational level

MAGYARORSZÁG MEGÚJUL

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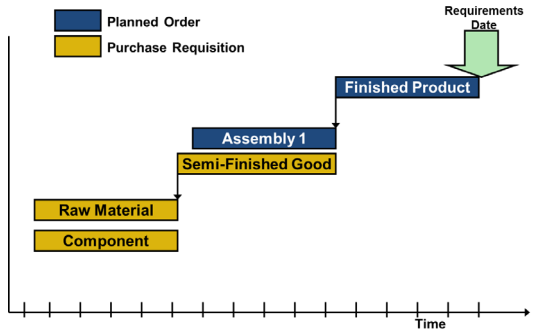
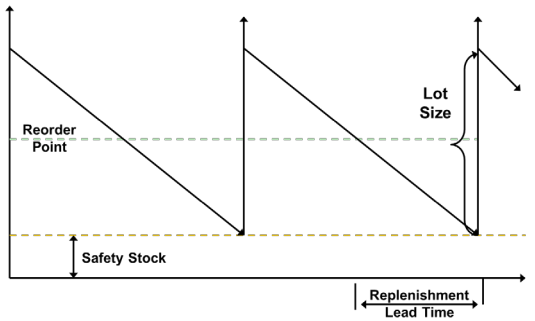
The operations level of logistic management

Everyday work at any sub-organizations

Manufacturing resource planning

Material requirement planning

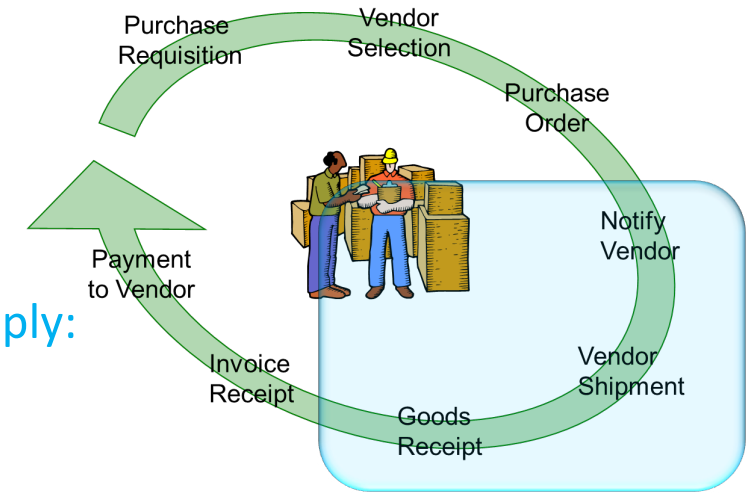




Source: SAP University Alliances – Introduction to ERP Systems with GBI

Purchase operation level

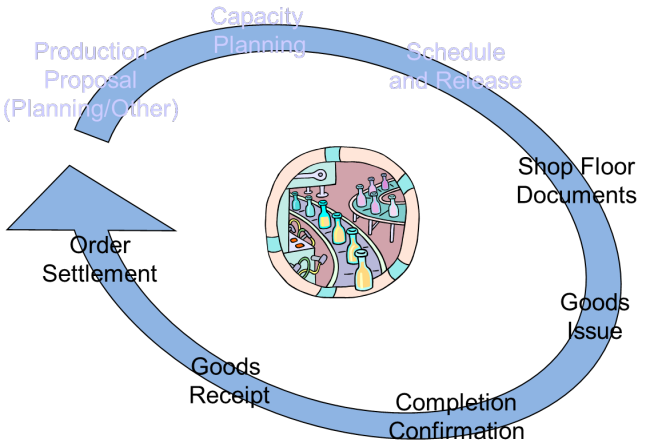
- Supply receiving and unloading the incoming vessels
- Quality control
- Depackaging
- Sorting and labelling
- Placement of the incoming supply:
  - internal transportation
  - buffer storage or longer warehousing
- Document handling:
  - creating goods receipt documents
  - creating supplier performance



Source: SAP University Alliances – Introduction to ERP Systems with GBI

Production exectuion level

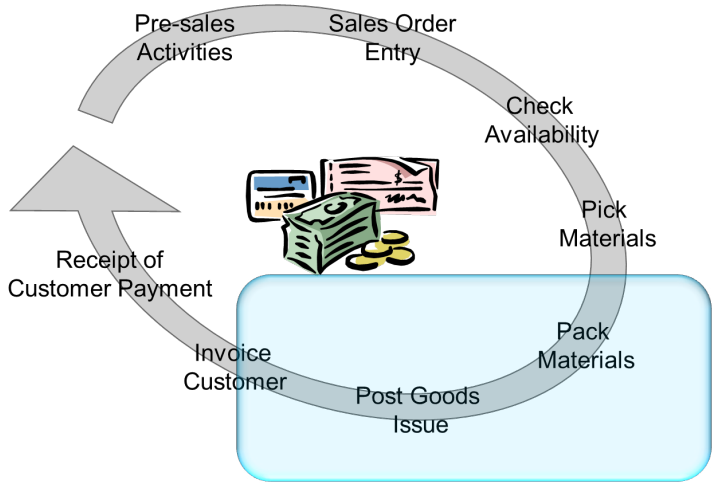
- In-process materials handling
- In-process storage
- Internal transportation between the production locations and raw material warehouses or JIT receiving zones (buffers)
- Internal transportation between the production locations and finished goods warehouses or JIT delivery zones (buffers)



Source: SAP University Alliances – Introduction to ERP Systems with GBI

Distribution operation level

- Finished goods warehousing
- Sorting
- Buffer storage
- Packaging
- Labelling
- Creating document
- Cargo departure
- Quality control
- Creating customer fulfilment performance measurement documents and informations
- External transportation



Source: SAP University Alliances – Introduction to ERP Systems with GBI

Recycling operation level

- On-site collecting
- Internal transportation
- Internal storage
- Internal handling and recycling
- External transportation

LECTURE 4.

Lecture 4. TRANSPORT SYSTEMS
4.1. Transport systems and components

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Lecture 4. TRANSPORT SYSTEMS

4.1. Transport systems and components

MAGYARORSZÁG MEGÚJUL

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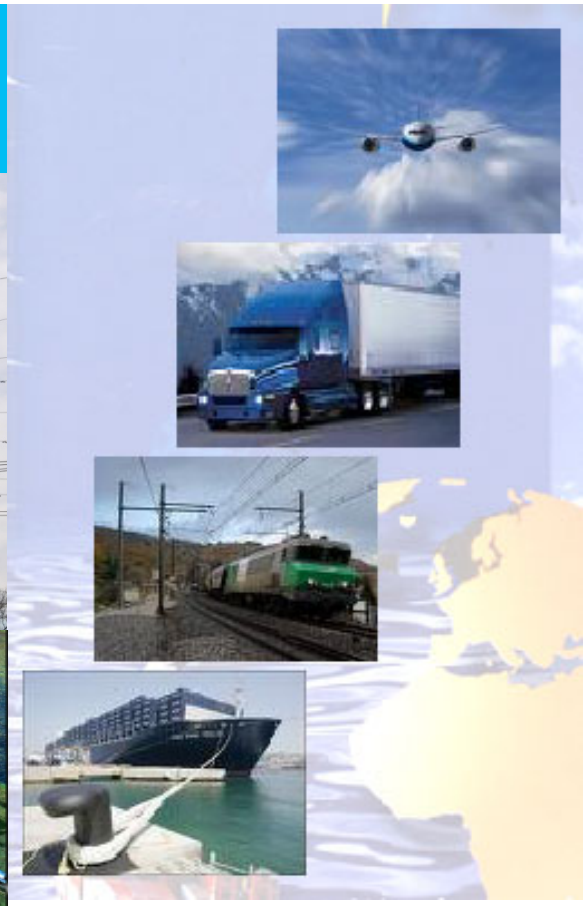
Transport sectors

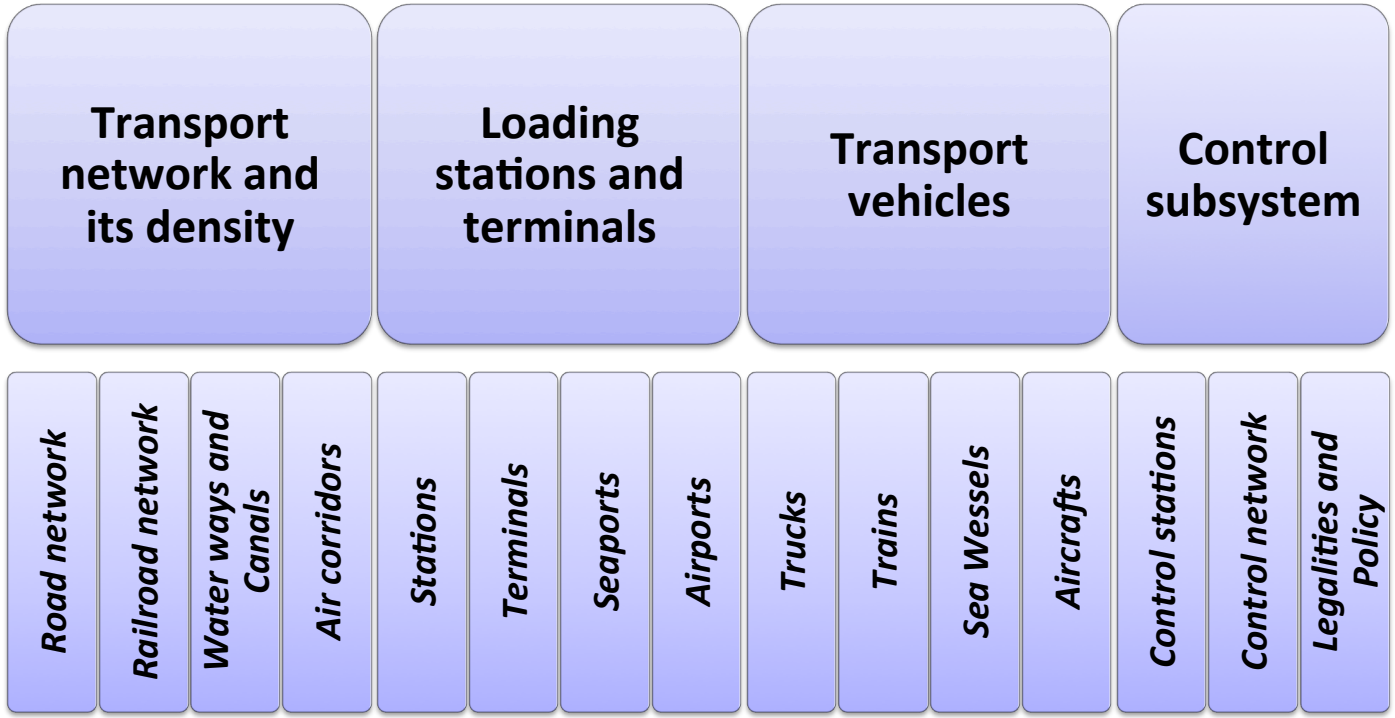
1. Road transport
2. Rail transport
3. Inland water transport
4. Maritime transport
5. Airway transport

Special Transport:

- Pipeline transport
- Wired electrical energy network



Subsystems of the Transport Sectors



TRANSPORT SYSTEMS
4.1.1. Inland transportation

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Lecture 4. TRANSPORT SYSTEMS

4.1.1. Inland transportation

MAGYARORSZÁG MEGÚJUL
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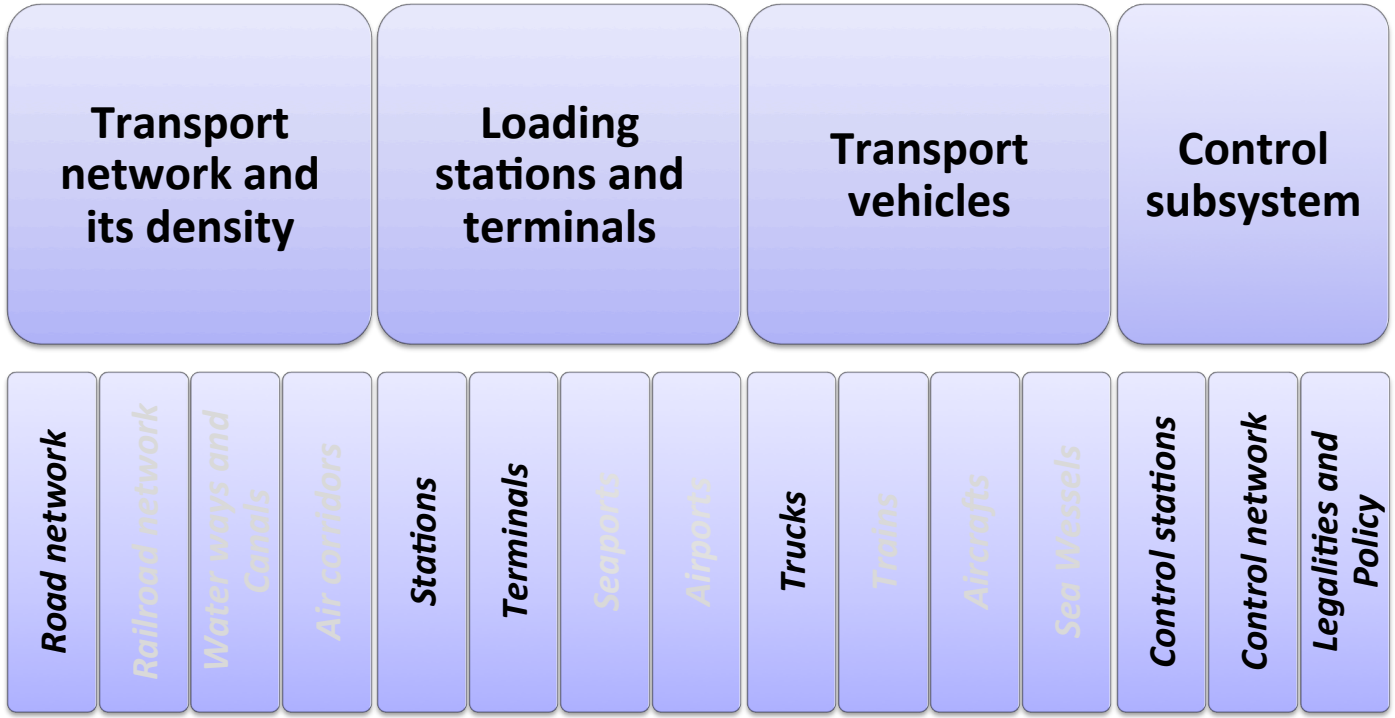
Subsystems of Road Tranport Sectors



Road transport systems
Most popular because…

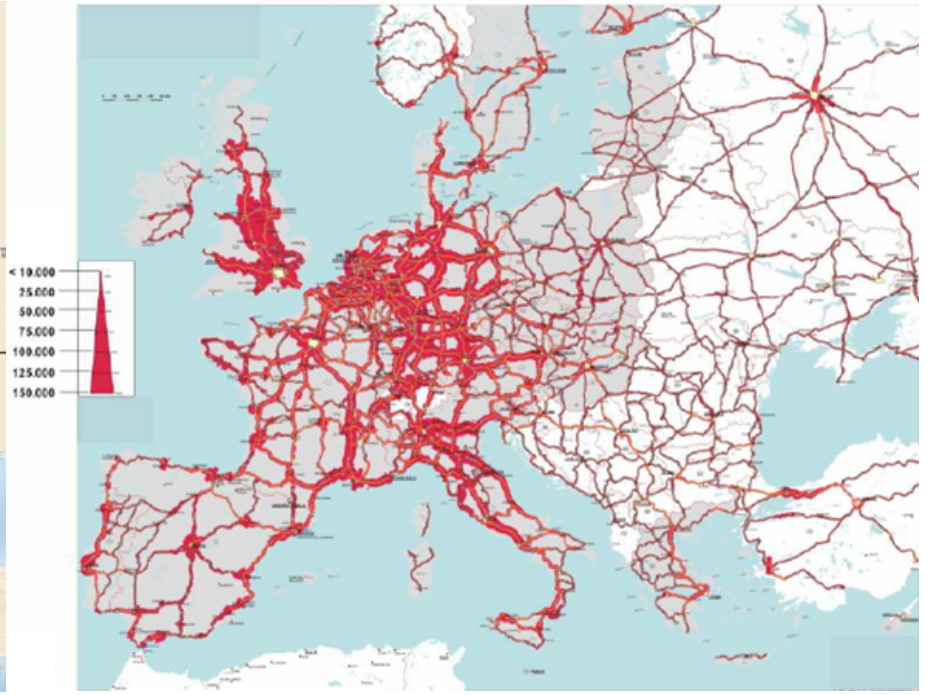
Advantages

- ✓ Highest density of road network
- ✓ Relative fast delivery on short and medium distance
- ✓ Ideal for transporting perishables (e.g. fruit and vegetables)
- ✓ General cheap method to monitor location of goods with online Vehicle Tracking System
- ✓ Relative efficient

Disadvantages

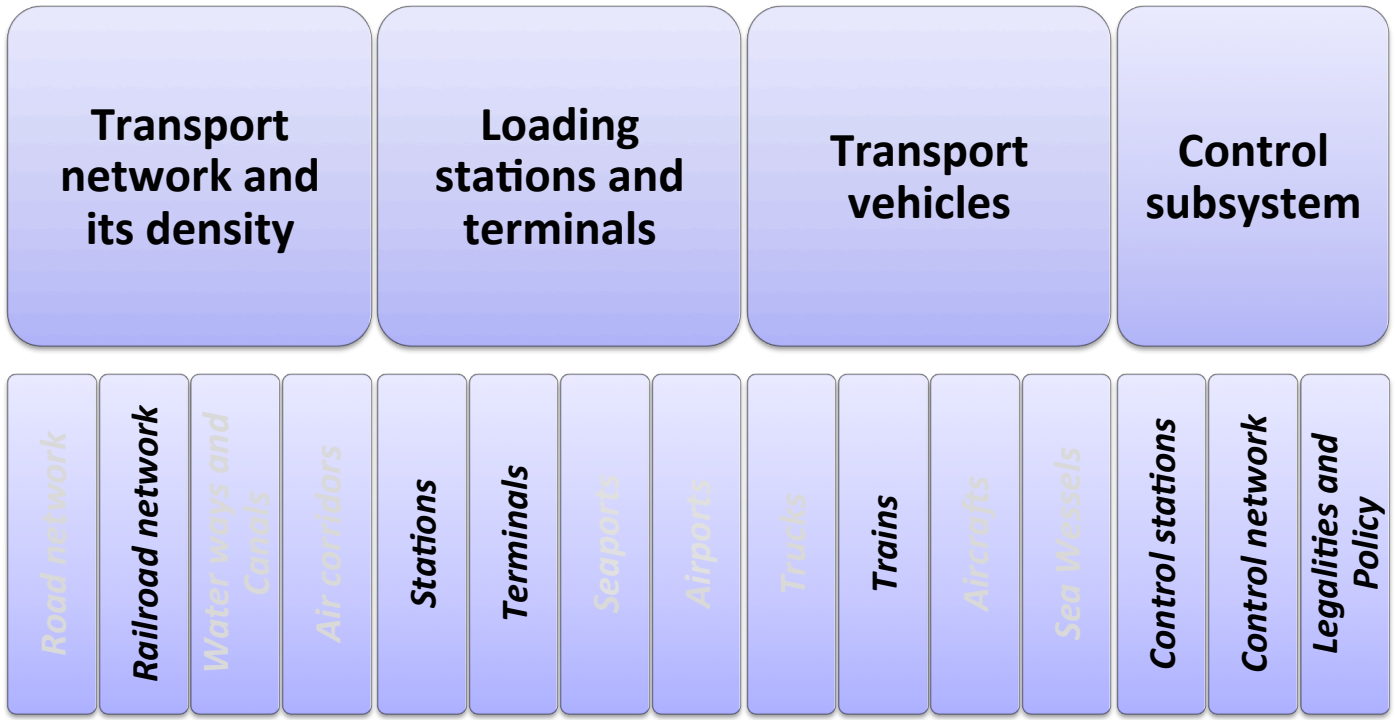
- – Huge environmental load: noise, exhaust
- – Traffic jams
- – Weather sensitivity
- – Driving regulations can cause delays
- – Road quality in Eastern-Europe
- – Breakdowns
- – Goods damage through careless driving

Daily Traffic load in Europe



Source: Traffic Science Institute – Hungary, www.kti.hu, 2000

Subsystems of Railroad Tranport Sectors



Railroad transportation

Advantages

- ✓ Relative fast delivery
- ✓ High capacity (weight and size)
- ✓ Cost effective
- ✓ Safe mode of transport
- ✓ Environment-friendly
- ✓ Reliable

Disadvantages

- – Delays because of train setup
- – Public traffic time table
- – Requires direct connection or additional road transportation
- – Lower track network density

TRANSPORT SYSTEMS
4.1.2. Water and sea transportation

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Lecture 4. TRANSPORT SYSTEMS

4.1.2. Water and sea transportation

MAGYARORSZÁG MEGÚJUL
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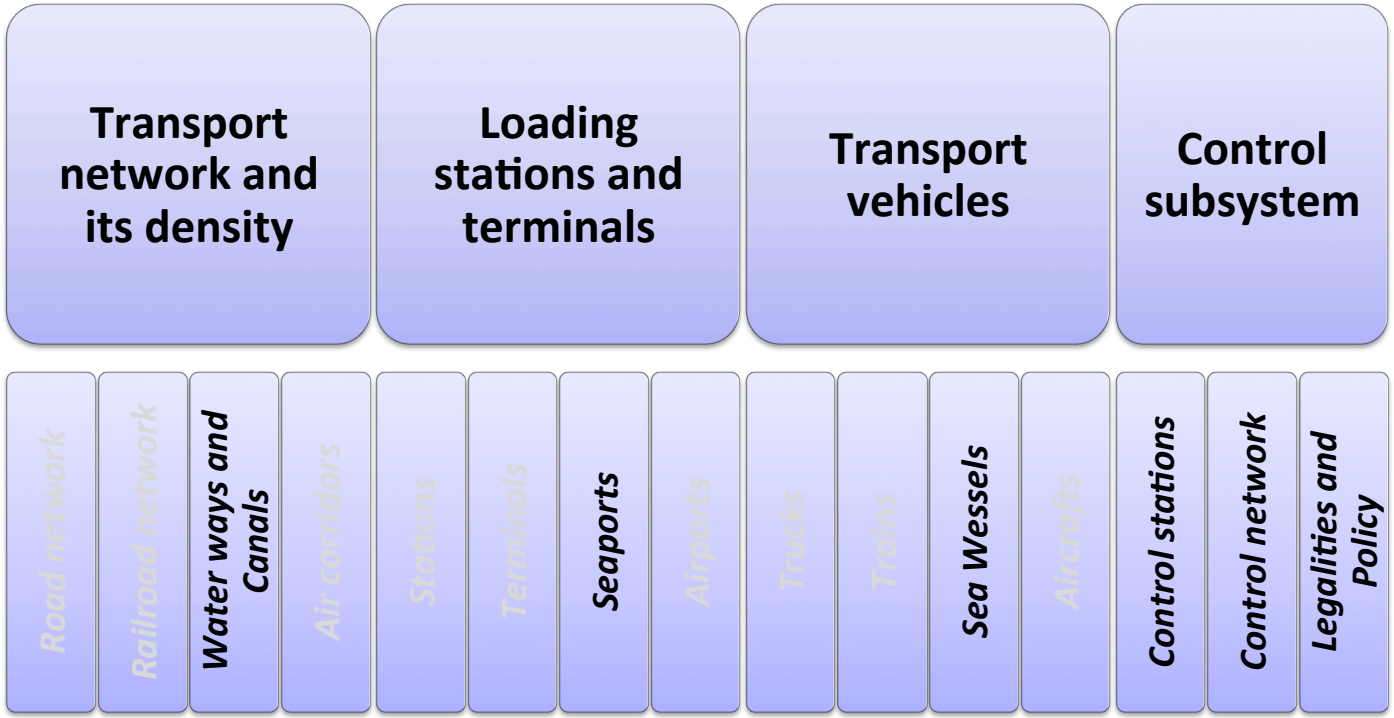
Subsystems of Water Transport Sector



Sea transportation

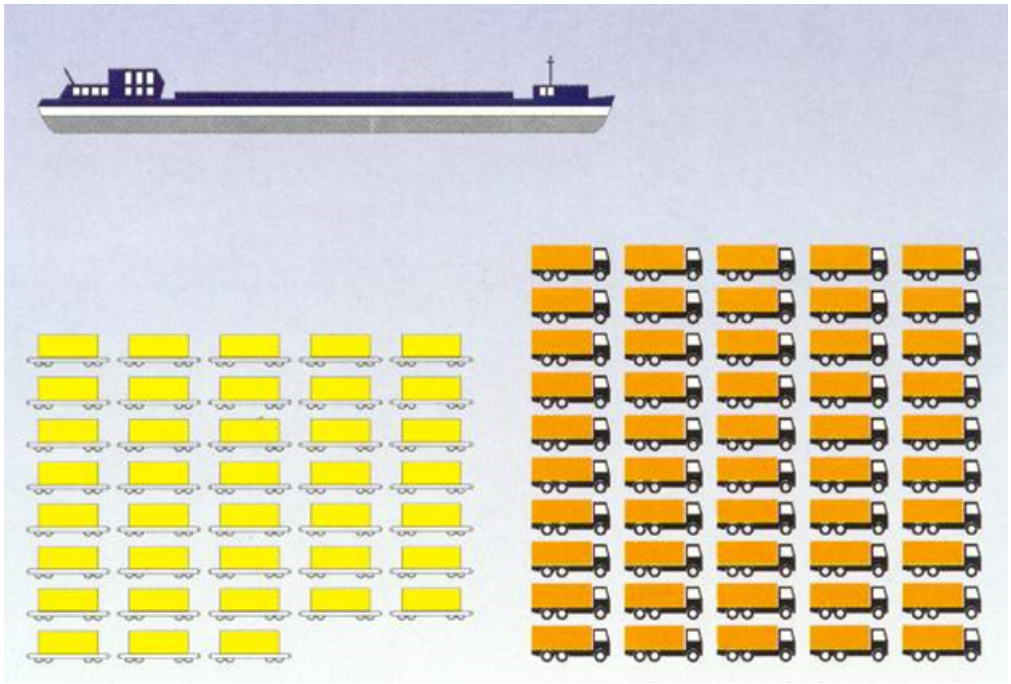
Advantages

- ✓ Ideal for long distance delivery slow motion
- ✓ Mostly container transport in various size
- ✓ Bulk shipments of loose goods, oil, grain, ore and coal
- ✓ Ideal for transporting heavy, ***big sized*** and bulky goods
- ✓ Suitable for products with long lead times

Disadvantage

- Much more long delivery times
- Weather sensitivity
- Difficult to monitor exact location of goods in transit
- Customs and Excise restrictions
- High danger at loading

Capacity comparison of Land and Water transportation



TRANSPORT SYSTEMS
4.1.3. Air transportation

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Lecture 4. TRANSPORT SYSTEMS

4.1.2. Air transportation

MAGYARORSZÁG MEGÚJUL

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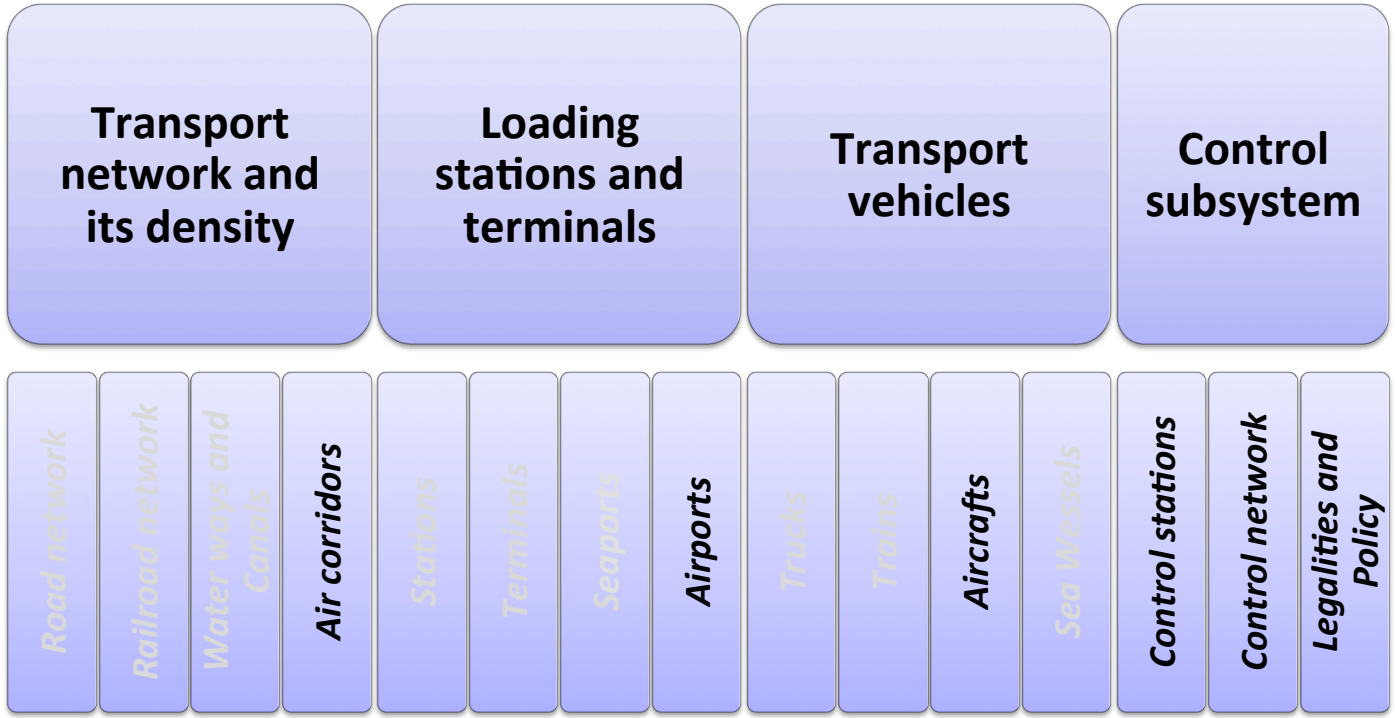
Subsystems of Airway Transport Sector



Air freigthing

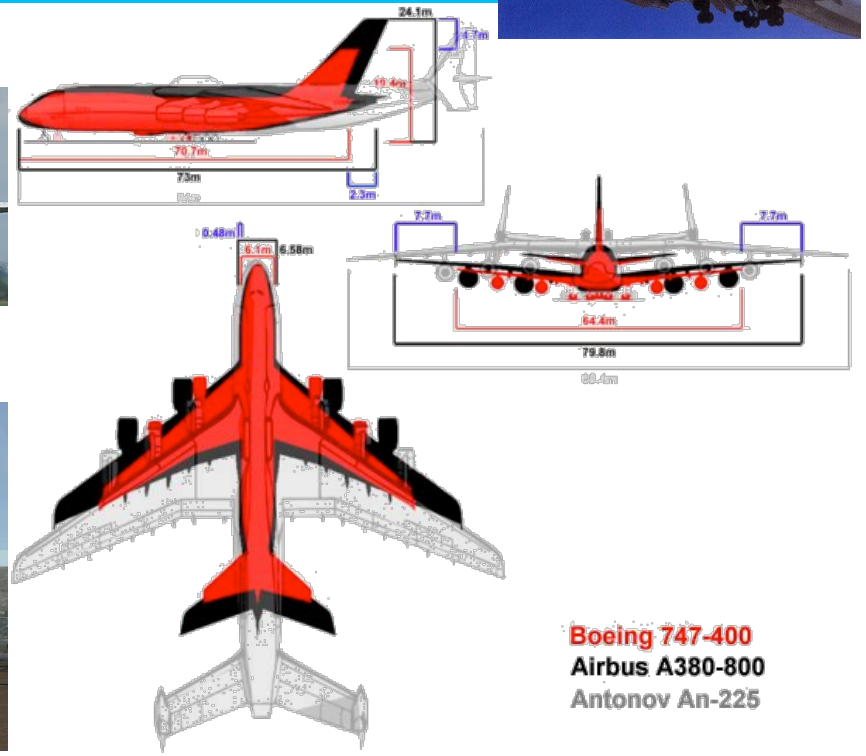
Advantages

- ✓ Fast delivery for very long distance, usually between 24 and 48 hours
- ✓ Ideal for valuable, fragile, important products
- ✓ Improved service levels

Disadvantages

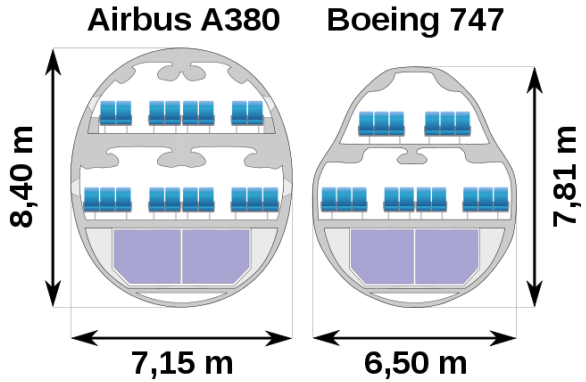
- – Very high cost
- – Weather sensitivity
- – Flight delays and/or cancellations
- – Airport jam
- – Big environmental load: noise, edxhaust
- – Customs and Excise restriction
- – Strict size and weight limitations
- – Requires additional road transportation

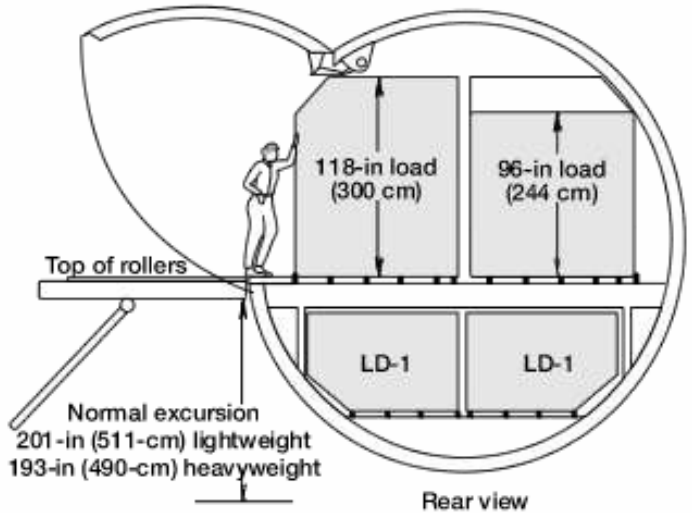
The „largests”



Boeing 747-400
Airbus A380-800
Antonov An-225

Air Cargo Unified Loading Devices





TRANSPORT SYSTEMS
4.1.4. Pipeline transportation

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Lecture 4. TRANSPORT SYSTEMS

4.1.4. Pipeline transportation

MAGYARORSZÁG MEGÚJUL
A projekt az Európai Unió támogatásával valósul meg.

Pipelines Transport Systems

- ✓ Long distance continuous delivery
  - ✓ for liquids and gases: oil, natural gas, stable chemicals, petrol
  - ✓ for piece goods in solid for capsules using compressed air
- ✓ Relative slow, but continuous flow
- ✓ Expensive installation costs, but cheap to operate
- ✓ Short-distance systems for clear water, sewage, slurry, and beer

TRANSPORT SYSTEMS
4.2. Combined transportation

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Lecture 4. TRANSPORT SYSTEMS

4.2. Combined transportation

MAGYARORSZÁG MEGÚJUL

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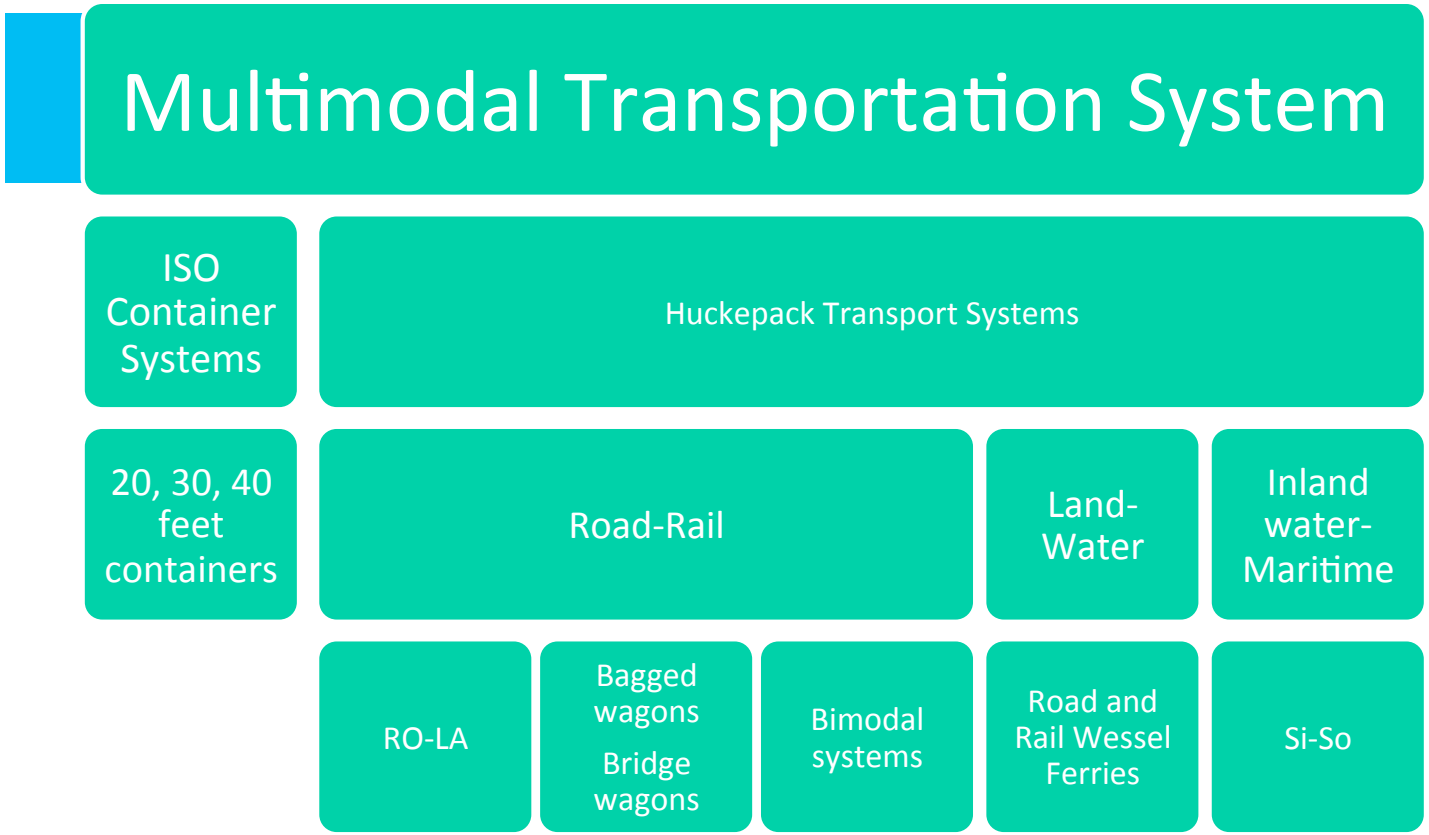
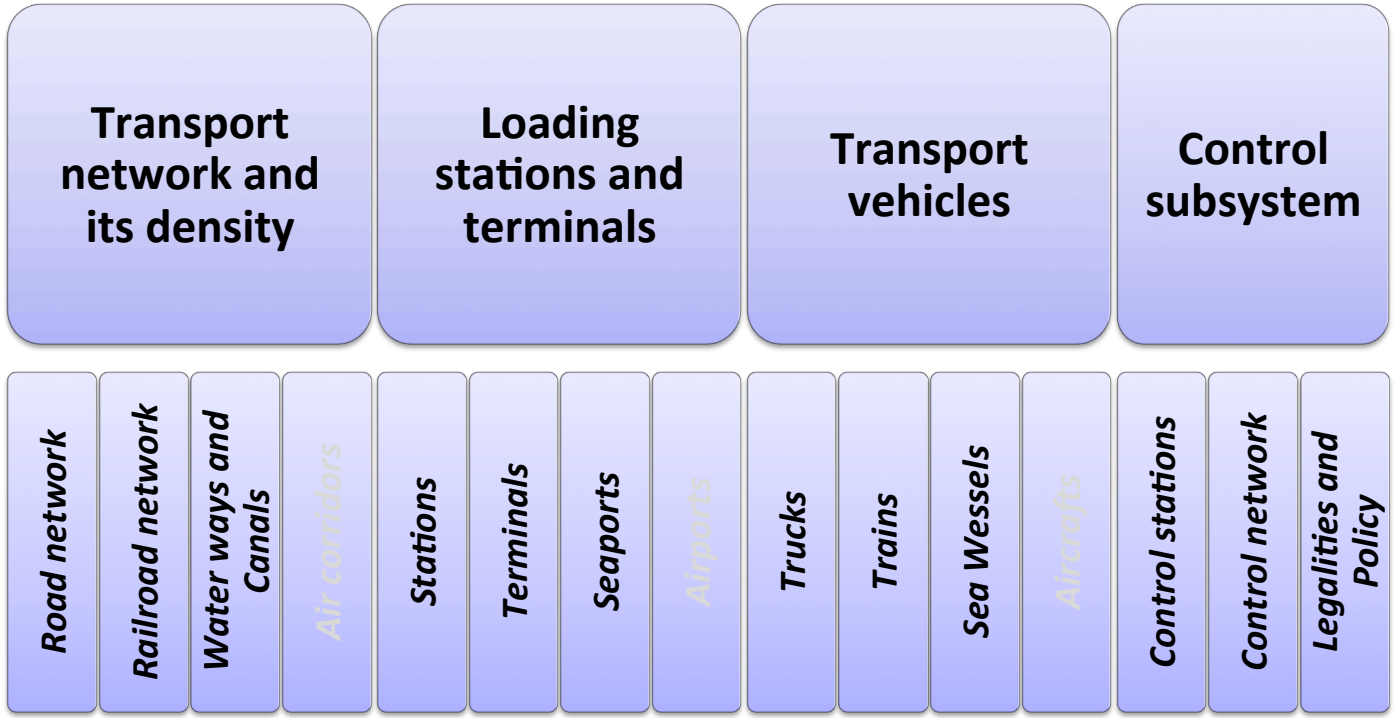
Combined transportation

Combination of using more transport sectors to deliver the cargo with less cost and time.

- ✓ For using mostly the benefits of the involved sectors
- ✓ For eliminating the disadvantages and losses
- – But! It takes additional expenses:
  - – Special devices for loading units
  - – Special loading machinery:
    - – Cranes
    - – reachstackers
  - – Special vessels with special loading surface


Multimodal Transportation System
ISO Container Systems
Huckepack Transport Systems
20, 30, 40 feet containers
Road-Rail
Land-Water
Inland water-Maritime
RO-LA
Bagged wagons
Bridge wagons
Bimodal systems
Road and Rail Wessel Ferries
Si-So

Subsystems of the Transport Sectors



TRANSPORT SYSTEMS
4.2.1. Combined land transportation

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Lecture 4. TRANSPORT SYSTEMS

4.2.1. Combined land transportation

MAGYARORSZÁG MEGÚJUL
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Rollende Landstrasse – RO-LA systems

Benefits:

- ✓ Less road load in the relater countries and cities
- ✓ Less accident opportunities
- ✓ Weather risk is much smaller
- ✓ Drivers can have a scheduled compulsory rest during a long distance transportation
- ✓ Road and motorway fees are changed for train transport and loading fees

Handicaps:

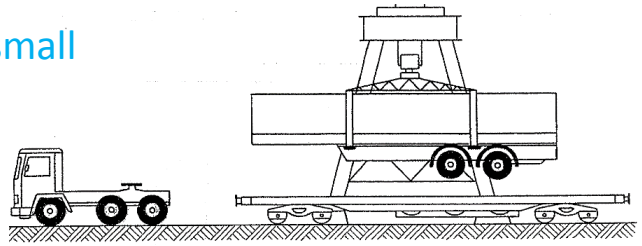
- – Timetable
- – Loading and unloading time
- – Double deadweight transporting
- – Lower useful run of trailers
- – Lower useful run of expensive tractors and trucks (RO-LA)

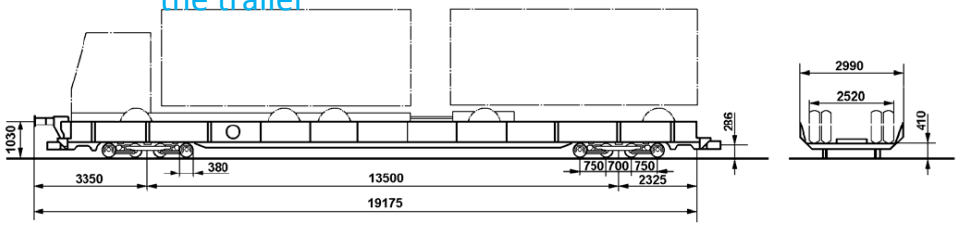
Low platform wagons for trailers

European railway gauge and cross section is too small to carry a trailer on a train board

Solutions:

- ✓ Special RO-LA wagon for truck and trailer
  - ✓ the truck and the trailer is carried by the wagon
- ✓ Bagged wagon for liftable trailers
  - ✓ Requires stronger trailer construction!
- ✓ Lifting platform wagon for non-liftable trailers
  - ✓ The truck pulls the normal trailer onto the wagon, leaves the wagon, and the platform is lowered with the trailer

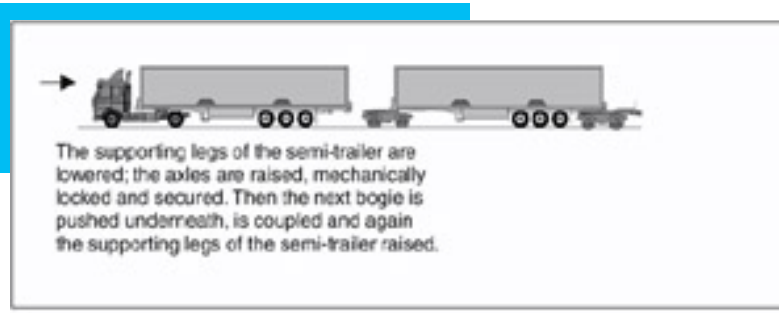




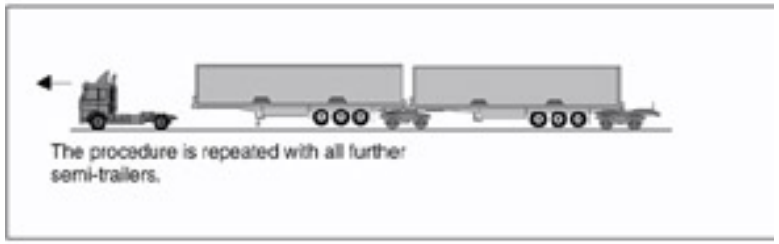
Bimodal system

Requires strong construction trailers with pneumatic pipes and pneumatic suspension

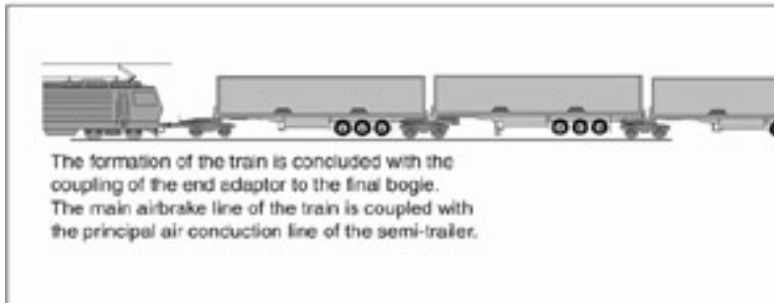
Additionally 10-20% expenses



The supporting legs of the semi-trailer are lowered; the axles are raised, mechanically locked and secured. Then the next bogie is pushed underneath, is coupled and again the supporting legs of the semi-trailer raised.



The procedure is repeated with all further semi-trailers.



The formation of the train is concluded with the coupling of the end adaptor to the final bogie. The main airbrake line of the train is coupled with the principal air conduction line of the semi-trailer.

TRANSPORT SYSTEMS
4.2.2. Combined water-sea transportation

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4.2.2. Combined water-land transportation

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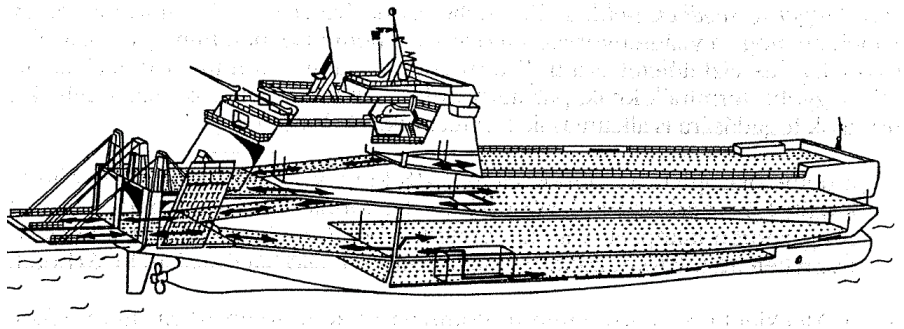
Terrestial-Water transportation combination

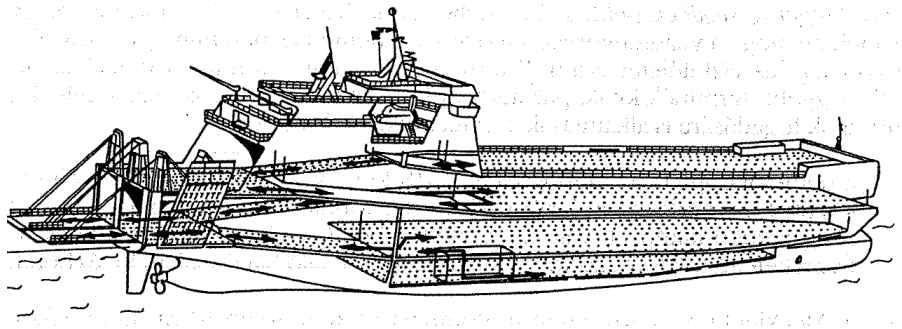
Road trucks and trains are drive onto water way vessels, like

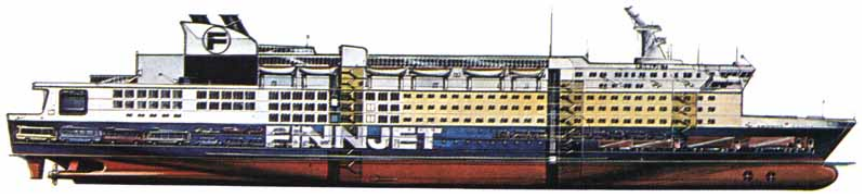
- short or long distance ferries between continents
- inland water vessels for long distance river way

Sea vessels road and rail wagons



Characteristics of terrestial-water combined transportation





Benefits:

- ✓ Less road load in the relater countries and cities
- ✓ Less accident opportunities
- ✓ Weather risk is much smaller
- ✓ Drivers can have a scheduled compulsory rest during a long distance transportation
- ✓ Road and motorway fees are changed for water transport and loading fees

Handicaps:

- – Timetable
- – Loading and unloading time
- – Double deadweight transporting
- – Lower useful run of trailers
- – Lower useful run of expensive tractors and trucks

TRANSPORT SYSTEMS
4.2.3. Combined water-sea transportation

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4.2.3. Combined water-sea transportation

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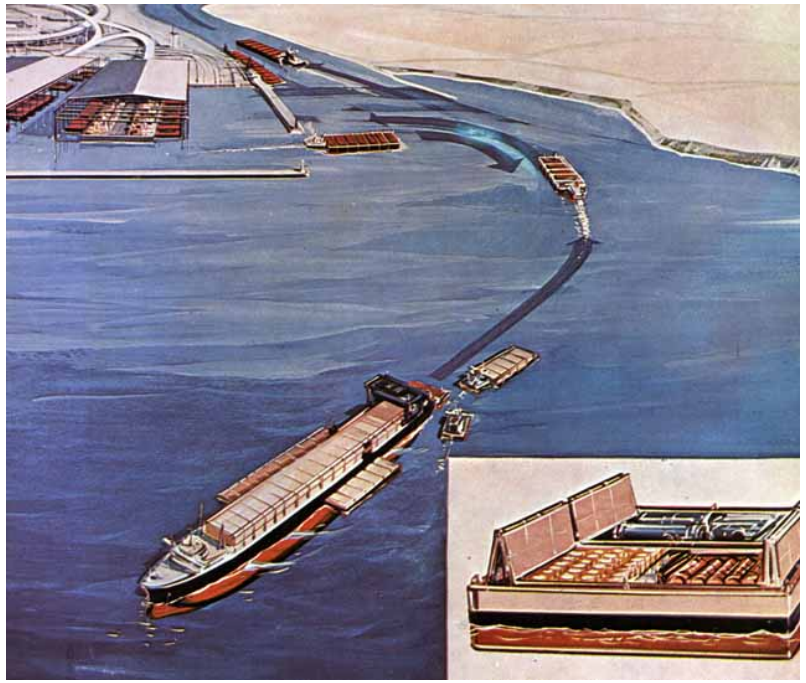
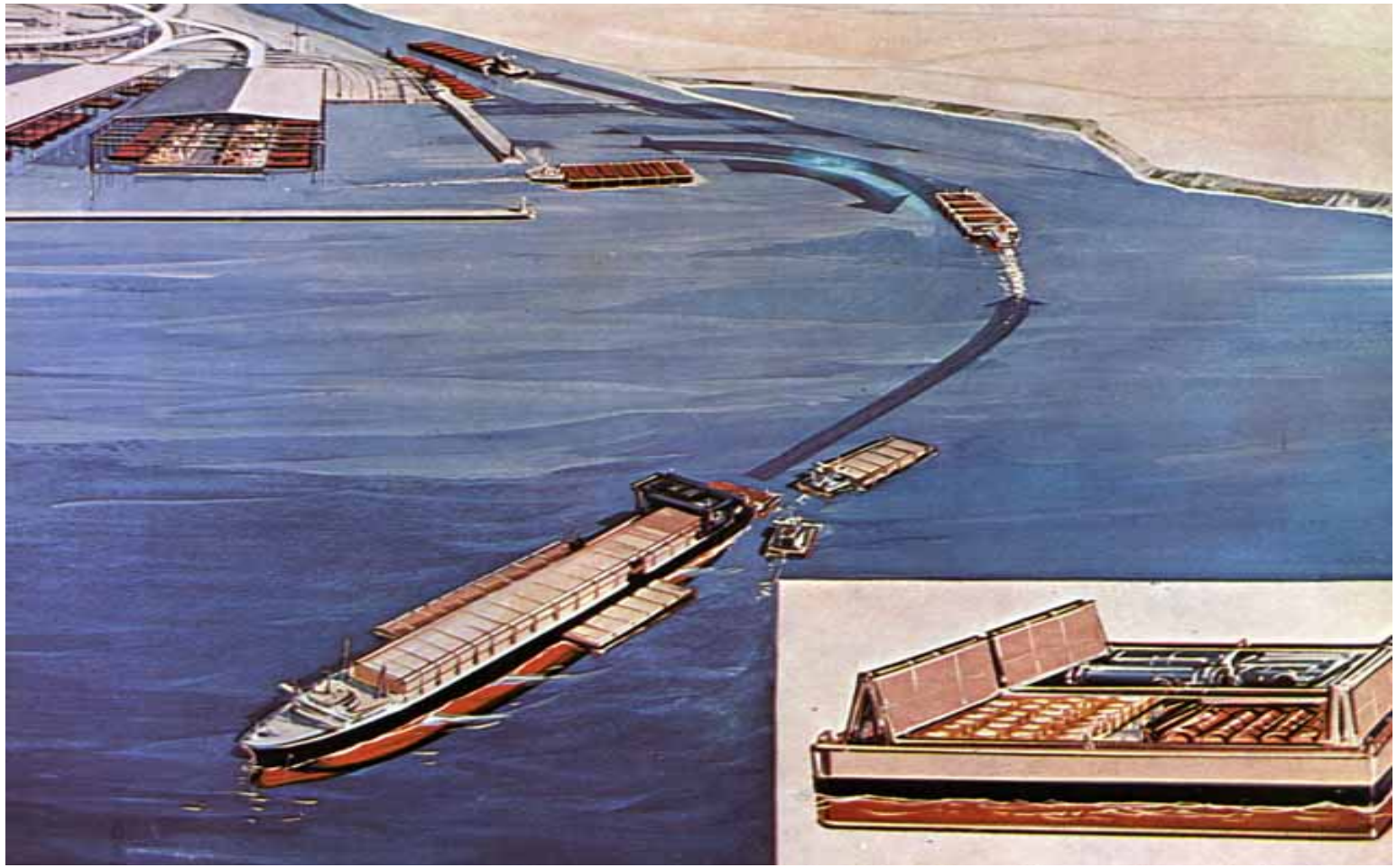
Swim-in Swim-out systems

- ✓ Fast loading from inland water transport to maritime transport
- ✓ Barges are used for inland water transportation and cargo loading
- ✓ Barges are loaded onto seafarer barge-carriers at the end of the river way
- ✓ Seafarer barge-carriers are used only for maritime transport, but in 80-90% of operating time in comparison to 40-50% in case of normal sea vessels
- ✓ Less load in seaports
- ✓ Less seaport expenses
- – But requires additional expenses
  - – Special barges and tugboat
  - – Special barge-carriers with loading equipments

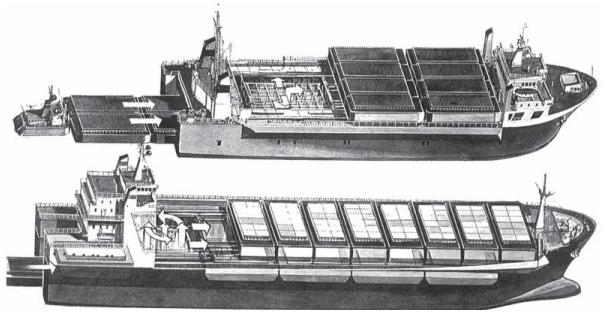




Types of Si-So vessels and carriers

- ✓ Lash (Lighter Aboard Ship) system from 1960's as an alternative of ISO containers in USA.
- ✓ SeaBee was developed majorly for US Navy with submersible elevator for 850 tons barges.
- ✓ BACAT I. & BACAT II. Danish Barge-Catamarans from 1973 between northern Europe and Great Britain with load-carrying capacity of 140 tons.

Source: http://www.seaships.ru/lighter.htm



TRANSPORT SYSTEMS
4.3. European transport networks

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Lecture 4. TRANSPORT SYSTEMS

4.3. European transport networks

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1) Baltic – Adriatic Corridor
2) Warsawa – Berlin – Amsterdam Corridor
3) Mediterranean Corridor
4) Hamburg – Lefkosia Corridor
5) Helsinki – Valletta Corridor
6) Genova – Rotterdam Corridor
7) Atlantic Corridor
8) Dublin – London – Paris – Brussels Corridor
9) Antwerp – Lyon – Basel Corridor
10) Seine – Danube Corridor

TRANSPORT SYSTEMS
4.3.1. What is the TEN network?

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4.3.1. What is the TEN network?

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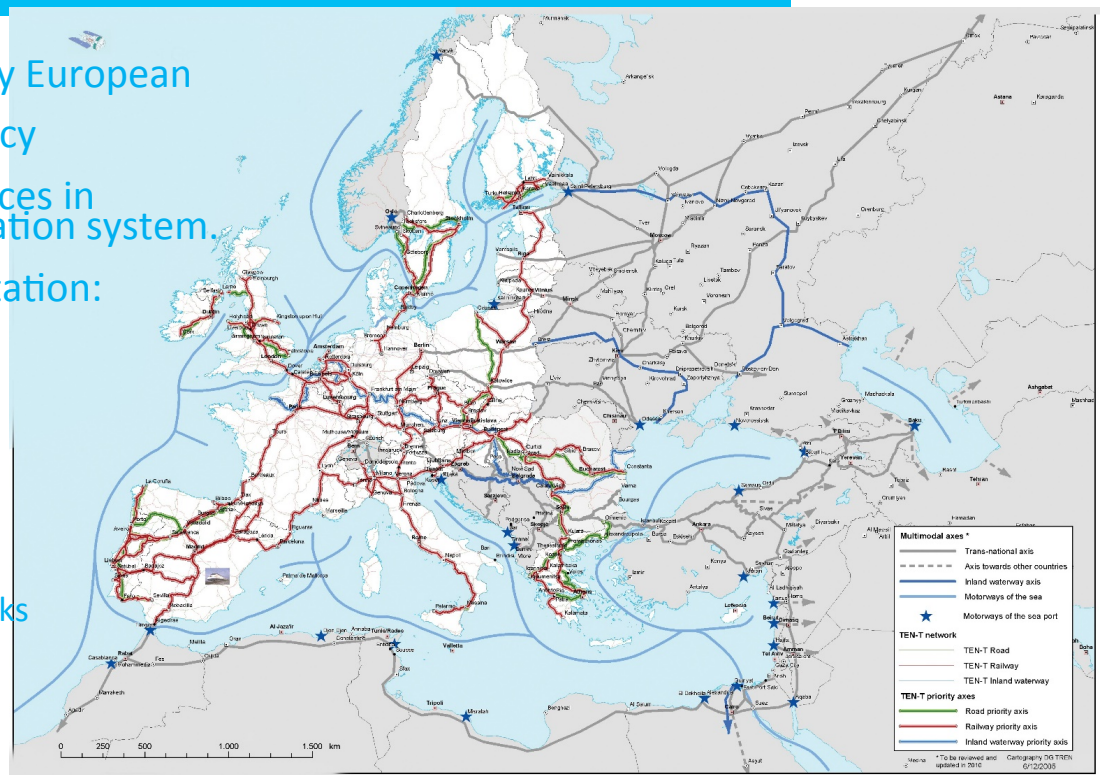
A projekt az Európai Unió támogatásával valósul meg.

Trans-European Networks

- Founded in 1989 by European Union for common transportation policy
- Target: no differences in national transportation system.
- Goals for transportation:
  - ✓ Interoperability,
  - ✓ Compatibility,
  - ✓ Standardisation.
- Major area:
  - ➢ Vessels
  - ➢ Transport networks
  - ➢ Control system
  - ➢ Energy supply



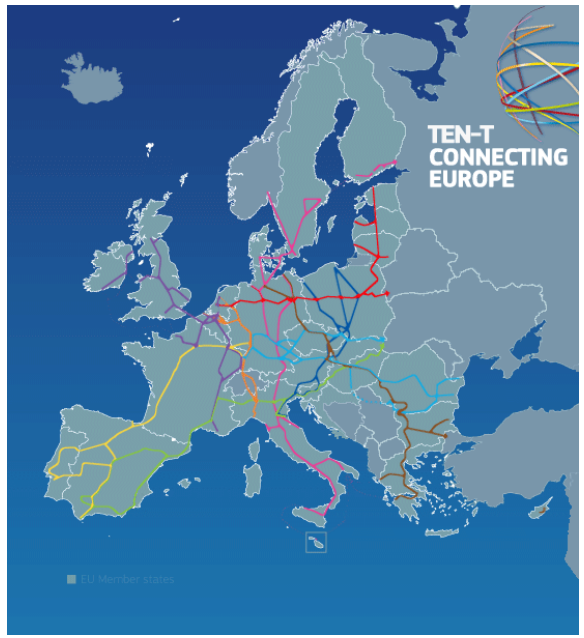
TEN components - Trans-European Transport Networks

TEN-T: Trans-European Transport Networks

- 96 000 km of roads
- 106 000 km of railways (32 000 high speed)
- 13 800 km of inland waterways
- 411 airports
- 400 international ports
- 3 000 domestic airports
- traffic management system
- Total cost estimated at 250 billion euros

TEN-E: Trans-European Energy Networks

e-TEN (TEN-Telecom): Trans-European Telecommunications Networks



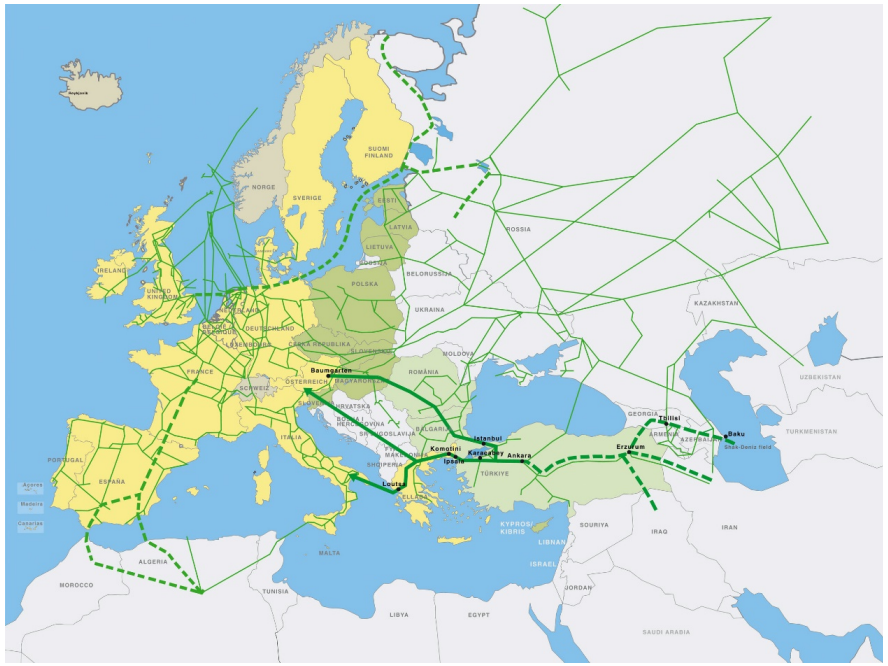
TEN components - Trans-European Energy Networks

TEN-T: Trans-European Transport Networks

TEN-E: Trans-European Energy Networks

- effective operation of the internal energy market
- territorial cohesion
- security and diversification of supply
- sustainable development

e-TEN (TEN-Telecom): Trans-European Telecommunications Networks



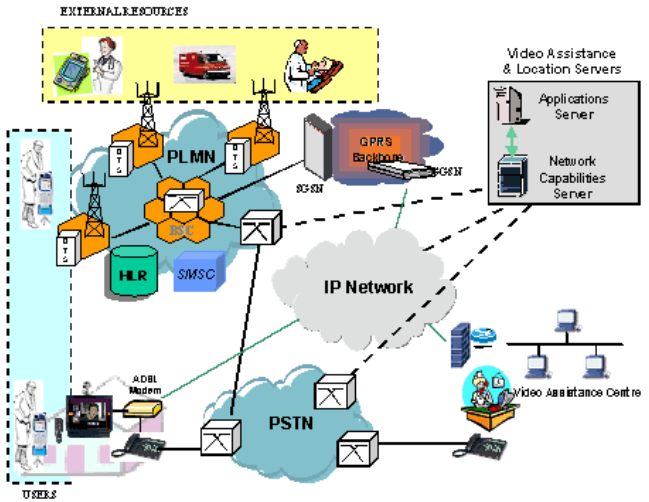
TEN components - TEN-Telecom

TEN-T: Trans-European Transport Networks

TEN-E: Trans-European Energy Networks

e-TEN (TEN-Telecom): Trans-European Telecommunications Networks

- facilitating the transition to the information society
- deployment of new networks and applications on social activities;
- improving the competitiveness of Community firms
- strengthening economic and social cohesion
- accelerating the development of new growth-area activities leading to job creation.



TRANSPORT SYSTEMS
4.3.2. Helsinki corridors

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4.3.2. Helsinki corridors

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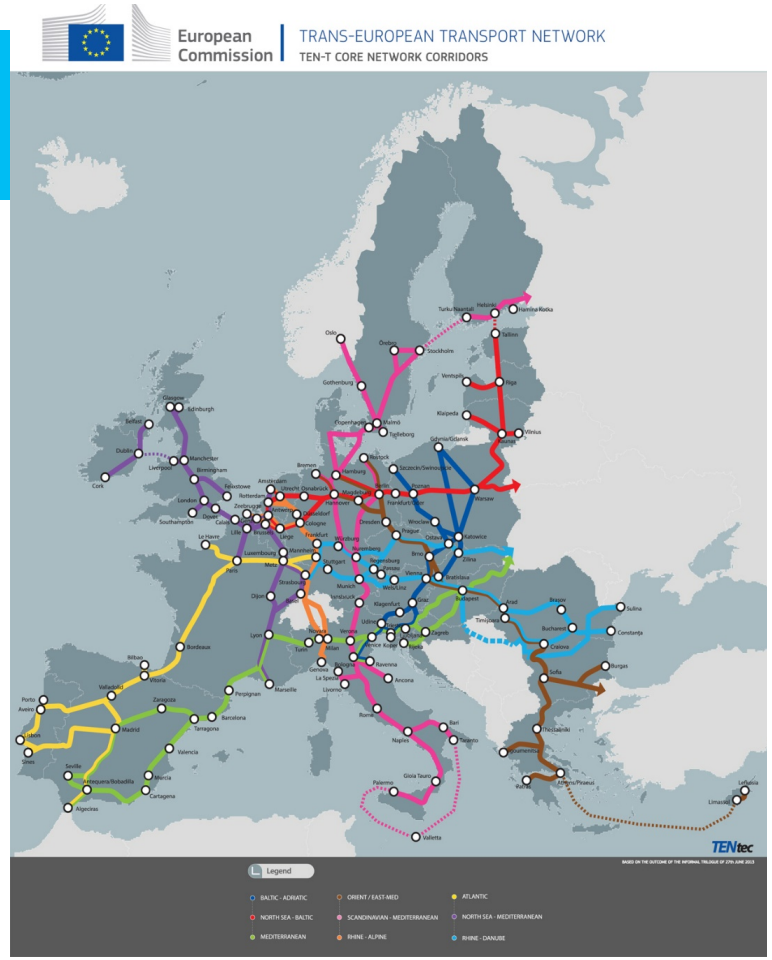
Helsinki corridors

1. Helsinki-Tallin-Kaunas-Varsawa-Riga-Gdansk
2. Berlin-Varsawa-Minsk-Moskow
3. Berlin-Drezda-Wroclaw-Lvov-Kiev
4. Berlin-Nürnberg-Prague-Budapest-Arad-Konstanca-Szaloniki-Istambul
5. Venice-Trieste-Koper-Ljubljana-Budapest-Ungorov-Lvov
6. Gdansk-Varsawa-Zilina
7. Danube-Rhein-Main Canal
8. Durres-Tirana-Skopje-Sopia-Varna
9. Helsinki-Petrograd-Moszkow-Kiev-Bukarest-Dimitrovgrad
10. Salzburg-Villach-Ljubljana-Passau-Linz-Graz-Zagreb-Belgrad-Nis—Skopje-Saloniké



TRANSPORT SYSTEMS
4.3.3. TINA network

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4.3.3. TINA network

MAGYARORSZÁG MEGÚJUL

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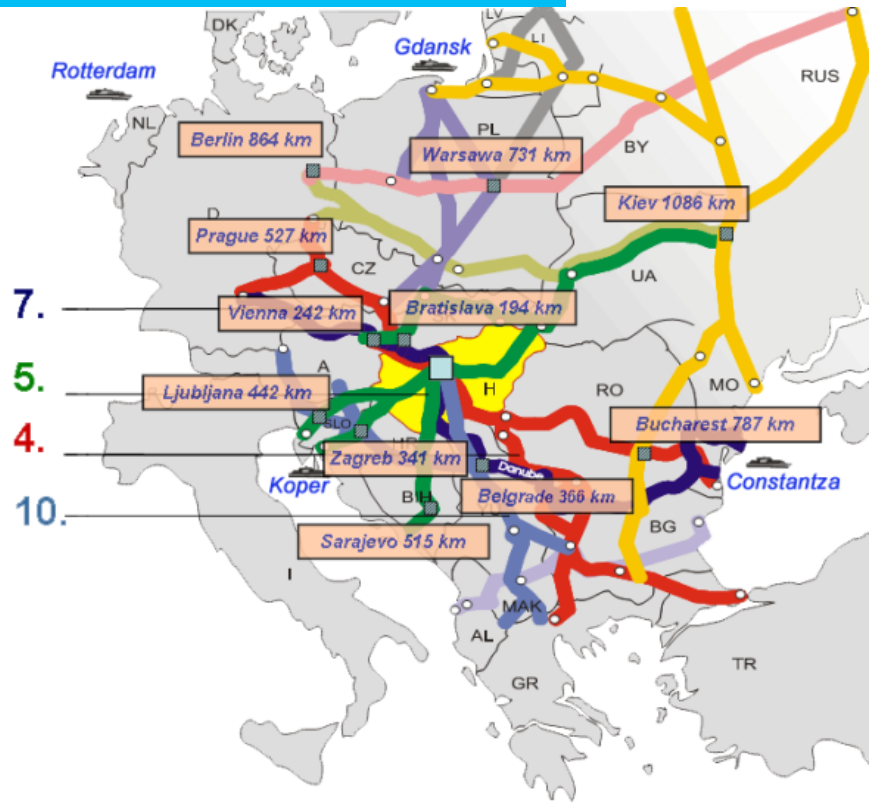
Transport Infrastructure Needs Assessment

Extend the TEN-T network in candidate and new countries in European Union

- Main corridors are the TEN-T corridors
- Secondary corridors are the extensions of the 10 main corridors in the joining countries



TRANSPORT SYSTEMS
4.3.4. Airports, seaports and water ways

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Lecture 4. TRANSPORT SYSTEMS

4.3.4. Airports, seaports and water ways

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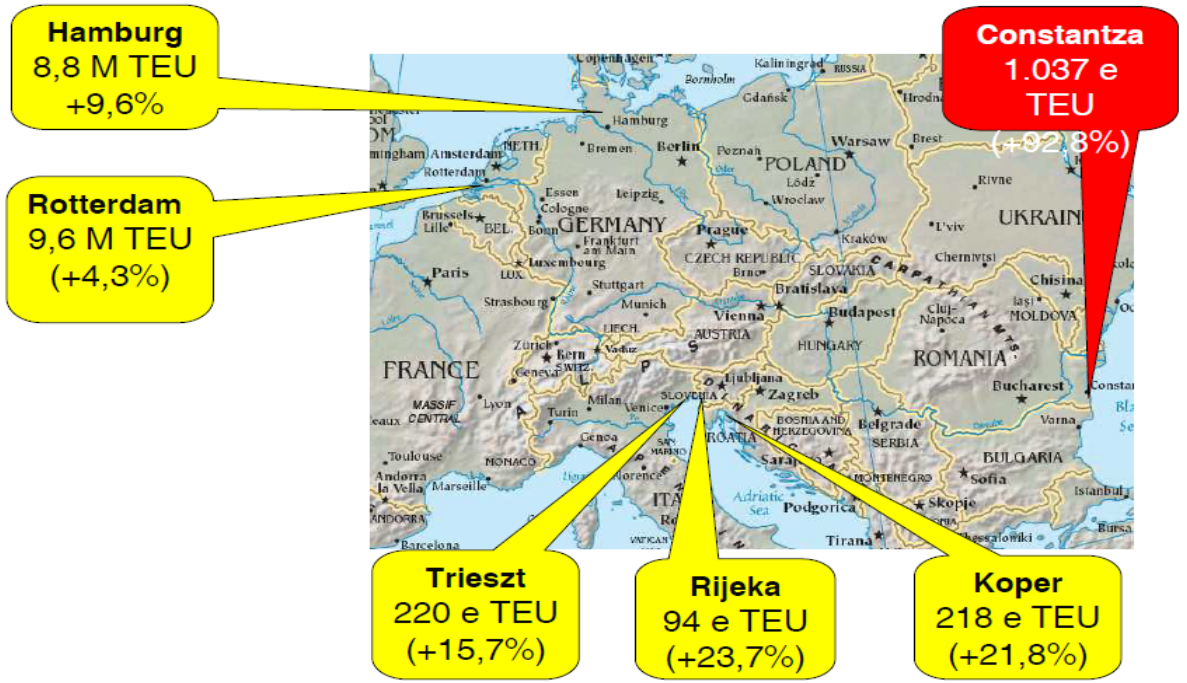
European seaports



Danube-Rhein-Main Canal

Major European Airports

Major traffic in Western-Europe

Major European Airports

TRANSPORT SYSTEMS
4.4. Combined transportation

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4.2. Combined transportation

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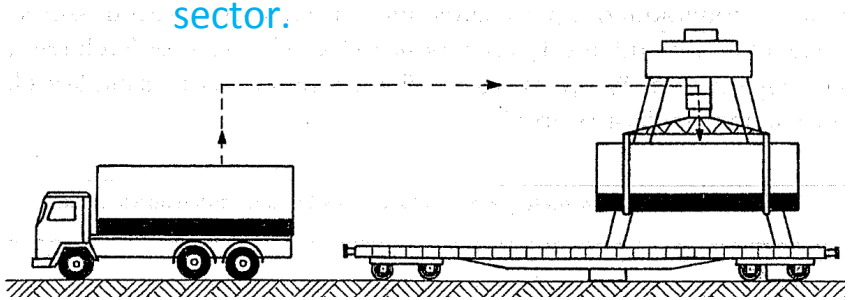
Intermodal freight transport

Cargo transportation:

- in intermodal container or vehicle,
- using multiple sectors of transportation, usually rail, ship and truck,
- without any handling of the freight itself when changing sector.



Combination of using more transport sectors to deliver the cargo with less cost and time.

✓ For using mostly the benefits of the involved sectors

✓ For eliminating the disadvantages and losses – especially road transportation expenses

But! It takes additional expenses:

- Special devices for loading units
- Special loading machinery:
  - Cranes
  - reachstackers
- Special vessels with special loading surface – more weight!

Characteristics of intermodal transportation

Combination of using more transport sectors to deliver the cargo with less cost and time.

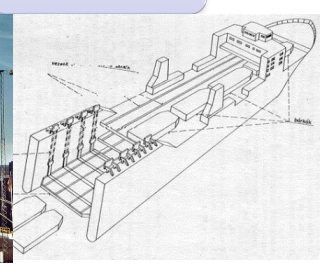
- ✓ For using mostly the benefits of the involved sectors
- ✓ For eliminating the disadvantages and losses – especially road transportation expenses
- – But! It takes additional expenses:
  - – Special devices for loading units
  - – Special loading machinery:
    - – Cranes
    - – Reachstackers
  - – Special vessels with special loading surface

Intermodal Transportation Systems

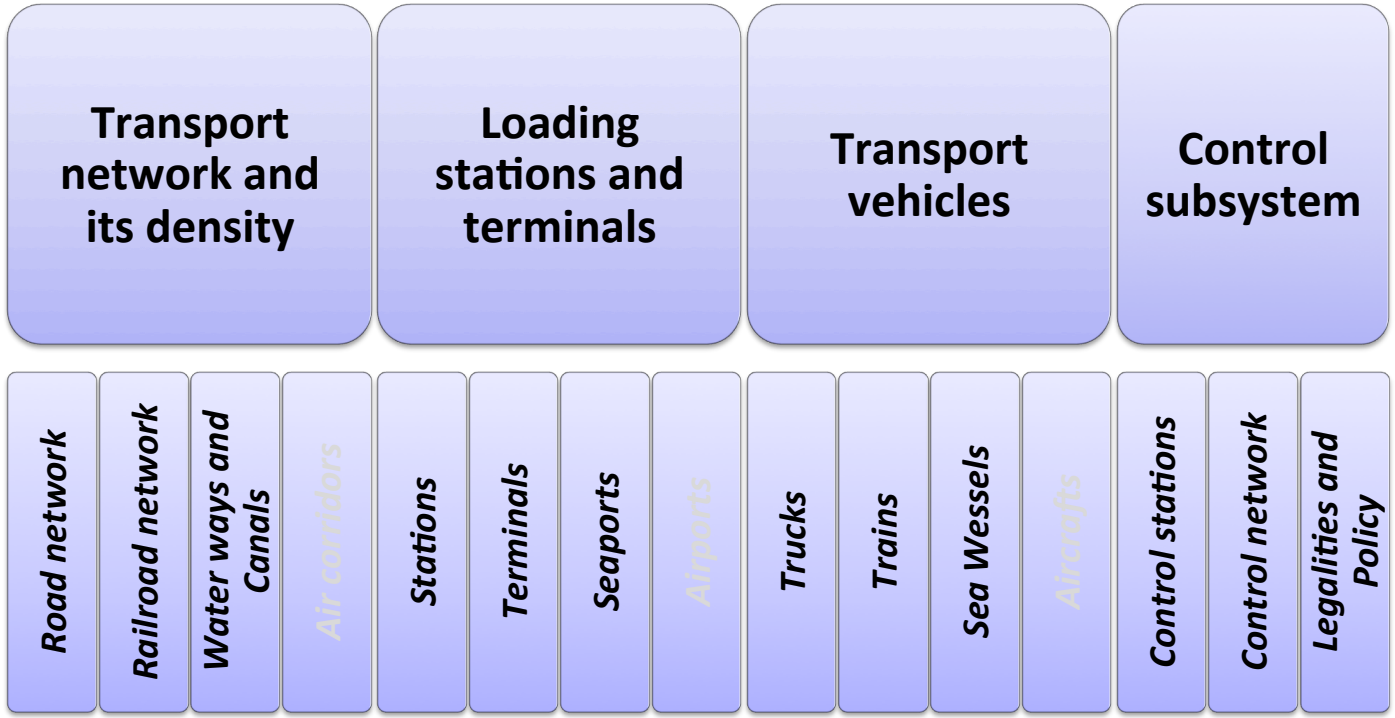
ISO Container Systems	Huckepack Transport Systems			
20, 30, 40 feet containers	Road-Rail combination		Land-Water	Inland water-Maritime
	**RO-LA** **Rollende Landstrasse**	**Bagged wagons** **Bridge wagons**	**Bimodal systems**	**Road and Rail Wessel Ferries**	**SI-SO** **Swimm-in Swimm-out**





Involved Subsystems in intermodal transportation



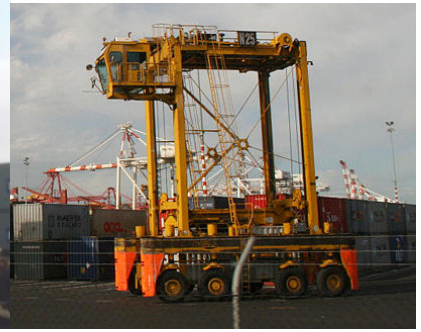
Intermodal ISO standardised containers

Requires container handling machines at the intermodal terminals:

- Gantry cranes – problems with electrical wire of ralway
- Reachstackers, container trucks, grappler lifts
- Self loading trailers

Closed transportation unit can by sealed

The smallest dead-weight to be moved additionally



Gantry Cranes and Portal Cranes for Container loading

Half of the sea vessel operation time is used for loading and unloading the ships

Without containers this would be worse

LECTURE 5.

LECTURE 5 – FORWARDING AND ITS DOCUMENTS

5.1.1. What is the Forwarding?

Delivery means a sales transaction, which can include the transportation of the sold items to the location according to the buyer's wish.

Transporting means the transportation of foreign cargo by the carrier with its own transport tools for fee from a sending location to the destination.

Forwarding means to organize the transport for fee, like hiring the required transporters, managing the additional operations, like loading, and the administration tasks, like insurance and customs.

Furthermore a forwarding activity means usually an international trade, which requires the cargo transportation on a long distance route through several countries or continents. These long distance transportation applies usually combined tranportation

The forwarder in combined transportation is called to Multimodal Transport Operator as prime contractor, or MTO in short.

In comparison of tools and resources,
– a transporter has got:
  –Trucks, wagons, wessels
  –Transport network and control system for the vessels.
– a forwarder has got:
  – The skill to organise for minimal expenses
  – The knowledge about the international transportation sectors and related services, like insurance, customs offices.
– The knowledge about international cargo forwarding regulations

LECTURE 5 – FORWARDING AND ITS DOCUMENTS
5.1.1. What is the Forwarding?

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LECTURE 5 – FORWARDING AND ITS DOCUMENTS

5.1.1. What is the Forwarding?

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Transporting and Forwarding

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- The knowledge about international cargo forwarding regulations

LECTURE V. Forwarding and its documents

5.1.2. CMR

Convention on the Contract for the International Carriage of Goods by Road (CMR).

– United Nations convention about transportation of cargo by road

– signed in 1956 in Geneva

– ratified by 55 european countries

– defined the standard CMR waybill

  – ackownledged by the Police and Customs in any european country

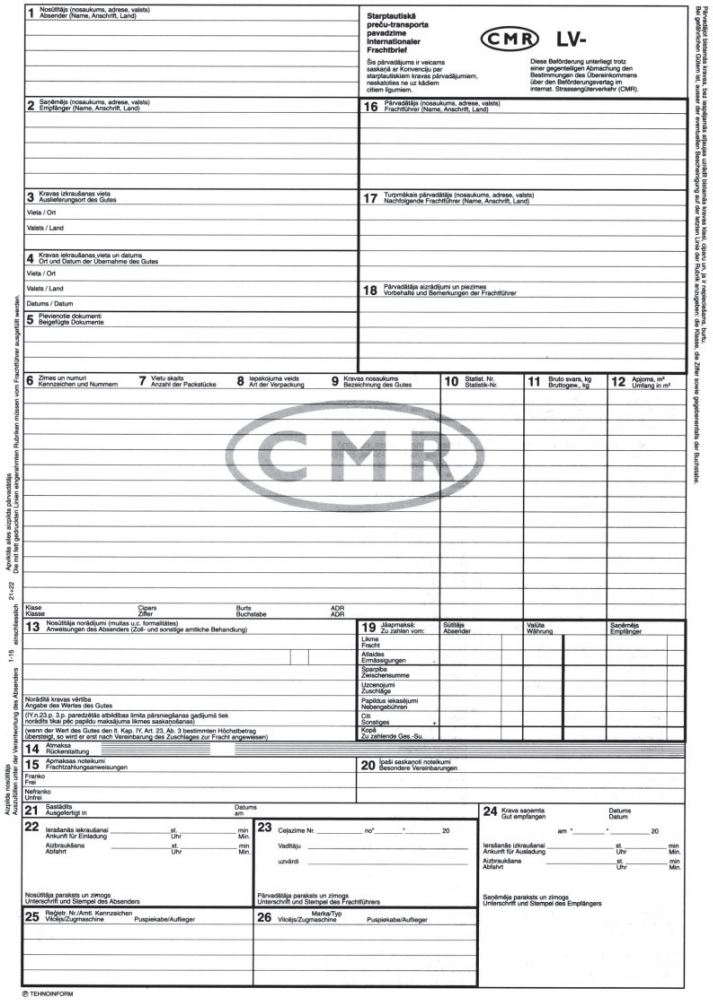
  – Contains minimum informations about cargo: sender, consignee, content and quantities, hazardous informations

    – red printing for sender

    – blue printing for receiver

    – green imprint on carrier

    – black print on second carrier (if present)



LECTURE 5 – FORWARDING AND ITS DOCUMENTS
5.1.2. CMR

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LECTURE V. Forwarding and its documents

5.1.2. CMR

MAGYARORSZÁG MEGÚJUL

A projekt az Európai Unió támogatásával valósul meg.

Convention on the Contract for the International Carriage of Goods by Road (CIM)

- United Nations convention about ransportation of cargo by road
- signed in Geneva on 19 May 1956
- ratified by 55 european countries
- defined the standard CMR waybill
  - ackownledged by the Police and Customs in any european country
  - Contains minimum informations about the cargo: sender, consignee, type and pieces, hazarduous informations
    - red printing for sender
    - blue printing for receiver
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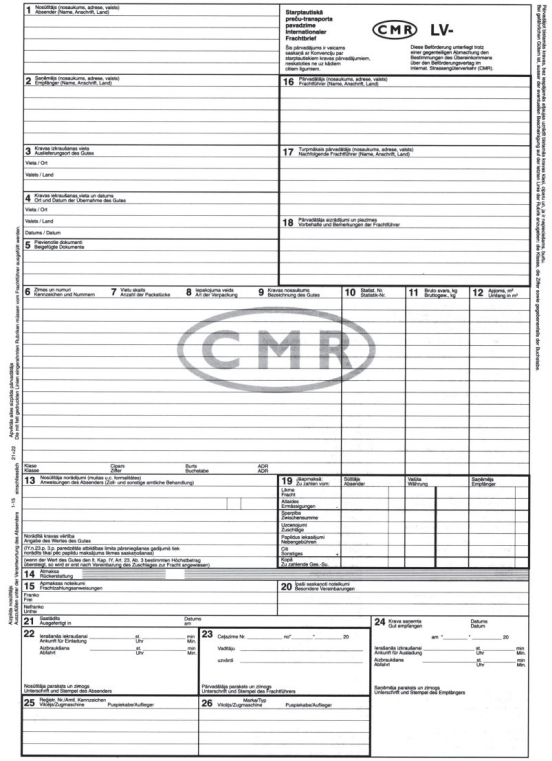


LECTURE 5 – FORWARDING AND ITS DOCUMENTS

5.1.3. CIM and SMGS

– Convention concerning International Carriage by Rail (CIM)

– Defined by Intergovernmental Organisation for International Carriage by Rail COTIF) in 1893

– From 1985 is in general use in Europe, except the exSovietUnion and exJugoslavian countries

– It is available for transports touching at least tw– country

– Important appendicies are:
  – Appendix B: for carg– transportation,
  – Appendix C: for hazarduous carg– (RID)

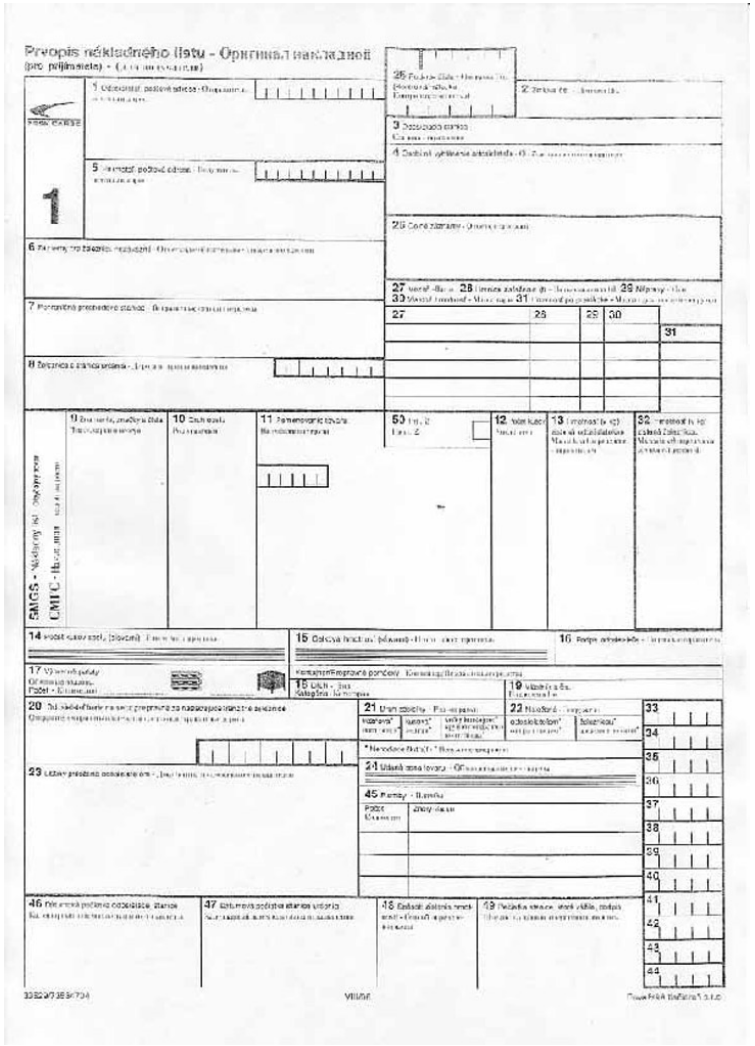
– CIM Railway Waybill issued by the carrier in five copies:
  – original accompanies the goods
  – the duplicate of the original is kept by the consignor
  – the three remaining copies by the carrier for internal purposes.

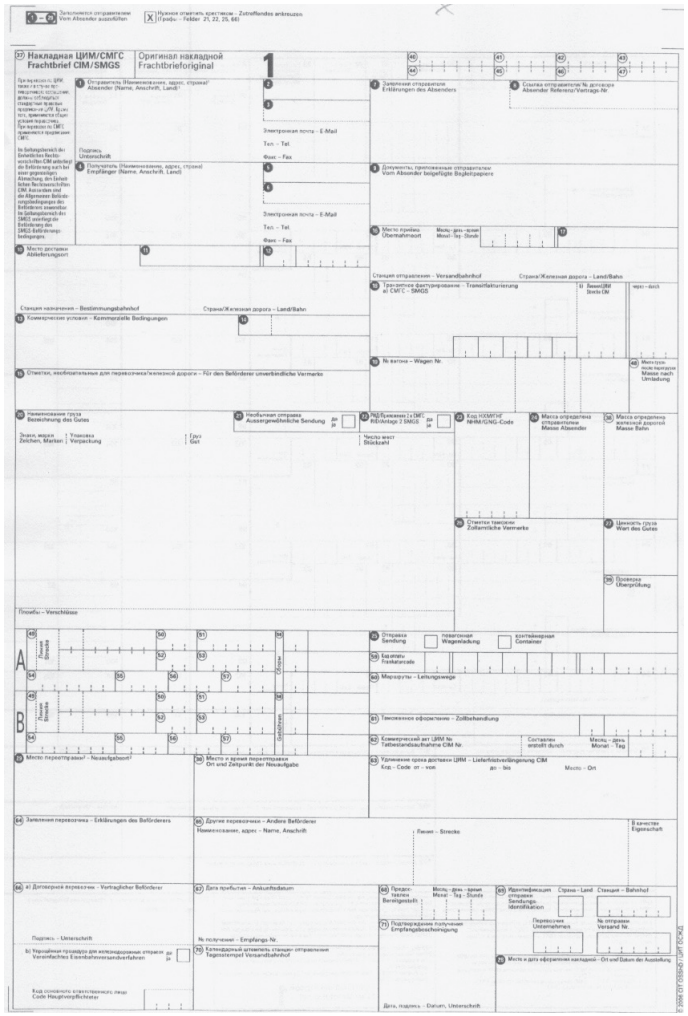
SMGS Railway Transportation Convention

– From 1951, the Soviet Union and Socialist Countries applied until 1990.

– From 1990, only the exSovietUnion, Mongolia, China and Vietnam and exJugoslavian countries apply

– The rail companies transporting cargo into these countries have to apply included into the General Contract Conditions




Накладная ЦИМ/СМГС
Frachtbrief CIM/SMGS
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LECTURE 5 – FORWARDING AND ITS DOCUMENTS
5.1.3. CIM and SMGS

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LECTURE V. Forwarding and its documents

5.1.3. CIM and SMGS

MAGYARORSZÁG MEGÚJUL
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Convention concerning International Carriage by Rail (CIM)

- Defined by Intergovernmental Organisation for International Carriage by Rail (COTIF) in 1893
- From 1985 is in general use in Europe, except the exSovietUnion and exJugoslavian countries
- It is available for transports touching at least two country
- Important appendicies are:
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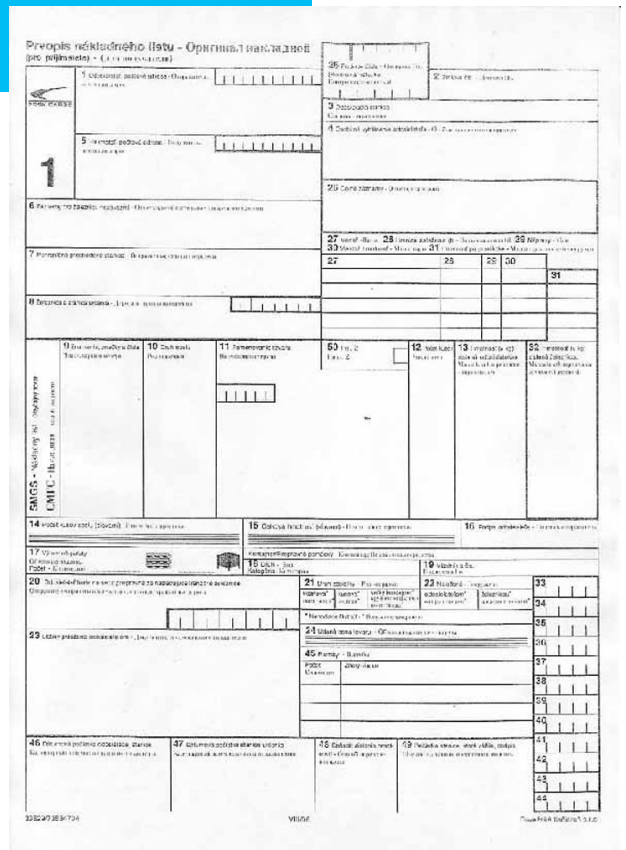

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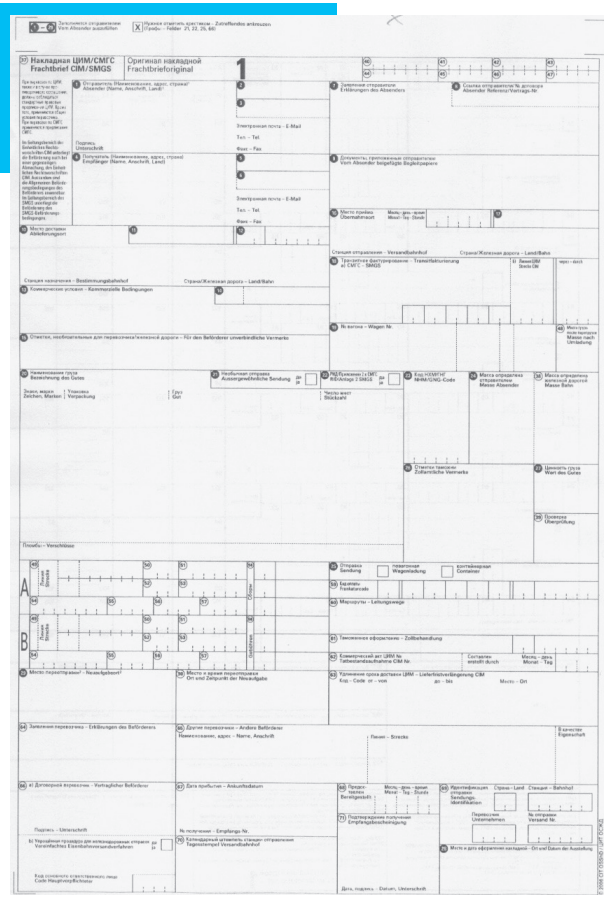


LECTURE 5 – FORWARDING AND ITS DOCUMENTS

5.1.4. CIM-UIRR

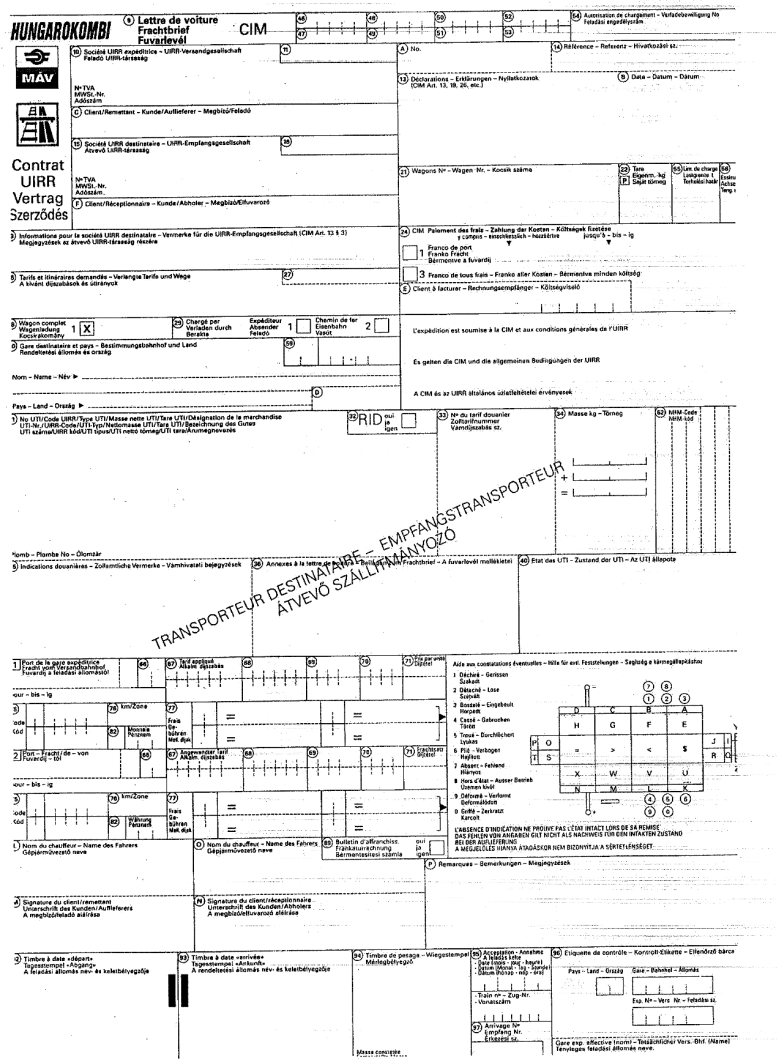
International Union of Combined Road-Rail Transport Companies (UIRR)

– Accompanied Combined Transport means, that the road truck tractor and its driver accompanies the semi-trailer, like RO-LA systems

– Unaccompanied Combined Transport forwards only the goods in containers or trailers, like Bimodal systems

– Operator (CTO=Combined Transport Operator) is the company organising the transportation and contracts with the client

– Railway Undertakings Companies provide train capacity


HUNGAROKOMBI
Lettre de voiture
Frachtbrief
Fuvarlevél
CIM
MÁV
Contrat
UIRR
Vertrag
Szerződés
TRANSPORTEUR DESTINATAIRE – EMPFANGSTRANSPORTEUR
ÁTVEVŐ SZÁLLÍTMÁNYOZÓ
RID

LECTURE 5 – FORWARDING AND ITS DOCUMENTS
5.1.4. CIM–UIRR

HUNline Hungarian Online University

ÚJ SZÉCHENYI TERV

Basics of Logistics
College of Dunaújváros

LECTURE V. Forwarding and its documents

5.1.4. CIM-UIRR

MAGYARORSZÁG MEGÚJUL

A projekt az Európai Unió támogatásával valósul meg.

International Union of Combined Road-Rail Transport Companies (UIRR)

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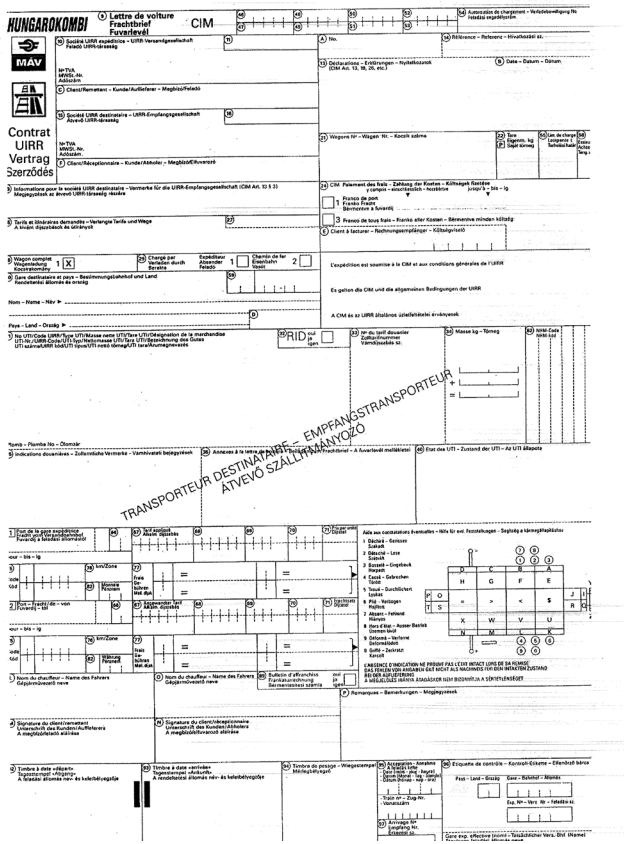


LECTURE 5 – FORWARDING AND ITS DOCUMENTS

5.1.5. Sea transportation rules

Sea transportation rules

Haga/Visby regulations:

– Ship is sailing under a flag

– The flag defines the country, which the laws applied for the ship of

– Ship operator is responsible from „crane rope to crane rope”

– Waybill is the Bill of Lading

  – 3 original, 3 copies

  – originals provide proprietary

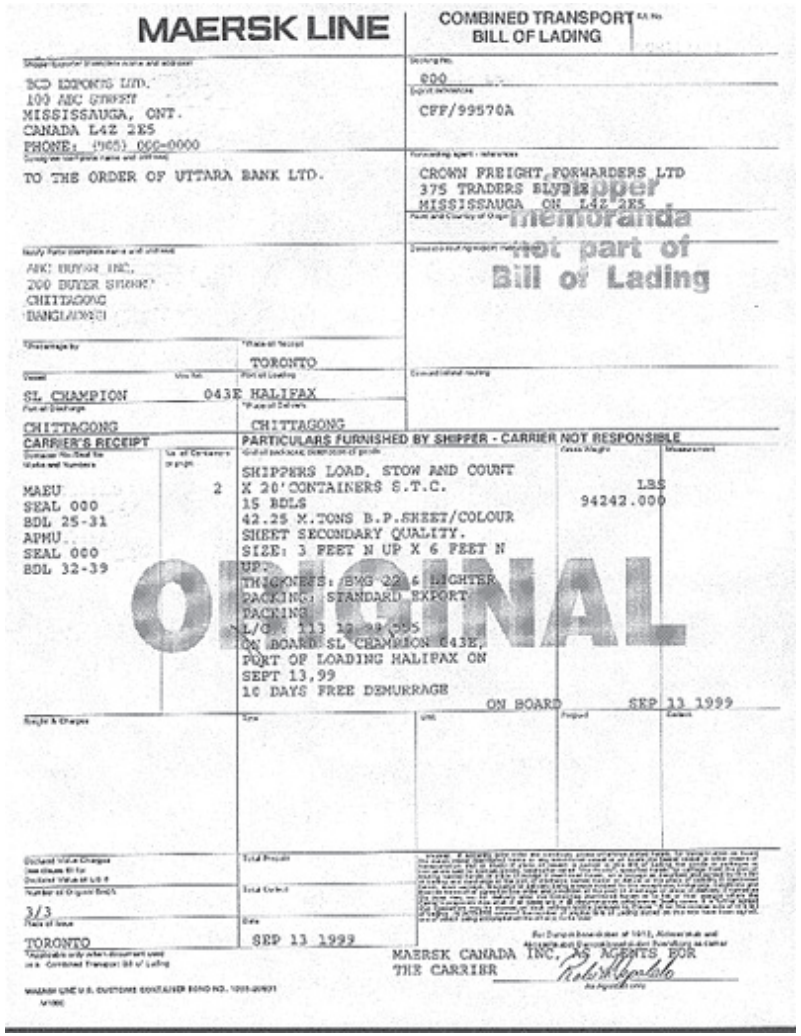
– Types:

  – Consigned to B/L, Order B/L

  – Clean B/L, Unclean B/L

  – Transloading B/L, Multimodal B/L

  – shipped on board B/L, received for shipment B/L



MAERSK LINE

COMBINED TRANSPORT BILL OF LADING

SCD EXPORTS LTD.
100 ABC STREET
MISSISSAUGA, ONT.
CANADA L4Z 2E5
PHONE: (905) 000-0000

000

CFF/99570A

TO THE ORDER OF UTTARA BANK LTD.

CROWN FREIGHT FORWARDERS LTD
375 TRADERS BLVD
MISSISSAUGA ON L4Z 2E5

Shipper memoranda not part of Bill of Lading

ABC BUYER INC.
200 BUYER STREET
CHITTAGONG
BANGLADESH

TORONTO

SL CHAMPION 043E HALIFAX

CHITTAGONG

CHITTAGONG

CARRIER'S RECEIPT

PARTICULARS FURNISHED BY SHIPPER - CARRIER NOT RESPONSIBLE

MAEU SEAL 000 BDL 25-31 APMU SEAL 000 BDL 32-39	2	SHIPPERS LOAD, STOW AND COUNT X 20'CONTAINERS S.T.C. 15 BDLS 42.25 M.TONS B.P.SHEET/COLOUR SHEET SECONDARY QUALITY. SIZE: 3 FEET N UP X 6 FEET N UP THICKNESS: BWG 22 & LIGHTER PACKING: STANDARD EXPORT PACKING L/C : 113 [illegible] ON BOARD SL CHAMPION 043E, PORT OF LOADING HALIFAX ON SEPT 13,99 10 DAYS FREE DEMURRAGE	LBS 94242.000	

ORIGINAL

ON BOARD SEP 13 1999

3/3

TORONTO

SEP 13 1999

MAERSK CANADA INC., AS AGENTS FOR THE CARRIER

LECTURE 5 – FORWARDING AND ITS DOCUMENTS
5.1.5. Sea transportation rules

HUNline Hungarian Online University

ÚJ SZÉCHENYI TERV

Basics of Logistics
College of Dunaújváros

LECTURE V. Forwarding and its documents

5.1.5. Sea transportation rules

MAGYARORSZÁG MEGÚJUL

A projekt az Európai Unió támogatásával valósul meg.

Sea transportation rules

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- Ship is sailing under a flag
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- Waybill is the Bill of Lading
  - 3 original, 3 copies
  - originals provide proprietary
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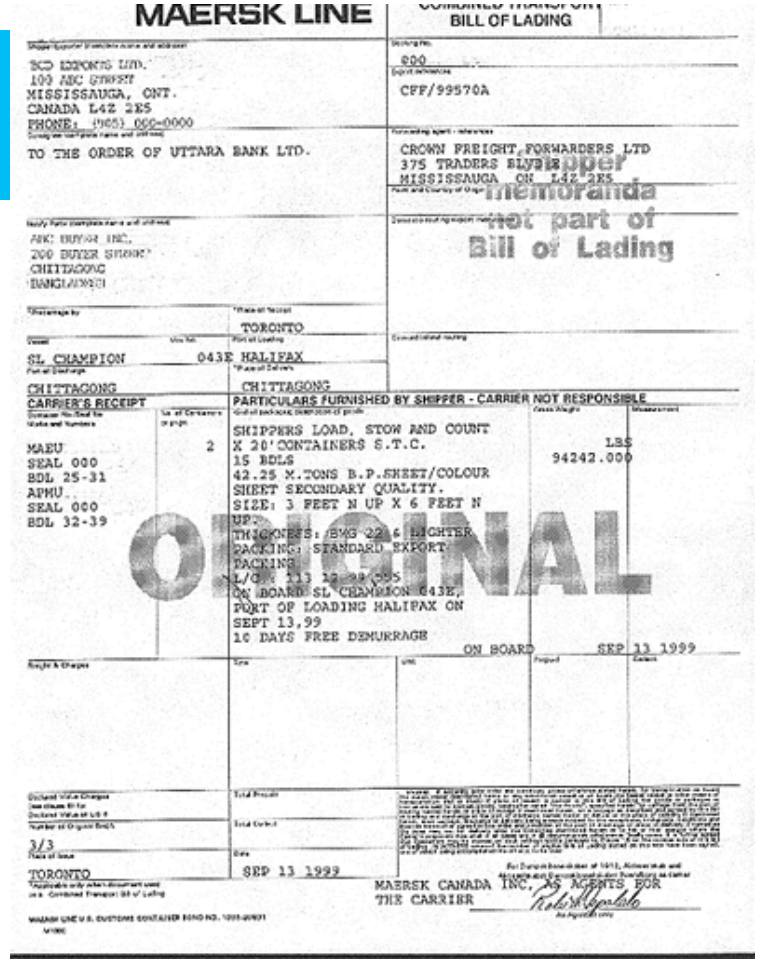
  - Consigned to B/L, Order B/L
  - Clean B/L, Unclean B/L
  - Transloading B/L, Multimodal B/L
  - shipped on board B/L, received for shipment B/L


MAERSK LINE

BILL OF LADING

TO THE ORDER OF UTTARA BANK LTD.

CFF/99570A

CROWN FREIGHT FORWARDERS LTD
375 TRADERS BLVD E
MISSISSAUGA ON L4Z 2E5

Paper Memoranda not part of Bill of Lading

TORONTO

SL CHAMPION 043E HALIFAX

CHITTAGONG CHITTAGONG

CARRIER'S RECEIPT

PARTICULARS FURNISHED BY SHIPPER - CARRIER NOT RESPONSIBLE

MAEU
SEAL 000
BDL 25-31
APHU
SEAL 000
BDL 32-39

2

SHIPPERS LOAD, STOW AND COUNT
X 20'CONTAINERS S.T.C.
15 BDLS
42.25 M.TONS B.P.SHEET/COLOUR
SHEET SECONDARY QUALITY.
SIZE: 3 FEET N UP X 6 FEET N
UP.
THICKNESS: BWG 22 & LIGHTER
PACKING: STANDARD EXPORT
PACKING
L/C. 113 [illegible]
ON BOARD SL CHAMPION 043E,
PORT OF LOADING HALIFAX ON
SEPT 13,99
10 DAYS FREE DEMURRAGE

LBS
94242.000

ORIGINAL

ON BOARD SEP 13 1999

3/3

TORONTO

SEP 13 1999

MAERSK CANADA INC., AS AGENTS FOR
THE CARRIER

LECTURE 5 – FORWARDING AND ITS DOCUMENTS

5.1.6. Rules on the airways

International Air Transport Association (IATA)

– Founded in 1919

– 240 countries joined

– Uniform tariff system Document standardisation

– Information and technology transfer

– Provides professional trainings

– Additional Regulations:

  – IATA LAR for live goods

  – IATA DGR for hazardous goods

– Use the Airway Bill:

  – Green for transport payment o Blue for the Sender

  – Pink for the Consignee


PLEASE TYPE OR PRINT (6 PLIES)
023 7378 3813
023-7378 3813
Air Waybill
Fed
Shipper's Name and Address
Shipper's Account Number
Consignee's Name and Address
Consignee's Account Number
Issuing Carrier's Agent Name and City
Accounting Information
Agent's IATA Code
Account No
Airport of Departure (Addr. of First Carrier) and Requested Routing
Reference Number
Optional Shipping Information
Declared Value for Carriage
Declared Value for Customs
Airport of Destination
Amount of Insurance
Handling Information
SCI
No. of Pieces RCP
Gross Weight
Rate Class
Commodity Item No.
Chargeable Weight
Rate / Charge
Total
Nature and Quantity of Goods (incl. Dimensions or Volume)
Prepaid
Weight Charge
Collect
Other Charges
Valuation Charge
Tax
Total Other Charges Due Agent
Total Other Charges Due Carrier
Shipper certifies that the particulars on the face hereof are correct and that Insofar as any part of the consignment contains dangerous goods, such part is properly described by name and is in proper condition for carriage by air according to the applicable Dangerous Goods Regulations.
Signature of Shipper or his Agent
Total Prepaid
Total Collect
Currency Conversion Rates
CC Charges in Dest. Currency
Executed on (date)
at (place)
Signature of Issuing Carrier or its Agent
For Carrier's Use Only at Destination
Charges at Destination
Total Collect Charges
023-7378 3813
ORIGINAL 3 (FOR SHIPPER)

LECTURE 5 – FORWARDING AND ITS DOCUMENTS
5.1.6. Rules on the airways

HUNline Hungarian Online University

ÚJ SZÉCHENYI TERV

Basics of Logistics
College of Dunaújváros

LECTURE V. Forwarding and its documents

5.1.6. Rules on the airways

MAGYARORSZÁG MEGÚJUL
A projekt az Európai Unió támogatásával valósul meg.

International Air Transport Association (IATA)

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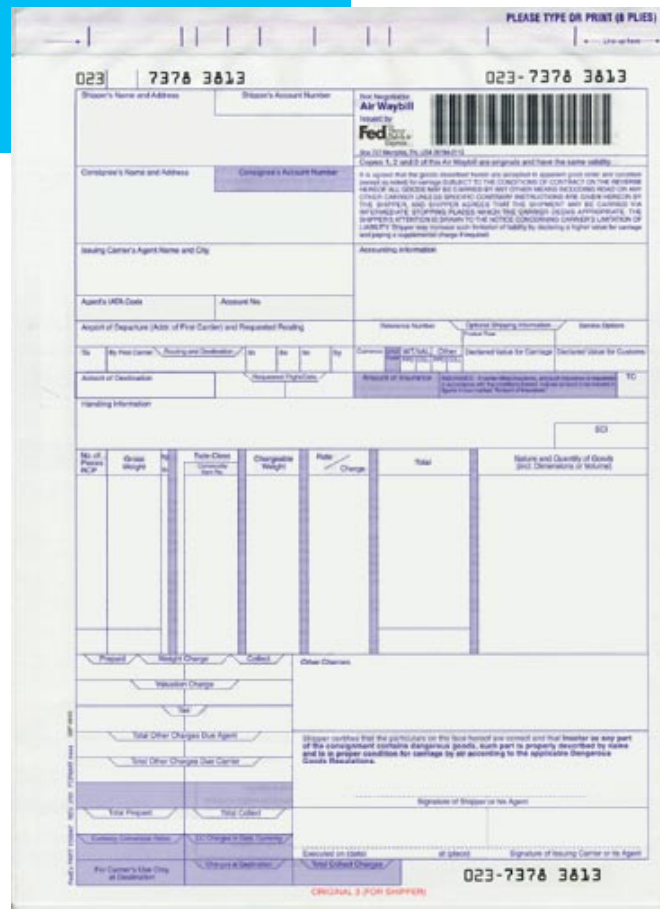

LECTURE 5 – FORWARDING AND ITS DOCUMENTS

5.2.1. What is the FIATA?

International Federation of Freight Forwarders Associations

– founded in 1926 in Austria, headquarter in Switzerland

– representing 40,000 forwarding and logistics companies in 150 countries

– help the international commerce and forwarding

– representing the freight-forwarding industries by international organisations in the field of transport:
  – International Chamber of Commerce (ICC)
  – International Air Transport Association (IATA) o International Union of Railways (UIC)
  – International Road and Transport Union (IRU) o World Customs Organization (WCO)
  – World Trade Organization (WTO)

– established Foundation for Vocational Training

– created uniform documents for worldwide forwarding, which have a very good reputation:
  – FCR: Forwarders Certificate of Receipt
  – FCT: Forwarders Certificate of Transport
  – FWR: FIATA Warehouse Receipt
  – FBL: FIATA Bill of Lading (negotiable Multimodal Transport)
  – FWB: FIATA Waybill (non-negotiable Multimodal Transport)
  – SDT: Shippers Declaration for the Transport (of Dangerous Goods) o SIC: Shippers Intermodal Weight Certificate
  – FFI: FIATA Forwarding Instructions

LECTURE 5 – FORWARDING AND ITS DOCUMENTS
5.2.1. What is the FIATA?

HUNline Hungarian Online University

ÚJ SZÉCHENYI TERV

Basics of Logistics
College of Dunaújváros

LECTURE V. Forwarding and its documents

5.2.1. What is the FIATA?

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  - World Trade Organization (WTO)
- established Foundation Vocational Training
- created uniform documents for worldwide forwarding, which have a very good reputation

LECTURE 5 – FORWARDING AND ITS DOCUMENTS

5.2.2. FIATA forwarding documents

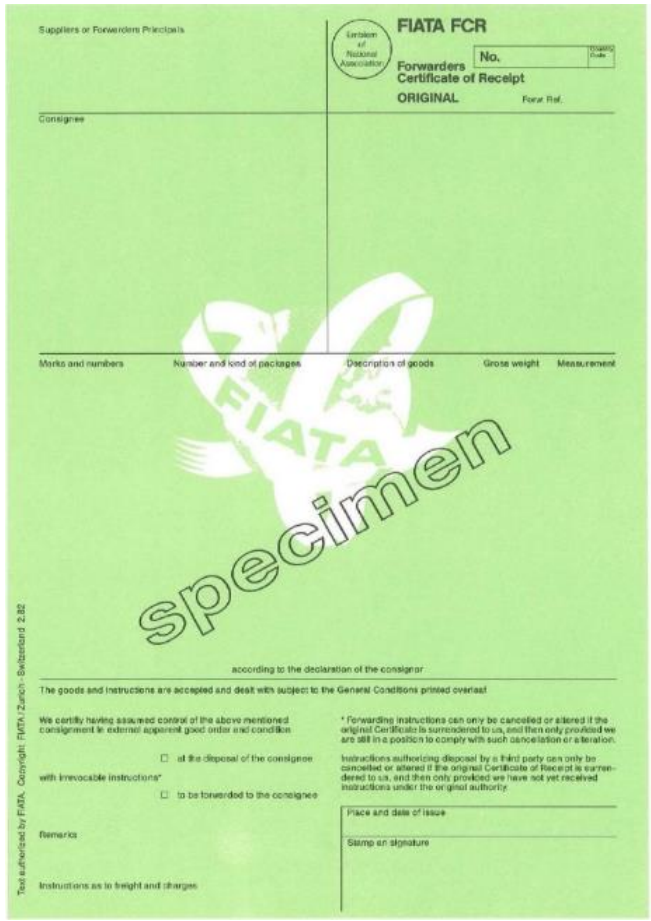
FIATA FCR is the Forwarders Certificate of Receipt, which have got similar function to the CMR, CIM and Bill of Lading, and other Forwarder Receipt. It proves the fact, that the forwarder received the cargo for holding or forwarding to a third party. The most important facts to be considered:

– Date

– Content, items, packaging

– Weight, quantity, crates

– No damage



FIATA FCT is the Forwarders Certificate of Transport, which proves the fact, that the forwarder forwarded the cargo to the consignee to the right time or deadline.

The consignee has to give it to the forwarder for the cargo. Without this, the forwarder cannot extradite the cargo.

Suppliers or Forwarders Principals

Emblem of National Association

FIATA FCT

Forwarders Certificate of Transport

ORIGINAL

No.

Forw. Ref.

Consigned to order of

Notify address

Conveyance

from / via

Destination

Marks and numbers | Number and kind of packages | Description of goods | Gross weight | Measurement

specimen

according to the declaration of the consignor

The goods and instructions are accepted and dealt with subject to the General Conditions printed overleaf.

Acceptance of this document or the invocation of rights arising therefrom acknowledges the validity of the following conditions, regulations and exceptions also of the trading conditions printed overleaf, except where the latter conflict with conditions 1–6 below.

1. The undersigned are authorized to enter into contracts with carriers and others involved in the execution of the transport subject to the latter's usual terms and conditions.
2. The undersigned do not act as Carriers but as Forwarders. In consequence they are only responsible for the careful selection of third parties, instructed by them, subject to the conditions of Clause 3 hereunder.
3. The undersigned are responsible for delivery of the goods to the holder of this document through the intermediary of a delivery agent of their choice. They are not responsible for acts or omissions of Carriers involved in the execution of the transport or of other third parties. The undersigned Forwarders will, on request, assign their rights and claims against Carriers and other parties.
4. Insurance of the goods will only be effected upon express instructions in writing.
5. Unforeseen and / or unforeseeable circumstances entitle the undersigned to arrange for deviation from the envisaged route and / or method of transport.
6. Unforeseen and / or unforeseeable disbursements and charges are for the account of the goods.

Insurance through the intermediary or the undersigned Forwarders

☐ Not covered

☐ Covered according to the attached Insurance Policy / Certificate

All disputes shall be governed by the law and within the exclusive jurisdiction of the courts at the place of issue.

For delivery of the goods please apply to:

Freight and charges prepaid to:

thence for account of goods, lost or not lost.

We, the Undersigned Forwarders in accordance with the instructions of our Principals, have taken charge of the abovementioned goods in good external condition at: .....

for despatch and delivery as stated above or order against surrender of this document properly endorsed.

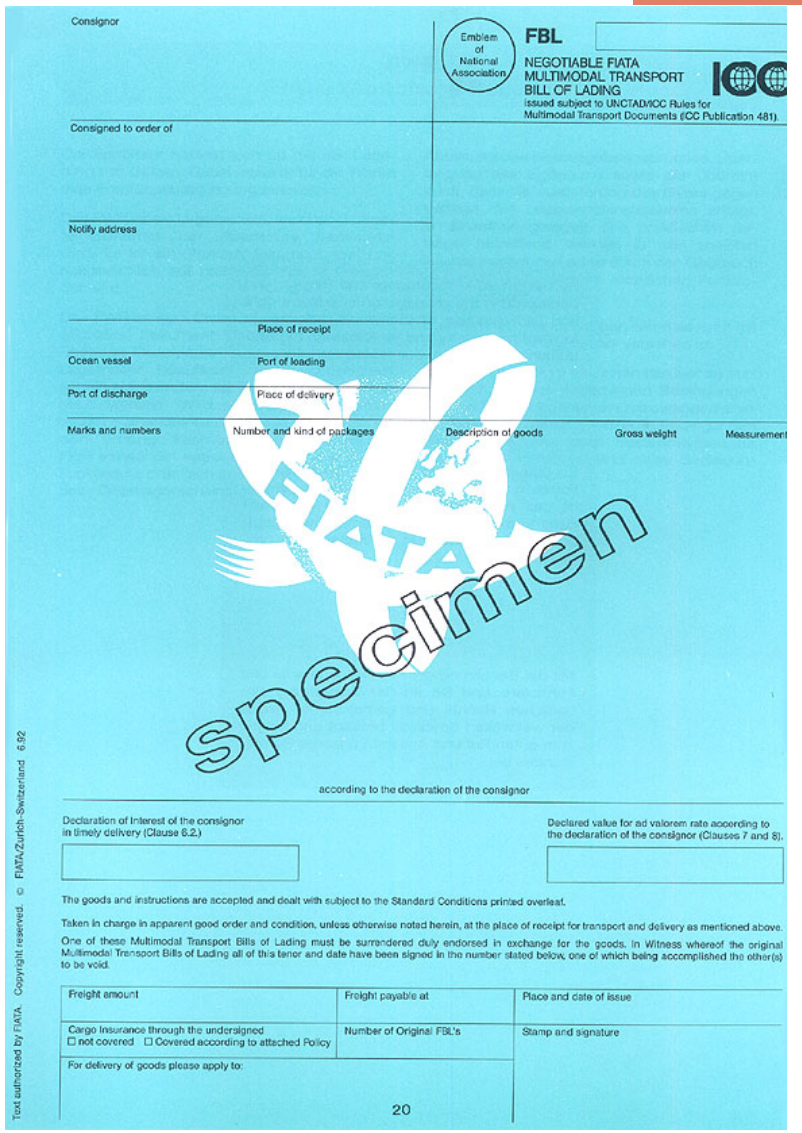
In witness thereof the Undersigned Forwarders have signed originals of this FCT document, all of this tenor and date. When one of these has been accomplished, the other(s) will lose their validity. .....

Place and date of issue

Stamp and signature

Text authorized by FIATA, COPYRIGHT FIATA / Zurich - Switzerland 5.96

FIATA FBL is a negotiable FIATA Multimodal Transport Bill of Lading, which has got a very similar role to the FCR's, but it is a more secure document for multimodal forwarding and works as a forwarding contract.



Consignor

Emblem of National Association

FBL

NEGOTIABLE FIATA MULTIMODAL TRANSPORT BILL OF LADING
issued subject to UNCTAD/ICC Rules for Multimodal Transport Documents (ICC Publication 481).

Consigned to order of

Notify address

Place of receipt

Ocean vessel | Port of loading

Port of discharge | Place of delivery

Marks and numbers | Number and kind of packages | Description of goods | Gross weight | Measurement

FIATA specimen

according to the declaration of the consignor

Declaration of interest of the consignor in timely delivery (Clause 6.2.)

Declared value for ad valorem rate according to the declaration of the consignor (Clauses 7 and 8).

The goods and instructions are accepted and dealt with subject to the Standard Conditions printed overleaf.

Taken in charge in apparent good order and condition, unless otherwise noted herein, at the place of receipt for transport and delivery as mentioned above.

One of these Multimodal Transport Bills of Lading must be surrendered duly endorsed in exchange for the goods. In Witness whereof the original Multimodal Transport Bills of Lading all of this tenor and date have been signed in the number stated below, one of which being accomplished the other(s) to be void.

Freight amount	Freight payable at	Place and date of issue
Cargo insurance through the undersigned ☐ not covered ☐ Covered according to attached Policy	Number of Original FBL's	Stamp and signature
For delivery of goods please apply to:		

20

Text authorized by FIATA. Copyright reserved. © FIATA/Zurich-Switzerland 6.92

FIATA FWB is the non-negotiable waybill for multimodal waybill, which is also similar to the FBL, but the value of the cargo cannot be handed over by this document.

FWR is the FIATA Warehouse Receipt, which is a record about the receipt of cargo by the forwarder's warehouse. It is used only in national transportation for the purpose of helping the logistic processes by unified forms. Therefore is non-negotiable and cannot be used as a normal warehouse receipt.

FIATA SDT is the Shipper's Declaracion for the Transport of Dangerous Goods.

It's roles are:

– Help the information providing about hazardous goods

– On the back side, the classification of hazards have to be printed

– To use in a country, the national forwarder association has to announce it at theFIATA

– Have to be created and signed by the sender

– Help to determine the responsibility in case of accidents

Shipper (Name & Address) / Chargeur (Nom & Adresse)

Emblem of National Association

FIATA SDT

No. | Country Code

SHIPPERS DECLARATION FOR THE TRANSPORT OF DANGEROUS GOODS

(approved by FIATA)

Consignee (Name & Address) / Destinataire (Nom & Adresse)

Forwarder / Transitaire

Ref. nr.

In accordance with the European Agreement concerning the international carriage of Dangerous Goods by Road (ADR) with Annexes A+B of 30.9.1957, or
the International Regulations concerning the Carriage of Dangerous Goods by Rail (RID) as Annex I of the International Convention concerning the Carriage of Goods by Rail (CIM) of 1.7.1977, or
in accordance with Chapter VII – Carriage of Dangerous Goods – of the International Convention for the Safety of Life at Sea, 1960 (or 1974) supplemented by the provision of the IMCO International Maritime Dangerous Goods (IMDG) Code, 1965 as amended, or national official regulations when applicable giving the precise listing of relevant ADR/RID Class, and/or IMDG IMCO Class, and/or Marginal Reference No.,
the undersigned, as principal of the forwarder remits to him together with the order of shipment of Dangerous Goods the following informations:

Conformément à l'Accord européen relatif au transport international des marchandises dangereuses par route (ADR) et ses Annexes A+B du 30.9.1957 ou au Règlement international concernant le transport des marchandises dangereuses par chemin de fer (RID) et à l'Annexe 1 de la Convention internationale concernant le transport des marchandises par chemin de fer (CIM) du 1.7.1977, ou conformément au Chapitre VII – Transport de marchandises dangereuses – de la Convention internationale pour la sécurité des vies en mer, 1960 (ou 1974) complétée par les dispositions du Code maritime international des marchandises dangereuses (IMDG) 1965, amendé, de l'OMI ou aux réglementations nationales officielles d'application donnant la liste précise des classifications ADR/RID et/ou IMDG/OMI applicables, et/ou le No. de référence marginal, le soussigné, commettant du transitaire, lui remet en même temps que l'ordre d'expédition de marchandises dangereuses les renseignements suivants:

Marks & Numbers; Number & Kind of Packages; Correct Technical Name of Substances. Indicate ADR/RID Class, IMDG/IMCO Class, UN-No., Flashpoint (in °C). Marques et Numéros; Nombre et Nature des colis; dénomination technique appropriée des substances. Indiquer la Classe ADR/RID, Class IMDG/IMCO, n° d'ordre UN, Point Eclair (en° C).	Gross Weight (kg) Poids brut (kg) Net quantity Quantité nette (when required) (s'il y a lieu)
specimen	

Characteristics:

Special information is required for (a) dangerous goods in limited quantities, and (b) radioactive substances (class 7). In certain circumstances, (c) a wheathering certificate, or (d) a Container/Trailer packing certificate is required.

Caractéristiques:

Des renseignements supplémentaires sont nécessaires pour (a) des marchandises dangereuses en quantités limitées et (b) les substances radioactives (classe 7). Dans certains cas, (c) un certificat d'intempéries, ou (d) un certificat d'emballage pour conteneur/remorque est requis.

ADR/RID and/or IMDG/IMCO Declaration

The undersigned declares that goods to be shipped are authorized for transport by road according to ADR or by rail according to RID and/or transport by sea and that their nature conditions, packing and labelling are in accordance with ADR/RID and/or IMDG/IMCO prescriptions.
If several dangerous substances are packed together in a collective package or in a single container it is furthermore declared that the mixed packing is not prohibited (ADR/RID).

Instructions in case of accidents ☐ are joined ☐ will be given

The packages ☐ have been labeled ☐ are not labeled

Déclaration ADR/RID et/ou IMDG/OMI

Le soussigné déclare que les marchandises à expédier sont admises au transport par route suivant l'ADR ou par fer suivant le RID et/ou par mer et que les conditions de leur nature, l'emballage et l'étiquetage sont en concordance avec les prévisions de l'ADR/RID et/ou IMDG/OMI.
Si plusieurs marchandises dangereuses sont emballées ensemble dans un colis collectif, ou dans un même conteneur, il est déclaré également que cela n'est pas prohibé (ADR/RID).

Des consignes en prévision d'accidents ☐ sont jointes ☐ seront suivies

Les colis ☐ ont été étiquetés ☐ n'ont pas été étiquetés

Special remarks
Remarques particulières

Place and date of issue
Lieu et date d'émission

26

Shippers signature and stamp
Sceau et signature du chargeur

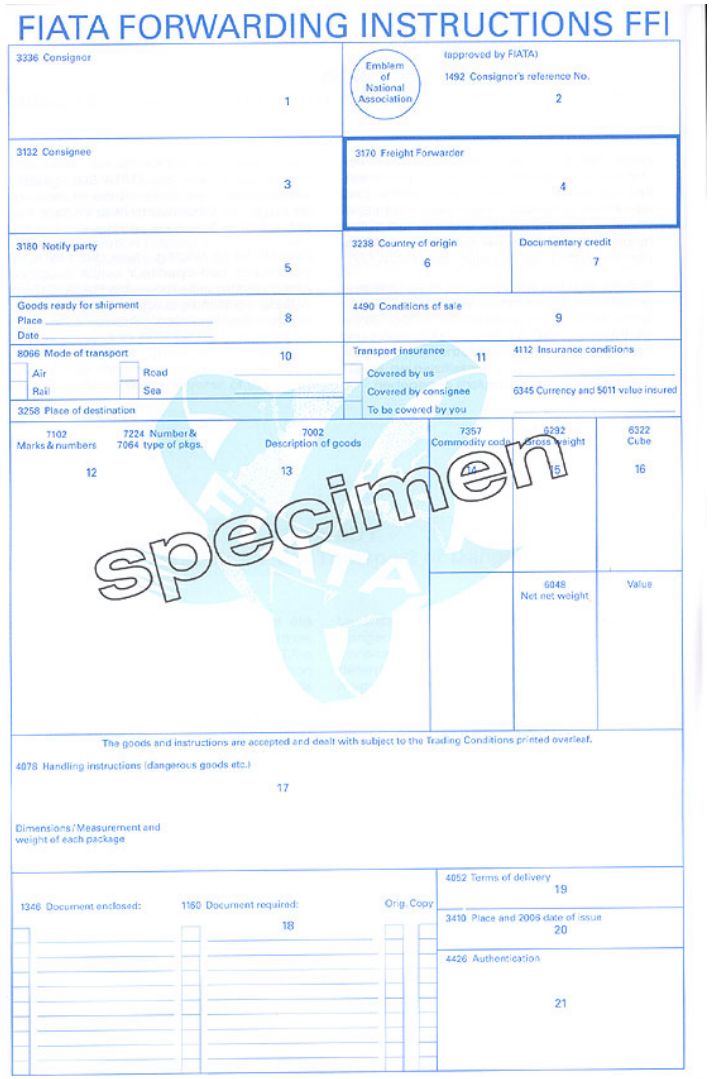
Text authorized by FIATA Copyright FIATA / Zurich – Switzerland 5.97

FFI document is the FIATA Forwarding Instructions.

– A standard form to create forwarder contract.

– Based on the UN layout key for international commercial documents.

– 4-digit code table printed onto the back side helps the digital submission.


FIATA FORWARDING INSTRUCTIONS FFI

3336 Consignor 1

Emblem of National Association

(approved by FIATA)
1492 Consignor's reference No. 2

3132 Consignee 3

3170 Freight Forwarder 4

3180 Notify party 5

3238 Country of origin 6

Documentary credit 7

Goods ready for shipment
Place
Date 8

4490 Conditions of sale 9

8066 Mode of transport 10
Air Road
Rail Sea

Transport insurance 11
Covered by us
Covered by consignee
To be covered by you

4112 Insurance conditions
6345 Currency and 5011 value insured

3258 Place of destination

7102 Marks & numbers	7224 Number & 7064 type of pkgs.	7002 Description of goods	7357 Commodity code	6292 Gross weight	6322 Cube
12		13	14	15	16
				6048 Net net weight	Value

specimen

The goods and instructions are accepted and dealt with subject to the Trading Conditions printed overleaf.

4078 Handling instructions (dangerous goods etc.)
17

Dimensions / Measurement and weight of each package

1346 Document enclosed:	1160 Document required:	Orig.	Copy
	18		

4052 Terms of delivery 19

3410 Place and 2005 date of issue 20

4426 Authentication 21

LECTURE 5 – FORWARDING AND ITS DOCUMENTS
5.2.2. FIATA forwarding documents

HUNline Hungarian Online University

ÚJ SZÉCHENYI TERV

Basics of Logistics
College of Dunaújváros

LECTURE V. Forwarding and its documents

5.2.2. FIATA forwarding documents

MAGYARORSZÁG MEGÚJUL

A projekt az Európai Unió támogatásával valósul meg.

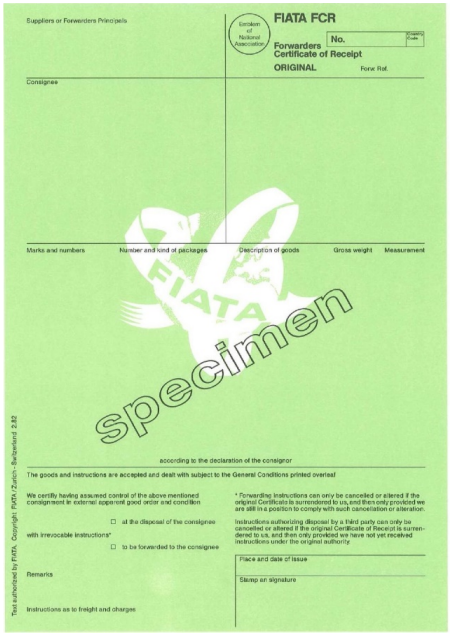
FIATA FCR
Forwarders Certificate of Receipt

Similar function to the CMR, CIM and Bill of Lading, etc.

Prove the fact,that the forwarder received the cargo for holding or forwarding to a third party

Facts:

- Date
- Content
- Weight/Quantity
- No damage



FIATA FCT
Forwarders Certificate of Transport

Prove the fact, that the forwarder forwarded the cargo to the consignee

The consignee gives it to the forwarder for the cargo

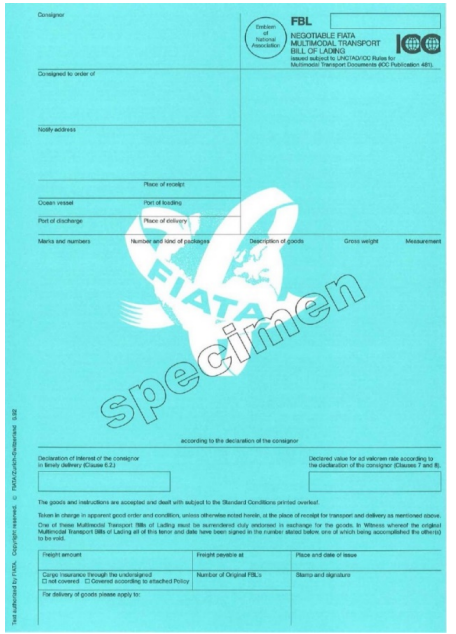
FIATA FBL
Negotiable FIATA Multimodal Transport Bill

Same to the FCR,

but it is a security

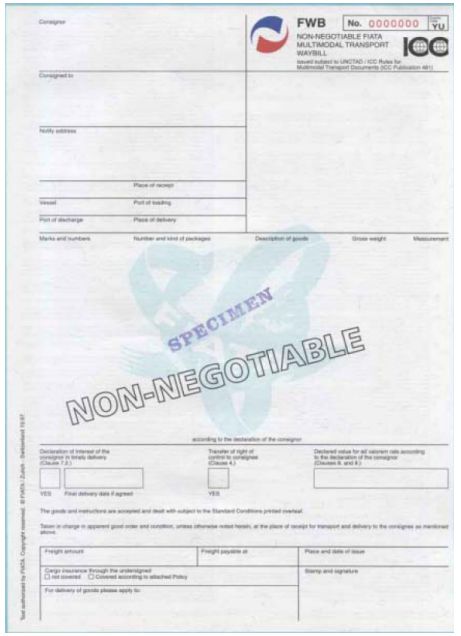
Used in multimodal forwarding

Works as a forwarding contract



FIATA FWB
Non-negotiable FIATA Multimodal Waybill

Same like the FIATA FBL



FIATA FWR
FIATA Warehouse Receipt

- Receipt about cargo received by the forwarder warehouse
- Used only in national transportation
- Main purpose is to help the logistic processes by unified forms.
- Non-negotiable
- Cannot be used as a normal warehouse receipt

FIATA SDT - Shippers Declaracion for the Transport of Dangerous Goods

- Help the information providing about hazardous goods
- On the back side, the classification of hazards have to be printed
- To use in a country, the national forwarder association has to announce it at the FIATA
- Have to be created and signed by the sender
- Help to determine the responsibility in case of accidents

FIATA FFI
FIATA Forwarding Instructions

- A standard form to create forwarder contract
- Based on the UN layout key for international commercial documents
- 4-digit code table printed onto the back side helps the digital submission.

LECTURE V. Forwarding and its documents

LECTURE 5 – FORWARDING AND ITS DOCUMENTS

5.3.1. What is the InCoTerms?

InCoTerms are the International Commercial Terms published by the International Chamber of Commerce and declared first in 1936. It regulates the tasks of the seller in the international commercial transactions in the following parts of delivery from administration to physical logistic tasks:

– Export customs declaration

– Carriage to port of export

– Unloading of truck in port of export

– Loading on vessel in port of export

– Carriage (Sea/Air) to port of import

– Insurance

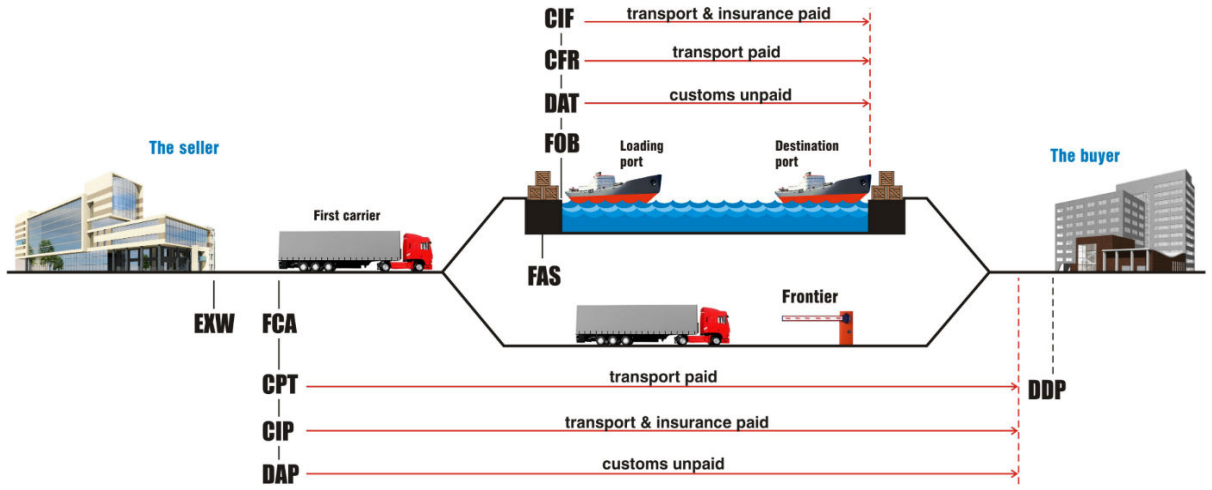
– Unloading in port of import

– Loading on truck in port of import

– Carriage to place of destination

– Import customs clearance

– Import taxes



Source: http://www.wtglogistics.com/images/publ/incoterms-en.jpg

The seller needs to provide the activites from the above mentioned activites free for the buyer, but the costs of these provided activities are included into the sales price of the items. So a price e.g. 10000$ FAS New York means, that the seller delivers the subject of the delivery contract to the port of New York with clearing the export customs for the named sales price included these activities for free.

LECTURE 5. Forwarding and its documents
5.3.1. What is the InCoTerms?

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LECTURE V. Forwarding and its documents

5.3.1. What is the InCoTerms?

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A projekt az Európai Unió támogatásával valósul meg.

International Commercial Terms

- Published by the International Chamber of Commerce
- Declared first in 1936
- Last update: 2010
- 11 predefined terms:
  - "E" group: EXW on departure location
  - "F" group: FCA, FAS, FOB on receipt location
  - "C" group: CFR, CIF, CPT, CIP on shipment location
  - "D" group: DAT, DAP, DDP on destination location

Seller's tasks regulated:

1. Export customs declaration
2. Carriage to port of export
3. Unloading of truck in port of export
4. Loading on vessel in port of export
5. Carriage (Sea/Air) to port of import
6. Insurance Unloading in port of import
7. Loading on truck in port of import
8. Carriage to place of destination
9. Import customs clearance
10. Import taxes

LECTURE 5 – FORWARDING AND ITS DOCUMENTS

5.3.2. InCoTerms premises

The last update was in 2010, when 11 predefined premises were left in 4 major groups:

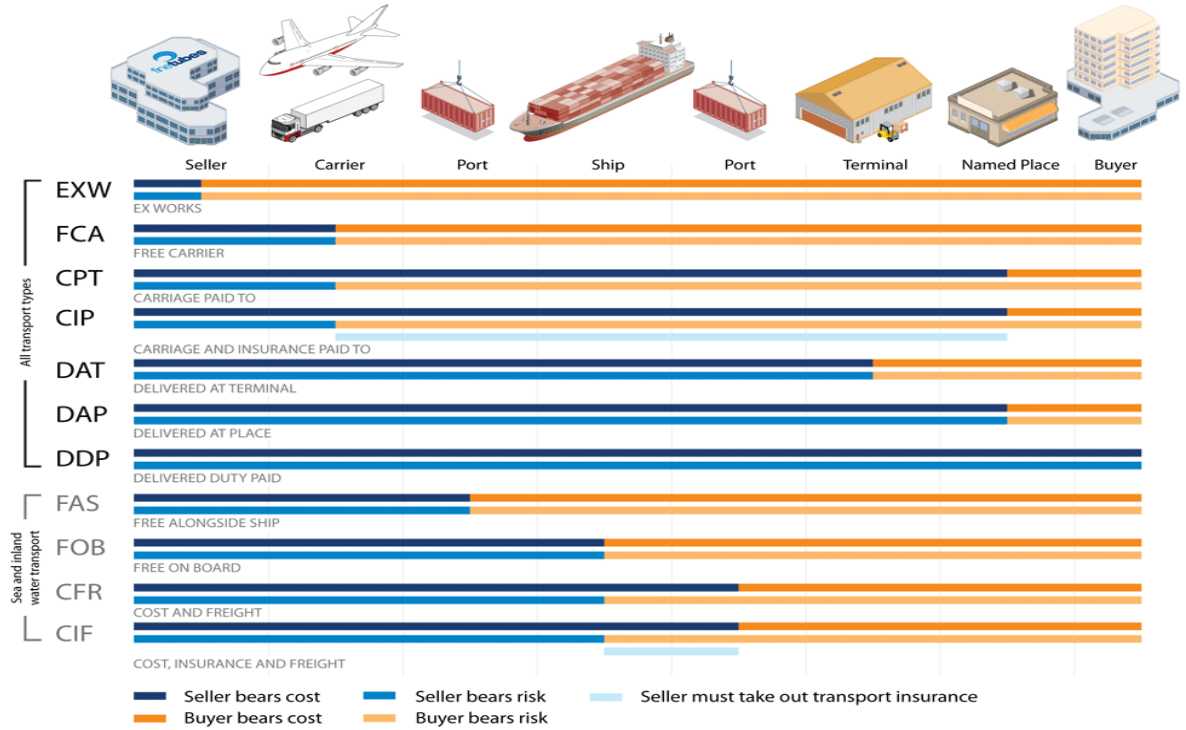
– "E" group: EXW on departure location
In case of Exworks term, the shipper delivers the items at its home location in delivery packaging. So the deliver location is at the shipper's site.

– "F" group: FCA, FAS, FOB on receipt location
In case of the F group, the seller provides included logistic activities to the departure or export seaport for free.

– "C" group: CFR, CIF, CPT, CIP on shipment location
These are multimodal and maritime transportation terms with multiple parity locations, where the location of transportation free of charge and the location of insurance content are different. This requires, that the buyer should contract for insurance from the boarding or receipt location. The ownership of the items changes also on the receipt or boarding location.

– "D" group: DAT, DAP, DDP on destination location
The D group include the most logistic services for the buyer for free, included not only the export clearance, but the import customs administration. In case of Delivery and Duty Paid terms, the import custom fees and additional commercial taxes in the buyer's country are also paid by the seller.

The next figure shows, how the tasks of the seller are raising and the tasks of the buyer are reduced, of course the costs of these tasks are included into the sales price. The light blue line shows the additional insurance requirement of seller in case of CIF and CIP. The pairs of these premises require to contract additional insurance by the buyer.



Source: Trend Food International official webpage: www.trendfoodinternational.com

The Cost Assignment Table presents the costs have to pay by the seller and by the buyer regarding to the using of InCoTerms2010 premises.

Incoterm 2010	Export customs declaration	Carriage to port of export	Unloading of truck in port of export	Loading on vessel in port of export	Carriage (Sea/Air) to port of import	Insurance	Unloading in port of import	Loading on truck in port of import	Carriage to place of destination	Import customs clearance	Import taxes
EXW	Buyer	Buyer	Buyer	Buyer	Buyer	Buyer	Buyer	Buyer	Buyer	Buyer	Buyer
FCA	Seller	Seller	Buyer	Buyer	Buyer	Buyer	Buyer	Buyer	Buyer	Buyer	Buyer
FAS	Seller	Seller	Seller	Buyer	Buyer	Buyer	Buyer	Buyer	Buyer	Buyer	Buyer
FOB	Seller	Seller	Seller	Seller	Buyer	Buyer	Buyer	Buyer	Buyer	Buyer	Buyer
CPT	Seller	Seller	Seller	Seller	Seller	Buyer	Buyer	Buyer	Buyer	Buyer	Buyer
CFR(CNF)	Seller	Seller	Seller	Seller	Seller	Buyer	Buyer	Buyer	Buyer	Buyer	Buyer
CIF	Seller	Seller	Seller	Seller	Buyer	Buyer	Buyer	Buyer	Buyer	Buyer	Buyer
CIP	Seller	Seller	Seller	Seller	Seller	Seller	Buyer/Seller	Buyer/Seller	Buyer	Buyer	Buyer
DAT	Seller	Seller	Seller	Seller	Seller	Seller	Seller	Buyer	Buyer	Buyer	Buyer
DAP	Seller	Seller	Seller	Seller	Seller	Seller	Seller	Seller	Seller	Buyer	Buyer
DDP	Seller	Seller	Seller	Seller	Seller	Seller	Seller	Seller	Seller	Seller	Seller

Source: www.nomadusb.com

LECTURE 5. Forwarding and its documents
5.3.2. InCoTerms premises

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LECTURE V. Forwarding and its documents

5.3.2. InCoTerms premises

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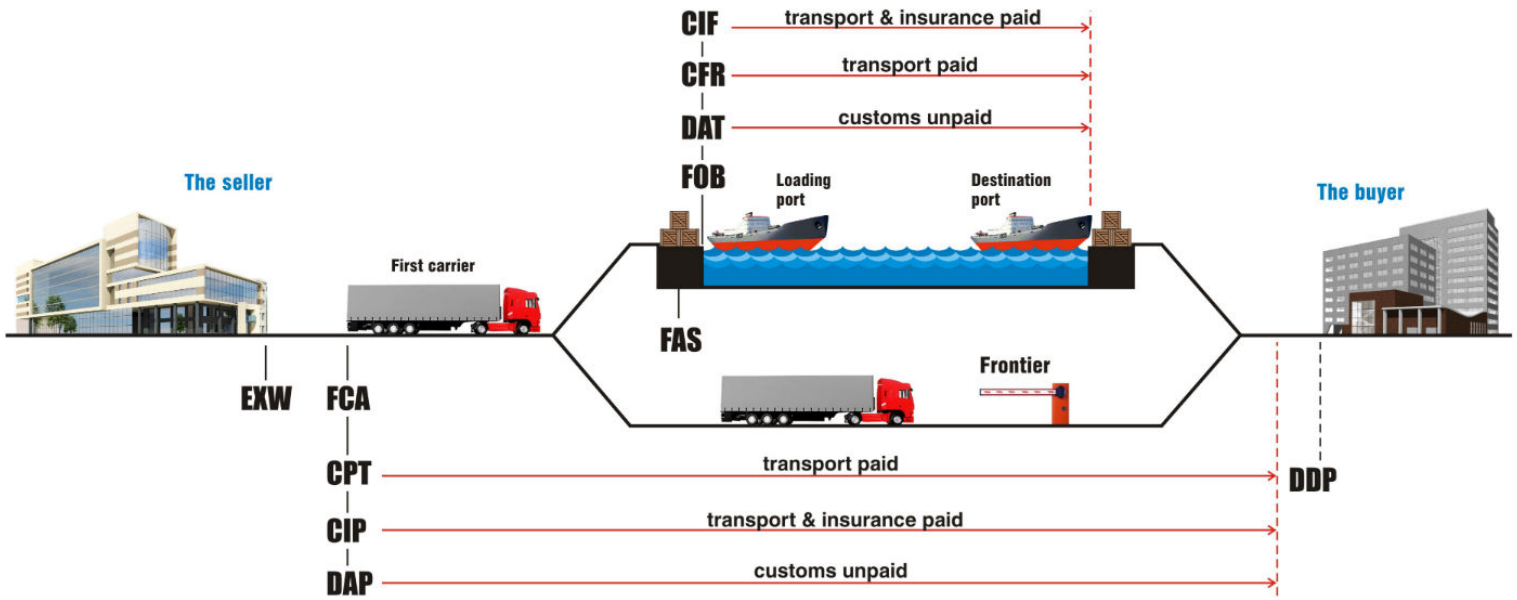
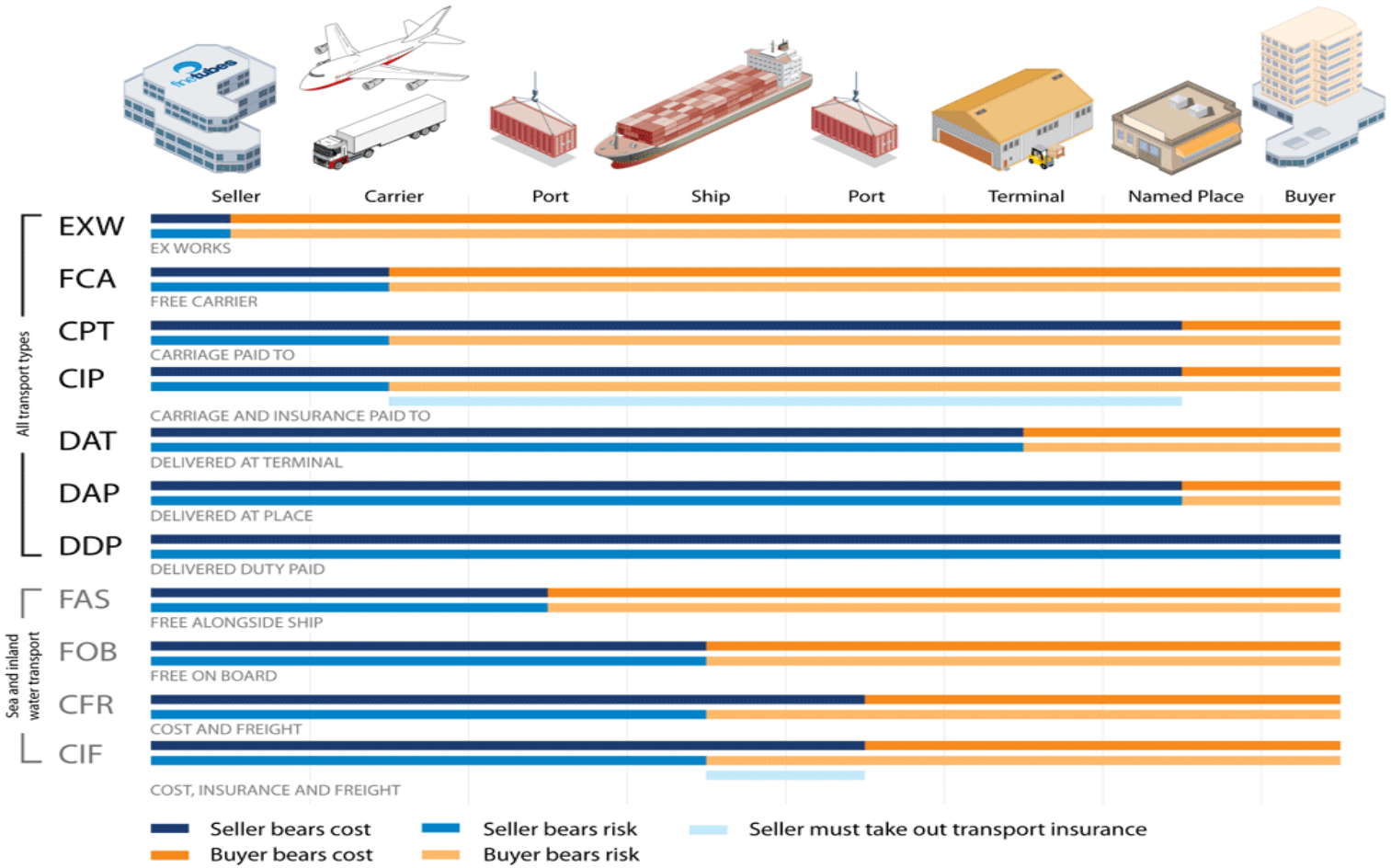
International Commercial Terms




Seller
Carrier
Port
Ship
Port
Terminal
Named Place
Buyer
All transport types
Sea and inland water transport
EXW
EX WORKS
FCA
FREE CARRIER
CPT
CARRIAGE PAID TO
CIP
CARRIAGE AND INSURANCE PAID TO
DAT
DELIVERED AT TERMINAL
DAP
DELIVERED AT PLACE
DDP
DELIVERED DUTY PAID
FAS
FREE ALONGSIDE SHIP
FOB
FREE ON BOARD
CFR
COST AND FREIGHT
CIF
COST, INSURANCE AND FREIGHT
Seller bears cost
Buyer bears cost
Seller bears risk
Buyer bears risk
Seller must take out transport insurance

Cost assignment between Seller and Buyer by InCoTerms2010

Incoterm 2010	Export customs declaration	Carriage to port of export	Unloading of truck in port of export	Loading on vessel in port of export	Carriage (Sea/Air) to port of import	Insurance	Unloading in port of import	Loading on truck in port of import	Carriage to place of destination	Import customs clearance	Import taxes
EXW	Buyer	Buyer	Buyer	Buyer	Buyer	Buyer	Buyer	Buyer	Buyer	Buyer	Buyer
FCA	Seller	Seller	Buyer	Buyer	Buyer	Buyer	Buyer	Buyer	Buyer	Buyer	Buyer
FAS	Seller	Seller	Seller	Buyer	Buyer	Buyer	Buyer	Buyer	Buyer	Buyer	Buyer
FOB	Seller	Seller	Seller	Seller	Buyer	Buyer	Buyer	Buyer	Buyer	Buyer	Buyer
CPT	Seller	Seller	Seller	Seller	Seller	Buyer	Buyer	Buyer	Buyer	Buyer	Buyer
CFR(CNF)	Seller	Seller	Seller	Seller	Seller	Buyer	Buyer	Buyer	Buyer	Buyer	Buyer
CIF	Seller	Seller	Seller	Seller	Buyer	Buyer	Buyer	Buyer	Buyer	Buyer	Buyer
CIP	Seller	Seller	Seller	Seller	Seller	Seller	Buyer/Seller	Buyer/Seller	Buyer	Buyer	Buyer
DAT	Seller	Seller	Seller	Seller	Seller	Seller	Seller	Buyer	Buyer	Buyer	Buyer
DAP	Seller	Seller	Seller	Seller	Seller	Seller	Seller	Seller	Seller	Buyer	Buyer
DDP	Seller	Seller	Seller	Seller	Seller	Seller	Seller	Seller	Seller	Seller	Seller

LECTURE 6.

Lecture 6. INSTALLATIONS AND MACHINES IN LOGISTICS

6.1.1. The structure of materials handling machine types

The Materials transport and handling systems can be defined in system approach as the devices or/and equipment for transporting materials from source location to destination location preserving the quality of materials. It includes:

– tracks,

– power supply,

– and control units.

These componens are closely related to the activities of the connected processes of – loading, – manufacturing, – storage.
The important characteristics of materials to be transported and handled are the

– Type

– Physical state

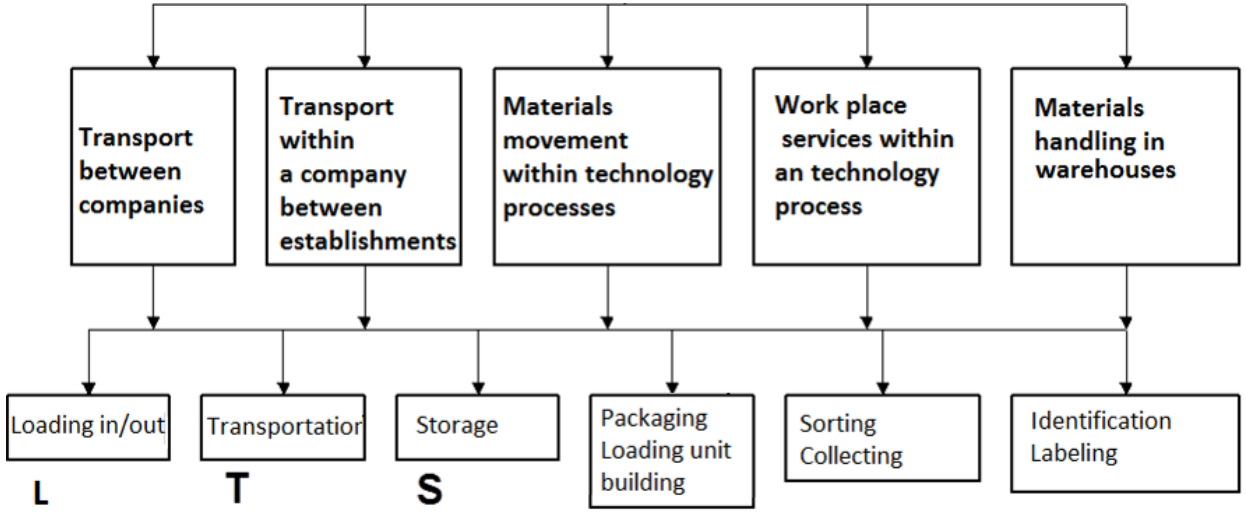
– Weight, size

– Type of packaging

– Special characteristics like:
  – Mechanical sensitivity

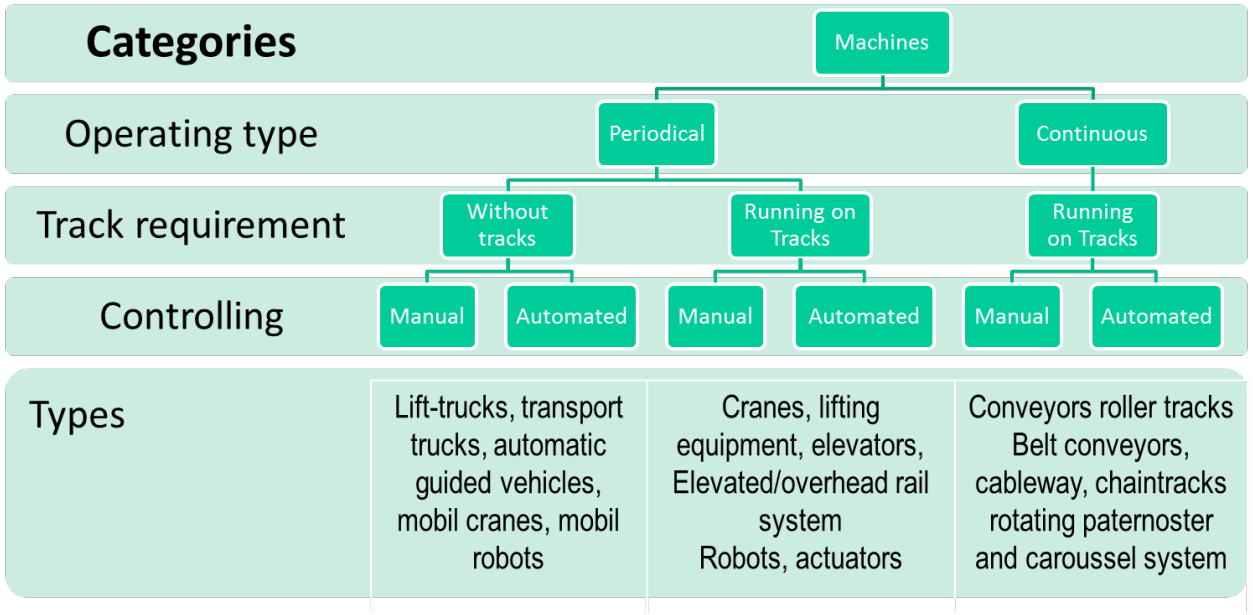
  – Temperature a climate requirements o Danger level and hazard type of it

The next figure recap the levels of enterprise materials transport and handling discussed in one of the first lectures.



Source: J. Cselényi – B. Illés: Planning and Controlling Materials Handling Systems (Anyagmozgató rendszerek tervezése és irányítása), University Miskolc, University Press, 2006

The structural types of materials handling and transport machinery can be classified by operating type, track building requirement, controlling type. The related types are summarized on the bottom of the figure.


Categories
Machines
Operating type
Periodical
Continuous
Track requirement
Without tracks
Running on Tracks
Running on Tracks
Controlling
Manual
Automated
Manual
Automated
Manual
Automated
Types
Lift-trucks, transport trucks, automatic guided vehicles, mobil cranes, mobil robots
Cranes, lifting equipment, elevators, Elevated/overhead rail system
Robots, actuators
Conveyors roller tracks
Belt conveyors, cableway, chaintracks
rotating paternoster and caroussel system

Lecture 6. INSTALLATIONS AND MACHINES IN LOGISTICS
6.1.1. The structure of materials handling machine types

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Lecture VI. INSTALLATIONS AND MACHINES IN LOGISTICS

6.1.1. The structure of materials handling machine types

MAGYARORSZÁG MEGÚJUL

A projekt az Európai Unió támogatásával valósul meg:

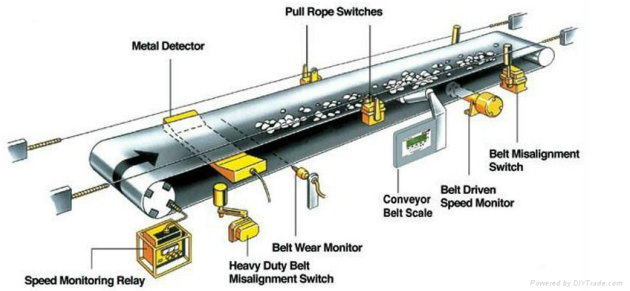
Materials transport and handling systems

System approach: device or/and equipment **transporting** materials

- ✓ **from source** location **to destination** location
- ✓ preserving the quality of materials
- ✓ Including:
  - ✓ **tracks,**
  - ✓ **power supply,**
  - ✓ **control units.**

Closely related to the activities of

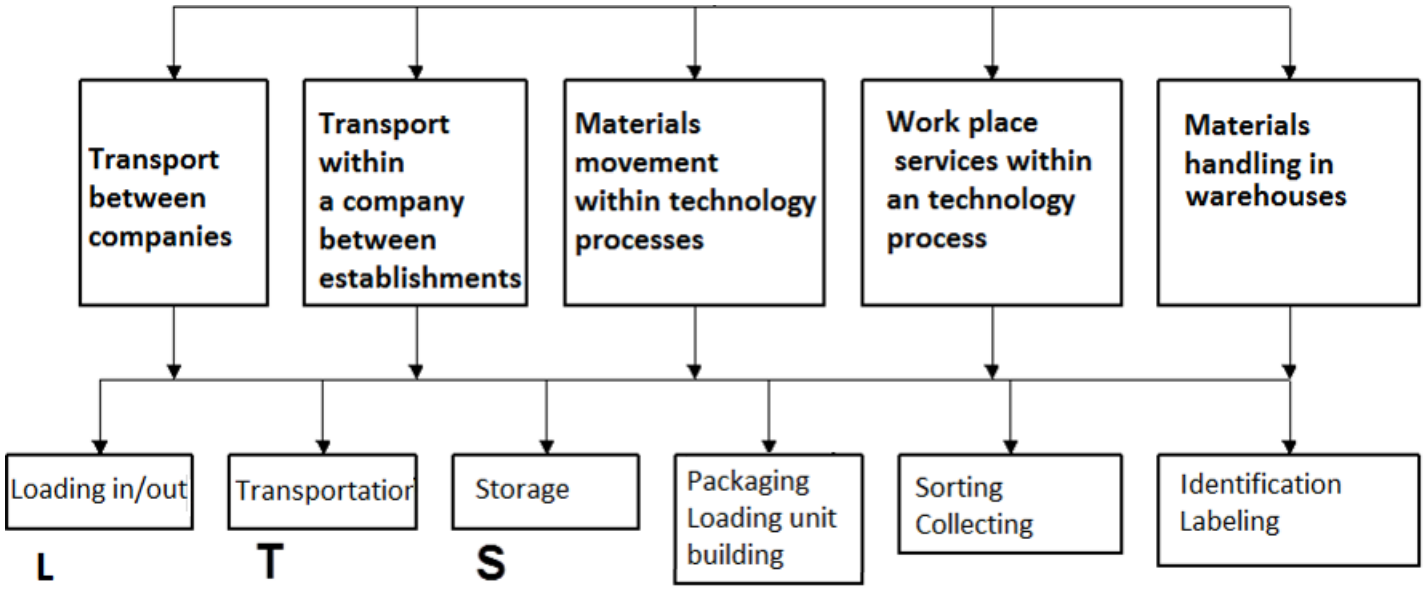
- ✓ loading,
- ✓ manufacturing,
- ✓ storage.



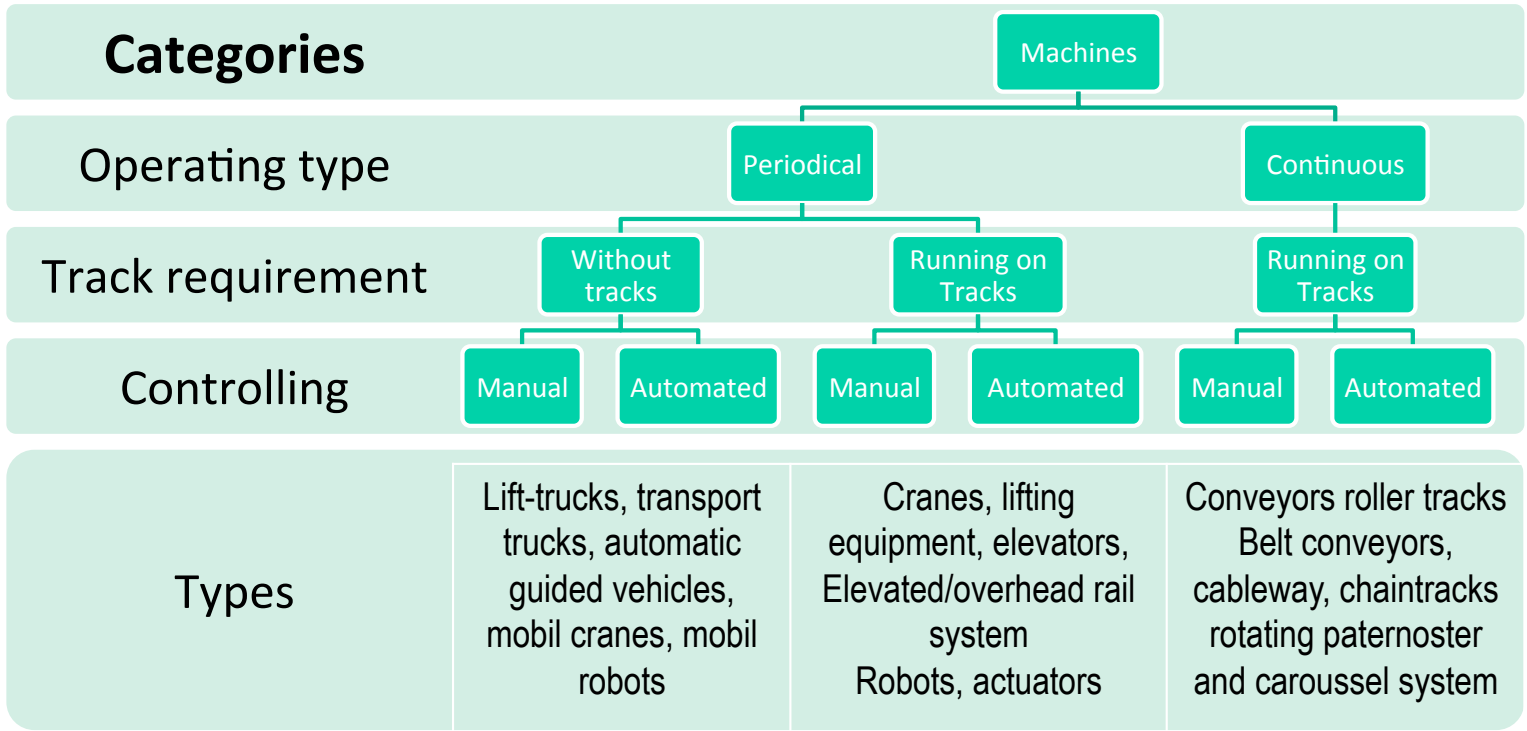
Important characteristics of materials to be transported and handled

- ✓ Type
- ✓ Physical state
- ✓ Weight, size
- ✓ Type of packaging
- ✓ Special characteristics:
  - ✓ Mechanical sensitivity
  - ✓ Temperature a climate requirements
  - ✓ Danger level and type

Levels of enterprise materials transport and handling



Structural types of materials handling and transport machinery



Lecture VI. INSTALLATIONS AND MACHINES IN LOGISTICS

6.1.2. Features of cranes

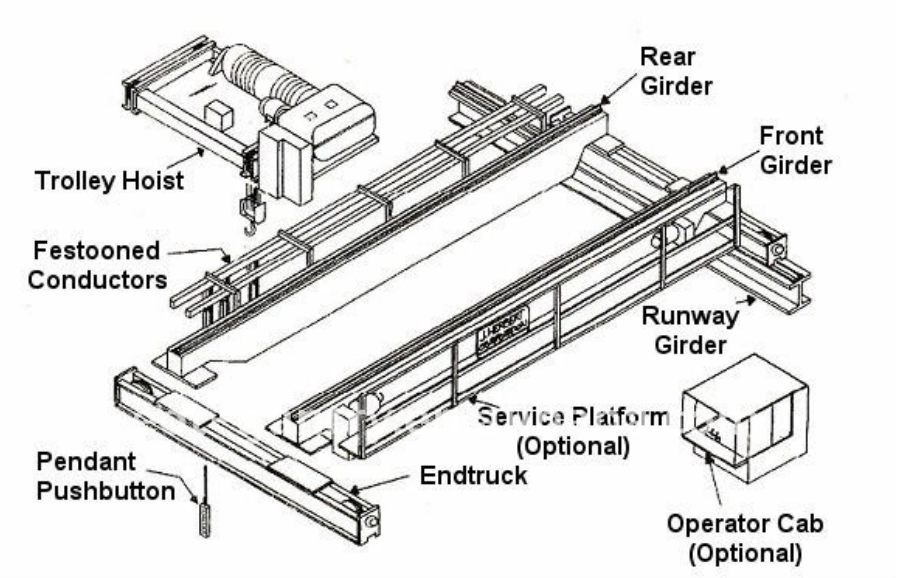
The cranes are vertical lifting machines with additional horizontal positioning. The application is mostly loading and unloading operations, buti n shop floors and work centers, these smaller or huge machines are used for machine service operations, like changing huge tools in dye cast machines, positioning large part sin case of assembly operations of big machines.

Major types:

- Running cranes:
  - Bridge cranes
  - Gantry cranes

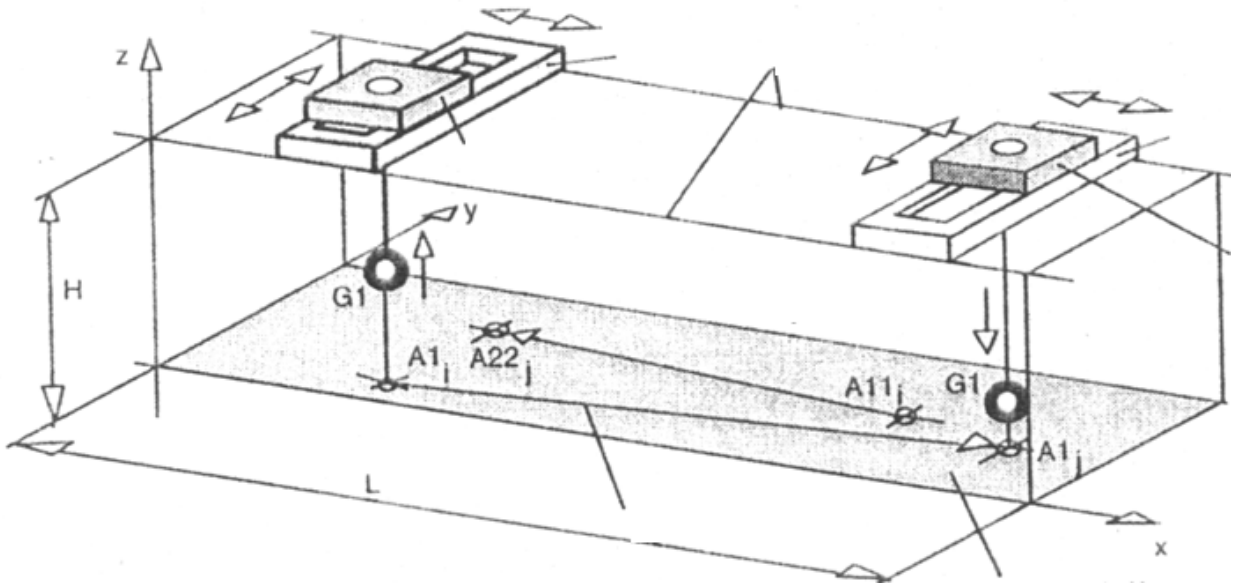
- Rotating Cranes:
  - Portal cranes
  - Tower cranes
  - ShopFloor Cranes

Main components of a crane are the lifting unit, the horizontal driving units and the whole support structure. Of course, the controlling unit is also required, a crane can be controlled from ground floor or from operator cabin mounted onto the crane structure.



Source: http://mhscrane.com/

An automated crane requires full sensoring system into the directions and at the end points of movement ability in the operating space. Furthermore, the cargo grabbing should be automated, as well, and this requires a machined grabber unit lifted by the lifting unit.



Operating space of cranes

Source: Béla Kulcsár: Industrial Logistics, LFK, 1998

Lecture 6. INSTALLATIONS AND MACHINES IN LOGISTICS
6.1.2. Features of cranes

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Lecture VI. INSTALLATIONS AND MACHINES IN LOGISTICS

6.1.2. Features of cranes

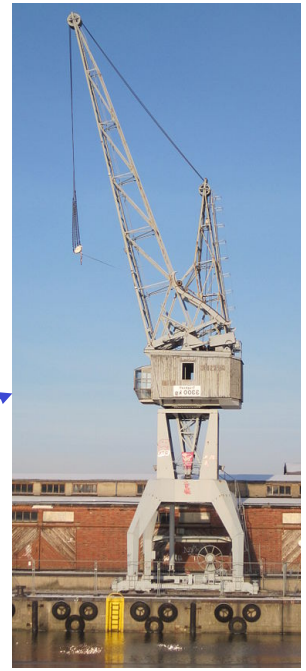
MAGYARORSZÁG MEGÚJUL

A projekt az Európai Unió támogatásával valósul meg:

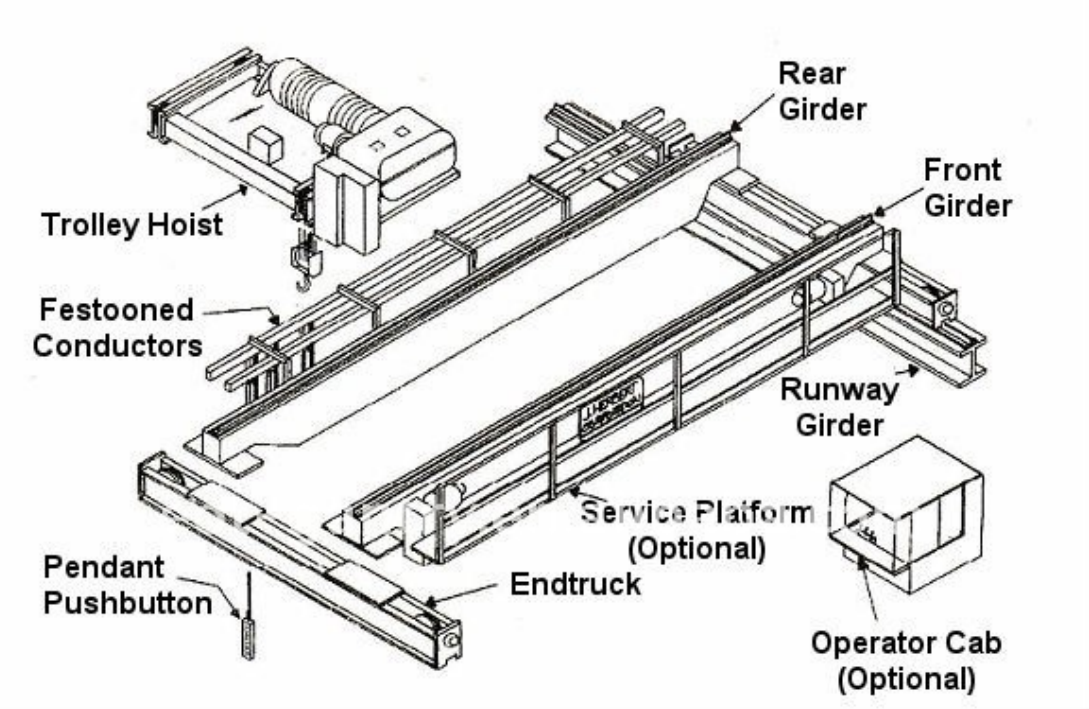
Cranes: vertical lifting machines with additional horizontal positioning

Types:

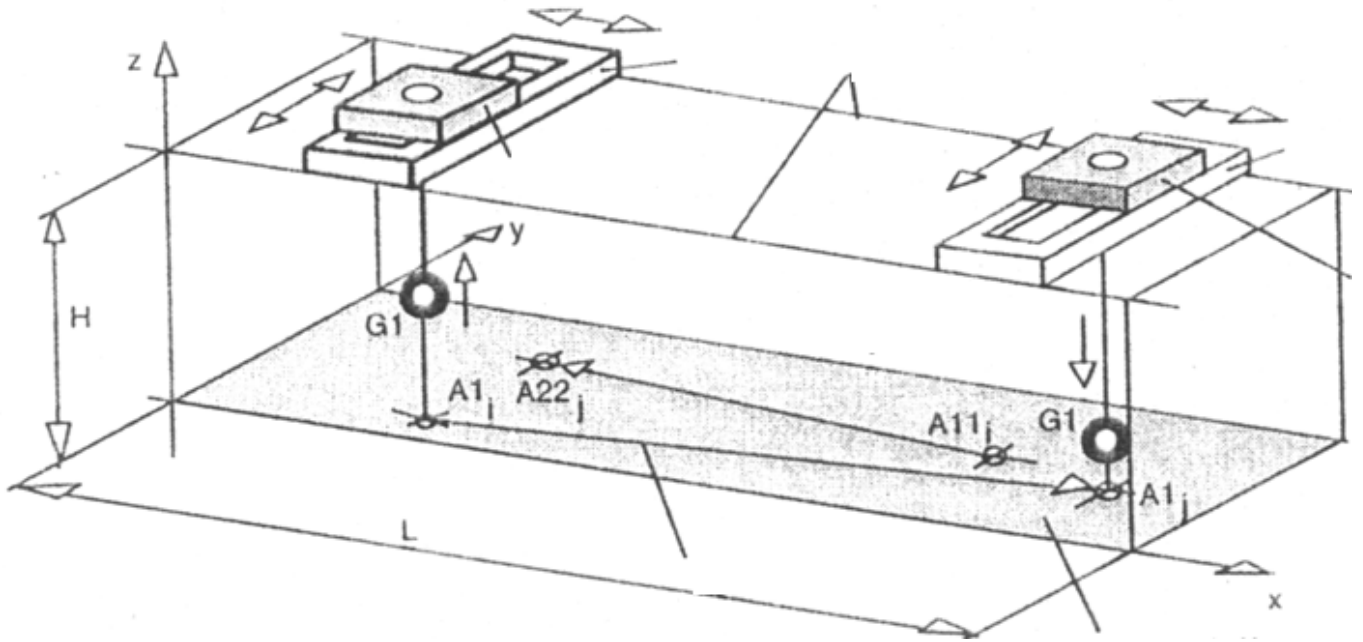
- ✓ Running cranes:
  - ✓ Bridge cranes
  - ✓ Gantry cranes
- ✓ Rotating Cranes:
  - ✓ Portal cranes
  - ✓ Tower cranes
  - ✓ ShopFloor Cranes



Main components of a running crane



Reaching space of cranes



Source: Béla Kulcsár: Industrial Logistics, LFK, 1998

Lecture VI. INSTALLATIONS AND MACHINES IN LOGISTICS

6.1.3. Features of Industrial Trucks

Industrial Lifting Trucks are horizontal moving machines for especially loading and unloading operations of transport vessels, trucks, trains, storage racks, but available for shorter distance transportation, as well.

So the functions are:

– loading with lifting requirement

– short distance transportation

– usually only for one crate/pallete

Therefore the industrial trucks usually mounted with forklift elevating tower for lifting the cargo.

The driving system are often a hydraulic transmission type drived by rotating energy of:

– Electrical engine and batteries

– Diesel engine

– LPG/CNG engine

These same hydraulic systems are used for:

– horisontal movement

– steering

– cargo grabbing and fixing

– cargo lifting

The forklift trucks and transport trucks are mostly manned type with driver cabin or driver stand, but there are unmanned automated, onboard or central computer controlled industrial trucks.

Their automated operating are based on:

– Automatic steering, moving

– Automated loading and retrieving

– Central control

Steering of Automatic Guiding Vehicle can be implemented by induction wires mounted into the groundfloor of operation area, or by optical path, RFId tag or magnetic point tracking, by navigation on laser reflection points, shape recognization based machine intelligence. The automatic guiding vehicles are cooperating with the central logistic control system.

Lecture 6. INSTALLATIONS AND MACHINES IN LOGISTICS
6.1.3. Features of Industrial Trucks

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Lecture VI. INSTALLATIONS AND MACHINES IN LOGISTICS

6.1.3. Features of Industrial Trucks

MAGYARORSZÁG MEGÚJUL

A projekt az Európai Unió támogatásával valósul meg:

Industrial Lifting Trucks

Industrial Trucks usually mounted with forklift elevating tower

Hydraulic transmission with:

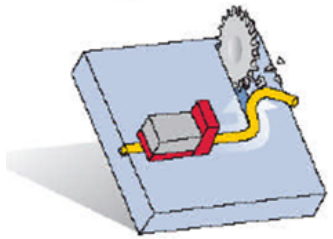
- ✓ Electrical engine and batteries
- ✓ Diesel engine
- ✓ LPG/CNG engine

Used for:

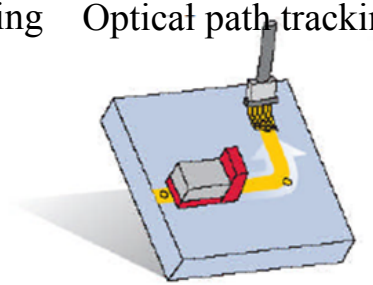
- ✓ loading with lifting requirement
- ✓ short distance transportation
- ✓ usually only for one crate/pallete

Steering of Automatic Guiding Vehicle

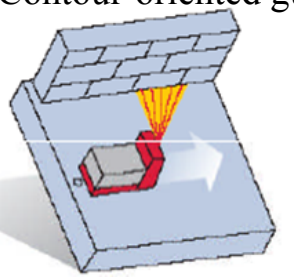
Active induction path tracking



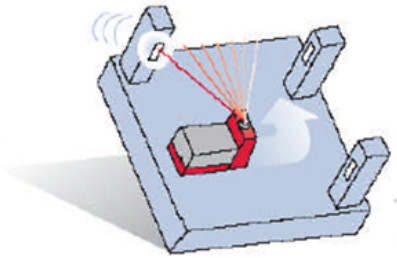
Optical path tracking



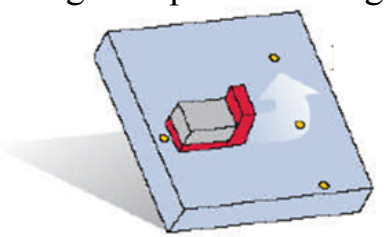
Contour-oriented guidance



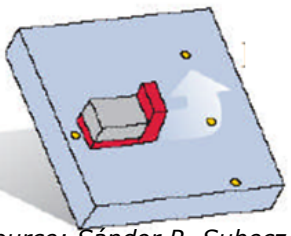
Laser navigation



Magnetic point tracking



Tracking of RFId points



Source: Sándor P.-Subecz P.-Szilassy L.:
Nem kötött pályás vezető nélküli targoncarendszerek a raktári- és termelési láncban,
Modern Logisztikai Workshop, Logisztikai Fejlesztési Központ, 2009

Information about products

- ✓ Quantity, quality, Type, Manufacturer
- ✓ Unit load type, packaging mode, size and weight
- ✓ **Expiration date**
- ✓ Special features:
  - ✓ Chemical, phisical dangers, e.g. fire hazard and explosivity grade
  - ✓ Mechanical and Radiation Sensitivity (heat, light, electromagnetic)
- ✓ Logistic information:
  - ✓ Bill numbers/ID, Distributor,
  - ✓ Speditor, Date of arrival, etc.

Lecture VI. INSTALLATIONS AND MACHINES IN LOGISTICS

6.1.4. Overhead Monorail Transport Systems

The essence of the Overhead monorail systems is that the materials transporting is established over the object to be server by material and is implemented by electrical drive or centrally pulled wagons running on overhead railway tracks.

– The overhead installation does not disturb the technological processes installed on ground floor. Volume utilization of the plant is higher.

– Cars can control individually and remotely on full-automated way. There are two major types:

– Automated Electrified Monorail systems with individual drive

– Overhead trolley conveyor systems with central drive

Automated Electrified Monorail systems

Features

– Better for piece-goods.

– Free, complex 3D track can be established:

  – Straight sections, curves, slopes,

  – Switches and elevators can link separate track sections, o Storage and parking track sections can be assigned.

– Modular, flexible, extendable, replaceable system.

– Each transport wagon has own electrical and autonomous controlled drive:

– The transport direction can be alternated,

– The track line can be open line.

– The wagons can independently stopped at any time at any position.

– The loading and retrieval points can be established at any position on the track line

– The wagons can be equipped with active cargo grabber and actuators.

– Control system can be developed with the newest IT for fully automated operating integrated into the entire logistic and materials handling system of the operating environment.

Track variations are available:

– on closed loop track lines the movement direction is fixed, the track sections are oneway sections,

– only with special control strategies can be alternate the direction in a track section

The features of overhead railway wagons or so called sky cars:

Construction:

Transporter wagon with electrical drive,

Cargo wagon without drive and tractor wagon without cargo bearing element,

Load distribution:

One cargo bearing beam,

More cargo bearing beam are connected to distribute the load weight.

Functions:

transport,

Loading and retrieval,

Line up the wagons, storage.

Technical range:

Weight carrying capacity: 0,1kg – 1t,

Transport speed: 0,1 – 5 m/sec,

Transport distance: 0,01 – 1km.

Overhead trolley conveyor systems and cable-way transport systems

Features

– Drive transmission from a **central electrical drive** via endless traction chain

– **Continuous** materials transport – cannot be stopped for individual cargo

– Load holder suspensions are fastened to the traction chain and are towed to the forward direction – one direction closed loop transport

– Mostly indoor factory overhead applications – leave gound floor free.

– Piece-goods transport methods

– Can be applied to transport piece goods within plants and between plants and buildings in a works,

– The line of track can be only in closed loop,

– More loading and retrieving points can be established along the track

– Best volume utilization by compact design

– Vertical and horizontal track tracing

– Modular construction type

– Fully automatic, can be controlled by computer

– Cargo tracking is possible with automated cargo ID devices

– Payload capability: up to 5 tons

– Transport speed: 0,2–60 m/min, 1 m/min–2 m/sec

– Available transport distance: from 10 m up to 2 km

Lecture 6. INSTALLATIONS AND MACHINES IN LOGISTICS
6.1.4. Overhead Monorail Transport Systems

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ÚJ SZÉCHENYI TERV

Basics of Logistics

College of Dunaújváros

Lecture VI. INSTALLATIONS AND MACHINES IN LOGISTICS

6.1.4. Overhead Monorail Transport Systems

MAGYARORSZÁG MEGÚJUL

A projekt az Európai Unió támogatásával valósul meg:

Overhead monorail system

The materials transporting is established over the object to be server by material and is implemented by electrically drived wagons running on overhead railway tracks.

- ✓ The overhead installation does not disturb the technological processes istalled on groudfloor. Volume utilisation of the plant is higher.
- ✓ Cars can control individually and remotelly – full-automated

Features

- ✓ Better for piece-goods.
- ✓ Free, complex 3D track can be established:
  - straight sections, curves, slopes,
  - Switches and elevators can link separate track sections,
  - storage and parking track sections can be assigned.
- ✓ Modular, flexible, extendable, replaceable system.
- ✓ Each transport wagon has own electrical and autonom controlled drive:
  - The transport direction can be alternated,
  - The track line can be open line.
  - The wagons can independently stopped at any time at any position.
  - The loading and retrival points can be established at any position on the track line
  - The wagons can be equipped with active cargo grabberand actuators.
- ✓ Control system can be developed with the newest IT.
- ✓ Can be fully automated.

Features of overhead railway wagons

Construction:

- Transporter wagon with electrical drive,
- Cargo wagon without drive and tractor wagon without cargo bearing element,

Load distribution:

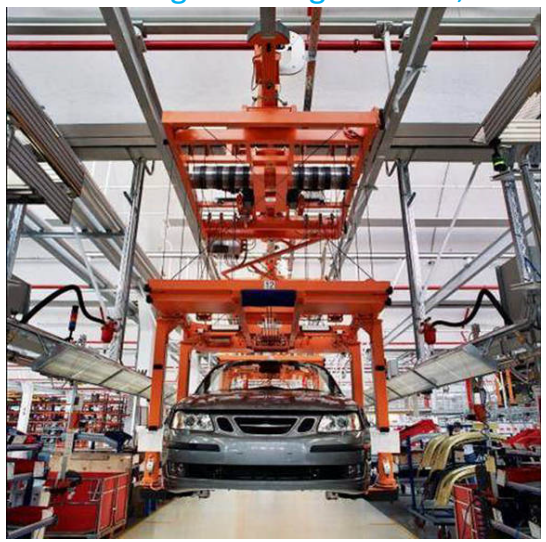
- One cargo bearing beam,
- More cargo bearing beam are connected to distribute the load weight.

Functions:

- transport,
- Loading and retrival,
- Line up the wagons,
- storage.

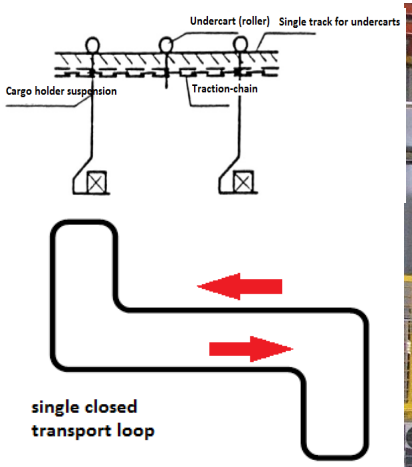
Technical range:

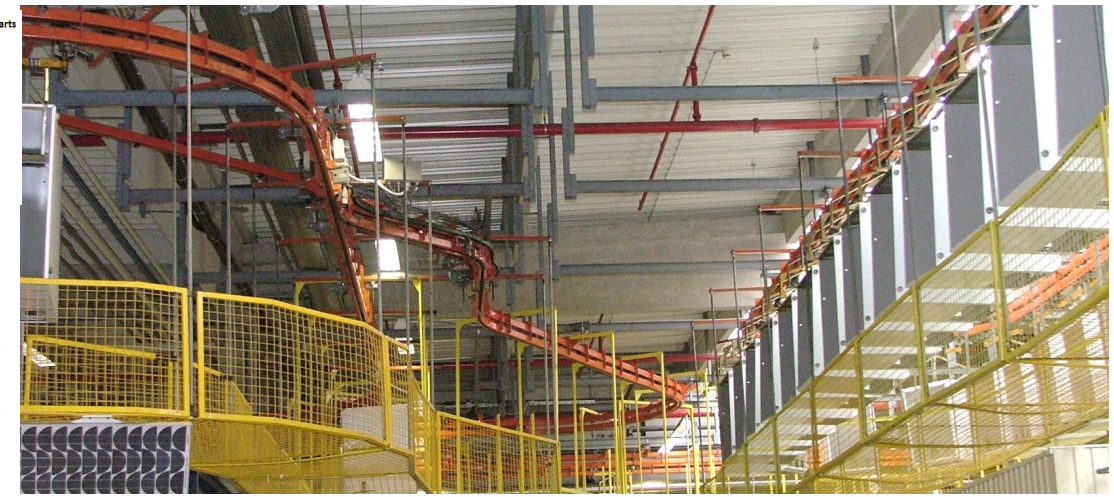
- Weight carrying capacity: 0,1kg – 1t,
- Transport speed: 0,1 – 5 m/sec,
- Transport distance: 0,01 – 1km.



Track-chain and cable-way transport systems

- Drive transmission from a **central electrical drive** via endless traction chain
- **Continuous** materials transport – cannot be stopped for individual cargo
- Load holder suspensions are fastened to the traction chain and are towed to the forward direction – one direction closed loop transport
- Mostly indoor factory overhead applicatons – leave goundfloor free.



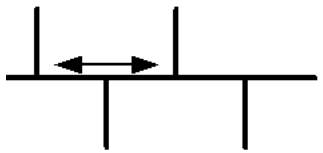


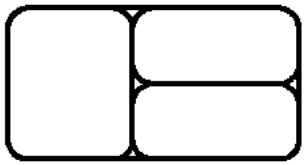
Features of track-chain transport systems

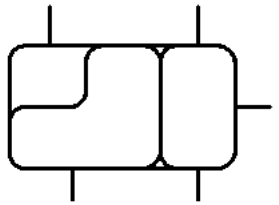
- ✓ Piece-goods transport methods
- ✓ Can be applied to transport piecegoods within plants and between plants and buildings in a works,
- ✓ The line of track can be only in closed loop,
- ✓ More loading and retrieving points can be established along the track
- ✓ Best volume utilisation by compact design
- ✓ Vertical and horizontal track tracing
- ✓ Modular construction type
- ✓ Fully automatic, can be controlled by computer
- ✓ Cargo tracking is possible with automated cargo ID devices
- ✓ Payload capability: up to 5 tons
- ✓ Transport speed: 0,2 – 60 m/min, 1 m/min – 2 m/sec
- ✓ Available transport distance: from 10 m up to 2 km

Track variations

- ✓ The track formation depends on position of established technology objects and the controll strategy of the materials handling.
- ✓ On opened and mixed track lines the movement directions are alternate directions.







- ✓ On closed loop track lines the movement direction is fixed, the track sections are one-way sections,
- ✓ only with special controll strategies can be alternate the direction in a track section

Lecture VI. INSTALLATIONS AND MACHINES IN LOGISTICS

6.1.5. Roller and Belt Conveyors

These systems are continuous material handling track, which the goods are laying and moved on a roller or belt surface.

Functions:

– Transport

– Sort and collect

– Store

Types:

Roller conveyors

– Free running roller track

– Roller drive track

– Belt conveyor track

– Chain conveyor track

Belt conveyor applications

In case of belt conveyors, the laying surface is a continuous material type, which make the system available to transport both piece goods and bulk materials.

Lecture 6. INSTALLATIONS AND MACHINES IN LOGISTICS
6.1.5. Roller and Belt Conveyors

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Lecture VI. INSTALLATIONS AND MACHINES IN LOGISTICS

6.1.5. Roller and Belt Conveyors

MAGYARORSZÁG MEGÚJUL

A projekt az Európai Unió támogatásával valósul meg:

Roller conveyors

DEF: Continuous material handling track, which the goods are laying and moved on a roller or belt surface.

Types:

- ✓ Free running roller track
- ✓ Roller drive track
- ✓ Belt conveyor track
- ✓ Chain conveyor track

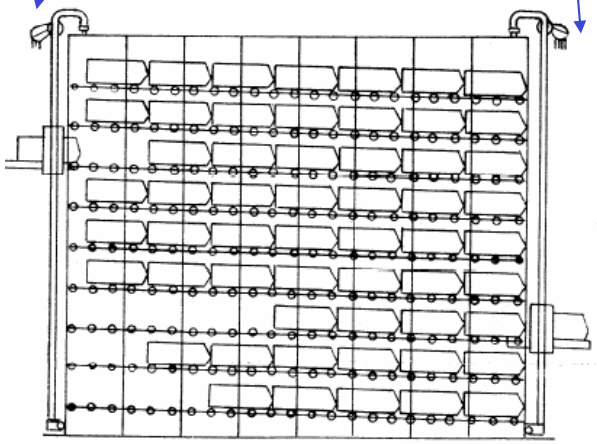
Functions:

- ✓ Transport
- ✓ Sort and collect
- ✓ Store

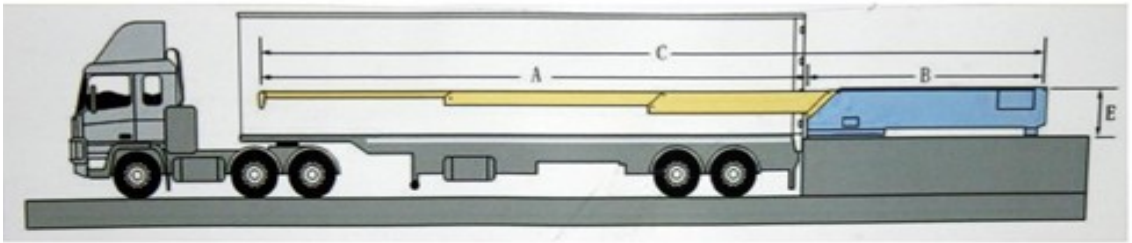
Gravity roller track FIFO storage

One side for loading

Other side for retrieval



Belt conveyor applications



Lecture VI. INSTALLATIONS AND MACHINES IN LOGISTICS

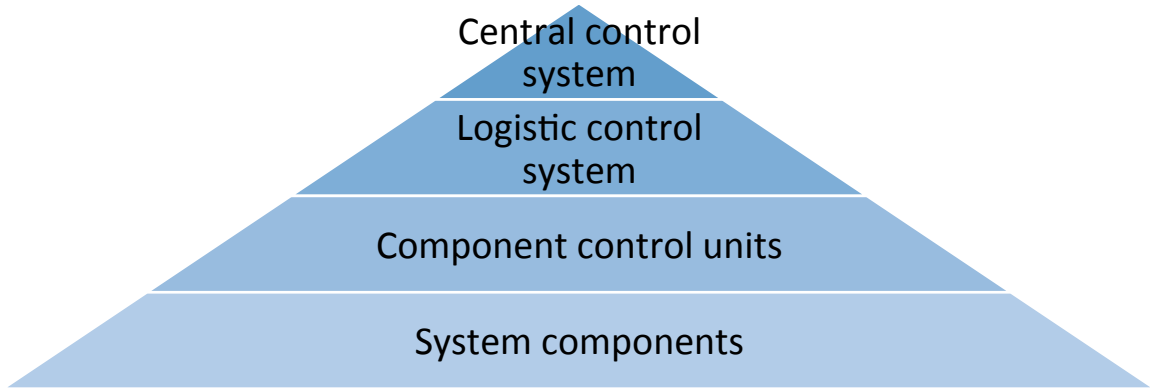
6.1.6. Control Systems and Data Acquiring

The control system of a material handling system has got multiple role:

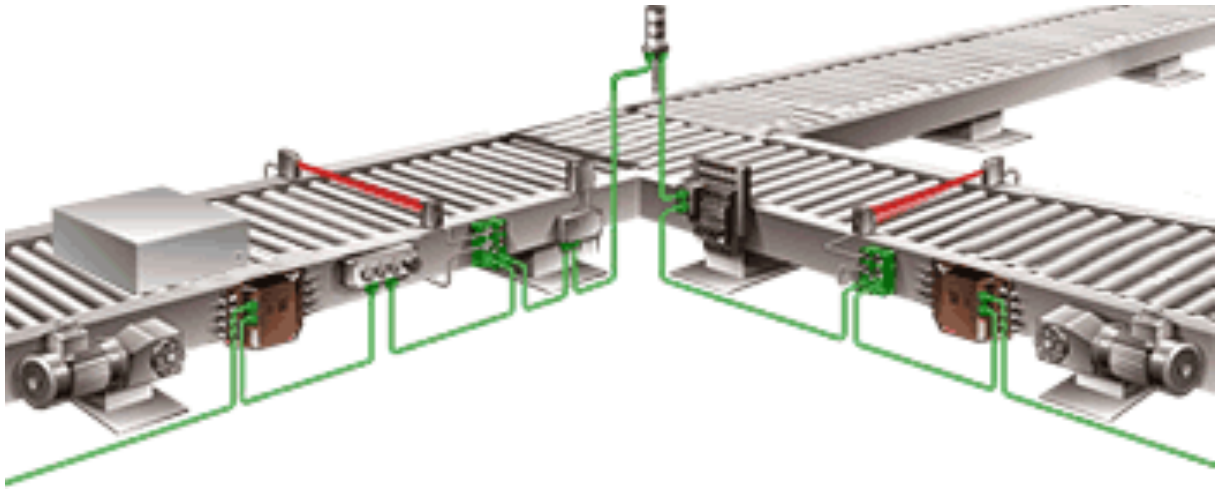
– coordinating the system components in the whole system for the proper cooperation,

– controlling the individual system components.

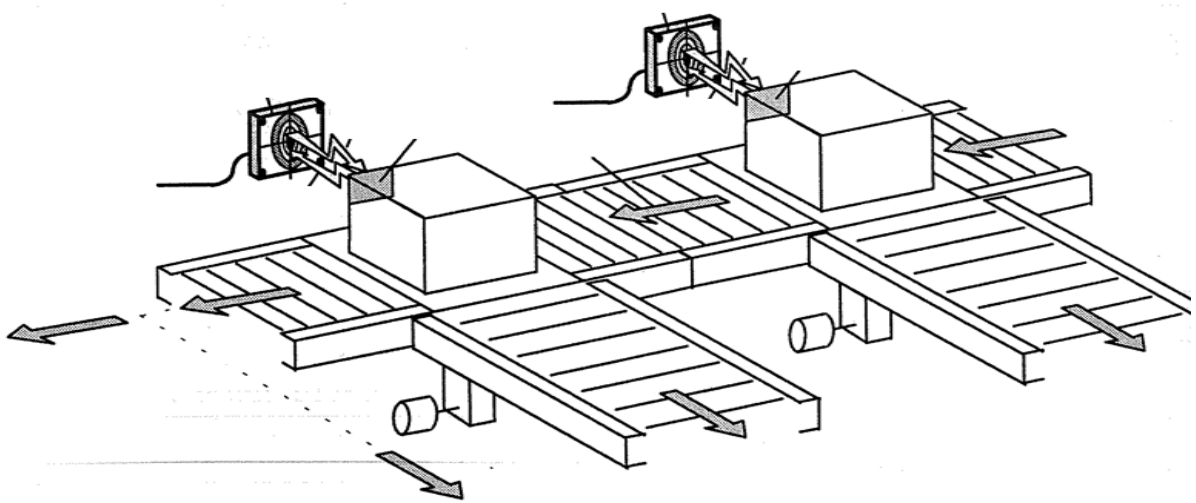
These multiple roles have implemented on different level of the system controlling.



On the Component control level are the traffic control sensors, which can coordinate the cooperation between e.g. track sections. This is required for the normal operation and transportation without any accidents and collisions.



But e.g. for the proper routing in a materials handling network, additional coordinating function is required to forward the cargo to its destination. The destination information can be provided by the central logistic control system, but it is important to know, which cargo is forwarded at the time. This is the role of Cargo Identification in transport systems.



Source: Kulcsár Béla: Industrial Logistics, LFK, 1998

In the structure of computer control system, data transmission techniques are required to provide efficient, standardized computer based information flow:

– Radio Frequency based electromagnetic on-line transmission

– Infrared optical on-line transmission

– Wired on-line transmission

– Touching or connecting batch transmission for off-line operation

The terminal types are

- Built-in, fix
- Mobile Hand-held
- On-board Mobile

The Product Identification techniques are based on:

- Bar Code reading (optical)
- RFId
- Character, Color or Shape Recognition

The important information about products are:

- Quantity, quality, Type, Manufacturer

- Unit load type, packaging mode, size and weight

- **Expiration date**

- Special features:
  - Chemical, phisical dangers, e.g. fire hazard and explosivity grade
  - Mechanical and Radiation Sensitivity (heat, light, electromagnetic)

- Logistic information:
  - Bill numbers/ID, Distributor,
  - Speditor, Date of arrival, etc.

The system collect a lot of operational informations about materials handling, as well:

– Loading, retrieval and transport commands

– Resource master data (features, position and priority) of
  – machines,
  – storages,
  – transport tracks and relations.

– Measurement of materials handling performance
  – Resource utilisation rate (storages, materials handling machines, HR) o Delivery and handling errors
  – Cycle time of operations
  – Detailed analysis of handling operations

These information are available later for planning and improve the logistic system and its efficiency.

Lecture 6. INSTALLATIONS AND MACHINES IN LOGISTICS
6.1.6. Control Systems and Data Aquiring

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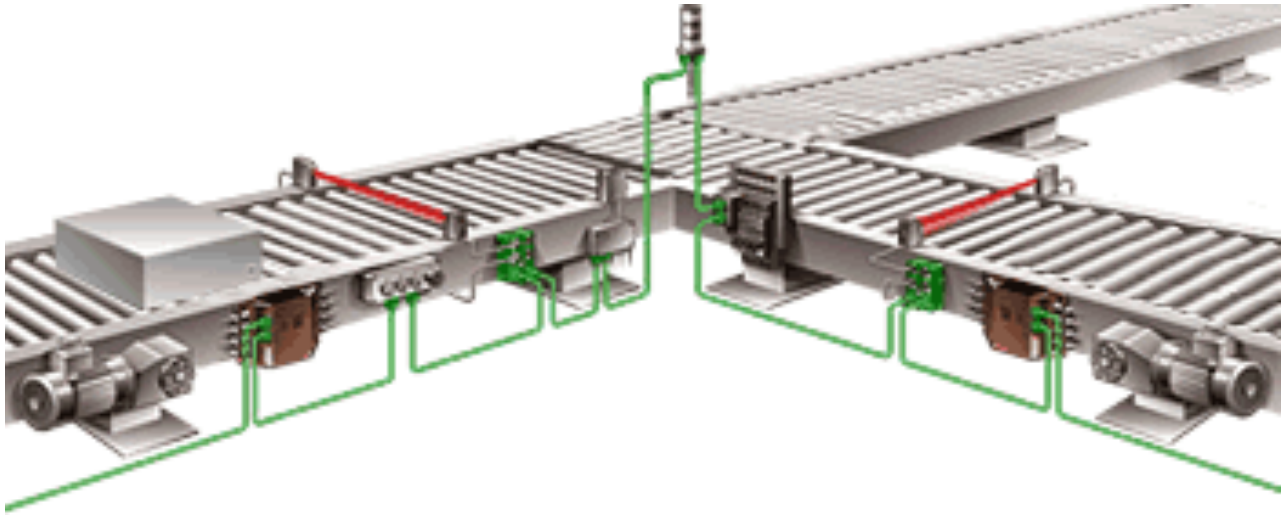
Lecture VI. INSTALLATIONS AND MACHINES IN LOGISTICS

6.1.6. Control Systems and Data Aquiring

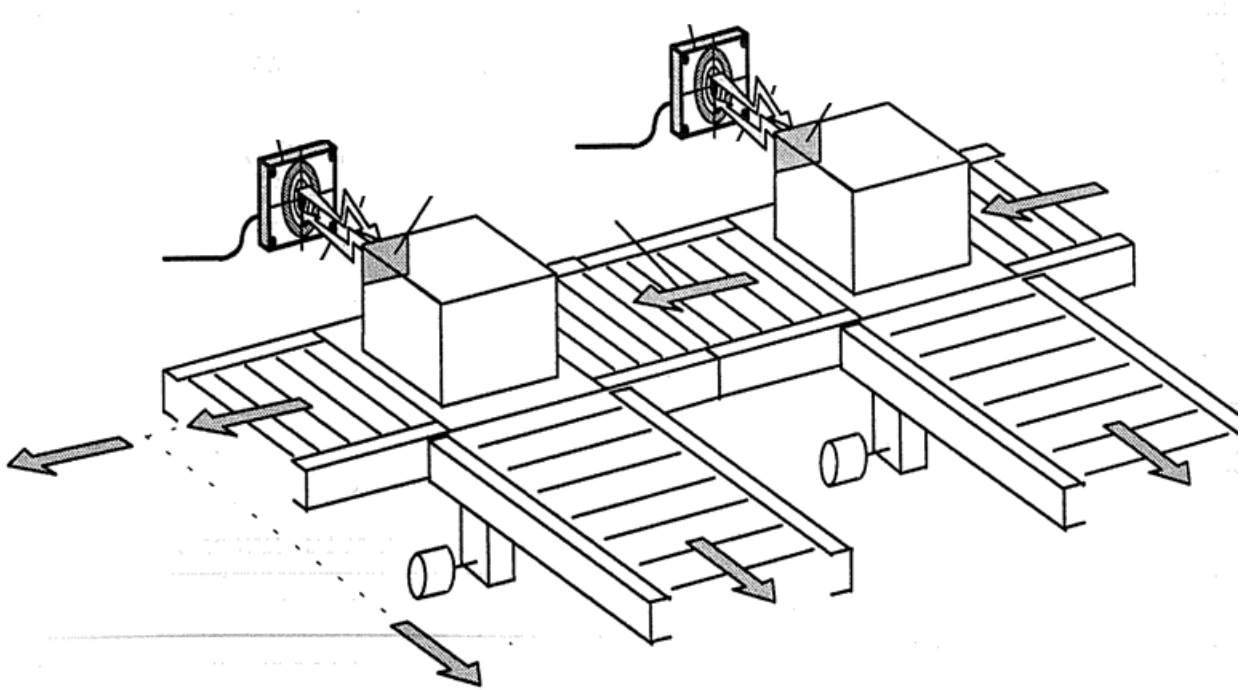
MAGYARORSZÁG MEGÚJUL

A projekt az Európai Unió támogatásával valósul meg:

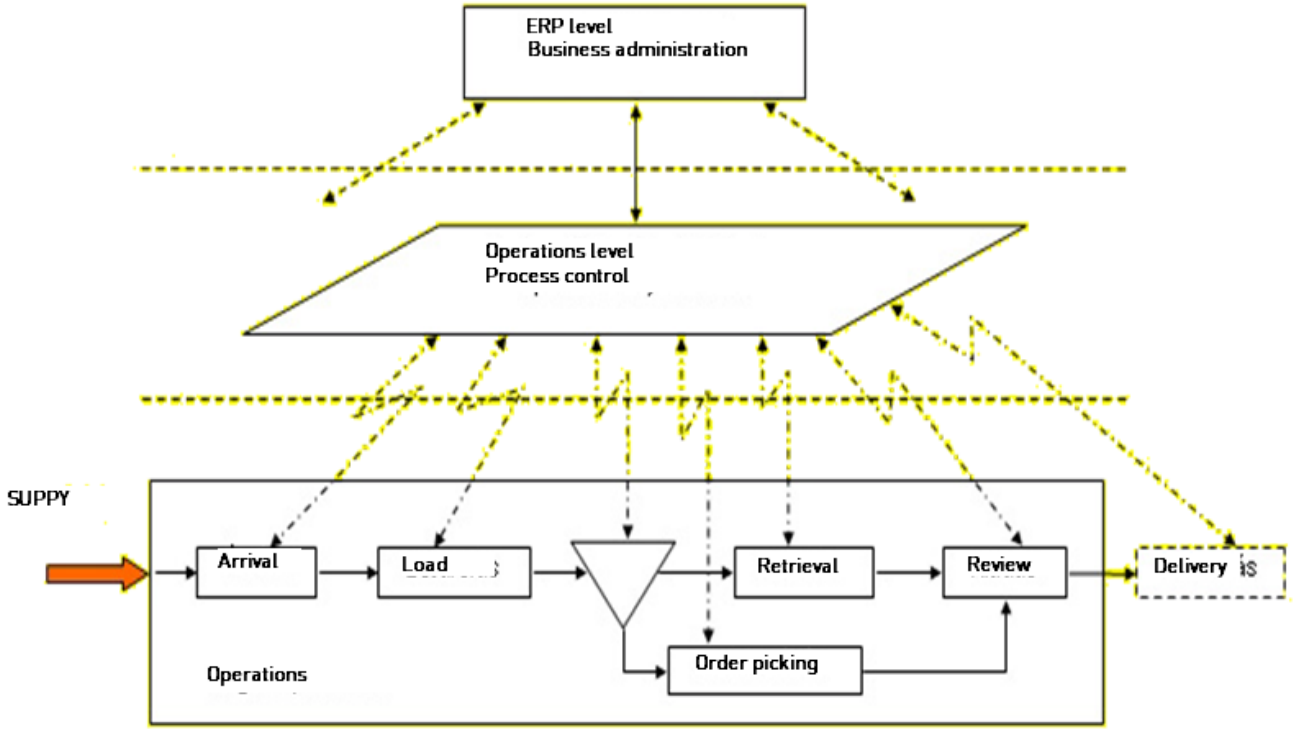
Traffic controll sensors and track sections



Role of Cargo Identification in transport systems

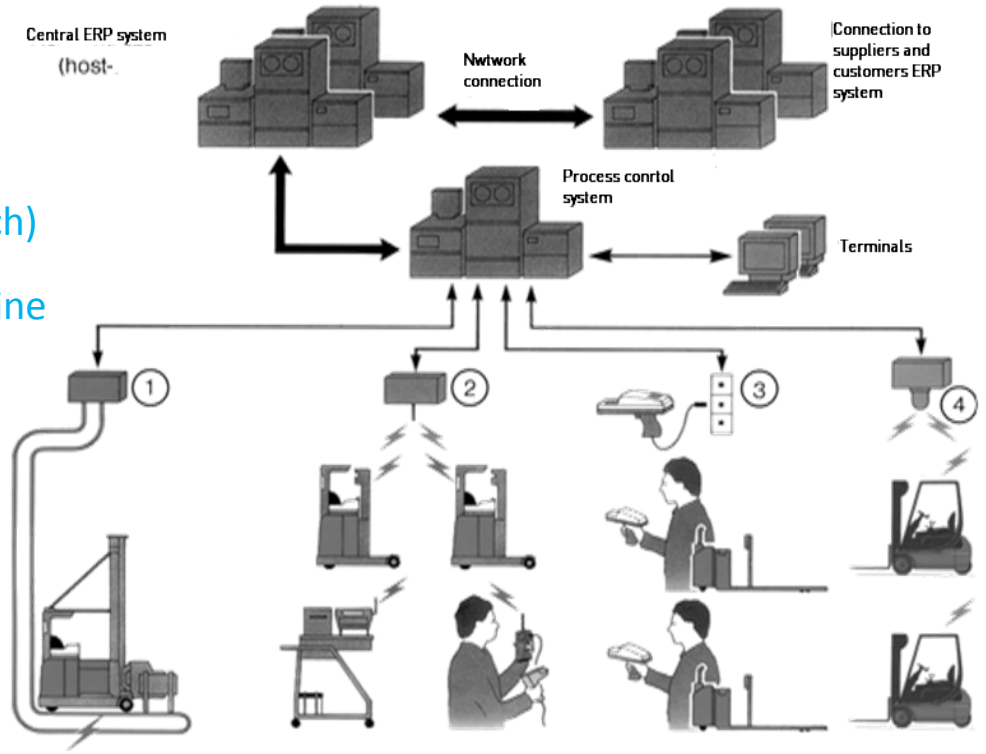


Structure of computer control system



Data transmission

1. Wired on-line
2. RF on-line
3. Wired off-line (batch)
4. Infrared quasy on-line



Techniques

On-line/off-line/batch data transmission:

- Radio Frequency Electromagnetic Transmission
- Infrared optical Transmission
- Wired (offline)

Terminal types

- Built-in, fix
- Mobile Hand-held
- On-board Mobile

Product Identification techniques:

- Bar Code reading (optical)
- RFId
- Character, Color or Shape Recognition

Information about products

- ✓ Quantity, quality, Type, Manufacturer
- ✓ Unit load type, packaging mode, size and weight
- ✓ **Expiration date**
- ✓ Special features:
  - ✓ Chemical, phisical dangers, e.g. fire hazard and explosivity grade
  - ✓ Mechanical and Radiation Sensitivity (heat, light, electromagnetic)
- ✓ Logistic information:
  - ✓ Bill numbers/ID, Distributor,
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Informations about materials handling

- ✓ Loading, retrieval and transport commands
- ✓ Resource master data (features, position and priority) of
  - ✓ machines,
  - ✓ storages,
  - ✓ transport tracks and relations.
- ✓ Measurement of materials handling performance
  - ✓ Resource utilisation rate (storages, materials handling machines, HR)
  - ✓ Delivery and handling errors
  - ✓ Cycle time of operations
  - ✓ Detailed analysis of handling operations

Lecture 6. INSTALLATIONS AND MACHINES IN LOGISTICS

6.2.1. Role and Trend of Storage

Till years of 1950's only low height storage and hand made materials movement were applied in commercial, industrial and military materials handling. After the Second World War, forklift trucks and pallets came to general use, reforming the whole materials handling industry.

Globalisation and supply chains are evolving from years 1970's

The role of warehouses in Supply Chains regarding to the economical need of JIT (Just-in- Time supply) are today the reliable supply, which can manage only with sufficient stocks concentrated at efficient warehouses. In other words the storage of the stock had become a secondary role. Additional functions of warehouses are the packaging, unit load building, labelling and so called product finishing.

But where come the need for storage from? In supply chains can be intensity differences between materials usage by users/customers and supply capacity of material producers. Ideal case is if the output volume meet with input volume, but its cannot manage because of stochastic input market and stochstic consumption of goods. But in logistics chain there is differences between in the production and usage of products and this results stock, e.g. there is more products than it is needed. However, stocks held in warehouses in the supply chain to meet the needs of the next phase if there requires a bigger volume of materials than the producted volume is, so it must be pre-stacked. The most commonly case are 2nd and 3rd, and they alternate each other. In some period it is needed to exceed the needs of product emission to serve the additional requirements arising in next period. Optimally, longer term also applies to the following relationship. But if this balance is broken then a fault will appear in the supply chain with the following consequences:

– If the product output is greater than the consumption then goods surplus (inventory) is formed.

– If the consumption exceed the available quantity of goods, then shortage occurs.

What are the reasons of the differences between production level and consumption level?

– Fluctuating demand for finished products

– Changing procurement opportunities, the uncertainty in the purchasing process

– Global value creation, outsourcing of manufacturing operations

– Product life cycle and life shortening

– Product types, variants increase

– Lean principles, optimal production batch sizes

– Manufacturing cycle time reduction

These reasons do not automatically imply the need for large inventories of even!

New requirements compared to storage and storage management:

– Outsourcing of storage processes, concentration of warehouses,

– Centralization of Warehouses, Cross-docking technique.

As a summary, here is detailed list of functions of warehouses:

More efficient movement of goods with the coordination of material flows:

– Consolidating the materials transport:
  – Collection of materials to move them in bigger volume and less frequency, if it is possible by deadlines

  – Collection of materials moving in the same direction

– Protection of quality and quantity of stocks till starting of its use:

  – With Proper storage techniques

  – With Good climate (humidity (rain, humid air resistance), temperature (cooling, heating))

  – With Tracking and recording the storage and handling processes o First in first out method Against obsolescence

– General asset protection

Lecture 6. INSTALLATIONS AND MACHINES IN LOGISTICS
6.2.1. Role and Trend of Storage

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Lecture 6. INSTALLATIONS AND MACHINES IN LOGISTICS

6.2.1. Role and Trend of Storage

MAGYARORSZÁG MEGÚJUL
A projekt az Európai Unió támogatásával valósul meg:

Role of Warehouses in Supply Chains

Till years of 1950's low height storage and hand made materials movement.

Forklift trucks and pallets appeared at 1960's.

Globalisation and supply chains are evolving from years 1970's

Today: need of JIT (Just-in-Time supply), which can manage only with succifient stocks concentrated at efficient warehouses.

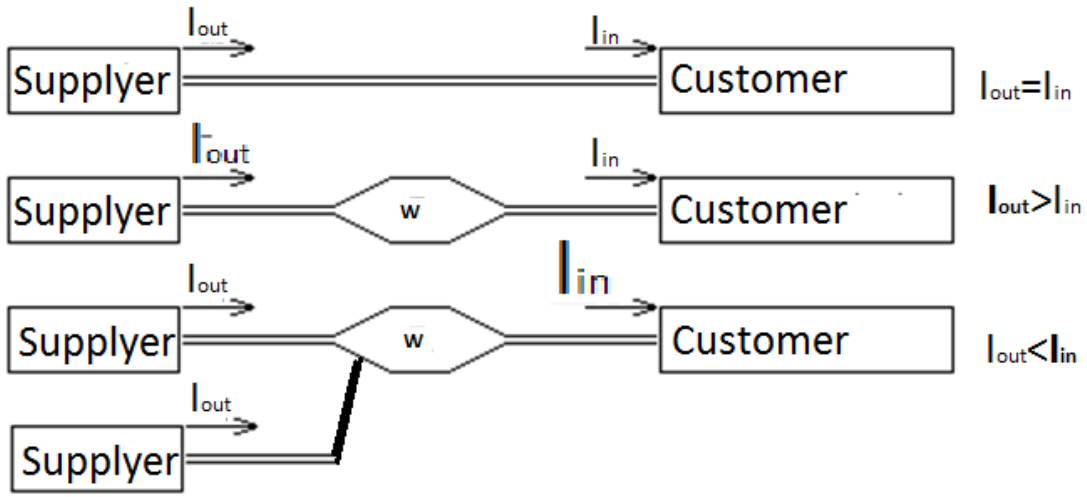
Role of warehouses:

- Primary: supply the consumer of stored stock
- Secondary: store the stock

Additional works in warehouses: packaging, unit load building, labelling, product finishing

The need for storage

In supply chains can be intensity differences between materials usage by users/customers and supply capacity of material producers.



The need for storage

- Ideal case if the output volume meet with input volume, but its cannot manage because of stochastic input market and stochstic consumption of goods.

$$\mathbf{I_{out} = I_{in}}$$

- In logistics chain there is differences between in the production and usage of products and this results stock, e.g. there is more products than it is needed:

$$\mathbf{I_{out} > I_{in}}$$

- However, stocks held in warehouses in the supply chain to meet the needs of the next phase if there requires a bigger volume of materials than the producted volume is, so it must be pre-stacked.

$$I_{out} \mathbf{< I_{in}.}$$

Cases

The most commonly case are 2nd and 3rd, and they alternate each other.

In some period it is needed to exceed the needs of product emission to serve the additional requirements arising in next period.

Optimally, longer term also applies to the following relationship:

$$\sum I_{out} = \sum I_{in}$$

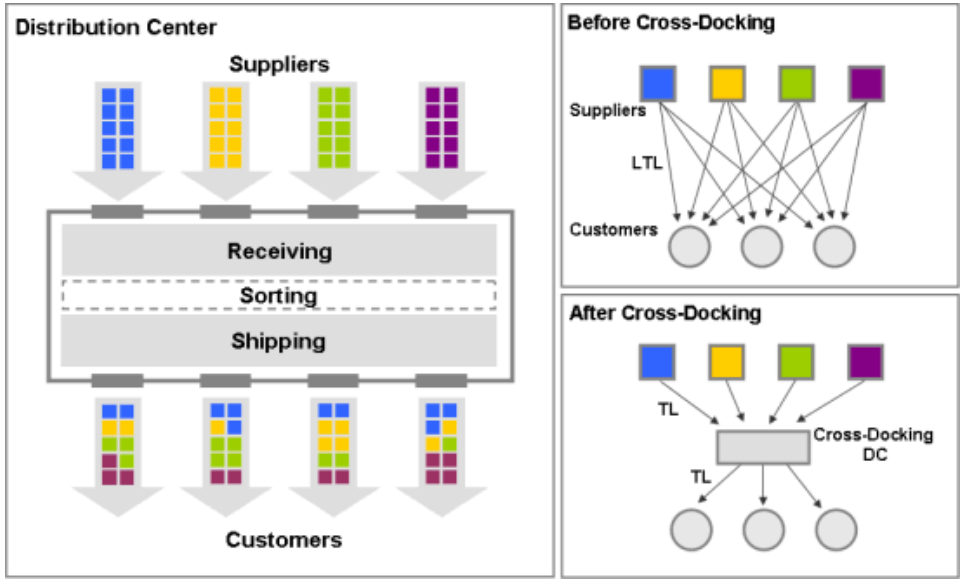
If this equilibrium is upset then a fault will appear in the supply chain with the following consequences:

- If the product output is greater than the consumption then goods surplus (inventory) is formed.
- If the consumption exceed the available quantity of goods, then shortage occurs.

Why come for the differences between production level and consumption level

- ✓ Fluctuating demand for finished products
- ✓ Changing procurement opportunities, the uncertainty in the purchasing process
- ✓ Global value creation, outsourcing of manufacturing operations
- ✓ Product life cycle and life shortening
- ✓ Product types, variants increase
- ✓ Lean principles, optimal production batch sizes
- ✓ Manufacturing cycle time reduction

New role of warehouses



These reasons do not automatically imply the need for large inventories of even!

New requirements compared to storage and storage management:

- ✓ Outsourcing of storage processes, concentration of warehouses,
- ✓ Centralization of Warehouses, Cross-docking technique.

Additional functions of warehouses

More eefficient movement of goods with the coordination of material flows:

- ✓ Collection of materials to move them in bigger volume and less frekventy, if is possible by deadlines
- ✓ Collection of materials moving in the same direction
- ✓ Protection of quality and quantity of Stocks till its use:
  - ✓ With Proper storage techniques
  - ✓ With Good climate (humidity (rain, humid air resistance), temperature (cooling, heating))
  - ✓ With Tracking and recording the storage and handling processes
  - ✓ First in first out method Against obsolescence
  - ✓ General asset protection

Lecture 6. INSTALLATIONS AND MACHINES IN LOGISTICS

6.2.2. Warehouses and Storage Structures

Major Warehouse Structures

– *Internal structures within a warehouse location:*

  – Facility layout

    – Head-layout (stack-type)

    – Cross-flow layout (FIFO-type)

  – Storage zone layout

    – Block-storage (heap/stack)

    – Corridor-storage (random access)

– *External consolidation warehouses between geographical locations:*

  – Distribution centers

  – Centralized warehouses

Head-type Warehouse Facility layout

– Less empty run with common loading+retrieving cycles

– Common Point of reaching the Storage Area

– Loading and retrieving operations can block each other

Head-type Warehouse Facility layout

– Loading and Retrieving operations do not block each other

– Common cycles for less empty run are unavailable

Storage layout types

Block Storage:

– Put packages near to each other and onto each other

– Place saver method

– High floor utilisation

– Hard to reach unique cargo

– Cargo must be strong enough

– Only for few different type

Serial Storage:

– Unique columns of cargo is available to reach

– Requires more floor for transport corridors

– For more different type of products

– Lower floor utilisation

Rack-less Storage Layouts

– Block storage mode

– Big block storage mode

– Channel storage mode

– Corridor (serial) storage mode

Static storage rack systems

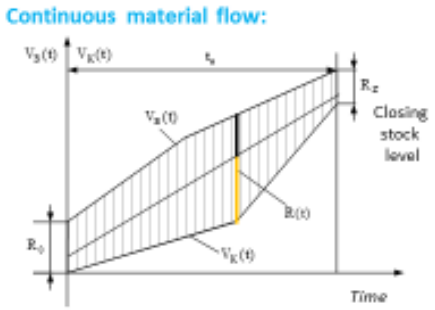
– Shelf Rack System

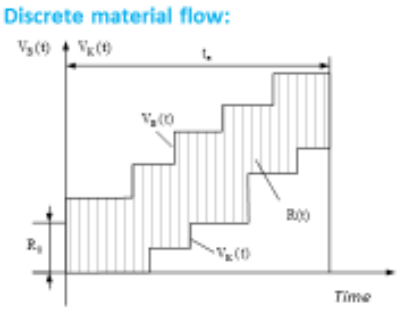
– Box Storage Rack

– Pallet Storage Rack

– Drive-in Rack System

Material Flow – Time function of Warehouse Supply and Shipping





Brake Bulk and Order Picking operations

– Receiving Mode Disposition

– Put-away Batch Sizing

– Put-away Tour Construction

The development of the External Structure of the Warehousing

In Traditional Warehousing, every company operated a raw-mareial warehouse and a finished-goods warehouse, which means on one hand high supply security, but on other hand double warehousing:

– From finished goods warehouse of the Plant

– To the Raw Material (input) warehouse of the Customer

Results:

– Double stock

– Double infrastructure

– Double costs

– Double risk

This method takes a lot of costs, therefore using more reliable transportation and supply, the smaller on-site warehouses are replaced by central distribution centres:

– Less small, low efficient storage capacity

– One large, high efficient warehouse

– Centralised and consolidable transport, distribution and additional services (packaging, sorting, management)

This is a good method, but long distance distribution routes mean big transport and supply risks. Here a central warehouse can help the supply and make it reliable. But Double stockà double cost. Therefore centralized warehouses with Regional **Cross-docking** Distribution Centers were established, where the Cross-docking DCs operate with JIT (zero) stock:

– Minimal stock to supply the daily requirements

– Arriving crates are immediately broken for shipping

Lecture 6. INSTALLATIONS AND MACHINES IN LOGISTICS
6.2.2. Warehouses and Storage Structures

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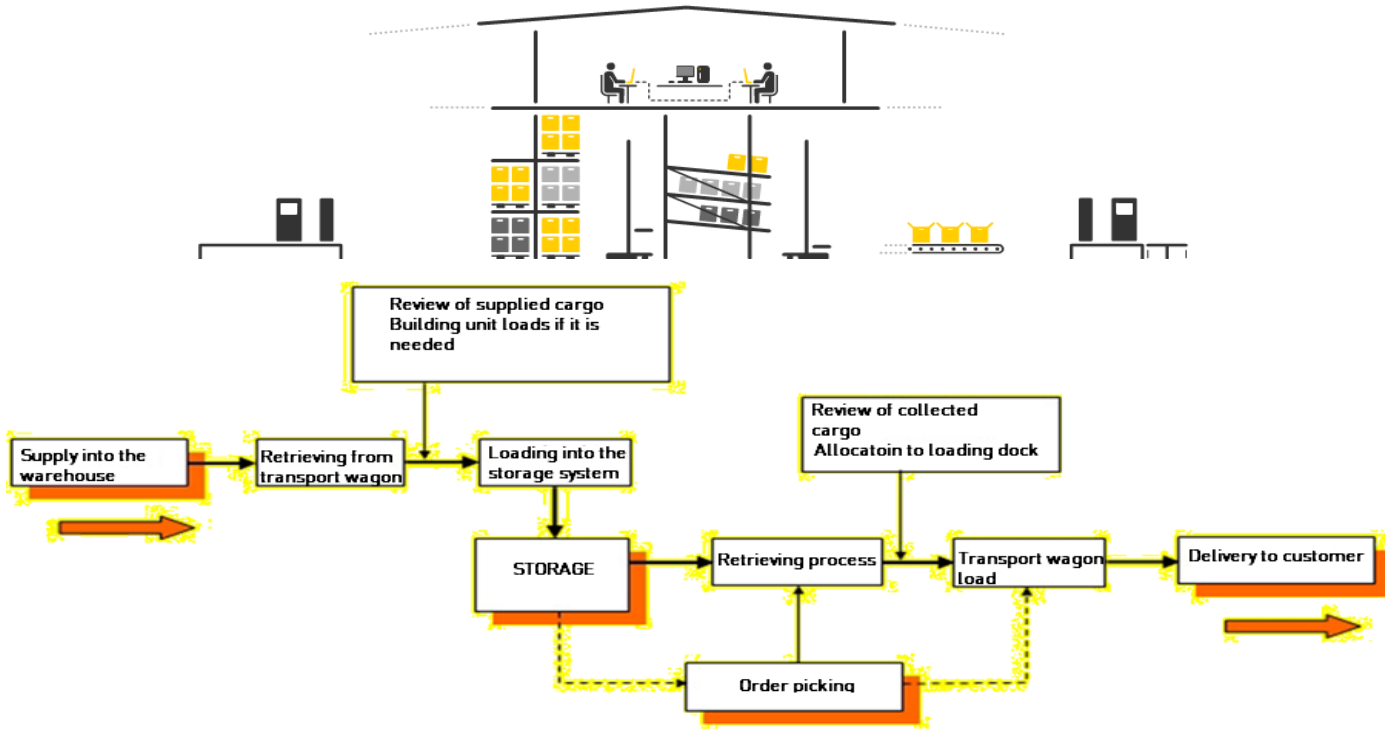
Lecture 6. INSTALLATIONS AND MACHINES IN LOGISTICS

6.2.2. Warehouses and Storage Structures

MAGYARORSZÁG MEGÚJUL

A projekt az Európai Unió támogatásával valósul meg:

Warehouse processes



Major Warehouse Structures

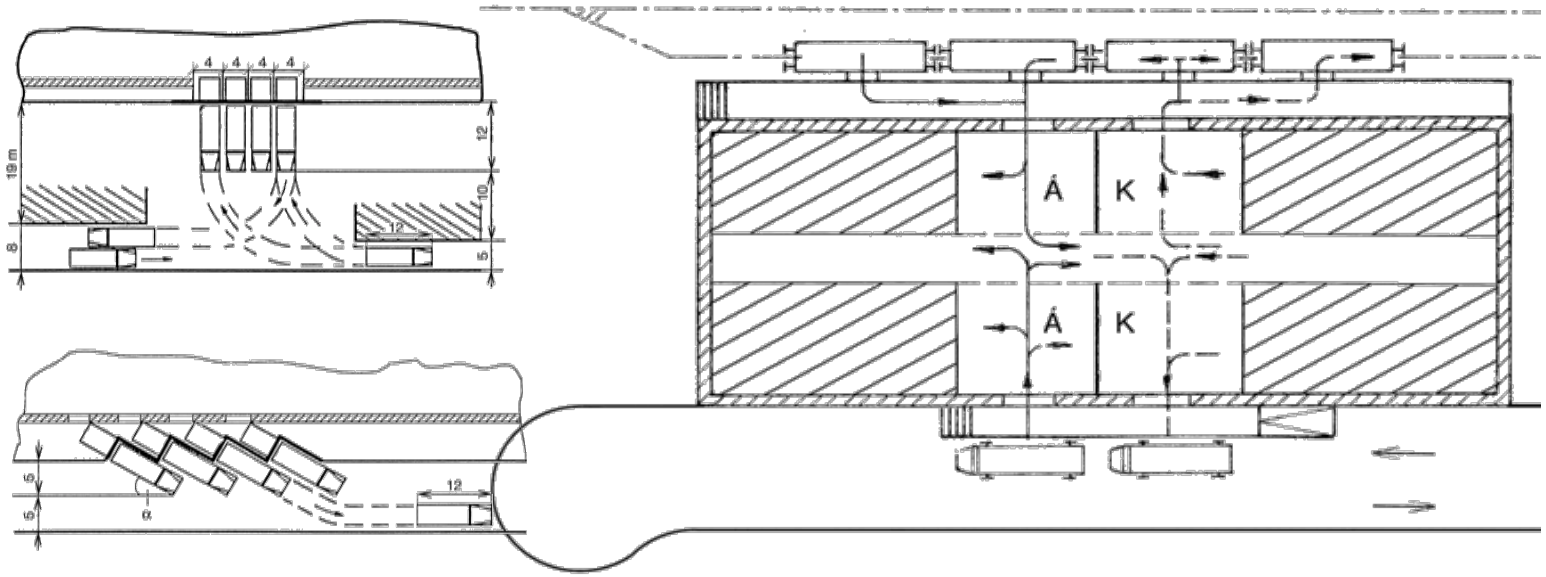
Internal structures within a warehouse location:

- Facility layout
  - Head-layout (stack-type)
  - Cross-flow layout (FIFO-type)
- Storage zone layout
  - Block-storage (heap/stack)
  - Corridor-storage (random access)

External consolidation warehouses between geographical locations:

- Distribution centres
- Centralised warehouses

Facility system of Warehouses
Transport and Railroad Connections



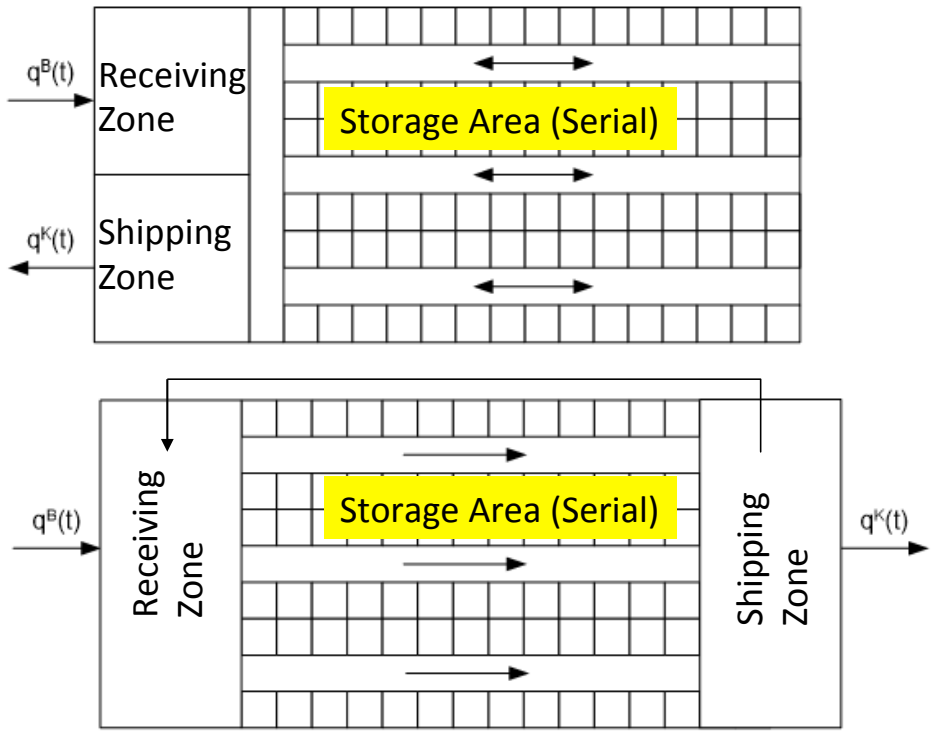
Facility system of warehousing
Warehouse buildings and layout

Head-type layout

- ✓ Less empty run with common loading +retrieving cycles
- ✓ Common Point of reaching the Storage Area
- ❑ Loading and retrieving operations can block each other

Walk-though

- ✓ Loading and Retrieving operations do not block each other
- ❑ Common cycles for less empty run are unavailable



Storage layout types

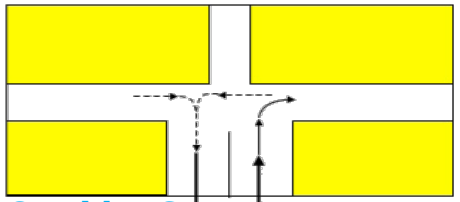
Block Storage:

- ✓ Put packages near to each other and onto each other
- ✓ Place saver method
- ✓ High floor utilisation
- ❑ Hard to reach unique cargo
- ❑ Cargo must be strong enough
- ❑ Only for few different type

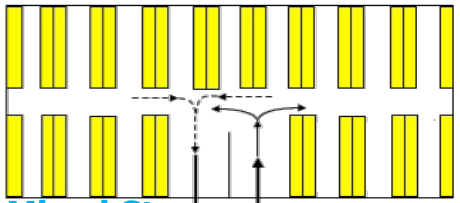
Serial Storage:

- ✓ Unique columns of cargo is available to reach
- ✓ Requires more floor for transport corridors
- ✓ For more different type of products
- ❑ Lower floor utilisation

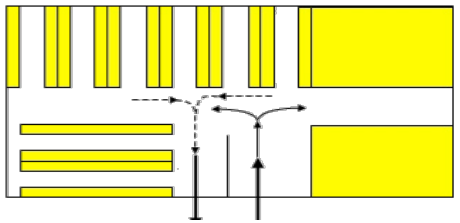
Block Storage



Corridor Storage

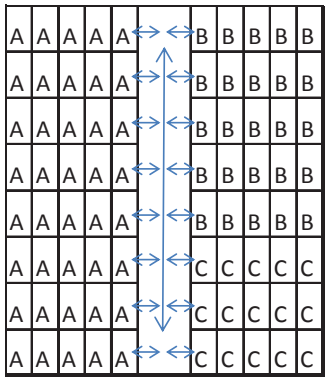


Mixed Storage

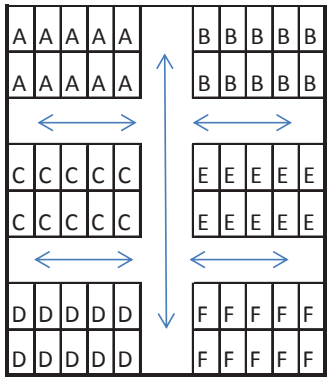


Rack-less Storage Layouts

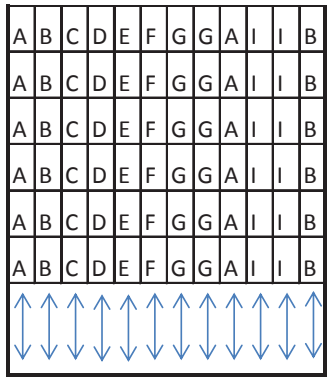
Block storage mode



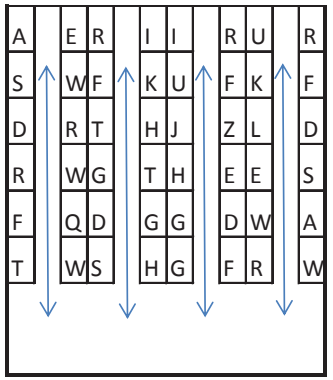
Big block storage mode

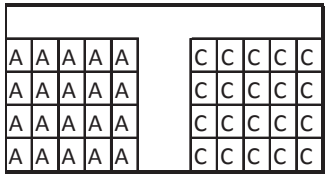


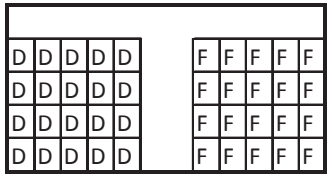
Channel storage mode

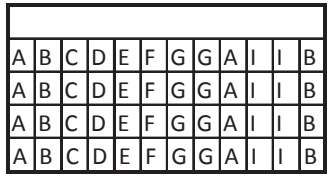


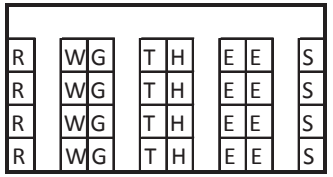
Corridor storage mode



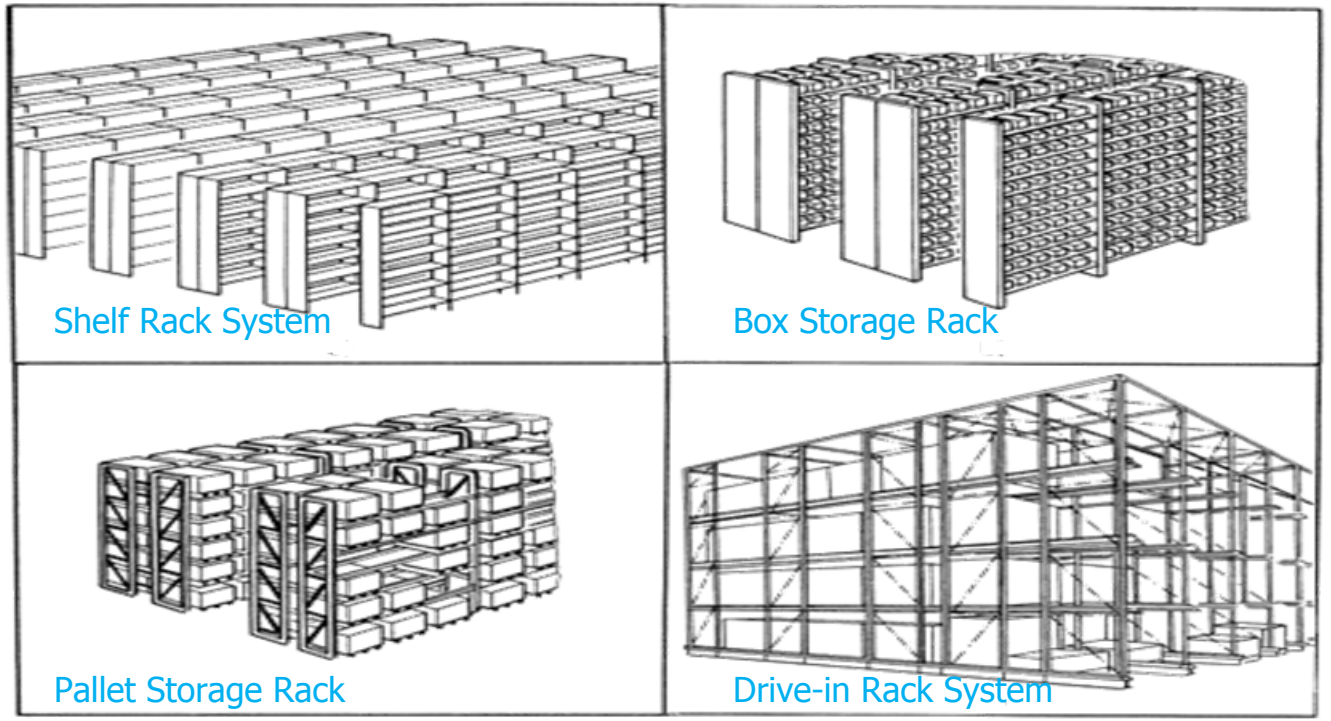








Static storage rack systems



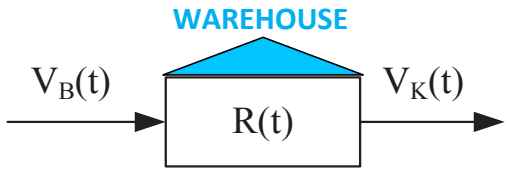
Material Flow – Time function of Warehouse Supply and Shipping

Continuous delivery:

$$V_B(t) = \int_0^t q_B(t)dt$$

Discrete delivery:

$$V_B(t) = \sum_{i \in \Theta_B(t)} Q_{Bi}$$



$$R(t) = R_0 + V_B(t) - V_K(t)$$

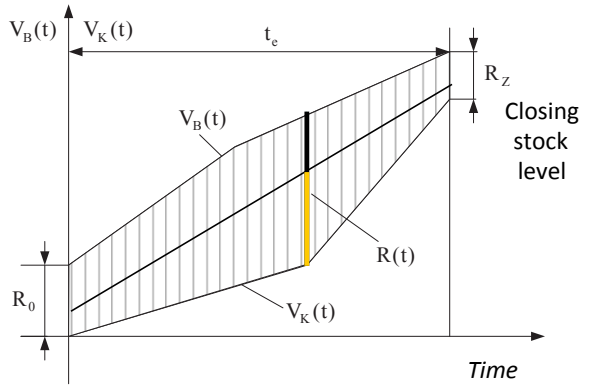
Continuous delivery:

$$V_K(t) = \int_0^t q_K(t)dt$$

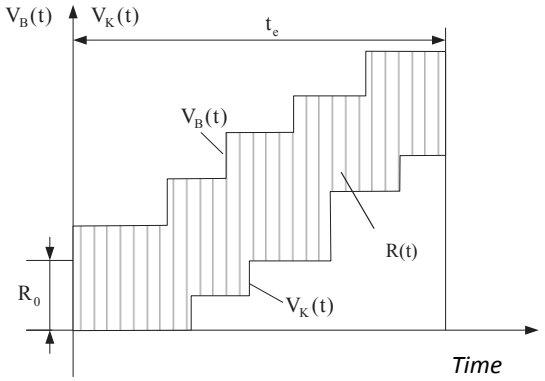
Discrete delivery:

$$V_K(t) = \sum_{i \in \Theta_K(t)} Q_{Ki}$$

Continuous material flow:



Discrete material flow:

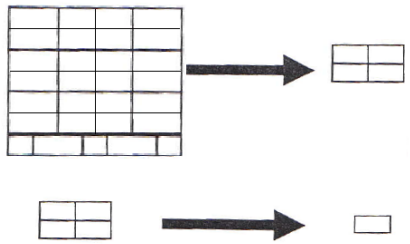


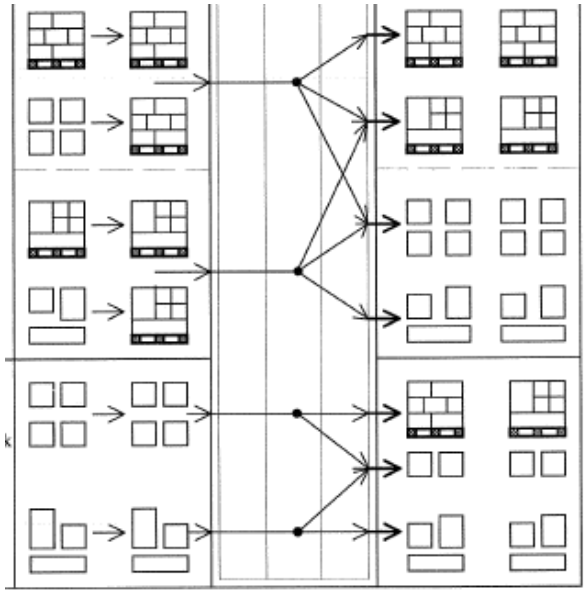
Brake Bulk and Order Picking operations

Receiving Mode Disposition

Put-away Batch Sizing

Put-away Tour Construction





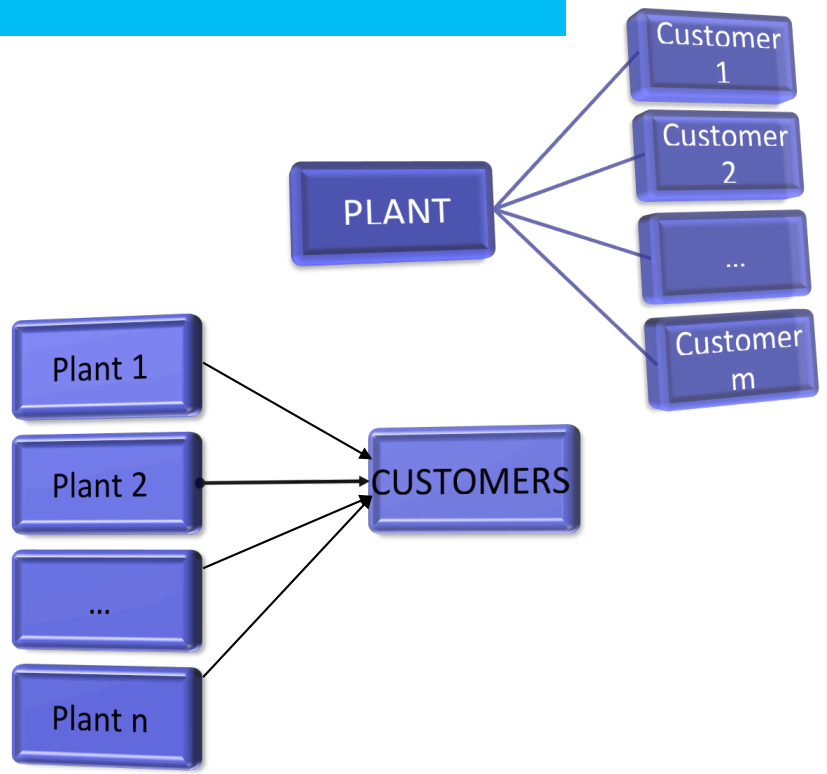
Traditional Warehousing

Replace smaller on-site warehouses by central distribution centres:

- From finished goods warehouse of the Plant
- To the Raw Material (input) warehouse of the Customer

Results:

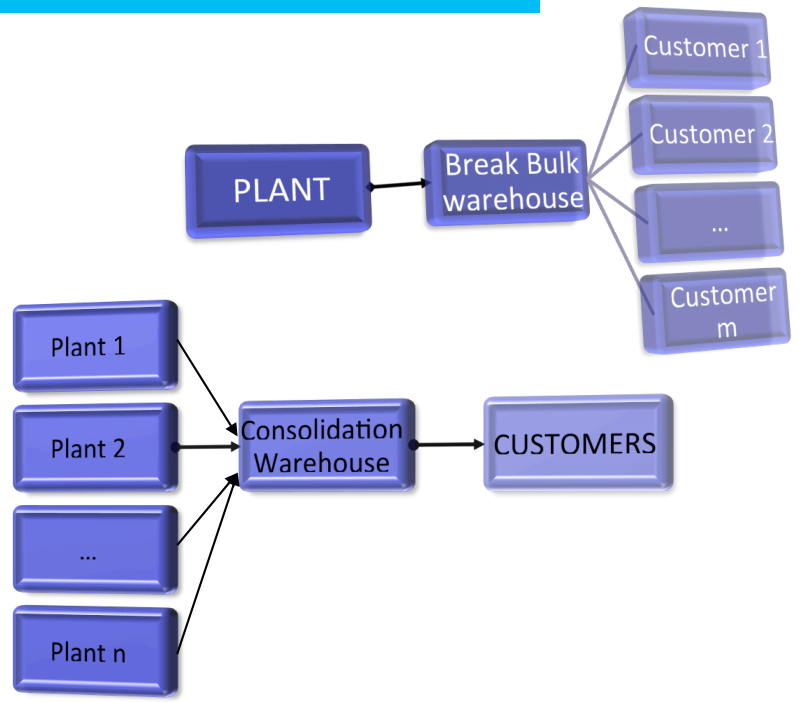
- Double stock
- Double infrastructure
- Double costs
- Double risk



Distribution Centres

Replace smaller on-site warehouses by central distribution centres:

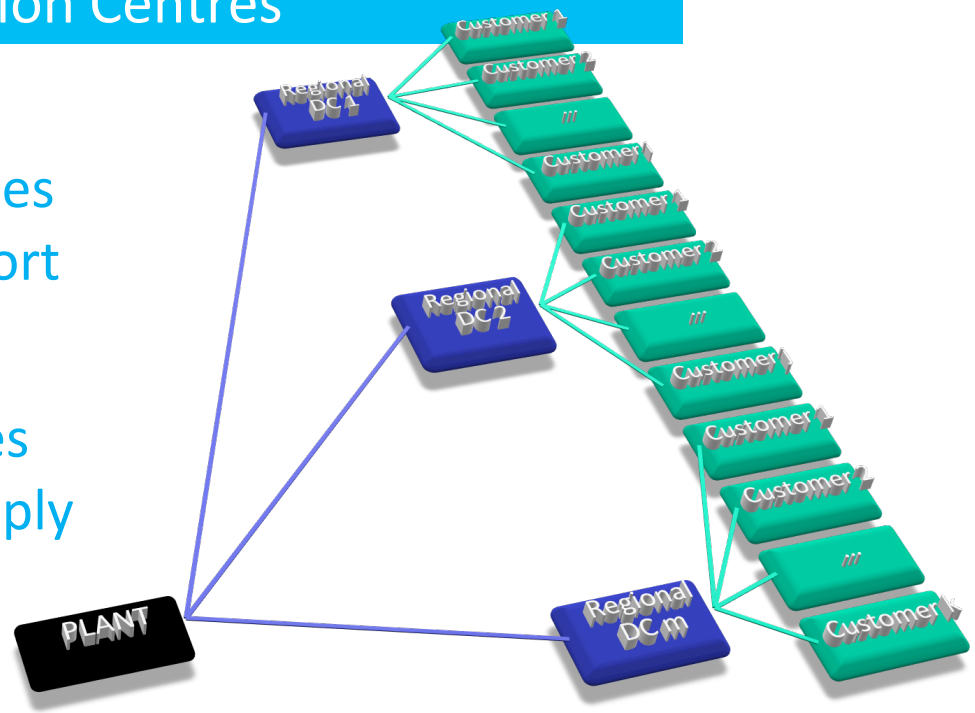
- Less small, low efficient storage capacity
- One large, high efficient warehouse
- Centralised transport, distribution and additional services (packaging, sorting, management)



Traditional Supply of Regional Distribution Centres

Long distance
dsitribution routes
means big trasport
and supply risks

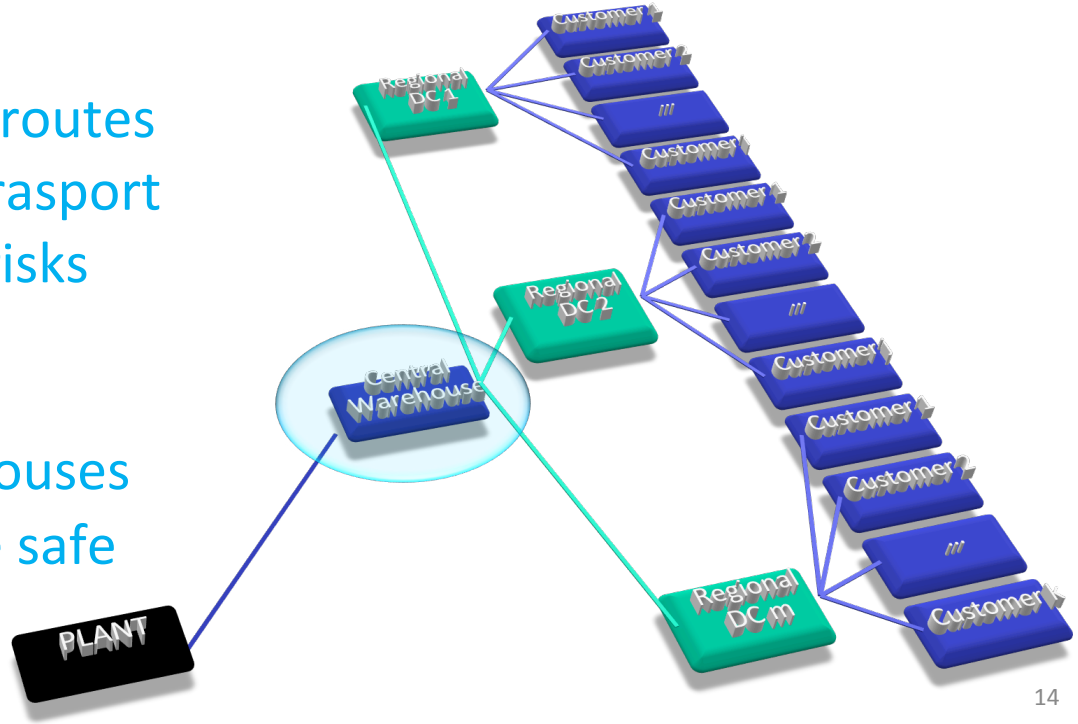
Central warehouses
can help the supply



Central Warehouse with Regional Distribution Centres

Long distance dsitribution routes means big trasport and supply risks

Central warehouses can help the safe supply

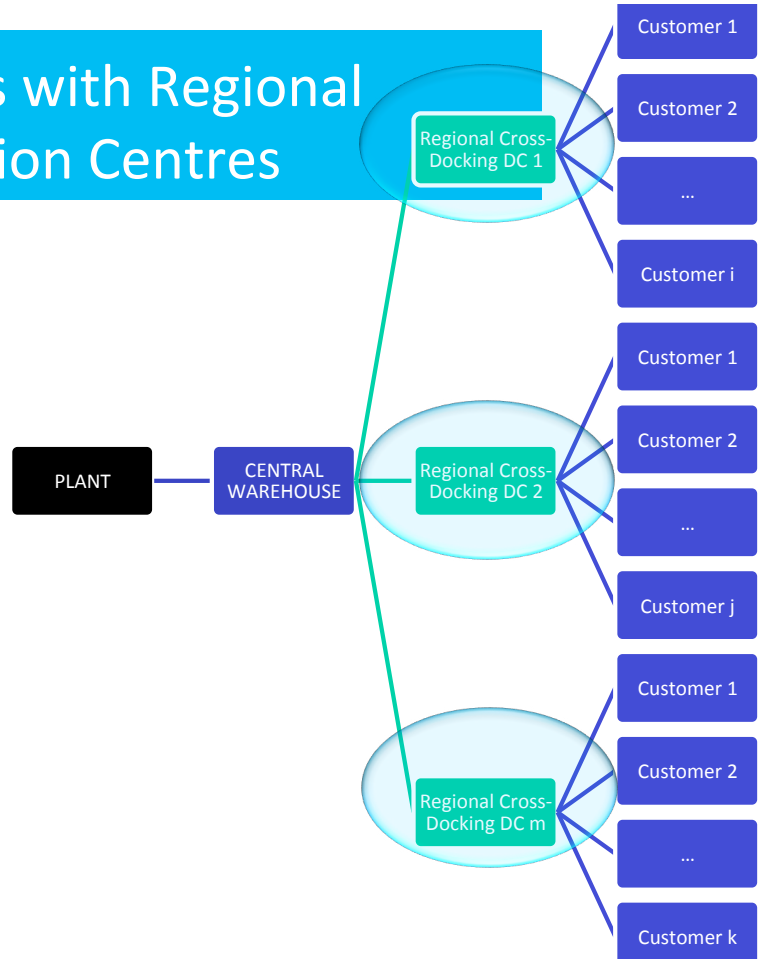


Centralized warehouses with Regional **Cross-docking** Distribution Centres

Double stock → double cost

→ Cross-docking DC-s with JIT (zero) stock:

- Minimal stock to supply the daily requirements
- Arriving crates are immediatelly breaked for shipping



Lecture 6. INSTALLATIONS AND MACHINES IN LOGISTICS

6.2.3. Equipments and Machines of Storage Systems

Machines and workforces in warehouses are both required:

Manual handling is applied for 25-50kg heavy packages, with Rolley cars or Palletizer rolley Machines:

- Fork-lift trucks
  - Low elevation for only moving pallets o Normal elevation up to 6 m.
  - High elevation up to 20 m.
  - Order picking with lifted cabin.
- Track bounded materials handling
- Bridge cranes
- Retrieving&loading machines (RegalBedienGerät)
- Additional roller conveyors

Loading and Retrieving Machines in High-rack Storage System

- Fast and robust
- High-performance

– Fully automated

– Expensive

– Cannot live the work corridor

Roller track storage

– Independent loading and retrieving operations

– Continuous material flow

– physically forced First-in First-out queue

– Channel type

– Gravity force

Rotatory Storage Systems

– Pater-Nosters and Lift-based Tray Systems Closed Rotating Storage Systems

– Caroussel

Rolling rack storage

– Space saver

– Electrical drive

– Remote control

– Help cooling

– Expensive

Summary

Saving space:

– takes more cost for special storage constructions

– takes more manipulation time and work

For less manipulation:

– We need more space

But remember! The most of expenses are in the buildings!

Lecture 6. INSTALLATIONS AND MACHINES IN LOGISTICS
6.2.3. Equipments and Machines of Storage Systems

HUNline Hungarian Online University

ÚJ SZÉCHENYI TERV

Basics of Logistics
College of Dunaújváros

Lecture 6. INSTALLATIONS AND MACHINES IN LOGISTICS

6.2.3. Equipments and Machines of Storage Systems

MAGYARORSZÁG MEGÚJUL

A projekt az Európai Unió támogatásával valósul meg:

Machines and workforces in warehouses

Manual handling

- 25-50kg
- Rolley car
- Palletizer rolley

Machines:

- Fork-lift trucks
  - Low elevation for only moving pallets
  - Normal elevation up to 6 m.
  - High elevation up to 20 m.
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- Track bounded materials handling
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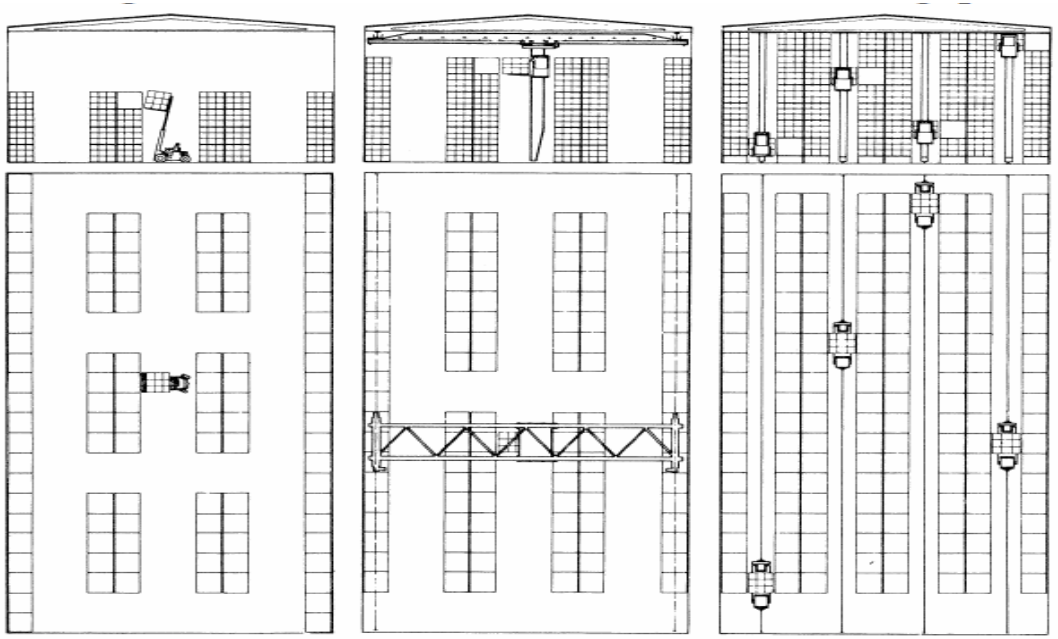
  - Additional roller conveyors

Serving warehouses with Forklift trucks, Bridge cranes and Retrieving&loading machine

Forklift trucks Bridge cranes Retrieving&loading machines



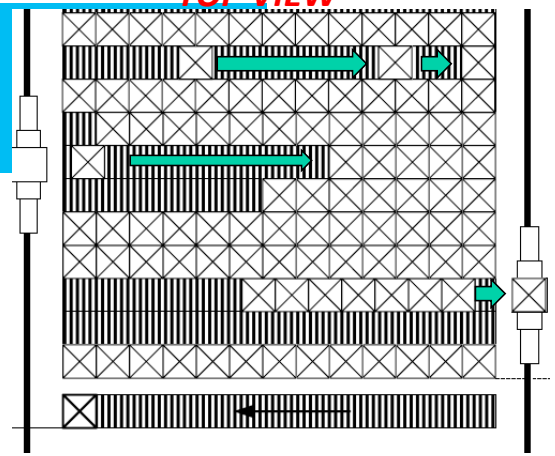
Loading and Retrieving Machines in High-rack Storage System

- ✓ Fast and robust
- ✓ High-performance
- ✓ Fully automated
- ✓ Expensive
- ✓ Cannot live the work corridor

Roller track storage

- Independent loading and retrieving operations
- Continuous material flow
- FIFO queue
- Channel type
- Gravity force

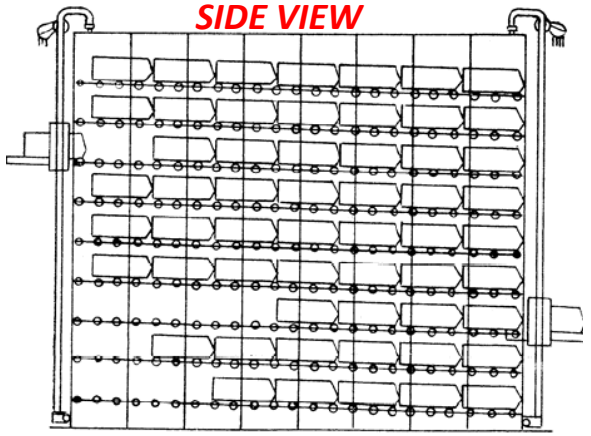
TOP VIEW



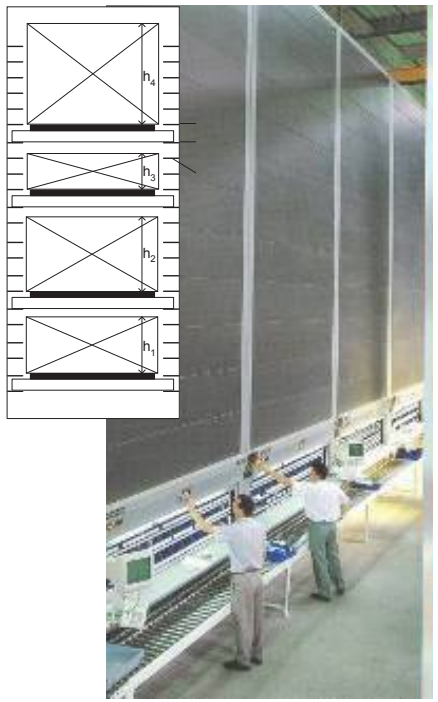
FRONT VIEW

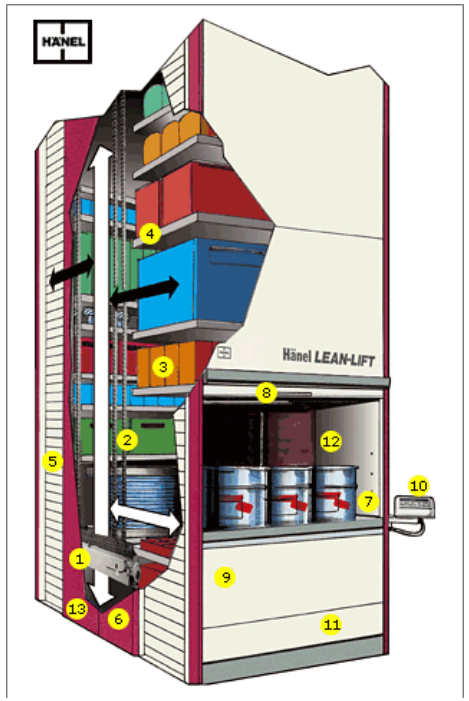
C	D	E	F	E	F	G	G	A	I	I
C	K	C	M	E	H	J	C	B	I	I
D	F	A	F	E	F	G	K	A	I	I
C	M	E	H	J	C	B	C	V	C	M
H	J	C	K	J	K	U	C	Cs	C	V
D	M	E	S	J	C	B	C	P	C	M
C	M	E	S	G	C	B	C	Q	C	Q
C	M	E	P	J	C	P	C	V	C	N
C	D	D	F	E	F	A	G	D	I	J

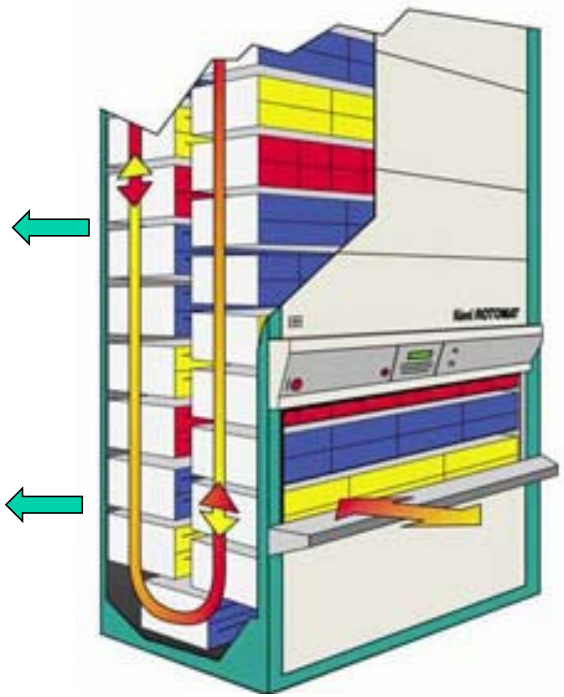
SIDE VIEW



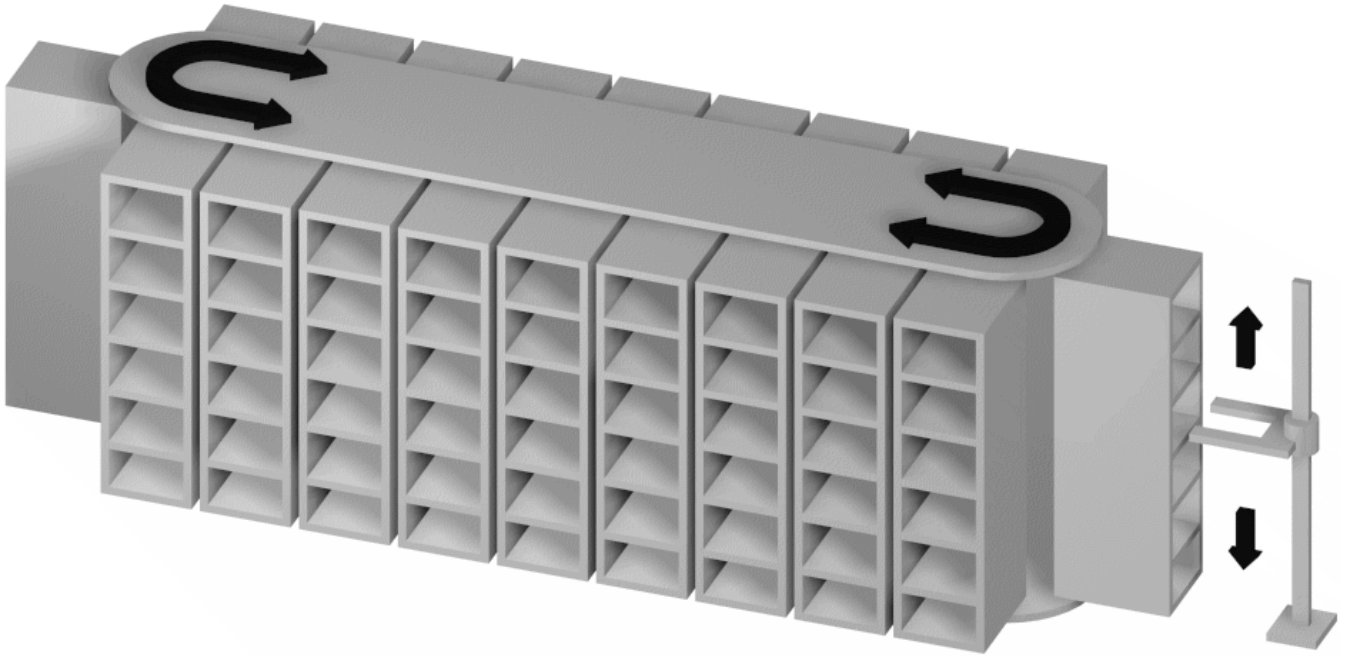
Pater-Nosters and Lift-based Tray Systems
Closed Rotating Storage Systems







Caroussel



Rolling rack storage

- ✓ Space saver
- ✓ Electrical drive
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- ✓ Help cooling
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Lecture 6. INSTALLATIONS AND MACHINES IN LOGISTICS

6.2.4. Warehouse management systems and automatic goods identification

Tasks of warehouse management systems

– *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.

Warehouse database

Role:

– Data collecting and recording about the materials flow processes

– Data providing for control operations in materials flow

Data:

– Goods, products, cargo master data - Identification of goods

– Storage cell master data - Identification of store positions

– Materials flow process data

– transactions, events, operations history:

  – Inventory supply control

  – Cargo arrival administration

  – Inside materials handling operations control and log o Retrieval from storage

  – Preparing delivery

– Calculated empty storage capacity – empty storage cell list

– Calculated inventory reports

Tasks of computer aided warehouse management

Warehouse process and inventory administration:

– Master data administration

– Administration of load and retrieval processes

– Administration data update and process follow up

– Up to date reports about warehouse, performance report

– Inventory forecast

Process control on tactical level:

– Update of supply and delivery requirement

– Inventory management strategies enforcement

– Storage position allocation by optimum strategy

– Allocation of Materials handling and order picking by optimum strategy

– Control of Materials handling and order picking resources

– Log and follow up of tasks

Information for warehouse management:

Product flow information

– Supply and delivery orders

– Load and retrieval commands

– Storage cells master data(features, position and priority)

Inventory level, free positions in storage system

– Logistic information: Bill numbers/ID, Date of arrival

– Product master data

– Allocation strategy

Statistics about inventory and storage

– Resource utilisation rate (storage, materials handling machines, HR)

– Inventory rotation speed and time

– Order and supply forecasts

– Measurement of materials handling performance

– Order picking performance

– Order picking errors

– Delivery error

– Cycle time of mechines

– Detailed analysis of handling cycles

Product Identification

– Optical Bar Code

  – Cheap labelling

  – Worldwide used

  – Requires direct visibility

  – Read-only (requires re-labelling)

  – Poor information capacity

– Electronic Radio Frequenty Transmission

  – Longer distance reading without direct visibility

  – Megabyte capacity memory chips

  – Rewrite available with active tags but more expensive

  – More-more expensive

  – Privacy risk!

Lecture 6. INSTALLATIONS AND MACHINES IN LOGISTICS
6.2.4. Warehouse management systems and automatic goods identification

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Lecture 6. INSTALLATIONS AND MACHINES IN LOGISTICS

6.2.4. Warehouse management systems and automatic goods identification

MAGYARORSZÁG MEGÚJUL

A projekt az Európai Unió támogatásával valósul meg:

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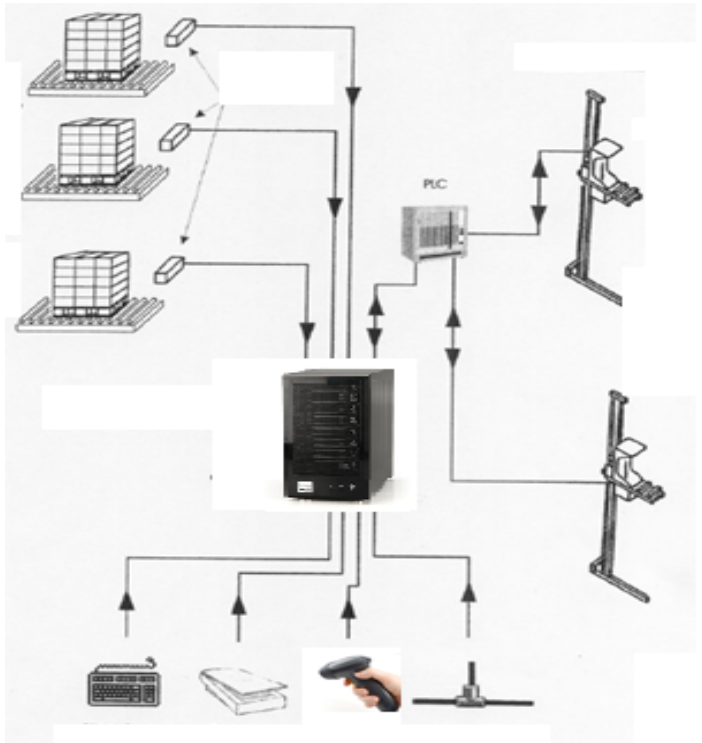

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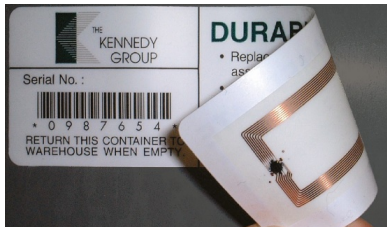
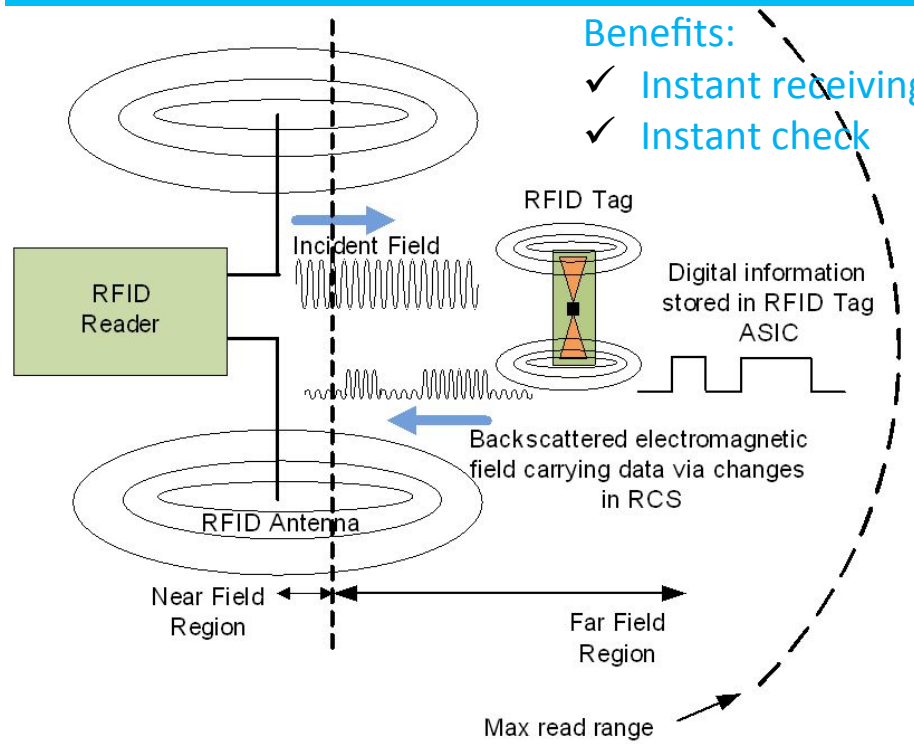
HYBRID LABELS



Electronic Radio Frequenty Transmission

- ✓ Longer distance reading without direct visibility
- ✓ Megabyte capacity memory chips
- ✓ Rewrite available with active tags but more expensive
- ❑ More-more expensive
- ❑ Privacy risk!

Reading passive RFId tags



Benefits:

- ✓ Instant receiving
- ✓ Instant check

LECTURE 7.

Lecture 7 – Overview of Logistic Subsystems

7.1. Distribution logistics

Objectives

– Minimum stock level

– No material leak

– No scrap

– Low purchase expenses

– Reliable supplyers

– Less supplier, less connections

Structures

Centralized purchase organization

– 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 organizaton

– 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

Methods

Direct supply

– On short distance results short lead times

– Efficient in mass purchase and full truck or full container load quantities

– Not efficient in case of wide variety of products and small quantities

Indirect supply

– Efficient transport opportunities

– Longer lead times

– Difficult delivery tracking

Just-in-Time supply

– Efficient for the buyer

– More expenses for supplier

– Smaller shipments, high shipping frequency

– Means practically smaller safety stock

– The key is the transport channel reliability is

Make-or-Buy decision

– What is cheaper?

– Capacity requirements?

– Reliability?

– Quality and innovation skill?

– Risk of industrial espionage

Lecture 7 – Overview of Logistic Subsystems
7.1. Procurement

HUNline
Hungarian Online University

ÚJ SZÉCHENYI TERV

Basics of Logistics
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Lecture VII – Overview of Logistic Subsystems

7.1. Procurement

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No scrap

Low purchase expenses

Reliable supplyers

Less supplier, less connections

Structures

Centralized purchase organization

- 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 organizaton

- 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

Methods

Direct supply

- On short distance results short lead times
- Efficient in mass purchase and full truck or full container load quantities
- Not efficient in case of wide variety of products and small quantities

Indirect supply

- Efficient transport opportunities
- Longer lead times
- Difficult delivery tracking

Just-in-Time supply

Efficient for the buyer

More expenses for supplier

Smaller shipments, high shipping frequency

Means practically smaller safety stock

The key is the transport channel reliability is

Just-in-Sequence packaging

Make-or-Buy decision

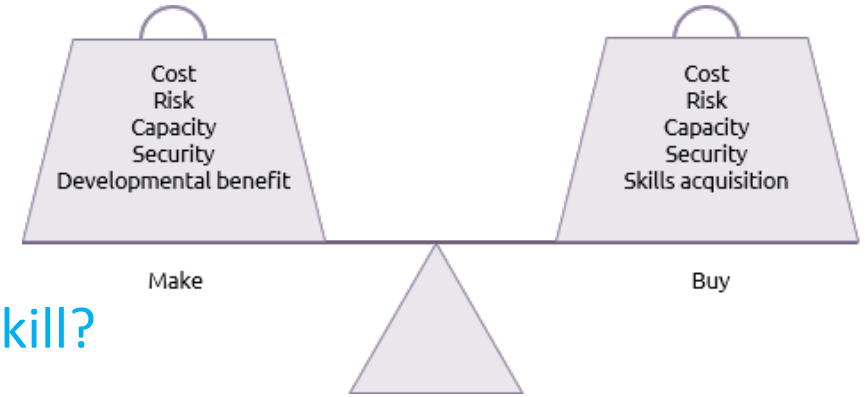
What is cheaper?

Capacity requirements?

Reliability?

Quality and innovation skill?

Risk of industrial espionage



Lecture 7 – Overview of Logistic Subsystems

7.2. Production logistics

Targets

– Maximum capacity utilization

– Reliable supply

– No malfunctions and breakdowns

– Minimum losses by maintenance

– No damage of materials and finished products

Major structures

Flexible manufacturing systems

– Better for wide variety of products

– Easy to reorganise

– Difficult planning and scheduling

– Longer lead times

Mass production lines

– Very short lead times

– Minimum production costs

– Only one product

– No flexibility

– High installation costs

Methods

Integrated logistic system

– Delivered and integrated by the technological system manufacturer
– Integrated information system

– Flexibiliy problems

External logistic system

– Modular systems

– „Easy-to-Integrate" requirement

– More manufacturer – more problems

Lecture 7 – Overview of Logistic Subsystems
7.2. Production logistics

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Lecture VII – Overview of Logistic Subsystems

7.2. Production logistics

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Targets

- Maximum capacity utilization
- Reliable supply
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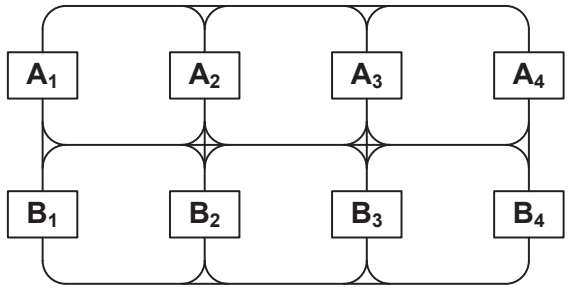
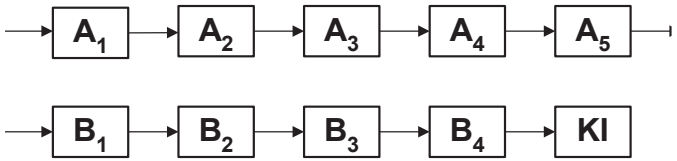


Mass production lines

- Very short lead times
- Minimum production costs
- Only one product
- No flexibility
- High installation costs



Methods

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- Integrated information system
- Flexibiliy problems

External logistic system

- Modular systems
- „Easy-to-Integrate” requirement
- More manufacturer – more problems

Lecture 7 – Overview of Logistic Subsystems

7.3. Procurement

Targets

Maximum customer fulfilment

No mistakes

Accurate documents:

– Delivery notes

– Invoices

Structures

Direct and indirect distribution channels:

– Direct sales

– Wholesale channel

– Superstore networks

– E-Commerce channel

– Direct marketing

Methods

– On-line delivery tracking

– Sending invoice with the shipment

– On-line webshops and marketplaces

– External transporters

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7.3. Distribution logistics

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7.3. Distribution logistics

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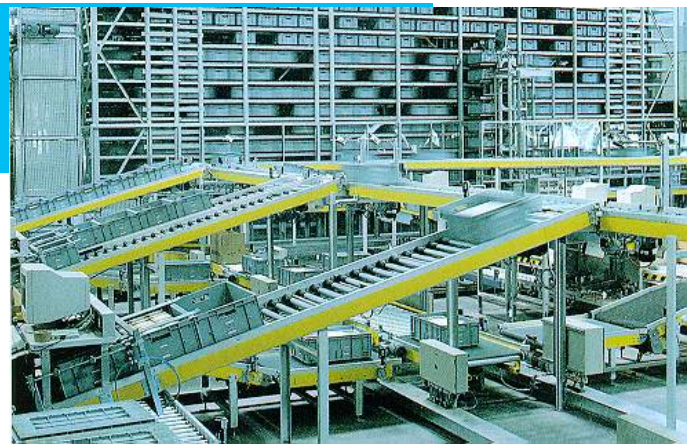
Targets

Maximum customer fulfilment

No mistakes

Accurate documents:

- Delivery notes
- Invoices



Structures

Direct and indirect distribution channels:

- Direct sales
- Wholesale channel
- Superstore networks
- E-Commerce channel
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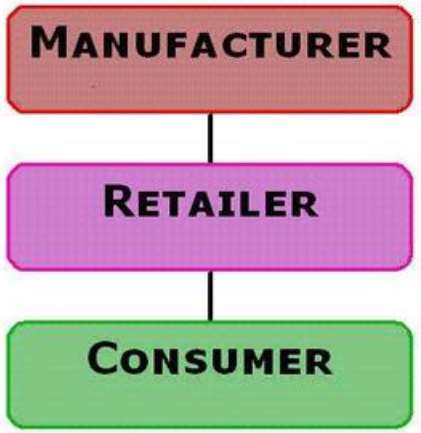


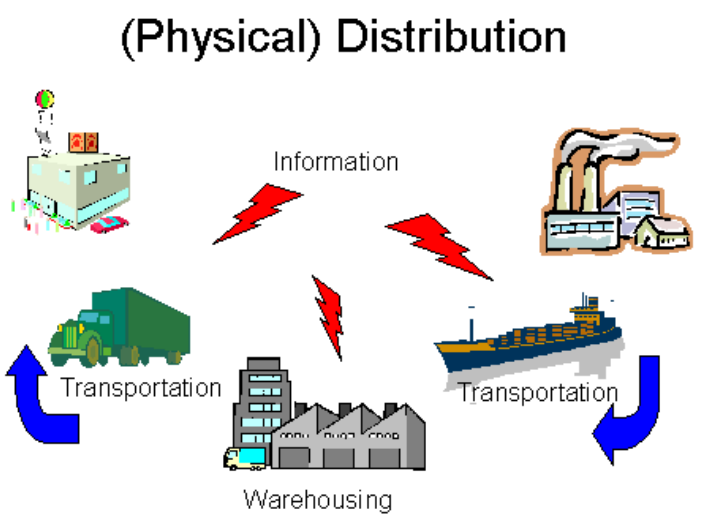
Methods

On-line delivery tracking

Sending invoice with the shipment

On-line webshops and marketplaces

External transporters



LECTURE 8.

Lecture 8 – Recycling and reverse logistics

8.1. Recycling and its logistics

Targets of recycling

The targets in recycling are generally related to the environmental and social requirements, strongly regulated by the countries and the European Union and United Nations. The targets are simple: less waste, environmental pollution and emission and the sustainable development on the Earth. In logistics aspect, it is about the materials handling.

The first targets are the environment-friendly logistic processes and tools:

1. Transportation with lowest emission, with lowest road load.

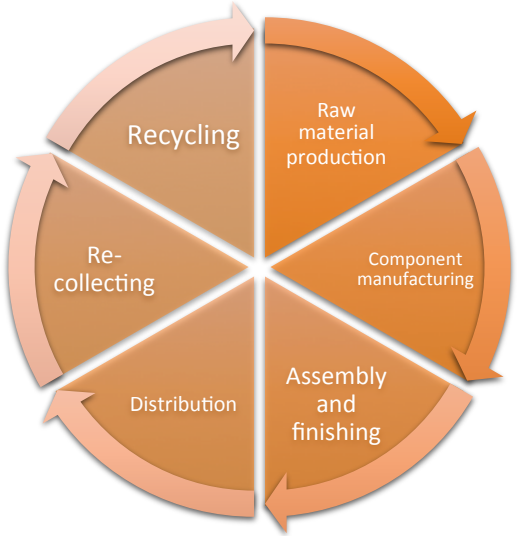
2. Low emission aircrafts.

3. Scheduling the transportation with less routes, although the Just-in-Time requirements orders the opposite

4. low emission manufacturing

If we look at the 4th point, the technology has got an important role in environment-friendly manufacturing of all goods, included the materilas handling and transport systems and its components and tools. But on other hand, the logistics can help the environment-load, if it helps to recycle the end-of-life products and in-process remaining slivers and scrap.

Recycling the used products for raw materials



The logistic processes helping the recycling processes with efficient logistic services are the so called reverse logistic processes.

Its targets are:

– Less waste

– Less primary raw material usage

– More reusable product, components

– Efficient, environment-friendly recycling!

Requirements for environment-friendly recycling

The processes of the environment-friendly recycling technology

– Renewing of used products

– Acquiring useful components and materials

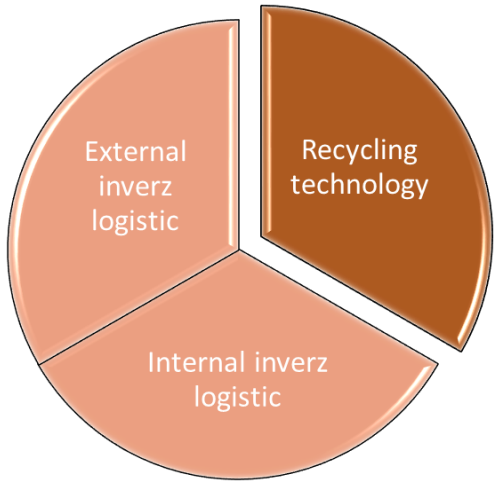
– Appropriate reverse logistics:

  – Within the company

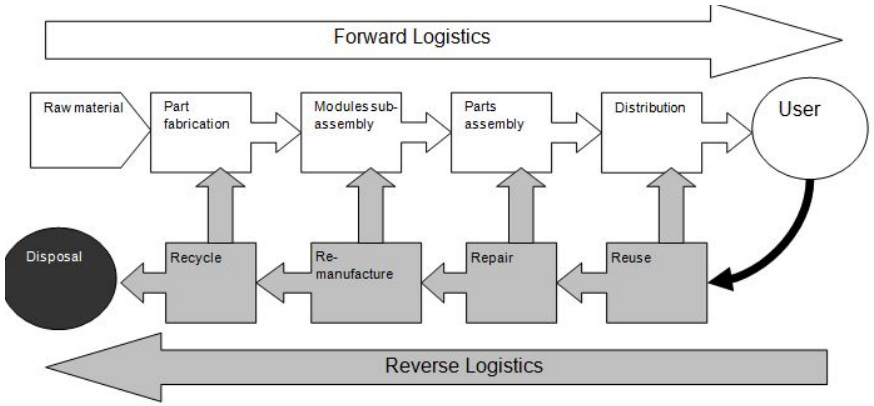
  – Within the recycling logistic network

But the recollecting of end-of-life, but particularly useful products are not easy, it is the reverse process of the distribution. Previously, we saw, that the distribution is a difficult, expensive and customer-sensitive process. The reverse of it is more difficult. The buying wish of a customer is higher, than the wish to give back an end-of-life, recyclable product. It is easier for them to dispose.

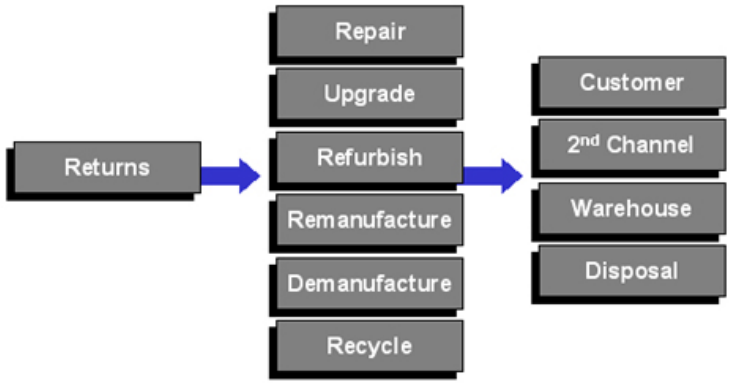
Therefore the reverse logistics takes the larger amount of the recycling, so it is very reasonable to optimize the reverse logistic methods.



The next figure about the reverse logistics summarize the recycling opportunities and technologies available and today generally compulsory for the companies. Each of the recycling technologies provides secondary input or raw material for the appropriate stage of manufacturing process.



There are more technologies to utilize a malfunctional or end-of-life product or component, e.g. refurbishing, remanufacturing, upgrade or simply repair or rebundle them. Not all of the material mass can be utilized, but the rate of recycled amounts raises.



The last figure of US Government shows the priorities in the recycling!

Source: www.epa.gov

Lecture 8 – Recycling and reverse logistics
8.1. Recycling and its logistics

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8.1. Recycling and its logistics

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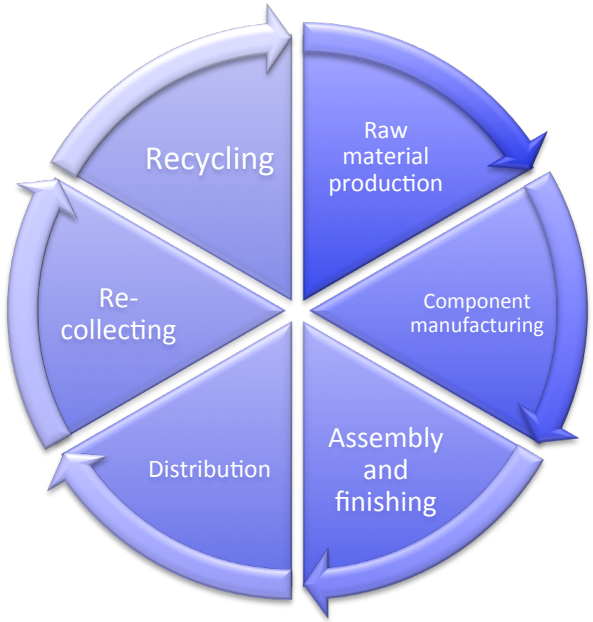
Targets of recycling

Recycling the used products for raw materials

- Less waste
- Less primary raw material usage
- More reusable product, components
- Environment-friendly recycling!



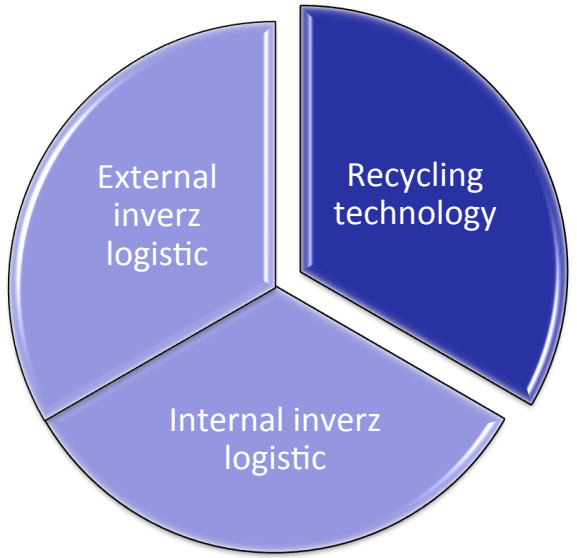
Requirements for environment-friendly recycling

Environment-friendly recycling technology

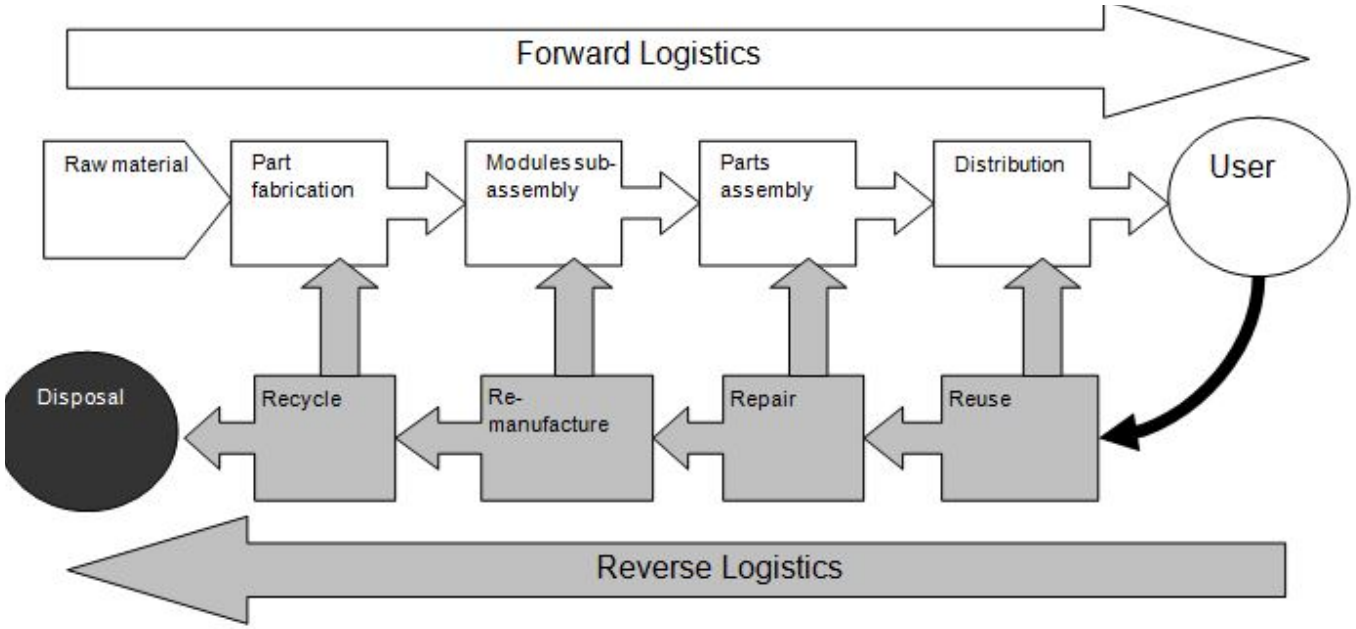
- Renewing of used products
- Acquiring useful components and materials

Appropriate inverz logistics:

- Within the company
- Within the recycling logistic network

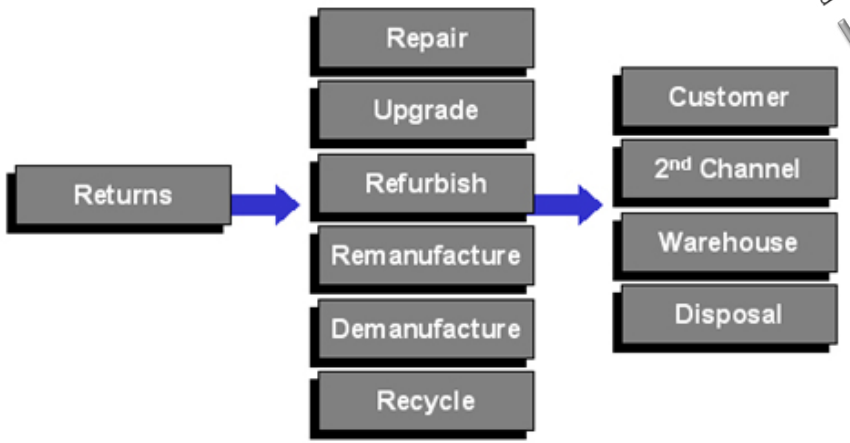


Reverse logistics

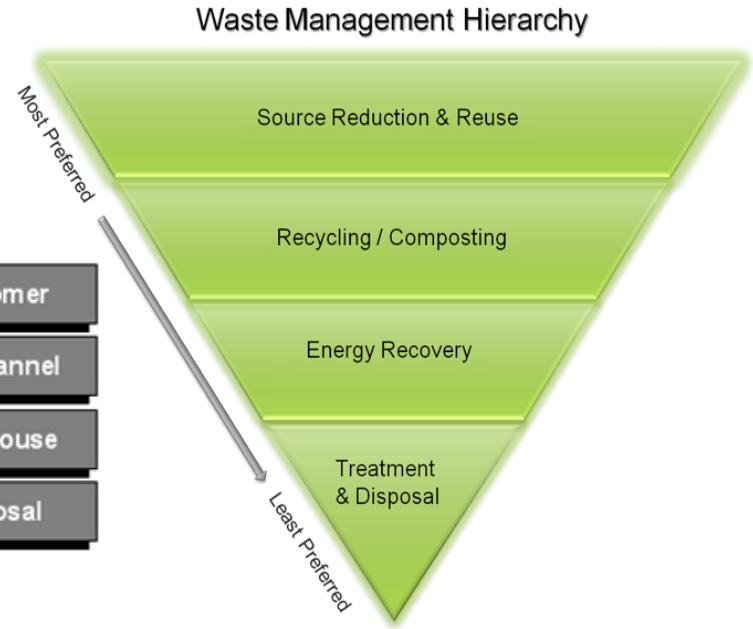


Technologies

More utilization from product to waste



Source: Steve Banker, e-Business and Reverse Logistics *http://www.ebizq.net/*



Source: www.epa.gov

Lecture 8 – Recycling and reverse logistics

8.2. Recycling at the companies

The reverse logistics deals with the in-process manufacturing materials and products at a company.

The reusable materials are collected in three groups:

– Unit load devices, like pallettes

– Shavings, sliver, lubricants

– Work piece scraps

Additional there are material classes to be recycled according to the legal regulations:

– Supply wrappings

– (Hazardous materials)

– (Technological water)

– (Remaining energy)

The last three classes requires special handling technology, therefore the reverse logistics do not handle these special remaining resources.

System components and operations are:

– 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

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8.2. Recycling at the companies

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8.2. Recycling at the companies

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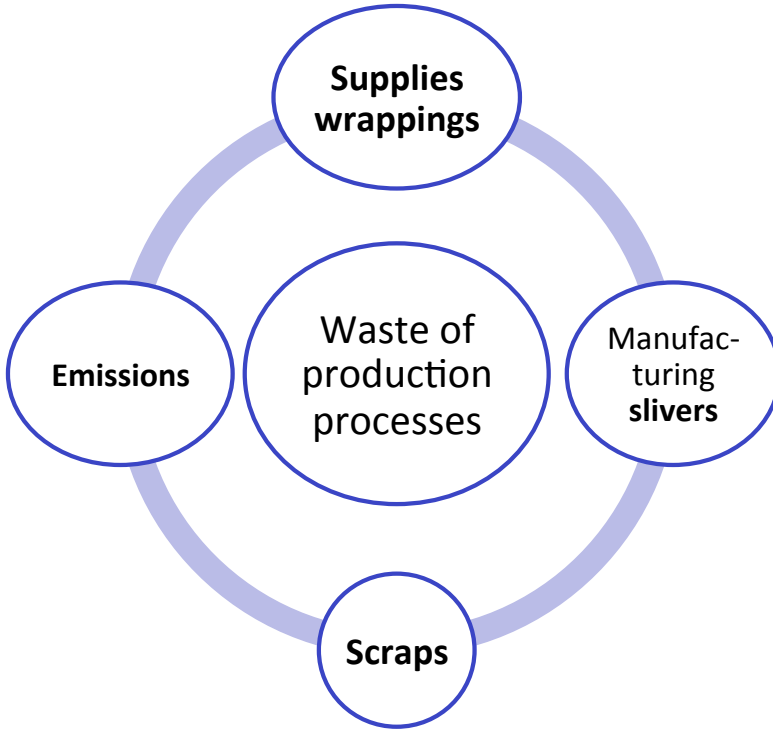
Manufacturing reverse logistics at a company

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

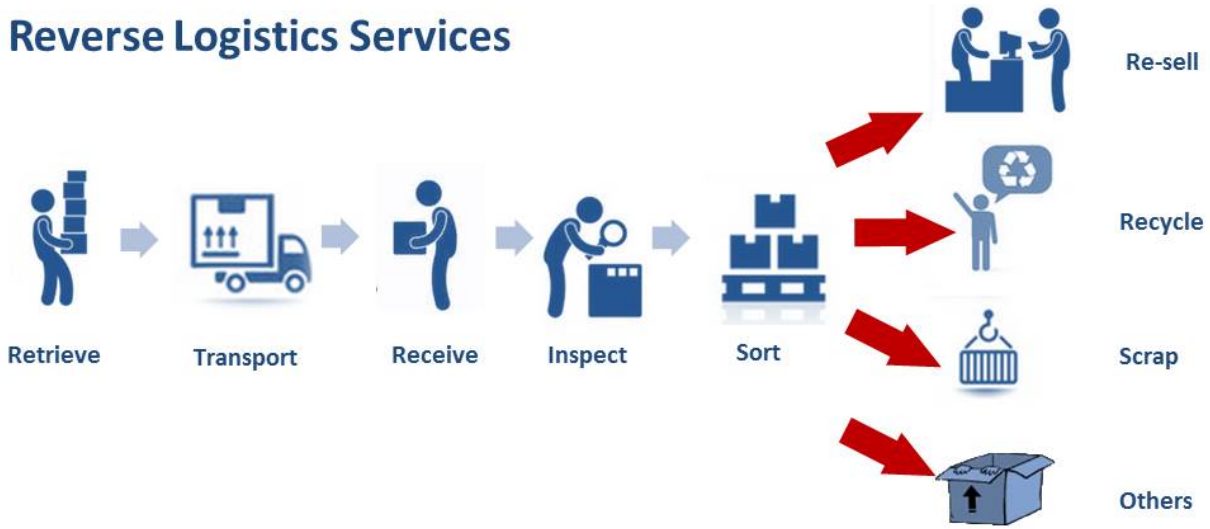
- Work station storages
- Transportation to central recycling storages
- Sorting (if needed)
- Packaging and labelling
- Administration! (ISO 14001)
- External transport scheduling
- Loading to external transport machine

Lecture 8 – Recycling and reverse logistics

8.3. Recycling logistics networks

In previous unit, we discussed the internal reverse logistics of an enterprise. Of course, there are external recyclers contracted for recycling, what materials are not available to recycle internally. To reach these external recyclers, the external reverse logistics has the role to solve the collecting, inspecting, sorting, storage and transportation tasks optimally.

The targets are same, to raise the recycled amount with high efficient logistic services.



Participants in these external extended networks for recycling:

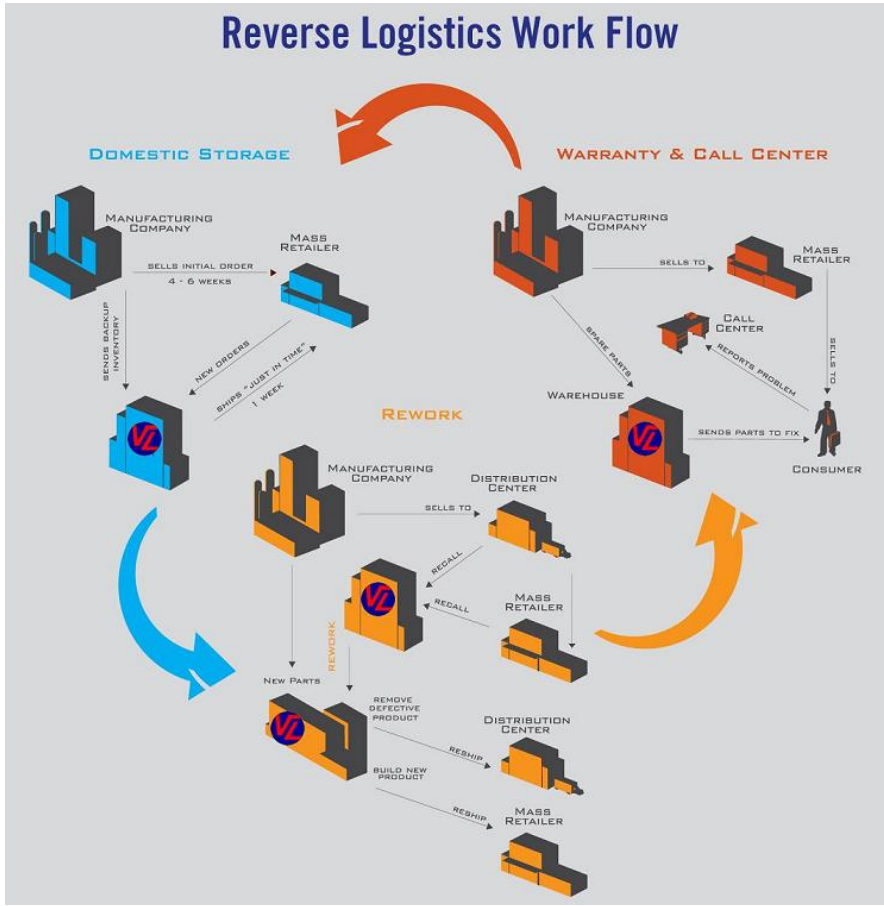
– Distributors, Retailers: providing collecting the end-of-life products and inciting the customers with advertisements.

– Customers: hopefully have got environmental thinking

– 3PL reverse logistics: providing appropriate and efficient services

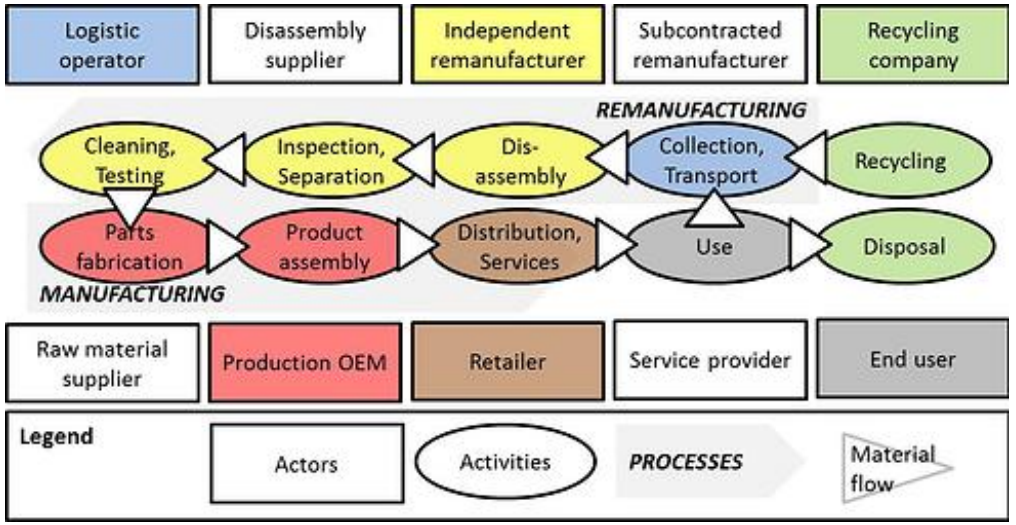
– Recyclers: operates the technology for profit

– Manufacturers: hopefully have got environmental thinking



An example provided by Venture Logistics for extended networks for recycling

Additionally, the internal remanufacturing processes in the enterprise reverse logistics can be outsourced with all of the reverse logistic operations, as well.



Features:

– Less new material usage

– Less disposal costs

– More and more handling costs of reusable waste

– Huge bad quality mixed waste stocks

– Hard to plan!

  – Capacity planning

  – Recycled material leaks: for the paper recyclers, the lack of paper waste is often problem

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8.3. Recycling logistics networks

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8.3. Recycling logistics networks

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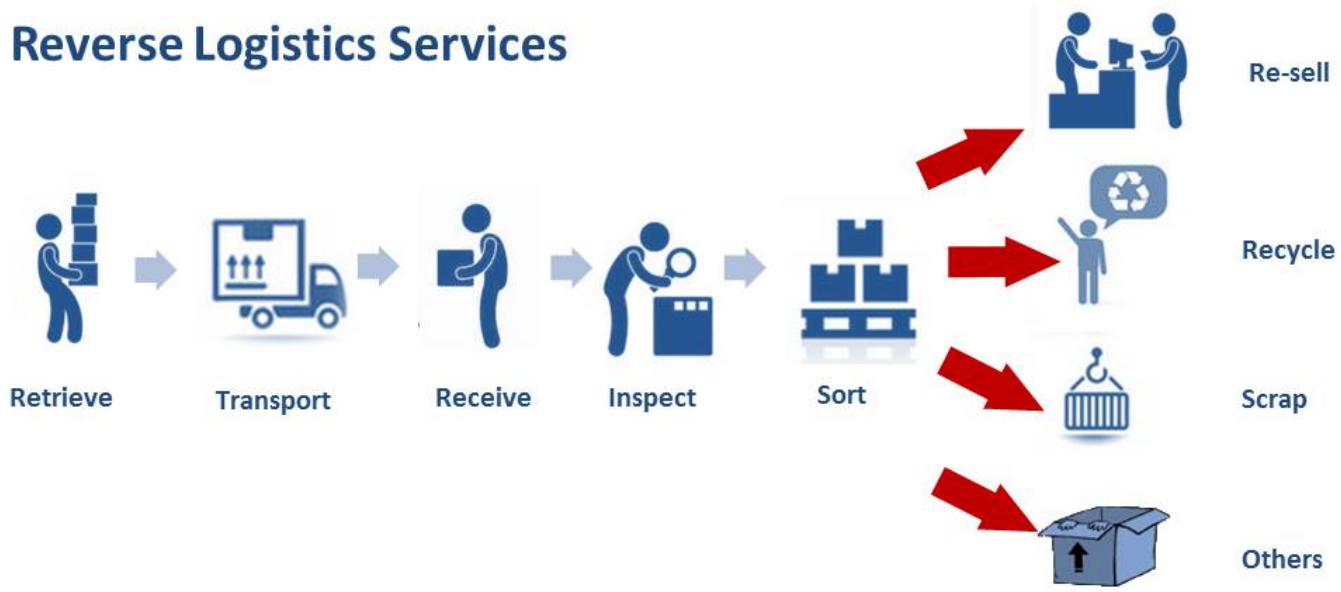
Targets

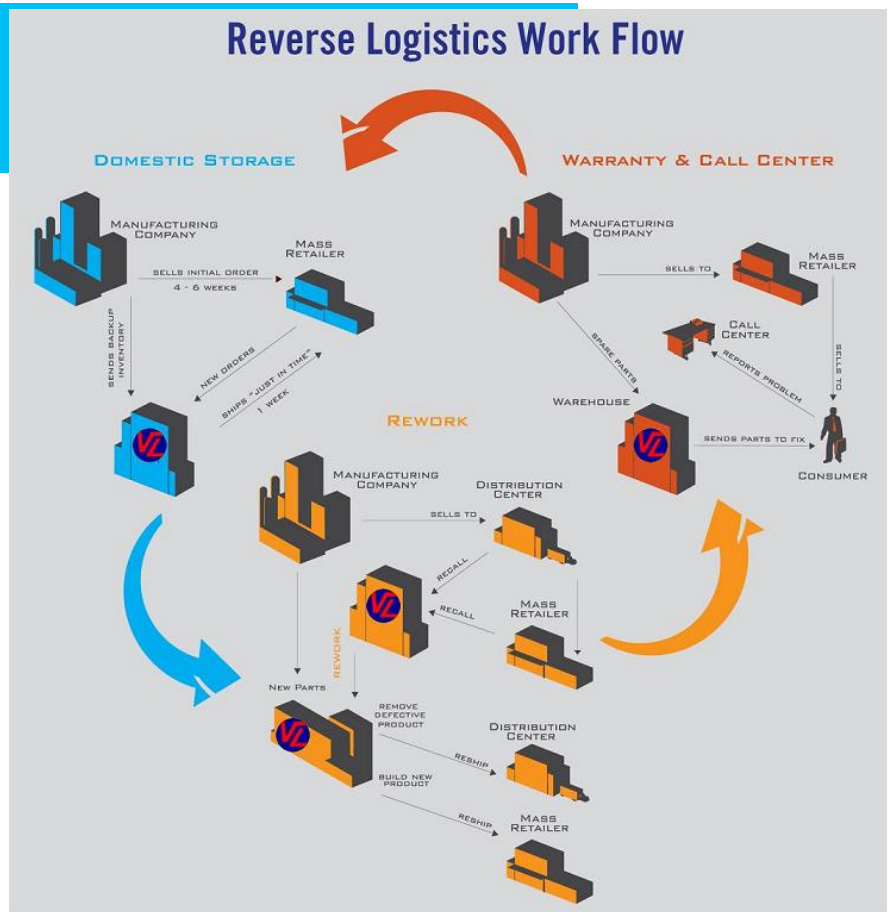


Source: www.basexsolutions.com

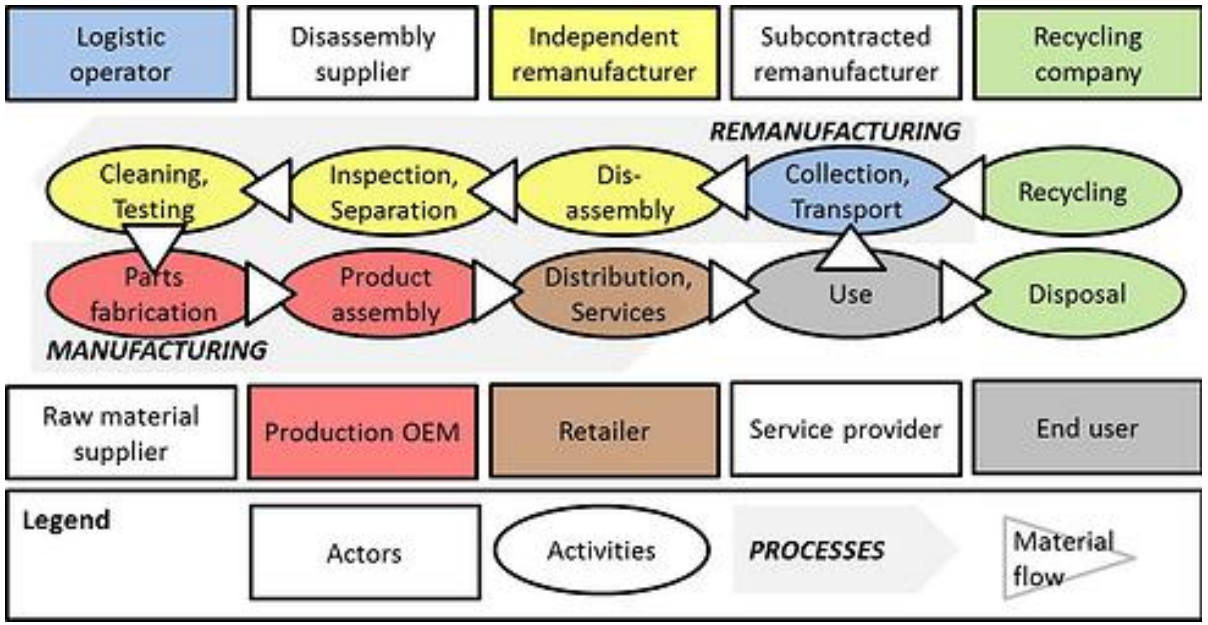
Extended networks for recycling

Participants:

- Distributors
- Retailers
- Customers
- 3PL reverse logistics
- Recyclers
- Manufacturers



Extended networks for recycling



Source: Guidelines for Remanufacturing Networks 2015 (www.remanet.org)

Costs

Less new material usage

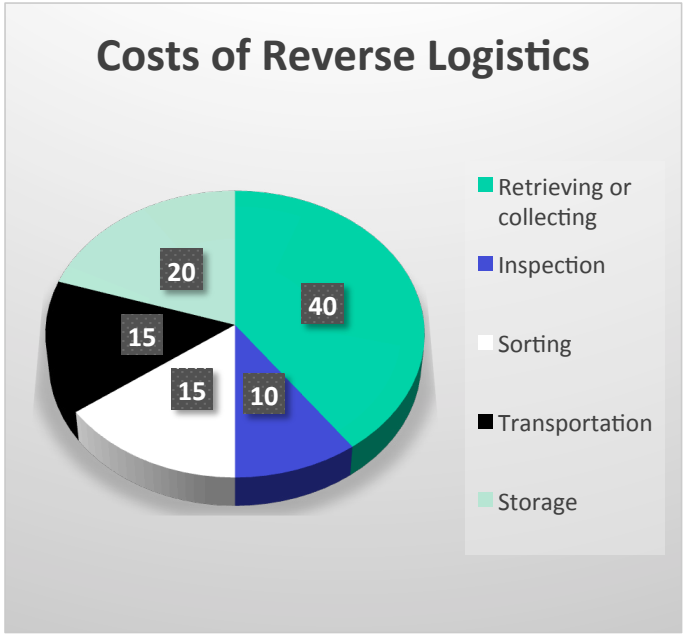
Less disposal costs

More handling costs

Huge recycling stocks

Hard to plan!

- Capacity planning
- Recycled material leaks



LECTURE 9.

Lecture 9 – Cost and value of the logistics
9.1.1. The logistics serving the customer satisfaction

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Lecture IX – Cost and value of the logistics

9.1.1. The logistics serving the customer satisfaction

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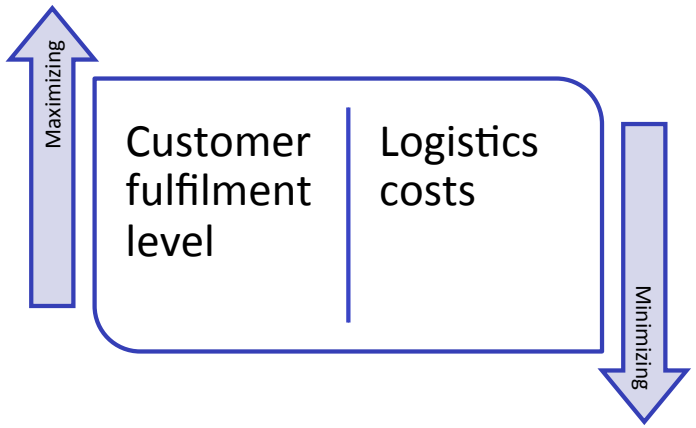
Connection between the customer satisfaction and the logistic

Marketing defines a customer fulfilment level

Logistics has to provide it for adequate costs

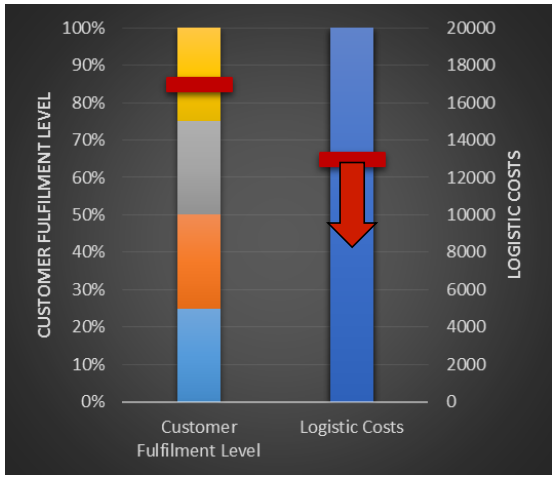
Optimization methods:

- Minimizing costs
- Maximizing fulfilment level

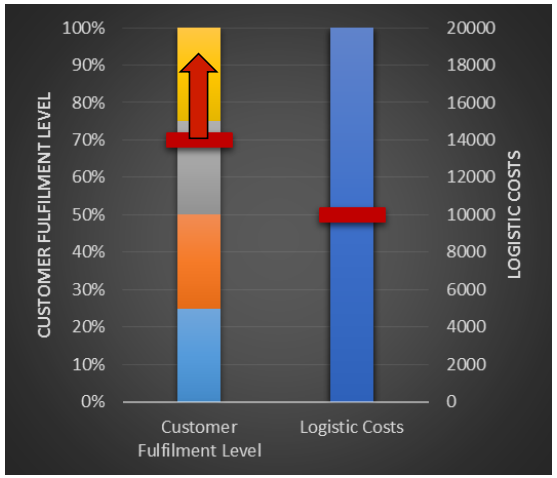


Optimization of Logistic Costs

Minimizing the costs to the predefined customer fulfilment level



Maximizing the fulfilment level at the enabled logistic costs



Lecture 9 – Cost and value of the logistics
9.1.2. The key performance indicators of Logistics

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Lecture IX – Cost and value of the logistics

9.1.2. The key performance indicators of Logistics

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Logistics Performace Measurement Requirements

Key Performance Groups

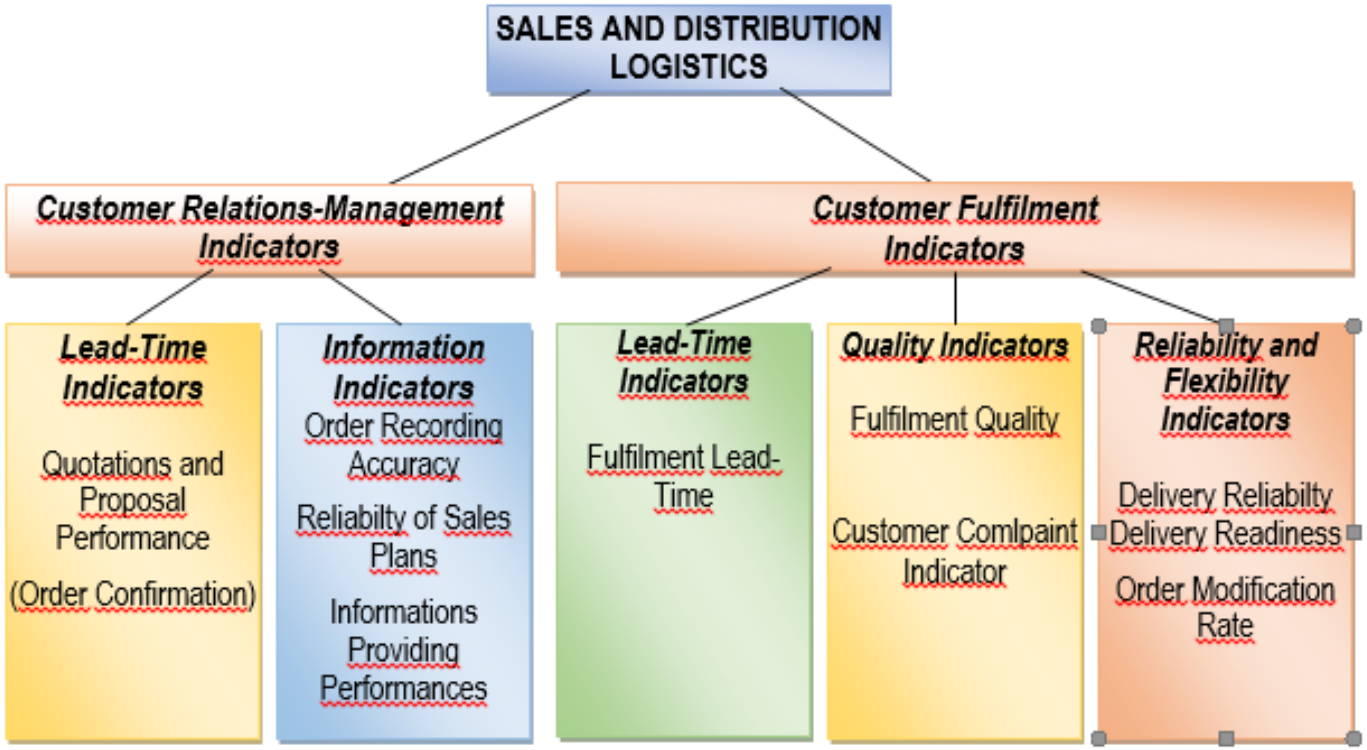
Economic efficiency indicators mostly defined by financial controlling	Quality indicators mostly defined by standards	Customer service level indicators defined – by best practice – by the company's customer

INNOVATION CAPABILITY

Customer fulfilment level and customer satisfaction based on partial logistic goals:

- Short Delivery Lead Time
- Quality: Right Product, Right quantity, Right Time
- Flexibility: order modification, innovation capability

Logistics Performance Indicators related closest to the Customer Fulfilment level



Lecture 9 – Cost and value of the logistics
9.1.3. Cost of the logistic operations

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Lecture IX – Cost and value of the logistics

9.1.3. Cost of the logistic operations

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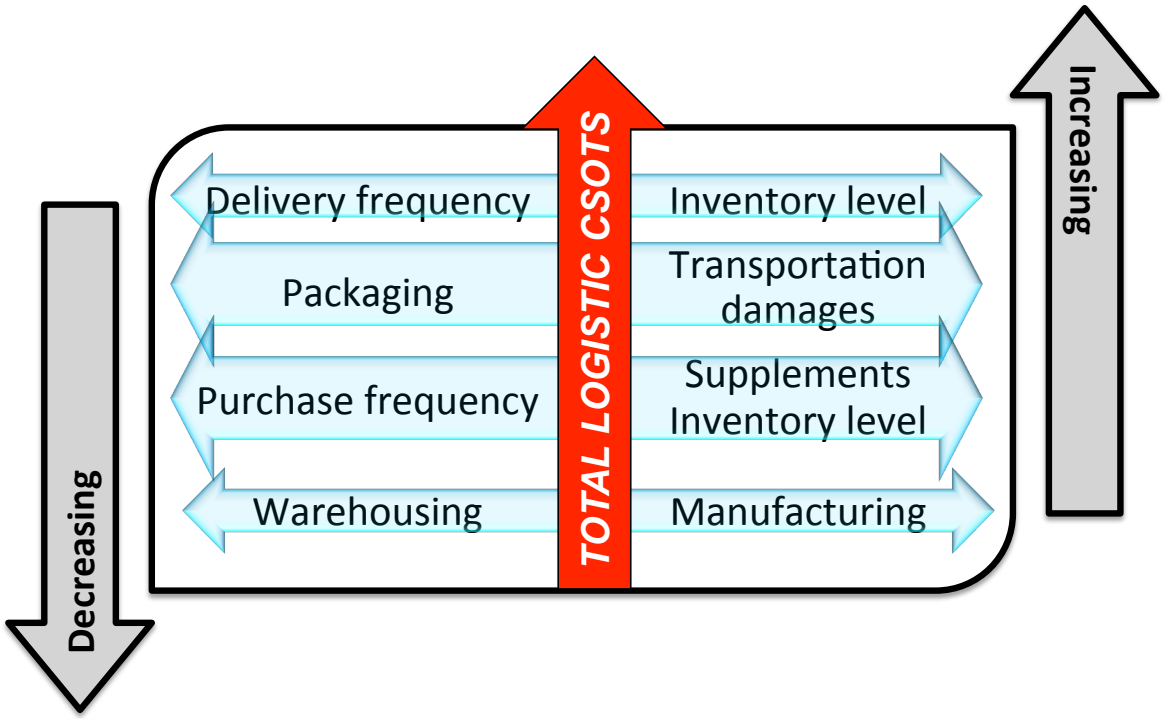
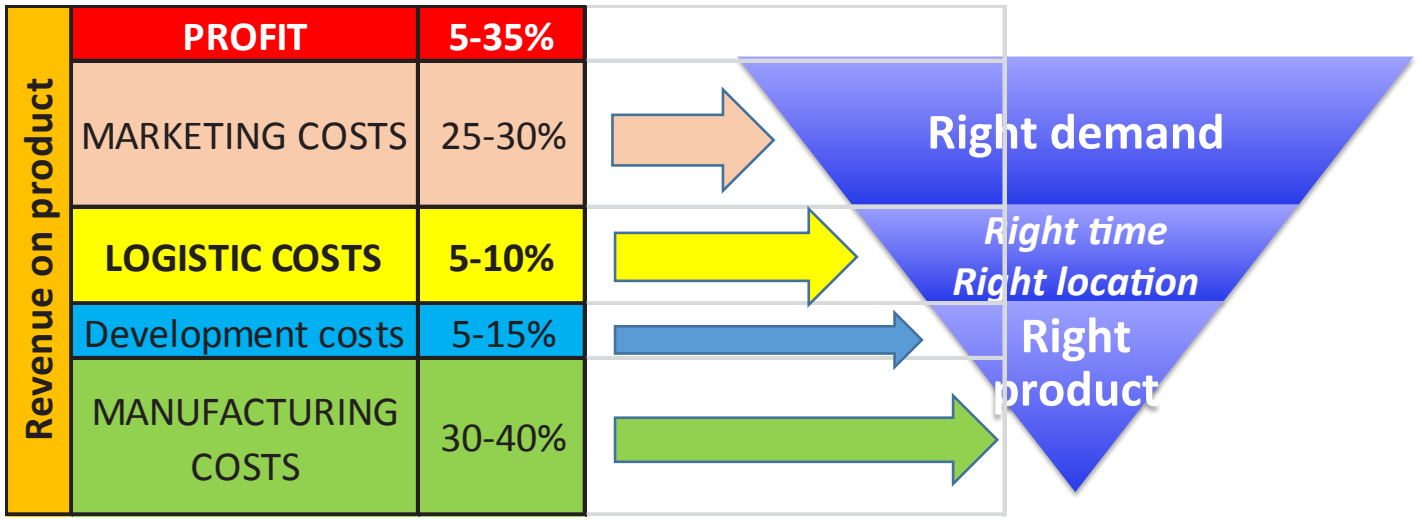
Conflicts of Logistic Cost Components



Importance of Logistic Costs



Lecture 9 – Cost and value of the logistics
9.2. Measurement and analysis methods

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Lecture IX – Cost and value of the logistics

9.2. Measurement and analysis methods

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Directions of measurement and analysis methods in logistics

Controlling methods

- Generally based on financial indicators
- From 2000, new direction is the natural-indicator based logistic controlling methods

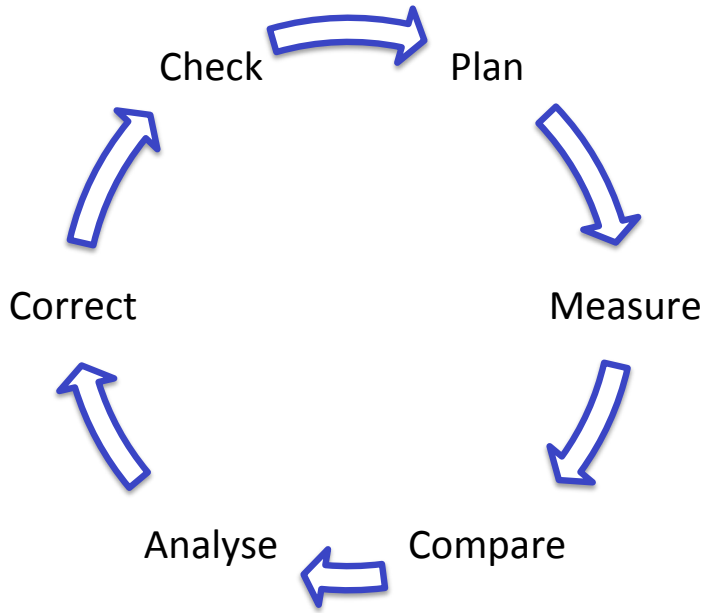
Operations analysis methods

- Based on direct natural indicators of logistic operations
- Primary data acquiring at data source
- Secondary data acquiring based on historical transactional data in logistic information system

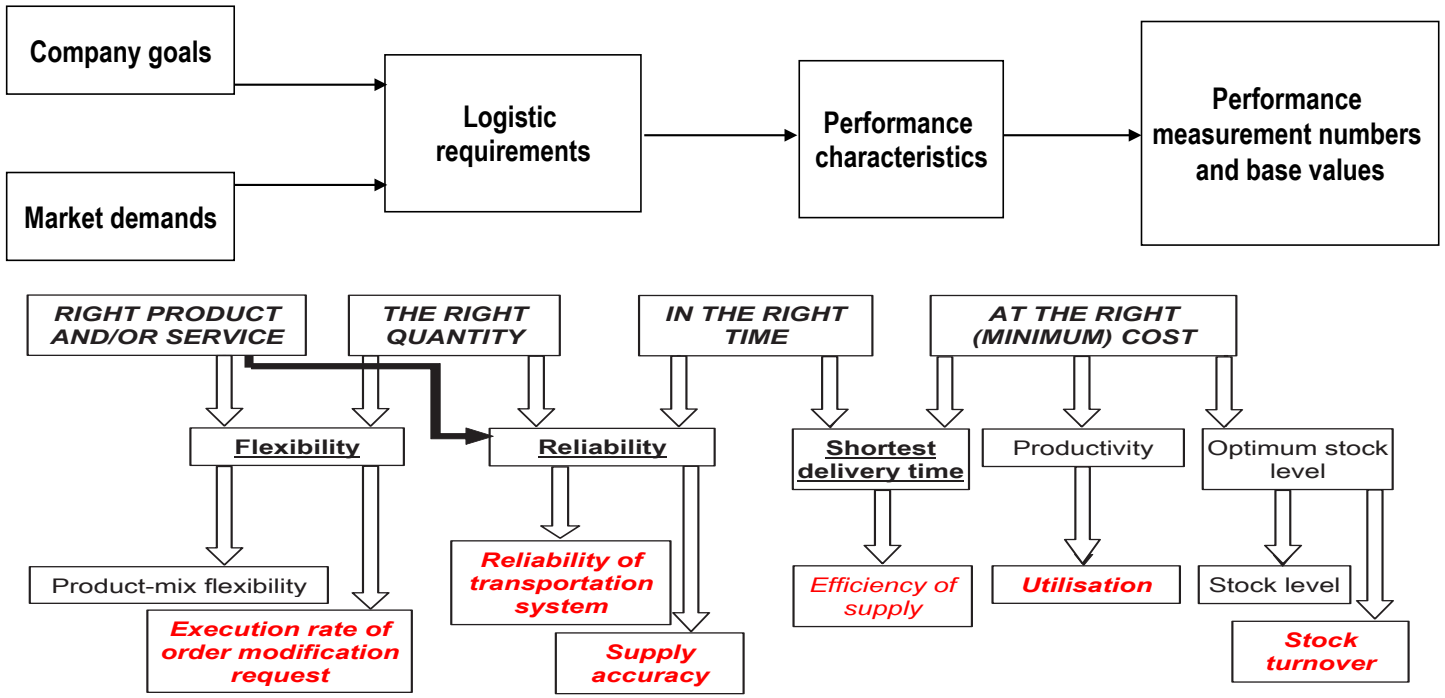
Logistic controlling mechanism

1. Planning and targeting of logistic processes
2. Continuous measurement of the operations
3. Comparison of planned and actual value
4. Analysis of the difference: determining, what to do?
5. Correct the differences
6. Checking the changing

Very similar to the PDCA cycle.



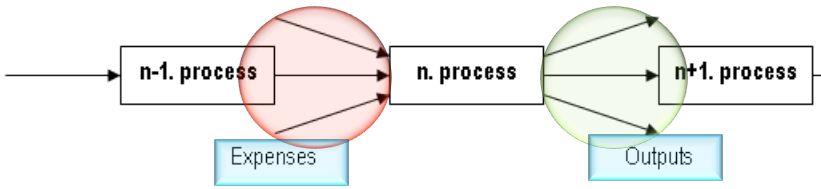
Creating measurement numbers



Characteristics of measurement

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 labour work, energy, information
- Transformation factors:
  - Lead time, capacity, inventory level
- Outputs:
  - Delivered, produced, transformed, transported quantities, amounts, volumes
  - Provided information

LECTURE 10.

Lecture X – E-commerce served by e-logistics

10.1. E-commerce basics

E-Technologies are Business or Public Administration Service processes conducted on open, on-line organizational computer networks.

Main features:

– Internet-based communication and data transmission

– Web-based graphical user interface

– Internet user society and ethics,

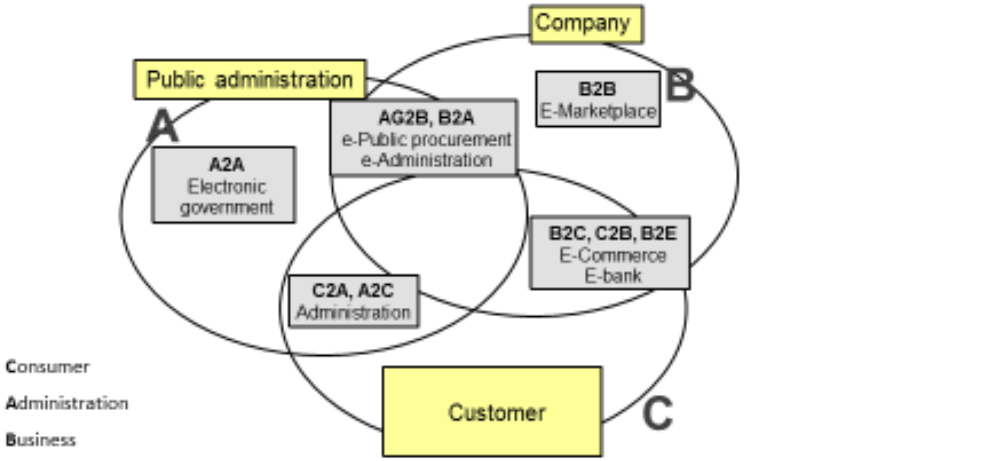
– Legal background required and created:
  – e-payment,

  – webshops,

  – e-governance,

  – E-bidding regulations.

Commercial relationships in cyber-space



Source: P- Bodinszky : E-Commerce, e-Logistics, Lecture Slides, Szent István University, Hungary

Feautres of E-commerce

– Security and privacy

– No personality. Who are we dealing with?

– Trust

– Inadequate system capacity

– Difficulties in system integrity

Lecture 10 – E-commerce served by e-logistics
10.1. E-commerce basics

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Lecture X – E-commerce served by e-logistics

10.1. E-commerce basics

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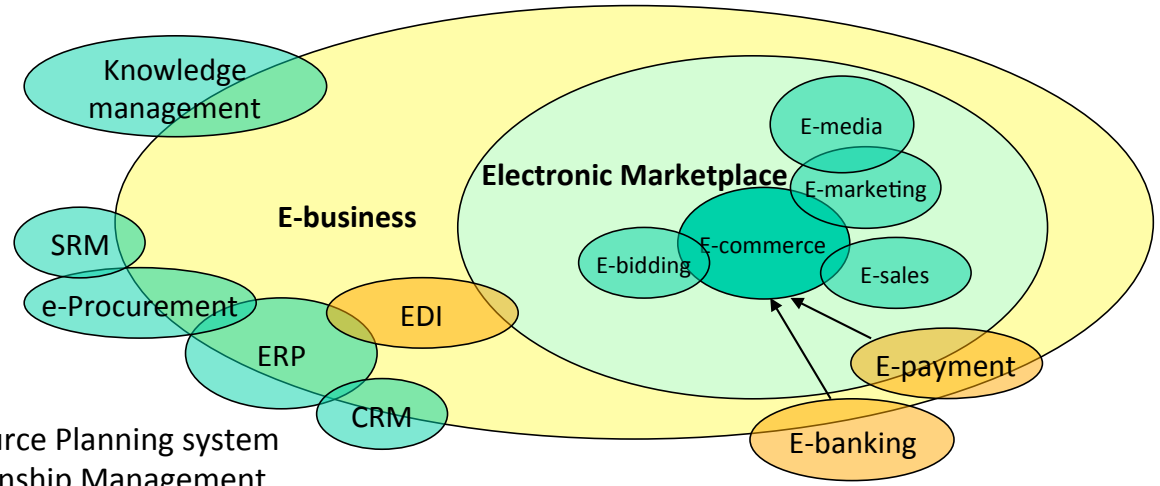
E-business and E-Commerce

E-Business: Market activities conducted in cyber space via computer networks
E-Commerce: Computer networks and generally but not exclusivelly web-based applications for commercial transactions



ERP=Enterprise Resource Planning system
SRM=Supplier Relationship Management
CRM = Customer Relationship Management

Source: P- Badinszky : E-Commerce, e-Logistics, Lecture Slides, University Holy Stefan, Hungary

E-Technologies

Business or Public Administration Service processes conducted on open, on-line organizational computer networks

Main features:

- Internet-based communication and data transmission
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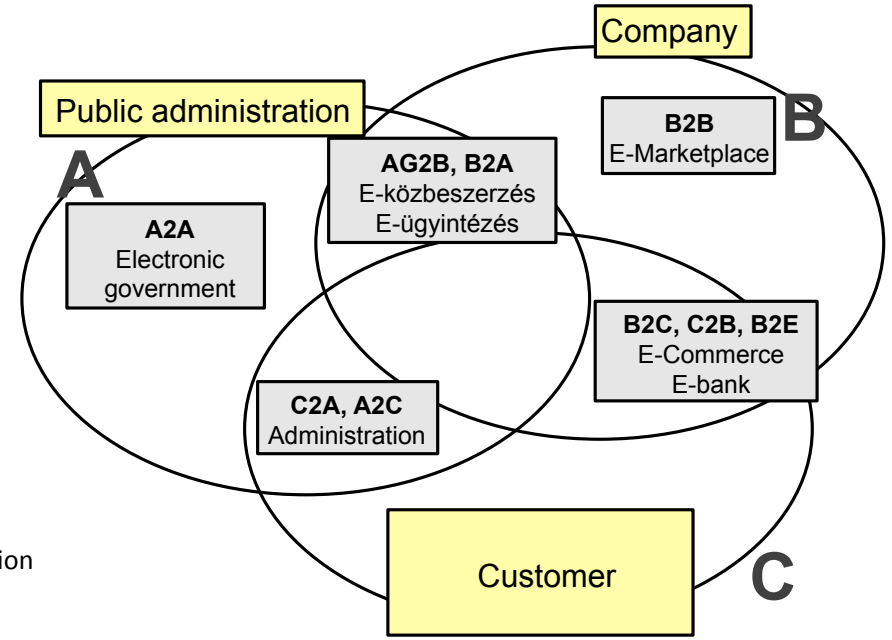
Commercial relationships in cyber-space



Consumer

Administration

Business

Source: P- Badinszky : E-Commerce, e-Logistics, Lecture Slides, University Holy Stefan, Hungary

Feautres of E-commerce

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Lecture 10 – E-commerce served by e-logistics

10.2. Outsourcing of logistics

Outsourcing is a today's basic practice

1. for cleaning the company portfolio and activities

2. to find the best solutions for non-core activities

3. to make the internal activities competitive

4. to extend the business fast way

Brand new fields are outsourcing of IT systems by using Cloud computing and Software-as-a- Service solutions

Benefits

– Stronger core activities

– Cost-efficient services

– Less problems deal with

Handicaps

– Dependency from external services

– Organization and coordination difficulties

– Privacy risk

Logistic processes and operations in outsourcing

– Transportation

– Warehousing

– Order picking

– Administration:

  – Custom crearance

  – Insurance

– Additional services:

  – Packaging

  – Unit load building o Labelling

  – Document handling

3rd Party Logistics:

Professional, cost-efficient logistic services High capacity techniques:

– Automated high rack storages

– Integrated open on-line information flow

– Appropriate truck fleet

– Advanced knowledge of logistic market

Results

Benefits for customers:

– Lower specific costs

  – in transportation

  – in warehousing

  – in materials handling o in administration

– Less problems with logistics

Benefits for 3PL service providers:

– Lot of customers makeable to build efficient systems and services

– Continuous development opportunities

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Lecture X – E-commerce served by e-logistics

10.2. Outsourcing of logistics

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Outsourcing

Todays a basic practice

- for cleaning the company portfolio and activities
- to find the best solutions for non-core activities
- to make the internal activities competitive
- to extend the business fast way
- Brand new field: could computing and Software-as-a-Service

Benefits

- Stronger core activities
- Cost-efficient services
- Less problems deal with

Handicaps

- Dependency from external services
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Outsourcing logistics

Transportation
Warehousing
Order picking
Administration:
- Custom crearance
- Insurance

Additional services:
- Packaging
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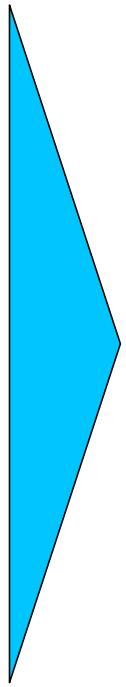
- Document handling



3rd Party Logistics:
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  - in materials handling
  - in administration
- Less problems with logistics

Benefits for 3PL service providers:

- Lot of customers
- ***Continuous development opportunities***

Lecture 10 – E-commerce served by e-logistics

10.3. E-logistic services

E-Logistics: functions of flow and control of materials, products, services and related information, which efficiently apply the internet and digital network.

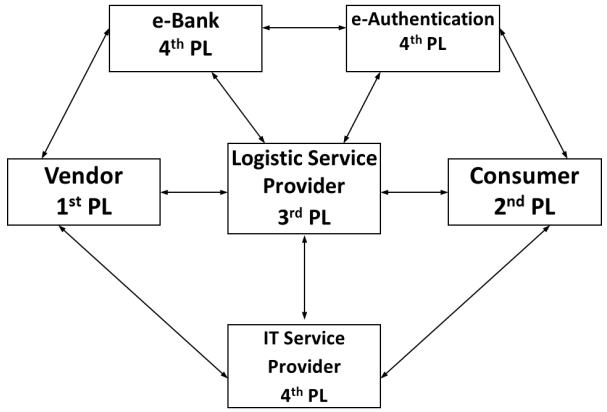
Benefits:

– fast response for customer requirements

– optimized information flow from customer to manufacturer

– less stock in distribution channel

The Diamond model of E-logistics is similar to the model of e-Commerce, but it highlight the role of the authentication service providers and the levels of participation in electronical commercial transactions.



Source: Badinszky, P. (Ed.): *E-Commerce, e-Logistics, Lecture Slides.* Szent István University.

Roles are reformed in e-logistics:

- Traditional:
  - Vendor
  - Consumers
- Outsourcing:
  - 3PL services
- e-Logistics:
  - e-Bank
  - e-Authentication
- Common:
  - IT services

What type of products are delivered in e-Logistics?

Virtual products:

- Descriptions, Brochures, Catalog entries
- Pictures, figures

– Multimedia

about real products:

– about physical products

– about digital and digitalized products

In other words, these are the product information ont he internet, ont he web pages.

Physical Products cannot be digitalized for electronical delivery

Digital productscannot be delivered in materialized, phyisical format, only provided electronically, like on-line services:

– information providing

– information processing

– consulting on-demand

Digitalized products:

– Deliverable in physical format and avaliable on-line

– Easy-to-digitalize or available on digitalized data storage media

– Books, softwares, multi-media

Lecture 10 – E-commerce served by e-logistics

10.4. City logistics

Targets

- Reduce the road traffic in big city centers o Traffic jam reduction
  - Noise reduction
  - Exhaust emission reduction
- Reduce the transportation costs and customer prices
- Provide reliable and continuous supply
- Consolidate the material flow and storage processes

Summary of the method

- Cross-docking function for order picking from incoming shipment
- Rest of shipment works as buffer stock
- On-line shipment tracking for the retail shops and customers
- Shipment organizing according to commonly transportable products

– Route planning

– Common dispozition for customer orders

– Faster response for customer requirements

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10.4. City logistics

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Targets

- ✓ Reduce the road traffic in big city centers
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  - Exhaust emission reduction
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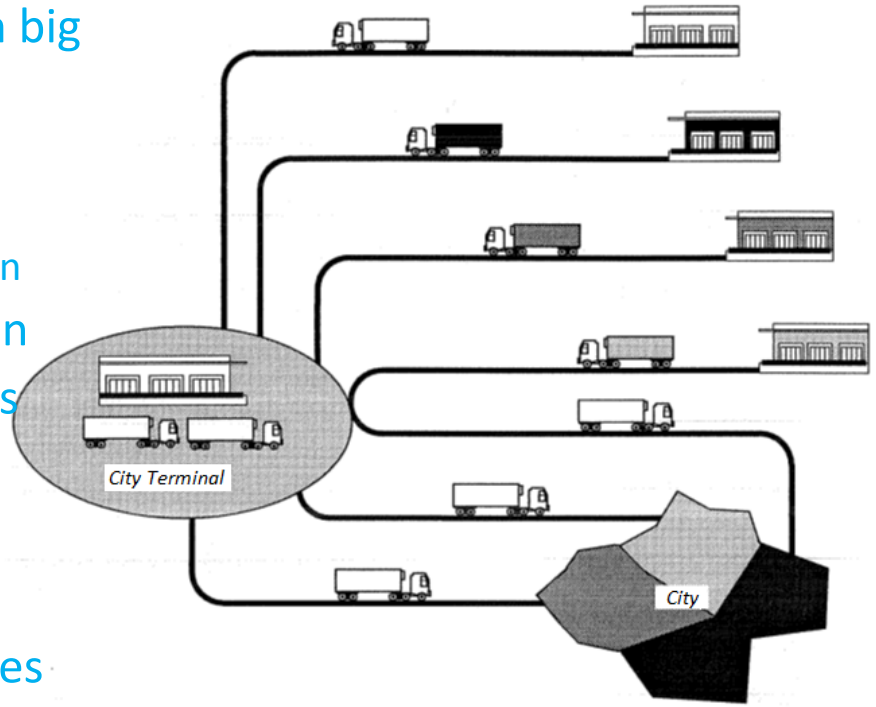
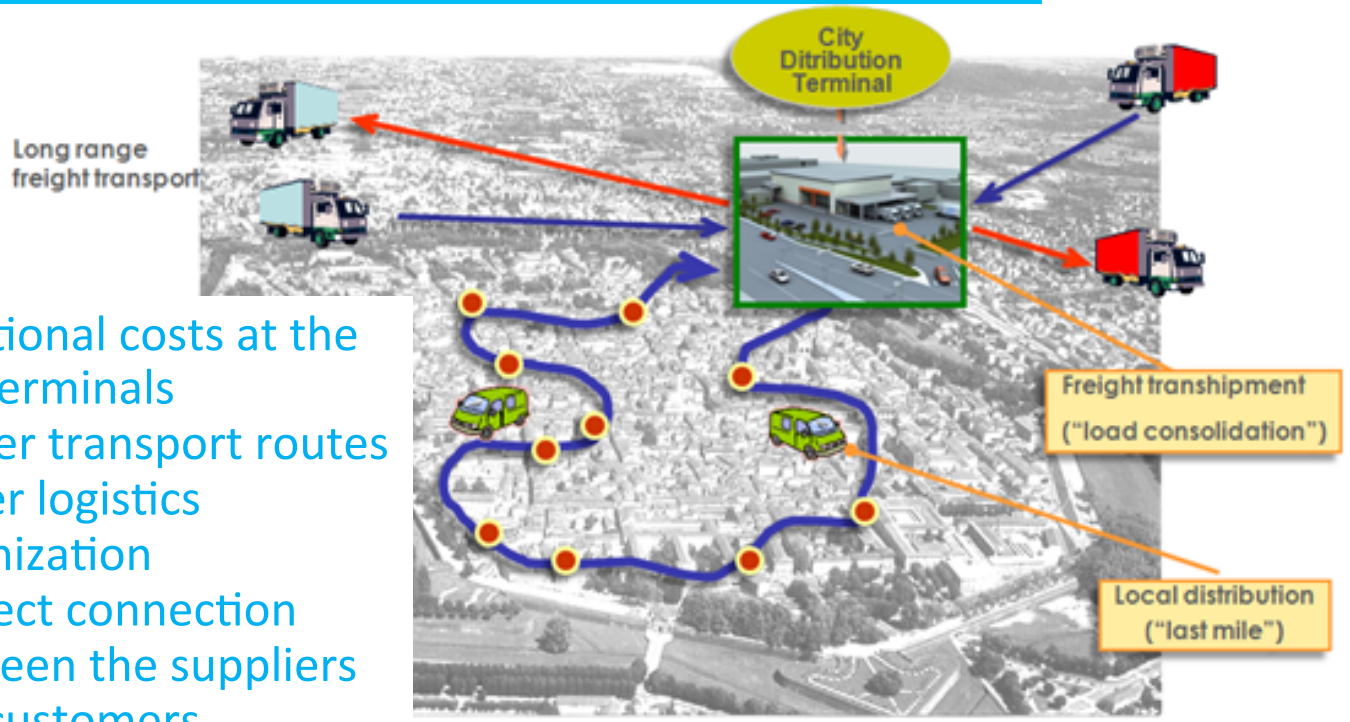
- ✓ Provide reliable and continuous supply
- ✓ Consolidate the material flow and storage processes



Structure and features

- Additional costs at the city terminals
- Longer transport routes
- Larger logistics organization
- Indirect connection between the suppliers and customers



Source: http://www.research.softeco.it/

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LECTURE 11.

Lecture 11 – LOGISTIC INFORMATION SYSTEMS
11.1. The information flow and the materials flow

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Lecture XI. – LOGISTIC INFORMATION SYSTEMS

1. The information flow and the materials flow

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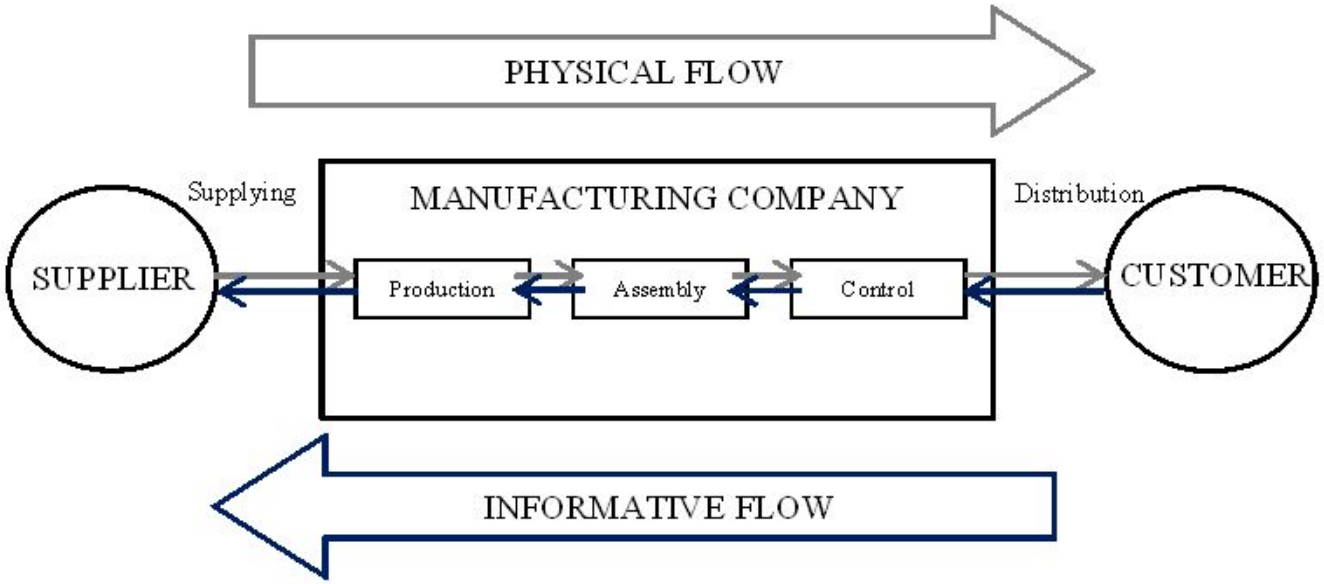
Logistic information flow



Lecture 11 – LOGISTIC INFORMATION SYSTEMS
11.2. LIS in ERP systems

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Lecture 11.

LOGISTIC INFORMATION SYSTEMS

2. LIS in ERP systems

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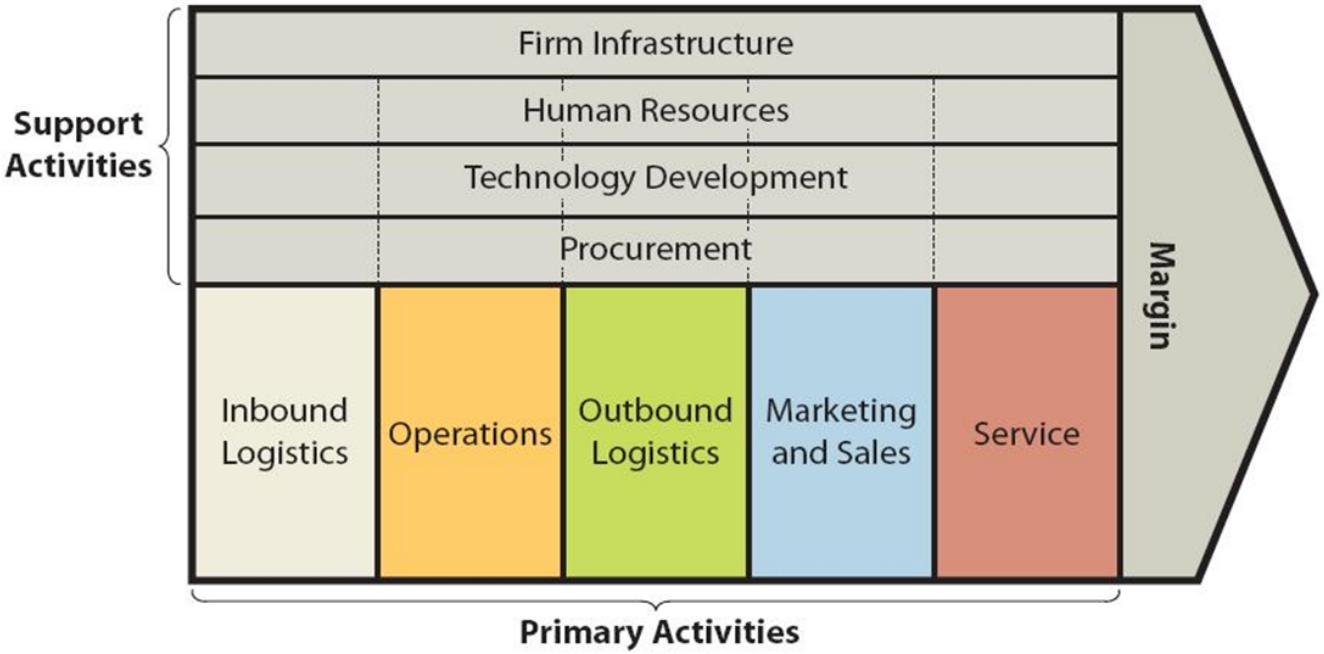
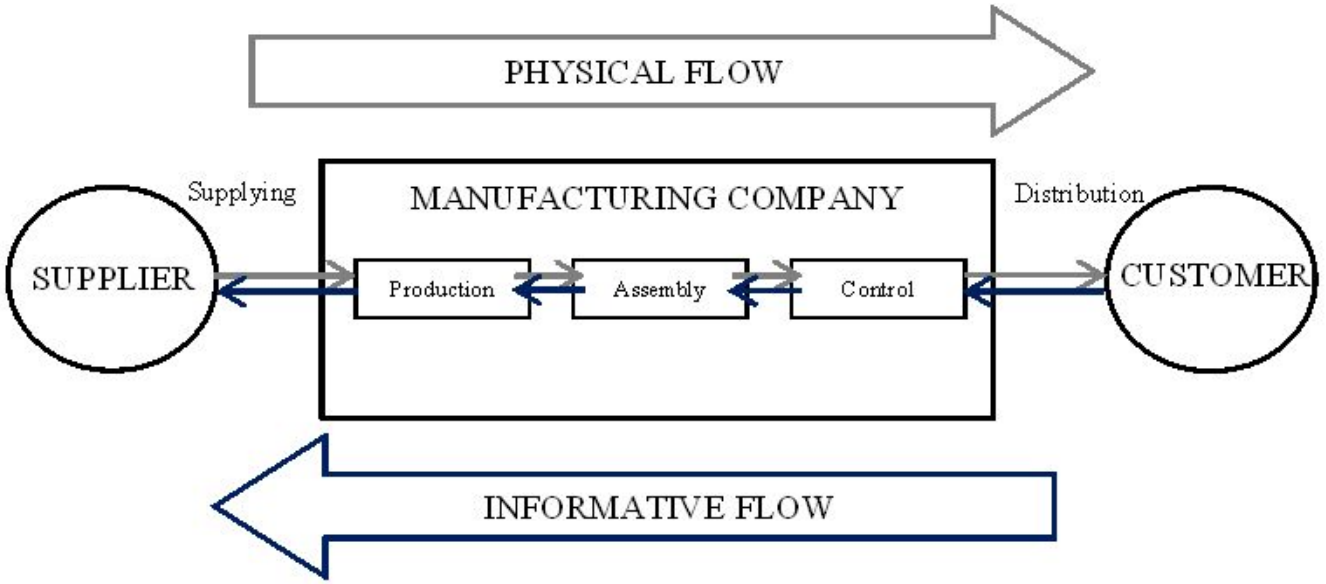
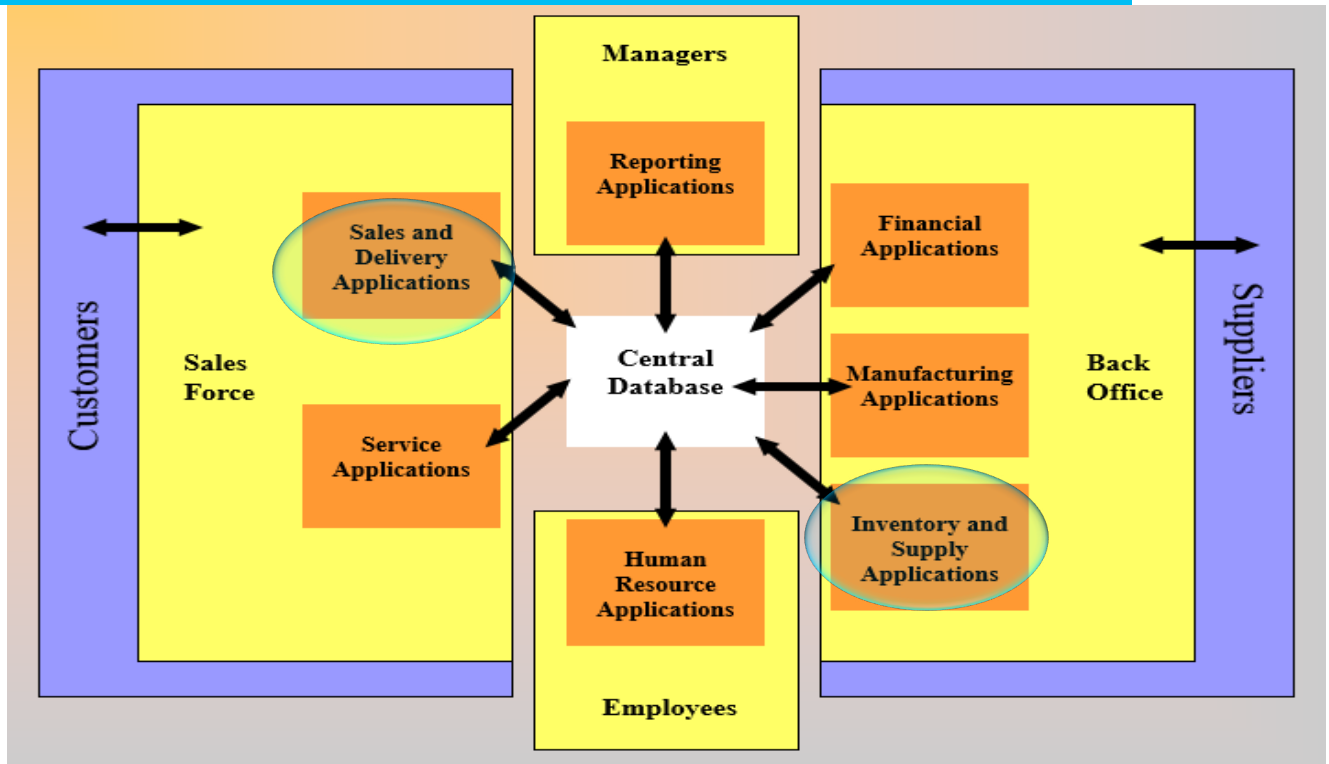
Porter Value Chain Concept



Logistic information flow



Davenport-model of ERP systems



Logistic Functional Fields in ERP systems