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LOGISTICS AND TRANSPORT

Supply systems management

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CONTENTS

1. INTEGRATED MATERIAL AND INFORMATION FLOWS OF THE SUPPLY SYSTEMS

1.1. Material movement - an essential part of the reproduction process

The **process of constant restoring the production** is the material basis of reproduction. This process raises the constant need for transport and storage and associated loading, unloading and transhipment of raw materials, semi-finished products and final products. Production, characterized by the labour shift, takes place in different places and usually other than consumption and at times other than consumption. Last but not least, the production rhythm is different from consumers' requirements. Smooth processes in production and entire market mechanism require so that labour, resources and objects (both work and consumer) are in the required **quantity**, **assortment** and **quality**, - **ecologically and economically optimally** - in a determined **time** and at the desired **location**.

The production, distribution, circulation and consumption of production means and consumed objects are realized through **transformation processes** in which the structure, shape, position and time of substances (masses, materials), information and energy are **transformed**, whereby the logistics transformation consists in the time-space transformation of materials performed by transportation, handling and storage of material.

These transformations take place in the process chains that interconnect the sources locations of with places of consumption and the entire cycle system of the tangible and intangible goods, which forms a closed circle, can be represented by the model in Figure 1-1.

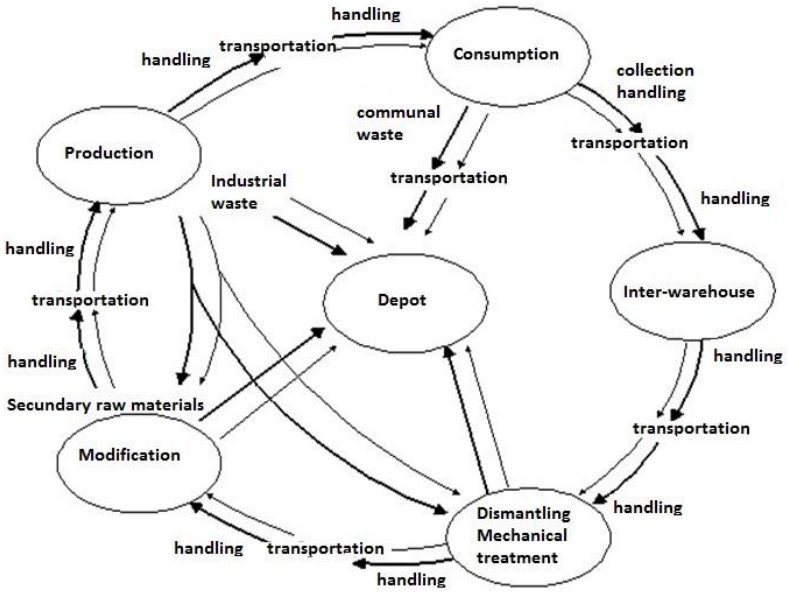

Fig. 1- 1: Model of materials circle and related information

Transformation of technological or logistics character of material objects is realized in the individual elements of process chains. During these transformations, their state changes occur. In processes of a technological nature, shape transformations (for example, in forming or machining) or structures of material objects (e.g. in chemical reactions) occur. In logistics transformation processes, time and position or orientation of objects in space change.

It is clear that the movement of materials is associated with a complicated information flow and it cannot be realized without energy flow. This fact can be captured by the cybernetic structural model which is a generally conceived logistics system in this respect - see Fig. 1- 2.

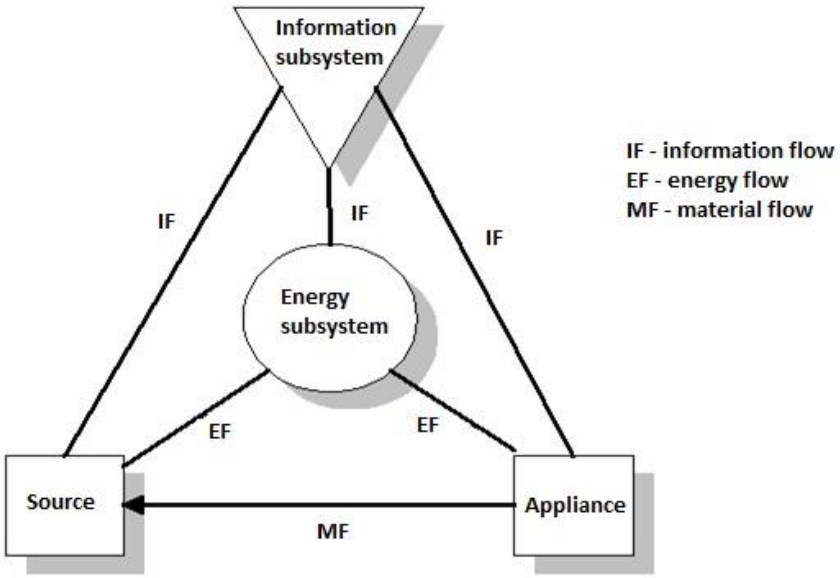

Fig. 1-2: Cybernetic structural model of the logistics system

1.2. System approach and integrated conception of material and information flows

The term system represents a purposeful defined set of elements and set of relationships (relations) between them which together determine the properties, behaviour and functions of the system as a whole. Mathematically can be expressed as:

***System* S = (A, R),**

Where:

$A = (a_1, a_2, a_3 \ldots a_n)$ - set of elements
$R = (r_1, r_2, r_3, \ldots r_m)$ - is a set of relationships between them

The structure of the system is a set of system elements and a set of relationships between them.

Thus, the task of logistics is to collect and process the information flow from the sales market, transform the information content into the purchasing market side and integrate it with the flow of material objects (raw materials, semi-finished products and final products) and optimize these integrated flows.

2. VALUE-CREATING CHAINS, CHARACTERISTICS, SYSTEM FUNCTIONS, PROCESS APPROACH

2.1. Functional model of a logistics chain element

Logistics ensures and manages the movement of objects (products, pallets, orders, etc.) through partial chain processes. In the individual partial processes, the transformations of objects are performed, i.e. for example, the excavation of foundations, their concrete, masonry, or brick moulding, their control, storage, handling, transportation, etc. Among processes, there is a change of materials (masses, substances) and information. The task of logistics is to manage interactions between material and information in enterprise process chains. The functionality of transformation processes in the process chain constantly influences the quality of logistics.

Each element acts in the process chain both as a customer and as a supplier, and has to handle a number of partial processes that have a character of business processes. Logistics model to allow for the evaluation of the process chains quality and uncover potential reserves for improvement and improvement of the current state must be able to describe the relationships between the supplier and the customer not only in terms of quality but also quantity. This is a requirement for the basic function of the logistics chain elements.

2.2. Structure and characteristics of process chain elements

The process chain elements model in Figure 2-1 shows an element in the "Black Box" concept. Only **inputs** and **outputs** are displayed.

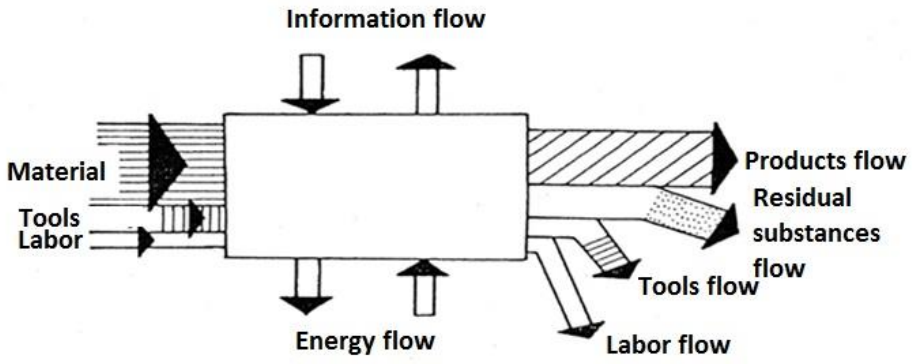

Fig. 2- 1: Inputs and outputs of the value-creating chain

The material enters into the elements (operand in state 1) from which the semi-product or the final product is made, thus the material leaves the element after the transformation in the form of the final product (operand in state 2) and some residues (splinters, waste, etc.). Transformation is carried out by labor by work tools (operators). Both operators also leave the element, but in the transformed form so-called worn-out tools, part of their value is depreciated and is passed on to product costs. The labor force is tired, exhausted, but on the other hand, it gets better, increases its qualification. Their contribution to transformation is also passed on to product costs. Similarly, it is with energy that is necessary for transformation, and with information, without which the transformation process could not be managed.

2.3. Processes management, Supply Chain Management

From the point of view of logistics goals, the influencing the process chain elements or the whole chains is limited to four basic factors. These factors are:

- processes,
- management,
- tools,
- structures.

From these four factors, a set of 17 classes of rationalization potentials, which are the building blocks of strategic logistics planning, can be derived by:

- customer,
- supplier,
- structure of processes.

Management includes:

- normatives,
- administrative,
- networks,
- control.

Tools are represented by:

- personnel,
- space,
- stocks,
- work tools,
- aids (ancillary tools),
- organizational tools.

Structure is represented by:

- layout,
- organizational structure,
- communicational structure.

3.SUPPLY CHAINS IN ORGANIZATIONAL STRUCTURE OF THE ENTERPRISE AND PROCESSES

3.1. Realization of the value-creating process in the subject of production character

The **content of logistics in a modern concept** is to provide comprehensively the material and integrated information flows from suppliers to enterprises and by enterprise to customers. An enterprise, like a target behavior system, cooperates with its surroundings. The main input-side links include processes of supplying raw materials, semi-finished products and final products. **Output-side** activities include operations related to the realization of products or services on the market. The purchase function consists in providing input processes in the supply chain on a commercial basis, while procurement logistics ensures the input processes to the enterprise in the whole range of integrated material and information flows.

The task of procurement logistics is to **plan** and **ensure** the **necessary material inputs** with the **optimal economy**.

Logistics management ensures:

- **in the purchase field:**
  - market survey,
  - finding and selection of optimal resources,
  - negotiating and concluding contracts,
  - price and value analysis,
  - purchase management.

- **in the supply field:**
  - acceptance and inspection of goods,
  - storage and warehouse management,
  - in-house traffic and handling,
  - planning, managing and controlling integrated flows of materials and information.

Stages of the purchase process is created by:

- specification of the enterprise's needs,
- determination of product types and its quality,
- detailed needs specification,

- identification of suppliers,
- offers analysis,
- supplier selection and pricing,
- an order issue and economic contract conclusion,
- continuous monitoring of suppliers and their evaluation.

3.2. System of variants evaluation and business partners selection

As part of the procurement process, the relevant component is the process of potential supplier selection who are capable to provide demanded commodities or services under the given conditions. When selecting a supplier, it is recommended to put particular emphasis on following criteria:

- supplier solvency,
- the level of management of its production process and possibilities of capacities expansion,
- guarantee of goods and deliveries quality,
- delivery times and their reliability,
- meeting the packaging requirements,
- the rate of possible defective deliveries exchange,
- flexibility within supplier-customer relationships.

The general criteria for evaluating or comparing products include utility value and procurement costs. This can be expressed by the so-called **relative effective value**.

From the economic point of view, the variant having the smallest costs (while maintaining the other parameters) will be most advantageous.

4. STRUCTURE OF THE PROCUREMENT, PRODUCTION AND DISTRIBUTION LOGISTICS

4.1. Alternative logistics structures

The value-creating chain forms a sequence of technological and logistics elements in which undergo transformation processes in which the products required in the market are created.

The value-creating chain begins by suppliers of raw materials for production and has a **different structure** depending on:

- the type of commodity,
- supplier's location,
- the way and organization of transport,
- customers' requirements, etc.

Alternative supply chain structures include:

- **individual deliveries** - are suitable for small numbers of suppliers and customers, short transport distances and large delivery volumes,
- **one-stage with transhipment areas** - is suitable for a large space of distributed suppliers and a small number of large customers,
- **one-stage with a distribution center** – is the structure suitable for regional conditions with a small number of suppliers and addressable customers,
- **two-stage structure** - is used for large numbers of suppliers and customers spatially scattered over long distances using outsourced transport services and assembly and distribution logistics centers.

Storage and transport strategies:
The most commonly used transport and storage strategies include:

- external distribution warehouse,
- transhipment concept,
- Randez-Vous system,
- the concept of regional carriers,
- logistics centers.

Supply chains:
Supply chains linking suppliers, warehouses, manufacturers, logistics centers and final customers can have a different structure. The most commonly used are as follows:

- direct deliveries,
- shipments through the central warehouse,
- transhipment,
- crossdocking.

4.2. Physical distribution and distribution networks

Physical distribution stands for not only the movement and storage of goods (primary logistics objects), but also the related information and financial flows running through the distribution space.
The distribution space consists of all distribution points, distribution equipment, distribution network and their mutual relationships.

The distribution network consists of distribution sources, distribution centers, customers and mutual relationships between these elements.

The distribution node stands for a distribution point, a distribution station or a distribution warehouse, in which the collection, distribution or storage of logistics objects and their subsequent distribution.

4.3. Distribution laws

1st distribution law:

The sum of the logistics objects entering the distribution node and located at that node is equal to the sum of the logistics objects exiting from that node and remaining there.

2nd distribution law:

The sum of logistics objects at the exit of a distribution source over a given period of time is equal to the inventories volume at the distribution nodes at the end of that time period, the number of objects dispatched from the distribution nodes during that period, the amount of objects on the route between the source and the distribution nodes, and the difference in the sum of inventory volumes in distribution nodes at the beginning of this period.

4.4. Supply Chain Management (SCM)

Supply Chain Management, due to its characteristics, offers much more options, i.e. due to the interconnection of all internal and external participants along the entire process chain, from the customer of the final product to the raw material supplier, the necessary information is exchanged in real time.

5. PROCESS MANAGEMENT IN THE SUPPLY SYSTEMS

5.1. Corporate philosophy and strategy

During any business activities, it is necessary to formulate their purpose and objectives. We also need to take into consideration relevant circumstances and influences, both positive and negative, which will affect the intended activities. It is important to take into account both external and internal factors. It is appropriate to apply the **STEP** and **SWOT** analyzes.

STEP analysis consists in assessing the impact of only external factors (global environment factors) on the enterprise position in following segments:

- **S**-social factors
- **T**-technical (technical and technological) factors
- **E**-economic factors
- **P**-political-legal factors

SWOT analysis is a tool especially used within value management and corporate strategy creation to identify enterprise strengths and weaknesses taking into account opportunities and threats.

Enterprise strengths:

- Individual approach
- Favorable prices
- New innovative products and services
- Enterprise location
- Experience in the field
- New technologies

Enterprise weaknesses:

- Bad marketing strategy
- Enterprise size and location
- Low awareness among potential clients
- Poor quality of products and services

Enterprise opportunities:

- Opening the EU market
- Possibility to extend for additional services
- Increasing need for tax advice
- Low competition
- Possibility to expand outside the region
- Inflow of foreign investment

Enterprise threats:

- Unexpected entry of the competition
- Change in regulations (directives)
- Government policy oppressing small entrepreneurs
- Another important part of this matter is to determine the position on the market. Each company should continuously perform a market segmentation of its products or services.

Logistics objectives

In relation to the concept and approach to logistics, we have come to the conclusion that if a company wants to gain a market position allowing selling its products at market prices, then these products must be of interest to customers by their parameters, quality, design, service and price; comparable or even better than competing products and customers - offered to customers at the desired location, in the required quantity, at the required time, in the specified quality and at prices corresponding to the market situation.

From aforementioned, relevant objectives in the field of logistics, ranging from large to small companies and individual craftsmen can be specified:

- to provide the necessary **performance** in the field of supply, transport, handling, storage,
- to ensure the required **quality** of these performances (supplier capacity, flexibility, meeting terms, consignments quality, ...) and
- to optimize **costs** (personal, transport, handling, storage, ...).
- while respecting the requirements of the environment throughout the entire process chains.

5.2. Transformation management methods

In this respect, the management methods like the Total Quality Management (TQM), Lean Production and Business Reengineering has been discussed over the last few years, basing itself on the pillars of business management orientation towards business processes, customers and co-workers. All these methods are characterized by extensive comprehensive enterprise monitoring.

Total Quality Management characterizes focus on quality and builds customer-contractor business relationships. The quality of the products (goods or services) that are the subject of the transaction is the relevant parameter in this relationship. An efficient information network enabling the necessary information flow to ensure the quality of the logistics transformation process is the prerequisite for all of it; i.e. the product delivery or the process assurance at the specified quality, at the desired place, just in time. TQM is a systematic learning process that focuses on the customer. Quality can be achieved by a permanent improvement process.

Lean Production or Lean Management is based on Japanese conditions (Kaizen). Lean business can be achieved by processes continuous improvement through the evolutionary way - in small steps. The corporate hierarchy and boundaries of enterprise units are of secondary importance compared to overall enterprise success. Responsibility for quality is required at all enterprise levels.

6.ANALYSIS OF SUPPLY CHAINS AND MODEL RESOURCES

6.1. Intentions and objectives of logistics analyzes

Intentions for analyzing logistics chains and systems can be very diverse. **The most common ones are:**

- rebuilding, extending or building new objects,
- capacity expansion and equipment upgrading,
- change of technological or logistics processes,
- reducing costs, the number of vehicles and workers,
- increasing competitiveness, etc.

Similar to intentions to analyse logistics chains and systems that can be very diverse, even objectives of analyses may vary from case to case. **Usually, the purpose of the analysis is:**

- identifying critical locations in material flows,
- reducing inventory volumes,
- shortening the running time,
- improving the organization and management of material flows,
- etc.

The outcome of the analysis and its qualitative level depends on a number of factors. First of all, however, it depends on the clear and unambiguous formulation of the assigned task.

6.2. Analytical systematics

Analysis of logistics, in more general terms, process chains, or logistics systems requires a systematic approach. **The following procedure can be applied:**

- objectives determination,
- task formulation,
- creating an action plan,
- preparatory work,
- specification of analyzed objects,
- elaboration of working procedures for the examination,
- performing a survey.

6.3. Techniques used within analyses

Querying

In most cases, analyzes initiate by querying. Besides the basic orientation in the given system, the decision-makers can get even the fundamental (primary) knowledge about the current problems. In addition to the list of respondents, it is useful to have prepared purposely focused queries.

Observation

System approach to logistics chain observations gives us an option to choose a monitored (research) area according to the necessary distinctive ability. The use of video-records and computer technology greatly simplifies working operations of observers.

Modeling

The complexity of logistics systems usually requires the use of different model forms to display a certain instant state. The model is an image of a real state, however, insignificant properties are suppressed (not shown), and on the other hand, significant properties in terms of the monitored objectives are highlighted.

Simulation

The simulation is an imitation of the dynamic process on the model in order to gain knowledge transferable to reality. It offers us possibilities:

- exclusion of errors when designing complicated systems with complicated behaviour,
- comparing the multiple variants,
- ensuring the proper functionality of the material flow system,
- assessing the stochastic effects (e.g., system behaviour failures),
- determining the system performance limits, etc.

7. PLANNING THE SUPPLY SYSTEMS

7.1. Relation between enterprise strategy and logistics planning

Planning is a gradual, partially iterative process, in which a number of functions are applied.

Planning includes a wide range of activities, such as:

- developing business plans,
- production or assembly planning,
- logistics planning,
- material flow planning, etc.

Planning monitors the **optimal solution** to the problem in the term, usually predetermined, while respecting all the essential influential factors and quantities. The result of planning consists in a **plan**.

Plan determines:

- goals,
- tasks and activities,
- as well as the tools,
- or ways to achieve them.

The main task of logistics planning is to implement a strategic business plan into implementation plans in compliance with the environmental changes and the system possibilities.

7.2. Structure of the logistics plan

Main objectives:

- competitive products or services,
- optimal material and information flow mutually integrated,
- high systems and processes flexibility,
- favourable use (consumption) of areas, premises and equipment,
- short lead and delivery times,
- favourable working conditions and motivation for staff,
- cost minimization.

The planning process covers the entire logistics, in other words the process, chains within the scope or influence of the enterprise.

In the field of **procurement logistics,** it includes, for example:

- planning, management, implementation and control of material procurement,
- ensuring production tools,
- inventory planning in shopping warehouses,
- etc.

In the field of **manufacturing logistics**, it includes, for example:

- production program planning,
- production batch planning,
- needs planning,
- inventory management of semi-finished products
- planning and management of material flows,
- planning and management, including in-house traffic control,
- workshop planning,
- etc.

In the field of **distribution logistics**, it includes, for example:

- distribution structure planning,
- inventory management of final products,
- ensuring supplier services, etc.

7.3. Objectives and process of planning

When assigning a task, it is desirable to pay particular attention to the unambiguous defining the subject of planning, determining the depth and scope of planning, defining the interface of involved systems, current, initial and final state specification (planning objectives) and capturing potential restrictions.

Stages of the planning process
Logistics system planning usually takes place in several stages. Typical stages can include, as follows:

- Intention
- Objectives defining
- Planning space analysis
- Decision on further steps
- System study
- Decision on the concept selection
- System planning
- Decision on offers selection
- Implementation.

8.INFORMATICS AND COMMUNICATIONS IN SUPPLY PROCESSES

8.1. Tasks of the logistics information system

The **task of the logistics information system (LIS)** is to provide:

- **the right information** - necessary and understandable for users,
- **at the right time** - to be available for decision-making,
- **in the right amount** - as many as needed, as little as possible,
- **in desired quality** - proper, undistorted, sufficiently detailed and immediately applicable,
- **in the right place** - ready for the recipient (consignee).

Structural changes in society lead to logistics goals varying in various sectors of the economy, but **informatics** is a common **denominator**.

8.2. Struktura informačního systému podniku

Structure of the enterprise information system

The basic functions of the manufacturing enterprise's **information systems** can be summarized in the following list:

- cataloguing / management of dial lists (recording, repairing, deleting, viewing: materials, products, warehouses, packaging and pallets, vehicles, payments, etc.)
- purchase (production / sales plan, supply orders, certificates),
- warehouse management (general warehouses, receipts, claims, returnable packaging, inventory management, ABC analysis, etc.)
- material demand planning (general planning, capacity planning and production management, etc.)
- communication with the external surroundings,
- information system administration (database backup, access rights, system software administration, etc.).

As a matter of fact, individual elements, however, are of lower level – these are especially the **systems**:

- storage,
- production,

- sorting,
- picking (commissioning),
- etc.

including logistics tools and other components. The information transfer in these systems is conditional upon the sorting the computers and peripherals into networks.

In terms of the range, the networks in the context of the LIS are divided into:

- **local - LAN (Lokal Area Network)**
- **wide- WAN (Wide Area Network).**

8.3. Communication in supply - EDI

With the large amount of data exchanged between business partners, it is not possible to control the supply management of purchased parts by paper documents. The development for the remote data transmission technology enables the direct **electronic exchange of large data** sets for delivery of data between **manufacturers** and **suppliers** - EDI. Electronic Data Interchange is the automatic transmission of messages formatted according to a given standard among business partner application systems.

9. STORAGE SYSTEMS AND WAREHOUSING IN THE SUPPLY CHAIN

9.1. Functions and types of warehouses

Storage fulfills important functions in value-creating chains. If chain processes are to be optimal, it is necessary **to balance capacity and time disproportion among raw material suppliers and their processors**, among individual technological or logistics processes in the production or assembly, among the rhythm of production and requirements of the products users, among the dates of supplies of construction materials and the construction procedures, etc.

Requirements for the warehouse are of three kinds:

- the order resulting from the nature of users´ orders of stored material and the nature of orders addressed to suppliers for stocks replenishment in the warehouse,
- flow and warehouse capacity requirements resulting from the amount of revenue and expense depending on time,
- assortment requirements, i.e. requirements for type, properties and number of items, parameters of handling units, movement of articles, etc.

Warehouses are divided according to many criteria:

- In terms of **warehousing type**:
  - free
  - stacking
  - warehousing in racks

- In terms of **construction**, we distinguish warehouses:
  - free, adjusted surfaces
  - covered
  - open
  - closed

- Whereby, such warehouses may be (fig. 9-1):
  - flat
  - layered
  - high
  - inflatable halls, etc.

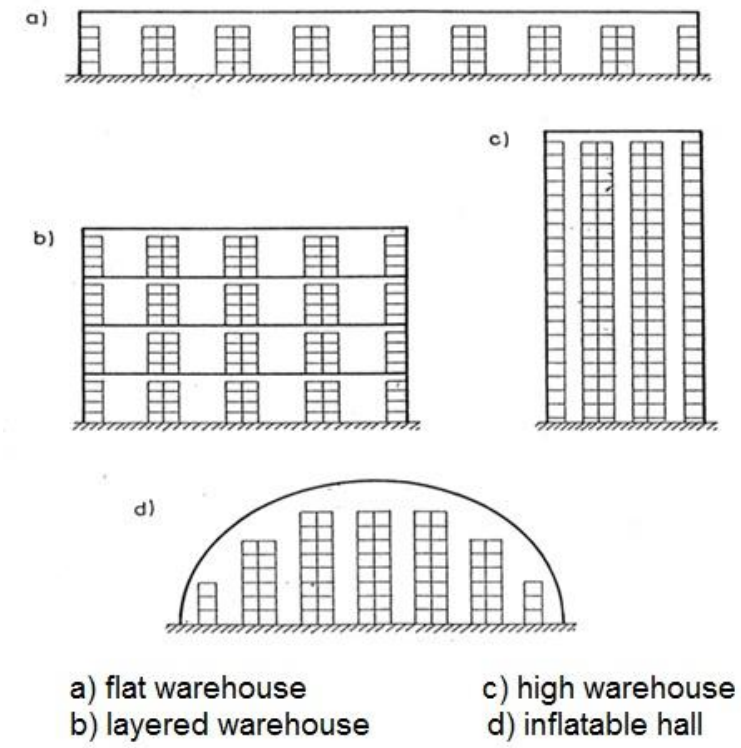

Figure 9- 1: Warehouse kinds

9.2. Organization and communication in the warehouse management

Warehouses and warehouse management organizations are one of the relevant factors influencing the quality level of processes in elements of the value-creating chain, and thus, the level of enterprise logistics. What requirements are placed on the organization of warehouses? We can divide them into **two fields:**

- warehouse regime field,
- administrative field.

The first field consists of:

- stocks and storage places management,
- handling and auxiliary equipment management,
- receipt and management of orders,
- orders formulation,
- assignment of orders and handling equipment,
- orders issue.

The second field consists of:

- invoicing,
- inventorying,
- statistics.
- In order to ensure the optimal operation of the warehouse, it is necessary to monitor a number of static and dynamic variables.

9.3. Picking

Picking (commissioning) is to assemble (collate) a certain amount of logistics objects from the prepared quantity of required assortment based on information about the assigned requirements. This activity can be done through employees or using the equipment.

9.4. Logistics objects

The most important effect on the method of logistics processes realization and on the handling machines and equipment selection has for obvious reasons the material itself - a **logistics object**. Thus, the material is one of the decisive factors influencing the character of the logistics chain.

If only one kind of logistics objects appears in the logistics process, we are talking about a **single-type problem**, otherwise (and such cases are in the majority) we are talking about a **multi-type problem.**

Not all kinds of material can be effectively handled by the same handling equipment. Therefore, we pay a greater attention to their classification in terms of handling, since they create a necessary prerequisite for successful selection and appropriate assignment of storage and handling equipment.

10. TRANSPORT IN THE SUPPLY CHAIN

10.1. Elementary elements of transport systems

"Transport" is referred to as the intentional movement (ride, voyage, flight) of means of transport in transport systems and their infrastructure. Transport is carried out by the **carrier** which thus becomes the transport operator for foreign or own need.

Transport results in consignment (shipment, handling unit, logistics object**) transportation (carriage)**.
Transportation is therefore the process by which the shipment is transported (displaced, relocated, moved) among the shippers, i.e. from the sender (consignor) to the recipient (consignee).

Elementary transport elements are:

- handling unit or logistics object,
- means of transport,
- transportation process.

Handling units consist of transported consignments, i.e. containers, pallets, crates, other auxiliary secondary logistics tools and goods carried therein, i.e. general cargo, bulk material, liquid, gas, even biological objects, referred to as the primary logistics objects.

Means of transport are rail vehicles, road, off-road and special vehicles, vessels, airplanes, helicopters, airships and balloons, or special means of transport.

The transportation process is ensured by an efficient organization, efficient management and modern means of communication.

10.2. Transportation system choice

Transport is the intentional movement of means of transport by which the carrier performs consignments transportation between shippers.

Means of transport are part of the transportation system and are therefore predetermined to fulfil certain functions, e.g. goods carriage in the commercial network, soil relocation from the construction site to the storage site, construction material delivery from the warehouse to the construction site, excessive load transportation from the producer to the construction site, etc.

When selecting or purposeful choice of means of transport, the purpose, for which the mean of transport (or transportation system) is acquired, is the primary point of view. If it is to become part of an already existing transportation system, it must of course be compatible with this system, i.e. to fit into the structure of the existing system taking into account any upcoming innovations.

In addition to already mentioned criteria, there are others yet. These include in particular transport **costs** (investment, operational), transport **performance** and **distances**, required transport **speed** and carriers' **availability**.

10.3. Special transport mode

More often, apart from traditional transport modes, we encounter non-standard modes of transport and handling. It is relatively common to use helicopters to transport various construction and other structures. Synergic effect can occur in the form of connection of transport and assembly of transported object, e.g. end-of-line transmitter antenna, power distribution masts, bells and crosses of churches, etc. Helicopters allow transporting loads up to 20 tons.

11. MATERIAL HANDLING IN THE SUPPLY CHAIN

11.1. Overview and breakdown of handling equipment

Material handling is a necessary part of all processes across the whole value-creating chain, from raw material extraction to processing, distribution, consolidation, circulation, consumption and reverse logistics.

Material handling is understood in modern terms as the complex issue of **transportation, loading** and **storage** processes consisting of a number of operations performing in handling systems and which need to be mutually aligned and controlled in order to achieve the desired effects in an optimal way.

11.2. Handling equipment - characteristics, parameters

Handling equipment is an essential part of handling systems and includes **handling tools** (devices) consisting of supporting structures, drive units, gears and control units, as well as **building structures** allowing their operation (concrete or steel crane tracks, tracks, handling surfaces and aisles, etc.).

Grabbing device is used to grab and hold the primary handled logistics material. **Handling equipment** together with **organizational** means and means of **information** and **communication** create a **handling system**.

11.3. Criteria for handling equipment selection

The number of input factors influencing decision-making when selecting the transport, handling, storage and other systems is very extensive. Prerequisites for selection of the optimal handling equipment or system are the knowledge of the matrix of **connections**, **flow**, **frequency** of **operations**, **paths topology**, **restrictions**, **properties** of logistics objects, their kinds, **quantity** in total as well as individual kinds, **frequency** of **warehouse** operations, storage **period**, etc.

Dimensioning the handling equipment

The **material flow** may be **continuous** or **pulsating** for this equipment. The flow in mass units is determined by the product of the material weight per 1 meter of length for continuously working equipment with a continuous material flow $\boldsymbol{q}$ [kg.m^{-1}] and speed of movement $\boldsymbol{v}$ [m.s^{-1}].

12. TRENDS IN THE SUPPLY SYSTEMS AND PROCESSES

12.1. Process chains among suppliers and final customers

The corporate strategy is the basis for successful business management and the starting point for creating all the business plans. **Corporate strategy** means the formulation of basic enterprise development processes. Enterprise strategy includes its strategic goals and strategic operations.

Thus, the **corporate strategy** is an open, active system that responds flexibly to new conditions in the company surroundings, both in the short- and in the long-term horizon. Therefore, conditions for enterprise stability, efficiency and prosperity are created. In the field of market economy, the corporate strategy is in the interaction with the market and competition. We derive from the corporate strategy the concept of competitive products or services, etc., the selection of suitable production technologies as well as the enterprise logistics concept including communication systems.

Logistics provides and controls the movement of objects (e.g. products, pallets, orders, etc.) through partial process of the chain processes. Transformation of objects, i.e. machining, storage, handling, control, etc., takes place in individual processes. Among processes, the exchange of material (matter, substances) and information occurs. The task of logistics is to control the integrated material and information flows. The level of interactions among process chain elements affects the quality of logistics and the level of communication systems is therefore the main aim of logistics experts.

12.2. RFID – Hardware and Software integrated into material flows

Recently, many research and development studies and works have been carried out in the field of improving the properties and implementation of radio frequency identification. Especially, as far as the introduction of these executive elements into intralogistics is concerned.

RFID (Radio Frequency Identification) - of radio frequency identification, at the current stage of development, enables unambiguous contactless identification of almost any object using means of electromagnetic waves. RFID technology was developed in the mid-

20th century for military purposes. Intense development, miniaturization and price reduction have led to the discovery of new options for the usage.

Establishing the RFID technology enables **to optimize the value-creating processes**. Already mentioned intensive development, resulting in increasingly smaller, advanced and cheaper components of RFID systems, has led to the increasingly widespread use of RFID in a wide range of fields - in trade, manufacturing, storage, transport, handling, etc. Transponder technology is a complete information management which replaces all the **manual data processing**.

12.3. Transponders

Transponders are systems that enable to exchange the data via transmitting and receiving units. The transponder consists of a transponder antenna, which for obvious reasons is smaller than the antenna system of the communication unit, and a chip. The chip is used to store the data and performs the function of controller. Active transponders also have an energy source and can process and transmit the information. They also have greater communication reach. Their disadvantage is the larger dimensions and the necessity to replace the batteries. Passive transponders gain energy by induction through the antenna system of the communication unit and require no maintenance.

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