

Modern information systems in logistics processes

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Abstract: Today, many companies improve operating management processes, as a precondition for overall cost efficiency and as a key to ensuring competitive advantage. Therefore, companies pay special attention to the production logistics that can achieve differential advantage in the market. The development of new information technologies is a very important area for efficient business management. Therefore, the logistics system should be developed as part of a single information system. The task of the logistics system is to ensure constant insight into the system's condition, as well as directing to measures to improve and manage the work systems.

Key words: *Business, logistics processes, Information system*

I. INITIAL CONSIDERATION

In the time of uncontrolled growth and development of different types of technologies, increasingly common changes requires markets, a change in labor and forecasts can be reflected in the process of operating a company or enterprise. Relying on predictions, introduces an additional dose of uncertainty in business. The uncertainty of staff is a great potential barrier towards finding new ideas and solutions leading to success [1].

To maintain continuity of success in stepping towards successful realization There are a number of logistics trends that are components of the above steps, and they are:

- Workforce;
- Electronic trade;
- Urbanization;
- Transport and storage;
- Competition;
- Green logistics and sustainability.

A. Workforce

The main clamp between the idea and successful realization is a qualified labor force. The man as the most perfect living thing, using his psycho-physical abilities achieves the set goals. The success of the realization of these goals depends precisely by the mentioned abilities of each individual. It is increasingly more difficult to rejuvenate the workforce, which is a logical

step. Younger people are eager for evidence, they learn faster, are full of confidence, etc. On the other hand, experience comes with age that is often crucial in the process of achieving successful goals. The rejuvenation of the workforce must not be executed too fast. The experience mentioned is the main factor of successful business. In order for young people to qualify, it takes time to achieve their abilities a certain level that meets the needs of the company. With fast rejuvenation, the company's productivity would significantly fall in relation to the previously reached level. The time required to achieve this level directly, depends on the time required for the new working force to be able to work.

B. Electronic trade

In achieving successful goals, one of the main factors is time. When it comes to producing the production organization, various programs that plan work tasks in order to obtain additional time savings. Both in business and private life, trade is very important. Anything can be the subject of trade, and trade itself requires going to address, selecting material goods, delivery of purchased goods back to the company, warehouse or warehouse. It is evident in the time, which would cause a minimum value reduction, created space for some other business activities. Electronic trade created with information technology, allows trade from remote places. Electronic trade (or e-commerce) primarily consists of distribution, purchase, sales, marketing, and servicing products and services via electronic systems such as internet and other computer networks. It also includes electronic money transfer, supply chain management, e-marketing, electronic data exchange, and automatic data collection systems. In fulfilling its tasks, it uses electronic communication technologies as internet, extranet, e-mail, e-books, databases, and mobile phones. Using mobile phones, tablets and computers with an internet connection, trade can be used from any end of the world. The crowds are avoided, catalogs enable the selection of material goods, the money directly from the customer's account switches to the seller's account, while the possibility of delivery to the customer's address allows enormous time savings.

Many aspects of electronic trade have implemented during the last thirty years. However, in the last ten years, both in specialized literature and among ordinary people, there are

different interpretations and significance of the notion of electronic trade, and under e-commerce usually involve purchase and sales operations, which are performed over the Internet. But the concept of electronic trade is much expanding and is not limited to the internet only. Electronic trade is a multidisciplinary concept, which affects ways in which interactions and negotiations with clients take place, the ways in which payments are performed, as well as suppliers, and for these reasons requires a new legal framework. According to the French Association of Trade and Electronic Exchange Association Française Pour Le Commerce Et Les Échanges, FCEE), Electronic. This definition involves any transaction that takes place over the Internet, phone, banking network, etc., as well as any payment method regardless of whether real or electronic money is used. E-commerce can be viewed from a wider and narrower point of view, so the wider definition includes business information, maintaining business relationships and business transactions by telecommunications networks [2]. And the narrower definition includes the purchase and sale of goods, services and information through the network. This means that A is e-commerce, the concept that describes the processes of purchasing and selling, i.e. the exchange of products, services and information through computer networks, including Internet [2].

C. Urbanization

Whether it is work, life or spending free time, most population wants to be in the center of events, or at least as close to the center. In the last thirty years, the cities increased by fifty percent. As the cities centers are already densely populated, cities begin to spread from the center to peripherals. In the West of Europe, especially in Germany, are all more cities common cases of expanding cities to this, that two neighboring cities are jointly combined. More and more running out of vacancies, nature is destroyed to raise buildings, crowds are on the streets due to excessive number of means of transport, and increased air pollution. From the aspect of logistics, urbanization has an unfavorable impact, precisely because of too much crowds, traffic is difficult, i.e. Transport. By immigrating an increasing population, there is a potential chance for acquiring new competition. In the full process of urbanization, companies are forced to build their warehouses now even further in relation to the periphery of the city, because the periphery is constantly expanding. And how so much population does not have to hold their things, storage will represent one of the biggest problems as life and logistics in the next years

D. Transport and storage

In time, different logistics trends get in importance, some even lose, but the two logistics trends are never and will never lose significance. It will always be necessary to store material goods, based on which companies survive, and to survive must be delivered to customers, i.e. transport. Therefore, it can be concluded that the good organization of transport and storage, i.e. storage space of half of the total logistics tasks of one firm or company.

1) Storage

Storage roots enter the distant past, until the moment, the man began to produce more than enough for consumption in that period. The process of storing depending on that. First and basic, the subject of storage dictates the conditions that storage must meet. If food, pharmaceutical or similar products, warehouses must be extremely clean and moisture. Some milieu criterion allows other products such as techniques, furniture, tools and accessories of various companies. The minimum warehouse criteria have construction materials, which can be preserved in the open space. If there is a possibility of damage to material due to variable weather conditions, it is necessary to place in a semi-desert or indoor space. The company's capacity dictates the capacity of the warehouse. It is very important to hit the right measure of the warehouse. Too few warehouses cannot accommodate all the goods that the company has, while the excessive warehouse can remain uncomfortable. The worst scenario is that the excellent warehouse is filled to the end of the capacity. In this way, the company enchants its capital, and at the time of transition, the question is how excess stored material goods will be cashed. In case of increased production or sales capacities, there should be enough space in the warehouse. The most avoiding additional costs of renting or buying storage space and due to extra space in the warehouse, a psychological inclination to increase production capacities is acquired. Storage next to the warehouse must also contain corridors for forklift trucks or wheelchair movement, as well as sanitary facilities. The manner of keeping the goods depends again on the type of stored goods. It can be stored on racks, shelves, in boxes, etc.

2) Transport

Transport essentially means transmitting or transporting passengers and goods. The transport of materials and goods is used to overcome spatial distance between suppliers, manufacturers and consumers.

The basic features of transport are:

- The loading is made of vehicle preparation, seating organizations, product sorting and documentation formation that monitors load transport.
- The complexity of movement of transport systems (vehicle load) requires special attention to the choice of route and in the transport itself.
- unloading is the lowering of the load from the transport agent, in place to postpone and submit loads with accompanying documentation.

Also, transport can be divided into:

- External transport (input and output) performed from suppliers to the client and from the manufacturer to its customers,
- Internal transport, for transportation of materials and / or (semi) products within the company.

The movement of material goods within a single production process is of great importance for the productivity of the company. Production capacities are increased, production process is accelerated, work systems are simplified, a need for

an increasingly better organization of internal transport is created. Within the production process, in addition to changing the form of a working object, it is necessary to move the object of work, in order to ensure the passage through individual production phases. Under internal transport, the entire process of movement and manipulation of material within the company should be "understand. When the material enters the company's warehouse, until it comes out of the company transfer, ranshipmend and other manipulations consists of internal transport. Considering that transport operations does not contribute to the increase in the value of the final product, and that on the other hand, it is obviously justified as the strive to minimize internal transport activities. In order to rationalize internal transport, it should be guided by the following ways:

- The material path should be optimally shortened,
- Transport operations should preferably turn off,
- Transport operations that cannot be omitted should be mechanized or automated by conveniently selected funds.

Before the planning and design of internal transport is necessary, it is necessary to consider the following elements:

- Before the planning and design of internal transport it is necessary to consider the following elements of the assumed technological process (or realistic if it comes to reconstruction of the current situation) and its influence on the internal transport,
 - the degree of automation of production equipment and its influence on the internal transport,
 - the course of movement of material depending on the technological process,
 - Possible transport roads, with respect for existing restrictions (existence of already built facilities),
 - Internal transport costs and their impact on the total cost of the production process.

Only at a detailed analysis of the above elements is accessed to project the transport system holding the following principles [3]:

- The basic principle of internal transport planning is to reduce its scope to a rational minimum.
- The length of transport roads must be as short as possible.
- In order to shorten the length of transport roads, return transports should be avoided wherever possible.
- During the design, the crossing of transport roads should be avoided.

E. Competition

In addition to all the global problems that the company is carried, one embodies as most important, and that is competition. The competition always threatens, and is reflected in a better product, a lesser price cost, as well as shorter delivery times. At the same time, these are three main items that are characterized by the success of the company's business

in terms of competitiveness in the market. Due to the problem of competition, the firm must be in step every day through the monitoring of modern trends and adapt its services to the wider target group of citizens. Single, small-room and tallerial production differ. In individual production, it is mainly a product very expensive, and it takes a lot of time for development (development of robotized lines). In such products, competition is least expressed, because it requires a lot of time and professional staff and money invested. In small-haired production, much less time for product development than individual production is required. There are many more competitions here in relation to individual production, because investments are lower in relation to individual production, and profits are realized faster. In large serial production, competition is most represented, because the ratio of invested resources in relation to resource individual and small production, much smaller. The invested capital returns faster, a single developed product does not require new development, and the availability of staff is very great due to knowledge that knowledge is transferred from one worker to another. In great-majority production, there may be a problem that the product comes to saturation or that other products will be expelled from the race to the target. For this reason, studies are made on how the product meets market requirements and is working on product improvement daily. For example, new mobile phones come out every year, with some improvements in relation to previous device. In this way, the manufacturer offers the buyer in a century something new and maintains competitiveness in the market.

II. TASK, GOALS AND TYPES OF LOGISTICS INFORMATION SYSTEMS

According to the basic form of organizing the basic activities of information systems, it can be talked about its three types:

- Centralized information system, where all these activities are supported and managed from one place, which is usually a special organizational unit of the business system;
- Decentralized information system, where these activities are autonomous in several places, usually in line with the organizational structure of the business systems;
- Integrated information system, where all these activities are fully integrated into all business processes and cannot be viewed separately [4].

The best option for company logistics as a whole is an integrated information system because all activities of the given system are related to business processes of companies which significantly facilitates and improves business operations. The main task of the logistics information system is to contribute to successful business management. The logistics information system is expected to ensure that business processes, business functions and business decision-making, ensure appropriate and accurate data and information. This task has the following goals:

- To fully and timely respond to all logistical information requirements of the business system;

- To ensure full documentation on logistics for monitoring business events between certain business functions.

There is a strong correlation between the logistics information system and the business system, ie. If a quality logistics system is, the business system will also be better.

A. *Logistic company of the future*

There are currently billions in stock parts needed to maintain various cars from cars to X-rays. It does not need a lot of imagination to understand the advantages for the supply engineer, which will be able to take a spare part design from the online library, print it on the 3D printer, and then install it in a very short period of time. This will reduce the need for global and national distribution warehouses of spare parts, as well as their supplies. Changing the dynamics of supply chain will be inappropriately to develop a new type of logistics company-like 4PL or service management company. Their services will consist of a mixture of software development, delivery services, relationship management, partner management, contract management as well as intellectual services. The new logistics company will design solutions that include demand planning, production, delivery, market monitoring, service management, return logistics and recycling. In essence, they will become the providers of the product life management services. This is a great opportunity for large players who have resources to establish this new organization.

B. *New technologies*

New technologies like robotics, internet things (IOT), and large data analysis (Big Data) have a crucial impact on supply chain and logistics, and develop very quickly and converges. In the coming years, the appearance of solutions in the supply chain will begin, which includes all these technologies with existing capacities. In the field of automation in storage and production, it is seen that various systems start more intense to use and become comprehensive in their implementation in certain sectors and in certain regions, such as automated driving vehicles (AGV), automated storage and detection systems (ASRS), integrated with the warehouse management (WMS) and warehouse control system (WCS), and supplemented with voice recognition and systems Pick by Light. However, due to high costs, these solutions have applied large companies in the regions of high labor costs. Bloc Chain technology in combination with IOT (Internet of Things) or devices built into physical assets, as well as inventory items, promises many valuable solutions for challenges in various activities such as assets (such as containers, vehicles), Product authentication, food tracking, license control and identity. These activities will be combined with the analytical potential of large data (Big Data) that arise from these devices to inspect the real time of the actual supply chain in a way that was not possible before. This will bring advantages in terms of reducing waste, improved sustainability and increased productivity. In recent times, the development of sensor technology has led to collaborative robots ("kobota") that can work similarly as people in, for example, collect storage orders. Some of the currently developed and implemented in small steps, which means that there is a possibility that "kobots" are

seen in the future and logistics operations of all sizes, not in the form where they are replacement to people, but as Improving human work. However, the presence of this technology in the company leads to a very drastic change in training, skills and abilities of people who will work in the future.

C. *Physical flow of goods and logistics systems*

The physical flow of goods shows the connection between individual business functions, so it connects (with equal importance) of order subsystem, procurement, storage, documentation processing, transport; And in everything the most important control. In this way, putting on the same importance of processing, records and physical flow of goods "logistics system" enables efficient control and analytical review of the current situation, but also quickly spotting omissions and downtime in the physical flow of goods. The flow of information connected to one whole, ie integrated all business functions, and supported by modern information technologies, significantly affects the:

- shortening the cycles and time of order;
- faster trade of goods;
- lower storage costs;
- faster delivery frequency;
- orientation according to the consumer;
- product diversification;
- greater business efficiency.

The logistics system brings many benefits for the physical flow of goods, accelerates it and improves. The physical flow of goods is a great representation of business function integration, and with a logistics system information system, the physical flow of goods becomes more efficient [5].

D. *Logistics management and logistics information systems*

The logistics management is not only vital to the production and industry, ie only for the production orientation of the business entity, but is more and more current in sales, in transport and distribution in all business entities, both profit, so even more in non-profit today. Logistics Management is usually based on the following information:

- Stream of information on raw materials and goods including supplies, delivery times, consumer needs,
- The course of trade information including marketing, distribution channels, the process of transporting goods on the road from manufacturers through intermediaries to consumers,
- Money information flow including all payments (classic billing and electronic)
- Information flow; (required, requested and desired information) communicating with all members (participants) in the chain, in the channels of the logistics information system.

Application of certain adequate information techniques and technologies in the logistics management today, cannot be replaced by manual insurance. The speed of information,

reliability of collected and processed information, new possibilities of the analysis and application of information technologies in application. (Practice) allows the logistics management added support during the organization of everyday business and making quality decisions for future business. Logistics management, among other things, assembles the application of certain IT technologies in operation for its successful work:

- POS (Point of Sale), terminal of the connected cash register,
- Bar and QR codes,
- Electronic data exchange,
- Vans (Value Added Networks)
- Electronic orders system.

The logistics management has become very complex because the manager must be based on several broad areas (production, transport, sale, distribution). The application of information technology has significantly facilitated the management and is almost impossible to be a successful logistics manager without the application of information technology.

E. Logistic databases in modern business

The development of information technology was observed by many shortcomings of information systems based on the principle that each application, ie a set of programs for a field of business, has its own data collection-file. By introducing the database system, a collection of data shared for multiple applications is obtained. Databases have been especially improved by information systems, especially when it comes to large numbers and quantities of different products-items that allow for normal logistics management to each data in the database. As well known, each database, even logistics, manage database control systems - Database Management System (DBMS). The DBMS has actually update control software, search, edit, connect and sort data as well as to form reports based on them. Important objectives of the database control system are easy to use, especially for logistics management in a modern company, logistics within individual business functions, business logistics companies in transition, international business logistics, as well as logistics information systems. Logistics databases allow for a better data overview and quality logistics because they contain all data related to logistics in one place..

III. CONCLUSIONS

The expansion of the development of logistics has occurred with the manifestation of the trend of globalization and decentralization of production, which significantly depends on the quality of logistical activities, on the other side, is provided, among other things, the revolutionary development of communication and information technologies. Namely, the more intensive development of logistics in companies came in the second half of the 20th century, that today, logistics would be present in all areas of society. In the past period, the logistics ripened, expanded the area of its action and adapted to

the development and requirements of technology and environment. In the time of the transition, urbanization and development of information technologies, it comes to, that people slowly replace various machines, whose productivity and precision is far higher level.

It takes as much as possible, monitoring new trends and the development of new software and applications, facilitate work. Consideration of logistics in production, ie in process companies, is certainly an imperative of time. Production can be successful if it meets the needs of customers and successfully competed in the global market. Contemporary production is increasingly complex in terms of participation of technology or production procedures or operations. In a complex process, logistics is especially important. Namely, the logistics in production is most associated with input allocation, and primarily reproductive materials and installation equipment. When procurement, there is a great coordination with preparation, warehouse and especially production. Preparation of production is also an important part of the logistical production system. The quality of preparation depends on the development of products that are defined all technically, commercial and financial dimensions. As part of the logistics in production, the issue of quality not only products but also procedures, preparation, procurement, and manufacture and information technology itself. All this is done in order to improve productivity, and to maintain market competitiveness. The survival of the company or companies in addition to the activity deals, depends to the fullest of the success of the business organization and savings of all forms of resources within the company itself.

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LITERATURE

- [1] Alan Harison, Remko van Hoek, "Logistics menagment and Strategy," Cranfield, England, 2002.
- [2] Јелена Кончар, "Електронска трговина," Економски факултет Суботица, Суботица 2003.
- [3] Јукић Домагој, "Информацијски сустав у Логистици," Економски факултет, Сплит 2016.
- [4] Ивић Ката, "Утјецај информацијског сустава на менаџмент," Економски факултет Осиек 2008.
- [5] <https://www.boschrexroth.com/en/xc/products/product-groups/assembly-technology/topics/engineering-software-mtpro/index>.