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INTEGRATION OF INFORMATION SYSTEMS IN SUPPLY CHAIN AND LOGISTICS NETWORK

Supply chain management means the conception of planning, steering and controlling by means of a supply chain, including all the stages of the creation and the supply of the logistics values - from the place of raw materials acquisition, through the production process to the ultimate customer in order to offer the proper goods in a proper time and place, in a proper quantity and quality, at the justified cost and with the use of the latest information technology. The notion of a supply chain is more and more often substituted with the notion of supply networks. The logistic supply network is a broader notion than the supply chain. The networks are formed by independent enterprises which, according to the circumstances, may compete or cooperate.

INFORMATYCZNA INTEGRACJA W ŁAŃCUCHU DOSTAW I SIECI LOGISTYCZNEJ

Zarządzanie łańcuchem dostaw oznacza koncepcję planowania, sterowania i kontroli za pomocą łańcucha dostaw, obejmującego wszystkie fazy tworzenia i dostarczania wartości logistycznych - od miejsca pozyskania surowców, poprzez produkcję, do ostatecznego nabywcy w celu zaoferowania odpowiednich towarów we właściwym czasie i miejscu, we właściwej ilości i jakości, przy uzasadnionych kosztach, z wykorzystaniem nowoczesnej technologii informacji. Coraz częściej pojęcie łańcuch dostaw zastępowane jest pojęciem sieci dostaw. Logistyczna sieć dostaw jest jednak pojęciem szerszym od łańcucha dostaw. Sieci tworzą niezależne przedsiębiorstwa, które w zależności od okoliczności mogą ze sobą w określonym zakresie współpracować a w innym konkurować.

1. INTRODUCTION

In the era of the globalization of trade and production, which requires struggling with competition and a high level of the offered distribution services, customer service determines the trading success of the companies to a greater extent than the basic elements of marketing strategy, such as: product, quality or price. Under the pressure of changes in the market, producers, distributors and logistics contractors offer the customers reliable deliveries, comfort in service, indispensable communication concerning orders and shorter and shorter delivery time. High logistics abilities are the basis of the competitive offer. The customers and

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their growing demands make the enterprises improve their logistics systems to deliver the right product, in the right quantity and condition, to the right place and customer, in the right time, at the right cost.

Logistics has become one of the main management conceptions allowing the company to increase its profits and work out the competitive predominance that permits the companies to stay in the market. The efficient logistics system supported by the adequate solutions of information technology can constitute such predominance.

2. SUPPLY CHAIN MANAGEMENT

In the 90ies the subjects participating in the service of goods flow intensified their cooperation. It resulted in establishing the supply chains, aiming at optimization of the supply chain management, stressing the relationship of the company with the suppliers, distributors and customers. Supply chains are created by the subjects interested in cooperation on operating the products flow from the production and acquisition place to the place of final consumption. The aim of this cooperation is reaching high efficiency of the elements of the chain and the chain treated as a whole. The success of the supply chain management depends on the integration and coordination of the three basic flows: information, products and cash.

Supply chain management means the conception of planning, managing and controlling by means of a supply chain, including all the stages of the creation and the supply of the logistics values - from the place of raw materials acquisition, through the production process to the ultimate customer in order to offer the right goods, in a right time and place, in a right quantity and quality, at a justified cost and with the use of the latest information technology.

The basic operations carried out by the subjects along the supply chain, which require integration, are the following: sale, purchasing, storage, transportation, finances, information supply etc. Individual subjects are linked with each other with cooperation and information ties.

The importance of the supply chains as the instruments for coordination of activities results from still increasing impact of the following factors:

- more complex and refined customers' requirements,
- regional and global sales planning,
- decreasing life cycle of products,
- increasing power of information and its effectiveness in a sphere of costs,
- changes in production technologies and technologies of deliveries,
- increasing delivery dependence on economic and strategic reasons,
- increasing number of legal regulations, particularly within the range of consumption and the environmental protection.

Autonomous information systems supported by modern technology function in the companies - links of the logistics chains. Large production, transport, forwarding and logistics companies profit from well-developed information systems MRSII (Material Resource Planning) and ERP (Enterprise Resource Planning). The systems cover practically all the activities of the company. They consist of the modules embracing finance and accountancy, materials management, distribution, planning purchases, demand analysis, human resources management, production management, renovation management, sale and supporting other elements of the relationship with the customer (winning new customers, customers database, preparing the offers, sale, after-sale support and service), designing new products, quality management and a whole sphere of e-business. During the implementation of the system the

above-mentioned modules are modified for the needs of a given enterprise. The degree of modification can be different and it is sometimes indispensable to prepare special software, typical for a given range of activities or specialist for an enterprise, for example, car fleet management, forwarding management, express dispatch and storage or packaging management. Among the modules typical for a transport sphere, there are the modules supporting the arrangement of the transport routes and the work schedule of the drivers and the transportation, modules covering transportation management (planning overhauls, keeping records of expenses for vehicles), recording and management of dispatches and informing the customer about the place in which the dispatch is.

The integrated information systems of the companies are open systems, which mean that they are able to integrate with the systems of other enterprises. An integrated information system of the whole chain is its information link. Such a system is – apart from cultural and operational conformity, flexibility and trust – one of the most important factors conditioning satisfying logistics partnership. The development of the integrated information systems of the companies extends beyond corporation structures. The systems of functional modules integration within the organization such as MRP (Material Requirements Planning) or ERP (Enterprise Resource Planning) evolve into integration of organizations in systems of SCM (Supply Chain Management), WMS (Warehouse Management System) or CRM (Customer Relationship Management). They favour the creation of integrated supply chains, becoming the link among different corporation systems. Electronic vertical business platforms are created in this way. [1]

CRM (Customer Relationship Management) systems are the tools used in all the relations with the customer: starting from the stage of looking for him, through winning, servicing and keeping him. It is commonly known that retaining the customer is a few times cheaper than acquiring a new one. Therefore, the enterprises focus largely on building the customer loyalty. The loyalty is based both on the quality of the product and efficient service.

CRM is a business strategy aiming at building long-term relationship with customers in order to increase profitability of the company and reduce costs. Customer satisfaction results from the quality of the offered products and services rendered by the company. Every customer feels exceptional for the company when the company knows his private preferences and meets his tastes. The advantage for the customer is that his needs are met, and for the company that its relationship with a satisfied customer is long-term. A large company has to build a database in order to use the knowledge about the customers. It becomes a valuable source of information as it contains information about the consumer. CRM is needed to make the management system uniform and all the sections of the company (sale, marketing and service) correlated. [2]

On a Polish market there are many accessible applications within the scope of CRM systems (a list of CRM suppliers: www.crmexpert.pl). Applications Prosper CRM, SIMPLE-CRM, VENDO CRM etc. can be enumerated.

The systems are modularly built and they enable the realization of different functions, among others such as: [3], [4]

- customer identification by name, industry, town or surname of contact person,
- facilitation of the process of customer profile analysis,
- systemizing marketing work through control and organization of work,
- ability to check both existing and potential customers,
- segregating the customers into groups by means of mechanisms of the company category and group,
- ability to track the history of contacts with customers,

- serial printouts or serial advertising e-mails, offers and other promotional materials for a specific group of customers,
- advanced orders control,
- ability to place, browse and search for any offer,
- supporting quality management,
- supporting business processes,
- improvement of inner communication,
- efficient sales management,
- purchases management,
- support of workflow in all the spheres of company functioning,
- documents management,
- knowledge management,
- competitor analysis.

The next application – e-Supply Chain belongs to a new generation of software supporting key business processes service, which is also directly used by employees of other enterprises, suppliers and customers with CRM module. E-Supply Chain uses the most modern information technology and possibilities of Internet, supports and facilitates key business processes among the companies collaborating within the range of the supply chain. At present the application is offered in two versions: eSupply Chain FrontOffice – for the companies exploiting complex base systems, and eSupply Chain Logistics – for the companies with their own warehouse service and sales order management. In both versions the main task of eSupply Chain is the service of key business processes appearing at the meeting of a supplier and a customer, such as: [5]

- exchange of information about the history of collaboration
- supplying the customers with marketing information,
- browsing through the offer,
- ordering and control of order fulfilment,
- control of the settlements of the customers' accounts,
- monitoring the level of reciprocal turnover,
- tracking the trade contacts,
- servicing mobile traders who use notebooks and handheld,
- efficient marketing – one-to-one marketing,
- informing the traders about threats,
- gathering information about bargains,
- collecting information on competitors' activities.

All the links of the supply chain: a company using eSupply Chain, suppliers and customers, profit from eSupply Chain. eSupply Chain is built modularly. The application consists of the modules such as: presenting an offer, orders recording, orders processing, CRM-Facts, reports and analyses, servicing sales, representatives, servicing warehouses, invoicing, price lists service, service module, entitlement service, log module of the application, DBI Interface, EDI Interface. [5]

eSupply Chain is one of the first in Poland and all over the world professional, commercial applications, designed and performed from the very beginning according to specification of the most modern Internet technologies.

SAP company offers on a Polish market mySAP SCM (Supply Chain Management) – an integrated solution serving the management of a modern supply chain network - starting from the phase of the design of the product to choosing the sources of supply, from product demand planning up to managing the distribution. Due to mySAP SCM, the collaborating

partner companies are quickly able to detect new demand on the market and use the information in the whole chain of logistics and co operational links. Planning and implementing the plan is synchronized all the time, and in case there is a shortage of product, there is still time to react and counteract the negative results of not meeting the customer' needs. mySAP SCM consists of complete and integrated tools indispensable for planning and realization of the supply chain tasks. They create a platform of collaboration on all the levels of planning - beginning with strategic, through tactic up to operational one. Partner companies can cooperate in all essential logistics fields – such as taking customers' orders or tracking the stock or supplies. The same forms of cooperation are developed by both customers and suppliers of a company. In the same time the efficiency of the supply chain is controlled constantly and improvements can be implemented to the economic practice straight away. [6]

Establishing an integrated supply chain causes an acceleration of the material turnover, due to the elimination of processing the same information many times. Such a concept determines the following practical recommendations: [7]

- electronic data interchange (EDI),
- e-trade,
- in case of a big number of data, which can take place in big integrated chains, the use of intelligent filters sorting the information,
- automation of the transaction data processing,
- simplification and optimization of the business operations,
- integration of the systems supporting the management of each company in the logistics chain.

3. LOGISTICS NETWORKS

The notion of a supply chain is more and more often substituted with the notion of supply networks. The logistics supply network is a broader notion than the supply chain. The networks are formed by independent enterprises which, according to the circumstances, may compete or cooperate. The networks enable the integration of the economic activities of the spatially dispersed companies in order to satisfy individual expectations of the customers. The organizational ties between the subjects forming the network are, contrary to the supply chain, more blurred and the collaboration and partnership relations impermanent, appearing and disappearing depending on the needs of the market. The transactions and the deliveries in the network have variable and high frequency, what requires a lot of flexibility of the operations.

The observation of the organizational configuration of the arising supply networks shows the existence of diverse hierarchical systems and kinds of ties between their participants. H.Ch. Pfohl distinguished and characterized four kinds of integrated networks: [8]

- a strategic integrated network which is a stable system managed by centrally situated production or trade enterprise,
- a virtual enterprise, which cooperates at the realization of the incidental transactions due to the use of information technology,
- an integrated operational network in which the cooperation is based on the integrated information system allowing to use up spare productive capacity and logistics service of the partners,
- a regional integrated network, characterized by cyclical cooperation of many small companies situated in a given region depending on the kinds of orders and their volumes.

One can also distinguish polycentric, hierarchical and taking into account organizational ties networks: [9]

- local networks based on private relations,
- supply networks based on technical ties,
- supply networks based on capital share,
- supply networks based on information ties.

In hierarchical networks there is a superior link coordinating the processes in the network and playing the role of integrator. Trade or production enterprises or logistics operator can become an integrator. Polycentric networks are characterized by lack of one integrator and the base of creating the relations can be capital, technical and technological connections or personal contacts and information links, which lead to the creation of virtual networks of correlations controlled by logistics processes. Correlations in logistics networks can be operational or strategic, and the network can have various territorial ranges. [10]

Present formation of networks and their functioning depends on the development of the information systems. The key role in forming the networks is played by communicational and transactional platforms (electronic logistics platforms) based on global standards of information exchange. An electronic logistics platform consists of eMarketplace, (virtual platform of buyers and sellers), eExchanges (integration with information systems of senders, recipients, logistics operators, and logistics integrators), eProcurement (purchases management) and eFulfilment (electronic support of order fulfilment). At present logistics requires the application of advanced information and communication technologies such as GPS (Global Positioning System) enabling tracing the items in logistics networks or RFID (Radio Frequency Identifier Device) enabling remote reading the data with the use of radio technology and electronic transponders. A great importance is attached to the implementation of the Electronic Product Codes (EPC) or "radio bar codes" using the RFID technology to track and trace the goods in the networks. Cellular telephony and the Internet also play a vital role. [11]

eMarketplace play the role of a bazaar on an electronic market enabling the buyers to choose an offer out of many of different suppliers, whose offers are grouped in one place. Two types of eMarketplace can be distinguished: horizontal and vertical. The main difference is that vertical markets deal with narrow (sometimes very narrow) field of economy. Therefore they need very specialized staff and products. Vertical markets can be divided into broad and narrow. Vertical, narrow eMarketplaces (niches) deal with strictly defined market and have an extensive knowledge about their customers and they offer a very specialist product. Vertical, broad eMarketplaces also focus on one field, but in a wider way. Horizontal eMarketplaces deal with distribution of almost everything to almost everybody. Their problem is ensuring an interesting service and attracting as many customers and suppliers as possible. Existing vertical eMarketplaces can be divided into many-to-many (trade association enabling a big number of sellers and buyers being on a common market), one-to-many (it enables big companies to trade with their business partners), one-to-many extranet (similarly to one-to-many, but bigger companies can afford building their own system). [12]

eProcurement can be defined as a new organization of procurement, which is supported by system solutions enabling entrepreneurs and suppliers to cooperate efficiently in a completely controlled way. Documents circulation is automated and made in an electronic way. The employees of all the organizational units get access to a uniform system of purchases process service. eProcurement includes all the procurement processes from placing an order, up to payment recording. It is applied in the whole organization on all the levels. It enables the organization to rationalize the costs of purchasing the goods and services by

efficient use of purchasing power and automation of procurement processes. eProcurement makes it possible to coordinate planning and budgeting centrally and to monitor the purchases process. Proper realization of the purchases is carried out directly by organizational units in which the procurement is dealt with. Application of the eProcurement eliminates or lessens the faults of the traditional model of procurement and it brings profits for both the subjects buying by means of it and the suppliers. The scale of profits possible to reach in case of a specific enterprise depends largely on the size of the organization, efficiency of the present purchasing process and the range of its implementation (in geographical and assortment point of view). [13]

e-Fulfilment is a virtual, on-line service of carrying out and realization of the transactions. It includes such interactive elements of the order fulfilment as valuation and planning, ordering, documentation, tracking the route of the goods and forwarding and storing events, invoicing the logistics services and reports. Both operators and electronic platforms can be the suppliers of e-fulfilment service.

Apart from information technologies, an essential role is played by telecommunication ones. Next to the applied GPS system (Global Positioning System), consisting in identification of the place based on signals received from satellites placed in the Earth orbit, the system of radio identification (RFID) is implemented. RFID is one of the most modern technologies of automatic identification. Radio waves permit remote readability of an identifier. The identifier is recorded in a special electronic system in a plastic card or in a special tag (used mainly in industry).

RFID technology was developed to enable the producers tracking, for example, goods transport. Advanced monitoring system, using the frequency of radio waves, enables not only a thorough supply control (and what it entails, economizing on staff who usually deal with it), but also quick reaction to the goods demand in retail outlets or fixing the precise date of the product delivery or warranty expiry date. Infosys ensures its customers that it would implement the system according to their needs, including adjustment of the used radio networks parameters to IT infrastructure already operating in a selected company. RFID technology attracts a lot of attention: it is tested, among others, by supermarket networks Tesco and Wal-Mart, American Gillette or Singapore network of state libraries. [14]

The development of electronics resulted in technologies of intelligent labels, which are the extension of bar codes, enabling the solutions of supplementing and copying information, inventory and protection with the use of one carrier – I-code labels. I-code consists of a microchip and an antenna. Such a philosophy of a product allows placing it practically on any carrier, for example foil, paper, plastic card, which enables the perfect connection of a few functions within the same system, among others goods inventory or access control. The idea of reading the label designates the diversity of its application and it perfectly fits the requirements of the customers. I-code, due to fixing it on laminated paper, is able to cooperate with a bar code system. Such a label with a bar code on one side and an I-code on the other, allows perfect inventory and protection, especially of valuable items, and what is more, it can be read independently in two systems: bar code one and RFID one. The application of such labels makes the goods labeling active, which means that there is a possibility of multiple reading and recording the information, collecting the data through terminals or while passing the subsequent gates, switching on and off the alarm functions or automatic inventory. It is a special kind of external database, enabling the direct edition and selective protection. [15]

As essential processes determining the base of the supply network management, from the point of view of the needs of each participant, one can show: [16]

- customers relations management – winning new customers,

- customer service management,
- demand management – keeping the balance between the market demand and the ability to satisfy it,
- order fulfilment – integration of production, logistics and marketing,
- production management – adjusting the production to market demand,
- supply management – adjusting the supplies to the production needs,
- product development – integration of the customers needs to the possibilities of the suppliers,
- returns management – collecting the returns from the customers.

Logistics networks are defined as a new dimension of 21st century logistics, determined by mega trends in contemporary distribution and logistics, reflecting the future of modern logistics.

4. CONCLUSION

The tendencies, observed in contemporary economy, towards deepening the division of labour, intensification of trade and geographical expansion of markets, structural changes and competitive struggle for customers cause the changes in the activities of industrial, commercial and service enterprises, including transport and forwarding companies, forcing them to change their approach towards traditional type of business contacts as well as business exchange (distribution processes). A new dimension of the customers needs forces the traditionally operating enterprises to integrate their activities in the range of product development, planning of demand and order fulfilment. The range of activities of such a type is much broader and it accumulates a lot of different functions (i.e. storage, stock control, purchasing policy, transportation, customer service etc.) into one integrated supply chain management system using modern information technologies. The systems are currently transformed into logistics networks which are thought to be of great importance in the nearest future.

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