■ Chapter 6 ■

Logistics and the Management of Information Flow

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Abstract: Information flow is a crucial component of activities in the logistics area. Each flow of raw materials and goods is also accompanied by the flow of information. Unlike the movement of goods, the flow of information is always two-directional. Information flow is a necessary guarantee for the movement of goods in the economy. Additionally, information which is passed at the end of the logistic process is a confirmation of the delivery. The aim of this study is the presentation of conditions referring to the management of information flow in different aspects of logistic activities. The flow of information in logistics supports the collaboration between a supplier and a recipient of goods, it connects individual links in the supply chain. As there is the need for efficient and quick transfer of all information available in an enterprise, cutting-edge information systems are commonly used in each of the areas of logistic activities. Contemporary IT solutions applied in the area of logistics help to increase the process speed and information accessibility. Logistics is a type of activity which shows in this scope great willingness and effectiveness of the implementation of innovative solutions.

Keywords: management of information flow, delivery, innovative solutions, logistic activities, Internet of Things, Artificial Intelligence

Introduction

Information flow is a crucial component of activities in logistics. The appropriate exchange of information between the sender and the recipient is the key condition for moving goods between their dispatch and reception point. Each flow of raw materials and goods is also accompanied by the flow of information.

Unlike the movement of goods, the flow of information is always two-directional. Information flow is a necessary guarantee for the movement of goods in the economy. Following this, the role of information consists in anticipating the movement of goods and accompanying it in an explanatory manner. Additionally, information which is passed at the end of the logistic process is a confirmation of the delivery itself.

The process of information interchange begins earlier than the process of the exchange of goods. The appropriate interchange of information between the sender and the recipient is the key condition for the movement of goods between their point of dispatch and delivery. It is reflected by, among other things, the need for sending a quotation to a prospective buyer and receiving in return a reply in the form of an order for specific goods. Thus, the flow of information also initiates the movement of goods. Usually, the exchange of goods is also accompanied by an exchange of information which refers to e.g. the current location of a given consignment or information on damage to or delay of the delivery, if any (Gołembska, 2006).

The flow of information in logistics supports the collaboration between a supplier and a recipient of goods, i.e. it connects individual links in the supply chain. Efficient information flow also plays an important role internally, contributing to the connecting of further spheres of organisation activities. It enhances communication between the purchasing and production departments as well as between the production and distribution departments. Therefore, in simple terms, it may be stated that information flow is a kind of a nervous system of logistics as it ensures the efficient command of all processes in an enterprise (Blaik, 2010).

As there is a need for an efficient and timely transfer of all information available in an enterprise, cutting-edge information systems are commonly used in each of the areas of logistic activities. Today's information and communication technologies are regarded as an indispensable component of a broader logistic systems infrastructure. The development of information technology has become an indispensable component of the appropriate implementation of assumptions relating to the functioning of logistic systems (Christopher, 2000).

Information as a factor supporting the management of a supply chain

The scope of collaboration between enterprises with reference to the logistic activity has been subject to numerous changes and improvements. At first, the collaboration on the enterprise - customer level was based solely on the execution of the delivery of a given product. Only subsequently, did the cooperation between enterprises and customers started to align to a greater extent. As a result, individual stages of enterprise activity, including purchasing, production, distribution and other back-office operations within the enterprise, has been technologically combined (Porter, 1998).

The consequence of such an approach was the claim that the success of an enterprise can be achieved by way of the efficient collaboration among all entities cooperating with an organisation. Newly-shaped relationships were based on a number of connections which were later referred to as supply chain links. It is worth noting that at the initial stage of the forming of the collaboration between enterprises, businesses strived for reduction of stocks; however, very soon, they also began to optimise other processes linking individual contractors. This was possible due to the streamlining of the exchange of information and to the technological advances taking place in this scope.

There are a number of different approaches in the scope of the identification of the supply chain. For the European Committee for Standardisation, a supply chain is the sequence of processes which create value added to a product during its flow and processing from raw materials through all intermediate forms to the form consistent with the requirements of the end-client (Logistics – Structure, 1997). According to the APICS (Association for Operations Management), relationships between the supplier and recipient, their solidity and mutual trust, are essential for the functioning of a supply chain (Cox, Blackstone, Spencer 1995).

The supply chain can also be referred to as a process or a structure. As a process, it is a sequence of events in the movement of goods which increases their value. The supply chain, referred to as a structure (organisation), is a group of enterprises performing together activities which are necessary to meet the demand for specific products in the entire chain of movement of goods stimulated by the flow of information.

We may usually distinguish the following in the structure of the supply chain:

- an initial link, which is a supplier providing a producer with raw materials and consumables,
- indirect links responsible for processing which results in the manufacturing of finished goods,
- a final link which is an enterprise supplying a customer with a product.

The supply chain may have the following nature:

- external – it is formed by independent enterprises which strive for a common goal,
- internal – it is formed by functional units within one enterprise.

The supply chain may refer to:

- one enterprise, together with its internal suppliers and recipients,
- a pair of collaborating enterprises, in a supplier-recipient relationship,
- numerous enterprises collaborating in a supplier - recipient relationship.

In a structure defined in this manner, a supply chain means mining, production, trade and service companies as well as their customers and clients collaborating in different areas. Between them, there is a flow of streams of products, information and financial means (Kawa, 2010). Apart from the three components mentioned above, more and more attention is being paid to the exchange of knowledge. Summing up, the types of streams mentioned here constitute the basis for each of the logistic activities.

Current business practice indicates that the majority of enterprises have numerous suppliers and recipients acting to achieve one goal - providing an effective service to the end consumer. In reality, this comprises the entire supply network where we may distinguish a series of individual chains.

On the one hand, the supply network is a type of a configuration of the supply chain where some of the links are multiplied so as to deliver different products to the points of production, distribution or sale. On the other hand, it is a collection of enterprises collaborating with the recipient so as to meet their needs regarding production, distribution and sale (Niestrój, 2004).

Within the supply chain there is often a business entity having a much-privileged position. The supply chain leader is an enterprise holding a dominant position as compared to other business entities. It is this enterprise that imposes the manner of functioning on other entities. At present, retail networks play the role of such leaders.

A network organisation is regarded as a group of enterprises, linked with a computer network, whose main objective is increasing the effectiveness of decision-making processes (Wiatrak, 2003). We may enumerate the following features which distinguish a network organisation:

- liquidation of borders between network participants (nods);
- the community of goals and the resulting high level of mutual trust;
- a low level of vertical integration and hierarchy between participants having as diversified as possible a set of resources and competence;
- the ability to learn, innovativeness and flexibility;
- information transparency through the application of advanced information and communication technologies.

Due to the need for the efficient and timely transfer of all information available in an enterprise, modern-day logistics operating within the supply chain are looking to cutting-edge information systems. The development of information technology has become an indispensable element of the proper realisation of assumptions relating to the functioning of logistic systems. Information and communication technologies available nowadays are regarded as an indispensable element of a broad logistic systems infrastructure (Fechner, Szyszka, 2018).

Information systems used in logistics perform the following functions:

- an initiating function - a series of actions connected with the processing of orders and the creating of necessary documents which goes back to the supply chain;
- a planning function - logistic processes seen in different cross-sections and various time spans; in this case, one of the key areas is planning of material needs in an enterprise, preparation of production schedules or planning of distribution of goods;
- a coordinating function - all actions, processes and operations taking place in the logistic system; this function is applied both in the environment of one enterprise and with reference to the entire supply chain; the coordinating function is performed with reference to time,

place and quantity, and it is also tightly linked to the need for communication;

- a control function - the performance of logistic operations, mostly in production, storage and transportation processes;
- a steering function - the operating sphere and all logistic processes, especially with reference to production, storage and actual distribution;
- an integrating function - integrating the information system of an enterprise with the systems of suppliers, business partners and recipients, which enables communication between various links of the supply chain (Szymczak, 2013).

So as to streamline the flow of information and goods within the supply chain, electronic interchange of documents was introduced, which is a natural next stage for the automated product identification which takes place in computer systems. Electronic Data Interchange (EDI) allows placing orders, preparing documents and issuing confirmation of shipment receipts owing to the use of readers and the application of computer systems. This system is based on international standards in the scope of communication and information interchange.

Electronic Data Interchange – as the support for logistic processes

The introduction of electronic document interchange is an obvious consequence of automated product identification in computer systems. The idea behind EDI consists in the combination of opportunities offered by information and communication technologies so as to eliminate the need for creating hard copies of documents. EDI is the simplest technology serving the purpose of carrying out business transactions without all the labour-intensive activities of creating, copying and sending of documents. It is one of the modern solutions combining directly the functionality of information systems with the minimum input of human work.

EDI is an electronic system of transmission of business data and other documents from computer system or database owned by one organisation to a computer system or database owned by another organisation. All documents referring to the placing and processing of an order, such as an order confirmation or an invoice, do not have to take the form of computer printouts. The application of proper computer structures makes it possible to send documents to a computer system where they are decoded and entered

into a computer file. A recipient does not have to get involved in any way, whereas the involvement of a sender is minimal.

Also, users operating within EDI do not have to own the same computer systems. The only requirement for them is to have applications enabling recording and reproducing of electronic structures. The assumption of this system distinguishing it from all others is the lack of human input throughout the entire process of data transfer, which is not possible with the use of popular drives. While speaking about EDI, it should be considered mostly as automated data processing and transfer.

The application of EDI in the area of logistic activities enables the immediate information transfer to business partners. The system uses standard commands which means that all users taking part in the information interchange use the same language. Using the EDI makes it possible to combine processes taking place within the external logistic chain and guarantees the control over the processes being currently performed.

An important achievement, aided by the use of EDI, has been the elimination of the need for the multiple entering of data and the possibility for information to flow efficiently and timely between the participants taking part in the interchange. The use of EDI shortens the time needed to access information and reduces the labour-intensiveness of the process. For the application to bring quantifiable benefits, all participants in the logistic channel should communicate with the use of a computer system. The effective implementation of the system means that all computer systems, both those of buyers and sellers, need to communicate directly.

The main grounds for the application of EDI is the globalisation of trade transactions enforcing the agreement on a worldwide standard of documents, the development of computer technology and the reduction of the costs of its application. EDI is an interface for sending documents which are most important for seller such as invoices, correction invoices, delivery notes, settlement reports and inventory reports. It significantly facilitates the interchange of information.

Information systems streamlining transport management

Contemporary transport companies operate in fast-developing local, national and international markets, where competition is fierce. The requirement to maintain customers and acquire new ones forces many businesses to improve

the quality of their services and to strive to meet the needs of their customers in the best possible manner. In turn, the pace of changes occurring in the environment of a contemporary enterprise requires more and more efficiency in operations (Bojarski, 2003).

The growing dynamism of the business environment has led to an expectation that IT tools will reduce the time needed between the identification of new needs andthe meeting of the same, which poses new challenges for transport companies. Now, the attention of every transport company is focused more and more on logistics management tools; and a prerequisite for effectiveness and the achievement of business objectives is having a smoothly functioning IT infrastructure.

The integration of all processes occurring in a business entity by means of direct access may be achieved by way of the application of a constant connection to the network and the use of proper software. Production, distribution and purchasing processes, financial records and cost control means are processed consistently in real time, or immediately after the occurrence of an event (Gołębowska, Szymczak, 1997).

The flow of information in transport and forwarding companies is more important than ever before. It forms a kind of a nervous system integrating links in the supply chain. It enables smooth steering of transport and forwarding processes, which facilitates the making of right decisions based on the provided, previously processed, information. With an increase in the the range of manufactured goods, and the expansion of businesses, the mass movement of goods is taking place. Thus, it is necessary to use modern information and communication technology so as to process the vast amounts of information which accompany this movement (Długosz, 2009).

Organisational changes in transport and forwarding companies are integral to the development and extension of information systems. Information forms the basic material for planning, decision-making and preparation of analyses based on generated business results. The information system supports decisions of the management and becomes an indispensable tool in day-to-day operations of transport companies.

Transport, as a tool serving all kinds of movement, is a key link in the logistics system. Streamlining this link, which directly conditions an increase in the efficiency of the entire logistics system, requires multilayer actions. The Computerisation of transport in a broad sense means the application of electronic communication networks, electronic data interchange techniques,

the implementation of bar codes and the paperless workflow of documents. This computerisation, facilitating transportation tasks, is a means leading to the gaining of a competitive advantage..

Transport units when realising the transport process often pass through numerous indirect links - a supplier, a recipient, one or more intermediaries, transshipment points, customs etc. In each of these links, it is necessary to identify these units so as to attribute to them information such as the specification of a supplier, a recipient, the content of the unit, weight, etc. This information is often stored in computer systems and may be interchanged between parties involved via the EDI.

A new functional quality of contemporary systems for information flow management results from their useful applications. Strong, both horizontal and vertical integration of individual market players is also of key importance. As a result, from the point of view of a user, it leads to the need for having instant access to a wide set of applications, to new computer technologies and hardware platforms. The protection and security of IT investment and of data transferred within the systems becomes a new challenge.

IT solutions used in transport enable full integration with clients, allow a company to be closer to its business partner, to integrate with his IT environment and to supply all necessary information on his carriage. Apart from the EDI, Track&Trace mobile application occupies an important place among solutions widely used by businesses. It enables tracking cargo online. Owing to the integration with a GPS transmitter of forwarding agents, contractors receive information on the location of a vehicle directly from a satellite.

Another example of the application of IT solutions is electronic freight exchanges. They enable a forwarding agent to track new offers submitted for transport. The exchanges have gained great popularity as they are easily accessible. In most cases, there is no need for interference with the participant's information system. Online logistic markets act as intermediaries in the interchange of information on demand for logistic services and options to satisfy this demand, using enterprises from the transport, forwarding and logistic industry which participate in auctions. The main activity of e-markets consists in matching the offers of the platform clients within one or many logistic processes. However, most often, it is transport that is involved as well as proper functioning of the mechanism of an auction as such. An enterprise

chooses groups of operators considering the requirements indicated by its clients and then offers for the rendering of a service are placed.

Depending on their range, electronic exchanges may divided into local, national, European and international ones (Pędziwiatr, Kaczmarek, 2018). Another classification distinguishes open and dedicated freight exchanges. Open platforms are meant for all entities that are interested in taking part. An enterprise accomplishes specified formalities and becomes a member of an e-exchange. Customers of such a platform are small and medium-size transport enterprises which have a fleet of 5-10 vehicles. It is the largest group of users of freight exchanges. Another extremely important link is forwarding companies, where day-to-day operations are impossible without participation in electronic freight exchanges. Forwarding agents usually use several exchanges at the same time so as to manage their transport fleet effectively (Kisielewski, Leśniakiewicz, 2016).

An electronic freight exchange is an ideal tool to increase the transport efficiency ratio, i.e. to use the space of the hold while meeting full transport orders. Then, the user may browse catalogues of suppliers, competitors, as well as its clients, at any time, creating transport environment independent of time zones and distances separating partners (Sosnowski, Nowakowski, 2015). Based on forwarding agent's current orders and information on his cargo, the system selects and offers to the forwarding agent new orders to be carried in the opposite direction. It considerably helps to reduce the costs of transport. As part of another function, a forwarding agent has an opportunity to check payment status and to print out a transport order. An important tool is also GetRate online calculator, which allows calculating in real time the cost of sending cargo from China to European countries via container rail transport.

A solution which comprehensively streamlines the process of transport order management is Oracle Transportation Management (OTM). It allows shippers to organise order processing and to streamline it, to check time devoted to order execution, to control the budget, to facilitate communication with customers and subcontractors, to build a knowledge base on customers and to settle individual orders automatically.

For large transport companies, which put their own development and an increase in the information flow between their employees and clients in the first place, CRM (Customer Relationship Management) and ECM (Enterprise Control Management) seem to be indispensable systems. Companies which are not using these systems are not able to compete with others in terms of

availability for a client and continuous communication between employees. With today's standards which clients have got used to, i.e. almost immediate reply to their queries, quick payments and availability of goods within not more than 24 hours, a company without the support of one or two systems cannot meet these requirements. Tools and strategies offered by these systems make it possible to manage information irrespective of its location, which allows businesses to consolidate all information from the area of logistics.

Conclusions

Contemporary IT solutions applied in the area of logistics help to increase the process speed and information accessibility. The intense development of technology and systems means that what was an innovative customer service only five years ago becomes a standard procedure nowadays. The service of in-route monitoring of cargo is just such an example. This is an intensely growing trend. The more information is gathered about the transportation of cargo, the more detailed is our anticipation of its flow and the efficiency of such transportation. It makes it possible for employees to save time dedicated to performing routine activities and to reduce the cost of downtime in transport resulting from inappropriate planning of delivery routes.

In the coming years, artificial intelligence (AI) may substantially change the process of information flow. Self-teaching algorithms, which are driven by more and more digital data provided by computers and home appliances, cars and devices plugged into the Internet of Things (IoT), will support us in our daily activities. Advances in the scope of machine learning, artificial neuron networks or computer vision mean that technology is no longer an obstacle to the implementation of AI. Then, the barrier is the readiness of the market, of the legal system and of society to implement innovative technologies and the related changes in the functioning of specified industries. Logistics is a type of activity which shows in this scope great willingness and effectiveness of the implementation of innovative solutions.