



INFORMATION LOGISTICS IN E-COMMERCE

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Abstract: The work investigates problems of e-trade as a main element of e-commerce. It is shown that information logistics occupies an important place in work of the Online shop. Six groups of information streams flowing in Online shop are described: information streams connected with the characteristics of goods; information streams connected with the price of goods; information streams connected with the process of making order; information streams connected with the process of payment for the order; information streams connected with gathering the order at the warehouse and issuing of the order; information streams connected with the process of the order delivery.

Key words: Information Logistics, Information Flow, E-trade, Online shop.

1 INTRODUCTION. DEFINITION OF THE PROBLEM AND ANALYSIS OF THE LATEST INVESTIGATIONS AND PUBLICATIONS. AIM OF THE INVESTIGATIONS

By definition Internet is a means of communication among the people. If earlier only computers could connect to the Internet, now practically all the electronic devices can do this (laptops, pads, smartphones, TV-sets etc.). Fast development of informational technologies allowed Internet to penetrate almost all the spheres of the human activity. Today people cannot only learn the necessary information through the Internet, but to perform certain operations as well which they can also do in everyday offline life. For example: buy air and railway tickets, purchase tickets to theatrical performances, concerts or cinema, various goods (clothes, shoes, books, home appliances etc.), make bank payments without going to banks and so on. Thus, Internet conditioned the development of the new forms of business which determined the occurrence of the notions “electronic commerce” and “electronic business”.

Electronic commerce (E-commerce) is a sphere of digital economics which includes the interaction among the subjects of microeconomics (household and company) as for buy and sell of goods and providing services with the use of up-to-date information networks (Internet,

mobile connection net) [1, 2]. Constituent parts of electronic commerce are [1, 2]: Electronic Data Interchange, EDI, Electronic Funds Transfer, EDF, E-trade, E-cash, E-marketing, E-banking, E-Insurance, etc. With the help of electronic commerce some traditional (habitual) operations of interaction among the companies and consumers are changed to innovative. Within the frames of electronic commerce the consumer (buyer) orders a product or service on the company's site and then gets it by traditional means of courier delivery or transporter, and for information products – by means of sending via Internet channels [3].

E-business is any business activity performed with the help of communicational resources of global information networks with the aim of receiving income [1, 3]. There are two opinions (statements): the notions “electronic business” and “electronic commerce” mean the same (are synonyms), electronic commerce is constituent part of electronic business. Electronic business is a wider notion which includes any forms of interaction among the subjects of microeconomics by means of modern technologies: information exchange, conduction of marketing researches, making payments, in particular, through electronic payment systems; ability of creating virtual companies etc. Electronic commerce presupposes that conclusion of business agreements between the companies and consumers (for example, purchase and sale agreement) is performed by electronic means without direct physical exchange of documents and contact. Therefore, we will stick to the second statement in the investigations.

One of the main places in electronic commerce is occupied by information, and success of business activity depends on the quality of its exchange and analysis. Information in (digital) economics is a total of various data which can be recorded, forwarded, transformed and used for planning, analysis, accounting, control etc. [4]. Information can be effectively managed by means of information logistics. Today there is no unanimous definition of information logistics. One scientists and practitioners, in particular [4, 5], consider that information logistics is a company's activity direction of managing the development and functioning of information systems on it. In [6] it is stated that information logistics is a system complex of measures which are aimed at managing information at minimum expense and is a metaspace for common logistics. There is an opinion that information logistics organizes the streams of data which accompany material streams [7]. A resumptive definition is cited in [8]: information logistics is a new scientific field the main function of which is organization and support of logistic information systems which are meant for saving, processing, optimization and distribution of logistics information resources turned into information product, with the use of efficient management methods with the goal of granting the company's competitive advantages.

The following authors investigate in their works various theoretical and practical aspects of the problem of functioning of information logistics, in particular, in electronic commerce: M. Arnold, V. G. Banko, N.I. Boiko, A. M. Gadzhinskiy, V. A. Ischenko, O. K. Nagina, V. Y. Kachurovskiy, K. Hessig and others. Studying the works of these and other scientists and practitioners allows to make a conclusion this problem is versatile, important, and actual. Still, there is a number of under-investigated moments. In particular, rapid development of information technologies stipulates constant changes (improvements) of logistic approaches of management in electronic commerce. This necessitates the use of up-to-date instruments of economic-mathematical modeling as means of support of taking effective management decisions in business.

Therefore, the aim of the investigations lies in the analysis and specification of the existing conceptual frameworks of managing information in electronic commerce, in particular, in electronic trade, and development of the new ones.

2 RESULTS OF INVESTIGATIONS

One of the most widespread constituent parts of electronic commerce is electronic trade. Today a typical Online shop is not just a business-card site, but a full-scale store of the new generation with a wide choice of goods and services. The structure of the Online shop as a subject of microeconomics constantly changes: it becomes more complex and changes according to the requirements of time. This calls for the necessity of constant effective management of the Online shop activity with the aim of increasing its income. This aim can be reached, in particular, if we regard the Online shop as a complex logistic system of microeconomic level which consists of the purchase, sale, marketing, stock, informational, financial, service, transport subsystems and the subsystem of managing stocks (see Figure 1).

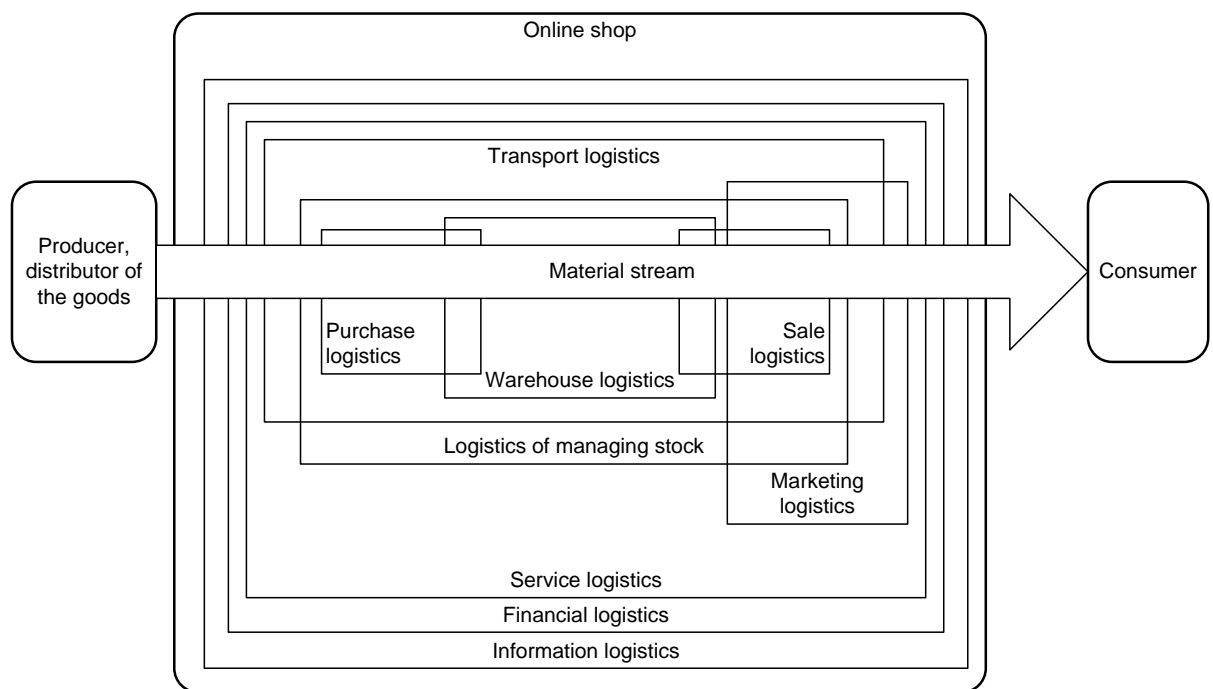


Fig.1 Schematic structure of the Online shop as a logistic system, author work

Each logistic subsystem can be regarded as a total of definite logistic operations which can take place either within one logistic subsystem, or grasp several of them. On Figure 1 logistic subsystems are displayed as sets: their intersections mean the existence of common for them operations; in case when one logistic subsystem maintains all the processes of the other logistic subsystem the latter is regarded as a subset of the first one. Material stream moves from the producer to the consumer successively through logistic subsystems of the Online shop: purchase, stock, sale. Transport logistics and logistics of managing stock are interrelated with these three logistic subsystems, they service them in a certain way, that is why it is shown on Figure 1 that purchase, stock and sale logistic subsystems are subsets of transport logistics and logistics of managing stock. Marketing logistics is connected with sale logistics and interacts in a way with transport logistics and logistics of managing stock. Service logistics which corresponds to service stream grasps all the processes of all the above mentioned logistic subsystems, that is why they are its subsets. Any logistic subsystem cannot function without financial resources and corresponding information, therefore financial and information logistics grasp all the logistics subsystems.

Information logistics is a subsystem which deals with organization of information streams which flow in logistics system. Online shop is a subject of electronic commerce, therefore this type of logistics is very important for it due to several reasons. Natural is the wish of the consumer to know actual information about the goods availability, their characteristics, terms and conditions of supply while making the order. When the order is made the consumer is interested in the status of its processing (accepted, processed, shipped, on the way etc.). Receiving full and true information as for the demand of the consumer allows the Online shop to effectively manage the goods stocks. There is a necessity to unite different types of information streams (verbal messages, document in paper and electronic form) on different levels of management (within the frames of the Online shop, between the Online shop and the consumer, between the Online shop and other organizations). At the moment these problems can be solved through introduction of the unified information system which should first of all complete the tasks of technical and software means of transition and processing of information which is necessary for the appropriate functioning of the organization according to the existing standards of electronic data exchange.

Information system in general case consists of functional, providing and organizational subsystems. Functional subsystem completes the tasks of planning, analysis, control and accounting and consists of the following elements [9]: support of marketing, forecasting in production, financial management, reports about the level of the consumer service, stocks management, warehouse management, support of transport, accounting and crediting etc. These elements are integrated in a unified information system by means of the following elements of the providing subsystem [10, 11]: technical maintenance (a complex of technical means which provide the processing and transition of information streams); information maintenance (a complex of various guides, classifiers etc.); mathematical maintenance (a complex of economical-mathematical methods and models); software maintenance (a complex of application and system-wide programs) etc. Organizational subsystem consists of human resources, ergonomical, legal and organizational maintenance.

On the basis of the rules of logistics «7R» (Right product, Right quantity, Right time, Right place, Right cost, Right condition, Right customer) the aim of information logistics will lie in transition or availability of the necessary information of the corresponding quality and content in a required place and for the necessary person who takes a decision, at minimum expense. Main tasks of information logistics in electronic commerce are [4]: planning of logistic needs; analysis of decisions connected with the flow of material stream; management control of logistic processes; integration of the Online shop, suppliers, transporters and consumers (buyers).

Information is one of the tools of the competitive advantage for any Online shop. In the context of information logistics we talk not only about information, but about information streams as well. Information stream is a set of circulating within the frames of the logistic system, between the logistic system and the environment messages (in paper and electronic form) necessary for management and control of logistic operations [4]. Characteristics of the information stream are [4]: the source of occurrence, the direction of flow, the speed of transceiving, intensity etc. Information stream is first of all connected with material stream, but there is no univocal correspondence, synchrony in the time of occurrence, the same direction of movement between them [9]. Information stream is not constant in the process of movement through logistic system. It changes, acquires the necessary properties for completion of the set before the logistic system tasks. Besides, there may exist several information streams in the logistic system which flow simultaneously in some periods of time and/or can intersect (unite) in the other.

The number, versatility and complexity of information streams which flow in the Online shop can increase with the increase of the shop scale. It is obvious that the logistic

system of the local Online shop (within one city) having homogeneous goods is much simpler than that of the shop working with buyers from all over the world and offering various goods. The set of information streams of the Online shop should cover its document flow. Thus, occurs the problem of effective information streams management (its direction, structure, volume, speed etc.) the salvation of which should facilitate reaching the aim of information logistics.

Information streams flowing in the Online shop can be divided into groups by various features (possible classifications of information streams are cited in [4, 9]). In particular, one can group information streams of the Online shop following the needs of the consumers as they (consumers) are the source of the potential income of the shop. In this case the following groups of information streams can be defined: information streams connected with the properties of goods (technical, functional etc.); information streams connected with the price of goods; information streams connected with the process of making order; information streams connected with the process of paying for the order; information streams connected with preparation of the order and its forming (these streams may not concern the buyer; information streams connected with the process of the order delivery. These streams flow through logical subsystems of the Online shop and accompany, in particular, the following steps of interaction with the buyer:

1. selection of the necessary item in the catalogue of the Online shop by the buyer and adding it to the shopping cart;
2. placing the order on the site of the Online shop (buyer's data, contacts, address and time of delivery etc.);
3. paying for the order by a convenient for the buyer way (as a rule it is a payment card for the Online shop);
4. confirmation of acceptance of the order on e-mail of the buyer;
5. transfer of the order to the sales department of the Online shop;
6. confirmation by the warehouse of availability of the necessary quantity of goods. In case there aren't enough goods in stock it is reported to the sales department which takes a decision of whether to change the order (replace the items at buyer's agreement) or order the necessary goods from suppliers (the buyer may not be informed about that);
7. preparation of the order (packing, creating the necessary supporting documents etc.);
8. sending the order to the buyer through delivery service (own or third party);
9. receiving the order by the buyer. Checking the goods and whether they are in good condition, without damage or defects, and in case the consumer is not satisfied – making claims to the delivery service or the Online shop, issuing of the return. Making payment if it wasn't made before. At this stage the consumer may resign from the purchase;
10. the order is considered fully accomplished if the buyer received the order and the seller – full payment for it.

Further we will describe each of the groups of information streams mentioned above.

The source of appearance of the information stream which describes the characteristics of goods is a producer of these goods. It would be appropriate here to outline the main characteristics and all characteristics. It is connected with the fact that making a choice a person simplifies the problem regarding not all the criteria, but several of them which in their opinion are the most important ones. For example, for tabs main characteristics can be the following: the size of the screen diagonal, matrix type, resolution and type of the screen, operation system, processor, number of the cores, onboard and RAM memory, the ability to support memory cards. Other characteristics may be: maximum memory card capacity,

availability of 3G-module, SIM-card capacity, navigation system, availability and characteristics of the web-cam, battery, size, color and weight of the tab, kit, warranty period etc. This stream moves through the Online shop to the buyer without changes. Speed and intensity of this stream may depend, in particular, on the appearance of the new goods, change of their characteristics etc. The aim of the information stream is motivation for making some actions, taking decisions. Among other things this information stream is the basis for the buyer's choice in the Online shop. Therefore, to this group of information streams may refer a stream the source of which are buyers which reflects the requirements and wishes of the buyers as for the goods. Elements of this stream are characteristics of the goods which have the greatest influence on consumer's choice.

The source of information stream connected with the price of the product is its producer. Although, moving through the logistic system of the Online shop this stream acquires new elements. It is obvious that price and conditions under which the producer sells the product to the Online shop differ from the price and conditions under which the Online shop sells this product to the buyer. That is why, in our opinion, it is appropriate to talk about several information streams connected with the price and conditions of the product sale: 1) the first stream flows from the producer to the Online shop (ending, for example, in purchase logistic subsystem of the Online shop); 2) the second stream is internal, it flows in the Online shop from purchase logistic subsystem to sale logistic subsystem and corresponds the price change; 3) the third stream flows from the Online shop and reflects the price and conditions of the product sale. As opposed to these streams the buyer generates the information stream which reflects, for example, the range of prices and the list of conditions under which the buyer is ready to buy this or that product.

Therefore, in the groups of information streams connected with the characteristics of the product and its price we can single out information streams which move towards each other and new information and material streams occur due to their interrelation.

Information streams connected with the process of making order are at first sight generated by the buyer. Although, in our opinion, the initial information necessary for making a purchase is generated within the frames of the Online shop: магазину: stock of the goods, minimal volume of the order etc.

To the group of information streams connected with the process of the order payment refer the streams the sources of which can be buyers, Online shop and financial institutions through which the payment is performed. It is important for the Online shop to effectively manage this group of information streams as part of income in e-business is lost exactly due to unsuccessful payment. For example, the level of non-complete online payments that could potentially be completed constituted 17% in 2013 in Ukraine [12]. This problem can be solved, in particular, with the use of reliable international processing centers in functioning of the Online shop which allow to safely and rapidly accept payments by various means from the buyers. The buyer should also know well the requirements of making online payments which bank institutions set towards such operations (activation of such service, limit of one operation or the number of operations per day etc.).

In case the product is available the group of information streams connected with gathering at the warehouse and issuing the order flows within the frames of warehouse logistic subsystem, in other words – goes beyond the frames of with the aim of complete satisfaction of the buyer's needs. For example, in case the product is unavailable at the warehouse (this often happens with the seasonal goods under discount) the information about it comes to the sales department (sales logistic subsystem) which can offer the buyer various variants of solving the problem: change the product for another one, return of the money to the bank card, providing a voucher for the sum of the unavailable product with opportunity to use it later etc. Further depending on the buyer's choice the information stream returns to the

Online shop which can generate a new stream (return of the money) to the bank institution. When the product is unavailable at the warehouse but it can be ordered from the producer and can be delivered within the short period of time such information is provided to the purchase department which issues an order to the producer. If the terms of delivery of the unavailable product are long this information goes to the sales department which informs the buyer, and in case he agrees to wait they order the product from the producer, otherwise – the actions described above for the discounted seasonal goods take place.

The elements of information streams connected with the process of delivery of the order to the buyer depend on the ways of delivery that the Online shop can use: 1) with the help of its own delivery service (if delivery is within one city this may be its own courier, if delivery is around the country then own transport and probably a courier are used); 2) with the help of the third party courier and transport services within the city, country and throughout the world (national or international); 3) customer pickup of the product by the buyer from the warehouse or Online shop office. In such a way the elements of these information streams should reflect, besides information about the order itself (the product, its quantity, price), the information as for the process of receiving the order, the quality of delivery, probable returns etc.

The system of information streams is actually a “blood circulating system” of the Online shop. Vitality of any organism is supported by constant circulation of blood in it. Similarly, the circulation of information in the Online shop supports its existence, income. The only difference is that blood does not leave organism under normal conditions, and information streams may enter the logistic system of the Online shop, move inside it, leave its boundaries. Information streams constantly interact either indirectly (through material, financial streams), or directly, that is why changes of one information stream may bring about the corresponding changes of the other. Besides, such changes should facilitate more effective functioning of the Online shop which is possible in case of their constant and coordinated development. In this case we can talk about such phenomenon as coevolution when development of one information streams brings about development of the other. Moreover, development of information streams may be both the reason and consequence of development of other elements of Online shop logistics system.

Elements of information streams are a source of data which can be used by means of support of management decisions in the Online shop. Such means are various economical and mathematical methods and models which can be divided into [9]: optimization, heuristic and imitational. The application of economic and mathematical models presupposes the creation of the corresponding computer information system to which a database should be included or the instruments of external database application should be envisaged. Such system should help solving, in particular, the following tasks: the choice of the goods producer (purchase logistics); selecting the assortment and planning of the goods sale (sales logistics); placement of the goods at the warehouses (warehouse logistics); finance management, planning of finance distribution and control over it (financial logistics); the choice of the transporter and expeditor, the choice of transport, determination of the optimal routes (transport logistics); managing stock etc.

Today progressive means used in building of economic and mathematical models are fuzzy sets and fuzzy logic, artificial neuron nets, evolution methods (genetic algorithm and coevolution). In particular, in [13] is described the way of using fuzzy multicriteria hierarchical model of support of decision making which is called the fuzzy method of hierarchy analysis (PMAI) [14] for solving the tasks of supplier and transporter choice. Evolution methods are used for solving optimization tasks. For example, they can be used for making the optimal structure of various information streams.

3 CONCLUSIONS

Rapid development of E-commerce stipulates the development of new and improvement of the existing approaches to business management. In particular, in the Online shop the optimal chain of orders completion on high level at minimum expense should be created. It is impossible to accomplish this without logistics, particularly, information the importance of which is very high for E-commerce. The work shows that one of the main elements of information logistics of the Online shop is information streams which can be divided into the following groups: information streams connected with the characteristics of goods; information streams connected with the price of goods; information streams connected with the process of making order; information streams connected with the process of payment for the order; information streams connected with gathering the order at the warehouse and issuing of the order; information streams connected with the process of the order delivery.

The elements of information streams help, in particular, the Online shop management to take managing decisions. For this economical and mathematical models can be used which are built, for example, on the ground of the instruments of the fuzzy sets theory and fuzzy logic, artificial neuron nets, genetic algorithms and coevolution.

This work can be a starting point for various theoretical and applied researches as for functioning of the companies in E-trade. In particular, there is a necessity of development of the existing and creation of the new modern economic and mathematical methods and models with the help of which one can take reasonable, rational and effective decisions on different levels of management in logistic system of the Online shop.

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