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THE ROLE OF INFORMATION IN E-COMMERCE

Abstract

The article presents different definitions of e-commerce and discusses the impact of technology development, the Internet, globalization, and changes in public awareness on its current form. It also indicates the functions of information and its pathologies most frequently encountered in e-commerce and presents the role of logistics information in building its competitive advantage.

Keywords: Big Data, information logistics, e-commerce

Introduction

Information is currently the main asset of companies, independently of the market in which they operate, their profile, or their size. The success of an enterprise in the competition game depends largely on its ability to acquire, store, and use information. The main factors that contributed to the increased importance of information for enterprises include rapid globalization, information technology development, and changes in customer behaviour. The same is true for enterprises operating in the e-commerce market. Regardless of their size or scope of operations, they process large quantities of information – even larger than in the case of traditional commerce, as they operate in virtual markets. This translates into a growing interest in information and its possible uses for building competitive advantage in e-commerce. E-commerce companies are currently exploring functions of information other than their role in supporting the decision-making process. The quantity and quality of information, however, make it a considerable challenge. Modern enterprises operate in an environment in which the number of information sources increases at a fast pace due to the rapid development of information technology. They use more and more high-tech support systems, larger-capacity data servers, and faster Internet connection, which increases

the speed of information acquisition. Facilitated access to sources of information means that the available information is more diverse in terms of both quantity and quality. These changes result in increased complexity of relations between particular e-commerce companies, which, in turn, generates problems that might be termed pathologies of information. Thus, it becomes necessary to perceive information as an asset, and information logistics begins to play an increasingly important role in e-commerce enterprises.

The main aim of this paper is to present the relations occurring between e-commerce and information logistics. It also discusses the pathologies of information most common in e-commerce as well as the essence of treating information as an asset that could contribute to building competitive advantage of e-commerce companies.

1. Electronic commerce

Analysing source literature, it is difficult to unequivocally pinpoint the beginning of electronic commerce. Many authors point to the dawn of commercial use of the Internet in the 1990s (Tian, Stewart, 2006, pp. 559–560). Along with it, the notion of electronic commerce was born, ceaselessly evolving and adjusting to ever-changing conditions. E-commerce itself, however, existed long before the term was coined. Analysing this issue, we might notice that many entrepreneurs and authors treat the terms "e-commerce" and "e-business" as synonymous, which, unfortunately, is incorrect. Just like traditional commerce is an element of business, so is e-commerce an element of e-business (Szpringer, 2000, pp. 22–26). This interrelation is presented in Figure 1. The broadest term is e-economy, defined as a virtual arena in which companies operate, commercial transactions are being conducted, values are being generated and exchanged, and participants engage in direct contact (Gregor, Stawiszyński, 2002, p. 77).
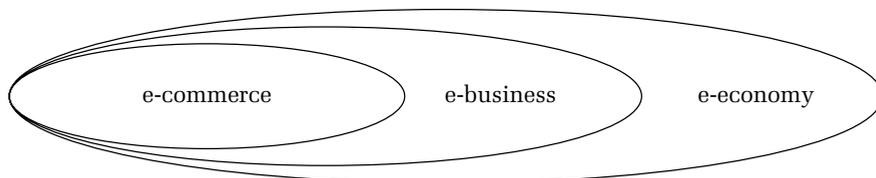

Figure 1. Interrelations between e-commerce, e-business, and e-economy
Source: (own elaboration based on: Gregor, Stawiszyński, 2002, p. 77)

The most popular and, at the same time, the simplest definition of electronic commerce views it as a commercial transaction conducted via the Internet (Oxford Dictionaries). It must be noted, however, that e-commerce is not limited to the Internet, but extends to EDI, cable and satellite TV, electronic cards, as well as Intranet and Extranet. Keeping in mind the multitude of communication channels, it can be argued that e-commerce existed before the beginning of commercial use of the Internet. An example from Poland from before the "era of the Internet"

could be the buying of goods and services by calling the 0700 numbers; in this case, TV advertisements, telephone sales, and the very transaction, which constituted a connection fee, all took place by means of electronic communication, making it an example of e-commerce (Jasiński, 2013, p. 17). Nevertheless, the Internet dominated other sales channels, which is why very often e-commerce transaction are considered to be conducted via the Internet – just like in the above-cited definition.

A broader definition, in terms of sales channels, is proposed by Ph. Kotler, who believes "e-commerce" to be a more general term referring to purchase and sale processes conducted with the use of electronic channels in general (Kotler et al., 2002, p. 1055).

From the point of view of the present paper it is worth taking a closer look at the two definitions proposed by the World Trade Organization (WTO) and the Organisation for Economic Co-operation and Development (OECD). According to the WTO, e-commerce means production, advertisement, sale, and distribution of products using ICT networks. The OECD, on the other hand, believe that the term should encompass clearly distinguished electronic transactions and Internet transactions (GoST). The former should be understood as sale or purchase of goods or services over computer networks, and the latter as using the Internet as the channel of communication between the parties. The Central Statistical Office of Poland defines e-commerce as ordering goods and services using only the Internet or EDI, but notes that payment and delivery of the ordered goods or services do not have to take place online. Transactions can be concluded between companies, individuals, government institutions, or other private or public agencies. Orders placed by phone, fax, or e-mail are not considered part of e-commerce (GUS).

The above discussed definitions are more or less overlapping. Their main common features include:
– purchase and sale transactions are conducted over electronic channels,
– the Internet is the main channel for conducting transactions (including payment) and communication,
– delivery of goods or services can but does not have to take place online.

There are other more or less similar definitions of e-commerce to be found in source literature, which results from the need to adjust the concepts to the present trends in globalization and customer wants – the main reason, however, is the ceaseless and rapid development of new technologies. The indicated similarities do not rule out differences and inaccuracies in the definitions of e-commerce, and the many discrepancies result from confusing or combining the concepts of e-commerce and e-business and other terms close in meaning.

In connection with the profile of their operations, channels of communication, sales, and finalisation of transactions, e-commerce companies generate, take in, and use enormous quantities of information. A comparison of information and data flows with the physical flows of products is presented in Figure 2.
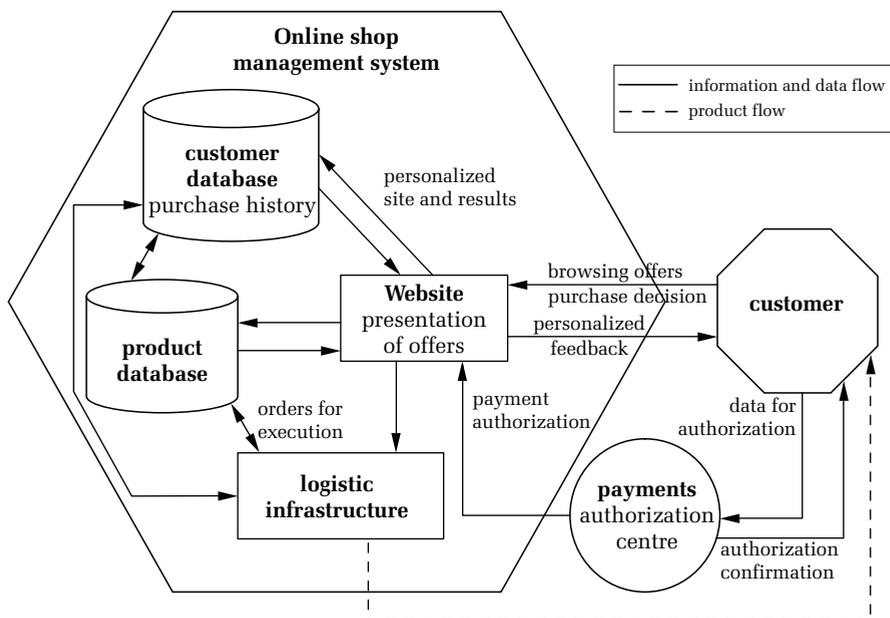
Figure 2. Model of information and product flow in an e-commerce company
Source: (own elaboration)

The above example refers to one of the most popular models of e-commerce, B2C (business to customer). Other models distinguished from the point of view of the mutual relations between transaction parties include (Nemat, 2011, pp. 100–104):
– B2B (business to business),
– B2A (business to administration),
– C2C (customer to customer),
– C2B (customer to business).

Irrespectively of the adopted model or classification of business models, however, they are characterized by a similar proportion of information flow to the physical flow of goods or services.

2. Information society

IT development and globalization significantly influenced and still influence not only the development of e-commerce, but also, first and foremost, the emergence of information society (Kotler et al., 2002, p. 59), whose characteristic feature is how highly it values information. According to B. Gregor and M. Stawiszyński (2002, p. 15), the issues of information are at the centre of society's attention, setting aside consumption, and IT infrastructure is regarded as the factor of the growth of national wealth.

Information society is largely based on knowledge, which, along with land, capital, and labour, is regarded as one of the most important resources, at the same time becoming one of the fundamental factors of production. It has to be remembered, however, that information is the tool that generates knowledge – and, conversely, knowledge is what enables us to generate high-quality information. Information, thus, becomes a carrier and should be considered as a resource and one of the most important factors of production. Undoubtedly, what substantially influenced the development of information society was the access to new technologies, which created unlimited possibilities of communication.

Information society is difficult to define. Source literature provides a large number of definitions. One of the most popular ones views it as a "society that not only possesses developed means of processing and communicating information, but those means constitute the basis for generating national income and the source of livelihood for most members of the society" (Goban-Klas, Sienkiewicz, 1999). For the purpose of this paper, the fundamental principles of information society compiled by Z.E. Zieliński (2008) are of importance, which include the following:

– generating information (mass production of, mass demand for, and mass use of information),
– storing information (technological development provides unlimited possibilities of gathering and storing information),
– processing information (new technologies and unified standards of information description and exchange),
– transmitting information (not restricted by time and space),
– retrieving information (availability of information to everyone interested),
– using information (open and unlimited access to the Internet as the source of information).

The above-listed features not only shape e-commerce, or e-business, but also the whole economy. For many companies, information used by information society can be an element of building strong competitive advantage, not only in e-commerce, but also in traditional sales channels. This testifies to the significance of information for the 21st-century society, and shows how important it is for companies to generate and use high-quality information.

3. Information: Its characteristics and functions

The etymology of the word "information" derives it from the Latin *informatio*, which should be understood as an illustration, explanation, or notification (PWN). Many authors state that it is difficult to provide an unequivocal definition of the word "information," others do not even attempt to do it – they content themselves with its intuitive understanding (Skrzypek, Grela, 2005, p. 16). N. Weiner (1971, p. 152), who is regarded as the father of cybernetics, believes that information is "a name for the content of what is exchanged with the outer world as we adjust to it." Another definition is provided by J. Gościński (1968, p. 19), who argues that "information should be understood as the content – a link, a recommendation,

an order, an instruction – transmitted by the sender, which can be any thing or any person, to the receiver, which can also be any thing or any person." W. Falkiewicz (1971, p. 37) perceived information as the factor that increases our knowledge of the surrounding reality. His definition is regarded as the simplest and the most pragmatic one.

Apart from the multitude of definitions, substituting the word "information" with other words close in meaning, such as knowledge or data, is also a source of difficulties and results in blurring the boundaries between these concepts. The interrelations between them are presented in Figure 3.
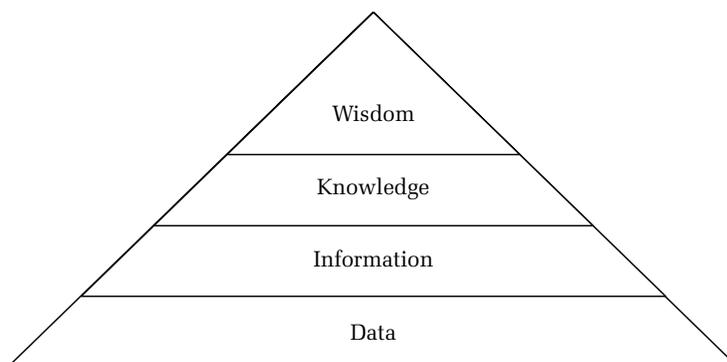

Figure 3. Hierarchy of data, information, knowledge, and wisdom
Source: (own elaboration based on: Heracleous, 1998, p. 155)

Data should be understood as all unstructured single facts about an event or an object. They may be the result of observation, research, raw statistical data, or transcripts of commercial transactions. They can constitute the material for the process of information generation, which, unlike data, is characterized by both sense and purpose. Data can be transformed into information, for instance by being properly processed with regard to their assumed purpose and classification, subjected to mathematical, statistical, or econometric analysis, as well as presented in a graphic form (figures, graphs). During this process a certain value added is generated, which gives information higher priority and underlines its superiority over data. Information, therefore, is processed, interpreted, and contextualized data. It has a subjective character and has to be considered in the context of its receiver, because the same data can be interpreted differently by different people depending on their knowledge.

Knowledge, on the other hand, is processed information. According to the pyramid in Figure 3 and logically speaking it is impossible to derive knowledge directly from data. Data can be transformed into information, and from that, making use of our experience and intuition, we are able to gather knowledge. Unlike data and information, which can be compiled by computer programs, possessing knowledge and wisdom is only characteristic of humans. The development of artificial intelligence and neural networks is more and more advanced, but they are still unable to substitute man in his innovativeness, awareness, and perception.

Wisdom, placed at the top of the pyramid, should be understood mainly as a skilful use of resources (knowledge, information, data) in practice – the ability to make good decisions on the basis of the gathered knowledge.

There is a reason for presenting the interrelations between data, information, knowledge, and wisdom in the form of a pyramid, which is confirmed by P. Drucker (2000), who believes that organizations are rich in data but poor in information. These words attest to the quantity of data in the environment and the company itself. The same goes for knowledge and wisdom. Many people are knowledgeable, but not wise – this feature is ascribed only to a handful of individuals.

However, irrespectively of the chosen definition, several features of information as well as its functions in modern-day economy can be distinguished. The most important features of information include:

– inexhaustibility (including the possibility of being processed without being used up),
– substitutability,
– complementarity,
– objectivism,
– virtuality,
– synergy,
– diversity,
– possibility of endless multiplication and relocation in time and space,
– subjectivity of assessment.

One of the most important features distinguishing information from other goods is the fact it is not being used up in consumption. This means that the same information can be used by multiple agents at the same time without the need to restock. It should be noted, however, that information is subject to the process of aging, as a result of which it becomes outdated.

Another important feature of information – its substitutability – is manifested when different pieces of information allow us to obtain the same benefits. A related characteristic is its complementarity, which means that one piece of information is often useless without another one. Synergy of information, on the other hand, can be observed when the use of multiple pieces of information by one agent is more beneficial than the use of a single piece of information by multiple agents.

Objectivism of information means that it is independent, in terms of quality and quantity, from the observer. It can, however, be assessed differently by different receivers. Virtuality of information means that it is not assigned to only one type of medium. It can be recorded in different ways and on different carriers without changing its characteristics. A closely related feature is the possibility of endless multiplication and relocation of information in time and space, which makes it possible to be sent even between very remote carriers and receivers.

On the basis of the described features and the definition of information we can now list its fundamental functions (Falkowicz, 2002, pp. 18–19):

– informative function,
– decision-making function,
– steering function,

–   consumptive function.

The first function should be understood mainly as providing knowledge by processing information. Information is also the fundamental resource supporting the decision-making process, as decision-making units insufficiently supplied with information are unable to make the right choices. It also performs a steering function, as it requires an appropriate response from the receiver. Its consumptive function should be understood as the ability to satisfy the needs of its receiver and user.

Some authors touching upon the issues related with information in their works also indicate other functions of information, such as cognitive, motivational, coordination, or control function (Bolesta-Kukułka, 2003, p. 75).

4. Pathology of information

Rapid development of technology contributes to the ever-increasing speed of information accrual. E-commerce companies generate, process, store, and use information, but the enormous quantity of information in company environment causes problems. Information can be laden with pathologies related to its inadequate quality and quantity. The most common pathologies of information faced by e-commerce companies include:
–   information overload,
–   information ambiguity,
–   information anaemia,
–   information distortion,
–   information retention,
–   blockage of information flow channels.

In e-commerce, information overload occurs when the customer, either internal or, most of all, external, receives much more information than he needs, which can result in, i.a., increasing the costs of information processing, incoherence of information, and the time necessary to find relevant information, or lowering his motivation. It is most frequently observed in product descriptions provided by online shops and auction sites, whose customers often have to spend a lot of time to find information they are looking for. The underlying reason is that many online shops do not have a professional approach to creating product descriptions, which they most often copy from the producer's site and which contain mostly technical details, not relevant from the point of view of the customer.

Information ambiguity occurs when information can be interpreted in various ways by the same person who has no means of establishing which interpretation is correct. There can be various causes of information ambiguity. It has to be remembered that what is clear and understandable to e-sellers may be unclear to their customers, as the former, unlike the latter, have direct contact with the merchandise. The use of abbreviations, numbers without the unit of measurement, or jargon can serve as an example. Ambiguity can be prevented by, i.a., standardizing

product descriptions, using a system understandable for the potential customers, and properly describing the used measuring systems.

Another important information pathology encountered in e-commerce is information anaemia – in other words, shortage of information, a situation opposite to information overload. Information anaemia can develop in phases. Its first and mildest form is manifested when relatively ample and high-quality information becomes partially outdated as the time passes. A slight change introduced into the technical specification of the product by the producer that was not accompanied by updating product description can serve as an example. The next stage is characterized by high diversification of information in terms of both quantity and quality – information is dispersed, incomplete, or very outdated. The last and most serious stage is extreme information poverty.

Information distortion is yet another information pathology; it results principally from all the previous aberrances, but can also be caused by the customers of online shops, who provide incorrect data in contact forms, order information, or address information.

Information retention is another very important and quite peculiar kind of information inefficiency faced by e-commerce companies, influenced by both their external and internal environment. It can be the result of, e.g., software or external server malfunction. The main cause of information retention is the fact that online shops allow for 24/7 purchases, but their staff works the same hours as in traditional stores; what is more, even large online shops, which are able to hire 24-hour service, experience information retention that causes many slowdowns and interruptions.

Just like information retention, blockage of information flow channels is characterized by a longer time of information transmission and processing; in this case, however, there is no slowdown of the processes – the problem is that information is not being provided simultaneously with their realization, but later. Such a situation is most often caused by the lack of full integration of human, technical, and organizational factors.

In practice, any combination of the above-described dysfunctions is possible and sometimes treated as a completely new kind of information pathology.

5. Information as a logistical asset

Information can be produced, stored, or sold, just like any other asset – and it should be treated as such. It is, however, a particular kind of asset, which, as mentioned, is not used up during the production process. The production process can be understood as a decision-making process that produces a decision, and information is a direct asset required to carry out this process. Another feature distinguishing information from typical assets is its immateriality. Admittedly, we can give form to information, for instance by storing it in data banks, servers, or data carriers; by default, however, it is immaterial, and what is actually stored are just "zeros" and "ones" – that is, information in binary code.

Treating information as an asset also requires proper logistics. Logistics encompasses all purposeful human activities, both related and unrelated to business. The essence of logistics is steering the processes of asset flow within and between organizations connected by logistic channels and chains (Chaberek, 2002, p. 15). One of such assets is information. Information should be used in a way that is effective and beneficial for the company. It is particularly difficult in today's turbulent economy, which is why logistics, as an area of activities that rationalize fundamental processes, plays an important role in building the competitive advantage of companies (Szmelter, 2013, p. 129). Logistic handling of information translates mainly into creating systems of information flow, storing and processing information, and ensuring the correct implementation of main and support processes. This boils down not only to providing the necessary equipment, but also suitable technical and organizational solutions. The essence of these activities is to achieve the goals of information logistics, that is, to ensure that required information is available in the right time, place, quantity, and quality, and for acceptable price. Another task of information logistics is to prevent the occurrence of pathologies of information.

As already indicated, in the recent years the asset that is information has been gaining in importance for companies. Along with such assets as labour, land, and capital it is becoming one of their strategic resources. This requires them to pay more attention to logistics (including information logistics). The aim of information logistics should be to maximize the use of the available equipment, tools, and technologies in implementing information supply processes. E-commerce companies face an enormous challenge, which is to create an information logistics system comprised of numerous elements, having multiple recipients (not only internal, but also external), and functioning in a dynamically developing economy. A properly designed information logistics system will allow to process data into information with attention to the above-listed goals of logistics, which should give companies advantage in the competition game in the e-commerce market.

6. Role of information logistics in building competitive advantage in e-commerce

Knowing the goals and assumptions of information logistics, we must now understand the need for systematic absorption and processing of new technologies and IT concepts, because this path of information development and flow will allow e-commerce companies to generate increasingly attractive values for their customers, which for many of them in the course of the last few years became the measure of success and a gateway to new business opportunities. New information technologies play an increasingly decisive role in shaping the conditions of storage, shipping, transport, and presentation of merchandise to Internet customers. Analysing the e-commerce market from its very beginning, we might notice the significant influence of IT development on the functioning of e-commerce companies and draw a conclusion that in the 21st century – the information age – there will be only two types of companies in the e-commerce market: those that

are going to be prepared for and follow the occurring changes, and those that are going to fail. Rapid development of both IT and IT tools enables to create new possibilities of optimising the IT supply, but just like new technologies in other areas, e.g. transportation, storage, or supply services, they can be effectively used only after a comprehensive design of their implementation. IT development also allowed for the creation of IT systems (including online shopping platforms), whose aim is to facilitate and support the processes connected with conducting e-commerce. Such systems, however, need to be adjusted to the needs of the company, its character, conditions, and, above all, demands of its customers, in order to clarify the IT system as much as possible – which, of course, is related to the above-described principles of treating information as an asset. According to M. Chaberek (1999), it is the very operation of clarifying the IT system from irrational information links and overflow of unnecessary information as well as properly designing the content of information packages and time required to supply all structural elements of an organizational unit with information that should be the subject of information logistics. The systems supporting the functioning of many of today's e-commerce companies could be compared to a sponge that absorbs information irrespectively of its quality and indispensability from the point of view of the company's operations. Thus, they become suffused with unnecessary information, which hinders the communication not only between company units, but also, above all, with the potential customer. A proper way of processing, storing, and distributing information will increase the possibility of a purchase. Chaberek (2001) notes that this means that the role of information logistics is to fully integrate the processes of information flow so as to ensure the best possible adjustment of the quality of information to the requirements of the recipient and to avoid the unnecessary system over-saturation. System oversaturation is most frequently observed in data regarding particular products. Very often online shopping sites quote descriptions copied directly from the producer, without paying attention to whether the information contained there is understandable or relevant from the point of view of the customer. Such an approach results in an overflow of unnecessary information, which can contribute to the emergence of one of the above-described pathologies. Getting to know the customers and adjusting product descriptions to their needs with attention to the aims of information logistics will increase the competitiveness of the company.

Information logistics also becomes a fundamental tool in building competitive advantage in multichannel sales. Many such companies do not see the need to integrate information between the channels. Often particular sales channels within one company compete for customers instead of cooperating. Information stored in particular channels is independent, which frequently causes problems resulting from contradictory and incomplete information. Such a situation does not favour building competitive advantage, which is the goal of the process of making decisions regarding multichannel sales. These problems can be prevented by creating an information logistics system whose main feature would be a shared database for all channels as well as a proper adjustment of information for the customers. Multichannel sales companies, regardless of their assumed strategy, should

strive to provide their customers with the same purchasing experience in each of the channels.

Conclusions

Although information plays an important role in e-commerce companies, they frequently underestimate it or are unable to fully grasp its meaning. This paper has demonstrated the significance of information as an asset and, consequently, the need for a properly organised information logistics system in e-commerce companies. Information is the carrier of knowledge, which a seller very often wishes to pass on to the potential customer, but it also facilitates communication between the units of an enterprise. Properly designed and functional information logistics should translate into a lasting competitive advantage. In every company, pathologies of information occur at particular stages of the processes; implementing adequate logistics processes will help to prevent them and, by the same token, to strengthen the company's competitive advantage. The e-commerce market requires companies to find themselves in the labyrinth of information and to be able to extract from it only what is indispensable for the implementation of their processes, including decision-making processes. Meeting these requirements will not be possible without an understanding of information logistics.

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