ELECTRONIC COMMERCE

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Abstract: In the modern society, electronic commerce (e-commerce) has become a primary factor of the global economy, opening up new possibilities for businesses, consumers and society. This is due to the widespread use of computing, which in turn has changed technologies and user behavior. Online trading platforms have become increasingly accessible and user-friendly. The use of IT (Information Technology) in commerce has enabled consumers to procure products and services conveniently and quickly.

Depending on the type of interacting entities, we can have the following categories: Business-to-business, Business-to-consumer, Consumer-to-business, Consumer-to-consumer, Business-to-government, Government-to-business, Government-to-consumer.

The use of computing in commerce has the following advantages: it leads to an increase in income, it is more convenient for the user and the seller, it is cheaper for the user, it saves time, it allows to improve the ecology, etc. For example, in online sales it allows to increase sales, which leads to an increase in income. When the user is looking for a product, he can see what parameters it has, what price it has in different stores, so he can find the right product much faster. In addition to saving time, it saves money because it finds the store with the lowest price, it does not spend on shipping. Because it uses less transport, so it pollutes the environment less. It is also more profitable for the seller, he has no expenses for the rent of the store, communal services, it needs a minimum number of staff, etc. More than that, not using e-commerce (compared to other companies) could leads to loss of income, or even bankruptcy of the business.

Other of the important factors in the growth of e-commerce is the use of mobile devices (m-commerce), such as smartphones and tablets. Companies quickly moved to develop mobile apps and websites adapted for mobile devices, making them easy to use and hassle-free.

Keywords: Electronic commerce, Business-to-business, Business-to-consumer, Consumer-to-business, Consumer-to-consumer.

JEL Classification: L81

Introduction

In modern society, electronic commerce (e-commerce) has become a primary factor in the global economy, opening up new possibilities for businesses, consumers and society. This is due to the widespread use of IT (Information Technology), which in turn has changed technologies and user

behavior. Online trading platforms have become increasingly accessible and user-friendly. The use of IT in commerce has enabled consumers to procure products and services conveniently and quickly.

Today, the computing technique is used in all fields of human activity. This is due to the fact that the use of IT allows us to increase production, reduce expenses, get a better quality product or get the result much faster. This fact has led to the modification of activities where computers are used. For example: in communication, studies, work, trade, etc. As can be seen from table 1, in 2021 about 5.4 billion people were connected to the Internet, or about 68% of the population [8]. But, taking into account the fact that every year new users log in, we can say that today the percentage is higher, which leads to the fact that e-commerce will be used more and more.

Table 1. World Internet usage and population statistics (estimates are for June 30, 2022.)

World Regions	Population (2022 Est.)	Population % of World	Internet Users 31 Dec 2021	Penetration Rate (% Pop.)
Africa	**1,394,588,547**	17.6 %	**601,940,784**	43.2 %
Asia	**4,352,169,960**	54.9 %	**2,916,890,209**	67.0 %
Europe	**837,472,045**	10.6 %	**747,214,734**	89.2 %
Latin America / Carib.	**664,099,841**	8.4 %	**534,526,057**	80.5 %
North America	**372,555,585**	4.7 %	**347,916,694**	93.4 %
Middle East	**268,302,801**	3.4 %	**206,760,743**	77.1 %
Oceania / Australia	**43,602,955**	0.5 %	**30,549,185**	70.1 %
WORLD TOTAL	**7,932,791,734**	**100.0 %**	**5,385,798,406**	**67.9 %**

Source: https://www.internetworldstats.com/stats.htm

If a while ago an accountant or architect did his work in a few weeks, now using IT tools the same thing can be done in a few days. If before a student had to come to the university to learn immediately, now he can take classes online. In addition, if before it was limited to bibliographic sources in the local library, now it has access to electronic libraries all over the world.

The use of IT in commerce has the following advantages: it leads to increased income, it is more convenient for the client and the seller, it is cheaper for the client, it allows to save time, to improve the ecology, etc. For example: in online sales, it allows sales to increase, which leads to an increase in the seller's income. When the client is looking for a product, he can see what parameters it has, what price it has in different stores much faster, so he can find the right product much faster. Apart from saving time it saves money because it finds the shop with the lowest price, it doesn't spend money on shipping, it also doesn't spend time on shipping. Because it uses less transport, i.e. it pollutes the environment less. It is also more profitable for the seller, he has no expenses for the rent of the store, communal services, he needs a minimum number of staff, etc. More than that, not using

e-commerce (compared to other companies) leads to loss of income, or even bankruptcy of the business.

One of the important factors in the growth of e-commerce is the use of mobile devices (m-commerce), such as smartphones and tablets [6]. Companies quickly or oriented developing applications and websites adapted for mobile devices. The ones that allowed their comfortable and trouble-free use. Among the most popular e-commerce platforms are: Shopify, Wix, BigCommerce, Squarespace, Square Online, Weebly, Ecwid, Sellfy, Magento, WooCommerce, Approval, nopCommerce, GoDaddy, Volusion, VetrinaLive, Big Cartel, Shift4Shop, EKM, X-Cart. Competition between e-commerce platforms is also favorable for users, as it imposes the need to offer quality services at a convenient price.

Another trend in e-commerce is the use of social media platforms. This approach allowed client to shop directly from social platforms, because users often and regularly visit social platforms, which is convenient for sellers and allows them to increase sales. Among the social platforms where e-commerce is used, we can mention: Facebook, Odnoklasniki, Twitter, Pinterest.

The importance of e-commerce also results from the fact that among the largest companies and richest people in the world are those who operate in the field of e-commerce. For example, in 1994 the Amazon project was started by Jeff Bizos, who came up with his general concept while traveling to Seattle by train. He invested only $300,000 in his enterprise. The site was launched on July 16, 1995. Then a large number of things began to be sold over the Internet, which previously could only be purchased in a regular store. It later positioned itself as both an online bedding store and an online clothing and home appliance store. This store has received universal recognition, as evidenced by the fact that its creator received the title "Person of the Year" in 1999, which was awarded to him by Time magazine. Today, Jeff Bizos' fortune is estimated at around 155 billion dollars.

As e-commerce grows more and more, there are increasing demands on data security. Companies are required to use appropriate measures to ensure the security of personal data. Collaboration between information technology companies, companies selling products and services, and government organizations lead to the creation of a secure environment for e-commerce and protection of buyer's personal data.

Categories of electronic commerce

Depending on the type of interacting entities, we can have the following categories [1]:

- Business-to-business (B2B)
- Business-to-consumer (B2C)
- Consumer-to-business (C2B)
- Consumer-to-consumer (C2C)

For the Business-to-business category, both entities (the seller and the buyer) are companies, legal entities. For example, the car manufacturer orders tires from the supplier. In the Business-to-consumer category an individual orders a product online, for example a TV. Consumer-to-business is a model where the consumer creates value for the business. The pawn shop is an example of a C2B model. In this case, the business is based on the products that people bring as collateral. In the Consumer-to-consumer model both parties are individuals. For example, online auction of second-hand products, here comes an intermediary who organizes a trading platform, for example, a web page for buying/selling, etc.

If one of the parties cooperates with government agencies, new categories appear:

- Business-to-government (B2G)
- Government-to-business (G2B)
- Government-to-consumer (G2C)

Let's see a more detailed description of the listed categories [2]. Often, the term Business-to-government is understood as the activity of some companies providing companies, services intended for the production of other goods (raw materials, energy, research and development, means of production). Here companies act as sellers and buyers of services or goods. B2B e-commerce is possible thanks to e-commerce, part of the software solution is installed inside a server or an electronic database for accounting, warehouse, production accounting. The one that means the connection between the business logic and the database of the back-end system is configured automatically.

B2C companies use marketing technologies focused on the mass buyer, which are called retail technologies. The B2C model is characterized by:

- Company producing goods and services interacts with the final consumer.
- The consumer buys a product that satisfies individual needs, makes an individual decision.
- The buyer is not a product expert.
- Apart from the rational, the emotional component of the purchase is also important.
- The cycle of the sales process is very short.
- The savings have a big effect, thanks to mass sales.
- The need to use mass communications.
- Sellers in the sales process use the same type of marketing solutions and methods.

Among the models listed, C2B is the most difficult to understand [3]. As mentioned, it is a model where the consumer creates value for the business. An important role in this type of marketing is customer reviews. Positive reviews allow to increase the number of sales, and negative reviews lead to the need to improve the product, without spending money from the manufacturer. Positive reviews typically lead to a 16% increase in sales. Customer-generated advertising is more effective than other types because it has more credibility with customers. The disadvantage, in this case, is the reduced possibility of control.

The C2C model includes lower prices for goods, lower transaction costs, etc. A negative factor is the possibility of transaction fraud. Therefore, web pages use the reputation system. Here each party can be both a seller and a buyer. For example, a buyer can purchase a newer phone, then sell the old one. A popular platform of this type is Ebay.com, in the Republic of Moldova 999.md, etc. In addition to placing ads, web resources also allow additional services such as product search by category, privacy of personal data, payment guarantees, some statistics, etc. Apart from trading in goods, C2C can also offer trading in services. In this case, services can be offered for small repairs of the building, where large companies refuse, or tutors can be used to prepare a child for an exam or for an item where he has arrears, etc. Another advantage is price negotiation, where you can find services and products for different pockets.

B2G (business-to-government) is a business model in which private companies cooperate with government agencies [4]. The B2G model is bureaucratically difficult for businesses, but in return provides access to administrative resources. The model assumes a multi-level decision-making

system, an auction structure for complex purchases, but ensures the attraction of administrative resources, large-scale and regular transactions between companies and the state. The B2G business model has the following advantages: long-term orders, advantages for young companies, large orders.

In B2G, a private company can get contracts for several months or even years, which is beneficial for the company. For young companies without many years of experience, participation in tenders and public procurement is an opportunity to gain market share. B2G experience will have a positive impact on the future, including private orders. The state is the largest organization, so it may need large orders. For example, printing textbooks for schools, repairing and paving roads, ordering computer technology for state organizations.

But, like any model, it has the following disadvantages: complex tenders, corruption, guarantee of the quality of goods and services, bureaucracy.

In state tenders the supplier and executor of the state order is selected in a transparent tender system. Auction participants go through a multi-stage check, it is necessary to know the law, correctly fill out the documentation, etc. The corruption component is in setting the requirements for the auction. Statesmen may, in particular, set conditions in such a way that only one company meets the requirements. For example, only a company that has experience in paving roads can receive an order. If no other firm has such experience, then there will be only one bidder in the auction, who will set his price and receive the order without competition.

The guarantee of the quality of goods and services means that if the work is performed poorly, then the contractor is obliged to correct it or redo it, in addition to his own money, and given the value of the order, this can become a problem. Bureaucracy is another reason, at every stage of cooperation with the state, even on simple issues, bureaucracy can appear, they can take a long time. But the most serious, in this situation, are the delays in settlement.

Security of e-commerce

Today, cybercriminal activity is one of the biggest challenges facing modern society. With the increasing use of computers this problem will become even more acute. Cyber-attacks are the fastest growing globally and are increasing in size, complexity and cost. Cybersecurity Ventures says that in 2023 the damages caused by cybercrime will reach 8 trillion US dollars and 10.5 trillion US dollars by 2025 [10]. The one that makes cybercrime one of the top 10 biggest global risks in the next decade, according to the World Economic Forum. Cybercrime now joins such threats as climate change and involuntary migration in 8th place.

Losses from ransomware alone in 2021 reached $20 billion, but ransomware damages are expected to exceed $265 billion annually by 2031. The largest ransomware payment on record was made by CNA Financial. The Chicago-based company paid $40 million to the Phoenix cybercriminal group, believed to be from Russia.

Attackers often target the largest companies. For example, the largest personal data breach was suffered by Yahoo. Due to a security incident in 2013, the company's three billion user accounts were affected. Another example is the loss of personal data recorded was at the T-Mobile company in 2023. The company disclosed the theft of personal information belonging to about 37 million customer accounts. Another type of attack hit Cloudflare in February 2023. The company detected and mitigated the largest distributed denial of service (DDoS) attack of 71 million requests per

second (rps), called "hyper-volumetric". This DDoS attack was the largest ever recorded, which is 54% higher than the previous attack of 46 million rps in June 2022.

To ensure the growth of e-commerce and ensure the security of data and savings of economic agents, appropriate security measures are necessary. According to statista.com, annual losses in electronic commerce amount to several tens of billions of US dollars. In 2022 these losses were around 41 billion, but already in 2023 they could reach 48 billion dollars.

Huge sums of money are spent on cyber security. According to Cybersecurity Ventures, in 2023 this spending will reach approximately $5.6 billion. But by 2027 this spending is expected to exceed $10 billion. Likewise, enormous sums are being spent on the cyber insurance market to protect companies. The company Cybersecurity Ventures estimates that in 2025 the cyber insurance market will be around USD 14.8 billion, but already in 2031 it will exceed USD 34 billion.

- **Types of threats**

As you can see there are quite a few threats that e-commerce needs to be protected against: website hacking, misuse of personal data, money theft, phishing attacks, insecure service delivery and card fraud, etc. Let's examine some of them.

Financial fraud has been in online business since its inception. Hackers make unauthorized transactions and erase traces, causing significant losses to businesses. Some scammers send claims for fake refunds or returns. Refund scams are a common financial scam where stores return money for supposedly purchased or damaged items.

It is not uncommon for internet spammers to leave blog comments or fill out contact forms leaving infected links to harm a business. They can also send infected links in private messages to company social media communities [7].

Reconnaissance attack. Here the attacker can use nslookup and whois instructions to determine the IP address space assigned by the operator. After that, it determines the active addresses. To automate the process, you can use the fping or gping instructions [5].

Phishing is another security threat where hackers disguised as company representatives send messages to customers to trick them into revealing confidential information or lure customers to a fake version of the website.

DDoS and DOS attacks aim to disrupt the website. In such attacks, numerous requests are sent to your servers. The goal is to make the site crash. This type of attack is simple to carry out, but restoring the system is difficult. Because, they are simple, they are very widespread. There are several types of DoS attacks, their goal is to consume as many network and computer resources as possible, to make it difficult or impossible to use services. Some of the types of DoS attacks are: Ping of Death, SYN Flood, DDoS, Smurf Attack.

Finding the password. The goal is to find the website password and gain access to the admin panel of the online store. Special programs are used to select passwords. One way to carry out this type of attack is to use packet sniffer applications, with their help the bad guy reads openly transmitted data, transmitted without data encryption. Another method is to select the login and password from a dictionary or generate them automatically. With the help of this method, the attacker can find the password of the server, the router by making several thousand, hundreds of thousands of attempts. These types of attacks are called dictionary attacks or brute-force attacks [7].

Viruses, Worms and Trojans. They are one of the most serious threats to network security, when attackers can infect a site and gain access to confidential information of store customers. A virus is a software that attaches itself to another software to perform some unauthorized function on the workstation. For example, it can attach itself to the command.com file, which is the main compiler of the Windows OS, delete certain files, and infect other versions of the command.com file that it can detect.

Trojan Horses are written to appear to be another type of software, but are actually an attack tool. As an example, an application that launches a game can serve. While the user is playing, the application e-mails the Trojan Horses game using the user's address book. Other users receiving and accessing the game also infect their computer and spread the infected game.

The virus needs a transfer mechanism to spread, for example a ZIP file or an executable file attached to an email message. Viruses differ from worms in that they need user interaction to spread.

Worms are independent applications that try to exploit some security vulnerabilities (holes). After finding the weak spot, it infects the system, in order to continue infecting other computers. Worms have the following structure:

- Vulnerability detection – infects the computer using system vulnerabilities, for example using the naivety of the user launching executable files from unsafe sources.
- Spreading mechanism – after receiving access it infects the computer and chooses another target.
- Payload – after infection, the attacker increases his rights, most often obtaining administrator rights to have as much access to the system and data as possible.

- **Protection methods**

Having seen what the purpose is and what is the type of attack, we can see what methods of protection we can use. In addition, after researching what the attacker can do, depending on the type of attack we can choose the most optimal methods to protect e-commerce against computer attacks. In general, protection methods can be grouped into: management methods, software protection methods, physical protection methods [10].

By management methods we mean using the security policy at the enterprise, explaining to simple users how to work in the network, how to use the computing technique, etc. Since people are the weakest part of security, this fact is called social engineering attacks. By software protection methods we understand the use of specialized applications in the field of IT security [11]. By hardware protection methods we mean the protection of network equipment, computers, servers, etc.

Switching to HTTPS, using outdated HTTP protocols makes the site vulnerable to attacks. You need to switch to HTTPS, a protocol that protects user data and confidential information. To migrate to HTTPS, you must purchase an SSL certificate from your hosting company. Having an up-to-date SSL certificate and HTTPS protocol has become a standard, so it's very important to get them if you don't want to lose traffic.

Protect your servers and admin panels, remember to use strong passwords and change them regularly to prevent your site from being hacked. In addition, you can set up notifications in your admin panel to be alerted when someone tries to connect from an unknown IP address.

Payment gateway security, pay special attention to payment data security. Never store debit and credit card information on your servers, ensure the security of your payment gateways is not compromised. You may use third party payment processors.

Use antivirus software, hackers can use stolen card information to place orders. Antivirus or anti-fraud software can help with this problem. Software of this type uses algorithms that are able to recognize malicious transactions and assess fraud risks.

Use firewalls, another effective method is to use firewall software and plugins that monitor untrusted networks and regulate incoming and outgoing traffic to protect against cyber threats.

Use SSL Certificates, Secure Sockets Layer (SSL) certificates are files that associate a key with transactions on various network paths. SSL certificates encrypt data to protect payment information from interception. Plus, SSL gives you proof of ownership so hackers can't spoof a phishing site.

Use multi-level security, you can improve your security using different levels: content delivery network, two-factor authentication, etc.

Use Plugins, plugins are an easy way to keep your site secure. They provide protection against malicious bots, injection of infected code and hundreds of other serious attacks.

Back up your data, data loss due to hardware failures or cyber attacks is not uncommon. Back up your data regularly, you can either use an automatic backup service or choose a managed e-commerce web host to back up your data automatically.

Updating security tools. Security tools and plugins should be updated regularly. Install updates and patches as soon as they are released, as hackers can use bots that determine which resources have outdated software.

Choose a reliable e-commerce platform. It is important to choose a secure e-commerce platform that is updated regularly. Popular platforms protect you from common threats.

Staff training, employees must be aware of user information protection laws and policies. Personnel with access to customer data must not provide login credentials to third parties.

Customer training, security issues don't always happen on your end, customers can make mistakes – use soft passwords, provide confidential information on phishing sites, etc. It is easier to educate customers about the risks and phishing than to eliminate the problems that arise.

Conclusions

In the Republic of Moldova, more and more users shop online. The significant increase is mainly due to trading platforms. In the first quarter of 2023, bank card payments reached 53 billion lei (2.65 billion euros), 16.7 billion lei more than the same period last year. As the experts say, "Until 2016, card payments in the Republic of Moldova were lower than card payments abroad. Currently, 3 out of 4 lei that Moldovans pay with their card are spent in the Republic of Moldova and 25% abroad. In the Republic of Moldova, currently, cash payments dominate when an online order is made. In the Republic of Moldova, the largest payments that are made, currently, are made to pay bills and taxes". In 2020, e-commerce reached 17 billion lei, and is currently estimated at 38.8 billion lei, compared to 34.8 billion lei in the fourth quarter of 2022 [9].

Worldwide, the importance of e-commerce is even greater. According to the source [12], "In 2022, retail e-commerce sales were estimated to exceed 5.7 trillion U.S. dollars worldwide, and is expected to reach new heights in the coming years.". The revenue ranking in the E-commerce market is led by Asia with 1.7 trillion U.S. dollars, while the USA is following with 984.39 billion dollars. In contrast, Africa is at the bottom of the ranking with 32.49 billion dollars, showing a difference of 1.7 trillion dollars to Asia, see figure 1.
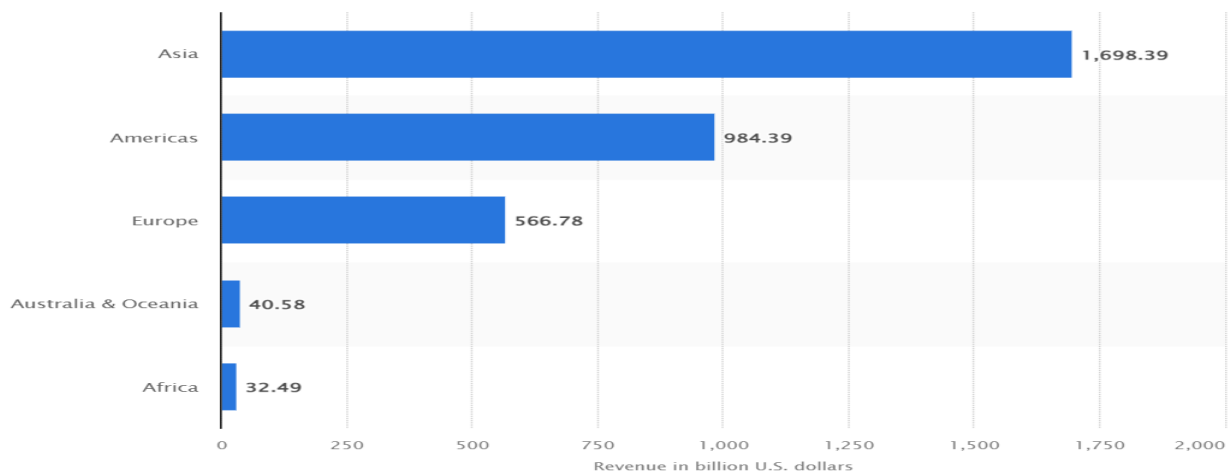

Figure 1. Total retail e-commerce revenue worldwide in 2022, by region (in billion U.S. dollars)

Source: https://www.statista.com/forecasts/1117851/worldwide-e-commerce-revenue-by-region

Apart from the importance of e-commerce, the article drew special attention to ensuring the security of e-commerce. Because it can only be used when both the buyer and seller are confident in the safety of the tools used, without losing money and personal data.

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