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ABSTRACT

of a dissertation for the award of the educational and scientific degree "Doctor" (Economics) under the doctoral program "Finance, Money Circulation, Credit and Insurance" (Finance) on the topic:

CHALLENGES TO E-COMMERCE PRICING IN OUR COUNTRY DURING A PANDEMIC

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CONTENT OF THE AUTO-REFERENCE

I. GENERAL CHARACTERISTICS OF THE DISSERTATION

1. Relevance of the topic

E-commerce has long been no longer an exotic way of selling goods and services, but today, as a result of the massive lockdowns of the world economy, it is about to become one of the main channels for carrying out commercial - activity . According to Preceedence Research . (2023) e- commerce annual revenues in 2032 are expected to reach US$57 trillion with volumes of US$14 trillion in 2022.

Despite the positive trend in the development of e-commerce in our country, according to official Eurostat statistics, Bulgaria ranks last in the European Union in terms of the share of the population that shops online with 22% of the population, behind the leader Denmark with 84%. The data show that Bulgaria is in last place also in terms of the share of enterprises that carry out online sales, 7% compared to the leader Ireland with 36%, and the turnover generated from online sales in our country is about 5% against the background of 18% for the European Union as a whole.

Regardless of the lagging place of Bulgarian e-commerce , positive trends are also observed in our country: according to NSI data, in the last 5 years, the growth of e-commerce is between 21% and 33%, and the growth in sales is 30%. In addition, 92% of customers are young people between 16 and 30 years old, with 31% of them regularly shopping online and spending an average of 470 euros per year in 88% of Bulgarian merchants .

Thus, the highlighted trends in the development of Bulgarian e-commerce make the present research particularly relevant, and its results will help the sector to develop its business potential, and our country to move forward in the world and European rankings, respectively. to generate significantly more tax revenue for the state budget.

The present study can be defined as interdisciplinary given its research focus , which includes key aspects of product and service pricing in companies

and e - commerce, financial management, marketing and the role of information technologies in the modern economy and corporate business.

2. Object and subject of the research

The subject of the present study is pricing in e- commerce in Bulgaria in the context of the COVID -19 pandemic. **The subject** of the dissertation is the pricing models for products and services in the e-commerce sector.

3. Research thesis

The dissertation is based on **the research thesis** that the application of adaptive pricing models, taking into account the specifics of e- commerce and consumer behavior, can lead to the maximization of sales in the conditions of dynamic economic processes caused by external shocks such as the pandemic of COVID-19. The specifics of electronic commerce form characteristic business models, which also take a special look at pricing.

4. Purpose of the dissertation work

The main objective followed in the present study is to evaluate the applicable models for pricing products and services used by Bulgarian companies in the field of electronic commerce and to look for opportunities to optimize the pricing process taking into account the new economic realities.

5. Research tasks and methodology

Achieving the main goal of the study requires the formation of the following more specific **tasks** :

1. To carry out a critical analysis of views on the essence, functions , elements and structure of prices, as a basis for clarifying the stages and elements of pricing in the company.
2. To clarify the role of price policy and strategy within the overall price management process in the company.

3. To carry out a critical review of the emergence and development of electronic commerce as a basis for clarifying the place and role of companies in the new economy.
4. To analyze applicable business models and approaches for generating - revenue from companies in the field of e-commerce, with a view to clarifying the specifics of the pricing process of their products and services.
5. To evaluate, study and assess the state and trends in the e-commerce sector in our country as a result of the pandemic situation and the applicable models for pricing products and services used by Bulgarian companies
6. To look for opportunities to optimize the pricing process and , by testing the effectiveness of different pricing models, to give recommendations and proposals for optimizing the pricing process in Bulgarian companies in the field of e-commerce, taking into account the new economic but you are real .

The dissertation uses traditional **scientific research methods** , such as: the historical method, the comparative method, the inductive and deductive method , the method of analysis and synthesis , the descriptive method, the method of observation, questionnaire surveys and other methods, combined with appropriate graphic and statistical toolkit. In the analysis of the situation and the challenges to pricing in the field of e- commerce in our country, publicly available data on the investigated issue , the results of a planned survey, as well as information from interviews and informal conversations with representatives of the sector in our country were used.

The survey was conducted in the period October 1 - November 30, 2021 among 1,000 online merchants on the territory of Bulgaria through an online survey available at: https://docs.google.com/forms/d/e/1FAIpQLSd4S4G4ke8UgtwMqq5hsJJs9v4S9T8Fdf9PL1rbp34avD3mFw/ viewform .

The questionnaire survey used the respondent method, and as a means of initial contact , a message sent through the social networks of the studied online

stores was used . The questionnaire was prepared in full compliance with the questions and possible answers from the research conducted by SearchNode (2021), with the aim of achieving maximum comparability of the results obtained.

The survey is anonymous, and the questions in it are optional . The - questionnaire contained 17 closed-ended qualitative questions , including dichotomous (1) and multivariate (8) questions , questions with more than one possible answer (7), and open-ended questions (1).). As of December 1, 2021, 98 completed and valid survey cards have been received. The average response rate for the entire survey was 9.8%. The presented results and conclusions are valid only for online merchants participating in the study .

For the purposes of creating the electronic questionnaire, the Google toolkit was used Forms , and for the statistical analysis and graphical presentation - MS Excel 2016. Due to the small volume of survey cards valid for analysis, for the purposes of the analysis, only applicable methods for statistical processing and analysis were used , and in particular - frequency analysis division of the answers, as well as applicable methods for graphical presentation of the results . The chosen methodology also corresponds to the methodology of the leading study by SearchNode (2021), which in turn is a prerequisite for comparability of the obtained results.

In order to investigate the feasibility of opportunities to implement a dynamic pricing system using big data and artificial intelligence in the field of Internet commerce, the author develops and tests his own model (through an implemented software solution) using Big Data and a neural network Long short-term memory , - type of "recurrent" neural network (recurrent neural networks), using sequential data series, for which the position of the data in the time range is relevant to the outcome of the tasks performed. Apply the bridge of the model has been tested in an international online store with a staff of 20 people , having a catalog of 1500 auto parts of one type, offering its products in 15 countries without introducing a local price policy for each individual market .

6. Structure of the study

The dissertation is structured in three chapters:

In Chapter 1. Key issues of pricing in a modern economy , a critical analysis of the essence, functions, factors, elements and structure of the price and the main stages and methods of pricing in the company is carried out . Special attention is paid to the company's pricing policy and strategy as part of the company's overall pricing and financial management.

Chapter 2. Current aspects of modern e-commerce examines the emergence, essence and types of e-commerce, and on this basis, the place, role and interaction between companies in the e-market are also examined. Special attention is paid to the analysis of applicable business models and approaches for generating revenue in e-commerce.

Chapter 3. Challenges to e-commerce in the context of the COVID -19 pandemic. We present an analysis of in the impact of the pandemic on the economy and consumer behavior , as well as on e-commerce through a comparative analysis of global trends and trends in Bulgaria (survey results). The chapter tests possibilities for implementing a system for dynamic price formation by using Big data and artificial intelligence .

7. Applicability of the research results

The main results of the dissertation can be defined as **scientific and applied** , the originality and scientific significance of which **stems from** the expansion of scientific research on pricing and is one of the few systematic scientific researches on pricing in the field .

The practical significance and applicability of the research are related to us, both with outlining the real picture of Bulgarian e-commerce in the conditions of a pandemic situation, and with the evaluation of the applicable pricing models in the field of e-commerce in our country and the search for an opportunity for their improvement.

The results of the research have been popularized among the scientific community through the publication of 4 articles, of which 1 is in print and 1 is a report.

8. Limitations of the study

Outside the scope of the dissertation remain questions related to the purely technological aspects of e-commerce, which would shift the focus of the research.

II . MAIN CONTENT OF THE DISSERTATION WORK

Chapter 1.
KEY ISSUES OF PRICING IN THE MODERN ECONOMY

The concept of measuring the value of goods by their price appears in deep antiquity, for example, the ancient Romans put into their word for price " pretium " both the meaning of "price" - as a measure of exchange, and of "value ” – as labor input and intrinsic value of the commodity. (Simon , 2015). A similar view is defended by the representatives of the Svishtov school of finance, who emphasize the natural occurrence of prices in economic relations with their function of measuring value even before the appearance of money, while at the same time they reflect the specifics of individual and aggregate demand and through them the connection between producers and their markets [1]is realized . (Simeonov, 2018, Lilova, Adamov, Simeonov, 2003). In the dissertation , the author agrees with their view that the essential functions of the center are measuring and informational, and all the others - stimulating, protective (- protective) , social, etc. economic manifestations are the result of redistributive effects, while at the same time the application of the price, as a tool for economic impact , requires a clear highlighting of the market and non-market factors in its formation ." (Simeonov, 2018)

In order to be able to study the influence of price on economic processes, it is of key importance to know the factors that influence it. In general, they can be distinguished as external (the specifics of the production process, cost of production, uniqueness and quality of products, market strategy, product life cycle and other internal company factors) and internal (state of the economy - competition , state policy, attitudes of the population, etc.) for the company.

An essential aspect in clarifying the economic essence of a company is - determining the nature and scope of its **composition** (elements) **and structure** .

[1]Here we use the term commodity "market" in its marketing sense - as a collection of consumers (Lilova, R., Simeonov, St. and Radulova, A. 2016)

According to the Svishtov Economic School, the structure of prices characterizes the percentage ratio between its main elements (Lilova, Adamov, Simeonov, 2003; Totev, Naydenov, 2003), and the composition of prices is a description of the constituent parts that form them " (Totev, Nai de nov, 2003). Here it is appropriate to emphasize that the price structure depends both on purely market factors and on the regulatory impact of the state in the form of tax policy and administrative regulation of price levels (Yakunina , Romanenko , 2013).

On the other hand, the concepts "price composition" and "price elements" represent the constituent parts that cumulatively form them in the pricing process (Totev, Naydenov, 2003). In this way, the composition of the price is characterized by its economic elements (cost, profit, etc.), expressed by their absolute values in currency. (Yakunina , Romanenko , 2013) The number and included elements in the price may vary depending on the specifics of the production of the relevant product or service, the stage of its distribution, the number of intermediaries, market conditions , industry affiliation, etc. (Yuzov , Petrakova, 2012; Wingert , Yaki mova, 2015). As the authors from the Svishtovsk School of Finance (Lilova, Adamov and Simeonov, 2003) point out, the price elements mainly include activity costs (costs for the main activity and costs for organization and management), financial costs and extraordinary costs.

Pricing can generally be defined as a set of principles, rules and methods for forming and managing the price of goods (Wingert , Yakimova, 2015), and the price formation process itself includes a series of stages. According to some authors, these are: determining the objectives of pricing, determining market demand and capacity, estimating production costs, analyzing the prices and quality of competitors' products, choosing a pricing method , calculating at the base (initial) price, price correction due to other factors and formation of the final price (Mosh kina , 2006, Taktarov , Aisenov , Grigorieva , Nabiev , 2014). Other authors, for their part, consider the process in a more generalized form, and the last three stages unite them into one common one under the name "formation of the final price " (Wingert , Yakimova, 2015, Shakhovskaya , Chigirinskaya , Chigirinsky , 2015). There are also authors who expand the detail of individual

stages by including the process of price formation and formation of pricing policies and strategies, assessment of the possibility of using the company's logistics system, and price control (Shakhovskaya , Chigirinskaya , Chigirinsky , 2015).

The choice of pricing method in the company depends on the state of - demand and competition in the specific market, company goals and the approach adopted by its management . According to the Svishtov school of finance (Lilova, Adamov, Simeonov, 2003, Lilova, Radulova, 2013, Lilova , Simeonov, Radulova, 2016), it largely depends on whether the firm adheres to or wants to change its production and market parameters , there are passive (cost- calculative methods, value methods - the method of user evaluation, the method of pricing in accordance with market competitors) and active (marginal-analytical, dynamic) pricing methods. Another widely accepted classification groups price formation methods as (Bober , 2001, Moshkina , 2006; Shakhovskaya , Chigirinskaya , Chigirinsky , 2015, Yuzov , Petrakova, 2012; Lev, 2015; Kosinova , Belkina , Kazarova , 2012) cost methods (method of: full costs , of standard costs, of direct costs, of direct standard costs, of average costs plus profit, of target profit, of the critical point, method with consideration of the profitability of the investment), parametric methods (unit price method, point method, regression analysis method, aggregate method) and market methods (demand-driven method , "follow the leader" method, price discount method, "psychological" pricing method, pricing based on the user value of the product, prestige pricing method , competitive level method, sealed envelope method (market pricing), tipping point method).

The price policy is a specific and important part of the company's management , related to the organization and coordination of those activities that enable the formation of such prices, which in the conditions of competition provide the market effect sought by the company and an optimal financial result (Lilova, Radulova, 2013). It is the final stage of the developed marketing strategy of the company and is a powerful tool for influencing the market for the goals and objectives set by the company management (Lilova, Adamov, Simeonov, 2003,

Lilova, Radulova, 2013, Lilova, Simeonov , Radulova , 2016). The price policy of the company is directly related to the company's production, market and price strategies (Lilova, Radulova, 2013). We find a similar view of the essence of price policy in some authors from the Varna school of economics, who define price policy as a set of long-term company goals in the area of prices and pricing, combined with the approaches and main actions of the company to achieve of these goals (Blagoev, Yanakiev, Angelova, Kirov , 2003). Some authors perceive a significant but simpler interpretation of the essence of the price policy, reducing it only to the management of the price setting activity (Totev , Naydenov, 2003), a system of company activities , aimed at forming the price levels for the products it offers on the market (Stoychev, 2010), general principles for pricing the goods and services in the company (Verkhovets , 2014, Gritsai , 2006). The marketing point of view in determining the essence of the price policy is also quite widespread . Yankov (2000) defined it as a set of activities and actions (formation of prices, making price decisions taking into account company and market - specifics, creation of price lists , application of price strategies and tricks , search for opportunities for a stimulating effect through the price), forming a stimulus tool in the direction of increasing demand.

An essential aspect in defining the company's pricing policy is determining its main goals. For example, Boychev (2019) groups company goals as: survival-related goals, sales-oriented goals , and profit-related goals, while noting that there are also a number of other pricing goals such as: forming a high ki prices to emphasize high quality, keeping stable prices in time and space to create a climate of non-price competition, determining prices covering certain costs. The marketing emphasis can also be found in Kosinova , Belkina and Kazarova (2012), who consider that the pricing policy aims at: removing competitors from the market of a specific product, applying the necessary protective efforts to protect against the pressure of competitors, implementing intermediary structures, with the aim of providing favorable conditions for the sale of the company's products, creating an image in consumers related to the high quality of the products offered and the sustainability of the company, encouraging consumers

making large purchases of goods, penetrating the market by establishing lower prices in order to reach a larger number of users. On the other hand, Moshkina (2006) defines the objectives of the pricing policy as: long-term existence of the firm, short-term maximization of revenues , short-term maximization of turnover , maximum increase of profit, "skimming the cream" and leadership in quality, protection of company interests, suppression of competitors, conquest of new - markets, quick reimbursement of costs, etc. Similar is the view of other Russian authors, who include as possible goals: increasing the value of the organization as an object of pricing, achieving maximum profit, preserving business and market positions, increasing production within the technological capabilities of the company, ensuring leadership in quality in order to achieve customer loyalty, imposing premium prices ("skimming the cream"), ensuring maximum product sales (Shakhovskaya , Chigi rinskaya and Chigirinsky , 2015, Bober , 2001).

At the same time, others point out that when determining the price policy , the company should be based on: the definition of the brand, the definition of the "vision, the definition of the customers and the organizational differentiation of the activities, the segmentation of the market and the definition of the market structures, the definition of the objectives of pricing, formation of the commercial portfolio and commercial policy, selection of pricing strategy, selection of method and principles of pricing, and analysis of methods for reacting to price changes (Gryzunova , Bondarenko, Ermilova , Keri, Kookueva , Pyatanova , Soltakhanov , Tsertseil , Nagornykh , 2020). They believe that the pricing policy should be developed in accordance with the general financial policy of the company, on the basis of which the specific methods of pricing should be determined , which will subsequently be reflected in management strategies and tactics of prices in the company.

Of interest to the present study is the place and interrelationship of pricing policy with pricing strategy and pricing tactics. As a starting point for this relationship, we can accept the classical view of their hierarchical subordination, placing at the top the policy , which is carried out through strategies and with the tool of tactics . According to the views of the Svishtov school of finance , policy

precedes other management actions and in the first place develops not a strategy (Adamov, 1996), while at the same time it can also be defined as a fundamental document outlining the guidelines, goals, principles and the rules for the company's activity as a whole or in a specific direction, on the basis of which strategies and plans for the company's activity are built (adapted from Bozhinov, 2016). On this basis, Lilova and Radulova (2013) point out that the price policy is characterized by a principled and long-lasting nature, being directly related to the company 's production , market and price strategy. In this way, the authors from the Svishtov School of Finance defend the view that the price strategy can be defined as a guideline followed by the enterprise in establishing the supply prices with a view to achieving its long -term goals through the analysis and systematization of competitors, attracting buyers and with rationalization and transparency of the ratio price level / results. (Lilova, Radulova, 2013)

The price strategy can be defined as a set of tools (Verkhovets , 2014) or a set of methods (Parshin , 2010) with the help of which the company's price policy is implemented. There are also views that the price strategy is a set of actions of the company in relation to prices , representing a model of development of the pricing system , including the strategic goals for the behavior of the enterprise , setting tasks and their decision, based on the development of a system of rules, principles, methods and tools for making decisions for forming the final price of realization of the company's products (Gryzunova et al., 2020). They emphasize that pricing strategy requires a set and coordination of concerted and interrelated marketing, competitive and financial decisions and actions to determine a reasonable level of product prices, with the aim of achieving the forecast - indicators of profitability and profitability in the long term perspective, and is aimed at certain activities of the production and distribution system of the company, in order to ensure the competitiveness of the manufactured products in accordance with the goals and objectives of the general strategy of the company.

The choice of price strategy is influenced by the structure and type of needs of the product market, the conditions of competition, the prices of competitors , the interrelationship and interdependence of the goods included in one product

line, the share of the goods in the market, the profitability of the product (Shakhovskaya , Chigirinskaya , Chigirinsky , 2015). At the same time, here is the place to emphasize that the development of the price strategy is not a one -time action, but it needs to be changed and improved, both when new products are launched on the market and when changes occur . market conditions (Yuzov , Petrakova, 2012).

The third element of the price triad is the so-called pricing tactics. It can be defined as a set of specific practices and measures for managing product prices, most often with different types of discounts and margins (Verhovec , 2014). Usually, they have a short-term and one-time character and aim to eliminate the "deformations" that arise in the activity of production and distribution as a result of unforeseen changes in market prices, the behavior of competitors and mistakes of the management staff, reflecting on the strategic goals of the company (Par Shin , 2010).

Chapter 2.
CURRENT ASPECTS OF MODERN ELECTRONIC COMMERCE

E-commerce is a relatively new sector in the modern economy , which is usually associated with the use of various electronic means, channels and resources in the process of traditional commercial activity . In the specialized literature, there is no unified view of when and how e-commerce arose: some authors associate it with the process of commercialization of the Internet (Laundon and Traver , 2018, Jelassi , Enders and Martí nez -López , 2014), while others search for its roots in the electronicization of intercompany business relations (Sheikh and Basti , 2015, Qin , Chang , Li and Li , 2014, Schneider , 2017, Becker , 2007, Dik, Luzhetskyi and Rodionov, 2005, Kobelev , 2010) . A number of authors consider the introduction of Electronic Data Interchange (EDI) as a precursor of modern electronic commerce as a means of electronic exchange of standardized business documents mainly between large manufacturers and their suppliers , quite often as part of their electronic management systems and resource

management systems MRP (Management Resources _ Planning) and mainly for electronic orders and electronic funds transfers (EFT, Electronic Funds Transfer).

The starting point of modern electronic commerce is considered to be the 1964 IBM and American Airlines flight seat reservation and automated fare calculation system SABER, which allowed the reservation of 26,000 seats and used specialized terminals and telephone lines for communication . (Dick, Luzhetsky and Rodionov, 2005). The next significant technological step in the development of the electronicization of business was the appearance of personal computers in the 1980s, which, thanks to their relatively low price, massively entered the business and helped its automation and computerization (Laundon and Traver , 2018). The mass penetration of computers is accompanied by the construction of internal company information systems and increasingly frequent attempts to ensure their compatibility and integration with those of the company's business partners. In parallel, the electronic data interchange standard EDI used until now has been upgraded to EDIFACT (Electronic Data Interchange in Administration, Commerce and Transport) and adopted as an international standard ISO 9735 (Dick, Luzhetskiy and Rodionov, 2005).

The last and most significant step related to the emergence of modern electronic commerce was the construction in 1985 of the research and educational network NSFNET, which is the de facto backbone of the modern Internet . In the early 1990s, the management of the network was transferred to private corporations, and the US government lifted the ban on commercial use of the Internet, marking the beginning of the commercialization of the Internet and the emergence of modern e-commerce (Qin , Chang , Li and Li , 2014, Becker , 2007). Existing B2B e-commerce is also adapting to the changes – existing standards for electronic data exchange are adapting to data transfer not only in private virtual networks (VPN, Virtual Private Networks), but also through open public networks , which leads to the emergence of the so-called EDIINT (EDIFACT over Internet).

In the middle of the 1990s, a significant innovation in the development of electronic commerce occurred. The decreasing prices of computer equipment and communication services, combined with the opening of the Internet to society, create prerequisites for digitization of the last process of the commercial transaction, namely - reaching the end customer electronically. In this way, the existing e-commerce, which is mainly business-to-business (B2B) oriented, is being expanded and transformed with a strong end-customer (B2C) focus.

Many authors distinguish the period from the commercialization of the Internet (1995) to the first years of the 21st century (1999-2004) as the "first wave of electronic commerce" (Schneider , 2017) - between 1997 and 2000, more than 12,000 Internet sites were created in the USA companies that attracted more than 100 billion dollars of investment (Schneider , 2017). Revenues from electronic commerce during this period have been steadily increasing: $707 million in 1996, $2.6 billion in 1997, and $5.8 billion in 1998 (Becker , 2007). The second stage of electronic commerce is associated with the institutionalization and - internationalization of this process. Among our main factors , we can stand out: the transformation of the Internet from a national to a global information network , the introduction of the so-called broadband access to the Internet, the continuing trend towards cheaper computer equipment and communication services, the penetration of portable computers, the growing number of households with access to the Internet. In parallel, the used business models and ways of distribution of goods and services are also changing. The Google phenomenon forces a new type of targeted advertising , which was a major source of revenue for the company in the early years of its existence. The institutionalization and regulation of the digital content trade allowed record companies and publishing houses to protect their rights and interests and to develop a new segment of electronic commerce , with iTunes being among the leaders in the supply of digital tal but content in this period. Wikipedia , You Tube and Facebook laid the groundwork for the shared social technologies underlying the so-called Web 2.0 technologies (Schneider , 2017, Becker , 2007, Qin , Chang , Li and Li , 2014).

With the wide penetration of smartphones and tablets, the electronic market is entering a new stage of its development. Mobile technologies, wide access to the Internet, the accumulation of a critical mass of users and the processes of globalization lead to the so-called “ reinventing ” e - commerce (Laundon and Traver , 2018). The emergence of new technologies related to cloud services and artificial intelligence lead to the emergence of new business models of the type XaaS (X as a Services) - Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS), Business Process _ as a Service (BPaaS), Unified Communications as a Service (UCaaS), Desktop as a Service (DaaS). All this drastically reduces the requirements for start -up capital and infrastructure investments and allows more and more small businesses to turn to e-commerce (Schneider , 2017). During this stage, e-commerce leaves the boundaries of the traditional transaction with retail goods and services and covers completely new business segments such as education, administration, medicine, finance, military technologies , etc. (Qin , Chang , Li , and Li , 2014). The transformation of mobile communications and social networks into a part of modern times makes some authors talk about the transformation of e-commerce into mobile and social (Schneider , 2017, Laundon and Traver , 2018, Jelassi , Enders , Martí nez-López , 2014).

In the specialized literature, there is no unified and generally accepted view of the nature and scope of electronic commerce. According to the World Trade Organization , it includes the production, distribution, marketing , sales or delivery of goods and services by electronic means (WTO, 2017). The Electronic Commerce Promotion Council of Japan states that electronic commerce includes product design, production , advertising, commercial transactions, and settlement through the use of various types of computer networks (ECOM, 1996). Definitions of e -commerce can also be found in the views of a number of other institutional views : the International Chamber of Commerce defines e- commerce as a process of digitization of all phases of commercial activities in the entire commercial process, the Commission on Global Information Infrastructure - defines it e-commerce economic activities that are enabled by electronic

communication technologies through which people can post, buy, and transact for products and services of economic value , and according to the US government , it includes all business Internet activities, including advertisements , payments and services, etc. (Qin , Chang , Li , Li , 2014).

The European Commission expands the scope of purely commercial activity and states that e-commerce is related to doing business and providing goods and services electronically by means of electronic data processing and transmission, covering activities such as electronic e- commerce of goods and services, online delivery of digital content , electronic funds transfers, e- trading of shares, e-bills of lading, commercial auctions , collaborative design and - engineering , online deliveries, public procurement , direct consumer marketing, and after-sales service (EC, 1997).

According to the Electronic Commerce Act (2016), electronic commerce is the provision of services to the information society, as the National Strategy for Electronic Commerce (2000) specifies that it is a continuous cycle of data processing and exchange through which unified and integrated information provision for participants in the entire commercial transaction, regardless of the sphere of activity, industry , country, etc. These views of the Bulgarian legislator allow them to be smoothly applied both in the process of inter-company electronic commerce and in the process of finalizing the placement of goods and services through their immediate sale to end customers. At the same time, NSI (2020) adopts a significantly more limited definition of e-commerce, considering that it represents the purchase of goods or services on the Internet (via a website or web application) for personal purposes, through any type of device (desktop computer, laptop, tablet, mobile phone or smartphone), and the purchase is for the sake of, and the payment can be both online and offline .

For the purposes of the dissertation, we will adopt the following definition: *electronic commerce includes the process of buying and selling goods and services (physical or digital) between economic agents (companies, individuals , state institutions, organizations, etc.), such as this process or part of it is mediated through public open communication networks (Internet) and is related to the*

transfer of digital information (commercial , financial, etc.) between the participants in the transaction .

There are multiple classifications of e-commerce depending on the classification features applied. Depending on the communication channels used, a widespread view is that e-commerce can be considered as Internet commerce (i - commerce , internet commerce), mobile commerce (m - commerce , mobile com merce), social commerce (s - commerce , social commerce), collaborative commerce (c - commerce , collaboration commerce), b exported commerce (b - com merce , business commerce), and unified commerce (u - commerce , unified com mer ce). Depending on the place of the buyer in the trade chain (retailer or end user), it becomes e-wholesale and e-retail. Depending on the territorial scope of the commercial activity, we distinguish between local, regional and global e-commerce . Depending on the type of subjects involved in the commercial transaction , we distinguish the following types of e-commerce: business to business (B 2 B), business to consumer (B 2 C), business to administration (B 2A), business to employee (B 2 E), user to business (C 2 B), user to user (C 2 C), user to administration (C 2 A), administration to business (A 2 B), administration to user (A 2 C) and administration to administration (A 2 A).

E-commerce inherits part of the specificity, features and organization of its traditional form , while at the same time developing and creating new models of interaction both between the business entities themselves and between them and their customers. As Meier and Stormer (2009) point out, the traditional commercial intermediation at the inter-firm level is undergoing change and evolution – increasing niche specialization and increasing the role of external suppliers in the overall value chain, thus contributing to both niche specialization of each participant in the chain, reflecting in higher quality products and services, as well as by realizing savings contributing to the reduction of costs for the creation and distribution of products and services, resp. and for their lower price. This change often necessitates the emergence and development of various forms of horizontal and vertical integration between individual actors in the value creation chain.

In horizontal interfirm integration, certain members of several value chains support the main supplier horizontally by taking over part of the business activities that are not specific to it, i.e. are not core business activities for a company . These are the so-called MRO (Maintenance , Repair and Operations Supplies) services are services related to maintenance, repair and operation, which most often include a set of activities and operations related to the maintenance in normal and working condition of the production and service facilities, structures and buildings in the company and guaranteeing the continuous production and technological process. This includes both the direct activities of maintaining the main production process (e.g. maintenance and repair of production machinery and equipment), as well as the support of the company's administrative activities (maintenance of office equipment and supply of office supplies) and relationships with external suppliers of services (water supply, electricity supply, gas supply). In modern economic literature, the separation of non-specific company activities to external companies is associated with the term " outsourcing ", and specialized companies offering these services are outsourcing providers (Varamezov , 2012, Wienclaw , 2008, Turban , Whiteside , King and Outland , 2017, Laudon and Traver , 2018).

, a specialized company called an integrator (vertical integrator) appears again , which works according to a specific business model, offering specialized business services and transactions for companies from a given industry or branch. Typically, they create specialized portal sites that attract both specialized companies that want to offer their specific products and services, and customers that are looking for exactly those products and services. Very often, successful vertical integrators also form a la find completely new markets, which allows some authors to call them market makers (Wienclaw , 2008, Meier and Stormer , 2009, Turban , Whiteside , King and Outland , 2017, Laudon and Traver , 2018).

As Afuah and Tucci (2002) point out, this inter-firm grouping and integration is a natural response to the high fragmentation of business entities in the Internet space, which, in turn, is associated with an increase in transaction

costs for carrying out a given business transaction. Through the formation of unique business hubs, which enable the meeting of the demand and supply of the business units, the number of necessary communication links between individual companies is drastically reduced, the coincidence of the opposite business interests of the different companies is accelerated, respectively - they significantly reduce the time, communications and general costs accompanying the conclusion of a transaction.

Of interest to the present study is the view of Afuah and Tucci (2002), who form business entities in the field of e - commerce into three interrelated groups: consumers, suppliers, and providers of communication services. It is very important to note that the authors explicitly exclude end users (individuals) from the relationships they describe, emphasizing B2B relationships. To the group of the so-called users refers to companies that use the Internet as a means of communication and a basis for conducting their business, including e-commerce companies, content aggregators , market makers , brokers/agents, Internet service providers, while the group of providers refers companies that present key products and services related to and fundamental to the implementation of the normal - business activity of the previous group of companies: content creators , software suppliers and hardware suppliers, and in the last group of the so-called providers of communication services refer to companies that provide services that provide communication connectivity to the Internet, without which e-commerce in its true form is unthinkable , namely: companies that support the backbone of the Internet, Internet providers , and last mile providers.

An essential aspect of the overall understanding and study of e - commerce is the clarification of the applicable and specific business models for carrying out company activity. Some authors consider that the business model describes the basic logic of business activity in the process of value creation; others refer to it as the architecture of product , service and information flows , including a description of the various business actors and their roles and the sources of revenue for the organization ; while others consider that it is a business concept that explains the logic of doing business for a company (Pateli and Giaglis ,

2003). Bhasker (2013) points out that the business model describes the set of business entities and the interrelationships between them , as well as the sources of income and the accumulated potential benefits of the participating agents. Others believe that it is a method of doing business by which an organization can sustain itself in the short term and develop and grow in the medium in the longer term, gaining a competitive advantage . which allows it to earn more than its competitors (Tassabehji , 2003, Afuah and Tucci , 2002). Others describe the business model as a set of activities (business processes), the purpose of which is to generate profit for the company from its activities (Laudon and Traver , 2018, Schnei der , 2017 , Turban , Whiteside , King and Outland , 2017, Chaffey , 2015). An interest in the view of Lam and Harrison-Walker, according to which they define the business model in e-commerce : "Methods, concepts, frameworks or architecture by which companies can use the Internet or the network to implement their strategies to capture dominant market positions , creating viable market niches, adding value to them for stakeholders or sustaining them over time." (cited in Hayes and Finnegan , 2003).

We also find an interesting approach to the problem in the studies of Pateli and Giaglis (2003), who propose a conceptual framework of business models, including two mutually complementary and intertwined frameworks: the horizon , which includes a mission (strategic goals), a target market (scope and market segment), value proposition (product/service offering), resources (capabilities, assets), key activities (intra- and inter- organizational processes), cost and revenue model (cost and revenue streams, pricing policy), and value chain / network (alliances and partnerships), and a vertical framework including elements of business and social environment, such as market trends, regulations and technology.

On the other hand, the revenue model (the financial model) describes how the company will generate revenue, how it will form profit and how it will guarantee a higher rate of return on invested capital compared to possible alternative investments. The last aspect is particularly important, because for a

company to be successful, it must not only generate revenue and generate some profit, but it must be more profitable compared to alternative investment options.

One of the most widely imposed classifications of business models in the field of e-commerce is Rappa's, according to which we can distinguish (Turban , Whiteside , King and Outland , 2017): brokerage, advertising, information mediation, retail , direct model (selling without intermediaries), affiliate activity, subscription , and social media communities. An interesting approach to taxonomy of business models in the Internet economy can be found in the research of (Bhasker , 2013). According to him, depending on whether they are inherent and specific to the Internet economy or whether they are borrowed ("transplanted ") from the real economy (first classification feature) and whether they are based on content or transaction monetization, it forms four main groups of models: Internet economy-specific models for content monetization (information content -based model , freeware model , model based on the exchange of information), models for generating income from transactions inherent in the Internet economy (model based on the sale of digital products, model of providing access to the Internet, model of providing web hosting and Internet services, model of measurable services, metamedia model), ported content monetization models (subscription-based model, advertising-based model, infomedia model, affiliate-based model (partner model), and ported models for generating revenue from transactions (e-shop model, brokerage model, manufacturer model).

As price theory and business models, particularly those characteristic of e-commerce, show, price is key to business success and maximizing profits in the short and long term. Based on the considered pricing models and pricing - strategies, we can highlight two key factors, resp. the price optimization tool: the magnitude and structure of costs and the market situation, which reflects the state of demand and competition.

On the basis of the above judgments about e-commerce and the preceding analyzes of the price policy, we can conclude that the price policy of companies operating in the field of e-commerce needs a specialized view that takes into account the current specifics of the sector. Among the leading features and specifics affecting pricing in the field of e-commerce are the shortening of

delivery channels, savings in maintaining stores, sales areas and staff in the retail store network , removing restrictions on regional and local markets and the resulting shift in traditional market segmentation and target market.

Like the stock market, where the concentration of supply and demand is at its highest, the globalized market simultaneously achieves two important, albeit contradictory effects – it increases potential and real competition, and at the same time it expands tremendously the circle of potential users, which in turn - contributes to the unification of advertisements, resp. reducing the costs - associated with them, at the same time largely unifying the pricing policy of forms in e-commerce. The globalization of electronic markets allows supply-side traders to consciously and/or intuitively ignore differences in the purchasing power of consumers from different regional markets, which is a violation of the classical principles of pricing policy, according to which it is oriented for each specific market separately (Lilova, Si meo nov, Radulova, 2016).

Chapter 3.
CHALLENGES FOR ELECTRONIC COMMERCE DURING THE OT PANDEMIC COVID -19

Discovered in the city of Wuhan in December 2019, an unknown corona virus of infection in just a few months spread like an avalanche and reached every point on earth, and neither the introduced local and national lockdowns, nor the intensified medical measures and the imposed social distance. The economic effect of all the measures implemented to limit the spread of the disease led to an economic collapse comparable to the World Financial Crisis of 2007-2008. In Bulgaria, on March 13, 2020, a one-month state of emergency was announced (subsequently extended until May 13 and turned into an extraordinary epidemiological situation), with which all schools , malls, bars, discotheques , shopping centers, cinemas, restaurants , fitness and sports halls were closed , and many other sites reduced or ceased their activities as a result of the imposed measures and reduced demand , which gave an extremely negative impact on the GDP of a country and the volume of trade.

COVID -19 pandemic has also had an impact on the public's perception of prioritizing their basic needs, with the two highest priorities being personal health (51%) and the health of family and friends (29%) (Accenture, 2020). And if we increase the demand for personal hygiene products and cleaning agents and the decline of goods in the fields of fashion, home decoration and cosmetics are completely understandable and logical, then the drastic jump in demand for - canned and frozen foods clearly reflect people's fears about the duration and - strength of the first wave of the pandemic.

Research by Market Links and bTV (2020) shows unequivocally that the majority of the population in our country has concerns about their financial future , as, apart from the immediate negative impact of the COVID-19 pandemic , a significant share of respondents (86%) have expectations of the next financial and economic crisis. Almost half of the respondents are worried about losing their job or at least - reducing income from work. This is also evident from Ninova and Tomov's research , in which their respondents indicate that 95% of their purchases during a pandemic are essential goods, followed by disinfecting materials (55%) , and medicines (44%). (Ninova, Tomov , n / a) In parallel, there is a significant share of the Bulgarian population that has significantly reduced the funds allocated for shopping (34%) or has kept them at the same level as before the pandemic (48%) , and a significant part of them have reduced the frequency of shopping (41% of respondents shop once a week, and another 36% - even less often). (Dimi trov, 2020). In the research, Dimitrov also takes into account the relatively reduced funds for shopping, which for 56% of households are up to BGN 50, and for another 21% they are in the range of BGN 50-100.

As for online shopping in conditions of a pandemic in Bulgaria, a study by Nielsen Atmosphere Bulgaria and the Bulgarian National Panel (2020) shows that 69% of respondents have not changed their online shopping habits, and only 17% of the Bulgarians have started to steal much more often than before. It should be noted that compared to the data presented above for European online trade, the same in Bulgaria occupies a significantly smaller share. This can be partially explained both by the relatively more liberal measures to limit the pandemic

imposed in our country, and by the clearly visible concerns of people about their health and financial situation, reflecting both a reduction in social contacts and the reduced spending on reckless purchases. Regarding the categories of products we shop online , in their study, Ninova and Tomov indicate a definite dominance of food products (62%), followed by clothes and shoes (8%), small tech (6%), goods for the home and garden (6%) and books and games (5%), which overlaps to a significant extent as a behavior with the trends found at the European level .

Of particular importance for effectively dealing with the challenges of e-commerce in the conditions of the COVID -19 pandemic is the preliminary - assessment of its negative impact through the eyes of the parties concerned , and on this basis, proposals could also be defined, aimed at their minimization or complete elimination. In this context, for the purposes of this dissertation , an own survey was also conducted with the main goal: defining the state and the main problems facing online commerce in Bulgaria as a result of the pandemic from COVID -19 . It was conducted in the period October 1 - November 30, 2021 among 1,000 online merchants on the territory of Bulgaria through an online survey, available at : https://docs.google.com/forms/d/e/1FAIpQLSd 4S4G4ke8UgtwMqq5hsJJs9v4S9T8Fdf9PL1rbp34avD3mFw/ viewform .

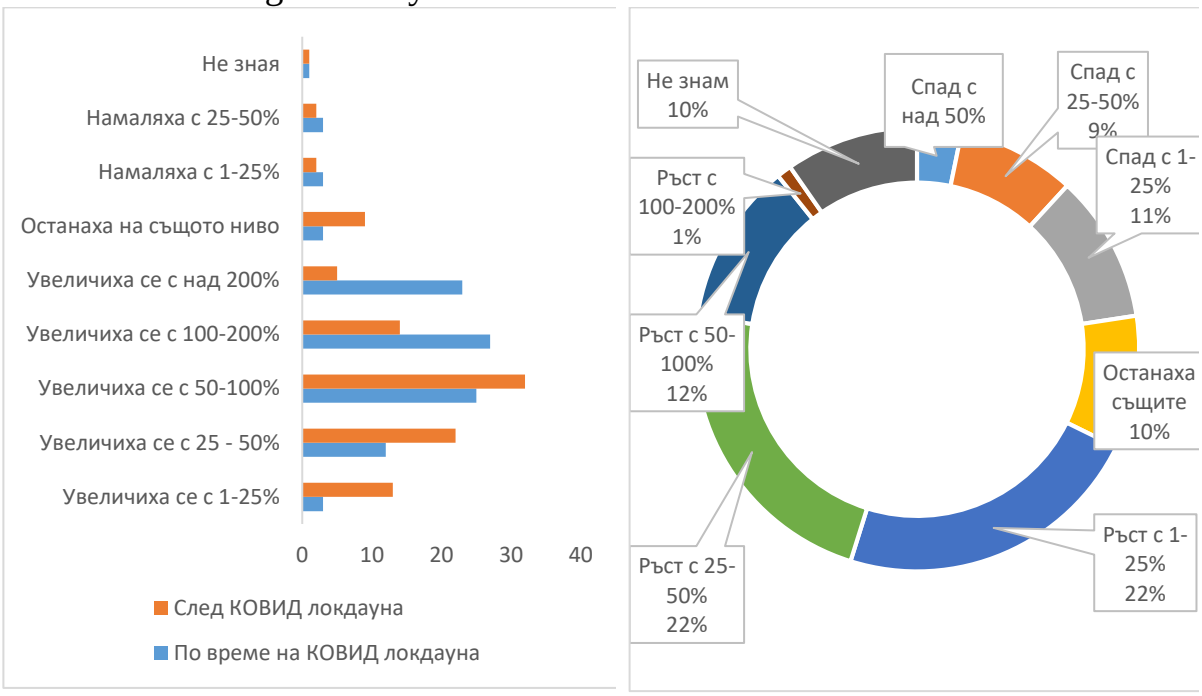
The questionnaire survey used the respondent method, and as a means of initial contact , a message sent through the social networks of the studied online stores was used . The survey is anonymous, and the questions in it are optional , and the survey on the card contains at least 17 questions of a closed-ended - qualitative nature , including dichotomous (1) and multiple -variant (8) questions , questions with more than one possible answer (7), and in a question with an open answer (1). As of December 1, 2021, 98 completed and valid survey cards have been received. The average response rate for the entire survey was 9.8%. The presented results and conclusions are valid only for online merchants participating in the study .

For the purposes of creating the electronic questionnaire, the Google toolkit was used Forms , and for the statistical analysis and graphical presentation - MS Excel 2016. Due to the small volume of survey cards valid for analysis, for the

purposes of the analysis, only applicable methods for statistical processing and analysis were used , and in particular - frequency analysis division of the answers, as well as applicable methods for graphical presentation of the results . The chosen methodology also corresponds to the methodology of the leading study by SearchNode (2021), which in turn is a prerequisite for the comparability of the obtained results of the situation in Bulgaria compared to that in the European Union and the USA , and the profile of the companies covered has a high degree of similarity.

One of the most important aspects when assessing the impact of the COVID -19 pandemic on e-commerce is its impact on the income from the business activity of online merchants - this is also confirmed by the research: in both analyzed populations, a significant growth in sales revenue through digital channels. Also interesting is the trend that the research of SearchNode (2021) captures when comparing the sales volumes during and after the first lockdown and from which it is clearly evident that during the mass closure of the economy, the volumes of goods sold marked a significant growth. which, after the relaxation of the measures, show a decreasing trend, but while maintaining relatively higher levels compared to before the start of the pandemic. As far as the Bulgarian economy is concerned, 67% of the surveyed traders report an increase in the volume of goods sold, and here we must note that the reported growth in sales is moderate and only 1% of the respondents in our country report an increase of over 100% in their sales. while for respondents from Europe and the USA, this percentage is 50% for the lock down period and 19% for subsequent periods. These differences may be due both to the degree of development of the online market in different countries, and to the difference in the severity of pandemic containment and social distancing measures that were applied in different countries. In this aspect, in the presence of stricter measures, it is logical to expect a boom in e-commerce due to the lack of alternative distribution channels for purchasing goods, and vice versa - in countries like Bulgaria, where the measures were relatively weak and not everywhere applied in full, consumers still had

access to alternative physical distribution channels, the growth of online sales volume was at a significantly lower rate.



Europe and the USA *Bulgaria*

Figure. Changes in online revenue (SearchNode (2021) and survey results)

Another important aspect of the activity of online retailers that was affected by the pandemic was related to the management of personnel, where two opposing trends collided - the need for personnel as a result of the increased volume of sales and the restrictions imposed by the authorities on social distance and physical presence of those working in the business. In the US and Europe, employers have mainly resorted to optimizing work processes by moving staff (44%), or even hiring new employees (31%), incl. and through financial incentives and salary increases (5%) SearchNode (2021), while in our country, companies have introduced the option to work from home (28%), and the increased sales volume is met with an increase in the number of employees (14%)) and increase their salaries (10%).

It is interesting to note that in both studies conducted, we report a relatively equal share of marketers increasing and decreasing their staff – 31% increased to 26% reduced staff in the SearchNode (2021) study and 14% increased to 13% reduced staff in the study conducted in Bulgaria.

is a significant divergence in the results of the two studies regarding the main challenges facing businesses as a result of the COVID -19 pandemic . If SearchNode research (2021) shows that in the US and Europe, online retailers mainly suffer from disrupted supply chains (57%), the ability to meet increased product demand (43%), limited operations as a result of the measures imposed during the lockdown (29%), stock management (28%) and insufficient staff - (26%), in Bulgaria the main problems and challenges are related to problems with supply (33%), decline in consumer demand (28%), shortage of skilled personnel (15%) and inventory management (14%).

The changed business environment as a result of the restrictions related to the COVID -19 pandemic also causes a number of changes in the strategic vision for the business . Among the most significant in the USA and Europe, there is a focus on the digitization of business, incl. by improving the used software - products and online marketing campaigns (45%), accelerating the implementation of current strategies (20%) and optimizing the physical store network (10%) (SearchNode , 2021). As for Bulgaria, the need to strengthen digitalization again comes to the fore (24%), but it is combined with a change in the time horizon, and in particular – the shortening of it through shorter-term plans (19%). improvement of the product range (15%) and changes in delivery methods (13%). At the same time , part of the native business resorted to creating a completely new strategy (7%) or changing the focus of the market to B2B (7%) or B2C (7%).

When asked if companies are preparing for the next lockdown, 71% of American and European traders answered positively (Search Node , 2021), while in Bulgaria this percentage is only 32%. At the same time, 21% of those asked in our country indicated that they expect and will follow the guidelines and measures of the government, and another 7% indicated that they are still working in lockdown conditions . Aggregating all positive responses, i.e. other than "no" and "I don't know", we can point out that de facto 60% of Bulgarian companies are in some way preparing for possible unfavorable changes in the business environment when another lockdown of the economy is introduced. Thus, regarding this aspect

of the study, we do not find significant differences in the behavior of the respondents in the two studies.

As for specific measures to prepare for business in the conditions of the next lockdown, companies surveyed by SearchNode (2021) prioritize improving work-from-home policies (57%), increasing satisfaction (51%) and the experience (48%) of online consumers, diversification of supply chains (39%), expansion of online presence (39%), incl. by increasing the marketing budget - (32%), as well as improving the web infrastructure (36%) and hiring new people (29%). As for the companies in our country, they predominantly focus on expanding their presence in online trade (23%), incl. by increasing their marketing budgets (18%) and improving the services they offer (17%) and diversifying their delivery methods (9%) and hiring new employees (5%) or improving their work-from-home policy (5%). Here, one significant difference stands out among the respondents in the two studies, namely: if the American and European traders - mainly emphasize the processes of improving the customer's experience and - satisfaction , and only then on the additional market expansion, in our country the priorities are exactly the opposite - an emphasis on conquering new markets, and only after that - increasing customer satisfaction with the purchase. This finding in itself says that the Bulgarian online market has not yet achieved its maximum extensive growth, while the high competition in the American and European markets means that qualitative growth is emphasized more than purely - quantitative growth. .

These findings are confirmed for the SearchNode (2021) study, where the majority of respondents indicated that they work in very strong (40%) or strong (44%) competitive environments. It is interesting that, although the responses of the native traders are similar to ours and they indicate that they work in very strong (29%), strong (40%) and moderate (24%), as already mentioned above, they still prioritize customer satisfaction over market expansion. Increased competitive - pressure logically impacts e-commerce spending attitudes . And if 78% of the merchants surveyed by SearchNode (2021) foresee an increase in their budgets in the field of e- commerce and related activities, then in our country we report a

similar attitude in only 41% of those surveyed, and another 44% of them envisage maintaining the level of expenses at the currently existing levels.

Of interest to the current analysis is the finding of the special importance of the omnichannel sales strategy, which is indicated by almost half of the respondents as very important (47% in the USA and the EU and 48% in Bulgaria). At the same time, the share of companies that maintain their neutral assessment of omnichannel trade remains high - 19% in the USA and the EU and 41% in Bulgaria. The importance of omnichannel commerce is also confirmed by the intention of the respondents (12% in the USA and the EU and 14% in Bulgaria) to make sales through social media and the fact that 30% of the American and European and 43% of the Bulgarian merchants already they practically carry it out. The percentage of companies that are currently in the process of considering and analyzing the possibilities for distribution of their products through social networks remains high - 33% in the USA and the EU and 14% in Bulgaria.

A significant part of the possibilities for the possibilities of implementing effective e-commerce is related to the platform or specialized software used by the trader for this purpose. Both studies unequivocally show that over 40% of merchants prefer to work with an e-commerce platform that is specially adapted and customized for their needs , while the rest rely mainly on ready-made solutions and platforms. At the same time, the majority (62%) of American and European merchants plan to make improvements to their existing e-commerce platform (SearchNode , 2021), while only 33% of respondents in our country declare such intentions, and others 48% state that they are satisfied with the functionality of the platform they use. Among the leading directions for improvement is the order management system - for 60% in the US and the EU and 39% in Bulgaria , and the method of payment - for 59% in the US and the EU and 36% in Bulgaria .

For the impact of technological innovation on online commerce , among the favorites with a potentially large effect is artificial intelligence. The main expectations are aimed at improving the possibilities for personalization (70% in the USA and the EU and 12% in Bulgaria), search on the site (54% in the USA

and the EU and 8% in Bulgaria), forecasting (52% in USA and EU and 8% in Bulgaria), marketing (43% in USA and EU and 12% in Bulgaria), sales (28% in USA and EU and 8% in Bulgaria) and fraud prevention (25% in USA and the EU and 4% in Bulgaria). On the basis of the answers received, certain differences emerge - if American and European traders see a significant potential in artificial intelligence for the implementation of more effective pricing (38%), then Bulgarians are significantly more skeptical in this regard (3%). A high level of skepticism in our country can also be read in general regarding the applicability of technology in electronic commerce (18%), while the level of skeptics in the USA and the EU is only 4% of the respondents . It is important to note that despite significant difficulties and challenges , positive attitudes among online marketers around the world about financial success per year are overwhelmingly positive, 91% in the US and EU (Search Node , 2021) and 74% in our country.

The high expectations of online retailers for artificial intelligence, especially in the area of improving personalization, forecasting , marketing and sales , incl. and by improving the effectiveness of pricing methods is also one of the reasons why the author focused on developing and testing a dynamic pricing model using Big data and artificial intelligence

The model for dynamic pricing presented in the dissertation using big data and artificial intelligence is completely proprietary and is suitable for the needs of an international online store with a catalog of 1,500 auto parts of one type, which offers its products in 15 countries without implementing a local pricing policy for each individual market.

The model is a recurrent neural network - Long Short-Term Memory (LSTM), and its mathematical representation with a range of 10 features is presented as follows:

$$f_t = \sigma(W_f * [h_{(t-1)}, x_t] + b_f) \quad (1)$$

$$i_t = \sigma(W_i * [h_{(t-1)}, x_t] + b_i) \quad (2)$$

$$\tilde{c}_t = \tanh (W_c * [h_{(t-1)}, x_t] + b_c) \quad (3)$$

$$c_t = f_t \odot c_{(t-1)} + i_t \odot \tilde{c}_t \quad (4)$$

$$o_t = \sigma(W_o * [h_{(t-1)}, x_t] + b_o) \quad (5)$$

$$h_t = o_t \odot \tanh (c_t) \quad (6)$$

where:
f_t , **i_t** and **o_t** are respectively input-output gates ;
c̃_t is the state of the memory cell;
W_f , **W_i** , **W_c** and **W_o** are weighted matrices;
b_f , **b_i** , **b_c** and **b_o** are bias vectors;
σ represents the sigmoid activation function;
tanh is the hyperbolic tangent function.

The output function has the form:

$$Y_t = W_y * h_t + b_y \quad (7)$$

where:
Y_t are the estimated values at time t
W_y - the weighting matrix,
b_y - the deflection vector.

The model has been implemented and tested using specialized software for intelligent and automated price determination for each product, where the merchant will have the highest profit without necessarily looking for an increase in sales volume and turnover. The main data for analysis are date, product code, price, number of sales, number of sales by marketing channel, number of visitors, number of visitors by marketing channel, holiday / working day, day of the week, product availability, average selling price of competitors of current market, weighted average selling price of competitors in the current market, and number of competitors in the current market offering the current product with positive availability. A/B data and a multivariate test of different prices were used to feed the model with additional data and verify the results, with the model being self-trained with our primary and secondary data for the last 5 years, as well as price dynamics data from for the next 7 days.

When measuring the effectiveness of the model for determining the prices of the product, a set of several indicators is taken into account, while excluding the impact of external factors that influence consumer behavior and sales of the online store. Main indicators that are used to determine the efficiency of the price, and subsequently to determine the price at which the store will generate the greatest profits in the long term are: number of unique visits (views), number of purchases, conversion rate, returned products, product price, attribution model (attribution model). On this basis, the software builds a matrix with the price data of competing suppliers of the same product, including the following summary parameters: median price by country, average price by each country, lowest price by each country, highest price by each country .

In the analysis of the market in Germany, the software sets the median obtained from the preliminary analysis for this market at 145.10 euros. Since the "pretty price" functionality is included, the price is rounded to the nearest ending in 9 and no value after the decimal point. The resulting starting price is €149.00. In step 1 of our experiment, we bet the lowest price (149.00 euros) that we have determined for our project - the meridian of the top competitors according to their popularity when searching for the product subject of the current experiment. Thanks to the low price, we generate a record high number of sales, the highest conversion and a lower cost of advertising, which is achieved as a result of the high percentage of visitors who made a purchase. We measure advertising spend as a percentage of revenue, and although here the value of the total amount spent on advertising is the highest of the 3 experiments for this market, the percentage spend is the lowest at 7%. The obtained data is extremely interesting, and the figures show the exact opposite of the generally accepted ones of a higher volume of sale and a higher turnover being preferred, which in this case leads to a lower profit due to higher costs.

In an experiment from step 2, we observe a drop in sales, which can immediately be explained by the higher price, the drop in conversion also leads to a higher percentage of advertising spend, which increases the value of our order. According to the calculations, it is clear that the higher selling price cannot

compensate for the lower income from the lower number of sales, nor the higher advertising expenditure. This results in an 8% profit drop and automatically excludes the current price as the test favorite. In step 3, the software experiment is conducted with the highest possible price set within the set project limits – 199.00 euros. From the results, the lowest number of products sold immediately impresses - only 5 units, which, however, generate almost 1,000 euros in gross turnover. A comparison with the experiment of option two shows that with almost 50% more sales in experiment-2 almost the same turnover was generated. This reflects lower production costs in option-3 compared to 1 and 2. The share of advertising costs is greatly increased, reaching over 50% compared to experiment-1 and approximately 20% compared to experiment-2. At the same time, the low cost of purchasing a good leads to a higher turnover and, accordingly, to the generation of a higher net profit, namely 258 euros, the highest value of the 3 experiments. Summarizing the results of the experiments for the German market we can say that thanks to the high price and despite the small number of sales, the efficiency of the business is improved and the product should be sold at a price of 199.00 euros, generating the highest net profit for the company.

When analyzing the second market in the current experiment - France, the software sets the resulting market median at €129. In step 1 of our experiment, we bid the lowest price (€129.00) that we have determined for our project - the median of the top competitors according to their product search popularity. Unlike the German market, in France the lowest price does not contribute to the highest number of sales. This can be explained by the low trust that is associated with the cheapest auto parts, which can eventually lead to a repeated need for repairs or even a road accident. Advertising costs in this step are the lowest and also have the lowest percentage value of the generated turnover , but this is not enough to generate the desired profit.

In an experiment from step 2, we observe an increase in sales, which can be explained by an increase in customer confidence in the product due to the higher price, but in parallel it is only 15% higher than the meridian, which from its country contributes to this experiment generating the most sales – 12 each. The

profit here is almost 5 times higher than in experiment 1, but still lower than the achieved profit optimization for the German market. Step 3 leads again to the most correct price, which corresponds to the previous price of the product for the relevant market – 179.00 euros. It generated 33% less sales than experiment 2 and 11% less sales than experiment 1. The profit was over 7 times higher than that of option 1 and 50% more compared to option 2. The percentage cost of advertisement is the highest 9.47% of the turnover, but the absolute value is lower than experiment 2, as well as 2 times higher than experiment 1. The obtained data from the performed experiment verify the assumption made from the initial data, in which sees that the French market has one of the highest conversion values (performance index 0.56), due to the correct price positioning of the product.

When analyzing the third market - Great Britain, on option 1 of our experiment, we bet the lowest price (129.00 euros). In Great Britain, the median is 93 euros, but according to the set parameters and the calculated costs, the project cannot sell the corresponding product at a price below 129.00 euros, therefore the software takes it as the minimum price and calculates the next two steps on this basis. Experiment-1 generated the most sales – 17, but here, unlike the previous markets, advertising costs increased, the reason for which could be low trust in a product with such a low price. In option-2, we see a significant drop in the advertising price, which suggests an improvement in customer attitudes towards the product based on its higher price, which is perhaps in the golden mean. A range of 14 products sold, which is 23% less than the result in step-1, but the difference in profit is almost 5 times in favor of the pricing policy of step-2. In option-3, we again explore with the highest determined price, which also corresponds to the current price at which it is sold in the store. From the results, the lowest number of products sold immediately impresses again - only 8 units, which, however, generate a little more than 1400 euros in gross turnover. The ad cost in this experiment is the highest - over 100% increase over step-2 and over 50% over option-1, which ranks this experiment second in terms of net profit generated, compared to the option-2 favorite which generated with 7% higher profit. In contrast to the German and French markets studied so far, in the UK the

favorite price is the intermediate price of step 2 (€149.00), thanks to which experiment 2 is second in sales volume, but generates significantly less costs as a percentage of turnover (50% less than experiment 3 and 30% less than experiment 1), leading to an increase in net profit.

When analyzing the first market (USA), the software sets the resulting US market median of €169.00 to use as a starting price. In variant 1 of our experiment, we bet the lowest price (€169.00). Experiment 1 achieves the same number of sales as Experiment 3 (4 each) and advertising costs are the lowest, but this does not lead to an increase in net profit compared to Experiments 2 and 3, which may be is the low confidence in a product with such a low price. In option 2, we report a minimal increase in the price for advertising (5%), which suggests an improvement in customer attitudes towards the product based on its higher price, which is perhaps in the middle of the price range. We reach 7 products sold, which is 75% more than the result in option-1, and the profit is almost more than 3 times more in favor of the pricing policy than option-2. In option-3, we again explore the option with the highest set price at which it is sold in the store. Again, we notice a drop in sales to only 4 units, which, however, form a little more than 870 euros gross turnover. The ad cost in this experiment is the highest - over 60% increase over option-1 and, which ranks this experiment in second place in terms of net profit generated - 220 euros, compared to the favorite of option-2, which generated 60% higher profit. Similar to the UK market, in the US market again the price favorite is the intermediate price of experiment-2 (€199.00), thanks to which experiment-2 has the highest number of products sold and generates the same percentage of costs as in experiment -3, but due to the higher number of sales, the net profit is significantly higher.

The effectiveness and applicability of the model is tested on the leading European and American markets with real data in the fourth quarter of 2022. Market tests unequivocally showed the absence of a direct positive relationship between the low prices of the product, the volume of realized sales and the generated profit from sales. This is most likely due to the high degree of distrust of consumers in the quality of cheap goods offered through online stores, which

is also evident from the analysis of the markets in France and the USA. The analysis of the market in Germany showed that, against the expectations of high profits at low prices, high trade turnovers are also associated with high levels of accompanying costs, which in turn reduces the company's profit.

Another interesting finding from the analysis is that there is a difference in the behavior of consumers in continental Europe, and in particular in Germany and France, compared to the Anglo-Saxon market (Great Britain and the USA). If in Europe customers tend to associate a high price with high quality , then in the USA and Great Britain they prefer to focus on the average price levels, which shows that consumer behavior is oriented towards the search for a good "price/quality" ratio.

The analyzes made clearly show that a changed business environment and increased competition in online trade, the use of technological innovations such as artificial intelligence and big data is transformed from an exotic option into a full-fledged tool for managing e-business and pricing the offered goods through a set of methods and approaches contributing to the maximization of realized profit from e- commerce.

CONCLUSION

In the conclusion of the dissertation, the main findings and results of the theoretical studies and practical analyzes and experiments are summarized.

Based on the systematization and critical analysis of leading researchers in the field of price policy, the thesis is confirmed that the choice of a successful method and model for pricing in the company requires to a large extent compliance with the corporate goals of the company with the particularities of the specific market and the nature of the competitive environment. This necessitates the use of different pricing models (market and cost), and in the context of their strengths and weaknesses, combined with the specifics of the company's activity and the company's market positions, a special role is played by the analysis of the control point in practical price formation , as a model that is based on the size and structure of company expenses , together with which reflects the market influence

- a view in unison with that of professors Lilova and Simeonov . Taking into account the impact of information technology and electronic commerce, it is found that they lead to the modification of some of the already known classical models, which shows that price management should not be perceived as an already studied sphere of theoretical and practical knowledge.

The dissertation also outlines the key role of the price policy, as the final stage of the company's marketing strategy and a key stage of corporate management, from which the market positions, the volume of realized goods (services) and financial results depend and includes both the company's long-term and short-term goals, as well as the strategic and operationally tactical tools for their achievement, and the necessary organizational structure and control methods. In order to implement its pricing policy , the company develops and implements an adequate pricing strategy, which can be considered as a general guideline that the company should follow when establishing supply prices in order to achieve its long-term and long- term goals, or as a kind of set of tools or a set of methods with the help of which the price policy of the company is implemented

Originating in the second half of the 20th century, e-commerce has gone through periods of booms and busts to become part of the modern business landscape , while fundamentally changing applicable business models and the global business environment. The dissertation adopts the view that modern e- -commerce includes the process of co -sale of goods and services (physical or digital) between economic agents (companies, individuals, state institutions, -organizations etc.), and this process or part of it is mediated through public open communication networks (Internet) and is connected with the transfer of digital information (commercial, financial, etc.) between the participants in the transaction . Inheriting some of the specifics, features and organization of its traditional form, it builds and creates new models of mutual action both between business subjects themselves and between them and their clients, reflecting the roles that individual subjects can play into these relationships.

With the aim of a more comprehensive understanding of the specifics of electronic commerce, the dissertation clarifies the applicable business models for

carrying out the company's activities, with particular emphasis placed on its - revenue generation model . The importance and applicability of the main groups of business models for effective e-commerce is demonstrated , and in particular the models inherent in the Internet economy for generating revenue from: content (information content-based model, freeware model, exchange of information), from transactions (model based on the sale of digital products, model of providing access to the Internet, model of providing web hosting and Internet services, model of measurable services , metadata model) as well as ported models for generating revenue from : content (subscription-based model, advertising-based model , infomedia model , affiliate-based model (partnership model) , and of transactions (e-store model, brokerage model , producer model) (Bhasker , 2013).The view is also advocated that regardless of the chosen business model, the firm can generate its revenue by using one or a combination of the following sources of revenue : from advertising , from subscription, from fees from transactions , from sales , from associated companies (from brokerage services , referral services) , from infomedia, from shared revenues , from license fees, from economies of scale and from using hybrid revenue models .

The dissertation also presents the results of the author's online survey conducted in the period October 1 - November 30, 2021 to assess the condition and the main problems facing online commerce in Bulgaria among 1,000 online merchants in the territory of Bulgaria . Its results showed a significant growth in sales revenues through digital channels, especially in periods of lockdowns, with the rate of sales growth being significantly higher in the EU and the US than in Bulgaria . Among the main problems and challenges in our country are the problems with supplies, the drop in consumer demand, the shortage of qualified personnel and inventory management, which contrasts with the problems of online merchants in the USA and Europe, which mainly suffer from violations in the supply lines and the ability to meet the increased demand for products . It is noted that the changed business environment causes a number of changes in the strategic vision for the business, mostly related to the digitalization of the - business, including through the improvement of the software products used and

online marketing campaigns , incl. and processes to improve the customer experience and satisfaction.

It was found that the predominant share of the surveyed online traders work with a specially adapted and customized e - commerce platform for their needs , but also temporarily plan to make some improvements to it. Some of them are also betting on emerging artificial intelligence, especially in the field of improving the possibilities for personalization, forecasting , marketing and sales , incl. and by improving the effectiveness of pricing methods .

The latter findings provoked the author to develop his own dynamic pricing model using big data and artificial intelligence, which has been tested and approved in an international online auto parts store offering its products in 15 countries with no local pricing policy implemented for each individual market. The model is a recurrent neural network - Long Short-Term Memory , being implemented and tested through specialized software for intelligent and automated determination of the price for each product, in which the merchant will have the highest profit without necessarily seeking an increase in sales volume and turnover. Data from A/B and a multivariate test of different prices were used to feed the model with additional data and verify the results , and the model was self-trained with data for the last 5 years, as well as data on price dynamics from the following 7 days.

The effectiveness and applicability of the model was tested on the leading European and American markets with real data in the fourth quarter of 2022, and the tests conducted clearly show the absence of a direct positive relationship between low product prices, the volume of sales and the generated sales profit . A high degree of consumer mistrust in the quality of cheap goods offered through online stores (France and the USA) is accepted as a possible explanation , while in Germany high trade turnovers are also associated with high levels of associated costs . The data analysis showed a difference in consumer behavior in continental Europe compared to the Anglo-Saxon market, where European customers tend to associate high price with high quality, while in the US and UK they prefer to look for good value for money.

The presented and tested dynamic pricing model using big data and artificial intelligence confirms the presence of potential in these new technologies for a full-fledged tool for managing e-business and pricing the offered goods through a set of methods and approaches contributing to the maximization of - realized profit from e -commerce.

II . _ REFERENCE ON SCIENTIFIC AND SCIENTIFIC-APPLIED CONTRIBUTIONS IN THE DISSERTATION

First. Based on an in-depth review of the scientific literature on the related issue, the author offers a complex systematization of the theoretical aspects in the field of pricing and his own view of the importance of pricing policy and pricing strategy in the overall price management process in the company.

Second. Through a theoretical-practical analysis, the author defines the place and role of modern e-commerce, methodologically evaluates the applicable business models and approaches for generating revenue from companies in the field of e-commerce, and distinguishes the specifics of their pricing processes - products and services based on key indicators .

Third. An author's definition of the term electronic commerce is offered as a process of buying and selling goods and services (physical or digital) between economic agents (companies, individuals, state institutions, organizations, etc.), such as this process or part of it is mediated through public open communication networks (Internet) and is related to the transfer of digital information (commercial, financial, etc.) between the participants in the transaction.

Fourth. On the basis of a survey conducted on the state and trends in the e-commerce sector in Bulgaria, it was found that, in order, the main problems and challenges in our country are the problems with supplies , the drop in consumer demand , the shortage of qualified personnel and inventory management, which contrasts with the problems of online retailers in the US and Europe, which mainly suffer from disruptions in supply chains and the ability to meet increased product demand.

Fifth . Based on the survey, it was found that the changed business environment causes a number of changes in the strategic vision for the business, mostly related to the digitalization of the business , including by improving the software programs used ducts and online marketing campaigns, incl. and processes to improve the customer experience and satisfaction . It is established that although the surveyed online merchants work with a specially adapted and

customized e - commerce platform for their needs , some of them are also betting on the emerging artificial intelligence, especially in the field of improving - personalization, forecasting , marketing and sales capabilities , incl. and by improving the effectiveness of pricing methods .

Sixth. It has been developed own dynamic pricing model by using big data and artificial intelligence based on recurrent neural network - Long Short-Term Memory is implemented through specialized software for intelligent and automated determination of the price for each product, where the merchant will have the highest profit . The model has been tested and approved in an international online auto parts store offering its products in 15 countries with no local pricing policy implemented for each individual market , and its effectiveness and applicability have been tested on the leading European and American markets with real data in the fourth quarter of 2022.

Seventh . The results of the conducted tests clearly show the absence of a direct positive relationship between the low prices of the product, the volume of realized sales and the generated profit from sales. Differences in the consumer behavior of the studied markets are also noted: European customers tend to associate high price with high quality , while in the USA and Great Britain they prefer to search for a good " price/quality" ratio .

I V. REFERENCE TO DOCTORAL STUDENT'S PUBLICATIONS

Articles:

Anev, G. (2021). *Place and role of the price policy in the modern company - conceptual aspects* . Industrial relations and social development, no. 3/2021, Sofia, pp. 39-49, ISSN 2683-0167

Anev G. (2021). *The nature and the scope of the modern ecommerce* . International independent scientific journal , Kraków , №29, p. 13-16, ISSN 3547-2340

Anev G. (2021). *Interactions between companies in the electronic market* , Warszawa , Poland _ journal of science , No. 44 (2021), Vol . 1, p. 50-54 , ISSN 3353-2389

Anev, G. (2021), *Business Models and Approaches to Generating Revenue in Electronic Commerce* . Annual almanac Scientific research of doctoral students - "Dimitar A. Tsenov" Academy of Economics - Svishtov, Volume XI V - 2021, Book 17 - Studies and articles, pp. 373-389, ISSN: 1313-6542

Reports:

Anev, G. (2021). *Origin and evolution of the e- commerce . Priority directions of science and technology development* . Proceedings of XI International Scientific and Practical Conference . Kyiv , Ukraine . 11-13 July 2021, p. 587-592, ISBN 978-966-8219-84-9

V. REFERENCE FOR COMPLIANCE WITH THE NATIONAL REQUIREMENTS UNDER THE RULES FOR THE IMPLEMENTATION OF THE LAW ON THE DEVELOPMENT OF THE ACADEMIC STAFF IN THE REPUBLIC OF BULGARIA

National requirement in number of points: 30.00

Number of studies published in non-refereed peer-reviewed journals or published in edited collective volumes: **0 nos.**

Number of points for the author: 0 points

Number of articles published in non-refereed peer-reviewed journals or published in edited collective volumes: **4 nos.**

Number of points for the author: 40 points

Number of reports published in non-refereed peer-reviewed journals or published in edited collective volumes **: 1 no.**

Number of points for the author: 10

Total Points: 50.00 > 30.00

VI. DECLARATION OF ORIGINALITY OF THE DISSERTATION

The dissertation in volume of 217 pages under the title: " **Challenges to pricing in e-commerce in our country in the conditions of a pandemic"** and is the author's own scientific production. It uses author's ideas, texts and visualization through graphs, diagrams, tables and formulas, complying with all the requirements of the Law on copyright and its related rights by properly citing and referring to someone else's author's thought, as well as data, including:

1. The results achieved in the dissertation work and contributions made are original and are not borrowed from research and publications in which the author has no participation.

2. The information presented by the author in the form of copies of documents and publications, personally compiled references, etc. corresponds to objective truth.

3. Scientific results obtained, described and/or published by other authors are duly and extensively cited in the bibliography.

Date: 29/11/2023 Doctoral student:

/ Georgi Anev /