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ANALYSIS OF THE DEVELOPMENT OF E-COMMERCE IN POLAND FROM 2010-2020 AND ITS IMPACT ON THE TRANSPORT SECTOR

Summary. Trade with the use of internet technology (e-commerce) provides new opportunities for expansion on a larger scale for already existing business entities and offers prospects for rapid development for new companies. This is possible due to the low entry barriers that encourage the sale of products. Online retail trade is gaining increased popularity in Poland. This article aims to analyze e-commerce development in Poland from 2010-2020. This analysis is based on data from the Central Statistical Office. The results of the analysis clearly show that the share of purchases made via the internet has been systematically growing from year to year. This growth contributes to the faster development of transport logistics, as well as the transport of the goods itself.

Keywords: e-commerce, online store logistics, logistics of transport, transport company

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1. INTRODUCTION

Trade is an important part of the Polish economy, belonging to the broadly understood sphere of services. In the Polish Classification of Activities, wholesale and retail trade entities are classified under section G, covering the following types of economic activity: wholesale and retail sale (that is, a sale that does not require processing) of all types of goods, provision of services related to the sale of goods, repair of motor vehicles and motorcycles. The retail sector is the third largest sector of the Polish economy. In 2018, it generated almost 17.6% of gross value added [16].

Electronic commerce (e-commerce) is a very dynamically developing sector of the Polish economy. Every year in Poland, it increasingly gains followers. Poland ranks thirteenth among the fastest growing e-commerce markets in the world. The ease and availability of e-commerce around the clock increasingly attract e-consumers. The tools for concluding transactions are constantly changing through the continuous implementation of advanced IT and logistics technologies, all to simplify the purchasing path of the buyer [1, 4, 6].

The main driving force behind innovative technologies is consumers, as they show their lifestyle and how to meet their expectations. E-commerce reaches an increasing number of older people who trust internet transactions, as well as the younger population who use mobile applications to make purchases via the internet on an ongoing basis [3, 11].

This article aims to analyze e-commerce development in Poland from 2010-2020. This analysis is based on data from the Central Statistical Office. The results of the analysis clearly show that the share of purchases made via the internet has been systematically growing from year to year. This growth contributes to the development of transport logistics, as well as the transport of the goods itself. This article consists of five sections. After the introduction, the second section presents and characterizes the types of logistic services that occur in e-commerce. The third section highlights the issues of e-commerce in Poland. While section four contains descriptive statistics of selected e-commerce data in Poland from 2010-2020. This analysis is based on data from the Central Statistical Office. Finally, the fifth section contains conclusions from the research presented in this article.

2. TYPES OF LOGISTIC SERVICE IN ELECTRONIC TRADE

The main forms of logistics services in e-commerce include own warehouse, just-in-time, dropshipping and fulfillment. Each of these forms of logistics service has its advantages and disadvantages [20, 21]. The choice of a given type of logistics service depends on many factors. The first basic type of logistics service is having your own warehouse. This model allows for immediate execution of the order, of which the service is at the highest level. Customers are more likely to return for a repeat purchase, and thus, encourage their relatives to take advantage of the store's offer. The main advantages of this form of logistics service include, above all, full control of orders, a high level of customer service, fast delivery, the possibility of personal pickup and the lack of intermediaries. On the other hand, the disadvantages are the freezing of cash in the goods during the storage of goods, limited storage space, and additional costs related to employing new employees [14].

Another type of logistics service for internet enterprises is "just-in-time ". In this form of logistics service, the entrepreneur offers a full range of products with virtually none in stock [15]. This solution does not require a warehouse. Correct integration of the system with the supplier's system allows for the efficient functioning of this type of solution.

The dependence between the entrepreneur and the supplier of the product may cause a delay in the execution of orders, which automatically affects customer satisfaction. The main advantages of this form of logistics service include, primarily, the reduction of storage costs and the possibility of offering a large number of products. Defects are, however, the occurrence of delays in deliveries, lower quality of customer service and possible shortages of products.

Dropshipping [9] is another solution in the logistics process. It consists in transferring from the online store all operations related to the implementation of the order to the supplier, for example, a wholesaler or manufacturer. The main advantages of this form of logistics service include, importantly, low start-up costs and quick order fulfillment, low risk of financial loss, no warehouse, and product flexibility. On the other hand, the main disadvantages are errors in orders and investments in IT integration with a wholesaler, which may result in complications in fiscal settlements and possible returns and customer complaints.

Fulfillment [10] consists in transferring all warehouse operations to another entity. This entity is responsible for all logistics-related processes in the store. In this model, we only make payments for specific operations, so there is no need to hire employees or rent warehouse space. The advantages of this form of logistic service include, particularly, the fact that logistics and sales service belongs to an external company, which allows us to save time that can be spent on other activities related to the company, as well as converting fixed costs into variable costs. In turn, the disadvantages of this form of logistics service include higher own costs for the enterprise than in the case of running its own warehouse and the lack of control over warehouse processes.

Opening an online store is an opportunity for small, medium and large entrepreneurs entering the e-commerce market. A visible factor causing an advantage over the competition is the years of experience gained in the market and the trust of customers [7]. Due to the opinions and comments issued in the network, stores gain new buyers. Customers have increased requirements related to product quality and order service. Therefore, online stores must constantly search for innovative solutions to increase their competitiveness. In some cases, the best solution turns out to be a combination of several logistic customer service models by selecting the appropriate configuration. Following the Pareto principle, 20% of the assortment generates 80% of the turnover. Therefore, the best-selling products should be kept in the company's warehouse to ensure high-quality customer service.

The logistics of an online store should usually be considered in three areas [13]:
- supplies (contact with suppliers),
- internal (storage, picking),
- deliveries (shipment of the ordered goods).

The supply area for online stores and the related logistics, as in the case of traditional stores, is usually less known. The reason for such a state of affairs is the fact that sources of supply are usually an essential element of competitive advantage and entrepreneurs are reluctant to share information on this subject. This is particularly reflected in e-commerce, where the pricing strategy is still the main way of competing. Another area of online store logistics is the implementation of internal logistics processes related mainly to the broadly understood warehouse management (inventory, completion, replenishment, order handling, returns, complaints, reverse logistics). The last of the considered areas of logistics for online stores is the area of delivery, which involves the physical delivery of the purchased goods to the customer. This is a special part of the order handling process related directly to the physical interaction with the customer. The specificity of this area results from the fact that the time of order fulfillment (measured from placing the order to the physical delivery of the ordered

goods) is, in addition to the price of the goods, one of the main determinants of choosing an online store.

3. CHARACTERISTICS OF E-COMMERCE IN POLAND

In 2020, 20 million people aged 16 to 74 made purchases over the internet in Poland. Polish e-commerce is in the process of dynamic development. Online stores and mobile applications are increasing, and the number of people shopping online is constantly growing. The reason for this is the dynamic development of IT services and the possibility of settling many official matters via the internet. The year 2020, which was the beginning of the pandemic, significantly accelerated the development of e-commerce in Poland. Figure 1 shows the increase in the value of the e-commerce market in Poland from 2010-2020. The forecast [20] assumes that the value of the Polish e-commerce market would increase to PLN 80 billion in 2021, PLN 92 billion in 2022, and amount to PLN 104 billion in 2023. In 2024, the market will grow by another PLN 14 billion, to an estimated PLN 118 billion.

It is estimated that in the coming years, the value of electronic commerce in Poland may even double [19]. This is because our everyday life is becoming increasingly dominated by various types of technological solutions. Almost everyone uses a smartphone today. The e-commerce industry is technologically enhanced and better prepared to serve e-customers via mobile carriers.

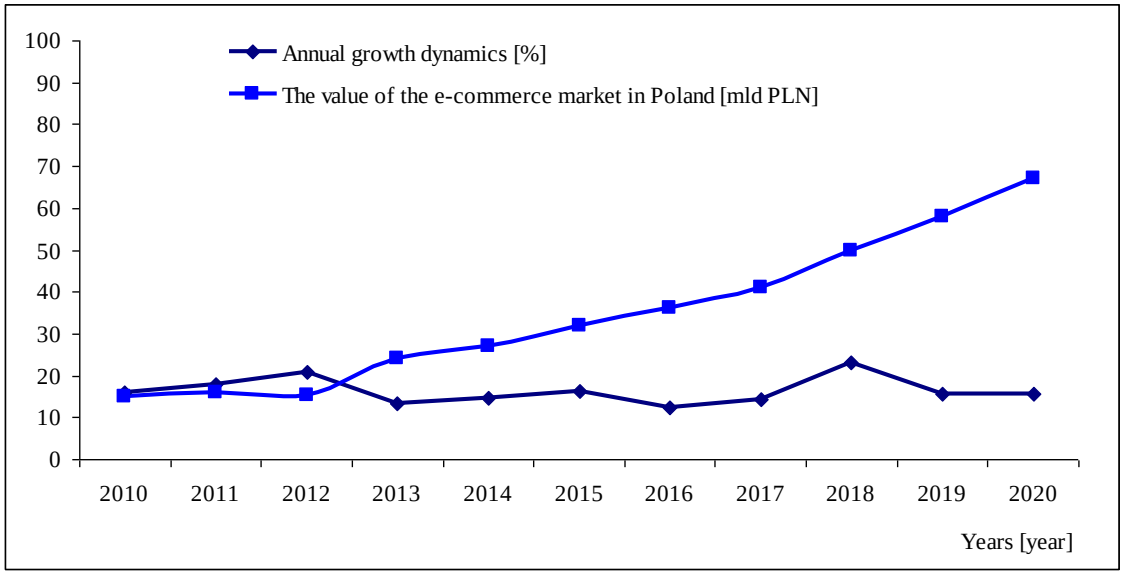


Fig. 1. The e-commerce market in Poland from 2010-2020
Source: Authors' research based on [5]

Several factors influence the rise in the number of online stores, as well as the importance of e-commerce itself. Undoubtedly, the restriction of trade on Sundays prompted entrepreneurs to transfer their activities, at least to some extent, to the internet. In addition, Poles' preferences for convenience contributed to the development of this type of shop. Besides, online stores, in addition to attractive prices (often lower than prices in physical stores), usually offer customers numerous amenities, including free returns, the possibility of quick payment,

efficient operation and search for goods, etc. Figure 2 shows the number of registered online stores in Poland from 2013-2021.

Based on Figure 2, it can be concluded that the number of online stores has been systematically growing since 2013. In 2019, the number of registered online stores amounted to 31 700. In 2020, there were almost 12 000 new online stores; however, their number at the beginning of January 2021 was less than 44 500. According to the forecast, by the end of 2021, the number of online stores will be around 55 000. For years, the number of brick-and-mortar stores in Poland has been systematically declining in favor of the increase in the number of online stores.

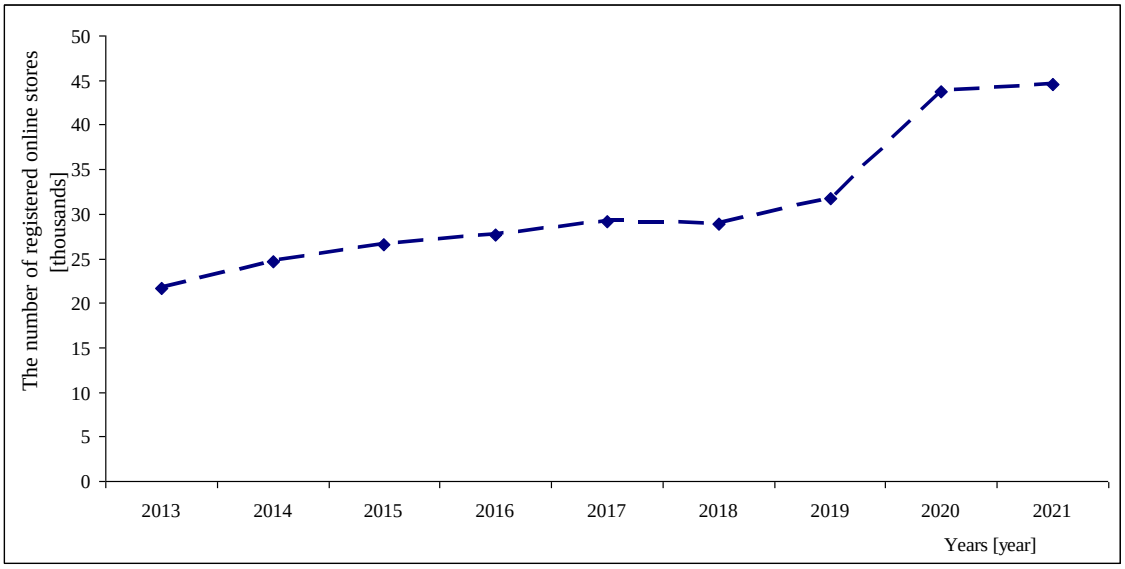


Fig. 2. The number of registered online stores in Poland from 2013-2021 (data from 2021 are for January 2021)
Source: Author' research based on [5]

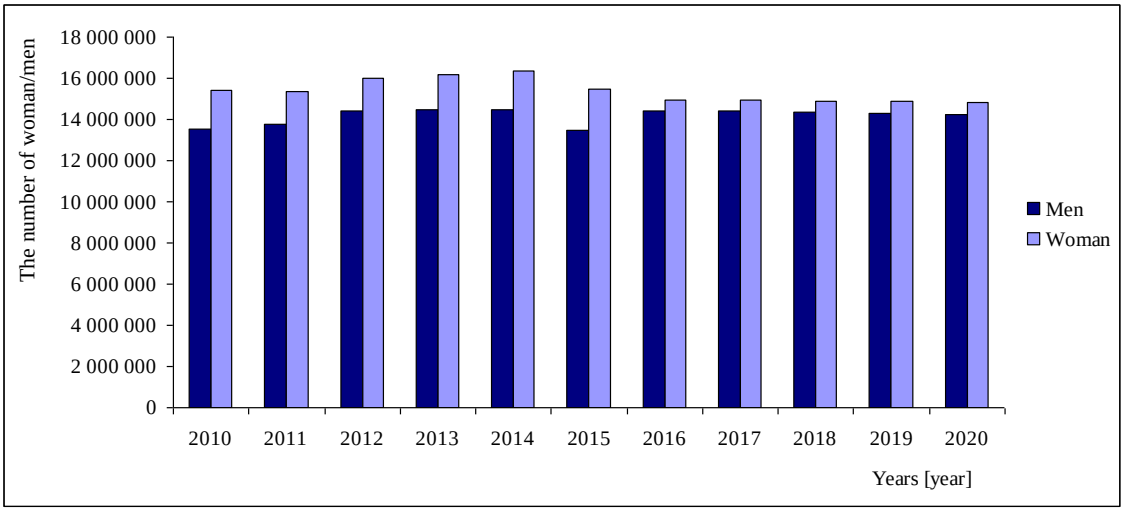
4. ANALYSIS OF E-COMMERCE IN POLAND FROM 2010-2020

This section presents an analysis of data on the e-commerce sector and the purchase of goods and services online in Poland from 2010-2020. The number of people using online stores is systematically growing. The share of people using the internet over these ten years increased from 64.9 to 84.9%, which indicates an increase of 19.5%. In Figure 3a, the number of people using e-commerce broken down by gender is presented. In fact, in each of the analyzed years, women use e-commerce slightly more than men. This difference ranges from 1.86 to 1.94 million. In the years from 2016 to 2020, the difference between these groups was no longer that significant and amounted to about 500 000, but the group of women was still dominant. On the other hand, when analyzing the structure of people ordering goods or services via the internet by education (elementary and junior high, secondary, higher), it can be concluded that the number of people in each group in the analyzed period showed an upward trend (Figure 3b).

The group with the most people shopping on the internet was those with secondary education. However, in the group of people with higher education, there has been a significant increase in interest in online shopping in recent years. Over the entire period of the analysis, this increase rose to 113%.

At a later stage of the work, the number of people ordering goods or services via the internet was analyzed according to the average net income per household (Figure 4a). The analysis distinguishes four groups according to net income per household. These are:
- group 1 - from 1 536 to 2 900 PLN,
- group 2 - from 1 536 to 4 200 PLN,
- group 3 - from 2 323 to 6 450 PLN,
- group 4 - from 3 760 to 6 450 PLN.

a).



b).

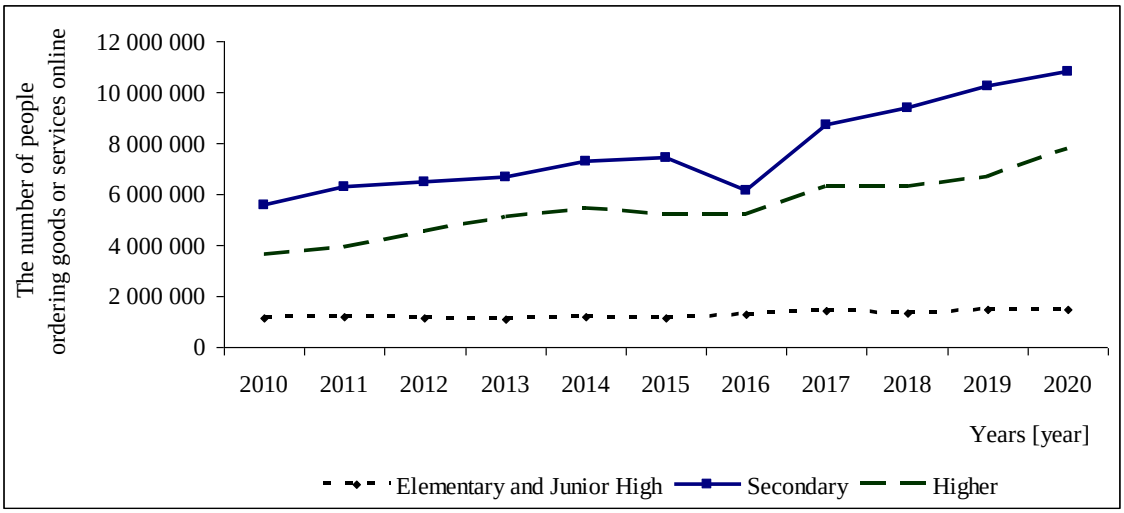
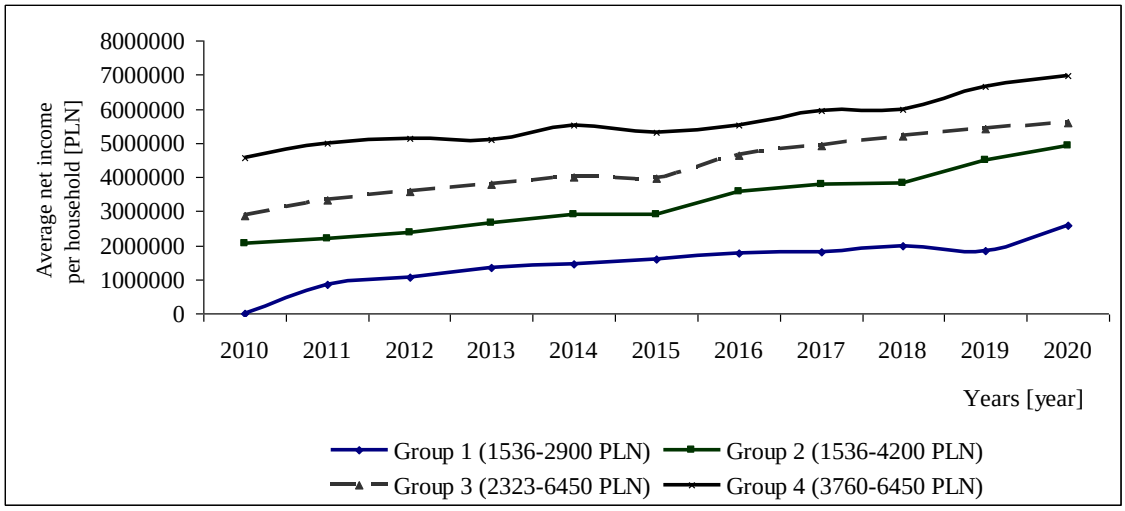


Fig. 3. The number of people using online stores in Poland from 2010-2020: (a). broken down by gender, (b). broken down by level of education
Source: Authors' research based on [5]

It can be noticed that in individual groups, the values overlap in certain ranges. This is due to the annual increase in the minimum wage in Poland. The highest increase of 200% was recorded in group 1, although this group is characterized by the lowest net income. The next group with high growth was group 2 with a result of 139%, then group 3 with an increase of 96% and group 4 with an increase of 53%.

Until 2016, people living in a city with more than 100 000 inhabitants turned out to be the group with the least number of people who shop online (Figure 4b). From 2017 to 2020, the group of people living in rural areas had the highest number of shopping online. Rural residents were also characterized by the highest growth dynamics, given the number of goods ordered via the internet. This increase over the period of ten years was as much as 161%.

a).



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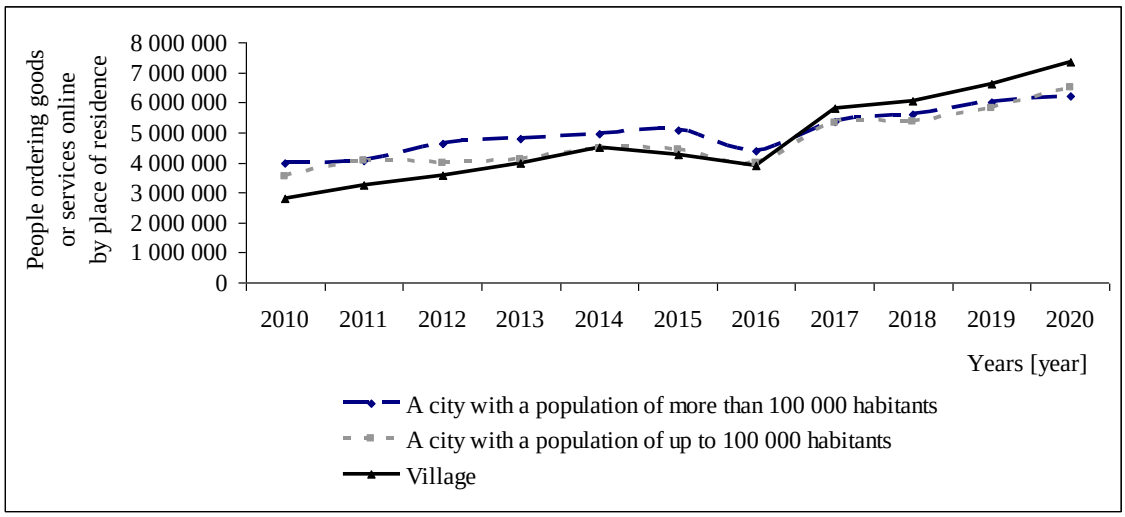


Fig. 4. The number of people using online stores in Poland from 2010-2020:
(a). broken down by the amount of net income per household, (b). by place of residence
Source: Authors' research based on [5]

At a later stage of this work, the frequency of online purchases was analyzed. The following time intervals were adopted in this analysis: 1-2 times a week, 3-5 times a week, 6-10 times a week and more than 10 times a week (Table 1). Due to the availability of data in the Central Statistical Office, the years from 2015 to 2020 were assumed as the period of analysis. Analyzing the data presented in Table 1, it can be concluded that most people use online stores 1-2 times a week and 3-5 times a week. The highest growth dynamics, especially in recent years, can be noticed in the group of people who use online stores more than 10 times a week; however, it is the least numerous group.

In Figure 5a, the number of people using online stores in Poland from 2010-2020 is presented, broken down by the amount allocated to spending on the internet (purchase of goods and services). The following ranges of amounts allocated for purchases were adopted:
- up to 150 PLN,
- from 151 to 450 PLN,
- from 451 to 950 PLN,
- from 951 to 1400 PLN.

Tab. 1
The number of people using online stores from 2015-2020 according to the given frequencies

Year	From 1 to 2 times a week	From 3 to 5 times a week	From 6 to 10 times a week	More than 10 times a week
2015	3 291 212	2 403 289	1 034 859	240 452
2016	3 751 687	3 332 790	1 488 661	414 502
2017	4 142 040	3 567 142	1 501 216	489 935
2018	4 139 469	4 103 454	1 860 860	732 623
2019	4 558 079	4 688 580	2 089 972	737 356
2020	4 365 440	5 174 779	2 414 030	1 569 328

Source: Authors' research based on [5].

The highest dynamics of growth of 98% over the last ten years is characterized by the number of people shopping online in the range of amounts from 151 to 450 PLN. On the other hand, in the group of amounts ranging from 451 to 950 PLN, a significant increase in the number of people by as much as 76% was also recorded. The number of people shopping online with a value of 951 to 1,400 PLN increased by almost a half. This increase is 47%. In turn, the smallest number of people do small shopping on the internet with the amount not exceeding PLN 150. In Figure 5b, the total value of ordered goods and services in particular years is presented.

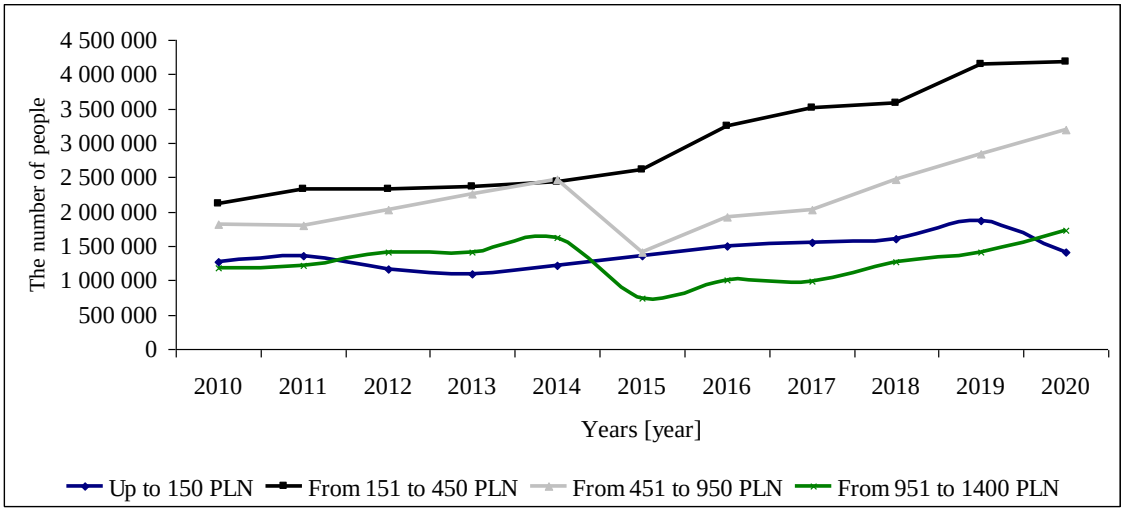
In Table 2, the number of people using online stores in Poland from 2010-2019 is presented, broken down into various categories of purchases, such as:
- food, drinks, stimulants, cosmetics, cleaning agents,
- furniture, vehicles, household appliances, tools, toys, jewelry,
- movies, music,
- books, magazines, newspapers.

Analyzing the data contained in Table 2, it can be concluded that the most purchased goods on the internet come from the category "food, beverages, stimulants, cosmetics, cleaning agents". Purchase of goods in this group increased by 156% over the last nine years. A significant 67% increase in purchases also took place in the "furniture, vehicles, household appliances, tools, toys, jewelry" category. On the one hand, sales of films and music carriers

decreased by 13%. While, on the other hand, a slight increase of only 19% was recorded in the "books, magazines and newspapers" category.

The number of people ordering goods or services via the internet from 2010-2020 according to their professional status is presented in Figure 6. The group of economically active people includes working and unemployed people. The increase in the number of people making purchases over the internet during the period under analysis in this group amounts to 104%. The group of economically inactive people includes those in education and those with the status of a pensioner. The increase in the number of people shopping online in this group amounts to 69%. The data presented in Figure 6 allows concluding that professionally active people are much more likely to shop online than professionally inactive people.

a).



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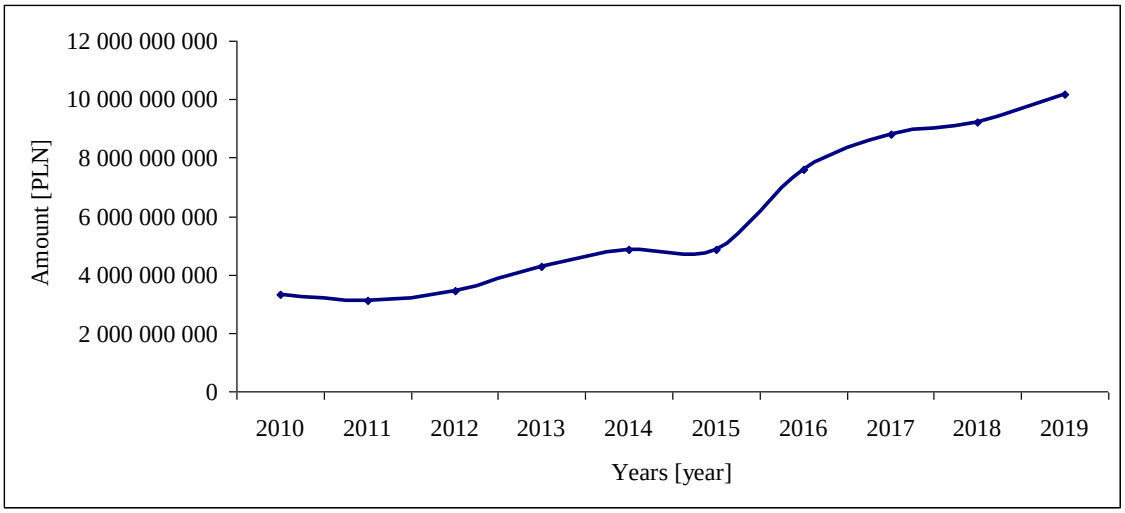

Fig. 5. The number of people using online stores in Poland from 2010-2020:
(a). broken down by the amount allocated to spending on the internet,
(b). total value of ordered goods and services
Source: Authors' research based on [5]

Tab. 2

The number of people using online stores in Poland from 2010-2019 broken down into different categories of purchases

Year	Food, drinks, stimulants, cosmetics, cleaning agents	Furniture, vehicles, household appliances, tools, toys, jewelry	Movies, music	Books, magazines, newspapers
2010	1 624 206	3 632 621	1 652 717	2 587 013
2011	1 630 424	3 536 265	1 370 042	2 538 490
2012	1 983 244	4 177 008	1 536 372	2 523 015
2013	2 357 549	4 295 440	1 598 202	2 679 428
2014	2 510 770	4 381 056	1 225 350	2 414 892
2015	2 057 896	3 665 505	908 738	2 151 668
2016	2 646 109	4 772 426	1 076 078	2 766 497
2017	3 257 019	5 181 464	1 297 123	2 972 396
2018	3 369 136	5 659 067	1 156 237	2 884 236
2019	4 165 667	6 064 099	1 442 589	3 078 320
Growth %	156%	67%	-13%	19%

Source: Authors' research based on [5].

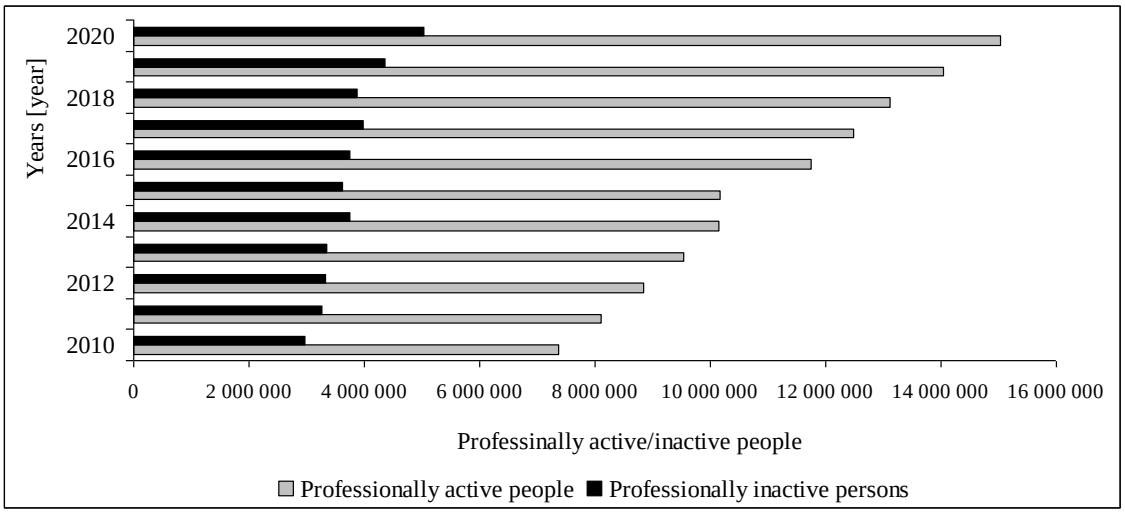

Fig. 6. The number of economically active and inactive people using online stores in Poland from 2010-2020
Source: Authors' research based on [5]

5. THE IMPACT OF E-COMMERCE DEVELOPMENT ON THE TRANSPORT AND LOGISTICS SECTOR

The dynamic development of e-commerce has been the driving force of the logistics and transport market for over ten years. E-commerce has undoubtedly influenced the volume of domestic and cross-border goods transport and the development of transport services. Part of the Transport, Freight Forwarding, Logistics (TFFL) market, represented by companies from

the courier, express and parcel services, is a particular beneficiary of the increase in online sales. The courier, express and parcel services are currently one of the fastest growing markets in Poland, and the number of parcels it handles has increased by over 60% over the last five years [12].

The main task of transport services is not only replenishing stocks but also, primarily, fast delivery to the end customer and the development of the last mile delivery. The last mile delivery is crucial for noise levels and air quality in cities where transport is the second major source of pollution. E-commerce deliveries to consumers account for only 0.5% of total traffic in urban areas. Physical retailing generates 11% of such traffic. Deliveries of purchases in e-commerce eliminate the need for consumers to travel to stores and help reduce traffic in cities by 4 to 9 times [8]. Already in Europe, e-commerce has on average, less negative environmental impact than non-food physical retail, which generates 1.5 to 2.9 times more CO_2 than e-commerce, and increasingly, companies base their supplies on electric vehicles, which are locally completely emission-free and quiet; this is important, especially in most crowded cities [8].

In addition, in recent years, we have been observing investments in new technologies in forwarding and transport companies, such as operating in the SaaS (Software as a Service) system and the growing frequent use of ETA (Estimated Time of Arrival) systems, that is, precise planning of transport travel time to the warehouse, hub and the client. This is because, for e-customers, information about the time of delivery is extremely important not only when choosing an e-store where people will shop, but also when choosing a product. Customers, apart from the price criterion, usually choose the product that will reach them faster [2].

The analysis of "Road Freight Transportation Market in Europe 2020-2024" [17] indicates that the road freight market in Europe is expected to grow to USD 58.43 billion by 2025 and will be largely driven by the dynamically developing e-commerce industry, which is expected to affect truck and bus transport that is an integral part of intermodal transport.

China's opening to the European markets is primarily a breakthrough in the development of container and rail transport, hence, the need to make significant infrastructure investments. The "Silk Road" initiative provides for the transport of goods from China to Poland, and then their distribution by road transport throughout Europe, which is a great opportunity for Polish logistics for further development [12].

A significant number of carriers are aware of the recent increase in the importance of e-commerce and are developing their company in this direction. At the time when economies were defrosted after the lockdown, many transport companies invested in semi-trailers to take courier orders. One of the conditions for carrying out freight in the courier industry is the availability of semi-trailers with a fixed structure (so-called boxes). Instead of the door, a roller shutter is installed, which makes it possible to open and close the car without having to put the car off the ramp.

6. CONCLUSION

Modern society is characterized by enormous technological progress, widespread consumerism, and an increase in the mobility of the population. Civilization changes occurring mainly in the technical area have caused changes in the way people function and the perception of the surrounding reality. The expansion of the media has led to significant social, economic, political and cultural transformations, pointing to the decreased importance attached to capital and material goods, with a simultaneous increase in the importance of intangible factors, such

as knowledge and information. E-commerce has been a dynamically developing area for several years, arousing the interest of a wide group of marketers. E-commerce includes a variety of methods that use means and electronic devices such as mobile and landline phones, the internet and television to conclude a commercial transaction. This article presents the analysis of the development of e-commerce in Poland from 2010-2020. The analysis covers such features of online sales as the total number of people ordering goods and services on the internet, broken down by gender, education, income, place of residence, professional status and category of ordered products, frequency of purchases, and the total value of ordered goods in the e-commerce sector. The analysis showed that in the analyzed period, the number of people ordering goods and services online doubled. The dynamics of the growth of e-commerce are enormous; this market will develop since there are no indications that anything can stop this trend.

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