

LOGISTICS MANAGEMENT UNDER THE INFLUENCE OF THE COVID-19 PANDEMIC: ECONOMIC, SOCIETAL AND TECHNICAL IMPACT


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Highlight

The paper discusses the miscellaneous impact of the COVID-19 pandemic on logistics management in the carrier, express and parcel services (CEP) market, while analysing the economic, societal, and technical view. At the same time, its results present the solution for the modernisation of the CEP market in Slovakia.

Abstract

The paper aims to analyse the current market in the carrier, express and parcel services market in the EU and Slovakia from the economic, societal, and technical view. It is divided into an introduction, an analysis of the current state in the EU and Slovakia, and a discussion and conclusions. The paper also includes related statistical data presented in the form of graphs. As a result, the development of the CEP market is possible only with a focus on improving the efficiency of delivery, motorisation, unification, expanding the network of collection points and improving the customer experience.

Keywords

logistics management, Slovak Post, carriers, parcels, pandemic, COVID-19.

Introduction

Since early human civilisations, people have needed to transport objects from one place to another. Growth in economic performance and industrial specialisation led to more extensive transport routes. Better use of technology, with advances in science, has allowed the expansion of transport to more places much faster with less effort. The logistics industry connects the economic world, and this connection evolves in response to the changing needs of the market. The emergence of the carrier, express and parcel services market (CEP) is an example of development in the logistics industry. The changing needs of customers and the dynamics of the global economy have forced the logistics market to respond to changes and create new opportunities. One of the market needs was the demand for a faster, better, and safer way to transport industrial goods to facilitate industrial production and consumer goods to satisfy the burning desires of customers around the world [1].

Postal services belong to the services that are considered to have economic impact and are particularly important for the society, whilst contributing to the development of the single EU postal market [2]. Postal services play a key role for EU citizens and businesses in the single market. The postal sector (which includes express services) employs around 1.8 million people in the EU and is an essential source of employment in the EU. The postal and delivery services sector generates annual revenues of 79 billion EUR. Technological developments have disrupted the postal industry, and digital transformation has hit it in two places. Firstly, digital communication tools have replaced traditional communication tools, such as the paper communication, as well as the demand for sending the letters. Secondly, since the number of online shopping possibilities have arisen, the demand for parcels has also increased. These opposing pressures bring challenges for all subjects of the postal sector. However, the postal sector faces the challenges resulting from a lower demand for sending the letters, which is

supported mainly by the continuous growth in the e-commerce industry. On the other hand, this trend supports new opportunities. As a result, the postal sector of the EU is changing, mainly due to the rise in electronic communication. The parcel segment of the postal market is showing a different state, whilst more and more competitors enter the market of universal service providers (USPs). Such phenomena results in many changes in USPs business models [3,4].

Methods

The paper deals with the miscellaneous impact of the COVID-19 pandemic on logistics management in the carrier, express and parcel services (CEP) market. The paper aims to analyse the current market in the carrier, express and parcel services market in the EU and Slovakia from the economic, societal, and technical view. The main motive for selecting the paper's topic was the success of our previous research from the field of economics and management [5,6] and research conducted by various authors who have dealt with the COVID-19 oriented topic [7,8]. The paper is based on existing European Commission research and data from the Slovak Post. The paper's aim is divided into an introduction, methodology, analysis of the current state in the EU and Slovakia, results, and conclusion. The scientific methods used to analyse and interpret the data included analysis, synthesis, generalisation, induction, and deduction. Statistics were used to determine the changes in variables over time (presented in Figures 1-3), while axe X represents years and axe Y represents percentage change. To demonstrate the importance and significance of the observed changes, the regression analysis was employed. The primary purpose of regression analysis is to examine and characterize the interrelationships between variables. Its task is to find a mathematical function, also called a regression or regression model, that best describes the course of dependence between variables, while we drew inspiration from research that statistically evaluated the effects of the COVID-19 pandemic [9–11]. The results are graphically visualised and are also described in text form.

Results and discussion

The postal industry, as well as other industries, is highly affected by the technological progress. Digitisation influences the postal sector in decline of paper communication and its replacing by electronic communication (e-substitution), and even more, the boom of online shopping causing the rise of the parcel demand. Electronic substitution has occurred by replacing traditional letter mail with means of electronic communication. For example, banks started sending monthly statements via online banking instead of paper copies by post. The drop in demand for letter mail is a consequence of this trend. Historically, the largest senders of letter mail have been public institutions and the business sector for mutual communication between them and citizens. The possibility for the business sector and citizens to communicate with government institutions electronically has become commonplace in many member states. In most Member States, official communication with public authorities is done by electronic and digital means. However, the level of digitisation in this field varies amongst individual Member States. The volumes of essential leaf products in Denmark for 2010-2017 decreased by 93%. The other Member States have undergone varying degrees of electronic substitution and decline in letter mail volumes in recent years. Its volume in the EU decreased on average by 3% per year. The exception is Germany, where letter mail is one of the main communication channels between citizens, the government, and the business sector due to the issue of digital security [12,13].

Digital innovation has opened possibilities for consumers to purchase online. The e-commerce segment in Europe currently represents 344 billion EUR, while in 2018, approximately 69% of European Internet users shopped online. The B2C e-commerce sector is growing in the EU due to higher and more frequent online shopping by consumers. In Europe, e-commerce affects the growth of volumes of parcels and express shipments nationally and cross-border. Between 2013 and 2017, the number of parcels and express shipments grew by 10% per year. The growth of shipments in cross-border traffic was faster than at the national level. In 2016, the value of international trade in shipments amounted to more than 16 billion EUR and 720 million of shipments. The growth of sending cross-border packages is also expected, while it represents the growth from 11% to 18% [14]. The postal market in Slovakia has been fully liberalised since 2012. Slovak Post provides postal services following the granted Postal License and Universal Service (US) Quality Requirements throughout Slovakia through 1 618 branches, including 1 504 post offices (1 342 delivery, 162 delivery), 35 post office partners, 61 postal centres, 14 contractual expenses and five mobile post offices. Out of the total number of 2 928 municipalities in Slovakia, one of the mentioned forms of the Slovak Post branches is operated in 1 449 municipalities [15]. Slovak Post is owned by the state and currently is one of the largest employers in Slovakia (12 700 employees). Cooperation with the state is critical for Slovak Post. In addition to the universal postal service, it includes the payment of benefits and pensions, the provision of e-Government services, the delivery of official documents in paper to

addressees who do not have an activated electronic mailbox (CADLUD), or the distribution of e-stamps and printing. For the future, the management of Slovak Post has set a new goal – to become the leader in the package delivery market. As part of the recovery measures from 2017 to 2019, the post office increased the prices of postal services four times, leading to a decrease in revenues due to the decline in shipments. However, it still had to operate branches that would not function without the obligation to provide US, because they do not bring profit. In 2019, it prepared a plan to optimise the postal network in 150 locations while complying with the US postal license and quality requirements. The first stage was implemented, in which 29 post offices were cancelled. Still, the Ministry of Transport and Construction of the Slovak Republic suspended optimisation of 120 branches. In the audited period, the Slovak Post recorded fluctuating economic results. In 2017, the economy ended with a net profit of 0.34 million EUR, but in 2018 with a net loss of 4.64 million EUR, the year 2019 already with a net profit of 1.39 million EUR. The reason was persistent problems related to replacing traditional postal services and increasing the competitive environment [2].

Slovak Post, like other traditional postal operators in Europe, has faced an unprecedented change in the market environment in recent years, which is fundamentally pushing for a change in the business model of operation. Interest in letter services is decreasing globally from year to year due to the massive boom in electrification [16].

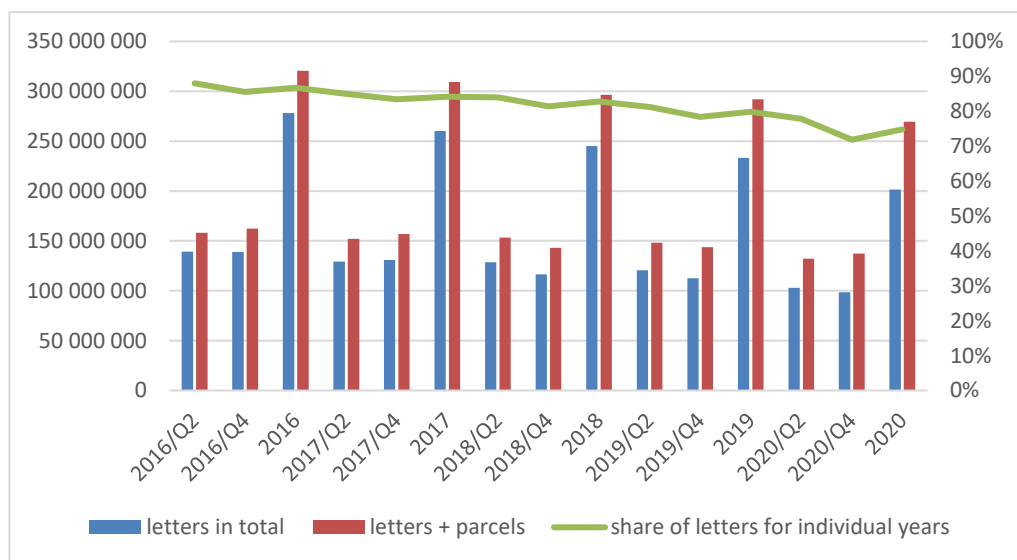


Figure 1. The number of mail items submitted in Slovakia from 2016 to 2020. Source: [17].

Decades of slow declines in letter delivery volumes (from 400 million to 100 million per year over the past 40 years) caused by the development of electronic means of communication have been exacerbated by the COVID-19 pandemic in the past two years. This has forced many post office clients to accelerate electrification and abolish physical communication with clients through traditional postal letter shipments. For Slovak Post, this means, of course, further shortfalls in revenue. This is a clear challenge for finding new approaches to delivery [16,18]. In other years, the world is experiencing an unprecedented increase in the e-commerce segment, which was also accelerated by the COVID-19 pandemic in the last two years. If we compare the volumes of parcels over the last 40 years, as with letter mail, we find that from the beginning of the eighties until 2016, it was in the Slovak Post's network the same volume of parcel shipments every year, which ranged between 6 and 7 million pieces [17].

Since 2016, the number of parcels had accelerated from 7 million to 16 million parcel shipments (estimated in 2021), when the annual growth rate, especially in the last two years, exceeded 23%. In 2021, the year-on-year growth rate for the first nine months was 21%. The dynamics of the development of this segment in Slovakia and at Slovak Post correlate with global developments and trends [17].

Based on the above facts, it could be assumed that the volume of parcels increased during the COVID-19 pandemic. In addition, we analysed the results published on the website Transport.sk [19] and results of COVID-19 pandemic influence analysis, it could be concluded that the shortfalls in letter shipments are being replaced by growth in the parcel segment [20,21]. The empty circles in Figure 3 represent a prediction; the difference

between an empty circle and reality is the impact of the pandemic. For example, in Q4/2020, there was a 5.09% difference between reality and prediction. Unfortunately, it is more complicated than that. Apart from the economic side of the matter, which is fundamentally against the Slovak Post, there is a problem in the very essence of the postal service. However, this is not only a problem for Slovak Post but also for postal companies worldwide.

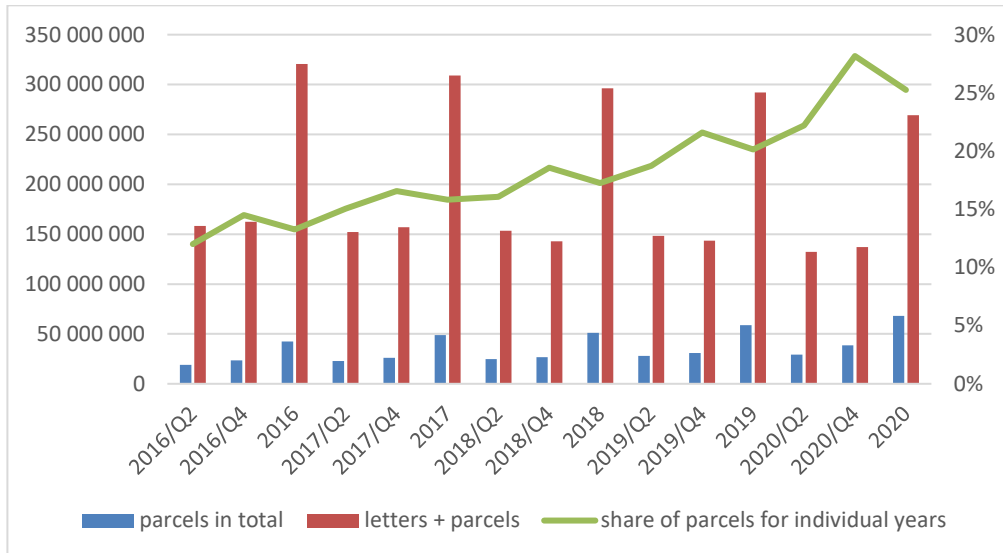


Figure 2. The number of e-commerce packages submitted in Slovakia from 2016 to 2020. Source: [17].

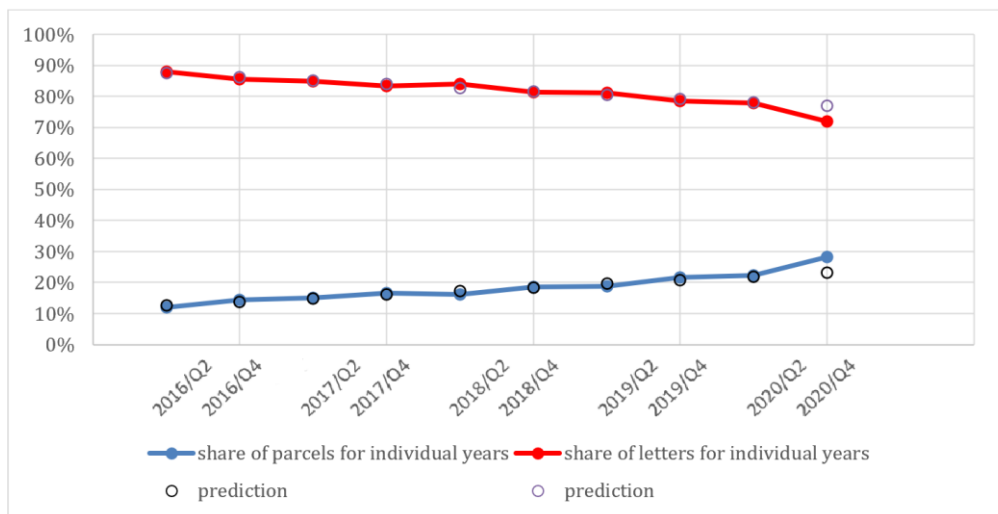


Figure 3. The number of submitted packages in Slovakia from 2016 to 2020. Source: [17].

The regression of the dependence of the proportion of letters and/or parcels over time is shown in Table 1. The last two values, which were reached during the COVID-19 pandemic, were omitted from the regression model. And so, the model is created from eight values of the pre-pandemic period, while it is used to predict values during the pandemic (Table 2). These predicted values are compared with reality, and the difference is calculated as the impact of the pandemic. The primary aim of Slovak Post was the letter delivery by means of more than 1 400 post offices. Sheet sorting lines are set to capacities that have not been used for many years. At the same time, with the annual drop in letter shipments, Slovak Post recorded growth in the number of letter items that are unsuitable for machine processing and must therefore be processed manually, which, of course, increases labour and human capital costs.

On the other hand, the parcel sorting lines Slovak Post uses (in Bratislava, Žilina, Zvolen and Košice) are technologically behind their zenith, and their capacity is insufficient. The last mile carrier shapes customer satisfaction. The problem with parcel delivery is the delivery network, which is separated from the letter mail

network. Parcel shipments travel after sorting to the so-called any of the nearly seventy regional nodes. Carriers then take them directly to the addressee, while part goes now to the post office (if the package is addressed to the post office). The Slovak Post, therefore, has two separate worlds: in one, which is less busy from year to year, there is a network of mail carriers who bring letters to the addressees every day, and in addition, the post office also has a network of increasingly busy carrier delivery, in which up to 95% work external carriers. As a result, a mail carrier with a letter shipment and a carrier with a parcel shipment can come to the same address on the same day. Of course, Slovak Post does not consider this method effective and is already starting to change it. However, another crucial problem that Slovak Post faces is the quality of the delivery network, especially the range of options for receiving parcels by the addressee and the quality of the customer experience from the delivery process itself.

Currently, among the 4 480 mail carriers, only 554 are motorised. These are usually rural areas where the mail carrier has a motor vehicle at his disposal. By streamlining and re-allocating cars from administrative employees, the Slovak Post has motorised more than 50 districts and plans to increase their number to 570. Motorised districts represent a potential for at least partial unification of the delivery of parcels on the last mile, thus saving financial resources. Motorisation also brings savings because the width of the serviced area is reassessed with each new motorisation. The districts are getting bigger; for example, three pedestrian districts with three mail carriers will become two motorised districts with two mail carriers. Considering the boom in e-commerce in recent years and long-term global trends that will direct buyers more and more to the Internet, it is also necessary for Slovak Post to build a network of delivery points across Slovakia that will provide customers with convenient options for picking up parcels.

Slovak Post has already built a primary network of 144 parcel boxes, which it plans to expand by nearly three hundred more in the coming years. However, it does not intend to go into its extensive network of parcel boxes as a competitor, because, according to its experience, it would not be profitable. It will focus on building boxes with the most significant potential based on the population's purchasing power, population concentration, and the history of the development of parcel delivery volumes. Also, the new generation of boxes it plans to procure should bring a higher standard of user comfort, simplified control and, finally, a much lower purchase price. A separate development area is the concept of low-capacity 10 to 12 mailboxes developed in cooperation with selected partners. The goal is to install this type of box in cooperation with the local government, especially in municipalities where Slovak Post never had a branch or has cancelled it. The boxes should be used to pick up undelivered express items and notify registered and undelivered items of the universal service (except for official items) via PIN. However, this requires an amendment to the legislation. In this way, the main disadvantage of the absence of a brick-and-mortar branch in the village could be eliminated, and thus the need to pick up an undelivered registered parcel at the successor post office in the next village.

The so-called package to the address is probably the most frustrating carrier delivery. The customer does not know precisely when the carrier will call during the day, so it is more complicated to collect the shipment at the address. Slovak Post is developing a new customer environment with its partners, which should dramatically improve this experience. Through GPS localisation and dynamic tracking, the application should provide clients with more accurate information about the delivery time of the shipment, including the location of their carrier and the remaining time until delivery, which will be updated based on the development of the delivery situation. The situation was like parcel delivery and food delivery during the COVID-19 pandemic. In 2022, research to determine the use of online food shopping and the reason for consumers' food purchases through a shopping portal was conducted in Slovakia. The survey found out that as many as 47.9% of respondents who purchase food through online shopping portals only started to do so with the emergence of the COVID-19 pandemic [17,22].

For the 46.4% of respondents who were already buying food online before the pandemic, the frequency of purchases increased with the emergence of the pandemic. 47.8% of respondents from the category of regular shoppers, who placed orders before the onset of the COVID-19 pandemic, assessed that their shopping frequency remained the same. Food supply, restaurants and prices for food and services have increased. Respondents reported that they could not physically go directly to the restaurant, were not at risk of contracting COVID-19, and were in quarantine as reasons why they started placing their orders after the start of the COVID-19 pandemic. Conversely, using plastic packaging for food delivery is also why respondents do not purchase food through shopping portals [19,23]. "Consumers are aware that every effort should be made to prevent the world from drowning in plastic waste. Society is, in general, open to the use of bioplastics produced from the second-

generation resource if second-generation bioplastics contribute to environmental and pollution reduction targets" [21].

Table 1. The regression of the dependence of the proportion of letters and/or parcels over time. *Source: [9–11,17].*

Strengths	df	SS	MS	F	Significance F
Regression	1	0.0058	0.0058	87.1495	8.5614E-05
Residual	6	0.0004	6.6125E-05		
Total	7	0.0062			
Intercept		Coefficients	Standard Error	t Stat	P-value
Time		0.1136	0.0063	17.9293	1.9357E-06
Intercept		0.0117	0.0013	9.3354	8.5614E-05

Table 2. Regression statistics (summary output). *Source: [9, 10, 11, 18]*

Regression statistics	
Multiple R	0.9673
R Square	0.9356
Adjusted R Square	0.9249
Standard Error	0.0081
Observations	8

Impact

The necessity of analysing the CEP market after the COVID-19 pandemic is nowadays highlighted by the changes that have occurred after 2019. Such changes have affected every partial market from the economic, societal, and technical view. It is essential to realise that such analysis is crucial for the Slovak Post and its position in Slovakia and for any other postal company. We aimed to compare the situation in Slovakia and the EU and, at the same time, present relevant numerical indicators, and graphs. To conclude, it is not possible to react flexibly to the changes caused by the COVID-19 pandemic, and that is why the CEP market will be able to recover only after a significant modernisation. Otherwise, the e-commerce market with alternative carriers would change the CEP market once and forever. The facts mentioned above are clearly described and analysed precisely in this paper.

Conclusions

Continuous growth in global parcel volume is expected to resume by 2026, reaching approximately 262 billion parcels. In that case, the transport volume will increase almost sevenfold in 13 years. Europe's express and small package market is estimated to reach more than 77 billion EUR in expected revenue in 2020. Some markets are much more progressive compared to countries. In 2019, the German CEP market was the largest in Europe and processed almost three billion parcels. This parcel-handling volume made the German CEP market five times larger than the second largest, the Italian CEP market [1].

Slovak Post recorded a substantial decrease in revenues, due to the COVID-19 pandemic, which fell by almost 11 million EUR to 339.4 million EUR due to restrictions on the international exchange of goods, which led to a decrease in the number of incoming shipments, which caused a reduction in revenues from international postal traffic by seven million EUR. Revenues from universal postal services and contractual letter shipments in domestic traffic decreased by 3.4 million EUR and revenues from postal payments decreased by two million EUR. At the same time, the loss of services for the payment of pensions and state social benefits provided for the state in the amount of more than six million EUR contributed to the deepening of the loss. On the other hand, the epidemiological situation caused an increased demand from the population for the delivery of express packages for contractual partners (e-shops) during restrictions on the operation of brick-and-mortar stores, which positively affected Slovak Post's revenues from express services. However, these could not fully compensate for the already-mentioned revenue shortfalls [15]. Slovak Post's sales fell by around 10 million EUR mainly due to the second wave of the COVID-19 pandemic. The most affected in recent months were revenues from international postal traffic, which decreased by six million EUR. Payments for universal services also fell by

four million EUR. The increased number of sick employees due to COVID-19 affects the operation of post offices and logistics. This was reflected in restrictions on opening hours for the public as well as delivery times. In the most critical situations, when the entire post office team goes down at once, and it is impossible to replace it immediately, the post offices must be closed for the necessary time [24].

Conflict of interest

There are no conflicts to declare.

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