

Anna SMOK\*

## THE IMPACT OF THE PANDEMIC ON THE DEVELOPMENT OF PACKAGING VENDING MACHINES IN POLAND

**Keywords:** *parcel machines, courier deliveries, last mile, COVID-19 pandemic*

The COVID-19 pandemic has affected many aspects of human life. In the described case, the impact of the pandemic on the last mile will be discussed in more detail. At the very beginning, the topic of the last mile was introduced, as well as how it relates to parcel machines. Then, in the second point, the changes that took place during the pandemic in the online shopping market were presented. In the third point, the issue of parcel machines was raised, where the demand for courier services in Poland was described based on the UKE report and the demand for parcel machines was discussed. The fourth point presents the detected problems related to the emerging parcel lockers as well as ways to solve them and measures for the machines to stay on the market. The aim of the article is to present the impact of the pandemic on the development of the parcel machine service in Poland and to present the proposed directions for further development.

### 1. INTRODUCTION

Nowadays, we live in a dynamically changing world. People's expectations of courier shipments are getting higher and higher. It is no longer enough to deliver the package intact. Today everyone has different needs: for some, the price will be necessary; for others, the speed of delivery will be crucial; and for others, the method of delivery and flexibility of collection are essential apart from the price, time, and security factors. Therefore, parcel machines, commonly known as parcel lockers, were created to facilitate parcel collection for the customer at the right moment. Over the last two years, the demand for courier services has increased, which is related to the outbreak of the COVID-19 pandemic. Due to the easy transmission of the virus by droplets, the consumers were forced to limit contacts to a minimum. This was related to the established legal provisions, including further restrictions on the number of people in stores and people's internal fears. Most of society was concerned about their health, which resulted in partial

---

\* Wroclaw University of Science and Technology, Faculty of Mechanical Engineering, Poland

changes in consumers' shopping habits. That, in turn, affected all branches, but logistics faced the biggest challenge. Broken logistic chains and the increase in demand for last-mile services have forced many changes, including increased flexibility throughout entire supply chains.

The article aims to present the impact of the COVID-19 pandemic on the last mile service, using parcel machines as an example, and to propose future solutions that combine the functionality of parcel machines with their aesthetics.

The second point will discuss the topic of last-mile service. What it is, its concerns, and how the pandemic affected its development.

The third point describes courier services and the service of parcel lockers as well as the change in the market related to the demand for parcel machines during the pandemic.

The fourth point presents the problems related to the increasing number of parcel lockers on the market and ways to meet the requirements of the environment.

The fifth section summarizes the topic.

## 2. LAST MILE SERVICE

The concept of the last mile can be described as "a set of related organizational activities in the spheres of transport and logistics, concerning the implementation of deliveries on the very last stretch of the road and, more precisely, the delivery of shipments to end customers" [1]. It focuses on the last stage of delivery, which is the most expensive and problematic area in the entire supply chain. This process has many problems, such as home delivery or DTD (door-to-door) delivery, because they involve additional costs or pollution.[2]

Last mile service includes not only a courier, parcel, and customer but also facilities enabling direct collection or sending of the shipment [3,4]. This can be done via parcel machines, stationary post offices, and authorized facilities.

The concept of a parcel machine is understood as a device resembling a rack with shelves on which parcels can be collected or sent. In Poland, the leader among parcel machines is InPost, with its network of parcel machines. For this reason, the term parcel machine is often used interchangeably with the term parcel locker, a trademark of InPost. The reason for this can be found in the fact that this brand pioneered parcel machines on the Polish market. In addition to the possibility of collecting parcels from InPost parcel machines, they can also be sent or redirected to stores cooperating with the company as well as to parcel machines belonging to other companies, such as DHL or Poczta Polska. Parcel machines can be found in Biedronka and Carrefour outlets and supermarkets, in Żabka stores, ORLEN gas stations, and RUCH kiosks. [4]

Recently, customers have been more willing to choose courier services, pick up/drop off at points, or parcel lockers, which is closely related to the increasing number of Internet users who are more and more willing to make purchases in a virtual environment. In 2020, over 60% of online shoppers chose delivery to parcel machines [4]; therefore,

it can be concluded that the pandemic contributed to an increase in the demand for courier services and the number of parcel pick-up/drop-off points.

The analysis of E-commerce reports in Poland from 2019-2022 made in cooperation with Gemius and the Chamber of Electronic Commerce, allowed us to conclude that during the COVID-19 pandemic, online customers' behavior changed. When we compare the number of Internet customers in relation to the number of people using the Internet, we can see a significant increase in the number of people making online purchases (Figure 1). The method of collecting the parcel has also changed. Before 2020, home delivery by courier was the most popular choice, while after 2020, collection at a parcel machine became the most popular form (Figure 1).[5]

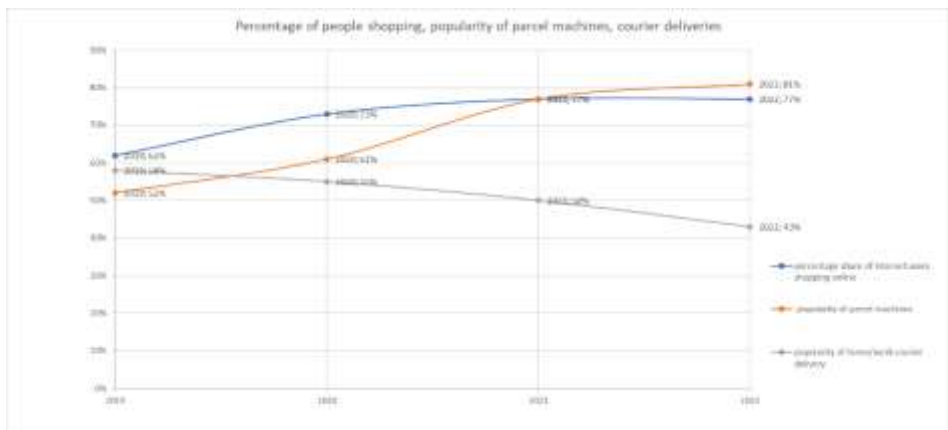


Figure 1 Number of online shoppers, popularity of vending machines parcels, deliveries [5]

In response to the question about what motivates them to shop online, Internet customers most frequently mentioned 24/7 availability, the lack of need to travel directly to the store, and unlimited selection time. As can be seen in the radar chart below (Figure 2), customers shopping online indicated these factors more often as necessary in 2020 than in other years. Knowing the circumstances related to the pandemic, the difficulties in doing stationery shopping, and concerns about contacts with other people, it can be concluded that there is a link between the motivators for online shopping and the pandemic.

Analyzing the number of Internet users, one can notice a systematic increase in the number of people using it, and currently, in 2022, there will be about 30 million users. Compared with the number of people using the online environment to shop, one can see uneven changes. In 2020, the number of customers increased by about 10% compared to 2019, while in 2022, their percentage share did not change and the market was saturated. One can see similarities by analyzing these differences and considering the context of the pandemic. The graph shows a significant increase

in the percentage of online shoppers in 2020 compared to the previous year. In 2021, people got used to the prevailing situation, and therefore there was only a slight increase in the percentage. In 2022, all restrictions on in-store shopping were lifted, and the number of online customers remained constant.

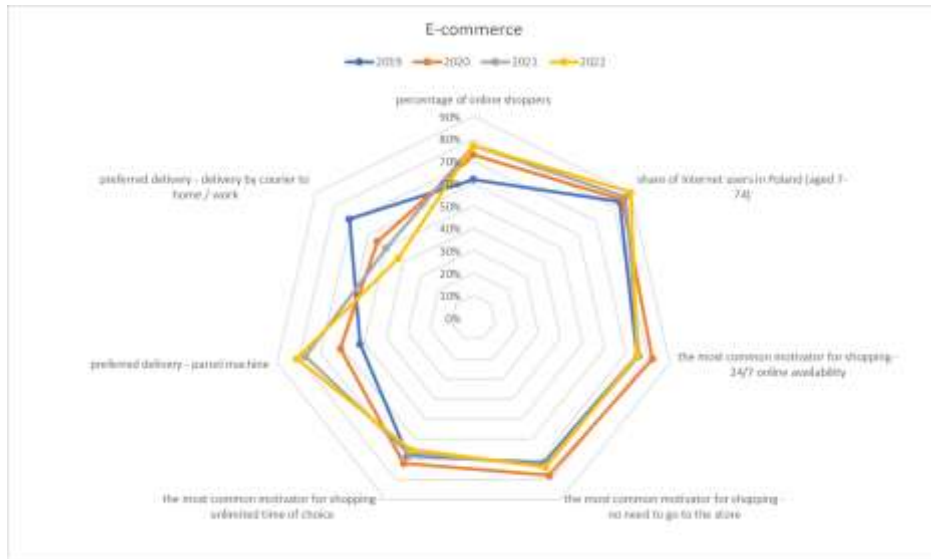


Figure 2 Behaviors in the e-commerce market [5]

Another dependence that can be seen is the increase in interest in delivery to a parcel locker instead of direct delivery to home or work by a courier. As seen in the chart (Figure 2), in 2020, the interest in courier services decreased compared to the previous year in favor of parcel machines. In the following years, the popularity of parcel machines maintained an upward trend.

Thus, analyzing the presented chart in the context of the COVID-19 pandemic, it can be seen that 2020 was a year different from the others. In almost all of the analyzed criteria, 2020 differed from the forecasts that assumed maintaining the level from previous years or stable growth. For the most common motivator for shopping, it can be noticed that the results obtained this year were different from the other analyzed years. The increase can also be seen in the percentage of online shoppers.

The COVID-19 pandemic caused the need to introduce various types of innovations in the field of logistics services, in particular for individual consumers. These innovations concerned not only the means of last-mile delivery but also the product packaging system and return processes. These innovations resulted from the development work of producers and logistics operators and were intended to improve

the quality of consumer service. These solutions would probably appear in the coming years regardless of the pandemic situation in the world, but the COVID-19 pandemic has undoubtedly accelerated these processes.

When analyzing the research conducted for Publicis Groupe by Starcom and presented in the article "Covid skills" - what we have learned and what will stay with us for longer - the results of the HX Stud [6], one can refer to the chart showing "Online grocery shopping, food delivery, shopping". This chart compares three periods (the pandemic's beginning, the present, and the future) by online shopping demand (groceries, food delivery, and stockpiling). Respondents answered questions about the extent to which they made online purchases in each period. According to the graph "Online grocery shopping, food delivery, shopping", there is an increase in demand for services related to delivering various goods to individual customers. It can also be seen that almost 20% of respondents order food with home delivery, and less than 10% still intend to shop for groceries online.[6]

The second graph, "Non-food purchases, medicines, and supplements online", was divided into three periods; in this case, two shopping products were distinguished (non-food and medicines, supplements). The analysis of the charts shows that about 40% of people continue to make non-grocery purchases, and about 5% made this type of purchase more often at the beginning of the pandemic than now. [6]

As it turns out, the customer must choose the place and time of delivery or collection. The advantage of parcel lockers is the ability to pick up a parcel at any time, which is more difficult in the case of courier deliveries because of the necessity to make an appointment in advance or wait for the delivery within a predetermined hourly interval. However, this is only sometimes successful; in such cases, it ends with leaving notice and having to collect the parcel in person. Another advantage of ordering parcels through parcel machines is how you can pick up a previously placed parcel. It is not complicated; one only needs to enter an individual code generated only for this specific shipment and then take it out of the parcel machine slot and close it. The machine automatically opens the box after reading the code to facilitate the search for the parcel's location.

### 3. COURIER SERVICES AND PARCEL LOCKER SERVICE

#### 3.1. THE DEMAND FOR COURIER SHIPMENTS IN THE ERA OF THE COVID-19 PANDEMIC

During the COVID-19 pandemic, the demand for courier services increased, in part because of the e-commerce market. UKE (Office of Electronic Communications) presented trends of change in *the Report on the state of the postal market in 2020*. In contrast, a sharp increase was recorded in 2020. This was mainly due to the virus's global spread, which caused the declaration of a pandemic, as well as a number of restrictions and limitations on consumer movement. Comparing the trend line

of courier shipments to letter mail shows that the latter has a declining market share. [7]

This is related to the convenience and ease of posting and delivery and the ability to track the package using a website where the package status and expected delivery date can be checked. These types of parcels are usually delivered in a shorter time compared to traditional postal services [4].

### 3.2. THE DEMAND FOR PARCEL MACHINES IN THE ERA OF THE COVID-19 PANDEMIC

Based on the report "Rudolf can't handle it alone - the market of parcel machines in Poland" [8], created by Colliers, it can be found that as many as 85% of respondents, having the choice of the type of delivery, regularly choose the option of delivering the parcel to the parcel machine. More than a third (32%) were in favor of choosing this method whenever possible. As a result, almost 40% of all delivered parcels are delivered to the parcel lockers, and 50% are delivered directly to the customer's place of residence [8]. As it turns out, almost 70% of people use the Internet to shop and, upon seeing the possibility of choosing a parcel machine as a delivery form, make a purchase decision. Thus, it can be concluded that they constitute a motivating element [4].

The period of the pandemic has contributed to an increase in the demand for courier deliveries and an increase in the number of parcel machines. By analyzing *Out-of-home reports delivery in Europe 2021 report* and *Out-of-home delivery in Europe 2022 report*, an increase in the number of parcel machines installed and used can be noticed. For 2020, compared to 2019, it was an increase of over 75%. However, in 2021, compared to 2020, by more than 80%, respectively. This marks a spectacular increase in the number of parcel machines in just 2 years. [9,10]

## 4. PARCEL LOCKERS

### 4.1. PROBLEMS

Before the pandemic, the entire distribution network to the end customer was gradually developing. When some stores were announced to be closed, restrictions on the number of people staying in them and restrictions on movement were introduced, and the current concerns about people's health began to gain strength. As a result, people have attempted to avoid contact with other people to reduce the risk of contracting the virus, contributing to increasing demand for last-mile services. In order to meet the requirements, many companies have come up with various initiatives to gain or retain customers. Understanding the market demand, InPost increased the number of its parcel lockers, e.g., by placing vending machines in villages. However, the insatiability of the market caused other entrepreneurs to take advantage of this opportunity. As was previously described in more detail, many

entrepreneurs have already been providing or are planning to start providing services on the Polish market, not the same as but similar to the operation of InPost parcel machines. This, however, causes increasing concern among the public. The mere possibility of collecting a parcel from a parcel machine located in the vicinity (up to 10 minutes' walk) from the place of residence is acceptable. Difficulties resulting from the location and the number of parcels delivered are becoming a growing problem. Residents adjacent to parcel lockers are increasingly dissatisfied because frequent deliveries and pick-ups of parcels by cars and customers cause an increase in noise and traffic in the area.

Another area for improvement is the method of collecting parcels. Customers frequently come by car and park not only in the designated places but also in the forbidden ones, which later translates into difficulties in the movement of residents of the area (e.g., parking on the pavement, parking the car partly on the roadside, partly on the road). However, a bigger problem is the occupancy of parking spaces belonging to residents by those collecting parcels, which causes parking difficulties. On the other hand, parking cars on green belts causes their destruction, which translates into the place's aesthetics. This means that a specific group of residents may not agree to the placement of new parcel lockers in their area, and even as it happened in one of Warsaw's districts, Ochota, residents objected to the already existing parcel locker, citing the issues mentioned above as a reason [11].

Kuba Czajkowski from Miasto Jest Nasze mentions another problem in his publication: the appearance of parcel machines. According to the author, the design should be uniform and constitute an element of infrastructure, such as bus stops [11], which have a unified form, are easily recognizable and at the same time fit into the urban infrastructure. Initially, there were few parcel lockers, and almost all belonged to one owner; therefore, they appeared uniform everywhere. Now an increasing number of competing companies are entering the market. The lack of standardized standards for parcel machines' performance, size, and aesthetics will result in the newly created parcel machines in different colors and sizes.

#### 4.2. SOLUTIONS

All aspects must be considered to improve the aesthetics of the places of the current or future deployment of parcel machines.

The first of these may be the choice of place. It should consider the opinions of customers and local residents as well as technical matters, and more specifically, depend on access to power, the possibility of being reached by a courier's delivery car, or the ease of finding the parcel locker.

The second aspect may be the very appearance of the parcel locker. The best solution, in this case, would be to create a legal provision that would regulate the size, color, and location of the parcel machine. Such facilities should also not be

close to public institutions, such as churches, museums, historic tenement houses, or the main square. This is because such placement can negatively affect the surrounding landscape. The colors should also be standardized. An example may be the approach of Żabka stores, which, while placing their parcel lockers, try not to spoil the image of the area.

The third aspect may be adding the possibility of using a parcel machine to store previously ordered groceries in, for example, grocery stores like Biedronka. This would require a refrigeration unit to be built into part of the parcel locker, and it would also require consideration of the problem with frozen products. Limiting the order function only to products that do not require freezing would save space for cold storage or for ordinary parcels. However, this would limit the shopping possibilities or the number of people using this type of service. However, adding the possibility of storing frozen food requires more advanced preparation of the machines. However, in order to make such a decision, it would be wise to do a market analysis at the very beginning and find out what percentage of people ordering groceries would like such a solution.

## 5. SUMMARY

The parcel machine market has existed in Poland since 2009 and has expanded to foreign markets. The leading representative, currently holding almost 90% of shares in the Polish market, is InPost [8]. As can be seen, the market is not saturated yet because there are plans to build many more contactless parcel collection points, not only by the leader but also by the competition, which is still growing. The COVID-19 pandemic has significantly contributed to the increase in consumers' interest in online shopping and contactless deliveries. This increased the demand for both courier services and the number of parcel lockers. This allows the competition to launch their vending machines, especially since a further increase in demand for parcel lockers is forecasted. In order to remain the market leader, InPost introduced shipments delivered on the same day as they were sent without charging additional fees. This allows them to stand out from the competition. However, to survive in the long term in this increasingly demanding market, it is necessary to take care not only of the aspects related to delivery time but also the aesthetic aspects. Fundamental here is the estrangement of parcel machines' appearance and the correct location choice (introducing parcel machine-free zones, such as next to a historic building). It is also important to ensure that the location of the parcel locker allows for free parking next to it, and that the collection of the parcel does not damage the surroundings or threaten other road users. Conducting a prior environmental survey and determining whether the parcel locker is located at an appropriate distance from the places of residence to minimize the impact of noise from unloading and collecting



parcels should reduce the likelihood of removing the machine in the future (as it happened in Warsaw in the Ochota district).

## LITERATURE

- [1] BRACH J., *Obecne zmiany na europejskim rynku pojazdów samochodowych do przewozu ładunków- analiza z perspektywy strony podażowej*, Wydawnictwo Uniwersytetu Ekonomicznego we Wrocławiu, 2019r, s.92
- [2] JUHÁSZ J., BÁNYAI T., *Last mile logistics: an integrated view*, IOP Conference Series: Materials Science and Engineering, Volume 448, XXIII International Conference on Manufacturing (Manufacturing 2018)7–8 June 2018
- [3] KOWALSKI A., ŻAK J., *Wybrane aspekty wyboru lokalizacji „punktów ostatniej mili” w łańcuchu dostaw*, Prace Naukowe Politechniki Warszawskiej, 2018r, s.63-72
- [4] KOŁATA D., *Ostatnią milą do automatu paczkowego*, Logistyka, nr 5/ 2020, s.13-17,
- [5] *E-commerce w Polsce 2019-2022*, Gemius dla e-commerce Polska, <https://www.gemius.pl/wszystkie-artykuly-aktualnosci/e-commerce-w-polsce-2020.html> (data dostępu 18.11.2022r.)
- [6] Publicis Groupe, *Starcom: „Covidowe umiejętności” – czego się nauczyliśmy i co z nami zostanie na dłużej – wyniki badania HX Study*, <https://infowire.pl/generic/release/574988/starcom-covidowe-umiejtnosci-czego-sie-nauczylismy-i-co-z-nami-zostanie-na-dluzej-wyniki-badania-hx-study> (data dostępu 25.03.2022)
- [7] UKE, *Raport o stanie rynku pocztowego w 2020 roku* (data dostępu: 31.05.2021 r.)
- [8] CHMIELEWSKI M., *Rynek automatów paczkowych w Polsce | Rudolf sam sobie nie poradzi* 20.12.2021rok,
- [9] Last mile Experts, *Out-of-home delivery in Europe 2021 report*, kwiecień 2021r.
- [10] Last mile Experts, *Out-of-home delivery in Europe 2022 report*, wrzesień 2022r.
- [11] Ilona Mrozowska, *InPost, SwipBox, Allegro, Poczta i inni: rośnie biznes w automacie* 17.05.2021rok, <https://handelextra.pl/artykuly/249367,inpost-swipbox-allegro-poczta-i-inni-rośnie-biznes-w-automacie> (data dostępu: 08.04.2022)

Corresponding author:

Anna Smok, [smoktyfel@gmail.com](mailto:smoktyfel@gmail.com)