Automated Parcel Terminals - Commercialization of the System for Automated Post Services

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Abstract

Automated post terminals (stations) are a modern concept of automated self-service. The development of this vending technology is alternative strategy of the postal and courier operators to cover the served territory and to offer more convenience in means of place and time. Automated postal stations deliver a tailored service to the needs and specifics of clients. In the paper different characteristics, positives and weaknesses of the automated postal station are described and their development in Bulgaria is summarized. Their future improvement is related to the extent of more automation and the introduction of different robotic and unmanned technologies used in the last mile of organization of product flow delivery.

Keywords: Automated post terminals (stations), automated self-service, vending technology, unmanned technologies, post and courier services

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Introduction

Digitization and automation are leading features of the fourth industrial revolution. They are an effective means to defend the competitiveness of business units in their transition to the digital age and the new Internet economy. Postal operators and couriers are a key link in the distribution of products, which elevate their importance with the increasing volume of electronic sales in an online environment and new forms of out-of-store exchange. The growing volumes of processed shipments and parcels pose challenges for the continuous automation of the entire process and the widespread use of contactless technologies and the concept of automatic parcel stations (APS).

The main aim of the present work is to summarize the characteristics and advantages of automatic post station (automatic parcel lockers / postal box) and their importance in the delivery of postal and courier shipments as an element of the material flow.

In the article, the terms automatic post station, parcel terminal, automated boxes or lockers, automated kiosks, are used as synonyms and interchangeable as categories to describe the automated process of sending or receiving courier and postal items or parcels, via autonomous self-service automats. In this work, the methods of content analysis, description research and comparison of data from secondary information sources are used.

1. Thesis statement

Automated post stations are a physical element of the provision of a postal service, which generally includes “the reception, carriage and delivery of postal items and the reception of messages transmitted in physical or electronic form by the sender, their processing and transmission by electronic means and the delivery of these messages to the recipient as postal items” (Zhelyazkova, 2013, p. 141). Automated Parcel Lockers (or Automated Postal Box) is a service that allows customers to “deliver postal and courier packages to a point of service and collect them at any time of the day or night using digital collection codes” (Orenstein and Raviv and Sada, 2019, p. 684). In general terms, this is providing postal service outside of an office in a user-friendly location. In practice, this means delivering the service at the customer's most preferred point without direct contact with service personnel. The latter in the context of social isolation measures during the COVID-19 pandemic has gained even greater significance. Furthermore, the importance

of „the last mile delivery“ is a key component in generating competitive advantages for retailers and their logistics service providers and is related to “the application of non-traditional logistics methods, which have their positive sides as far as the automation of the delivery process is concerned” (Kateva, 2020, p. 84).

At the same time, it is an element of the company's cost optimization policy, by replacing the traditional postal service with automation and one carried out by the customer as a self-service. Thus, the point of contact can be at any location that the serving postal or courier operator chooses to position the APS. Although the station is conditionally fixed to the chosen location, it can be relatively easily modified and relocated. Of course, the factors for such a decision can be diverse, such as: lack of opportunities to position a real physical office (absence of buildings, business premises or construction bans), significant or insufficient customer traffic in the chosen location, the specificity of the served client segment, which is looking for 24/7 type of service, etc. At the same time, it can be the implementation of a corporate social responsibility policy and ensuring the coverage of the postal operator's service in remote settlements and locations or those that are not attractive and economically profitable for business, but are an element of state policy or the operator's image strategy, etc.

The main advantages associated with the use of APS are:

• A business concept built around the philosophy of providing convenience, in its dimensions of place, time and service. Localization in the most diverse business and public buildings, private and public areas is motivated by the key interest in positioning in close proximity to the customer or as an element of the infrastructure used by the customer traffic flow (street network, public and private parking lots, transportation hubs and bus stops / stations, etc.). This provides wide opportunities for partnership between the courier company and other businesses or the local authorities, which supply a location for the positioning of APS for a certain compensation mechanism (rent). This facility is defined as a relocatable object that “does not have the characteristics of a building and can, after being separated from the surface and from the networks of the technical infrastructure, be moved in space without losing its individuality and/or the possibility of being used in another place with the same or with a similar purpose to that for which it was used in the place from which it was separated, and its placement and/or removal does not permanently change the substance or manner of use of the land, as well as the object on which it is placed or from which is separated” (Zakon za ustroystvo na teritoriyata, 2022). Although technical and service infrastructure requirements may be introduced to the location of the APS, their autonomy and modern wireless technologies allow them to be completely autonomous. For example, instead of using physical Internet connectivity, to impose wireless network communications on a serving telecommunications operator, including through a proprietary or postal and courier company-owned wireless network even using satellite system. Ensuring continuous internet connectivity allows the operator of the automatic post stations to improve its activity in an organizational and technological aspect, which provides multiple opportunities for “adapting traditional business to new economic requirements in order for companies to be competitive” (Grozdeva, 2006, p. 137). Another possibility is the use of autonomous photovoltaic solar systems, which are part of the APS system and, through appropriate battery technology, provide the electrical needs for full operation within the day and at independence from the power transmission network. The latter has its growing importance in terms of reducing the carbon footprint of the business and its energy independence. At the same time, it should be noted that the selection of a location for positioning APS allows their seamless use entirely according to the time preferences of customers. Of course, certain restrictions may apply here when placing the machines in public buildings with controlled access during certain working hours (commercial and entertainment centers, malls, large retail chains, public buildings, etc.).

• Automation of service, through the use of modern information and communication technologies, ensures the complexity of digital service at the point of contact. The built-in reading technologies (cameras with varifocal lenses), those for contactless scanning and payments (laser, CCD, LED, etc. scanners, RFID and others), wireless information exchange, etc. allow the service to be carried out with high dimensions of speed, convenience, accuracy, etc. characteristics determined by digital technologies.

• Measurement accuracy and reporting automation. Since the entire customer service process is ensured by the use of automated technologies (bar and/or QR code scanning technologies, RFID, etc.), the information transfer is with minimized errors. Entering information from the customer with verification algorithms reduces inaccuracies of a diverse nature, but mainly those due to the fault of the postal operator or the human factor of the serving party. Central principle here is the use of automatic parcel labeling, which eliminates the possibility of missing required address fields and entering the correct address specification and/or contact information of the sender and recipient into the operator's system. Additionally, the use of scanning (bar and/or QR code) technologies allows important information, including that containing personal data, to be properly encoded and cannot be freely read by unauthorized persons. Moreover, in the case of incompleteness of the entered information or its inaccurate reading and interpretation, there is a possibility to compensate for the information deficit and fill it in real time, so that the shipment does not fall into the category of impossible to fulfill, incomplete or incorrect address, etc. Also thus, the organization of the service process implies that a significant part of the activities related to the processing of the postage or courier shipment should be carried out in advance, according to the time and place of contact with the APS. This means that the customer has registered as a user at a place and time convenient for him, with the basic data of the sender/recipient correctly entered and validated by the operator. Then, in the service of the “shipping to/dispatch” type, he prepared, again in advance, the bill of lading of the future shipment and set all the necessary parameters for its subsequent execution, including by using templates. As a next step, he prepared the shipment, packing it in accordance with the disclosed and accepted by the customer requirements for the type of packaging and permissible contents of the shipment (dimensions, weight, permitted and prohibited products for cargo transportation, etc.). In the "receiving" mode, again at an earlier moment, the customer received information about the parameters providing him with controlled access to the designated APS with various payment options, as an example: "cash on delivery" type, forwarding the shipment to another point of contact, etc.

• More accurate pricing. The use of automated systems for requesting and personalizing the postal and courier shipment, according to the individual needs and preferences of the client and in sync with the price policy of the postal operator, provides ample opportunities to reach a price that is conditionally adapted to the individual characteristics of the costumer. An important point here is that the customer is at the center both as an information source and, in his leading role in entering parameters into the service system with the wide possibilities to specify by himself the service he requests for execution (within the framework of the agreement with the operator and the specified at the point of sale). It should be emphasized here that the use of APS puts the client in the category of persons who, by accepting certain general conditions of the operator, share personal data with him and go beyond the scope of anonymity, which is carried out in compliance with the norms and regulations of the GDPR and the treatment of personal information with a higher level of protection than conventional postal services. However, the APS ensures the discretion of the informational and physical exchange of the postal or courier shipment, because the exchange takes place without real face-to-face contact.

• Accurate real-time delivery management and the ability of corrections via the Internet, minimizing errors for the place of delivery due to the fault of the operator, optimizes the process for

both parties (place and time). APS creates options to enhance the operator's cargo handling processes and opportunities for implementing sophisticated logistics and transport management systems using alternative optimization criteria.

• Speed of service, due to the absence of queue formation in the customer service area, where servicing organization is on the first-come, first-served basis. Of course, in individual cases it is possible for customers to crowd in the APS area, but the speed of the service implies a quick reduction of the queue.

• Another benefit of APS is the possibility of the technology to be further developed and upgraded, both in the dimensions of software functionality (multilingualism, real-time software updating, cloud technologies, etc.) and in terms of physical characteristics (additional boxes/lockers/cabinets, technologies for additional service - ATM, vending for complementary assortment, etc.). In practice, this means that depending on the specifics of local user preferences for box sizes or APS capacity, the system can be upgraded or shrunk to what is necessary for the most optimal service of user demand in the specific location. The use of APS is related to information exchange, which can be carried out through the website of the service operator, and in the context of providing more alternatives, also through mobile applications or software for smart devices. This means that the operator's software solutions can be continuously developed to meet emerging product development opportunities and innovative product concepts.

• The integrated sensors allow the correct determination of the dimensions and weight of the parcel/package, ensure its security and guarantee the best opportunities for optimizing the service and calculate the exact price of it, in relation to the actual parameters of the pre-selected features in the ordering stage and actually used in the execution stage.

• Discretion of the courier exchange, when ordering products with specific characteristics (food supplements, products for adults, etc.), for which the user would not like to be placed in a situation of inconvenience and publicity. APS provides the required level of confidentiality.

• Last but not least in terms of its importance, it should be noted that APS provide, other things being equal, a decreased carbon footprint, as a consequence of lower energy needs when carrying out a normal operational process. This is related to the absence of the need for the system to be in a controlled environment such as the temperature regime or lighting required for the working atmosphere of postal and courier employees. Moreover, in moments of absence of customers, the APS can go into standby mode and further reduce energy consumption until it is activated or until it detects the approach of a potential customer. Of course, the continuous working mode ensures that APS can receive and deliver shipments to customers all year round and even during holidays and weekends. That is regardless of the fact that the actual physical execution begins at a certain moment of service of the APS by an employee of the operator (most often a courier).

2. Status and development

In Bulgaria, the introduction of the APS concept was initiated by the company Speedy, which in 2016 started with the first 25 automatic parcel locker stations throughout the country (Bozhilov, 2016), in order to reach 80 units in 2021 (see Table 1) and a national potential estimated at 100 stations. The second operator investing in APSs is Econt Express, the company launched its concept also in 2016 with 16 stations and they are developing under the brand Ekontomat (Aleksandrov, 2016) and by the first half of 2022 there are 35 operating APSs on the territory of the whole country. Although the automats are produced by two specialized companies, at Speedy the Estonian company Cleveron (Cleveron, 2016) and at Econt Express the Austrian company KEBA and their KePol product series (KEBA Group AG, 2022) they have similar physical characteristics and functionalities (Table 1 and Figure 1).

Table 1. Comparative characteristics of the automatic post stations of selected operators in Bulgaria

Characteristic	Postal and courier operator	
	Speedy JSC	**Econt Express LTD**
Minimum dimensions (cm)	60 × 35 × 4,5	61 × 44 × 8
Maximum dimensions (cm)	60 × 35 × 37	61 × 44 × 37
Maximum physical weight (kg.)	20	50
Standardized sizes	4 types of boxes	3 types of boxes
Specificity	• Acceptance of shipments with non-standard sizes, after confirmation of the request by the Operator. • The additional services "Open before you pay" and "Test before you pay" cannot be requested for shipments to APS	• Instructions cannot be given for shipments sent from and to APS. • A shipment consisting of only one part can be sent to APS
Maximum stay of the shipment before forwarding	72 hours (3 days) after loading the shipment in the APS	3 days
Contactless payment	Yes (Cash payments are not accepted)	Yes (Cash payments are not accepted)
Pricing conditions	Standard rate from/to office applies. E-merchants offering operator services use discounts up to 30%	10% discount for all shipments from and to APS. When using the same machine, the price is 50% off
Type of Shipments Served	Domestic and international to certain destinations	Domestic
Number of APS	80 (2021)	35 (2022)

Sources: Speedy JSC, Econt Express LTD

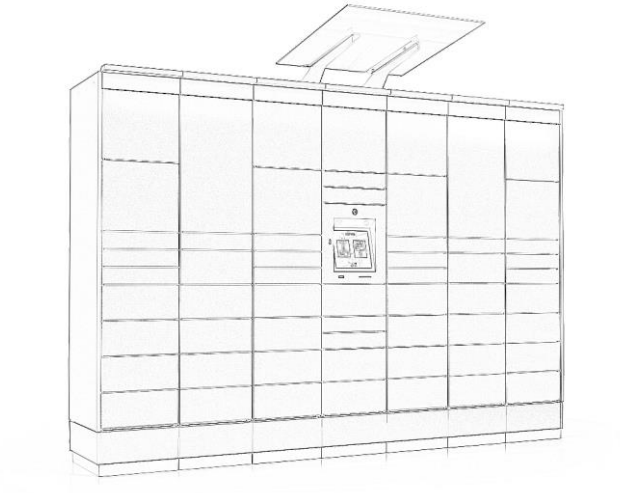

Figure 1. Modular system of the KePol company.

The two companies, which account for a total share of 67.9% of the Bulgarian postal market in 2021 (37.1% at Econt Express LTD and 30.8% at Speedy JSC, (CRC, 2022) use the APS concept as an alternative to service in a physical office, which improves accessibility to the service and ensures its uninterrupted mode.

Automated lockers are a technology that successfully implements the concept of the Internet-of-Things (IoT) in its operation, which allows effective and complete management of receiving and sending postal and courier shipments remotely via the Internet.

At the same time, certain requirements for the physical security of postal and courier shipments, as well as the protection of information exchange with the station, are also imposed on the APS. Within the framework of normal operation, physical protection is provided not only with passive systems, but also with active signaling and security technologies, video surveillance, GPS localization, etc. Additionally, in a situation of the spread of the viral infection from COVID-19, the absence of direct physical contact and automatic or other disinfection systems ensure that APS is a relatively safer point of contact for exchanging products. Their most frequent placement in the outdoors allows reducing the dangers of transmission of infections by airborne droplets from a human.

The importance of the human factor in servicing any automated technology, including APS, continues to be of key importance. At the present time, the intervention of the human factor for preliminary and main service and post-service of APS, which cannot function without the intervention of service personnel (serviceman and courier), remains necessary. In the near future, the automation of additional processes and activities may expand in the direction of the application of robotic and unmanned deliveries, integration of more technologies applying the concept of the Internet-of-Things, etc.

The use of the APS has specific limitations and barriers that should be taken seriously and considered in the context of technology limitations. First of all, it is the inability to offer the traditional range of services performed in the physical offices of post and courier companies. Such, for example, are the options for review, test and possible rejection of the product, i.e. its return to the sender at the time of receipt. This possibility is limited by the location of the APS, which does not mean that the parcels are tied to these delivery options, although the return of an unwanted product can again be done with the service of the postal automats. Therefore, the competition between traditional (physical) offices of the postal and courier operator and APS is escalating. Another example is the option to receive competent information service at the APS location, so much so that in a traditional office the client can receive advice and recommendations and remove the non-compliant service at the time of its request. This is due to the fact that consumers are used to and expect to be communicated with adequately, personalized and targeted through all contact channels (Galabova, 2016). While with APS, the execution of control activities relies solely on automated algorithms for formal and logical verification, but without the possibility of subjective assessment of the specific user situation and individual preferences.

With APS, it is impossible to use cash payment, which continues to be a popular way of payment for postal and courier shipments in Bulgaria. Official data on payments made by cash on delivery indicate that the dominant form for online users in Bulgaria remains payment on a cash basis, which holds a 60% share of payment methods (Bulgarian E-commerce Association, 2020). Thus, in 2020, the data of the National Revenue Agency obtained from “13 postal operators report about 41 million transactions, in which amounts of BGN 3.6 billion were paid by collect on delivery ... and in the tax declarations for the income received in 2020, individuals registered 5.7 million shipments with cash on delivery for BGN 498 million” (Kisova, 2021). According to the

World Bank's Global Findex database, about 63% of all transactions in the country are carried out in cash (Word bank, 2022). All this indicates that in the Bulgarian reality of sales over the Internet we have an active mixing and hybrid manifestation of purchasing over the Internet and traditional payment of the products upon receipt. Such a regime implies an active use of the services of postal operators and increasingly intensive use of APS by participants in commercial exchange (merchants and individuals). The main consideration for this favorable scenario is related to the fact that in Bulgaria by 2020 there is an enormous potential for the development of electronic exchange, since the country has a relative share of online buyers in the population of 42%, while in the United Kingdom it is 92 %, and in the EU-27 the average level is 73% (Lone and Harboul and Weltevreden, 2021).

Conclusion

The introduction of APS as an element of the product supply chain is a delivery system alternative that finds market representation and diffusion thanks to the digitalization of the postal service, the development of online purchases by end users over the Internet, the restrictions on traditional exchanges during the pandemic of COVID-19, the search for better conditions of commercial exchange in time of economic downturns, etc. All this suggests the concept of automatic lockers/boxes/cabinets/terminals to receive a new impetus of development and as a strategy to improve the service provided to postal and courier operators.

The growth and future development of the application of this technology as an element of the postal and courier service will be stimulated by the progress in the development of Internet commerce and other forms of non-store product exchange, which provide for the delivery of the order to the place desired by the customer and at the time preferred by him.

Additionally, the system of automatic postal terminals provides various opportunities for managing the place and time of postal and courier delivery, which allows optimization of costs related to the service for all its participants and lowering its final price for the client, with wide possibilities for its personalization.

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