

GLOBAL POSTAL E-COMMERCE DELIVERY NETWORK - TRADE SOLUTION FOR SMALL AND MEDIUM ENTERPRISES TO ENTER GLOBAL MARKET

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Abstract. The Global Postal Network (GPN) has encountered various challenges in its attempt to satisfy the needs of Small and Medium Enterprises (SMEs) when engaging in foreign markets. By providing parcel and package delivery and collaborating with express and courier services, GPN has a vital role in global supply chains and is an indispensable part of the e-commerce industry today. Moreover, through the implementation of mobile and online technologies, GPN has enabled financial services and other innovative approaches which facilitate e-business on both local and international markets. This article will explore examples of how the postal system can assist SMEs, particularly in last-mile delivery, in conducting successful business.

Keywords: global postal network, global postal chain, global supply chain, SME, e-commerce.

Introduction

Small and Medium Enterprises (SMEs) are vitally important in the global economy, accounting for a majority of economic enterprises worldwide and 99% of businesses in the European Union (EU) [1]. According to the OECD's Centre for Entrepreneurship - SMEs and Local Development, SMEs constitute a significant portion of the worldwide economy, accounting for approximately 50% of local and national Gross Domestic Product (GDP) [2]. Within the service industry, SMEs account for an even more significant proportion of GDP, at 60%. SMEs also account for 70% of employment, 30% of exports, and 10% of Foreign Direct Investment worldwide. SMEs are a significant provider of entrepreneurial skills, innovation, and job opportunities; they have contributed to the European economy diversification, boosting the European market's competitiveness. Recent estimates suggest that around 5.76 million SMEs were operating in the distributive trades sector (Wholesale and retail trade), and 1.2 million SMEs were in transport and storage trade [3]. This highlights the significance of SMEs in the economy in Europe, also in other regions in the world [4, 5] and their potential to contribute to economic growth.

Günter Verheugen, the former European Commissioner for Enterprise and Industry, has declared that micro, small and medium-sized enterprises are fundamental to the economic success of EU. SMEs significantly contribute to employment, stimulating both entrepreneurialism and innovation and ultimately making EU more competitive and prosperous. Without SMEs, the European economy would be substantially diminished. In economic, legal, and taxation contexts, the definition of SMEs can vary greatly depending on the economic size of the country. It is widely accepted that the number of employees is commonly used to determine SMEs. However, the precise size criteria for such definitions have historically been a contentious issue. For example, some institutions consider the number of employees to be the most important factor, while others prioritize either the turnover or the sales of a business [6]. This demonstrates that SMEs' definition and size criteria can vary significantly between countries.

The European Union's initial SME definition, established in 1996, had to be revised due to the rise in inflation and productivity [7] and was put into effect on January 1st, 2005. This definition was created based on conversations with the relevant stakeholders, demonstrating that hearing out SMEs is essential to successfully implement the Lisbon goals. This definition is seen as a significant step towards an improved business environment for SMEs and is hoped to stimulate entrepreneurship, investments, and growth. Consequently, the SME definition applies to all policies, programmes, and measures that the European Commission develops and provides for SMEs and those types of state aid for which there are no specific guidelines. However, determining whether a firm is considered an SME is not as straightforward as it may appear. According to EU recommendation 2003/361, the criteria for deciding whether an enterprise is classed as SME is based on the number of employees, along with either the turnover or the balance sheet total. It is important to note that these ceilings are applicable only to the individual firm, and therefore, if the firm is part of a larger group, the employee/turnover/balance sheet data must also be included from that group.

Analysis of current situation

SMEs face considerable challenges when attempting to sell their products and services in international markets. This is true regardless of the country in which the companies are based, be it a developed, developing, or least developed nation. The difficulties involved in cross-border trade include gaining access to supply chains, selecting suitable trade infrastructures, and dealing with limited access to financial infrastructures. This article will explore the obstacles within GPN - a system that is of great importance in the global supply chain and designed to meet the needs of SMEs entering foreign markets. Posts provide support to facilitate international trade by delivering parcels and providing financial services. There is a category of SMEs for which the lack of infrastructure in their region means that trans-border trade is not even a possibility. In particular, SMEs in e-commerce may be concerned about their ability to receive payment for goods or services and how to settle any disputes that may arise [8]. Numerous studies [9,10,11] have identified various barriers and obstacles that impede the entry of SMEs into new local and international markets. According to these findings, SMEs face several common barriers when attempting to penetrate foreign markets [8]. These include a lack of staff experience [12, 13], organizational resources and capital to finance internationalization; difficulties in determining potential market opportunities abroad; an inability to make contact with prospective customers overseas; challenges in securing reliable foreign representation; a failure to match competitors' pricing; a lack of government assistance and incentives at home; inadequate infrastructure for distribution (last mile); and excessive transportation and insurance costs. These issues can significantly impede SMEs' ability to compete in the global market.

Currently, SMEs are facing many issues that impede their development. As indicated by a series of research, SMEs need to internationalize to thrive. However, their expansion beyond their home market is hindered by the current impact of the Covid-19 pandemic. This has caused significant disruption to business contacts and original supply chains, thus limiting their access to international markets and consequently stunting their growth. In EU, approximately 20% of small businesses with e-commerce operations are restricted to selling in the domestic market. Less than half (8%) of these businesses transact with other countries within EU, while only 4 per cent engage in international trade outside EU. SMEs that express growth potential for the next five years indicate that a significant portion of their sales (almost 40%) is generated through online channels [14]. Consequently, e-commerce and digitization are further challenges that must be addressed. Additionally, various climate change initiatives create pressure on these entrepreneurs [15].

Goals and discussion

It will be discussed further how the global postal network, regarded as a global supply chain, can assist SMEs around the world in overcoming some of these impediments. Global supply chain (GSC) management entails a company's international interests and suppliers rather than merely a local or national approach. Almost all conceptions of the global supply chain encompass the notion of a circulation (of goods, data, resources, finances, expertise, etc.) that proceeds from supplier to manufacturer to wholesaler to retailer to consumer, with or without certain intermediaries. The postal system is considered a component of the global supply chain (See Fig.1).

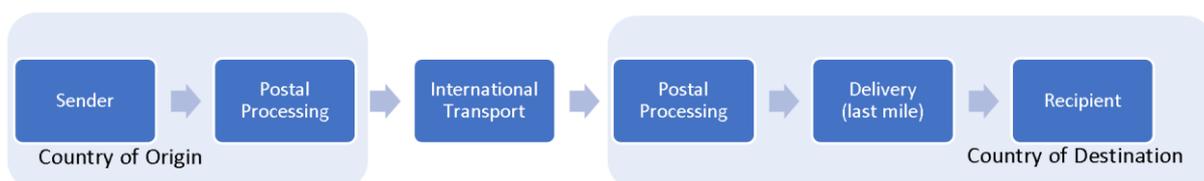


Fig. 1. Global Postal Chain in conditions international shipment

The Universal Postal Union (UPU) vision declares that the postal sector is perceived as a fundamental part of the global economy. To ensure this, the international postal supply chain must be compliant with the rising trend of e-commerce [16]. GSC provided by the posts is focused on the beginning and the end of any supply chain, connecting customers to the other links in the chain. Thousands of retail outlets are located worldwide, with the postal network allowing them to send goods to any point globally. This network also enables customers to return delivered goods to the supplier in

the event of dissatisfaction. The successful repatriation of goods procured through cross-border e-commerce is widely regarded as a crucial factor in the success of this market trend. Posts are offering a diverse array of digital payment solutions to bridge the gaps between the various components of the international supply chain.

UPU is an intergovernmental agency responsible for regulating the global postal sector. Posts provide their customers with local access to an international e-commerce supply chain, allowing SMEs to tap into global markets. Additionally, SMEs can benefit from having local contact in the event of any disagreements or discrepancies. To bolster the reliability, expediency, and traceability of cross-border e-commerce, postal operators have implemented numerous solutions. The market provides various networking options based on the type of provider and its geographical reach on a local, regional, national, or international level. Subsequent studies have assessed the logistics solutions available in the B2B and B2C parcel markets, indicating that there are typically six types of actors present: global integrators, European parcel operators, operators in European alliances, operators with their own intra-European regional networks, NPOs with national networks, and operators with local networks [17;18]. A specific solution, both on the European and global scale, is the UPU global logistics network, which includes the E-Parcel Group (EPG) and Express Mail Service (EMS). This network of postal operators has achieved remarkable levels of delivery efficiency thanks to the implementation of pioneering projects, such as the track-and-trace (T&T) system and a sustained monitoring process to measure performance results against established objectives [19]. UPU has established advanced contact with organizations such as the International Air Transport Association (IATA) and the World Customs Organization (WCO) to ensure that products entrusted to the posts are delivered across international borders in compliance with relevant regulations. This cooperation between international organizations has enabled the postal sector to become an integral part of the global supply chain. Furthermore, the provision of T&T information concerning the whereabouts and delivery status of products gives the postal sector a competitive edge. According to UPU, trust and security are essential elements of the postal service in GSC. The postal network is composed of three components: physical, financial, and electronic, all of which create a strong foundation that facilitates the construction of international trade relations [20]. We observe a proliferation of mergers between domestic postal operators and international postal service providers to facilitate the most significant benefit for the customer, particularly regarding e-retailers and e-shoppers.

SMEs, such as e-retailers, have many opportunities to connect their business through a global supply chain in a variety of distribution models and to expand into foreign markets. These models offer various possibilities for physical distribution and complex solutions for cash, and information flows between the participating members. Examples of such members include delivery operators, who deliver products on behalf of the e-retailers and may use other delivery operators as subcontractors; logistics intermediaries, who operate in the intersections between e-shoppers, e-retailers and delivery operators; and fulfilment service providers, such as third-party logistics (3PL) and fourth-party logistics (4PL) providers [21]. Constructing a global supply chain using the postal system is predicated upon observing three fundamental elements: security, transportation, and customs.

The paper's goals show how the postal services, and special last-mile services can facilitate business for SMEs. Moreover, innovative suggestions for GSC will be discussed in regard to how national posts are attempting to bolster e-commerce, both in the local and international markets, thus providing a powerful and competitive advantage in the future. Currently, postal sector innovations are directed towards processing parcels in large processing centres and the last mile, which is an integral part of the distribution process that is perceptible to the end customer. For SMEs to expand their reach on both local and international markets, it is essential to select a postal or logistics partner that can guarantee the quality of delivery and satisfaction of customer demands. The last mile is of paramount importance for SMEs in terms of various business models. Studies suggest that customers expect speed, reliability, flexibility and socially responsible behaviour from their e-retailer, particularly in the form of green transport. Consequently, GSCs must meet these criteria for SMEs to consider using their services. Nowadays, e-shoppers are increasingly seeking out merchants who offer delivery via cycle courier, electric vehicle, parcel lockers and pickup points. Drones (Amazon, Walmart, Alibaba and JD.com) are also emerging, particularly in more remote locations. Furthermore, droids (in Stockholm), autonomous vehicles, in-car delivery (HERMES UK in partnership with Ford) and other technological advancements

are being tested to save time, reduce emissions, minimize congestion and provide maximum flexibility for the customer.

Methodology

To achieve our defined objective, we have adopted a methodology involving the identification of delivery districts as potential locations for the placement of parcel boxes. In order to weigh the importance of the delivery districts, we have created weights based on the area, population, number of dwellings, houses, and businesses operating within each district. Criteria such as accessibility, location, parking safety, and electricity availability were considered in selecting the 15 most suitable locations for the placement of parcel boxes in the delivery districts.

To determine the optimal location for the placement of six parcel boxes, we employed the Tabu Search heuristic algorithm, subject to the constraint of parcel box capacity utilization. Subsequently, the isochrone method was used to plot the availability of parcel boxes within a 10-minute walking distance in the QGIS geographic information system.

Overall, our methodology provides a systematic approach to identify the most appropriate locations for parcel box placement, while taking into account various criteria such as accessibility, safety, and capacity utilization. The use of advanced algorithms such as the Tabu Search heuristic algorithm and isochrone methods further enhances the efficiency and accuracy of our approach.

Case study – SMEs as part of SC in the last mile process

The burgeoning quantity of parcel shipments disseminated across a substantial number of distribution service providers is presently leading to considerable issues, particularly in metropolitan areas, but also in regions with lower population density. In these areas, there is scope for collaboration between SMEs and postal organizations and between postal offerings from different companies. The research has revealed that customers prefer a selection of delivery methods and locations. This can be a challenge for SMEs, particularly when picking orders, as they must comply with the various stipulations of postal services. Nonetheless, it does ultimately result in a satisfied customer since they are provided with a wide array of delivery options and, thus, more flexibility. Among the fundamental postulates of how to address the issue of shared access to the endpoints of the global postal network for the purpose of e-commerce was the recognition that the delivery requirements of the stakeholders (e-retailers, postal providers, and e-shoppers) would overlap in certain critical aspects, such as deliverability of the parcel on the first attempt, 24/7 availability, territorial reach, compliance with delivery timeframes, reduction of the carbon footprint, security, and ease of use. Additionally, city logistics principles were to be applied, with the aim of sharing facilities and technologies for meeting customer delivery requirements and achieving positive environmental outcomes [22]. Taking into consideration the various benefits, a model for shared delivery to self-service boxes was developed. These benefits include the potential to provide service to the parcel machine during the evening or night-time, with reduced infrastructure utilization (thereby decreasing congestion and environmental impact), the availability of shipments in the early morning, and so on.

The basic requirements for creating a model involve selecting a site for regionalization, forming criteria for evaluating localities/districts, and optimizing shared mailbox locations. To evaluate districts, essential measures such as district workload (number of shipments to be delivered - average daily workload), area of the district and its structure (number of inhabitants - flats, houses, businesses), type of district (rural or urban) [23], and capacity of the self-service mailbox should be taken into account. Therefore, by considering the criteria mentioned above, it is possible to identify the number of self-service mailboxes with the necessary capacity (number of folders in the self-service mailbox) for the designated territory. The minimum criteria for the allocation of a self-service mailbox are based on both general rules and the analysis of requirements within the relevant territorial district, considering customer preferences and the nature of the locality. These criteria include accessibility (on foot, by car, or via public transport), the source of electricity (not necessary if solar panels are used), the frequency of the site/location/object, availability of parking (ideally free), security (e.g. lighting and city CCTV), and accessibility to the customer within 10 minutes of walking distance.

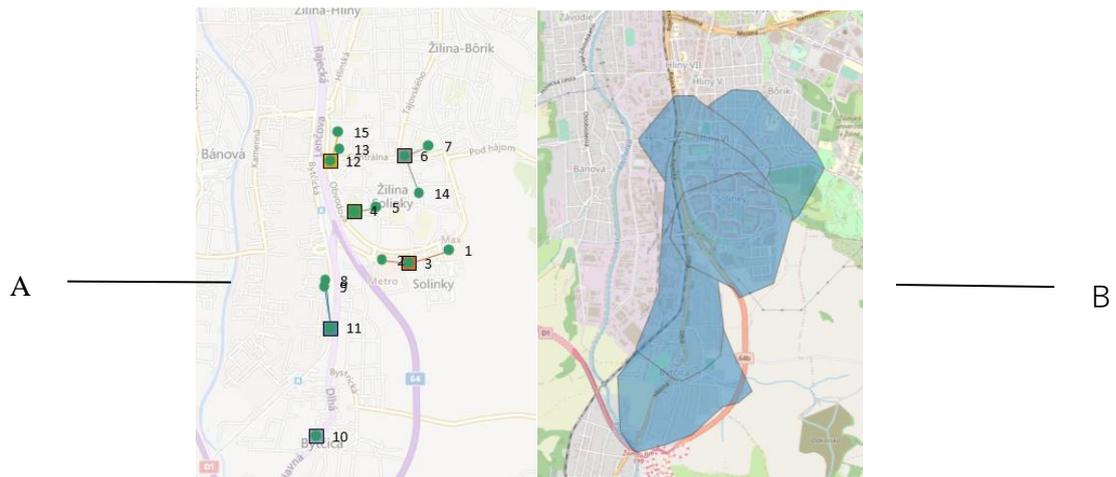


Fig. 2. Results of application SW tools to self-service mailboxes:
A – location; B - accessibility

Other criteria, which are not necessary but may be suitable for more sophisticated solutions, include the availability of a Wi-Fi connection. Furthermore, identifying the right location and determining GPS coordinates can be used to inform the process. Additionally, the use of appropriate software tools, such as the Facility Location Problem Solver for determining the time and distance between objects and the allocation of a reduced number of objects from all initially suitable, can also be employed. Finally, verification of the availability of the allocated objects according to the set criteria can be achieved by using a suitable software tool, such as QGIS, and an isochron representation (See Fig.2).

Modelling with the utilization of software tools facilitates the exploration of alternative solutions when the input conditions vary. The presented solution is a demonstration of a solution for the distribution of shipments in a particular region. It is noteworthy to emphasize that decision-making should also consider the economic ramifications of each potential solution. Nevertheless, shared solutions necessitate sharing the cost of establishment and operations between the multiple providers, which explains why an increasing number of postal providers and mail-order companies are currently contemplating this approach.

As previously stated, the current solution necessitates contemplating consumer access, money, and data streams. Consequently, communication solutions are also essential in conjunction with solving the physical circulation and distribution of equipment. Every involved party (e-retailer - postal provider - e-shopper) should maintain updated information regarding the shipment's status, the convenience of the mailbox (accessible folders, closest mailbox), payment, etc. There are a variety of satisfactory solutions on the market presently, for instance, the Lockers.ai platform from Balikobot.cz.

Conclusions

The postal network is an integral component of the global supply chain, playing a key role in the growth and development of SMEs by offering innovative solutions and supporting their e-commerce endeavours through online platforms and web portals. Its business model is geared towards cross-border expansion and growth. SMEs need to feel assured of their security, be granted easy access and be able to rely upon comprehensive services. Through engagement with international partners or even competitors within the global postal chain, SMEs are able to leverage their potential. By collaborating and unifying on common goals, postal providers can bring forth a number of advantages to all parties involved, including the customer, such as value-added services, rapid calculation of cross-border postage prices, tracking and tracing, and delivery options with decreased delivery times.

The methodology employed in this paper for the placement of parcel boxes can be implemented in other countries to improve the last-mile delivery for e-commerce parcels. The identification of delivery districts as potential locations for parcel boxes can be done using similar criteria such as population density, area, and the number of businesses operating within the district. The weights used to reflect the importance of each delivery district can be adjusted based on the unique characteristics of each country.

The Tabu Search heuristic algorithm can also be implemented in other countries to find the optimal location for the placement of parcel boxes, subject to the constraint of parcel box capacity utilization. The algorithm can be tailored to accommodate the specific needs and challenges of each country, such as varying levels of urbanization and transportation infrastructure.

To plot the availability of parcel boxes within a certain distance, isochrone methods can be used in other countries as well. The availability of parcel boxes can be plotted within a walking distance that is suitable for the specific country, taking into consideration the factors such as population density and transportation infrastructure.

In summary, the methodology used in this paper can be adapted and implemented in other countries to improve last-mile delivery for e-commerce parcels, thus enabling SMEs to leverage the capabilities of a global supply chain more effectively. By implementing this methodology, postal operators can play a significant role in providing consumers with a positive e-commerce shopping experience.

In our future research, we intend to explore the scope of application of the concept of creating a consolidator as a common denominator for international parcel shipping in both Business-to-Business (B2B) and Business-to-Consumer (B2C) e-commerce.

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Author contributions

Conceptualization, L.M.; methodology, R.M. and L.M.; formal analysis, R.M, L.M. and G.N.; investigation, R.M., L.M., P.S. and G.N.; writing original draft preparation, R.M. and L.M.; writing review and editing, P.S. and G.N.; visualization, R.M. and G.N.; funding acquisition, L.M.

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