

## The e-commerce logistics models of Polish clothing companies and their impacts on sustainable development

Beata Milewska

Poznań School of Banking, Faculty of Finance and Banking  
e-mail: [bmilewska@wsb.szczecin.pl](mailto:bmilewska@wsb.szczecin.pl)

**Key words:** e-commerce, sustainable development, clothing industry, logistics, distribution, B2C, natural environment, society

### Abstract

This paper discusses logistics models of e-commerce implemented by Polish clothing companies. The author has conducted research on Polish clothing companies and logistics operators serving e-commerce branches, and here presents and compares these models. There are various logistics models of e-commerce, which differ from each other in organisation of deliveries, level of outsourcing, location for keeping stocks, level of logistics in customer service, and organisation of returns (goods returned by customers). The impact of the different e-commerce models on ecological, economic, and social priorities is then discussed.

### Introduction

E-commerce is growing dynamically in Poland, especially in the clothing industry. However, if goods ordered over the internet are to be delivered in a timely manner, proper conditions, and without errors, appropriate organisation of logistical processes is needed, especially in the area of distribution. Distribution can be organised in various ways, which affect both the costs and the levels of customer service. This is therefore very important for the competitiveness of a company. However, looking more broadly, it also has an impact on sustainable development.

The aim of this paper is to present the impact of various elements of e-commerce logistics models used by Polish clothing companies on sustainable development. The processes of clothing distribution in e-commerce, various models developed by the author, and the impacts of the elements of e-commerce logistical models on sustainable development have been analysed by the author based on original research.

The author conducted observations and interviews with management staff, during visits to

clothing enterprises and logistics operators cooperating with them, supplemented by telephone interviews. The research was carried out from July 2017 to July 2019.

### Review of the literature

Sustainable development is defined in the literature in different ways. This concept can be considered from the macroeconomic (whole economy) and microeconomic (enterprise) perspective. In a narrow sense, it focuses on the natural environment. In the broadest sense it is understood as the ability to achieve various goals – economic, social, ecological, spatial, technical, etc. – in harmonious manners (Tundys, 2018, pp. 39–43). The aim of sustainable development is to ensure the quality of life for present and future generations by appropriately balancing the use of economic, social, and natural capital (Piontek, 2001, p. 17). The concept of sustainable development is understood in this paper as a balance between economic, social, and environmental priorities.

The internet can be used at various stages of the purchasing process, such as for identifying needs,

looking for information, and evaluating alternatives, but first of all, for placing orders by customers. E-commerce is technologically linked with m-commerce, i.e. mobile commerce, using smartphones or tablets (Grabiwoda, 2018, p. 138). In both cases, there is a need for properly organised logistics. Online sales may be the only distribution channel used by a company or may merely support traditional sales (Chodak, 2014, p. 22). Traditional sales in a shop and online sales can be combined in multi-distribution channels (Smyk, 2016, p. 18). There are various types of online stores, e.g. mono-brand (under the license of a producer), and multi-brand (Dziegieć, 2014, p. 231) and various types of e-commerce: B2B, B2C, C2C, C2B. The focus of this paper is on B2C, cases in which online sales only support traditional sales, and thus various distribution channels are used (multi-channel).

There are similarities between retail sales via the internet and retail sales in stores. For example, many logistics activities, such as transport and storage are performed in both cases. On the other hand, there are also differences; for example, orders over the internet are more diverse and placed in much smaller quantities than those in traditional stores (Murphy & Wood, 2011, p. 68). Also there are different regulations concerning the return of goods (Szołtysek & Twaróg, 2017, p. 201–202).

In the literature, e-commerce models are usually presented from the point of view of an e-store. For example, according to Marut (Marut, 2018), three e-commerce logistical models can be distinguished among Polish e-stores: the warehouse model (an e-seller has its own warehouse), drop-shipping (an e-store does not store goods but only mediates between a customer and a producer or a distributor), and fulfillment (an e-store purchases goods but stores them in the warehouse of an external company, which handles transactions and supervises the shipment of goods). Łapko and Wagner (Łapko & Wagner, 2019, p. 122–129), describe, in addition to these three models, the pseudo-just-in-time model (goods are ordered by an e-store only when a customer places an order), extended shopping (a supplier is fully responsible for the realization of an order, including warehousing, customer service, and the handling of returns), and commodity brokering (an e-shop, after receiving an order, finds the products at a supplier). Smużniak presents logistical models of online stores both in supply (own warehouse, drop-shipping, fulfillment, just-in-time, mixed method, and electronic deliveries) and distribution of goods (courier parcels, parcels and mailing lists,

parcel lockers, own transport, urban couriers, and distribution of intangible goods) (Smużniak, 2016, p. 1027–1030). Other models, focusing on the place from which goods are sent to online customers, are presented by Pluta-Zaremba and Rutkowski: deliveries from local stores, deliveries from a warehouse serving traditional stores, and from a warehouse directly to an on-line customer (Pluta-Zaremba & Rutkowski, 2005, pp. 226–227).

This paper presents e-commerce logistical models in which, apart from storage, other criteria are also considered relevant. These models are presented not from the point of view of an e-store, but from the point of view of a clothing company (a clothing manufacturer or distributor ordering products under its own brand), for which the Internet is one of its distribution channels.

Clothing and accessories are the most popular categories of products ordered in Poland via the Internet. In 2018, they were ordered by 64% of people from the online buyers group (Gemius, 2018, p. 142). At the same time, according to the same research, long waiting times for deliveries of products were indicated as the biggest problem associated with e-commerce (indicated by 40% of respondents) (Gemius, 2018, p. 120). The research also shows that the cost of delivery is not the most important assessment criterion used by online customers. Timely deliveries, lack of damage to goods, and guarantee of a delivery date are much more important (Kawa, 2014, p. 7). That means, that properly organised distribution of goods to online customers largely determines the success of e-commerce.

In the following sections of this paper, the distribution processes of clothing in e-commerce are discussed, on the basis of the author's research in the field, followed by the e-commerce logistical models and their impacts on sustainable development.

### **The clothing distribution processes in e-commerce**

The processes of clothing distribution described below for online customers are presented from the point of view of a clothing company. The discussion concentrates on logistics, ignoring marketing and financial aspects, such as payment for shipping. The processes of distribution for clothing in e-commerce are as follows:

- Clothes are delivered to the warehouse of a company that organises online sales – either directly from a sewing facility or from a warehouse, from which deliveries to shops are performed. In online

shopping, short delivery time is important (customers are not willing to wait long for deliveries), so the clothes ordered by customers are usually already produced and kept in stock. Of course, it may happen that stocks run out without being replenished, therefore information about the availability of goods needs to be updated on a regular basis. Sewing clothes, after accepting an order from an individual online customer, takes place very rarely.

- An online customer places an order on the online store's website. Online purchases of clothes are developing very dynamically at the present. In the opinions of many customers, the advantages of online shopping compared to traditional stores (convenience, low price, and a large selection), compensate for disadvantages – the waiting time for delivery and the inability to try on purchased clothes before placing an order.
- Orders are sent to a firm that distributes clothes for online customers. It can be the same company that organises traditional distribution, but not necessarily. Orders are prepared – clothing is completed, packaged, addressed, and delivered – from a warehouse.
- A shipment of clothing is transported from a warehouse to an online customer. Transport can be dealt with, for example, by a courier company. A parcel is delivered to a customer or, for example, left in a parcel locker. The distribution process ends, unless a customer resigns from the purchase.
- Resignation from the purchase of clothing ordered online often happens because customers cannot try on clothing before placing an order. It is therefore a common practice online to order several designs, colours, and sizes of clothing and to return some of them after trying-on. A customer sends goods back to a firm handling returns from online customers. It may be to the same place whence the goods arrived to the customer or to another place. The sending of clothes and receiving of returns from online customers is not always performed by the same company.

Returned clothes are checked for compliance with the conditions of returns – e.g. due date and state of the clothing (damaged, dirty, etc.). Then clothes are prepared for re-sale – cleaned, pressed, packaged, and handed over to a warehouse, where they wait for another customer.

From the logistics point of view, the main differences in the distribution of clothing to online customers versus in traditional distribution are as follows:

- fewer nodes in the distribution channel (there are no shops and showrooms);
- greater centralisation of inventories (in traditional distribution, part of the inventory of clothes is kept in stores);
- less predictability of orders for online customers;
- smaller sizes of delivery, to many different locations;
- more returns than from customers of traditional stores.

The first two features mentioned above are beneficial from the point of view of costs (lower costs of maintaining inventories and showrooms). The following ones are challenges for companies. Apart from the above mentioned features, adaptation to the dynamic growth of purchases via the internet, as well as the need for high precision in the preparation of orders, are also challenges. One risk for mistakes results from the range of products offered (many variants, sizes, colours, and clothing fashions).

### Elements of the e-commerce logistical models

As mentioned before, the models of e-commerce clothing distribution are presented here not from the point of view of e-stores, but of clothing companies for whom online sales only supplement traditional sales.

Models of e-commerce distribution for clothing consist of many elements. When creating them, one should find answers to the following questions:

- What firm deals with deliveries of clothing for online customers? From the point of view of a clothing company, we can distinguish between own or external distribution here. In own distribution, the organisation of e-commerce deliveries is handled by the clothing company (a clothing manufacturer or a company for which clothing is produced), while in external distribution a clothing company outsources this function.
- Where are inventories of clothing for online sale maintained? Deliveries to online customers can be made from the same warehouse as deliveries to traditional shops or from another warehouse.
- Whether goods are delivered to a warehouse by a push or pull system. Deliveries in a push system are based on pushing clothes from a previous node – e.g. from a production plant; therefore, inventories are usually held for a long time. On the other hand, deliveries to a warehouse in a pull system are frequent, in small quantities, on the basis of

actual demand; therefore, inventories of clothes are maintained for a short time.

- By means of what kind of transport and of what capacity, are clothes delivered?
- What are the standards for online customer service, the time required to complete an order placed over the internet, and the percentage of errors?
- What firm prepares returned goods for resale and where are the returned goods sent?

There can be many combinations of these elements, therefore various e-commerce logistic models.

### Selected e-commerce logistical models in the Polish clothing industry

Below are identified three models of clothing distribution for online customers used in the clothing companies studied by the author:

- Model 1 – own e-commerce logistics service: deliveries to online customers and showrooms from the same warehouse,
- Model 2 – e-commerce logistics service: outsourced deliveries to online customers and showrooms from the same warehouse,
- Model 3 – e-commerce logistics service: outsourced deliveries to online customers and showrooms from separate warehouses.

**Model 1** is the simplest model, often functioning in small and medium-sized clothing companies. It will be presented using the example of the company Unikat from Szczecin – a lingerie manufacturer. Unikat organises deliveries to online customers from the same warehouse in which clothing for its shops are kept. In this model, there is no transportation of clothing between different warehouses, as in some other models. What’s more, there is also no external transportation between production and the warehouse, because they are located next to each other. Clothes ordered by online customers prepared by the employees of the company are delivered to customers by one of four courier companies with which Unikat cooperates. These are the same companies that also transport goods to shops. Therefore the same resources are used for serving online customers and the shops. Clothes returned from online customers are sent back to the same warehouse. In this warehouse the goods are checked and prepared for re-sale. This model is presented in Figure 1.

The next two models are presented using examples of large clothing companies. These companies have outsourced customer service of online customers, as well as production, focusing on what is the

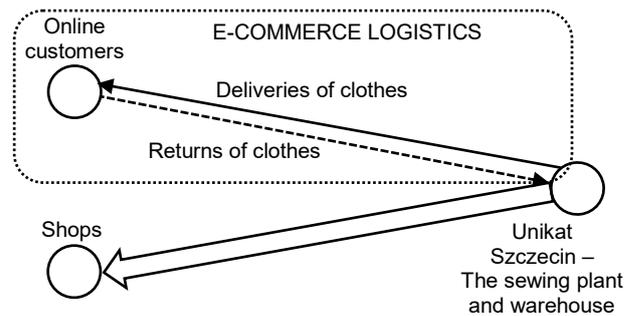


Figure 1. The e-commerce logistics model on the example of Unikat (author, based on this research)

most profitable in the clothing industry – the sale of custom-branded clothing, in their own showrooms.

**Model 2** will be presented with the example of online distribution by the clothing brand Vistula (Vistula Group S.A. after the recent merger with the company Bytom S.A., adopted the name VRG S.A.). Deliveries for online customers are organised by the logistics operator – Spedimex Company. Vistula outsourced to Spedimex all distribution of goods – not only deliveries to online customers, but also to its own shops. Clothing sent to the Distribution Center of Spedimex in Stryków is transported from the sewing facility immediately after production (push flow; the goods are “pushed” and not delivered according to actual demand). The Spedimex Distribution Center holds stocks both for the needs of showrooms and for the needs of online customers. Inventories are often stored for longer terms. On the other hand, goods returned from online customers are sent not to a Spedimex warehouse, but to the sewing plant, because it can better prepare the goods for re-sale than the logistics operator. In the sewing plant, the returned clothing is checked and, if necessary, cleaned, ironed, folded, and transported back to the Spedimex Distribution Center. This model is presented in Figure 2.

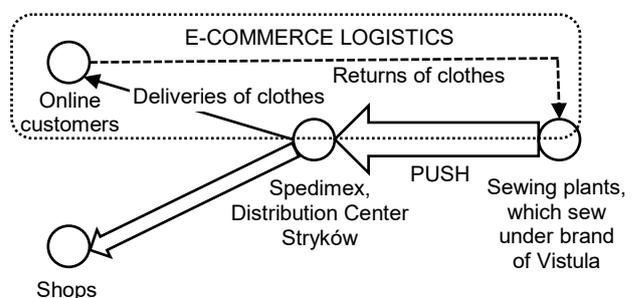


Figure 2. The e-commerce logistics model on the example of the Vistula’s brand (author, based on this research)

**Model 3** will be presented using the example of the largest Polish clothing company, LPP S.A.,

owner of the Reserved, Cropp, House, Mohito and Sinsay brands. This company, unlike with the previous models, shares the organisation of distribution. It hands over the service of online customers to Arvato, while it deals itself with traditional distribution – through its own Logistics Center and a network of over 1,700 showrooms. The outsourcing of their e-commerce logistical services, despite having their own Logistics Center, was caused by not only a significant increase in online sales, but also by its specificity. It is a process different from traditional distribution and LPP decided to entrust it to a specialist. Deliveries of clothing from the LPP Logistics Center in Pruszcz Gdański to the Arvato warehouse come on a daily basis, in amounts resulting from current levels of inventories. It is therefore a “pull flow.” When an order arrives from an online customer, clothing is ready for shipment and forwarded to

a courier company. Arvato serves both delivery to online customers and returns from them. This model is shown in Figure 3.

In addition to LPP S.A., Arvato also serves online customers for other well-known clothing companies. For example in the case of Inditex (Zara), Arvato maintains inventories and sends clothes to online customers in Poland and a dozen other European countries. For Inditex, however, Arvato does not deal with returns. Arvato offers a short time in preparing orders for shipment due to a good IT system and a properly prepared, trained staff. The company serves, apart from the clothing industry, the cosmetics, electronics, toys, and even pharmaceuticals industries. It enters markets where there is a big share of online sales.

A comparison of individual elements of e-commerce logistical models in the clothing industry is presented in Table 1.

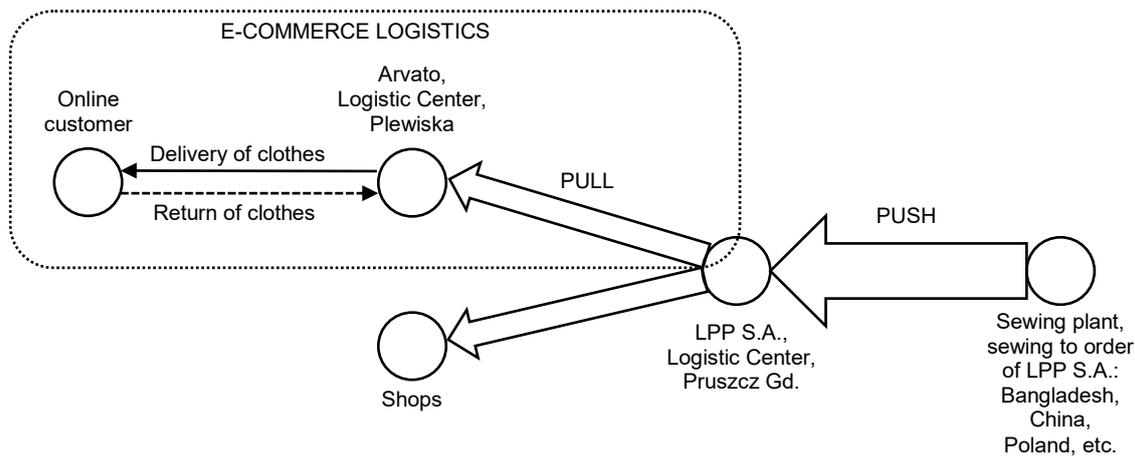


Figure 3. The e-commerce logistics model on the example of LPP S.A. (author, based on this research)

Table 1. Similarities and differences between e-commerce logistics models in the clothing industry

Elements of the model	Model 1	Model 2	Model 3
A firm delivering clothes to online customers	A clothing company	A logistics operator	A logistics operator specializing in e-commerce
A location holding stocks for online sale	Own warehouse; deliveries to online customers and showrooms from the same warehouse	The warehouse of a logistics operator; deliveries to online customers and showrooms from the same warehouse	The warehouse of a logistics operator; deliveries to online customers and showrooms from separated warehouses
Deliveries to a warehouse in which inventories for online customers are maintained	Deliveries from a sewing facility; a warehouse located at a sewing facility	Deliveries from a sewing facility; the “push flow”	Deliveries from a logistics center, in which inventories for shops are maintained; the “pull flow”
Transport to an online customer	A courier	A courier	A courier
A place to which returns are sent	The same from which the goods are shipped (own warehouse)	Other than the one from which the goods are shipped (sewing plant)	The same from which the goods are shipped (a warehouse of a logistics operator specializing in e-commerce)

## **Clothing distribution in e-commerce versus shops, and sustainable development**

Sustainable development means a balance in achieving economic, social, and ecological goals.

From the financial point of view, the development of online sales is a necessity for clothing companies. In this way, a company can win new customers and also retain existing customers who increasingly prefer this way of shopping. Increasing the share of sales online versus in stores allows one to reduce:

- inventory maintenance costs – due to greater centralization of inventories and shifting from shops to a Distribution Center, which reduces total levels of inventories and, consequently, costs related to their maintenance, e.g. costs of capital tied up in inventories;
- costs of operating shops.

However, in online sales the costs of returns increase (checking the goods and preparing for re-sale, transport). Transport costs can also increase due to deliveries to the final consumer, however, they are largely transferred to online customers, who do not pay for transport except in cases of larger purchases.

In terms of social goals, two groups should be considered: online customers and employees.

From the customer's point of view, online shopping is convenient and in many cases, better than traditional shopping, which eliminates the spatial and assortment gap. A customer is offered delivery to a chosen place, and a range of product selection in an online store wider than in a traditional shop. When it comes to the time gap, the situation is a bit more complicated. On the one hand, there are no restrictions related to shops' operating hours; orders can be placed around the clock. On the other hand, customers have to wait for delivery – the time between choosing clothes and receiving them. However it should also be taken into account that, due to internet shopping, a customer saves time related to traveling to and from a store. However, a customer has unlimited time to choose and compare products, so can spend more time shopping online than they would in a traditional shop.

Preparing deliveries for online customers is connected with greater requirements for employees than in cases of traditional distribution. Skills and experience are also required for checking returned clothes. Therefore, companies try to reduce staff turnover and offer higher salaries and additional benefits, such as social packages or free transportation to work from

nearby towns. From this point of view, increasing the share of online sales is beneficial for employees. However, on the other hand, the demand for employees from traditional shops may decrease.

From the point of view of ecology, the impact of online distribution compared to traditional is not completely clear.

For the natural environment, road transport is particularly harmful, especially when the loading capacity of the means of transport is underutilised. Such situations often happen with deliveries to online customers. Deliveries to stores are more predictable, because they are usually planned for specific days of the week. On the other hand, the consequence of traditional shopping is individual transport from a store to a customer's home. Of course, it is difficult to calculate which method brings greater environmental costs; a lot more information is needed.

## **Impacts of individual elements of e-commerce logistical models on sustainable development**

The impacts of the e-commerce models described earlier on sustainable development are ambiguous, because in each of them are elements more or less friendly to the natural environment. These elements also influence the economic and social aspects of the models in various ways.

In general, the following solutions may be more environmentally friendly:

- Outsourcing of e-commerce logistics to a logistics operator who specializes in providing these services to various customers. This allows the operator to achieve economies of scale (and therefore to lower costs), due to the greater possibility of consolidation of shipments and better use of a vehicle loading capacities, allowing a reduction in the number of transports, which is more beneficial for the natural environment (models 2 and 3).
- Stocks of clothing for online sales are kept in the same warehouse as stocks of clothing for traditional distribution. If the stocks for showrooms and online customers are in the same place, they do not have to be transported between warehouses, which is beneficial for the natural environment (models 1 and 2).
- Warehouses supplied by push instead of pull systems. The "push" flow means generally less frequent deliveries in greater quantities, and therefore lower external costs (model 2). On the other hand, from the economical point of view, the costs of maintaining inventories increase.

- Longer order times via the internet. It is beneficial from the point of view of the environment and transport costs, as it allows the consolidation of shipments transported in the same direction, and thus increases the use of loading capacities and reduces the frequency of trips. There is, however, a trade-off between ecological and economic, versus social goals – the expectations of a customer who would like to receive a parcel as soon as possible.
- Transport of goods returned by online customers to the same warehouse from which the goods will be sent again to a next customer (and not for example to a sewing plant). As a result, the goods will not have to be transported between a sewing plant and a warehouse, in which stocks are stored, which is beneficial both for the environment and the economy (models 1 and 3).

## Conclusions

Clothing companies use various e-commerce logistical models. The differences pertain to: who deals with deliveries to online customers (own or outsourced logistics services), the location holding inventories for online sale (own warehouse of a clothing company or a warehouse of a logistics operator; the same warehouse, from which traditional stores are served or another warehouse), the supply system of a warehouse (push or pull) and the place to which returns are delivered (warehouse or sewing facility). In each of the models, there are elements more and less friendly to the natural environment, which also influence the economic and social aspects in various ways.

Models, that require fewer movements of goods between warehouses or between a warehouse and a sewing facility are environment-friendly (e.g. keeping stocks for online sales in the same warehouse, which also serves traditional shops; returning goods to a warehouse, from which the goods will be sent to a next customer, not to a sewing plant). These solutions also reduce transportation costs.

Models that reduce the frequency of transport and improve the utilization of means of transport are also environmentally friendly. These solutions also reduce transport costs, but at the same time they can lead to increased costs for maintaining inventories (push flow) or may be disadvantageous from the point of view of satisfying customer needs (longer delivery time to online customers).

On the other hand, from the point of view of the natural environment, economy, and society,

outsourcing of distribution to online customers is usually beneficial; it allows achieving economies of scale, reducing transportation traffic, and often also reducing failures of delivery due to the employment of better trained and better paid employees.

In summary, some elements of logistical e-commerce models allow achieving, at the same time, ecological, economical, and social goals. In some cases there is a trade-off between these goals. In order to investigate more closely the impact of e-commerce in the clothing industry on sustainable development, further research should be carried out.

## References

1. CHODAK, G. (2014) *Wybrane zagadnienia logistyki w sklepach internetowych – modele, badania rynku*. Wrocław: Oficyna Wydawnicza Politechniki Wrocławskiej.
2. DZIEGIEĆ, J. (2014) E-commerce. In: Królewski, J., Sala, P. (Eds) *E-marketing. Współczesne trendy. Pakiet startowy*. Warszawa: PWN.
3. Gemius (2018) *E-commerce w Polsce. Gemius dla e-Commerce Polska*. Izba Gospodarki Elektronicznej.
4. GRABIWODA, B. (2018) *E-konsumenci jutra. Pokolenie Z i technologie mobilne*. Warszawa: Wydawnictwo Nieoczywiste.
5. KAWA, A. (2014) *Logistyka e-handlu w Polsce*. Available from: <https://secure.sitebees.com/file/attachment/612453/> [Accessed: July 24, 2019].
6. ŁAPKO, A. & WAGNER, N. (2019) *Logistyka dystrybucji – trendy, wyzwania, przykłady*. Warszawa: CeDeWu.
7. MARUT, D. (2018) *Modele logistyczne w e-commerce*. [Online] March 01. Available from: <https://blog.i-systems.pl/216-modele-logistyczne-e-commerce/> [Accessed: July 24, 2019].
8. MURPHY, JR. P.R. & WOOD, D.F. (2011) *Nowoczesna logistyka*. Gliwice: Hellion.
9. PIONTEK, F. (2001) Kontrowersje i dylematy wokół rozwoju zrównoważonego i trwałego. In: Piontek, F. (Ed.) *Ekonomia a rozwój zrównoważony. Teoria i kształcenie*. Białystok: Wydawnictwo Ekonomia i Środowisko.
10. PLUTA-ZAREMBA, A. & RUTKOWSKI, K. (2005) Logistyka dystrybucji w erze internetu. In: Rutkowski, K. (Ed.) *Logistyka dystrybucji. Specyfika, Tendencje rozwojowe, dobre praktyki*. Warszawa: Szkoła Główna Handlowa w Warszawie.
11. SMUŻNIAK, M. (2016) Charakterystyka strategii logistycznych w e-handlu zastosowanych przez sklepy internetowe z sektora małych i średnich przedsiębiorstw. In: Knosala, R. (Ed.) *Innowacje w zarządzaniu i inżynierii produkcji*. Opole: Oficyna Wydawnicza Polskiego Towarzystwa Zarządzania Produkcją.
12. SMYK, S. (2016) *Logistyka dystrybucji*. Warszawa: Akademia Obrony Narodowej.
13. SZOLTYSEK, J. & TWARÓG, S. (2017) Logistyka strumieni zwrotnych. In: Mindura, M. (Ed.) *Logistyka – nauka, badania, rozwój*. Warszawa-Radom: Wydawnictwo Naukowe Instytutu Technologii Eksploatacji.
14. TUNDYS, B. (2018) *Zielony łańcuch dostaw. Zarządzanie, pomiar, ocena*. Warszawa: CeDeWu.