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STRATEGY OF IMPROVEMENT OF THE LOGISTICAL PROCESSES IN AN ENTERPRISE

Summary. The e-commerce industry is growing in strength year by year due to the growth in the number of consumers using this solution. The market of e-commerce industry allows reaching to a broader group of customers and reduction of costs. In order to gain a competitive advantage, any enterprise must work out an appropriate plan, action strategy within the scope of distribution. A basis for decision about strategy of distribution actions, or aiming at improvement of executed processes, is a proper identification and analysis of external and internal factors. Rationalization of conduct result in high quality of customer service in the aspect of promptness of delivery, and also affects planning of actions in the long term. The goal of the article was to analyze the logistics distribution of the enterprise acting within the scope of e-commerce and to propose a strategy to

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improve the execution of the process of completion. A model has been developed and simulation has been made.
   Keywords: distribution logistics, customer service, quality of processes

1. INTRODUCTION

In the e-commerce industry, execution of large number of orders and finding the best method to deliver ordered goods brings many challenges [6, 7]. Above all, the main goal of any strategy is to gain a competitive advantage. Proper strategy allows defining the direction of development, working out the scope of long-term actions and also to adjust to the changing environment through earlier preparation for expectations of contractors [8, 19]. Therefore, while selecting appropriate actions, not only internal factors must be considered because logistics distribution joins participants of the whole supply chain [12]. Therefore, strategy must also consider customer service, which is focused on a key element, that is, time of delivery [9, 17, 21, 22, 27]. Therefore, enterprise in its actions should work on minimization of duration of performance of all actions, that is, preparation of an order, preparation of goods for shipment and hands over to supplier [24-26]. If enterprise in its actions treats these factors as a priority, then it can expect long-lasting success. What is more, the action strategy of the enterprise is largely affected by the distribution channel, and correct selection of a channel is a big challenge, and therefore, it should include precise determination of width and vertical and horizontal organization [11, 15, 18]. While planning the best distribution channel, we should pay attention to the degree of intensity that should be predicted in the event of the specific enterprise. Usefulness of a channel based on the degree that tasks must be done in the aspect of meeting expectations in a given segment of purchasers must also be taken into account [10, 13, 14]. Because in the event of usefulness, customers expect fast execution of an order, reliable delivery and additional after-sales services [16, 20]. This article also includes an analysis within the scope of processes of supply of goods and distribution illustrated with an example of an enterprise from e-commerce industry and strategy of improvement of executed processes in the aspect of completion route in the warehouse of analyzed enterprise has been developed.

2. LOGISTICAL MODELS IN LOGISTICS DISTRIBUTION

In the e-commerce industry, in the event of functioning of an enterprise, proper management of assortment, reserves, and transport of goods are key factors. While selection of a logistical solution in an enterprise, we refer to the amount and type of offered goods and goods that are physically in the warehouse. An extreme approach is outsourcing of logistical tasks. The total opposite of outsourcing is having only its own warehouse and offering only what can be found there. However, the most popular model is an indirect model, in which an enterprise has its own warehouse with only part of the offered assortment. Such a solution allows offering a large number of goods in assortment [1]. If an enterprise chooses logistical outsourcing, then an external company takes over some of the processes connected with logistics, that is, controlling of deliveries, execution of the orders, or monitoring of stock levels. In the event of outsourcing within the scope of storage, the external enterprise makes infrastructure necessary for storage of goods available and is responsible for execution of the orders.

Most commonly used logistical models for selection of an action strategy of an enterprise:

- *Own warehouse* – a model, in which an enterprise has its own warehouse space where goods are stored, which gives the possibility of purchasing larger amount of goods, and also affects better purchasing conditions (Fig. 1.). The application of this model has impact on reduction of duration of execution of an order, which results in increased satisfaction of the customers. The disadvantages of this solution are costs generated by maintenance of the warehouse. Another cost of such method of functioning is the necessity to purchase goods to this warehouse, which usually requires a lot of financial resources and poses a risk that invested resources may not be recovered because goods will deteriorate, past their sell-by date, or there will be no demand for them [5].
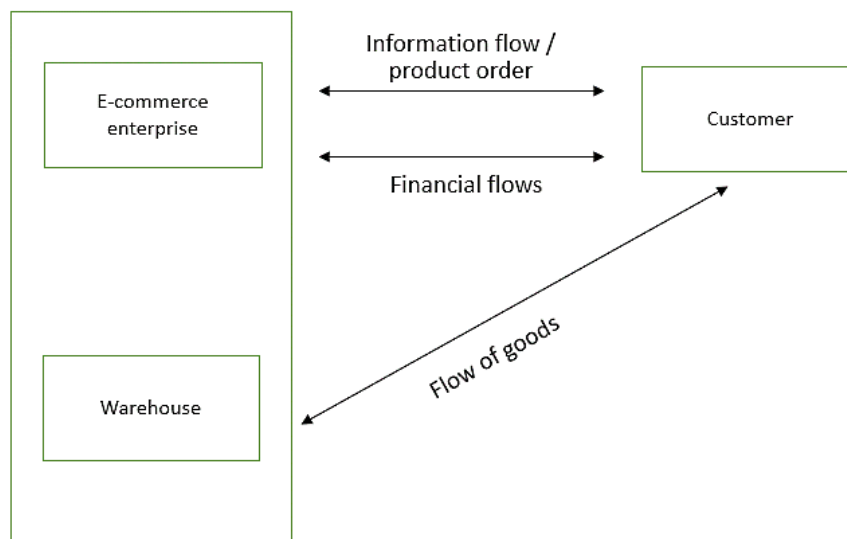
Fig. 1. Own warehouse model

- *Dropshipping* – a model of logistical outsourcing, in which the process of execution of an order is transferred from an e-commerce enterprise to the supplier (producer, wholesaler) (Fig. 2.). In this model, there are two elements, an online shop and an enterprise executing at least completion, packing, and shipment. This model can be applied by an enterprise that wants to increase retail sale and deals with execution of the orders collected by an external enterprise, that is, an online shop. Another method of functioning is entrusting online shops with full sale process, by for example, producer of goods and such shops take marketing actions by collecting orders. Two types of dropshipping can be distinguished: pure dropshipping, that is, an action model, in which an e-commerce enterprise has no own warehouse, and its activity is entirely based on external subcontractors, or partial dropshipping, that is, the case when an e-commerce enterprise has its own warehouse but commissions an external enterprise to execute parts of orders, for example, assortment with small demand being only supplement of the whole offer. Implementation of dropshipping in an e-commerce enterprise requires developing appropriate standards in the flow of information, packing, payments and returns. Communication between warehouse systems and online shop system is important so that information about the availability of goods in the warehouse was constantly visible on the shop website [1].
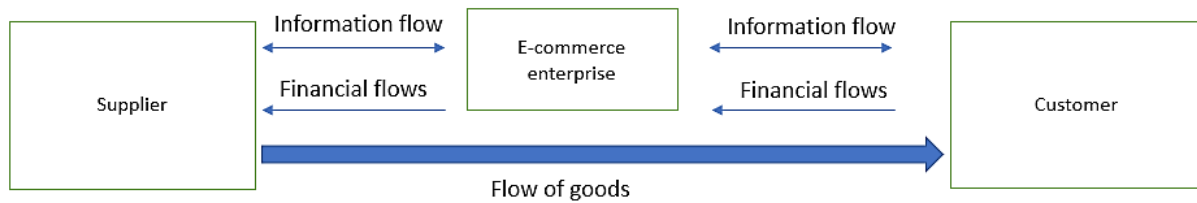
Fig. 2. Dropshipping model

The advantages of dropshipping include fast and easy change of an offer, which results from shortages of previously purchased goods, located in the warehouse. To change an offer, we only have to find a new supplier and change an offer of goods on the website of an enterprise. Another advantage similar to change of an offer is the possibility of testing the market, that is, creating new offer on the e-commerce enterprise website, and depending on the interest of the customers, ordering from the supplier, or when demand is low, it can be easily closed without the risk of leaving the goods in the warehouse. Dropshipping also brings financial benefits because, to start an activity in this model, an enterprise only needs a website allowing to reach the customers and place orders. Therefore, starting such an activity does not require practically initial capital, which gives the possibility of development for small enterprises. The disadvantages of dropshipping include becoming dependent on the supplier of offered assortment, lower credibility of an enterprise because e-commerce enterprise not having its own warehouse becomes the customer' agent. It has also impact on lower revenues caused by agreement conditions of the supplier. In the event of dropshipping, the problem is also lack of detailed information about product features from an e-commerce enterprise because there is no physical contact [1].

– *Fulfillment* - a model, in which an external company provides logistical services for an enterprise running an online shop (Fig. 3.). In the event of adopting the strategy of fulfillment, an e-commerce enterprise has no warehouse, whereas, purchased goods are stored in the warehouse owned by an external company, which also deals with goods service and further shipment. The advantages of this solution include avoiding execution of any processes connected with goods and often lower prices of shipments in the event of larger orders. The disadvantages of this solution are the lack of full supervision of goods, the lack of quality control of goods and high costs of such functioning [3].
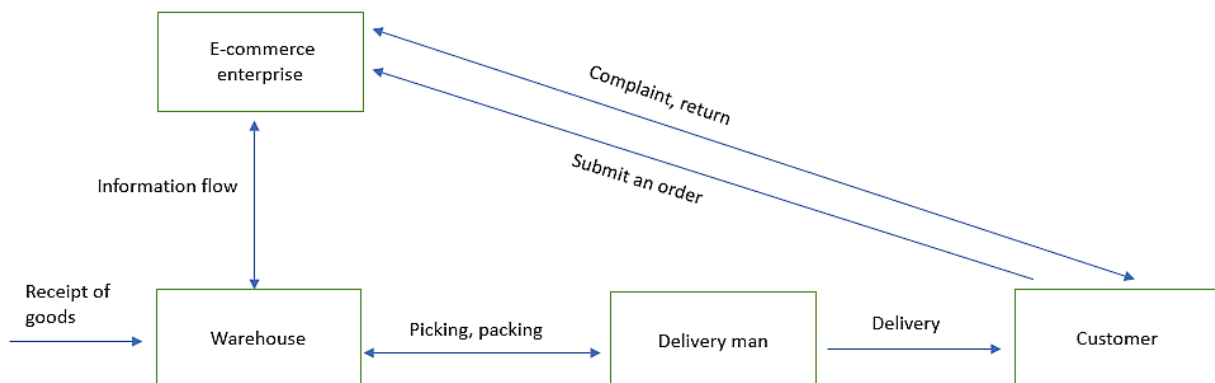

Fig. 3. Fulfillment model

- ***Pseudo-Just-in-Time*** - a model that is very frequently applied by the enterprises in the e-commerce industry. It includes agency of e-commerce enterprise between customer and supplier (Fig. 4.). The shop places assortment on its website and marks a delivery date. Only when a customer places an order on the website, an enterprise places an order in a supplier. An advantage of this solution is the possibility of offering a wide range of assortments with simultaneous minimal initial capital. Warehouse storage space, which affects the reduction of costs of functioning, is also not required. The biggest problem in such a solution is extended time of delivery to the customer and the occurrence of various mistakes. A disadvantage is also the lack of accurate information about stock level of a supplier, which can make time of execution of an order extended, and as a consequence, decrease satisfaction of the customers [3].
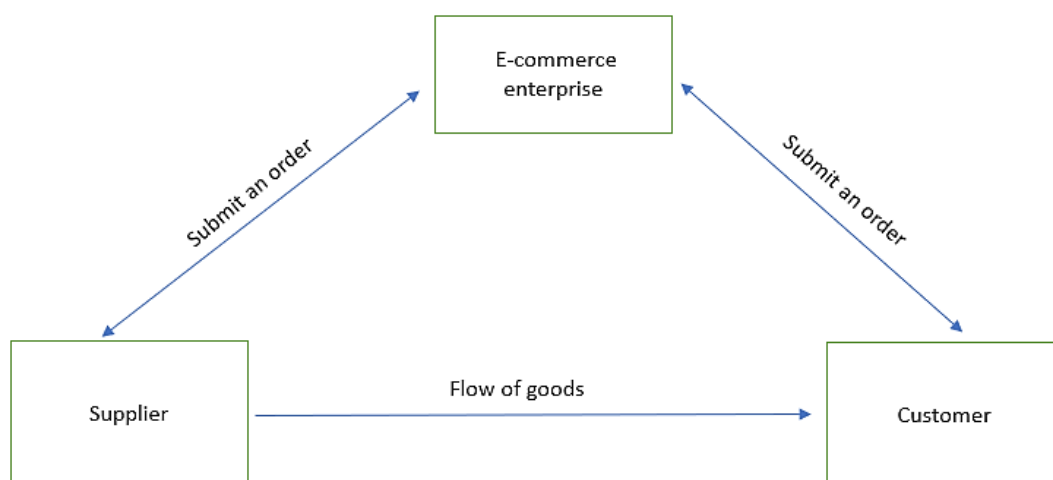

Fig. 4. Pseudo-Just-in-Time model

- ***Extended shopping*** – a model, in which e-commerce enterprise is fully serviced by external enterprises within the scope of storage, settlements, return service (Fig. 5.). E-commerce enterprise must only enlarge the customer base, suppliers do the rest. The advantages of this solution are low market entry threshold, an option of offering a wide range of assortments, high flexibility, fast execution of the orders, no need for customer service. Whereas, the disadvantages include shortages of goods and deliveries, as well as errors and no impact on the quality of customer service [4].
- ***Commodity brokering*** - a model, in which even supplier has no all goods in its warehouse, whereas, in the event that an e-commerce enterprise places an order, supplier must place an order in its supplier (Fig. 6.). Such a way of functioning allows to order larger batches of goods and results in lower prices. The advantages include simplified logistics and unlimited assortment. The disadvantages include long duration of execution of the orders and potential goods shortages that e-commerce enterprise has no impact on [4].

Apart from getting goods in the event of some models, e-commerce enterprises, to function efficiently, must decide about acceptance of the forms of delivery of goods to the customer. The most popular forms of delivery of ordered goods include: courier services and own transport when goods require specialist transport, and costs are so high that using own means of transport is cost-effective.
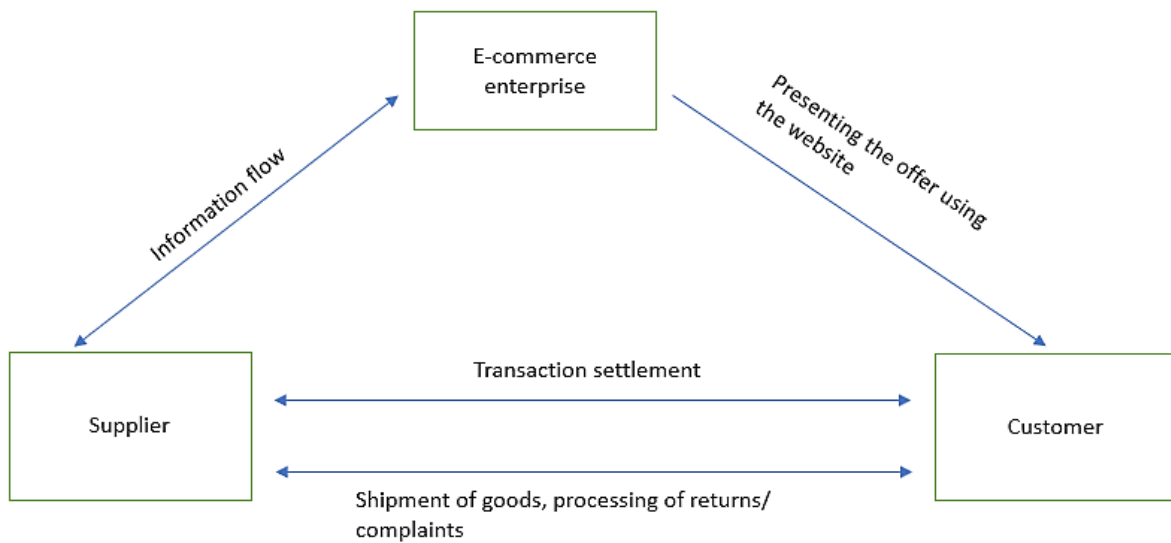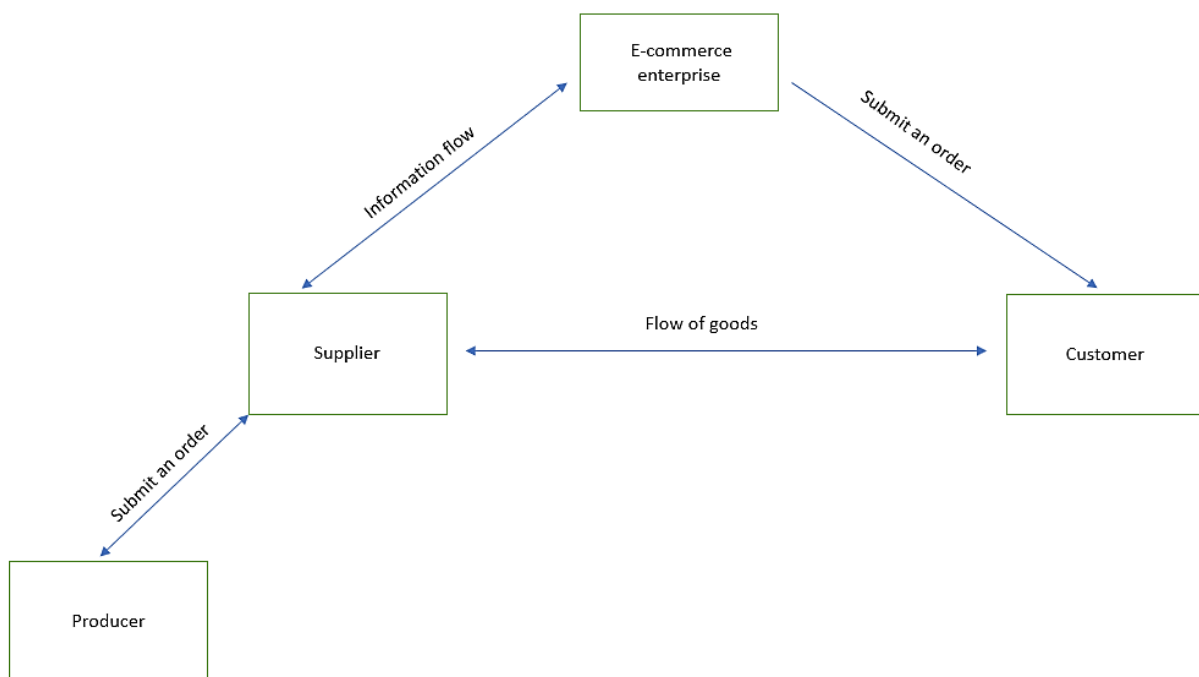
Fig. 5. Extended shopping model

Fig. 6. Commodity brokering model

3. AN ANALYSIS OF EXECUTION OF THE PROCESSES OF DISTRIBUTION AND SUPPLY ILLUSTRATED WITH AN EXAMPLE OF THE ANALYZED E-COMMERCE ENTERPRISE

Analyzed trade and service enterprise is functioning in the Sub-Carpathian region. Its assortment includes metal articles and materials for steel processing. The offer also includes acid-resistant fittings and stainless-steel elements used in yachting. The company also provides

services within the scope of production of steel structures designed for storage and production halls. The area that this enterprise is focused on is the domestic market. Analyzed enterprise does not run stationary sale, and offers its assortment via websites, the one with a general offer of all metal elements and the other oriented towards an offer of stainless-steel products. External e-commerce platforms are also used for selling, which helps to reach a broader group of customers. Due to the specificity of offered goods, the target group that company's offer is destined for are both individual customers and service enterprises. The enterprise offers their customers the possibility of issuing a certificate of conformity of offered products with requirements and certificates containing information about species of material, melt number and chemical composition of offered goods. The logistical model that the enterprise is based on its own warehouse model (Fig. 7.). The company has its own warehouse, in which goods are collected, properly labelled, distributed in a way allowing their efficient completion. In the warehouse, the process of completion and preparation of ordered goods for shipment is also conducted. The last of the warehouse's tasks is to give a proper parcel to a previously hired courier. The company also has an office responsible for marketing actions, that is, preparation and improvement of trade offers and contact with customers and, if necessary, after-sales service.
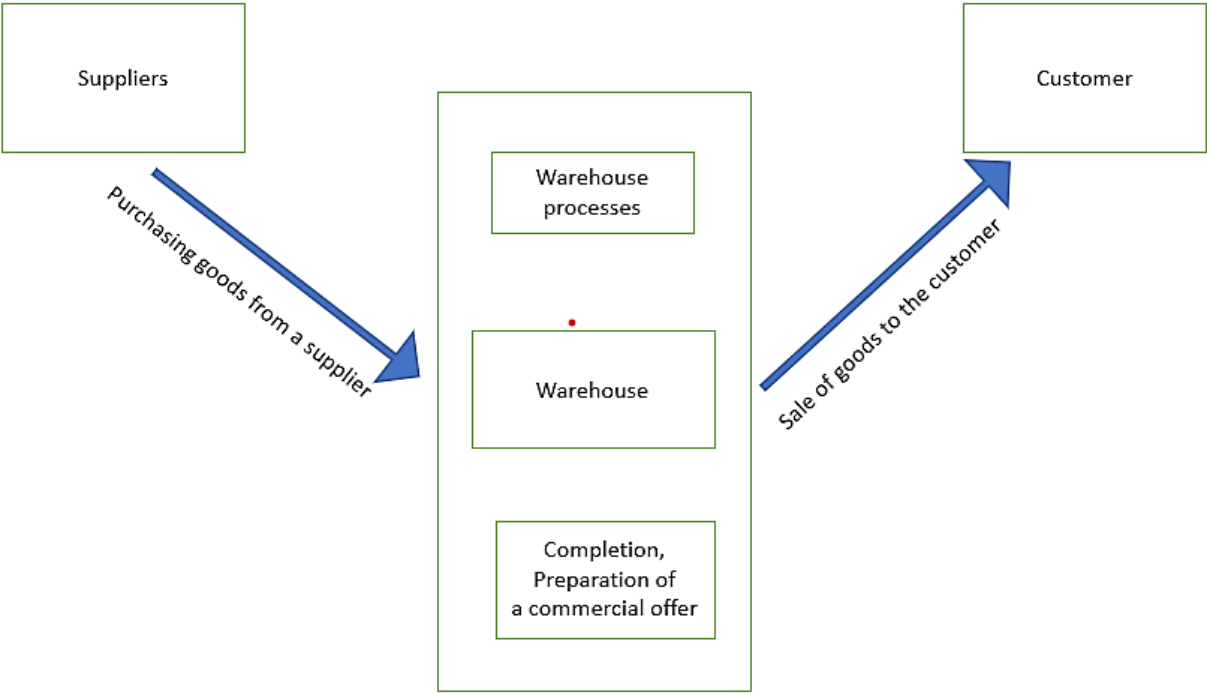

Fig. 7. Diagram of the flow of goods in the analyzed e-commerce company

In the event of the analyzed enterprise, the logistical model that this company is based on has many advantages, but unfortunately also disadvantages. Own warehouse model enables an e-commerce enterprise to immediately execute the orders while maintaining also supervision of the whole process and high quality of an offered service. Having its own warehouse also allows reducing the susceptibility to fluctuations of prices of goods on the markets. Whereas, disadvantages include the necessity of having warehouse space, as well as costs of maintenance of property, employment of people who will work in such warehouse and supervise the process of goods acceptance and deal with proper storage. Having its own warehouse is also connected

with the difficulty of having broad assortment because the broader offer, the more goods the enterprise must purchase, which requires appropriate financial resources and appropriate warehouse space for purchased goods.

The supply chain of the analyzed enterprise consists of producers manufacturing goods that the company trades in, as well as suppliers that the company purchases assortment from, trade enterprise and end customers who purchase these goods. Goods in this chain are given to the customers through the producer of goods and the suppliers and shops. Remaining information about the needs of the customers (types of goods, amount, etc.) and financial resources cover opposite distance (Fig. 8.). Goods are exchanged between suppliers, e-commerce enterprise and customers through external transport companies. It is similar with information and finances, external operators providing such services are responsible for their flow. Reverse flow directions occur in the event of returns and complaint – a customer sends to an enterprise previously ordered product that turned out to be defective, or did not meet expectations, then the enterprise investigates a complaint, or returns and provides information concerning further actions and if necessary, gives financial resources back. The form of functioning of an enterprise is not limited only to local customers, but also allows reaching the customers throughout the country at the right time.
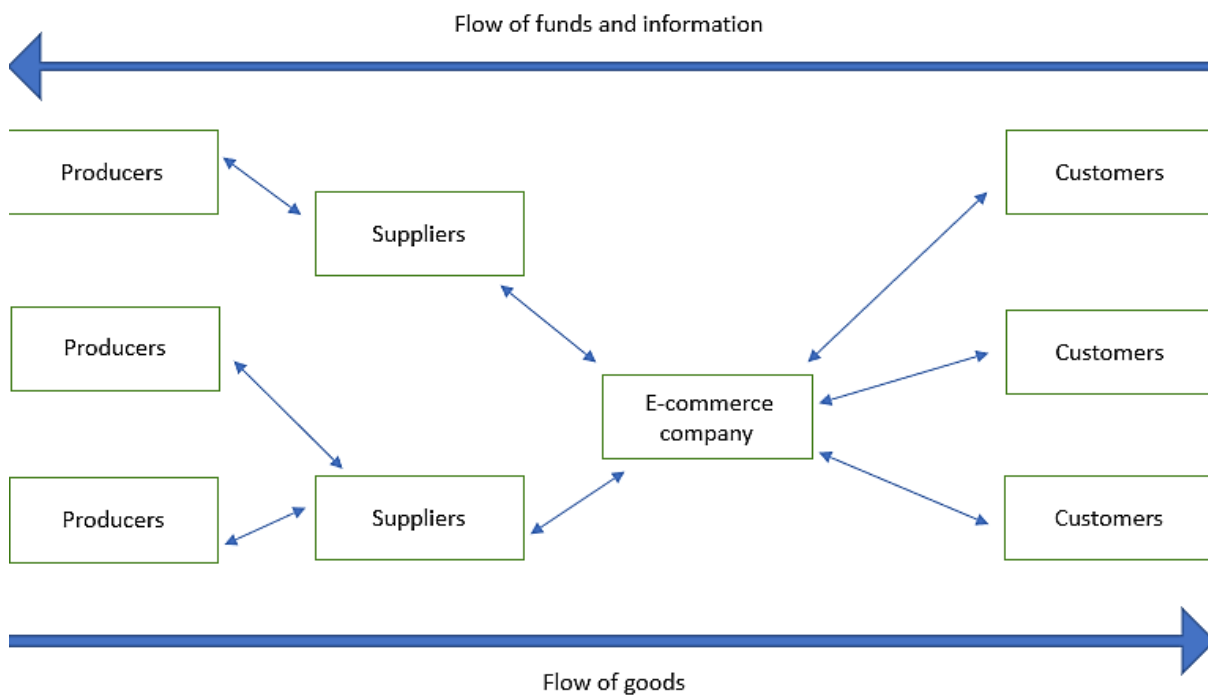

Fig. 8. Diagram of the supply chain in the analyzed company

In the analyzed enterprise, adopted strategy and model of conducting activity assumes the sale of assortment stored only in its own warehouse. An enterprise acting on such basis is responsible for the majority of logistical tasks connected with running a company in the e-commerce industry, and only transport is outsourced. It requires storing the whole assortment in its own warehouse, which is connected with the need of market analysis and selection of stock levels to the demand of the customers for specific products. In an enterprise acting on such basis, supply logistics is important, that is, connection between production and distribution

of goods. Supply logistics includes all decisions and actions connected with delivery of goods, and it is also responsible for the flow of financial resources and information connected with it.

The process of supplying the warehouse of the analyzed enterprise with assortment starts from an analysis of current stock levels. This action allows familiarizing with current state and allows depicting sale in a specific period of time. Due to the specificity and broad assortment, forecasting demand based on sale is important because using only its own warehouse, an enterprise may not have considerable reserves of every type of assortment. Another step in the process allowing correct execution is to determine what assortment and in what amount are required, due to the fact that supply has its limits and, it is important to avoid the situation of excess of specific goods, as well as shortages of other goods. Another phase of supply is to find an appropriate supplier. This problem occurs regardless of adopted strategy because either enterprise executes itself the distribution of goods, or commissions it to an external company, it must have suppliers of goods. Current contractors are usually employed in this process, although to be a competitive, an enterprise must constantly analyze the market situation and use the best offers. If demand and supplier are already determined, the next stage is the determination of financial conditions, dates and forms of deliveries, as well as the determination of conditions of returns and complaints. An important aspect is delivery date because long waiting time may cause goods shortages, which will have negative impact on customer service. The final stage of supply process is acceptance of goods in the warehouse and proper distribution. In the event of the analyzed enterprise, specificity of offered assortment requires careful labelling and distribution because goods are often small in size and in large amounts, which causes that only multipacks are labelled. Therefore, appropriate arrangement and labelling of goods using adopted norms in a company enables unproblematic execution of the orders of customers (Fig. 9.).

Distribution of goods is the final stage of the logistical supply chain. Its task is to make available by the sellers goods that meet expectations of the purchasers. The components of distribution include a form of sale and delivery service. Logistics distribution plays a very important role because delivery of goods in time to an appropriate place and customer largely affects the quality of customer service and reduction of duration of movement of goods, as well as reduction of costs. Logistics distribution combines all physical tasks connected with goods service and marketing to meet the requirements of customer service and reduction of costs connected with sale. Logistics distribution is connected with making many strategic and organizational and operational decisions, allowing to achieve the main goals of the enterprise [5].

In the event of the analyzed enterprise, the process of distribution starts from placing an order by the customer in an online shop on the company's website or external e-commerce platform. After placing an order, depending on the selected payment option, we wait for information from an external payment system, or execution of an order in the event of cash on delivery. In the event of no payment, an order after a lapse of specific time is annulled. The next stage is completion of goods, which were ordered. In the event of the analyzed enterprise, the process of completion is very important because due to specificity of goods and wide assortment, it must be conducted correctly. If given good in an appropriate amount was taken from the warehouse, goods are packed. While all actions are taken (completion, packing), the customer is informed about progress in execution of his/her order. If goods are completed and packed, the courier company chosen by the customer is informed that there is a parcel to collect. Another stage is a proper sending of a parcel using data provided by the customer. These actions are taken using a form made available by an external company, allowing better controlling of the flow of parcels and tracking by the customer where ordered goods are at a specific moment. If all actions connected with preparation of a parcel were taken, it is given to a hired courier.

The analyzed enterprise in order to deliver ordered goods to the customers, uses courier parcels and offers an option of personal collection of ordered goods from the company's warehouse. Along with sending a parcel, a sale document is also issued, depending on the customer, it is a VAT invoice or receipt. That is how the execution of an order ends, all tasks that the e-commerce enterprise was responsible for were done. A courier company is responsible for finishing an order and delivery of a parcel to the final customer. Upon collection of a parcel by the customer, the order is found executed (Fig. 10.).

In the event that a customer is not satisfied with delivered goods, or these goods are defective, or not the ones that were ordered, a return or complaint process is initiated (Fig. 11.). If goods are defective, or there is an error in completion, the customer may make a complaint through sending a form and sending ordered goods back to the seller. In the response to a reported complaint, the seller must investigate it within a specific period of time and take appropriate steps depending on a specific decision. If delivered good is correctly completed, the customer has the right to return purchased goods within 14 days. In such a case, the customer must fill in a return form and send ordered goods back to the company's address, where the completeness of goods is checked and if everything is OK, the customer is given financial resources back.

4. THE IMPROVEMENT OF THE PROCESSES OF DISTRIBUTION ILLUSTRATED WITH AN EXAMPLE OF AN E-COMMERCE ENTERPRISE

One of the most problematic and time-consuming stages in the warehouse processes in the analyzed enterprise is the moment of accepting goods from suppliers and entering the warehouse system. This stage requires considerable time and transfer to an employee, as each delivered load requires manual entry into the warehouse system. It is a time-consuming process and there is a high risk of human error. This process is automated by RFID (Radio Frequency Identification), that is, automatically identifying system with the use of radio waves. This system, apart from automatic identification, allows also to collect data, which allows managing warehouse reserves more efficiently. A significant advantage of RFID in the warehouse is also an option of accurate checking of the location of selected goods. To implement RFID in the warehouse of the analyzed e-commerce enterprise, it is necessary to assemble antennas that would cover the whole warehouse and collect data about goods within its range. Another required element of the system is a post, responsible for placing codes on the goods and programming of transponders, so data contained in it would correspond to the actual state of goods that they are fastened to. An important element that such post must be equipped with is also a reader, allowing that data from a transponder to be saved in the system (Fig. 12.). To increase automation, the manual reader can be replaced with an RFID gate, which allows that every good transferred by it will end up in the system.
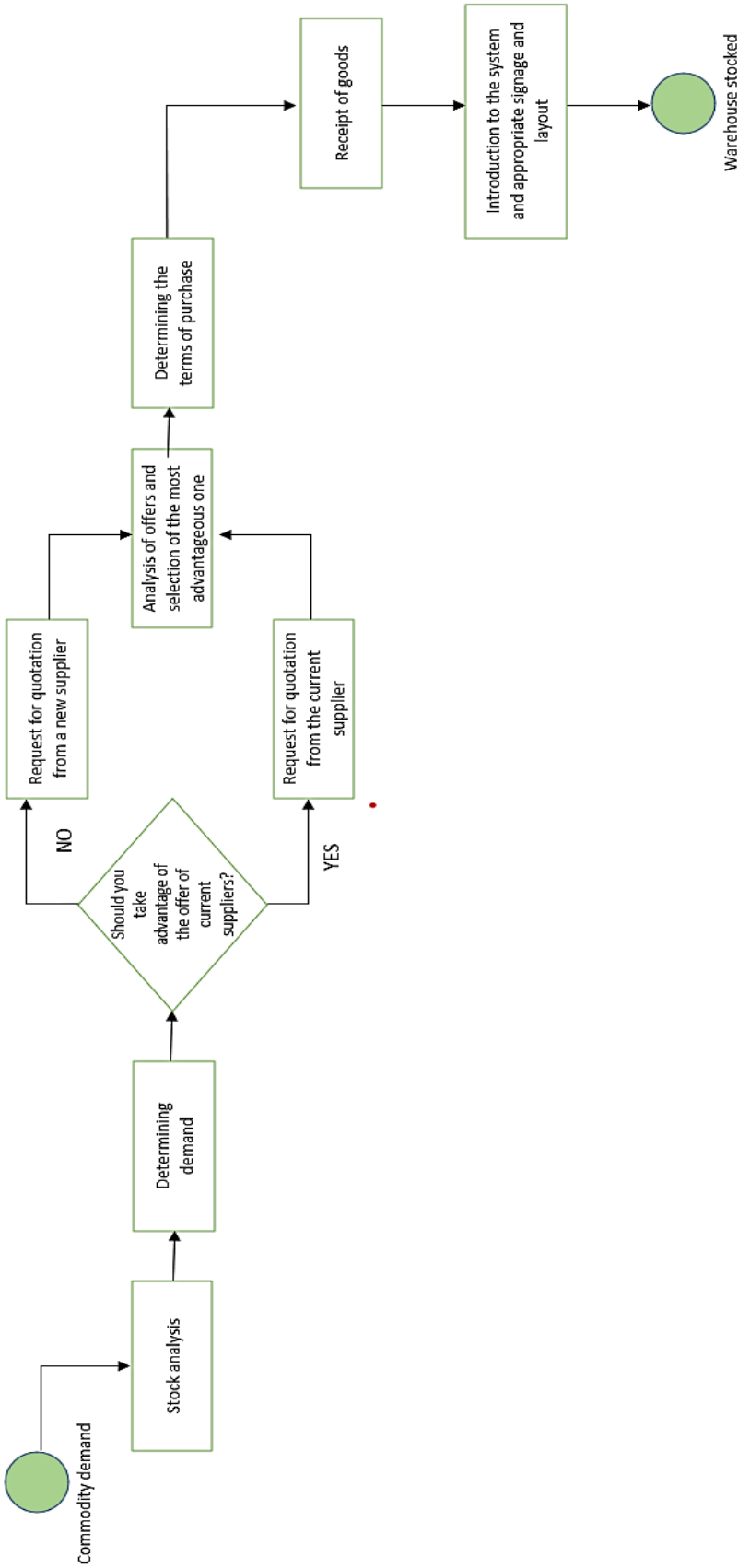
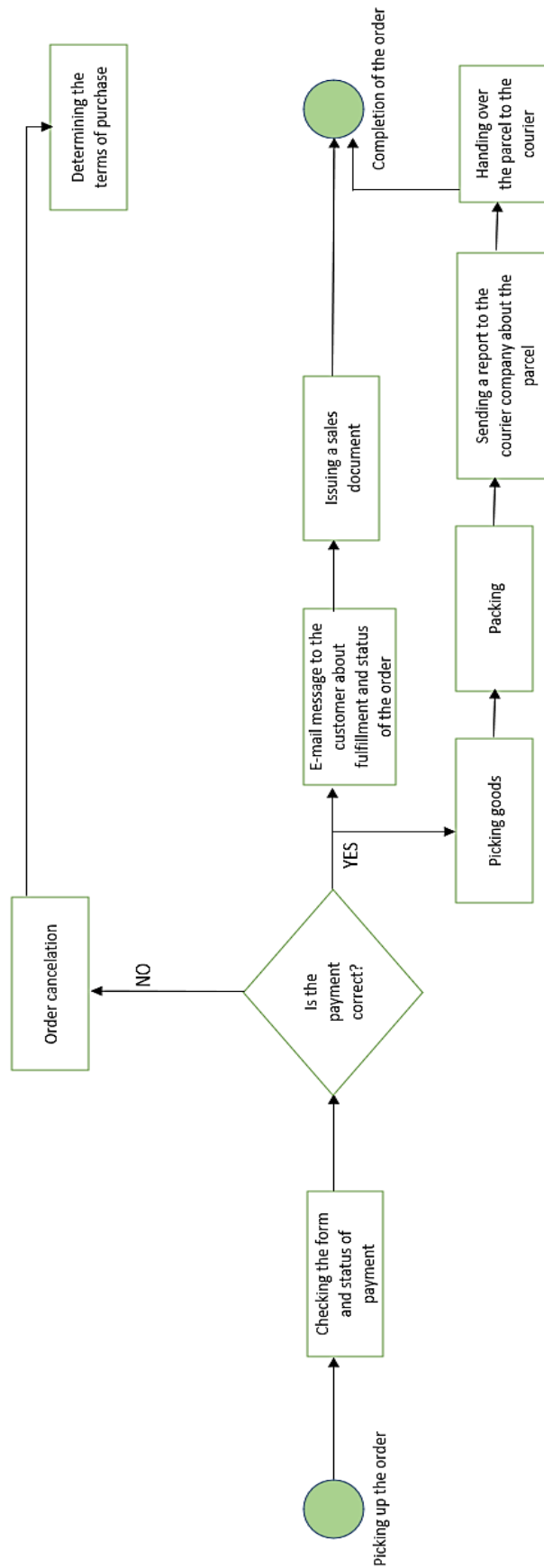Fig. 9. Algorithm of the supply process in the enterprise

Fig. 10. Algorithm of the goods distribution process in the enterprise
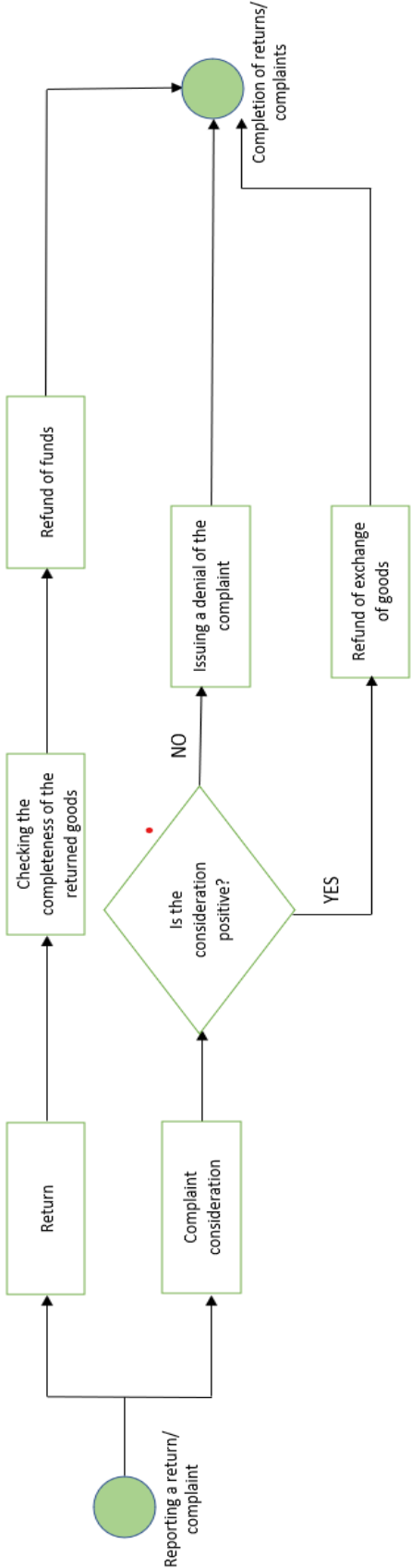
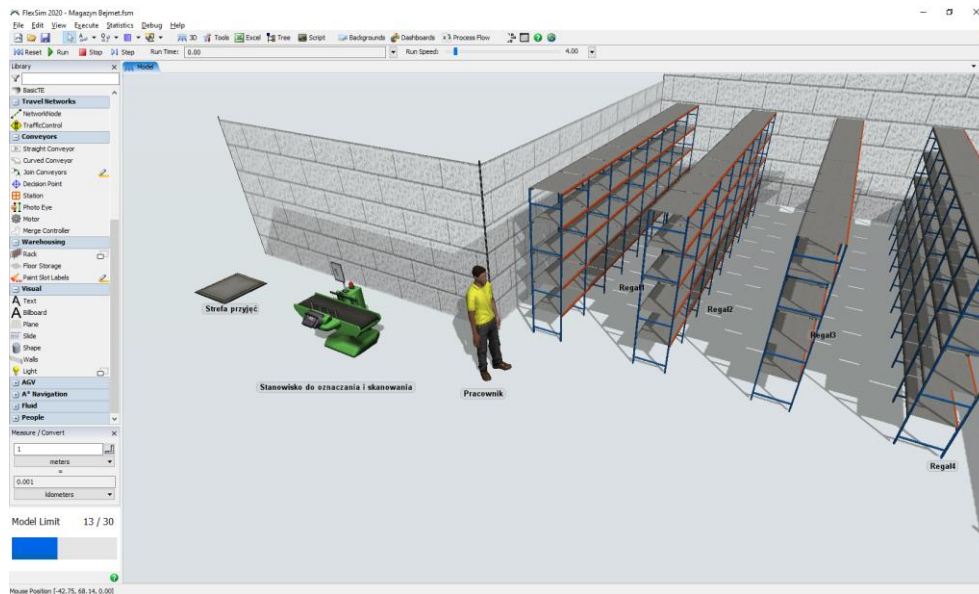Fig. 11. Algorithm for the return/ complaint process of goods in the enterprise

Fig. 12. Design of the receiving area of the warehouse of the analyzed company using
the Flexsim environment [23]

Apart from technical aspects of implementation of RFID, IT system must also be implemented in an enterprise with initial data such as the base of suppliers, goods, employees and appropriate authorizations allowing the employees to use the system. Remaining data is entered into the system in an automatic way. Thanks to RFID, the process of entering goods into the warehouse system does not require every good to be individually entered into the company's system every time, and partial automation can make it faster. Upon implementation of RFID in the enterprise, only labelling of goods using appropriate labels and scanning it will have to be done. After performance of such an operation, no other actions will be required, goods will be automatically entered into the warehouse's system and put on the racks in the warehouse. The process of arranging goods in the case of the analyzed company, owing to the limited space and high level of filling, is not automated and is executed by the warehouse employee (Fig. 13.) [23]. In contrast with manual entering of every good individually, RFID technology allows accelerating this process by scanning many codes at the same time. Apart from speeding up this process, this technology allows reducing the risk of mistake connected with wrongly identified goods, or wrongly entered. In the event of the analyzed enterprise, minimizing the risk of an error is particularly important because despite small warehouse storage space, a very broad assortment is kept there, which hinders the warehouse processes. Another advantage of this system is an option of tracking current stock level, which makes management of reserves and keeping smaller stock levels easier, and also minimizing the risk of a mistake and occurrence of goods shortages.

In the event of an e-commerce industry, a very significant factor shaping the high quality of customer service is time. The speed of execution of an order is very significant because it has a real impact on satisfaction of the customers and increases the probability that customer will choose a specific company next time. Apart from duration of executed order, certainty, and reliability are also key factors, which in the event of an e-commerce industry can be achieved through eliminating the errors during completion of an order. The abovementioned factors are impacted by RFID, as current access to information for an employee dealing with completion allows for executing this process in a quicker manner. As well as avoiding any errors connected with taking incomplete packaging, which is crucial for enterprises dealing with retail trade.
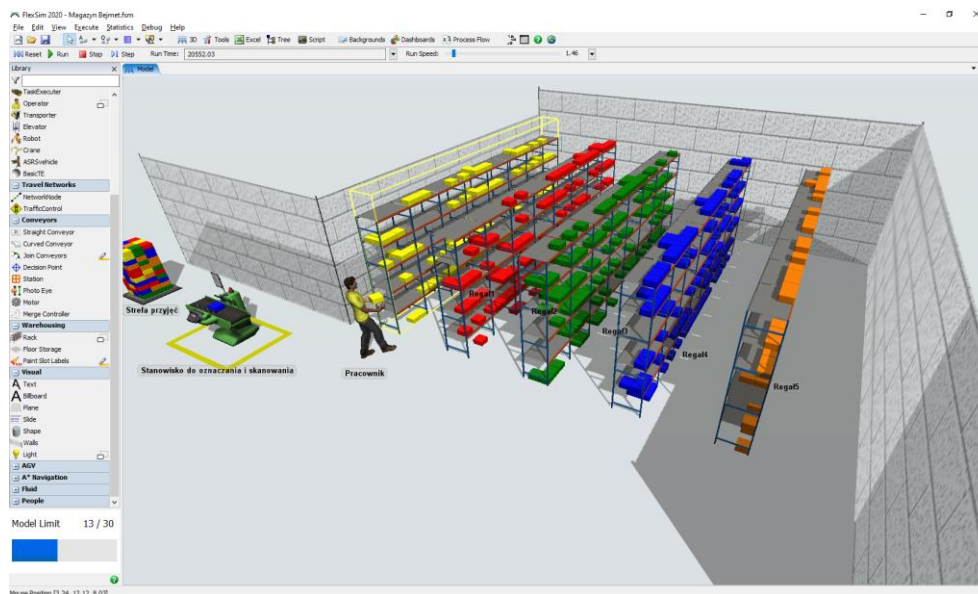
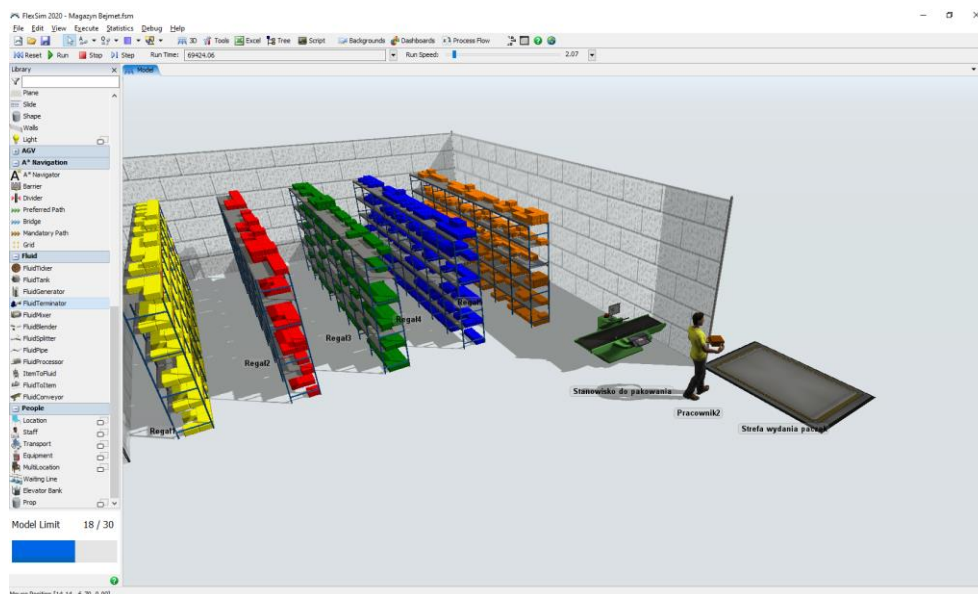Fig. 13. Warehouse design of the examined company

Fig. 14. Warehouse design – packing and picking zone

RFID makes the process of completion easier and more efficient, and the risk of making a mistake is minimized. Radio terminals make it possible for warehousemen to receive information about what goods and quantities are needed for a specific order. The process of completion begins with the receipt of a confirmed order to the warehouse, and then the employee uses information obtained from the system equipped with a set of antennas and transmitters that locate systematically all goods and show a warehouseman the exact location of goods necessary for execution of the current order. Knowledge of the exact location of goods allows avoiding time-consuming search for a given good, which is particularly onerous in the event of a wide assortment (Fig. 14.) [23]. When appropriate objects are found, an employee may start the process of packing and sending a parcel to the customer. With the use of RFID,

goods taken from the warehouse are automatically removed from the stock levels. No interference is required from an employee, which minimizes the risk of making any mistake, for example, removal from the system wrong amount of a given good.

5. AN ANALYSIS AND SELECTION OF OPTIMAL COMPLETION ROUTE FOR THE WAREHOUSE OF THE ANALYZED ENTERPRISE

The duration for execution of a given order largely depends on how a specific warehouse is run. Proper planning of works allows doing warehouse tasks more efficiently, for example, completion of goods and delivery to the customer. While optimizing the warehouse tasks, we must also remember about correctness of completion, so goods delivered to the customer are those ordered by him/her. The combination of fast and careful completion assures proper planning of completion route, that is, the distance covered by a warehouseman to collect the goods located in a storage zone that he/she needs for execution of the orders.

One of the most popular methods is the S-Shape. According to this method, a warehouseman during completion moves around the route shaped like letter S (Fig. 15.). The completion starts from taking an assortment container, then the employee enters the alley where he/she can find required good. If he/she takes all goods from a given alley, then goes to the end of racks and turns to the nearest point that he/she was not in and where goods from a completion list can be found. RFID can be used to find goods in alleys and avoid entering the alleys only to look for goods.

In the event of application of the S-Shape completion route in the simulation of the warehouse of the analyzed enterprise, an employee can finish within an hour on average 6 completion cycles starting from taking empty packaging, covering full route using S-Shape guidelines and delivery of goods to the packing station. In the event of the analyzed enterprise, full cycle also includes packing of completed goods by an employee and in such a case, an employee can finish within one hour 5 full cycles (completion, packing). The average duration of a full cycle, assuming also return to an initial place, is 10 minutes and 51 seconds (Fig. 16.).

Another method that can be applied in completion of goods is the Return method. The route in this method is the following: warehouseman goes through each of the alleys, in which goods necessary for execution of an order can be found. An employee completing goods enters selected alleys with necessary goods as far as necessary goods will be taken, and then returns to the main corridor that he/she goes to the next alley where necessary goods can be found (Fig. 17.).

Using the Return method in the event of the warehouse of the analyzed company, warehouseman is able on average to finish 5 cycles that include completion and packing and return to the initial point. Full cycle and return to the start in this case lasts 12 minutes and 14 seconds (Fig. 18.).

Another method of determining completion routes is the Midpoint method. This method assumes the division of the warehouse into two equal halves. A warehouseman, while completing an order, enters the first alley, in which he/she can find the good that he/she needs, then collects all goods from the list, but assuming that he/she cannot exceed the agreed half of the warehouse. When the warehouseman reaches the half or collects the good earlier, he/she moves back to the main alley and repeats the process entering other alleys. When he/she reaches the last alley, he/she must cover it fully to analogically conduct this process from the other side of the racks. When the whole process is finished, he/she goes through the whole alley again to return to the initial point (Fig. 19.).
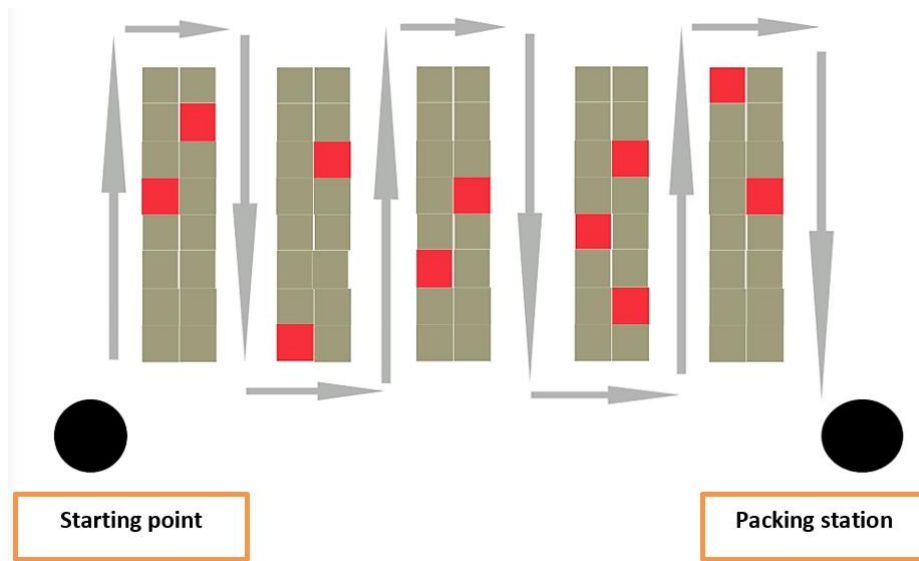
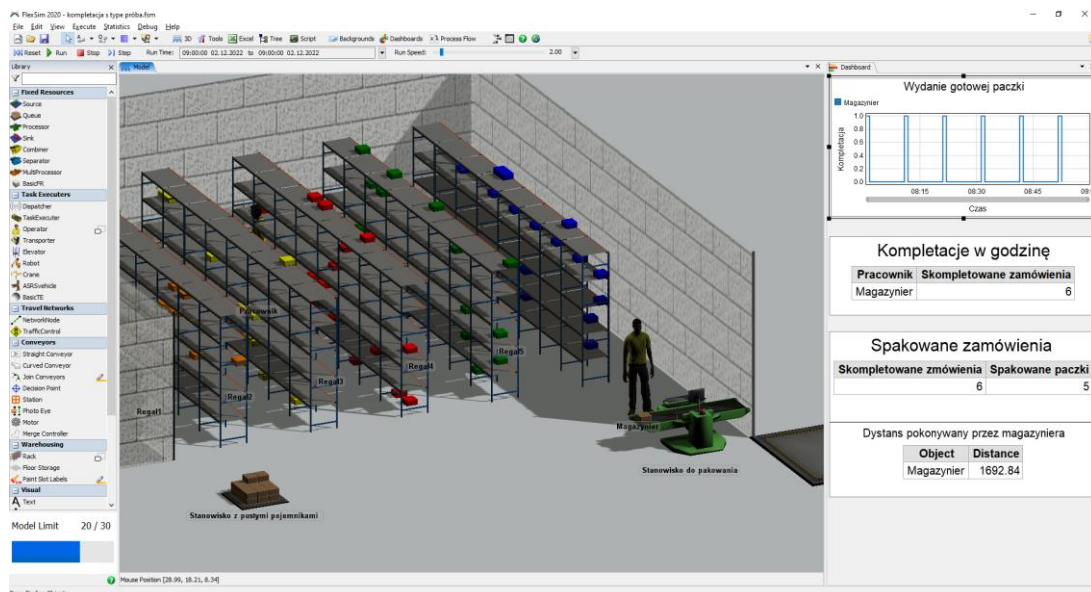Fig. 15. Diagram of the S-Shape completion route

Fig. 16. Simulation of the picking route using the S-Shape method on the example of
the warehouse of the examined company [23]

Using the Midpoint method in the designed warehouse of the analyzed enterprise, an employee responsible for completion will be able to finish on average 5 cycles consisting of completion and packing. Duration of full cycle along with return to an initial place is 11 minutes and 43 seconds (Fig. 20.).

In the warehouse of the analyzed enterprise, the best method of determining a completion route, considering the results of simulation, is the S-Shape method. The results are not considerably different in comparison with other methods because using each of them, warehouseman was able to finish 5 full cycles (completion and packing), but unlike others, in S-Shape method within one hour, he/she has enough amount of time to finish completion of

the next, 6th order. Another factor showing that the S-Shape solution is the best method, is the distance that the employee must cover while completing goods and returning to an initial place, which in the event of this method was the shortest.
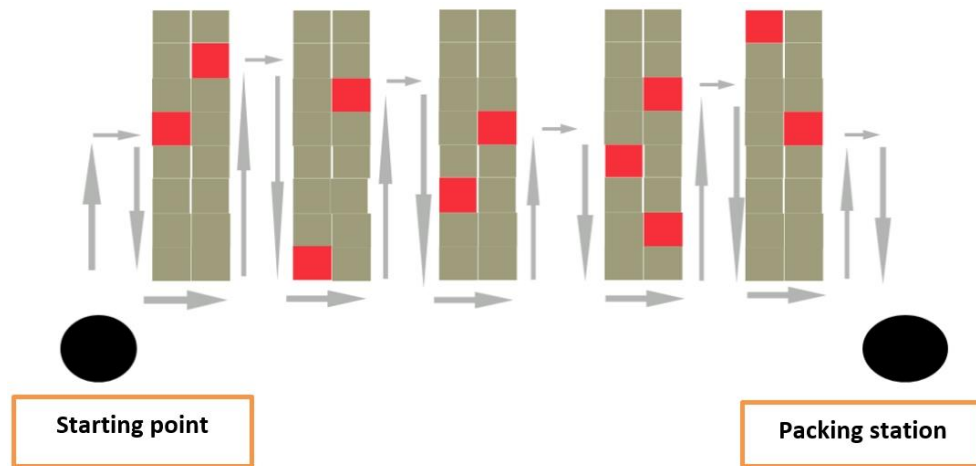

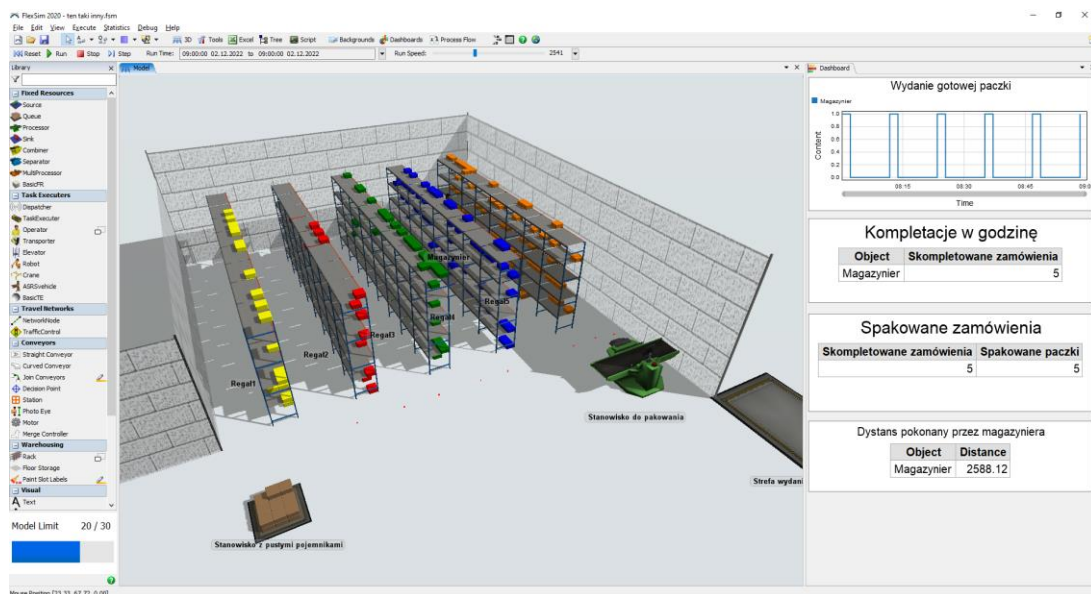Fig. 17. The Return method picking route diagram

Fig. 18. Simulation of the picking route using the Return method

Moreover, taking into account volume, arrangement of racks and the best completion route in the warehouse of the analyzed enterprise, an optimal solution may be application of the XYZ method. X goods were marked yellow, Y goods were marked green, whereas, Z goods were marked blue in the simulation (Fig. 21.).

Locating the goods that there is a regular demand for, and they have a considerable share of the total number of sold goods in an enterprise on the first racks, may result in acceleration of completion route. It results from the fact that goods that are most often sold can be found in the most of executed orders; therefore, they are most often taken from the warehouse.

When an employee goes through the completion route, he/she starts it from the rack number 1, and then moves to the others. Shortening the time of execution of this process results from the possibility of visiting lower number of racks because if an order includes only goods that are frequently sold or even seasonal, then warehouseman will not have to move next to a rack containing goods that are rarely sold, which will result in shortening the route and shortening the time necessary to do it. This solution allows managing the reserves more efficiently, and also largely facilitates and shortens the process of finding goods by a warehouseman, which really affects shortening the time of parcel preparation while maintaining a high quality of completion. Whereas, such actions result in increased satisfaction of the customers, which influences the development of an enterprise.
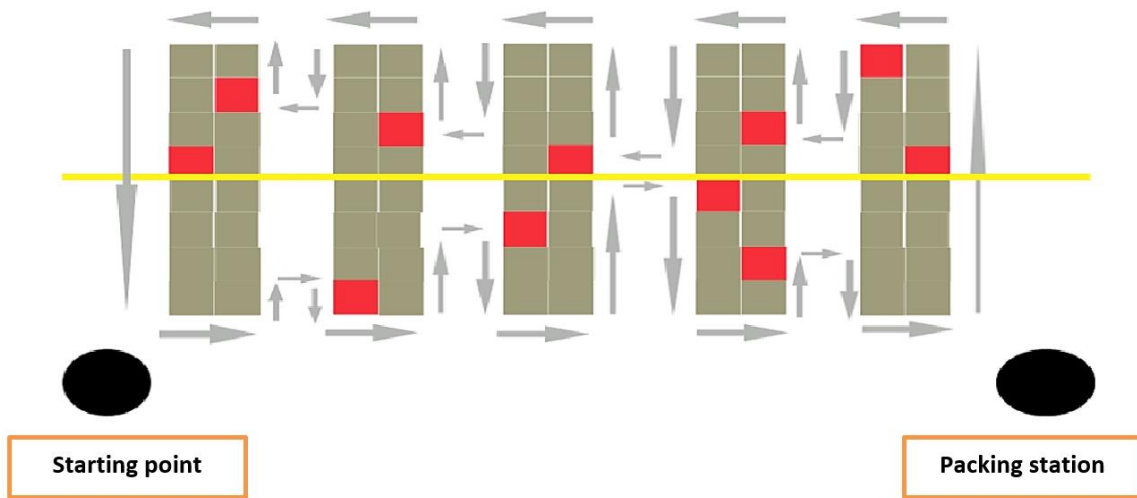

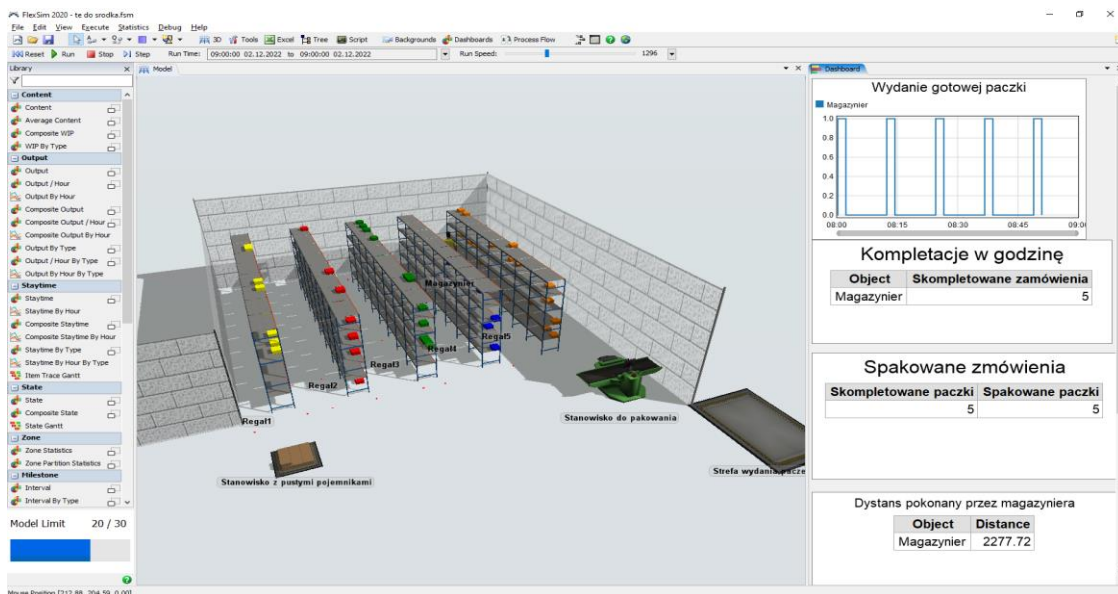Fig. 19. The Midpoint method picking route diagram

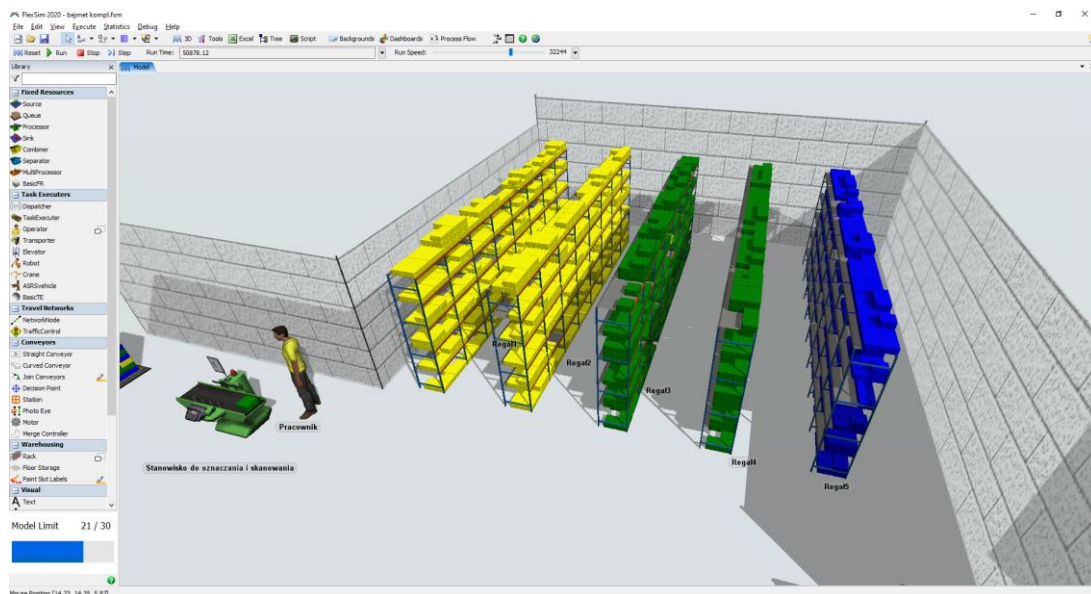Fig. 20. Simulation of a picking route using the Midpoint method

Fig. 21. Simulation of the method of arranging goods in the warehouse of the examined
enterprise using Flexsim environment

6. CONCLUSIONS

An analysis of logistics distribution of the selected enterprise shows that for the purposes of efficient functioning of a company in an e-commerce industry, it is important to adopt a proper strategy and constantly improve the execution of the processes in an enterprise. In the event of action strategy in the analyzed enterprise, the warehouse was the key place that we could seek improvements in. In the article, we improved the execution of warehouse processes through adopting an appropriate strategy of distribution of goods in the warehouse and selecting an optimal completion route.

As a result of conducted research on completion routes in the warehouse of the analyzed enterprise, it was found that selecting an appropriate diagram of the S-shape completion route allows speeding up completion to 10 minutes and 51 seconds, allowing in comparison with remaining methods such as the Return method to save 1 minute and 23 seconds and 52 seconds in comparison with the Midpoint method, which enables to increase the number of completions within a specific time. As a result of conducted modelling and simulations, a of distribution of goods in the warehouse space to improve the processes in the analyzed enterprise has been proposed.

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