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UTILIZATION OF BIG DATA ANALYTICS FOR LOGISTIC PROCESSES ENHANCING

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ВИКОРИСТАННЯ BIG DATA АНАЛІТИКИ ДЛЯ ПОКРАЩЕННЯ ЛОГІСТИЧНИХ ПРОЦЕСІВ

The relevance of the research is driven by the fact that the greatest impact of employing Big Data is on logistic processes of manufacturers, suppliers, and mass servicing enterprises. The increase in trade, increasing complexity of supply chains, and process optimization need compel economic entities to seek effective ways to manage the organized sequence of logistics operations over time, to the extent that it allows for the maximum alignment of interests among all participants in the logistics chains. The goal of the article is to identify the specifics of employing Big Data analytics to enhance logistical processes. It has been demonstrated that the utilization of Big Data analytics enables rapid optimization of logistical processes across various business sectors. The optimization effect is formed through transformations of logistical flows based on the nature of their inherent organization, available connections with suppliers, and circulating flows of goods and services. Based on the research findings, it has been concluded that the application of Big Data is a multi-level process oriented towards various directions. Among such directions are the enhancement of the supply chain (through data collection, demand forecasting, and procurement process adjustments), improvement of internal logistical flows (via efficient inventory management and goods redistribution within the

enterprise), elevation of departmental coordination (by ensuring smooth internal process operations), enhancement of customer interaction (by adapting product and service assortments to consumer needs), and improving service and customer satisfaction (through personalized offers and loyalty programs). The practical significance of the research lies in demonstrating the fact that the overarching goal of employing Big Data analytics in logistical processes is to enhance their efficiency and service content. Furthermore, the prospects for further research involve the development of mechanisms that allow manufacturers, trading, or logistic companies to more accurately respond to changes in both internal and external environments

Актуальність дослідження зумовлена тим фактом, що найбільший вплив від застосування Big Data припадає на логістичні процеси виробників, постачальників та підприємств сфери масового обслуговування. Зростання обсягів товарообігу, складності постачання та необхідність оптимізації цих процесів змушують суб'єктів господарювання шукати ефективні способи управління організованою у часі послідовністю виконання логістичних операцій, тою мірою, за якої можливо максимально наблизитися до гармонізації інтересів всіх учасників логістичних ланцюгів. Метою статті є визначення специфіки використання Big Data аналітики для покращення логістичних процесів. Доведено, що використання Big Data аналітики дозволяє швидко оптимізувати логістичні процеси у різних сферах бізнесу. Оптимізаційний ефект досягається шляхом трансформації логістичних потоків, які відрізняються за характером їх організації, змістом внутрішніх зв'язків з постачальниками та особливостями циркуляції продукції, товарів та послуг. За результатами дослідження можна зробити висновок, що застосування Big Data є багаторівневим процесом, спрямованим на різні напрямки покращення. Серед можливих напрямків: покращення ланцюга постачання (через коригування закупівельних процесів); покращення внутрішніх логістичних потоків (через ефективне управління складськими запасами та перерозподіл товарів у межах підприємства); покращення рівня координації між відділами, покращення взаємодії із клієнтами (за результатами адаптації асортименту товарів та послуг до потреб споживачів), покращення рівня обслуговування та задоволення потреб клієнтів (за результатами формування персоналізованих пропозицій та програм лояльності). Практична значущість дослідження полягає у підтвердженні того факту, що основною метою використання Big Data аналітики у логістичних процесах є підвищення їх ефективності та сервісного змісту. Крім того, перспективи подальших досліджень передбачають розробку механізмів, які дозволять виробникам, компаніям масового обслуговування або логістичним компаніям точніше реагувати на зміни як внутрішнього, так і зовнішнього середовища.

Key words: logistical operations; logistics companies; manufacturers; primary revenue stream; supply chain; optimization

Ключові слова: логістичні операції; логістичні компанії; виробники; основний потік доходів; ланцюг постачання; оптимізація.

TARGET SETTING

In today's world, vast amounts of data, commonly known as Big Data, have transitioned from sources of information to powerful tools for tackling diverse tasks aimed at enhancing the fundamental processes of economic entities generating primary revenue streams. One of the processes significantly influenced by the application of Big Data analysis is the logistical processes of manufacturers, suppliers, and enterprises in the mass servicing sector. The increase in trade volume, complexity of supply chains, and the need for process optimization compel economic entities to seek effective ways to manage the organized sequence of logistical operations over time, to the extent that it allows for the maximum alignment of interests among all participants in the logistics chains.

ANALYSIS OF RESEARCH AND PUBLICATIONS

An analysis of scientific works by domestic authors in logistics, including Kolyadenko O. L., Chornopyiska N. V.,

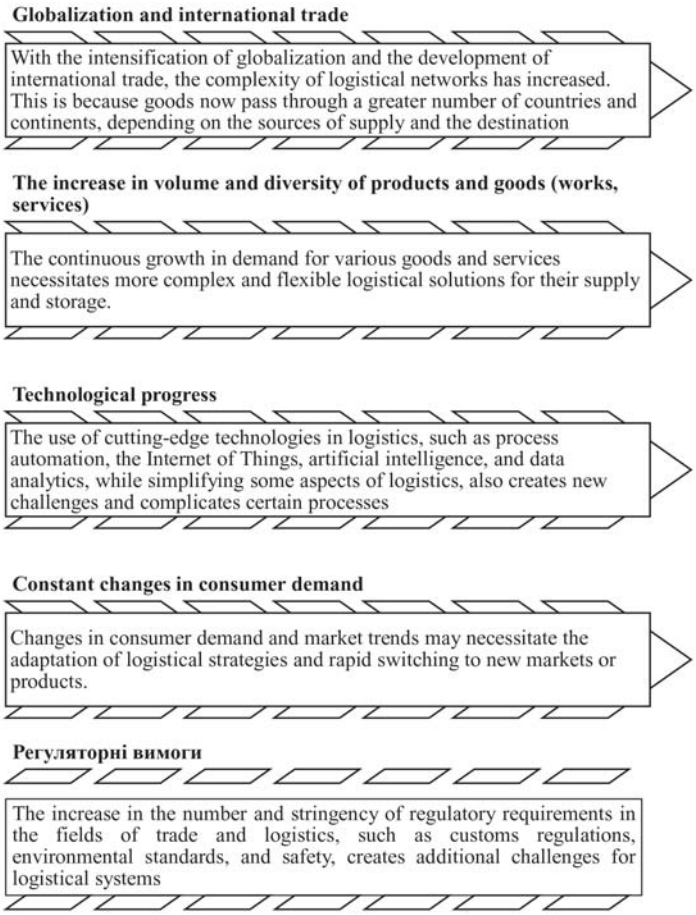

Figure 1. Reasons for the increasing complexity of logistical processes over time

Source: formed based on [1; 3—4].

Shandrivska O. Ye., and Mishchuk I., has shown that there is insufficient development regarding the specifics for improving logistical processes. Additionally, insufficient attention has been paid in economic research to the utilization of Big Data analytics in logistical processes.

THE WORDING OF THE PURPOSES OF ARTICLE (PROBLEM)

The goal of the article is to identify the specifics of employing Big Data analytics to enhance logistical processes.

THE PAPER MAIN BODY WITH FULL REASONING OF ACADEMIC RESULTS

Within the study, attention is drawn to the fact that logistical processes are increasingly becoming more complex over time. It is evidenced that this complexity arises due to the intensification of globalization and the development of international trade, the constant growth in demand for diverse products and services (requiring more complex and flexible logistical solutions for their supply, storage, and delivery), the utilization of advanced technologies in the logistics sector, and so on (see Figure 1).

As a result of the outlined arrangement, logistics processes do not simply revolve around logistical functions. They have become complex. They encompass loading, unloading, warehousing, dispatching of goods, transporting, and storage of goods, receiving and releasing goods from warehouses, transshipment, sorting and assembly, consolidation of goods, collection, storage, and transmission of information about goods, dealings with suppliers, cargo insurance, transfer of ownership rights to goods, customs clearance, and others. This complexity leads to the fact that quality execution of logistics processes is impossible without proper attention to the inherent parameters of space, time, form, and qualitative properties of logistical flows.

Improving logistics processes is a complex task that requires a set of actions. This set of actions should ensure the harmonization of interests among producers, suppliers, and consumers through the alteration of spatial (location), temporal, formal, and qualitative parameters of logistical flows by utilizing specialized methods and tools for analyzing large volumes of data.

Therefore, it is evident that while the nature of improving logistics processes varies depending on who performs them (producers, entities operating in the mass service sector, or logistics companies as suppliers [3]), it equally demands powerful Big Data computational resources and specialized algorithms tailored for their processing and interpretation. The primary goal of Big Data analytics is to uncover valuable insights, trends, and dependencies within massive datasets that can be utilized for making strategic and tactical decisions across various industries and domains.

It is worth noting that Big Data analytics can be utilized to improve logistics processes in the following ways:

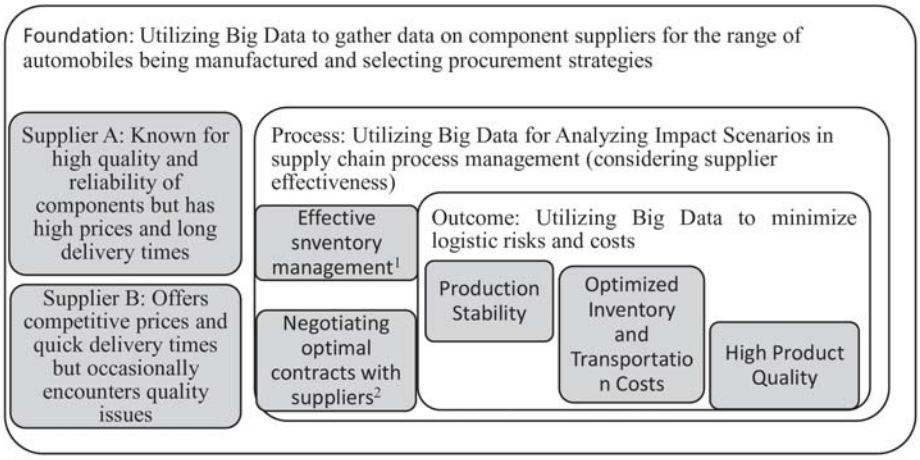

Figure 2. Utilizing Big Data Analytics to Enhance Logistic Processes at Opel Automobile GmbH

Note

1 The manufacturer carefully analyzes demand data, forecasts component needs, and plans orders with each supplier in advance. This allows for efficiently adjusting inventory levels (considering production and operational cycle lengths, cost reduction needs).

2 The manufacturer carefully analyzes the pool of components available under contracts to ensure their availability at the required times, thus avoiding production disruptions and ensuring acceptable product quality.

Source: formed based on [1—2; 4].

— Enhancing the parameters of incoming resource flows by improving relationships with suppliers. This process is a priority for manufacturers and entities operating in the mass service sector.

— Improving internal flows by optimizing results and coordination among departments within an enterprise. This process is prioritized for logistics companies.

— Enhancing connections with consumers by ensuring the most accurate alignment of output flows of goods and services with their demands. This process is prioritized for entities operating in the mass service sector.

So, relationships with suppliers are a critical element for manufacturers and trading enterprises, as effective management of supply processes determines the availability of necessary production resources or the breadth of the available product offering. The use of Big Data analytics in this direction enables [1—2; 4; 6]:

1. Forecast demand and adjust procurement strategies. The availability of large volumes of data on previous orders, market trends, and other factors enables manufacturers and trading enterprises to forecast changes in demand for products, and goods (works and services) in real-time and react to them by adjusting procurement strategies.

2. Supply chain optimization. Big Data analytics enables the assessment of supplier effectiveness, identification of opportunities for optimal agreements with suppliers, and enhancement of inventory management in both manufacturing and trading enterprises.

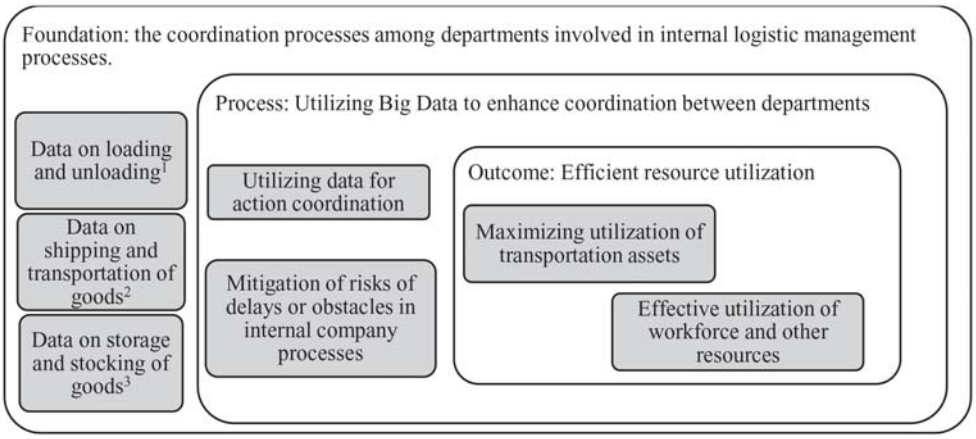

Figure 3. Utilizing Big Data Analytics to Improve Internal Logistic Flows at Kuehne+Nagel Company

Note

1 Analyzing data on loading/unloading times at various ports or terminals can assist a logistic company in making decisions regarding the selection of the most efficient routes and resource allocation

2 Analyzing data on transportation routes, variations in weather conditions, traffic, and other factors allows for optimizing routes and transportation schedules to reduce delivery times and costs.

3 Utilizing Big Data enables logistic companies to effectively manage warehouse inventory, determine optimal storage techniques, and arrange goods placement to maximize space utilization and reduce costs.

Source: formed based on [1;3—4;6].

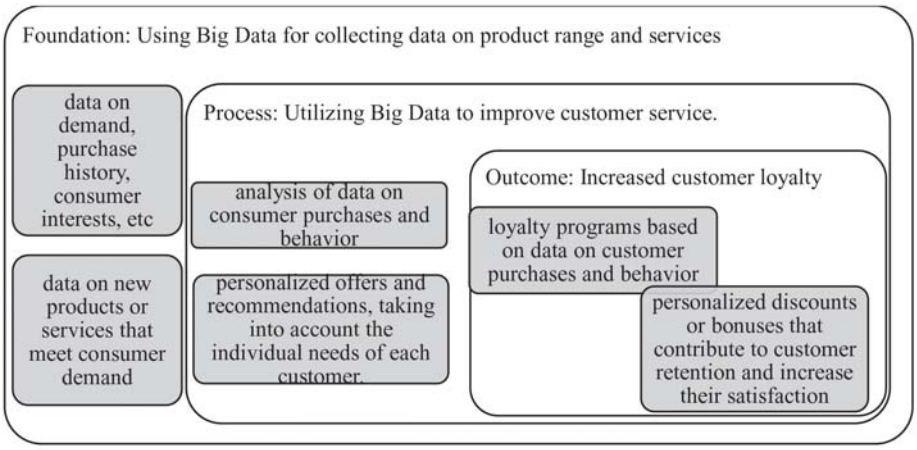

Figure 4. Utilizing Big Data Analytics to enhance customer relationships at LLC "Novus Ukraine"

Source: formed based on [1—2; 5].

3. Minimization of logistical risks and costs. Data analysis helps identify potential risks in the supply chain and take preventive measures, such as finding alternative suppliers or diversifying sources of supply.

The outlined specificity of using Big Data analytics to improve logistic processes can be examined based on the experience of the automobile manufacturer Opel. It should be noted that the optimization of supply processes for such a manufacturer is crucial, as it determines the availability of necessary components for automobile production. Naturally, the manufacturer develops partnerships with several suppliers of various components (such as engines, chassis, electronics, etc.) and aligns the application of Big Data analytics according to the specificities outlined in Figure 2.

In addition, effective logistics management occurs when the manufacturer carefully analyzes demand data, forecasts component needs, and plans orders with each supplier. It ensures the availability of necessary components at the right time, avoids production disruptions, and ensures high product quality.

Inefficient logistics management occurs when the manufacturer fails to utilize data analytics, and places orders for components too late or too early, sometimes even without considering demand forecasts or component quality. It can lead to excessive inventory, losses from production delays, and a negative impact on product quality.

Internal logistic flows are the main object of management for logistic companies (as they reflect the organized movement of goods, information, and resources within the enterprise). The application of Big Data analytics to improve the logistic processes of such companies involves [1; 3—4;6]:

1. Optimization of internal logistic management processes. The availability of large volumes of data on internal operations helps identify the efficiency of loading, unloading, stocking, shipping, transportation, and storage processes, identifying opportunities for optimization and automation of these and other processes.

2. Improving coordination between departments of the logistics company. Specifically, using data allows for identifying issues in the alignment of actions among different enterprise departments and taking measures to address them.

3. Ensuring efficient resource utilization. Data analysis helps identify underutilized resources and opportunities for their optimal utilization.

Given the specifics of using Big Data analytics to improve internal logistic flows, let's consider it based on the experience of the logistic company Kuehne+Nagel, specializing in international freight transportation. It's worth noting that the optimality of internal logistic management for such a company leads to cost reduction and increased competitiveness. Naturally, the company enhances coordination between departments regarding resource utilization, aligning with the specifics of employing Big Data analytics as outlined in Figure 3.

Improving connections with consumers is an extremely important aspect for entities operating in the mass servicing sector, as it allows for the most accurate alignment between outgoing flows of goods and services and consumer demands. So, utilizing Big Data analytics in this direction allows for [1—2; 5]:

1. Adapting product range and services. Data analysis enables understanding consumer needs and preferences, adapting the range of goods and services accordingly.

2. Improve customer service: Data analysis enables improving service and meeting customer needs by ensuring fast and high-quality delivery of goods and other services.

3. Increase customer loyalty: Utilizing Big Data allows for developing personalized offers and loyalty programs, promoting customer retention and increasing satisfaction.

Taking into account the specified specifics of using Big Data analytics to improve customer relationships, let's consider it based on the experience of the retail company LLC "Novus Ukraine". It's worth noting that the optimality of logistic processes for such a company contributes to increased profitability and competitiveness in the market. Naturally, the trading company utilizes Big Data analytics to determine consumer needs, service peculiarities, and their loyalty level, according to the specifics outlined in Figure 4.

Taking into account the above provisions, it is evident that the optimization effect of using Big Data analytics is formed through transformations of logistic flows based

on the nature of their organization, available supplier relationships, and circulating flows of goods and services.

Conclusions from this study and prospects for further exploration in this area. У Moreover, the optimization effect is formed through transformations of logistic flows based on their inherent organizational characteristics, available supplier relationships, and the circulation of goods and services. Based on the research findings, it is concluded that the application of Big Data is a multi-level process oriented towards:

1. Improving the supply chain by collecting data, forecasting demand, and changing procurement strategies based on real data on product demand.

2. Enhancing internal logistic flows through improved inventory management processes and intra-company goods redistribution.

3. Increasing departmental coordination through ensuring smooth internal process operations.

4. Improving customer interaction by adapting the product and service range to consumer needs based on analysis of their consumption behavior.

5. Enhancing customer service and satisfaction through the creation of personalized offers and loyalty programs.

The practical significance of the research lies in demonstrating the fact that the overarching goal of utilizing Big Data analytics in logistic processes is to enhance their efficiency and service content. Furthermore, the prospects for further research involve the development of mechanisms that allow manufacturers, trading, or logistic companies to more accurately respond to changes in both internal and external environments

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