

Impact of Data Technology on Logistics Industry Business Performance

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Abstract. In the big data era, more and more people elect to conduct their business online, and logistics firms are expanding in tandem with the quick growth of e-commerce platforms. However, since the outbreak of the epidemic in 2020, it has dealt a heavy blow to the whole world. Despite the economic downturn and difficult development in this particular period, it has also brought challenges and opportunities for logistics companies. The study finds that the effectiveness of logistics companies in managing their warehouses can be improved through the use of AI-driven data analytics and machine learning solutions; the impact of big data on the business performance of the express logistics industry; AI helps optimize the entire supply chain by providing insights on supplier performance, locating bottlenecks and suggesting process improvements; Big Data enables precise demand projections and coordinates supply chain operations with these estimates by using data analytics algorithms; and Big Data analytics and algorithms can help logistics companies improve cost control and resource utilization efficiency from transportation, warehouse management, distribution and other aspects. In addition, the study found that the application of big data can bring about ethical problems in logistics information, which negatively affects the property security and personal safety of both consumers and logistics companies.

Keywords: Big data, logistics industry, AI.

1. Introduction

Following the pandemic's inception in 2020, big data has entered a period of explosive growth. Internet employment, distance learning and shopping are all growing in popularity. This article focuses on the unique ways businesses are utilising data technology to enhance business performance. Utilizing a variety of tools, systems, and methodologies for the purpose of collecting, managing, analysing, and utilising data to drive better decision-making, streamline operations, and improve overall business outcomes is what is meant by the term "data technology" when referring to improving the performance of a business. Using data technology enables businesses to gather useful insights, recognise patterns, and find possibilities for development and improvement, all of which can help the firm succeed. This article will highlight the impact that data technology has had on logistics organisations by using examples from logistics companies as a case study. This study makes use of a literature review methodology for its investigation, utilising CJ Logistics and SF Express as illustrations of several types of theoretical corroboration. This research paper suggests that data technology can deliver improved business performance for logistics organisations. The purpose of the paper is to investigate this claim. In addition to the difficulties and emerging tendencies of big data. Logistics companies rely significantly on big data analytics to enhance their operations and customer experience. With the advent of e-commerce and online shopping, the demand for efficient and dependable delivery services has skyrocketed, Professional third-party logistics firms came into existence as a result of the acceleration of economic globalisation and the further development of the social division of labour. As a result, big data will affect company models, people's lives, and the course of social and economic growth more quickly in the future, which will undoubtedly benefit the logistics sector more [1]. In order to cut costs and increase productivity, many companies now

outsource their logistical operations. New methods of dividing up work like giving, volunteering, and donating will become the norm. [2]. The delivery business largely relies on big data analytics to optimise operations, enhance customer experience, and maintain competitiveness in a continually expanding market. By utilising big data analytics, delivery organisations can establish more efficient delivery systems, improve tracking information, acquire insights into consumer behaviour, do predictive maintenance, and avoid fraud.

2. Analysis of Data Technology Application in Logistics Industry

2.1. AI for Logistics

AI has continued to grow and gain traction in recent years. Computing technologies that have been created to sense, learn, reason, and behave correctly make up artificial intelligence. With the development of technologies include mobile computing, web data processing and machine learning, and the ability to store vast amounts of data online, etc. Artificial intelligence has been used in a variety of commercial areas, where it has been demonstrated to lower costs, boost revenue, and better utilise assets [3].

The efficiency with which logistics businesses manage their warehouses and supply chains can be considerably increased by the use of AI-powered data analytics and machine learning solutions. These businesses can increase productivity, cut expenses, and make wiser decisions by utilising AI. From a warehouse management perspective, robotic process automation, automated storage and retrieval systems, and intelligent inventory management are all ways AI-enabled solutions can improve warehouse operations. Numerous AI warehouse applications have been suggested [4]. For example, knowing and anticipating sales tendencies is useful for inventory management and supply-chain planning [4]. According to Juniper Research, artificial intelligence-based demand forecasting is predicted to more than triple by 2023 [5]. The logistics sector is currently trending towards the establishment of intelligent warehouse management. As science and technology have advanced, information technology has become more widely used in the logistics sector. To get around the shortcomings of current parcel detection and tracking methods, a big data-based intelligent logistics inspection system that uses a deep learning-based methodology was presented [6]. The study's subject is a collection of platform data from unattended monitoring stations using a variety of data sources. The system's job is to collect parcel flow information from each unattended monitoring point, upload it to the warehouse's scheduling system, and use that information to run the warehouse intelligently.

Artificial intelligence (AI) may help optimise the supply chain as a whole by providing insights into supplier performance, pinpointing bottlenecks, and suggesting process improvements. As a result of AI's data processing, analysis (automatically), and prediction capabilities, organisations can expedite their sourcing in terms of processing purchases and orders and save expenses connected with transportation, warehousing, supply chain management, etc. It can also help us spot trends and patterns that can inform our efforts to optimise manufacturing and distribution. For instance, this technology can help businesses reduce waste by just keeping on hand the exact number of units/products they expect to move [3].

What is more, data-driven analysis also improves sustainable development in the logistics industry, especially the concept of sustainable development has received more attention in recent years. Sustainability that is data-driven enhances low-carbon infrastructure, service delivery, and new product development [7].

However, smart logistics, which makes use of AI, ML, and DL, is still in its infancy. Much of the accepted research is theoretical, conducted in laboratories, or in its preliminary stages of development. There are currently no developed commercial applications. Alternatively, production process optimisation, machine setup, machine status, continuous reporting of quality parameter settings, predictive maintenance, decision support systems, inventory management, flow shop problems, traditional job shop scheduling problems, and improvements in identification and tracking methods are all promising research areas within operational logistics [8].

2.2. Logistics Companies' Distribution Plan Optimization by Big Data

Logistics organisations can obtain insights into their supply chain operations and utilise that knowledge to make better decisions about their distribution plans by leveraging the power of big data analytics.

All those can be achieved by analysing large amounts of data on customer demand patterns, inventory levels, and delivery times. Firstly, demand forecasting, by studying vast volumes of information on consumer behaviour, previous sales data, and industry trends, big data can assist businesses in more precisely predicting demand for their goods and services. Demand forecasting is a difficult task that might use more pertinent information and procedures. Therefore, by improving the accuracy and adaptability of mid-term sales and demand projections, agility is increased in extremely uncertain situations through the analysis of data from social media, point of sale, enquiry, and clickstream. After that, they can use this information to manage their production schedules and distribution plans. Supply chain management (SCM) initiatives aim to satisfy customer demand while minimising the overall cost of supply. Using data analytics algorithms could enable accurate (data-driven) demand projections and align supply chain activities with these predictions, thereby increasing efficiency and satisfaction [9]. Data is crucial to the inspection process, and CJ Logistics has developed an automated, intelligent logistics centre to increase operational effectiveness. This facility includes automatic volume measuring machines, box folders, intelligent handling robots, intelligent picking robots, eco-friendly buffer robots, and more. It also includes intelligent handling robots, intelligent movement robots, and digital twin technology. To verify that the overall weight of the ordered items matches the total weight of the packed goods, the weight checker consults weight data from earlier automatic volumetric scans. With the help of this automated technology, the Smart Logistics Center's efficiency has grown by about 12%, and the accuracy of the inspection is 99.95% [10].

Additionally, they can utilise data analytics to track and monitor shipments in real-time [11], enabling businesses to change and optimise their distribution strategies in response to changing circumstances like traffic jams, weather patterns, and other elements that may affect delivery delays [12].

Volume, variety, velocity, authenticity, and value have all been used in Big data. The term "volume" is the amount of information whose exponential increase is putting a strain on existing data storage methods. Sensors, the Internet of Things (IoT), mobile devices, online social networks, etc. are just a few examples of where one could find data. Structured, semi-structured, and unstructured formats are all possible throughout their creation. Data collection and delivery velocity can be handled in batches, in real-time, practically in real-time, or through streamlines, depending on the scenario [11]. The cooperative logistical delivery scheduling solution proposed in this research makes use of Internet of Things (IoT) technology, large amounts of data, and the cloud robot system. After collecting the massive amounts of data on logistics delivery resources and needs from logistics delivery firms over the Internet and/or IoT, and then creating a map of logistics delivery routes based on that data, the logistics delivery requirements are prioritised and the route that best meets those needs is selected. [12].

2.3. Logistics Companies Cost Control by Big Data

Logistics companies can use big data to optimize their cost control capabilities, improve the efficiency of resource utilization, and can optimize their logistics services.

In the process of logistics transportation, the size, type, and value of the goods, the required mode and timeliness as well as the problem of the time of loading the goods make it difficult for logistics companies to improve the loading rate and easily result in the waste of transportation resources. The intervention of big data can help logistics companies collect the timeliness requirements of express shipments, divide routes with different timelines, and improve the efficiency of the use of capacity resources. At the same time, as fuel costs account for a relatively large proportion of transport costs, big data analysis technology and artificial intelligence algorithms, and other technical analysis means

can help logistics companies build route optimization systems, shorten paths and transport times, reduce transport fuel consumption and thus reduce transport costs. Yao Yuanguo conducted a study on the optimization of distribution routes for agricultural cold chain logistics based on traffic big data research and established a distribution route optimization model based on real-time road conditions and feeder points, which was verified to be effective in reducing the cost of agricultural products and cold chain distribution and improving customer satisfaction [13]. In the warehousing sector, big data site selection technology can help enterprises reasonably plan the location and number of warehouses, while cooperating with the development of intelligent sorting equipment and upgrading the hardware and software equipment in the transfer station to improve the efficiency of goods transit and reduce the cost of warehouse management. In the process of goods distribution, data-driven logistics companies can build diversified distribution solutions, use smart courier cabinets, smart stations, and other terminal distribution products to improve distribution efficiency, release manpower and reduce distribution costs and manpower costs. At the outsourcing and management level, data can help logistics companies analyse information, achieve efficient sharing of information, and effectively help improve the efficiency of the use of external spare capacity. In terms of core competitiveness, SF has made use of the vast amount of data accumulated over the years and its expertise to achieve digital and intelligent innovation in logistics, establishing a big data technology company and laying out in advance in cutting-edge areas of technology such as artificial intelligence, big data and intelligent robots, and taking a leading position in a number of fields, accumulating new core competitiveness for the company [14]. In 2021, the survey report on satisfaction with delivery services released by the State Post Bureau showed that SF ranked first in the brand satisfaction ranking; at the same time, SF also ranked first in the list of "full time frame and 72-hour on-time rate", and was the first for eight consecutive years [15].

The rapid development of information technology in recent years has brought prosperity to China's e-commerce industry and greatly promoted the rapid growth of the logistics business. Even in the face of the impact of the novel coronavirus outbreak in 2020, China's logistics industry still withstood the pressure and realized the growth of performance. However, the logistics industry's lack of cost control ability and low efficiency of logistics links gradually emerged, limiting the further growth of the logistics business. With the help of data analysis, intelligent algorithms and other technologies, logistics companies can improve their cost control capabilities, optimise their logistics processes and increase the efficiency of their operations.

2.4. Logistics Information Ethics Issues Brought up by Big Data

The problem of logistics information ethics is raised by big data. Lv Yaohuai defines information ethics as "the standards of ethics that apply to the creation, dissemination, administration, and use of information, as well as the new ethical relationships established as a result of these standards, guidelines, statutes, and standards." [16].

On a technical and ethical level, big data technology increases the risk of damage and leakage of express logistics information and the lack of control of personal information. Based on the strong stickiness of the e-commerce industry and its own business model, logistics companies have access to a large amount of consumer logistics data, which can be analysed and studied to inform their strategic planning and daily operations and increase their level of competition. However, the risk of information leakage increases with the centralization of customer data storage, which is exacerbated by the instability of network system upgrades and maintenance mechanisms. In addition, the potential value of the vast amount of courier logistics information and consumer information is very attractive to criminals. At the same time, consumers are required to provide personal information when entering into a contract with a logistics company, and when using a website or application, companies provide personal privacy clauses to obtain informed consent for the collection, processing and use of information by the company, which is also the main channel through which consumers can exercise control over their personal information. In practice, however, the right to control consumers' personal information is rendered null and void by overbearing clauses such as "if you do not agree, you cannot

use the full functionality of the application", leaving consumers in a vulnerable position in terms of information security.

In 2020, in order to capture market share and seek market increment, major courier companies have lowered their courier prices one after another, with the price of a single unit even reduced to around RMB 2. With the market almost unprofitable, in order to enhance customer stickiness and gain market share, several logistics companies have discovered different methods to ask customers for more access and personal information via APPs and offline distribution sites, or even to coerce them into doing so [17]. In addition, goods need to go through multiple links in the transportation process, and the flow of logistics information has to go through multiple procedures. Some of the staff involved in logistics activities are tempted to ignore national regulations and market supervision, and illegally obtain and sell consumers' logistics data, which has a negative impact on the safety of consumers' property and personal safety.

3. Conclusion

In conclusion, big data technology has had a wide-ranging impact on the corporate sector, and in particular, it has the potential to help logistics companies increase their competitiveness and improve their operational efficiency. The ability of logistics companies to more accurately predict demand, optimise transport routes, reduce costs, and improve customer satisfaction is directly correlated to capacity for amassing, processing, and making use of copious volumes of information which allows these companies to achieve greater operational efficiency. In addition, the use of big data enables logistics organisations to improve their supply chain management, inventory control, cargo tracking, and information transparency in order to better respond to shifts in the market and the requirements of their customers. Furthermore, AI algorithms have the potential to further improve these processes by automating decision-making, recognising trends, and providing real-time insights that human analysts might not be able to understand. The utilisation of big data carries with it a significant amount of potential and benefits, but it also brings up a number of ethical concerns. These issues are related to the preservation of personal privacy, the security of data, discrimination and bias, and ownership of data. It is suggested to pay attention to these ethical difficulties and take appropriate actions to improve them so that big data technologies may be used and developed more effectively in the future. In the future, as Big Data technology continues to advance and become more widespread, the logistics industry will depend even more on data-driven decision-making and innovation to adapt to the rapidly changing business environment and to continuously improve business competitiveness. This is because Big Data technology is expected to continue to develop and become more pervasive. The ability of logistics organisations to successfully adopt big data and artificial intelligence technologies will be a key differentiator in the sector, helping to shape the landscape of the industry and propel forward growth in the global supply chain.

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