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USING BIG DATA TO MEASURE GENERAL PRICE INCREASES IN LOGISTICS

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ABSTRACT

Currently, Big Data and its applications enable the optimization of deliveries and the enhancement of operations associated with the Supply Chain. The supply chain encompasses the many movements of both raw and processed goods, along with the corresponding activities, that ensure the smooth operation of a company's business operations. The global supply chains have seen substantial disruptions due to the proliferation of the Coronavirus, leading to delays, labor shortages, and increased logistical expenses. This situation has emerged due to a significant imbalance between the supply and demand of goods. Logistics operations generate vast quantities of information. The objective of Big Data is to facilitate the management, manipulation, and visualization of extensive data collections. The extensive accessibility of Big Data applications allows for their integration into commercial decision-making processes, particularly in the field of logistics. Big Data approaches may be used to store data pertaining to a phenomenon. These may arise from either internal or external sources in the system being examined. By using Big Data, the field of Logistics may establish proactive maintenance schedules for machinery and automated systems, ensuring their uninterrupted functionality and reducing the occurrence of operational interruptions and delays. The shipping expenses have surged due to the disruptions and congestion in the worldwide logistics network. The container traffic between Shanghai and Rotterdam has seen a significant surge of 547 percent when compared to the average traffic volume observed over the last five years. Big Data is essential for warehouse management in the field of Logistics. Where can one get the essential knowledge to explore the supply chain? What are the applications of Big Data in Supply Chain and logistics? In this article, we will analyze a practical case study with the aim of offering a resolution to this problem.
Keywords: *Big Data, Logistics, Price increase, Supply chain*

1. INTRODUCTION

Logistics 4.0 denotes the contemporary era in logistics that has been initiated by the rapid progress of technology. In order to stay abreast of and predict changes in logistics pricing in an ever-changing setting, firms are progressively relying on the examination of substantial quantities of data, sometimes referred to as "Big Data". Employing Big Data to monitor price increases across all sectors is an innovative strategy that has yielded significant benefits by revealing the complex mechanisms at play in an ever-changing market. This study presents a thorough examination of the potential applications of Big Data in measuring and comprehending inflation within the context of Logistics 4.0. This novel approach provides fresh insights into the dynamics of the logistics industry, uncovering previously undiscovered trends, fundamental factors, and patterns of price volatility. This article aims to provide a comprehensive overview of the opportunities presented by this technology to improve decision-making and operational efficiency in the logistics industry. It will emphasize the benefits and constraints of using Big Data in this context. This research is innovative and visionary as it explores the use of big data to assess significant increases in prices in the context of Logistics 4.0. This article presents the potential advantages and limitations of integrating large-scale data analysis into the intricate logistics industry. Essentially, this development is significant for individuals in the logistics field, as well as researchers and policymakers, who want to use Big Data to overcome the financial challenges presented by Logistics 4.0. Due to the Covid-19 pandemic and the limited availability of fuel, there has been a decrease in worldwide freight levels as a consequence of the changes in global price. Since the second half of 2020, the supply chain has been experiencing the impacts of successive lockdowns, port closures, congestion on maritime routes, and a

shortage of truck drivers. These are evident in the increase in the expenses associated with transporting goods.

The rental price for a standard container has seen a significant increase of around 650% since the beginning of the epidemic. The significant surge in the cost of carrying goods across the sea may be ascribed to many variables. Among these factors, the COVID-19 pandemic resulted in the significant reduction or complete halt of major ports globally, particularly in China. Additionally, the crisis in Ukraine and other related issues also contributed to this predicament. Mainly resulting from a breach of the principle of supply and demand at a worldwide level.

The demand for raw materials has increased due to the expanding economies of emerging countries and, to a lesser extent, the industrial sector. The market for this product has a low level of price elasticity. Due to the increase in production costs and the delayed response of suppliers to the surge in raw material prices, there was a shortage of supply compared to the demand. The total rise in commodity expenses may be directly ascribed to fluctuations in supply and demand.

Conversely, the rising energy costs and supply chain disruptions resulting from the pandemic are being further intensified by the crisis in Ukraine. Two factors will impact future transportation and logistics expenditures. Given the significant role of Big Data, the availability of data is crucial for quickly and effectively responding to market events while ensuring stability and fair pricing. This enhances the importance of data collecting and analysis. Logistics 4.0, often known as the fourth industrial revolution, utilizes data integration to benefit all actors in the supply chain, including both humans and robots. The objective of logistics 4.0 is to achieve optimal control over the movement of materials, information, and finances, while also ensuring seamless collaboration among all stakeholders in the supply chain, starting with the producer and concluding with the customer. Integrating artificial intelligence (AI) with Big Data and predictive models has the potential to greatly reduce costs and minimize time delays. The many touchpoints in the supply chain may be seamlessly integrated via the use of platforms such as WMS (Warehouse Management System), ERP (Enterprise Resource Planning), or innovative inventory management systems.

2. MATERIALS AND METHODS:

There will always be a need for human capital in a manufacturing, even as the Internet of Things (IoT) rises to prominence as one of the most essential technologies of the 21st century. Humans constantly bear the burden of decision making. Implementing solutions like AI and Big Data really aid in doing so, even if in a sensible manner. In the event that one of the company's warehouses runs short on stock, the supplier will be notified immediately so that product may be sent to the warehouse as soon as possible. The objective is therefore to prevent supply shortages and above all not to generate annoyance or unhappiness with the final consumer who is at the end of the chain. This article's overarching objective is to show how Big Data may be used to gain control over logistics procedures version 4.0 despite a general rise in pricing. The essential ingredient and associated ideas will be discussed before moving on to testing.

This paper is important, despite the existence of prior research, since it contributes to an ongoing process where trends and conditions continuously change over time. The need for a fresh analysis arises mostly due to the inherent instability in the industry and economy, where current developments may surpass the coverage of prior evaluations. Furthermore, the implementation of more sophisticated approaches, the incorporation of evolving technology, and the use of wider data sources provide distinct possibilities to enhance the precision of findings, thereby advancing research into uncharted territories of comprehension. This research study is crucial since it concentrates on certain characteristics or difficulties that have been overlooked by prior investigations. By addressing these gaps, it enhances the overall comprehension of the topic, offering a more comprehensive and nuanced viewpoint. Moreover, the act of challenging or seeking independent validation of prior findings emphasizes the scientific rigor and ongoing pursuit of trustworthiness in the study area. Replicating prior research is a valuable method as it allows for the verification or rejection of previously acquired findings. This methodology improves the strength and reliability of the results, thereby adding to the trustworthiness and confidence given to future study. Concentrating research on certain geographic or industrial settings is a wise approach that yields more accurate information pertinent to specific conditions, so significantly enhancing the knowledge in the respective sector. This paper is a significant and innovative addition that surpasses

the scope of prior investigations, providing fresh and critical insights into our comprehension of the issue.

The problem of this article could be formulated as follows: Faced with the constant evolution of trends and situations in the logistics industry, how can we effectively use Big Data to measure general price increases? Despite previous studies, what new challenges, changes or specific aspects may emerge and how can these be addressed to enrich our current understanding of the subject? Furthermore, how can the reliability of results be ensured through the adoption of advanced methodologies, independent validation of previous studies and adaptation of analyzes to particular geographical or industrial contexts?

3. ARTIFICIAL INTELLIGENCE AS AN INSTRUMENT FOR MEASURING PRICE INCREASES

With the use of artificial intelligence, computers may mimic human intellect and take on activities like speech recognition, decision making, and visual perception. In the most basic type of AI, computers are taught to "help" people, by mining large quantities of data from prior occurrences of comparable behavior[1]. This might be anything from distinguishing between a cat and a bird to carrying out intricate tasks in a factory. Artificial intelligence (AI) has the potential to be a game-changer for organizations of all sizes, from those producing massive amounts of data to those just trying to improve their customer service processes. Artificial intelligence (AI) has the potential to improve many aspects of corporate operations. In the 1980s, with the growth of the algorithmic toolbox and more funding, AI was given a new lease of life. "Deep learning" methods were developed by John Hopefield and David Rumelhart to help computers learn from their mistakes. The concept of "expert systems," designed to simulate human judgment, was first proposed by Edward Feigenbaum. In spite of government neglect and a lack of attention, the field of AI grew rapidly and accomplished several firsts during the following two decades. IBM's Deep Blue, a chess-playing computer program, beat world champion and grandmaster Gary Kasparov in 1997. Dragon Systems' voice-recognition software was ported to Windows in the same year[2]. Kismet, an emotional-recognition and expression robot, was also created by Cynthia Breazeal.

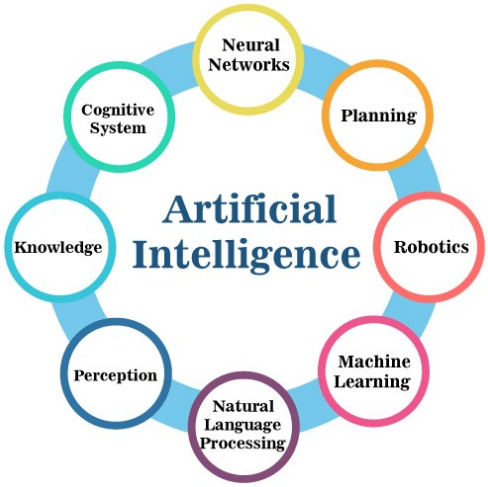

Figure 1: Goals of Artificial Intelligence (by javatpoint)

The advent of graphics processors in the current decade has allowed us to address this issue. Then, having access to large amounts of data is essential for learning. Although the Gafam are no longer involved, open-source data sets like ImagiNET have been made available. In 2016, Google's AlphaGo algorithm defeated Go master Lee Se-dol, while in 2017, the supercomputer Libratus bested the best human poker players. The percentage of businesses planning to use AI in at least one area rose from 50% in 2020 to 56% in 2021, according to a poll conducted by McKinsey. In addition, 27% of respondents (compared to 22% in the previous year) claimed that AI was responsible for at least 5% of their profits. Just as there are several machine learning algorithms ranging from the most basic to the most complicated (regression, decision tree, random forest, support vector machine, neural network), many different approaches to machine learning are accessible. Each may provide better or less accurate predictions depending on the nature of the issue being addressed and the quality of the training data set[3]. Artificial Narrow Intelligence (ANI), Artificial General Intelligence (AGI), and Artificial Super Intelligence (ASI) are the three main branches of AI currently in use.

Artificial intelligence is an area of computer science that tries to imitate human intellect in a machine. Algorithms like machine learning and deep learning fuel AI systems, allowing them to display "intelligent" behavior. Therefore, artificial intelligence (AI) allows robots to perceive, learn, reason, act, and adapt in the actual world, enhancing human skills and automating risky or difficult activities. In terms of the kind of

businesses that make use of AI today, the vast majority of them [4] employ AI in some capacity. Deep learning models, or networks of neurons, are what power AI in the automobile sector. It is used to calculate the potential loss on an investment or trade in the banking and financial industries. It figures out the most efficient routes for transport and logistics vehicles and improves warehouse traffic flow. It makes predictions about future consumer use in the energy and retail sectors with the aim of improving supply chain efficiency. Finally, in industry, it helps to forecast equipment failures[5]. Artificial intelligence (AI) technology boosts efficiency and output in businesses by taking over manual labor-intensive jobs. In addition, AI allows for data mining on a scale that is impossible for humans.

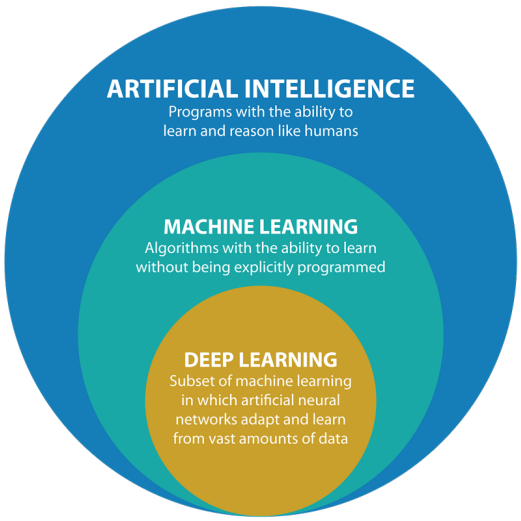

Figure 2: Artificial Intelligence structure (by Zekiatech)

This capacity may offer enormous commercial advantages. The discipline of measuring inflation in prices is only one area where artificial intelligence (AI) has had a significant impact. Artificial intelligence (AI) presents promising avenues for enhancing the accuracy, speed, and relevance of assessing price rises in a world where markets are always changing and prices change in response to a wide variety of circumstances. Data from many different sources, including online purchases, product catalogs, historical pricing data, historical weather data, and more, may be collected, analyzed, and interpreted with the help of AI. Artificial intelligence can analyze this complicated data using machine learning and data analytics, allowing for rapid detection of large price spikes. To anticipate economic or geopolitical events that may affect prices, AI systems may be taught to spot trends in price behavior, identify seasonal changes, forecast future volatility, and more. With this kind of foresight, companies and decision-makers will have a leg up on the competition when it comes to making educated judgments and crafting effective pricing policies. Also, AI may be used to automate tasks like watching prices in real time. Artificial intelligence (AI) systems that monitor markets and rivals in real time may detect pricing changes and new trends much more swiftly. This facilitates rapid responses to market shifts and helps companies to adjust to new circumstances. It's worth noting, however, that there are several caveats to employing AI to track inflation[7]. The intricacy of the elements that affect pricing, as well as the quality and amount of the training data, all affect the accuracy of the forecasts. Additionally, ethical and privacy issues must be taken into account when gathering and exploiting huge volumes of personal or sensitive data. Artificial intelligence's in-depth research, precise forecasts, and constant monitoring provide encouraging potential for better measuring inflation[8]. While there are still obstacles to overcome, the use of AI in pricing will allow for better analysis and quicker reactions to the ever-shifting economic landscape.

4. BIG DATA :

Big data, short for "massive data," is the term used to describe the vast quantities of unstructured information that are being produced at an exponential pace by modern technological systems, including the Internet of Things, social media, online commerce, sensors, and many more. The "three Vs" of big data are volume (how much data is produced), variety (how many different kinds of data are produced), and velocity (how quickly data is produced and must be processed). The advent of Big Data has completely altered the way data is analyzed and put to use. It was formerly impossible to extract useful information from these massive databases, but modern storage, processing, and analytic technologies have made this possible[9]. Health, e-commerce, banking, logistics, scientific research, consumer behavior analysis, and many more are just few of the many areas that may benefit from Big Data's many uses.

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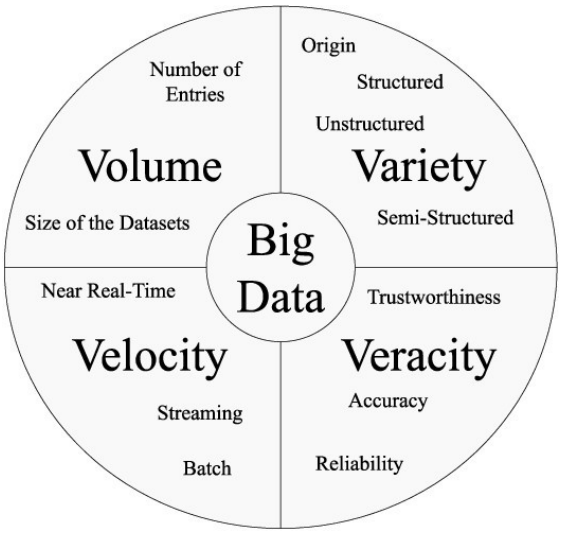

Figure 3: The Four Main Data Characteristics Of Big Data (By Daniel Staegemann Et Al.)

Big Data is crucial in Logistics 4.0 for optimizing operations, forecasting market trends, enhancing supply chain management, and arriving at well-informed conclusions. However, there are obstacles to using Big Data. Concerns about data storage, processing, and privacy must be addressed by businesses[10]. Data analytics and data science expertise are also required to convert raw data into useful insights. Big Data provides great potential to alter the way we use and understand data. Its capacity to glean meaning from massive amounts of data has the potential to transform logistics and other sectors.

Data processing and Big Data go hand in hand in terms of handling and capitalizing on the massive volumes of data being produced in the digital age. Data processing, on the other hand, refers to the processes and procedures used to analyze, organize, and extract meaningful information from the huge amounts of diverse data that are continually created by a wide variety of sources (Big Data). Big Data is defined by the presence of very large datasets that often exceed the limits of conventional data storage and processing methods[11]. Processing data necessitates the use of specialized tools and infrastructures for the effective administration of massive data volumes. The information comprising Big Data may be either organized (as in a database) or unstructured (as in a video, an image, or a text file). Data processing methods, such as NLP and CV, need to be flexible enough to accommodate this range of data types. The pace at which data is produced for Big Data is quite high. Capturing and processing these data streams in real time or very close to real time is essential for providing timely information. Big Data data might be prone to mistakes, noise or inconsistencies. To guarantee the accuracy and validity of the data, cleaning and validation procedures should be included into the processing phase. In the context of Big Data, analyzing data is meant to lead to actionable insights. The goal of data processing is to extract meaningful information by analyzing and interpreting collected data. Data processing, on the other hand, is the collection of methods, techniques, and tools required to process, evaluate, and turn this huge and diverse data into usable information[13]. Together, they provide a comprehensive strategy for extracting value from the digital era's vast and disparate data stores.

When it comes to tallying up price hikes, Big Data processing is key. In order to identify, measure, and comprehend general price rises across sectors, sophisticated data analysis methods may be used to the vast volumes of data provided by a variety of sources, including internet transactions, economic data, consumer data, and many more[14]. With the use of Big Data, it is now feasible to gather and combine information from many and varied sources. We can learn a lot from statistics like price changes, inflation rates, and consumer spending indices. Through data analytics, Big Data can uncover historical and present pricing patterns. Seasonal trends, geographical changes, and both short- and long-term variations may all be uncovered using machine learning algorithms. Future price changes may be predicted using big data predictive analytics approaches. Predictive models are able to provide predictions about the future behavior of prices by using past data and other contextual elements. The elements that cause price shifts may be isolated with the use of Big Data. Examples of this may include shifts in the economy, changes in consumer tastes, and shifts in supply and demand. Big Data also offers real-time pricing monitoring. Because the information is continually updated, any abrupt or unexpected price hikes may be identified right away. Big Data charts and dashboards simplify the analysis and interpretation of pricing changes for business leaders and analysts. Insight into general price rises may be gained by combining the Big Data capabilities of collecting, storing, analyzing, and interpreting massive amounts of data[15]. As a result, they will be able to better comprehend the economic processes that affect pricing, forecast market swings, and set prices accordingly.

5. THE GENERAL RISE IN PRICES

Inflation, or general price rise, is an increase in the cost of goods and services that persists over time. It's a regular occurrence in the market that may have far-reaching consequences for customers, companies, and the economy as a whole. The cost of a commodity or service goes up when consumer demand exceeds supply. This may be attributable to increasing consumer demand or greater government expenditure. Companies have the option of increasing prices to cover the higher costs of manufacturing that they are forced to absorb[16]. The price of raw materials, labor, and energy are only few of the variables that might affect production costs. Central banks' monetary policies, such as expanding the money supply, may drive up prices. Inflation occurs when the quantity of money in circulation grows faster than the supply of goods and services. Conflicts and economic sanctions are two examples of geopolitical events that may interrupt the supply of goods and services, driving up prices[17]. Changes in the value of a currency relative to another may affect the pricing of both imported and exported commodities. Inflation may have numerous repercussions on the economy and society. While some inflation is desirable in order to encourage spending and investment, too much inflation may cause financial instability, reduce consumer buying power, and hamper the ability to prepare for the future[18]. Economists often utilize consumer pricing indices (CPIs) or producer price indices (PPIs), which track the cumulative price changes of a specified basket of products and services over a certain time period, to gauge the overall upward trend in prices. These indices allow for the quantification and tracking of price changes and inflation monitoring.

Inflation, or the rate of general price increase, is a crucial indicator of economic trends and price swings. Several techniques and indices are used to quantify inflation, each with its own features and purposes[19].

The Consumer Price Index is a popular metric for tracking price increases across the economy. A standard basket of home products and services is used to analyze pricing changes. This include necessities such as nourishment, shelter, movement, medical treatment, and education.

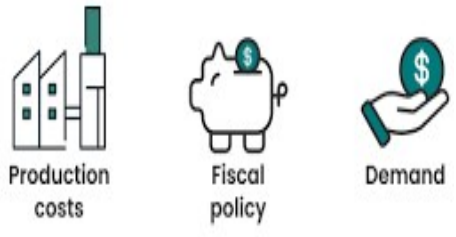

Figure 4: Factors That Influence Inflation (By Annuity)

The Consumer Price Index (CPI) is a key economic indicator used to track general price changes in the economy. The Producer Price Index tracks the fluctuation of prices at the point of production. This might be anything from raw materials to components to partially completed goods. Inflationary forces may be traced back to their origins with the PPI. Changes in the costs of exported items are tracked by the Foreign Trade Price Index. The impact of changes in exchange rates and transportation costs on the pricing of globally traded items is evaluated by comparing import and export prices. The CPI tracks the rate of inflation for everything needed to build anything. It is a useful tool for gauging long-term inflation patterns in the building industry. Medical services, pharmaceuticals, and inpatient care are the primary areas of emphasis for the Health Price Index. It makes it feasible to observe the fluctuations in health expenses. Government agencies, statistical research centers, and international groups all frequently compute these indices[20]. They are helpful for analyzing pricing changes, keeping tabs on inflation, and forming sound economic policies. Governments, corporations, and consumers need accurate monitoring of general price rises in order to understand the effect on the economy and alter policies accordingly[21].

Since price increases may have an effect on many areas of supply chain management and logistics operations, they can have a noticeable effect on the logistics sector as a whole. Supply costs for companies might rise if they must pay more for the commodities they need to operate. Expenses up and down the supply chain, such as for raw materials, replacement components, and final goods, may rise as a result. Fuel and freight pricing fluctuations may have an immediate effect on logistics expenditures[22]. Route planning, delivery expenses, and stock management may all be impacted by increases in transportation costs.

6. THE DIRECT IMPACT OF RISING PRICES ON LOGISTICS

Since price increases may have an effect on many areas of supply chain management and logistics operations, they can have a noticeable effect on the logistics sector as a whole. Supply costs for companies might rise if they must pay more for the commodities they need to operate. Expenses up and down the supply chain, such as for raw materials, replacement components, and final goods, may rise as a result. Fuel and freight pricing fluctuations may have an immediate effect on logistics expenditures[22]. Route planning, delivery expenses, and stock management may all be impacted by increases in transportation costs.

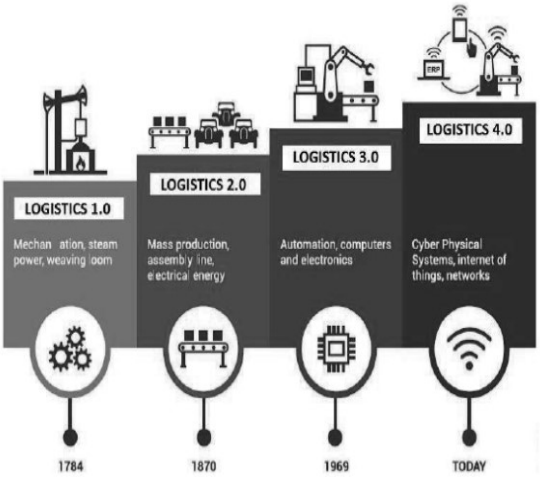

Figure 5: Stages of logistics evolution (y Izabela Dembińska)

The cost of storing goods may be impacted by inflation. Businesses may have to optimize inventory levels to save expenses while still satisfying customer demand if stocking prices rise. Rising pricing might lead to increases in operational expenses like personnel costs. This has the potential to affect the cost of labor in logistics facilities such as warehouses and distribution centers. Rising prices at suppliers might effect the connection and negotiation with supply chain partners. To combat price increases, some companies may need to revisit their supplier contracts. Profit margins in business may feel the effects of inflation. Companies often have to strike a delicate price-setting balance between keeping up with growing expenses and being competitive in the market. Cost changes need to be integrated into both short-term and long-term planning models, which may make planning and forecasting increasingly difficult as prices rise. Uncertain economic conditions brought on by inflation might impact logistical decision-making and long-term planning[23]. Businesses may need to respond swiftly to rising expenses and changing economic situations. Costs in logistics may rise, and supply chain management may become more difficult, if prices continue to rise. Companies may lessen the effects of these factors by taking measures including increasing the effectiveness of their logistical operations via optimization, inventory management, collaboration with suppliers, and the use of cutting-edge technologies[24].

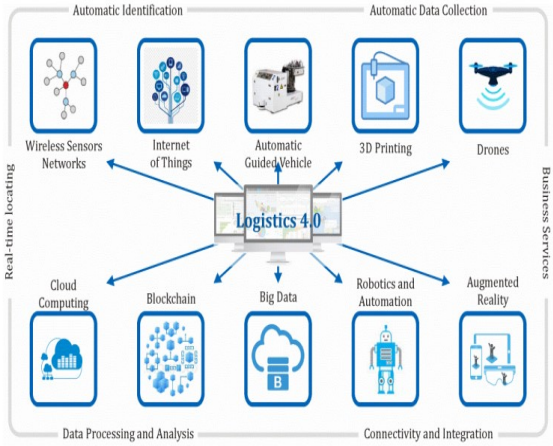

Figure 6: Components and technologies of Logistics 4.0 (by Gordana Radivojević et al.)

The overall growth in pricing has a major association with Logistics 4.0, which offers a revolutionary approach to logistics management incorporating digital technology and enhanced automation to improve operations and the supply chain. Companies require excellent cost management capabilities when the prices of inputs (such as raw materials, components, and services) rise as a result of inflation[25]. The increased transparency and nuanced cost analysis made possible by Logistics 4.0 may reveal savings opportunities across the supply chain. Inflation may affect demand since it affects consumers' ability to spend. Predictive analytics and machine learning are two examples of Logistics 4.0 technologies that may be used to foresee shifts in demand in response to inflation patterns. transit expenses and route preparation may be affected by inflationary shifts in the cost of fuel and transit charges. Tools made possible by Logistics 4.0 can optimize routes instantly, despite fluctuations in transport prices and operational limitations. The cost of storing goods may be affected by inflation[26]. Logistics 4.0 makes it possible to better respond to

fluctuations in cost and demand by monitoring and analyzing data in real time.

Logistics 4.0 advocates sophisticated automation, which may cut operating costs and increase supply chain efficiency. It may be especially helpful in balancing price increases due to inflation. Suppliers' manufacturing costs may rise or fall as a result of inflation. Better supplier cooperation is made possible by Logistics 4.0's digital platforms, which may be used to track price changes and identify areas for improvement. Logistics 4.0 provides cutting-edge resources for mitigating the business and supply chain impacts of inflation. Companies may retain the efficiency of their logistics operations despite price increases caused by inflation by using digital technology, automation, and data analytics. During times of widespread cost increases, Big Data in Logistics Management 4.0 becomes even more essential. In order to properly manage the issues presented by inflation, the large and diverse data created at every level of the supply chain may give vital insights. By analyzing previous and present pricing patterns, Big Data facilitates the forecasting of future fluctuations. Using predictive analytics models, businesses can foresee how price increases in key inputs like raw materials and fuel would affect their supply chain performance. This helps firms organize their operations properly. With the use of Big Data, transportation routes may be optimized in real time in response to changes in fuel prices and tariffs. Overstocks may be avoided by adjusting stock levels in response to fluctuations in holding costs and anticipated demand[28]. Big Data may provide light on the impact of price shifts on purchasing patterns by evaluating demand data from consumers. Because of this, companies may swiftly alter their promotions, specials, and stock levels to meet the demands of their clientele. With the use of Big Data, businesses are able to openly discuss pricing and cost fluctuations with their vendors. Inflation may be mitigated by more cooperation and well-informed bargaining, both of which are fostered by this. Using Big Data, companies can monitor and assess expenditures across the whole supply chain. Using this method, businesses are able to track expense patterns and make necessary adjustments to save money[29]. Big Data delivers trustworthy, data-driven insights, allowing decision makers to make educated choices in real time. When inflation causes sudden shifts in prices, this is of paramount importance. Companies may use Big Data to anticipate and prepare for price increases and other interruptions to their operations. Logistics Management 4.0 relies heavily on Big Data in times of widespread inflation for up-to-the-moment data, predictive analytics, and insightful conclusions. Through this, businesses can keep their supply chains efficient and competitive even as they face inflation-related economic issues, as well as make educated choices and improve operations.

7. RESULT:

In order to guarantee the strength and reliability of the article, it is essential to acknowledge and tackle any possible factors that might undermine the accuracy and credibility of the research. Internal validity, external validity, construct validity, and statistical validity are crucial factors to examine among these challenges. Ensuring the integrity of this research in light of several potential risks is a primary priority. To ensure internal validity, it is important to address and minimize any factors that may cause confounding effects or be influenced by the history or maturity of the logistics business. This may include the use of control groups and meticulous examination of temporal fluctuations. External validity necessitates a robust rationale for extrapolating the findings to other logistical scenarios, with specific emphasis on the representativeness of the sample. To ensure the external validity of the research, it is essential to provide a comprehensive explanation of the participant selection process. To establish construct validity, it is crucial to show that the selected measures appropriately evaluate overall price increases in logistics and reduce the risk of response bias. Statistical validity is achieved by justifying the sample size, which ensures sufficient statistical power, and by carefully selecting acceptable statistical analysis procedures that align with the study's unique aims. By including these factors into the research framework, researchers enhance the methodological rigor of their study and restore trust in the validity of the results reached.

Constant pricing volatility and shifting market conditions are hallmarks of the present economic climate and may have far-reaching effects on logistics operations. Our findings provide insight into a novel strategy for overcoming this formidable obstacle. Within the context of Logistics, we investigate how Big Data might be utilized strategically to monitor and anticipate inflation. In particular, we emphasize the implementation of this strategy in the region of Tangier Tetouan Al-houceima, which is home to a thriving and growing economy. The merging of

logistics and technology in the Logistics era creates an ideal testing ground for innovative approaches to controlling price swings. Capitalizing on the potential of Big Data, our research focuses on collecting, analyzing and interpreting enormous data sets to quantify the effect of general price increases throughout the whole supply chain. The objective is to provide companies with relevant data so that they can navigate the uncertain economic climate with confidence and make the best choices possible regarding risk management and logistics optimization. Our research takes into consideration the economic and geographical peculiarities of the Tangier Tetouan Al-houceima region. We look at how companies in this area may use big data to adapt to the difficulties of inflation and the benefits of Logistics to become more nimble and competitive. The purpose of this research is to educate local businesspeople, academics, and policymakers on the merits and pitfalls of using Big Data to gauge cost increases in Logistics. Our goal is to aid in the proactive management of economic fluctuations by offering a foundation of knowledge and insights that can be applied to logistical procedures. Here, we've made full use of data and insights from a number of different logistics providers in order to foresee their collective transition toward logistics.

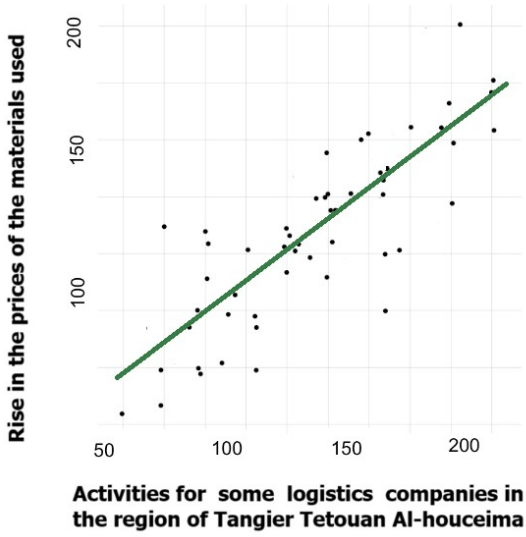

Figure 7: Use Of Big Data To Measure Price Increases In Logistics

When applied to the context of logistics inside firms in the area of Tangier Tetouan Al-houceima, the graphic image we see provides a clear and synthesized visual view on the use of Big Data to monitor general price increases. This visual aid is crucial in helping people grasp and explain the intricate ideas at the heart of our research. This graphic provides a concise and well-structured overview of how Big Data is being used to oversee pricing rises in Logistics. Key features such as gathering large data from numerous sources, in-depth analysis to uncover trends and patterns, and using those insights to make strategic choices are all graphically portrayed. The graph also shows how this strategy is being implemented at the regional level, with a particular emphasis on businesses in the sector that are active in the Tangier Tetouan Al-houceima area. This helps anyone—logistics experts, business owners, academics, or government officials—quickly grasp how Big Data may affect how businesses handle price hikes. for the sake of logistics. This image aids our comprehension of the content by giving us a bird's-eye perspective of how Big Data is being used to gauge broad pricing rises in Logistics, with a particular emphasis on businesses in the sector in the Tangier Tetouan Al-houceima area. It makes difficult ideas easier to understand and promotes more thorough comprehension among people who participate in our studies.

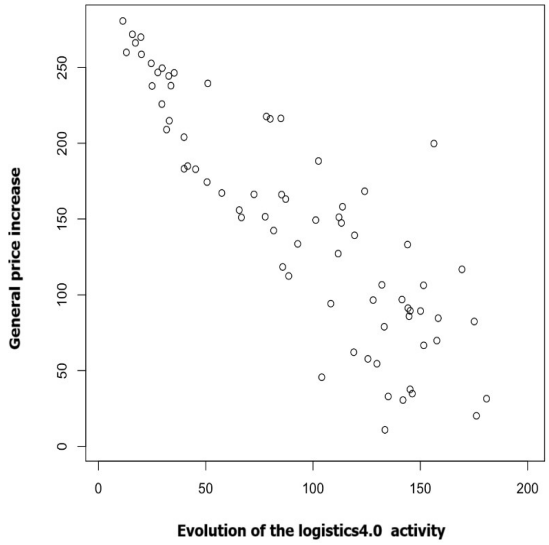

Figure 8: Evolution Of Logistics Activities After A General Price Increase

Several reasons may be linked, including the overall price rise, to explain the drop in logistics activity that followed. This finding might be associated with the ways in which businesses in the Logistics landscape respond to and adjust to the resulting price changes. When costs go up in general, people tend to buy less things, which might cause a drop in orders and shipments. This may have repercussions across the supply chain and slow down operations. As prices rise, producers and

distributors may reevaluate their expenses. Reduced logistics operations may be the consequence of companies reevaluating their cost initiatives. In the face of price increases, businesses may choose to lower inventory levels in order to save money on storage fees. This may lead to reduced transit of products and less logistical activities. When prices rise across the board, it may be difficult to keep everything in check. Logistics operations may be slowed down when companies waste time modifying and negotiating contracts with suppliers. The price hike may have an impact on business partners including suppliers and logistical service providers. This might result in service interruptions, delays, or course corrections. If people lose faith in the economy as a result of higher costs, demand drops and less resources are put into logistics. Economic uncertainty brought on by price swings might make businesses wary of making large expenditures or launching new initiatives. These theories are just that, and the scenario might look quite different based on aspects like industry, location, firm size, etc. To validate and completely comprehend the connection between growing pricing and falling Logistics company, more data and contextual research is necessary.

8. CONCLUSION

The study on the use of Big Data to measure general price increases in logistics has several strengths that strengthen its contribution to the understanding of the subject. First of all, adaptation to the temporal evolution of economic and industrial trends is a major strength, allowing an up-to-date and relevant analysis. Additionally, the incorporation of advanced methodologies and emerging technologies enhances the accuracy of the results, illustrating a commitment to methodological innovation. The focus on specific aspects previously neglected is also a strength, filling gaps in the overall understanding of the phenomenon. However, the study has some weaknesses that should be taken into account. External validity could be compromised if the results are not generalizable to other logistics contexts, requiring a strong justification of the representativeness of the sample. Additionally, construct validity concerns could emerge if the measures used do not comprehensively capture the complexity of general price increases. Given the volatility of the economy, it is crucial that Logistics make use of Big Data to track inflation. Through this post, we have studied how logistics technology and big data analytics may be coupled to better understand the implications of rising costs on the contemporary supply chain. With the emergence of Logistics and its advanced digital environment, companies are better equipped to adapt to the problem of inflation. Price changes, transportation expenses, and consumer demand may all be observed in minute detail with the use of cutting-edge big data analytics tools. With this information, firms can swiftly and accurately make changes to their operations, optimize their routes, manage their inventories, and stay competitive. In a period of widespread price hikes, the essay illuminated how big data aids strategic planning, decision making, and risk management. Companies may maintain the reliability of their supply chains while lowering costs by studying historical data and making predictions about the future. Logistics 4.0's use of Big Data to track inflationary trends foregrounds the synergistic potential of data, technology, and preemptive leadership. In addition to reducing the negative effects of inflation on prices and operations, this method also helps firms get insight into broader economic patterns, which is essential for adapting to an ever-evolving marketplace. Companies may strengthen their foothold in the ever-evolving global market by adopting the complementary benefits of Big Data and Logistics.

9. LIMITATIONS OF STUDY

The article "Using Big Data to Measure General Price Increases in Logistics " presents a promising approach to managing inflation-related challenges in logistics. However, it is important to highlight some specific limitations, particularly with regard to the unavailability of information and the difficulty of accessing data. The article relies on data collection and analysis to measure general price increases. However, in some situations, the data necessary for an in-depth analysis may not be available or accessible, which could limit the scope and accuracy of conclusions. Limited access to reliable and relevant data sources can hamper the ability to conduct comprehensive analyses. The article may be forced to use a smaller data sample, which could affect the representativeness of the results. When data is difficult to obtain, there may be issues with the reliability and quality of the information collected. Errors or gaps in the data could lead to biased or incorrect analyses. If the article only accesses certain data sources or certain types of companies, there could be a selection bias that limits the generalizability of the results to other contexts. Some companies might encounter technical obstacles to collect and process the

necessary massive data. This could be due to a lack of adequate infrastructure or insufficient technical skills. Some companies might be reluctant to share their data due to privacy and security concerns. This could make it difficult to obtain essential information for analysis. The unavailability or difficulty of accessing the data may limit the generalizability of the results obtained from the article. Conclusions may not be applicable to all companies or industries. To overcome these limitations, it is essential that researchers recognize potential constraints and take steps to mitigate their impact. This could include efforts to obtain reliable data, diversify sources of information, and carefully assess possible biases.

10. FUTURE PROSPECTS

The future prospects for this article are vast and exciting, given the rapidly changing technologies and practices in the field of logistics. By combining Big Data with AI, it would be possible to develop more sophisticated models for predicting price increases. Machine learning algorithms could identify subtle trends and complex patterns in the data, improving the accuracy of predictions. By exploring the use of unconventional data sources, such as social media, online consumer reviews and IoT sensors, it may be possible to detect early signals of rising prices and improve responsiveness. to market fluctuations. By incorporating more advanced economic models into the analysis, researchers could better understand the complex interactions between inflation, transportation costs, demand, and other logistical factors. This could help establish more nuanced strategies for managing price increases.

The article can serve as a solid foundation for future research and development aimed at further exploring the implications of Big Data in managing price increases in the context of Logistics 4.0. The opportunities for further study, practical experimentation and innovative applications are numerous and could contribute significantly to the improvement of logistics practices in an ever-changing economic environment.

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