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# *Financial Risk Management in the Supply Chain Using Business Intelligence and Big Data*

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## *Abstract*

Financial risk management and risk identification management have evolved into critical components of global supply networks. Machine learning, business intelligence, and big data technologies are used to detect system risks, manage financial risks, and help identify the cause of risks. The company may strive to improve the source of the risk. The methodology concentrates on three major supply chain danger areas: shipping, marketing, and distribution, with a licensed insurance model built, evaluated, and matched to current approaches before being adjusted based on the results. In this scenario, we're also using Business Intelligence (BI), which helps businesses make better data-driven decisions. As a result, reduce losses incurred. A framework of risk detection models based on machine learning, business intelligence and big data is provided to control financial risks in the supply chain. This study aims to identify risks, identify their sources and mitigate them. The proposed approach focuses on three distinct areas of supply chain risk: transportation, sales, and delivery. A risk disclosure model is used, tested, compared with existing methodologies, and then refined depending on the results for each area. Regardless of the supply chain data used, the proposed method is adaptable to any other type of supply chain.

***Keywords:*** Financial Risk Management; Supply Chain; Business Intelligence; Big Data; Risk Detection; Machine Learning.

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## *Introduction*

The traditional concept of a supply chain is that it is a system of organizations, people, technology, activities, information, and resources involved in moving a product or service from the supplier (producer) to the customer. Today, with the advent of global digital transformation, we find that Supply chains and how they are managed are changing and transforming, as risks and threats to their security and safety increase These trends highlight the increasing need for global solutions that are shared, adaptable, scalable and scalable and that can reverse or curb cyber threats to supply chains through the collaborative efforts of governments, industry, the technology community, and stakeholders' interest of others.

To be able to weather possible supply chain interruptions, a company must be more financially stable. To be prepared, one must comprehend and foresee the impact of any interruptions on the business and then plan appropriately. To examine and overcome possible financial risks in the supply chain, one must comprehensively evaluate the business and its operations, personnel, suppliers, customers, and the market environment ( Zhan et al., 2018).

A supply system is a network that connects a company to the suppliers it needs to manufacture and create a certain product for the end user. Financial risks in the supply chain include, among other things, disruptions in the settlement process, erroneous investments, and a failure to provide pricing transparency. Today's supply chains are international, complex, and extended, making them more subject to a wide range of risks and disruptions. As a result, identifying possible faults in the organization and devising strategies to remedy them is crucial. The latest development of real-time data communication via modern gadgets opens up significant potential for restructuring and resolution of this problem (Ali et al., 2021).

Company intelligence assists in the detection of possible business hazards and helps managers to take early remedial action. Business intelligence assists in the translation of a sea of data into information that can be utilized to make better business choices. Companies should install BI software that exposes the meaning behind the data to function more efficiently, increase revenues, and promote cooperation between numerous export markets (Yousif Alsharidah et al., 2020).

Risk detection and management have become essential components of global supply networks. Machine learning techniques are used to detect dangers in the system and to assist in determining the source of the risk. By doing so, the firm might attempt to optimize the source of the risk, so reducing losses.

Despite the maturation of Internet technology in recent years, Internet apps are now extensively employed across civilizations. A broad variety of technical gadgets can connect to the Internet. Internet users profit from the extensive construction of network infrastructure and the deployment of smart network elements. Handheld interface devices are relatively affordable, and ordinary people are often one or a few people, which makes it simple to access and use the World wide web at any time and from any place. The usage of the Internet has increased rapidly. During the network access method, a large amount of data information is generated (Liang et al., 2016).

As the bulk of this network data grows, big data and technological applications

become more widespread. Massive quantities of money have been continuously spent, resulting in in-depth research of Internet technology. Currently, communication network technology is constantly evolving. After years of development, 5G communication technology has advanced significantly and is currently being sold in several countries. The fast growth of these technologies has led to the rapid expansion of the information economy, and there is an urgent need to deploy big data technology in a suitable way for analysis and synthesis (Wu et al., 2015).
The current supply chain finance is a complicated network with no limits and an increasingly sophisticated transactional framework. Because of the big data development environment, there are multiple dangers in supply chain finance, and it is critical to use big data technology to analyze and mitigate financial risks (Ji et al., 2014). Certain concerns must still be handled in a concentrated way when using big data technology to reduce supply chain financial risks. The rise of supply chain finance has broadened the funding channels of SMEs, greatly reducing their financial challenges, thanks to the credit facility offered by core businesses (Wang et al., 2014).

## *Study Objective*

Financial risk management is a critical component of global supply chain networks. Business intelligence and big data, machine learning techniques are used to discover system dangers and to aid in the identification of the cause of the financial risk. As a consequence, the business may try to optimize the source of the risk and, as a result, reduce the losses experienced as a result of it. The primary goal is to detect financial risks and identify the major risk sources in the supply chain. The proposed study focuses on three major supply chain risk areas, namely Transportation, Sales, and Delivery, and for each area, a financial risk detection model is trained, tested, and compared to current approaches before being changed based on the results.

## *Literature Review and Theoretical Background*

### *Literature Review*

Originally, Business Intelligence was defined as "an automated system for transmitting information to various parts of any industrial, scientific or governmental organization." Business intelligence (BI) has been described in recent years as a planned process in which a company can study and train to extract information from huge sets of data to learn about an opportunity while minimizing the risks associated with uncertainty. The gap in this study or research is that previous studies have proven that artificial intelligence is advancing in a wide range of fields, and to detail this research gap and clarify the research problem, this section provides an overview of the basic topics and methodologies.
(Ali et al., 2021) analyzes the application of Sector 4.0 technology in risk management in the Australian food processing industry. Some of the techniques used in the paper include IoT, Big Data, Cloud Computing, and Robotics. The authors discuss the scarcity of empirical research in these industries-related domains.
(Chiu et al., 2020) provides a risk-reduction strategy for price rebate return contracts. Big data analytics and numerical analysis methodologies were used in this work. There were several

technological discoveries as well as administrative insights that might be applied to decrease risk. The disagreement between the sales rebate and the return policy was improperly addressed.

(Yousif Alsharidah et al., 2020) explores the connection between the digital revolution and SCM. The findings were based on the use of Artificial Intelligence in the digital realm. The major advantages are increased quality standards, flexibility, efficiency, and productivity. This is not suitable for many instances since it needs a large quantity of data and case studies, as well as a lengthy analysis.

(Yang et al., 2019) explore the feasibility of Internet supply chain capital budgeting and create the Online resource decision model and risk assessment analysis. In the findings, many models such as the Simunic model, fuzzy decision, and Internet financial model were employed. The Online revenue model, has a strong symmetric match for investment risk management and supply chain, and the data assessment accuracy is excellent. The risk kinds evaluated are limited, and the model's effect is gradual and time intensive.

(Oger et al., 2019) investigate the validity of the financing choice for the Internet supply chain, as well as the decision model and risk management analysis. The findings were based on many models, including the Simunic model, the fuzzy choice model, and the Internet finance model. Under the Online financial model, this has a great symmetric match for investment risk and supply chain management, and the data evaluation is highly accurate. There are fewer risk categories analyzed, and the model's effect is slow and time-consuming.

As a result, the preceding research encourages the adoption and utilization of BI systems and their capabilities in larger organizational contexts. Even though organizations have been unable to fully capitalize on the benefits of BI systems. They are mostly interested in obtaining value from completed systems. Prior research, on the other hand, has not offered a comprehensive answer that examines the methods associated with the adoption and usage of BI systems in practical and sequential stages in financial settings. We propose a framework that not only serves as a universal and reusable abstraction, but also provides specialized functionality that aids in the creation of business intelligence applications, products, and solutions.

### *Business Intelligence in Supply Chain Management*

For generations, company managers have made critical business decisions based on data collected from a variety of reports provided by IT by summarizing sometimes contradicting sets of data. Business intelligence solutions offer to change this by integrating data from all internal and external systems to give a unified view of reality. This fact may then be conveyed to decision-makers by answering the extremely critical question.

Gartner, an information technology research firm, coined the term "business intelligence" in the 1990s. The process of transforming raw data acquired by organizations from their many operations into usable information is known as business intelligence (Quinn, 2003) Because raw data is of limited use, organizations are increasingly turning to business intelligence solutions to maximize the value of their data. BI

software is advanced computing software that enables a company to easily integrate, change, and display data as actionable information or information that can be utilized to make informed choices.

By providing insight into crucial information, BI enables firms to improve their processes. Organizations are given the ability to offer goods and services at the lowest possible cost, with the greatest possible effectiveness and efficiency - all while generating the maximum possible profit margins and revenues. Some firms have recognized that sharing BI capabilities with both business partners and employees is useful. They are doing this by using Web-based "BI networks" to give information to suppliers, consultants, and others.

Business intelligence was traditionally handled by economists and company analysts. That is no longer the case. As businesses strive to put critical data in the hands of business users who need it to do their jobs, BI technologies are spreading to almost every department.

User expectations for business intelligence systems are as follows (Computerworld, 2005):

- ❖ Access to different databases.
- ❖ The ability to execute ad hoc queries.
- ❖ Scalability, cost-effectiveness.
- ❖ Dependability, as well as ease of interaction with back-office systems.

Many studies conducted by leading research firms show that BI has come to the top of the CIO's priority list. While other segments of the corporate software industry are faltering, interest in and use of business intelligence is growing. CIOs surveyed by IT research firm Gartner recently identified business intelligence as their number-two technology priority for the next year, a significant increase from the number-10 position in 2004. The market is also on the rise. According to Strategy Analytics, the market for BI reporting and analysis tools and applications software might reach $7.3 billion by 2008, up from $5.5 billion in 2005. 2006 (Datamonitor).

BI and business performance management account for 30% of the technical characteristics of a competent system (Decker et al., 2003) Over the next five years, the number of end customers utilizing business intelligence tools will increase by 40%, and at least 50% of the Fortune 500 will turn to outsource providers with that next technologies and the necessary expertise (Betts, 2003).

The supply chain and logistics sectors have had a substantial impact on BI technology development. To stay competitive in volatile markets and turbulent times, you must recognize potential vulnerabilities in your business and design strategies to overcome them. Modern software solutions such as Business Intelligence (BI), Business Analytics (BA), and Artificial Intelligence (AI) may provide insightful information into supply chain risks, inefficiency, and irregularities, enabling businesses to quickly identify and resolve any issues (Biere, 2003).

There are also new statutory duties for corporate accountability in the European Union. In its suggestion for new supply chain regulations to be enforced in 2022, the EU legislation requires compulsory provider thorough research on concerns such as human rights breaches such as slavery, trafficking of conflict minerals, and illegally obtained timber. These safety regulations will be impossible to meet unless Business Intelligence tools create a digital twin of the value chain.

Business intelligence refers to the organizational and technological infrastructure required to collect, store, analyze, and utilise data generated by a company's operations (BI). Business intelligence includes data mining, process analysis, performance benchmarking, and descriptive analysis. The purpose of (BI) is to discover important connections in existing data and generate new, financially relevant information from it. BI is the process of converting this ocean of data into knowledge for use in practical enterprise applications. Businesses may employ BI tools to convert their collected data into a meaningful and profitable context. So, what kind of data does Business Intelligence drive in the supply chain? Business Intelligence tools manage a lot of data and critical success factors (KPIs) including inventory, service level, cost, and quality indicators like commuting costs.

### *Big Data and Associated Technologies in Supply Chain*

There is no specific form of big data in academia, and there are several interpretations. Overall, big data is an information asset with vast capacity, fast throughput and unpredictability, low cost, and the need for unique processing techniques. In addition to its huge scale, academicians believe that big data has four important characteristics. Big data has a large data size, a wide range of data types, and a high overall value, but it has a poor value density (Fan et al., 2017).

With the improvement and extensive use of Internet technology, the number of Internet users is fast expanding, and mobile terminals can access vast volumes of data. The sharing, browsing, and other actions of network users will create a large amount of data (Pang et al., 2017).

Structured data types, as well as semi-structured and unstructured data such as photos, audio, and video, are examples of big data. Big data technology is a method for the rapid extraction of useful information from massive volumes of data. Big data processing technology in supply chain financial risk management involves the following components (Xu et al., 2018):

- ❖ Supply chain finance data collection pathways are integrated with data from core companies, e-commerce platform transaction databases, and other big data.
- ❖ In the network infrastructure, there are several suppliers of supply chain financial data, and ETL may filter large data sets to get benchmark datasets.
- ❖ Financial risk management in the supply chain necessitates the creation of financial planning databases with a significant storage capacity capable of storing moderately and imprecise information.
- ❖ Data mining is mostly utilized in supply risk management for risk assessment and prediction. For risk managers to grasp and read complicated data in supply chain financial risk management, charts, illustrations, and other visual aids must be used.

### *Financing the Supply Chain*

International business has made it impossible for any organization to function in isolation, and the ongoing expansion and usage of Internet technology has dramatically boosted the efficacy of supply chain management. Multiple enterprises from various industries collaborate to create development unity (Feng et al., 2019). The expansion of the supply chain scale required an improvement in management efficiency. SMEs, on the other hand, are unable to get sufficient financial

assistance owing to a lack of similar lending sources, and liquidity is highly constrained. The expansion of the supply chain is critical in restricting (Tang et al., 2018).

As a consequence, professionals and academics in related fields have boosted their research on how to solve the issue hindering the seamless evolution of the supply chain and see this topic as a hot area of critical research. The advent of supply chain finance has provided SMEs with alternative sources of money and financial products, reduced their financing threshold, and effectively relieved such enterprises' cash needs. Following the resolution of the capital problem, such enterprises may resume operational capabilities and promote the normal operation of the whole supply chain (Zhang, 2019).

The rapid emergence of Internet money has had a significant impact on conventional finance. Finance for supply chains paved the way for the banking company's expansion. Banking institutions services such as "trade finance," "logistic support banking," "supply chain financing," and others. The essence of these services is almost the same. Technically, it is reliant on core companies from diverse sectors, using future payments for purchasing in the supply chain connection, and conducting inventory foreclosures, purchases of trade receivables, and so on, to finance upstream and downstream firms in the supply chain (Salamai et al., 2019).

Banks often seek enterprises with good asset reputations and big company sizes as customers when performing Internet supply chain finance (Liu, H., 2019). Most core firms that conduct supply chain financial business do so primarily inside their supply chain and seldom conduct supply chain financial business outside of their sector (Li, 2019).

In the procedure of improvement and creativity, it employs contemporary advanced technology such as the web and cloud information technology to closely incorporate the transportation and cash flow of some smaller and medium-sized businesses in the both downstream and upstream supply chains of employees of the company, successfully minimizing the risks that large corporations must face. Convert the risk of a single business into a broad controllable risk. Nuclear distribution network financing may assist to accelerate the money flow and decrease the financial constraints of SMEs. It is crucial in promoting the growth of the whole company's environmental cycle (Hou et al., 2018).

### *Risk Factors in Supply Chain Finance*

Speculation is the fundamental cause of hazards. Both the internal and external environmental contexts are unpredictable. Internal threats include immature Internet technology and data integrity. It is critical to address the combined risks presented by the supply chain and financing. The manufacturing chains of different industries vary, and new enterprise processes are required; stakeholders in World wide web supply chain financing are intimately connected, and problems at any node may interrupt the continuous and efficient functioning of the entire supply chain (Yang et al., 2019).

## *Supply Chain Finance Risk Categories*

The key risks of supply chain financing in the era of big data may be summarized as follows:

❖ Financial dangers: The operating status and growth possibilities of supply

chain wealth management core businesses have a significant impact on the survival and growth of both downstream and upstream organizations, as well as the healthy development of the Internet supply chain financial ecosystem. Small and medium-sized enterprises (SMEs) are the principal beneficiaries of supply chain finance. Several SMEs have faults in their security solutions, governance practices structures, technology infrastructure, and effectiveness. All of these are future credit-independent predictors.

❖ Operational risk: If activities are forged, there may be problems with transactional agreements and deferred revenue, and banking institutions may suffer serious consequences.

❖ Fiscal dangers: Property values losses and threats emerge when the stability of the Web supply chain financing scheme is inadequate.

### *Financial Risks in The Supply Chain in The Context of Big Data*

❖ The expense of acquiring and analyzing huge amounts of data is outrageously costly: In reality, big data is scattered, rendering it impossible to achieve the following goals. A digital solution can only manage one-dimensional or multivariate data since big data is made up of diverse information bits. More outside data is required for risk assessment, and decentralised data reduces risk assessment efficacy. The cost of data handling is rising. During ordinary situations, you must invest in the collection of data, many organizations' data sets must be decompiled and docked several times, and creating a risk management strategy based on big data needs considerable R&D as well as operational and maintenance costs.

❖ Maintaining the authenticity of massive data is difficult: Large data analysis may result in inaccurate risk-management decisions if big data is misused, with disastrous consequences. There are many statistics in China right present, yet there are few high-quality resources. When employing big data in Internet supply chain finance, data quality challenges may develop. Big data fraud is difficult to identify and track. Others will simply mimic the behaviour of benefitting from data fraud, creating a trust challenge.

❖ Customer security and confidentiality concerns: When when compared to conventional financial derivatives, the most noticeable feature of Internet supply chain finance is the use of big data to replace conventional corporate governance. Big data may reduce the operating expenses of financial services organizations, yet customer privacy is easily violated. Clients must provide different private information to the website to get World wide web supply chain finance solutions. The safeguarding of private information and the product's use of it are opposed. To reduce risks, providers of internet supply chain financial services will try to understand as much as they can about their consumers. Big data may be used to recover client images while simultaneously extracting a plethora of customer privacy information. Big data in the world wide web supply chain finance refers to all forms of factual facts, such as online transactional data and checking account records. These issues about private information must be resolved before they may be employed in the foreseeable. Personally identifiable information cannot be properly protected since technological development does not classify personally identifiable relevant

data, and it may be exposed or accessed at any time.

### *Methodology, Data and Sample*

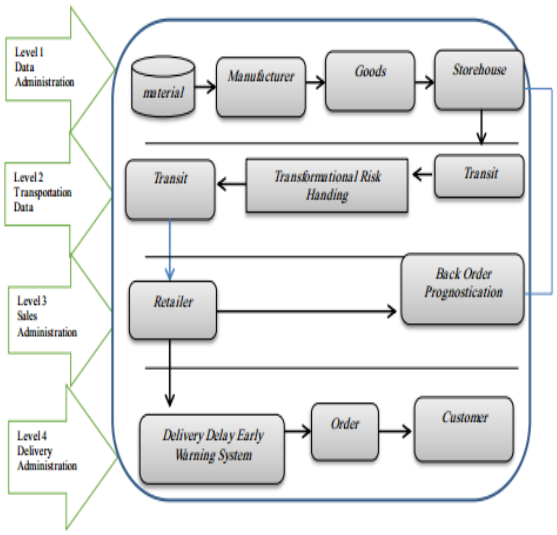
By assuming a modular structure for each stage of financial risk management in the supply chain using business intelligence and big data, this study seeks to give a complete framework for financial risk management in the supply chain. We offer it in three steps: transportation, backorder prediction, and delivery. The first lesson focuses on determining low-risk routes for goods delivery. The second module anticipates demand before it occurs. This third module is in charge of delivery optimization using business intelligence and big data.

### *The Architecture of The Supply Chain Financial Risk Management System*

The suggested architecture is made up of three modules: transportation risk management, back order forecasting, and a delivery delay early warning system. Initially, the clothing is stored at a warehouse by the manufacturer. The merchandise is delivered to the points of sale by road based on the needs of the retail markets. Various paths may be accessible during travel, and selecting the one with the least chance of harm to products is critical (Velmurugan et al., 2022).

When the commodities arrive at the stores, they are placed for sale and sold depending on demand and consumer satisfaction. When the store's supply runs low, it sends an order to the warehouse. However, making an order early, even before the item is out of stock, is done to boost sales and profits. Aside from places of sale, online ordering of goods is a common aspect of the supply chain, which includes the delivery of items to the customer's preferred location.

Delivery delays may lower customer satisfaction and lead to the consumer preferring a service that delivers faster; therefore, the earlier we foresee the delay in delivery, the sooner we may take steps to minimize it and keep the client. The following system architecture figure 1 depicts the planned system's flow in four stages. Level 1 entails the administration of all data necessary for the framework to function. Level 2 is in charge of detecting and mitigating transportation hazards. Level 3 is concerned with predicting back orders, whereas Level 4 is concerned with identifying and preventing delivery delays.




### *Sample Examinationand Implementation*

The suggested system was designed with the transportation and supply market environments in mind, and training and testing were carried out using publicly accessible statistics. Module 1 (Transport

Risk Processing Module) employs the Transport Metrics dataset, which has 2626 columns and 12 features with values ranging from 1 to 5 indicating the quality of the feature, with 1 being the worst and 5 being the best. It also includes the goal variable, an ultimate quality grade for the music ranging from 1 to 5. Module 2 (Back Demand Forecasting Module) employs a sales dataset of 18,633 columns, 16 attributes concerning product sales performance, and a binary target variable that signals whether or not the product should be placed on delayed demand. The final module 3 (Delivery Delay Early Warning Module) makes use of the Data Co. supply chain dataset, which has 142,311 columns and 44 characteristics, one of which is the variable number of days to delivery.

## *Pre-process the Data and Values*

The initial stage in creating the model is gathering and preparing the data. Data preparation is essential in every machine learning application and has a direct influence on the project's success rate. Although actual data is filthy, the intricacy of the material under inquiry is lowered. A dirty dataset comprises functionalities, various attributes, noise or abnormalities, data redundancy, or erroneous data. Any of these will have a detrimental influence on the final product's quality.

## *Risk Disclosure Form*

Risk identification is the first stage in managing risk. One of the most crucial initial steps in the risk management framework is risk identification. If, by chance, a failure to recognize a single or distinct risk factor occurs, all the following risk management steps will be skipped for that particular risk. The methodology should investigate the breadth of the risk, calculate the loss, recovery period, underlying technology, essential quality measures, and so on to assess risk. To achieve optimal modelling, each module in the design follows the procedure.

### *Risk Detection and Identification Algorithms*

Metadata from the supply chain was used as insight
Model of intelligent risk detection
Obtain a sample for the particular issue
Examine the database and its associated information
Preprocess (dataset)
Data is separated into train and test sets
Build the best (n) estimation technique for the dataset

***If the combination:***

Select the best (m) estimation methods ($m < n$).
Create an ensemble method using (m) estimation methods
Develop an ensemble method
Verify using the data set and continue the block until there is no increase in quality

***Otherwise*:**

Choose the best approximation from among (n) depending on the assessment criteria
Verify using data sets and fine-tune settings until there is no increase in quality
Finish.

## *Mechanism and Technology for Dealing with Transport and Shipping Risks*

To estimate the risk, the shipping risk management module applies a regression analysis. Initially, the sample was randomly sampled at a rate, then

preprocessed and randomly divided into test and training sets. Multiple regression techniques, such as regression analysis, (KNN) regressor, (SVM) regressor with linear and (RBF) kernel, and (SGD) regression model, were tried on the database and yielded ineffective results when assessed using measurements. Testing with additional algorithms, such as the Ridge, (LASSO), and Elastic Net models, yielded superior results than the others in regards to the performance measures discussed in the following sections. As a result, these three models were chosen for incorporation and blended into a new prediction classifier that outperformed the others. The hybrid learning yielded posterior probability and depending on the order of significance of characteristics and their levels, essential action may be done when selecting a mode of transportation.

### *Late Demand Forecasting Mechanism*

To determine if a company requires to be reordered, the delayed order forecasting module employs a categorization model. Due to class inequality, the data set samples were first chosen at random and then pre-processed and randomly separated into training and test sets. On the dataset, many different classifiers were examined, including regression models, (SGD) classifications with and without kernel estimation, linear (SVC), logistic regression, and incremental trees, which produced poor results when assessed using performance metrics. Other algorithms, such as Randomized Forest structures, AdaBoost, and Gradient Boost, performed better than others regarding the performance measures discussed in subsequent parts. Because (KNN) was a poor learner, a group of (KNN) learners was utilized for training and assessment. As a result, these models were chosen to be integrated into a new voting categorization model that outperformed the others. Given the input numbers, the collecting model may make a judgement about the company's back request.

### *System for Early Notification of Supply Disruptions*

A regressor model is used in the delay warning component to figure out how many days it will take for the goods to reach the consumer. Firstly, the database was normalized and divided randomly into training and testing sets. On the dataset, several machine learning explanatory variables such as regression analysis, (KNN) regressor, (LASSO), Ridge, Elastic Net, and Randomized Forest were examined and yielded subpar results when assessed using performance measures. Further testing with various algorithms, including AdaBoost, Gradient Boost, Extra Trees, and classification tree designs, demonstrated that the Clustering Algorithm multivariate regression model outperformed the others regarding the performance measures discussed in the following paragraphs. As a result, the (DT) Regressor was selected as the model for this module. Using the input data, the chosen model can identify delivery delays and depend on the characteristic significance, the appropriate step can be done to prevent the delay and maintain the client.

## *Results and Discussion*

The Transport systems Risk Control Module (Module 1) makes use of a mobility metrics database containing 2626 columns and 12 characteristics, each with a value that ranges from one to 5, representing the reliability of the feature, with 1 being the worst and 5

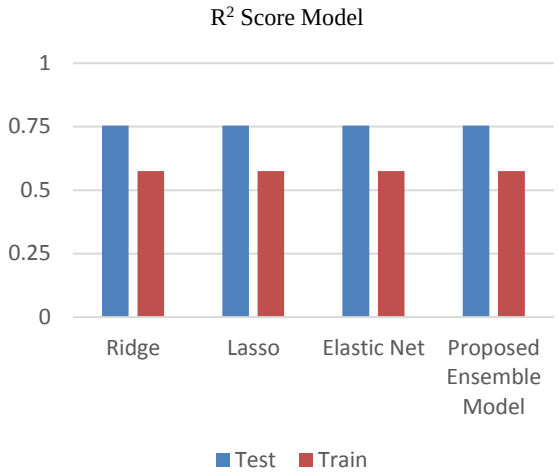
being the highest. It also included the objective parameter, which was a final quality measure for the approach that ranged from 1 to 5.

Substantial Return Forecasting Module (Module 2) employs a sales database of 18633 rows, 16 variables about the company's sales growth, and a single target variable indicating whether or not the commodity is planned to go into hand inventory. Furthermore, the Delivering delay warning system module (Module 3) makes use of the Data Co distribution network database, which comprises 142311 columns and 44 characteristics, with the variable length of distribution days functioning as the objective factor.

As this is a regressive job, we utilized the $R^2$ score, mean extreme error, and mean-squared error to evaluate the first and third modules. The second module is a forecasting job in which reliability and F1-score are used as measures.

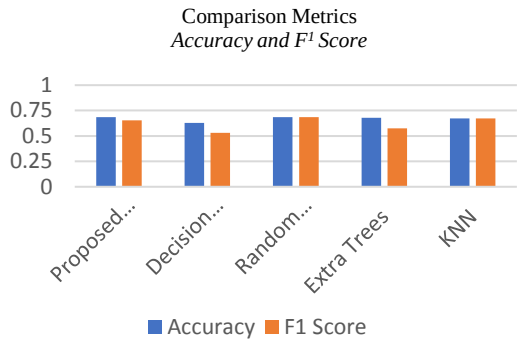
### *Transport Risk Unit*

The Mobility Risk Handling module focuses on determining low-risk routes for cargo transportation. The suggested method has a better $R^2$ score of 0.754 in evaluation than the current systems, as shown in Figure 2. The suggested ensemble learning has an average absolute inaccuracy of 0.575 and a sum of the squared error of 0.011, which are both lower than the current techniques.




### *Back Demand Forecasting Module*

Substantial Return Forecasting estimates consumption before it occurs. In evaluation, the sugges
ted method has a good accuracy score of 85.45% and an $F^1$ score of 0.6523 then the current systems shown in Figure 3. The suggested composite system outperforms the previous systems in




testing with an accuracy of 0.6295 and an $F^1$ score of 0.6843. It also has a greater AUROC score of 0.6783 in assessment than the current technique 0.5738.

### *Early Warning Unit for Delivery Delays*

Distribution optimization is handled by this Delivering Delayed Warning System component. As demonstrated in Figure 4, the suggested method has a better $R^2$ score of 0.8956 in testing than the current systems. The proposed scheme has a minimum error of 0.022 and an average absolute error of 0.033, both of which are below the current techniques.

### *Conclusion*

A model is created based on the suggested architecture to trace the complete flow of the textile supply chain from producers to end users. Our model detects and tells the user about the risk connected with the supply chain using data acquired from it. Global supply networks rely heavily on risk identification and control. Machine learning methods are used to identify system threats and assist in determining the source of the threat.

As a consequence, the firm may focus on optimizing the nature of the risk to reduce the damages suffered by it. The primary goal is to discover supply chain weaknesses and determine the primary risk causes. The methodology concentrates on three major supply chain danger areas: shipping, marketing, and distribution, with a licensed insurance model built, evaluated, and matched to current approaches before being adjusted based on the results. In this scenario, we're also using Business Intelligence (BI), which helps businesses make better data-driven decisions.

Business intelligence (BI) is a broad term that includes business analytics, data mining, data visualization, data tools, and infrastructure. It is an analytical tool that generates a complete analysis report on the supply chain using data from it, allowing users to make more informed business choices.

This suggested approach may be expanded to identify dangers connected with other types of supply chains. Forecasting the growth rate of the supply chain may also be adopted in the future, along with new ideas and techniques to help achieve the aim. Furthermore, a framework of financial risk assessment for the supply chain based on data science is provided in this work to strengthen supply chain resilience to hazards. Initially, the study examines the various forms and mitigation strategies for financial risks management in the World wide web supply chain. The risk assessment model is then analyzed using machine learning analysis methods, and a supply chain liquidity risk management model based on multivariate regression analyses and a finance decision performance simulation is built.

This study explores the relationship between supply chain financial risk management and organizational innovation using the online finance framework, investigates the authenticity of the internet supply chain cash flow, and employs the online strategic decision model using descriptive and inferential statistics. The fuzzy rule-based method was employed to assess the hazard identification of the supply chain via the World wide web, and the long - term learning was used to evaluate the causal connection model to handle the risks in the supply chain in three particular stages such as shipping risks, attempting to sell risks, and supply-and demand-side risks to enhance the risk management capability of the online supply chain and digitalization. Data analysis and general risk management decisions are made using the split-sample statistical method

and the research model and chart displayed in the figures.

The experimental observations analysis findings reveal that, under the online financing method and digitalization, the model is piecewise suited for financial risk management and supply chain management, and the data assessment reliability is excellent. The model is suitable for financial risk management and assessing supply chain performance, and it may successfully reduce the financial risks of the internet and digital technologies supply chain.

## *Limitations and Future Scope*

This work proposes a theoretical and practical research paradigm to guide future investigations in solving these particular research needs. Based on the problem statement, this study contends that institutions can use business intelligence and big data to smartly control the monetary risks of supply chains to create useful, scarcity, non-imitable, and non-fungible resources to address the key areas of financial risk management in supply chains, thereby increasing agility and efficiency. Supply chain administration. The research model was used to illustrate our claim that business intelligence and big data may be utilized to minimize uncertainty in essential activities of financial risk management in supply chains. Using the study framework, this suggested framework illustrates how the ability of business intelligence and big data in companies can manage and minimize financial risks in supply chains by enhancing decision-making in the areas of financial risk management in supply chains, which leads to improved business movement speed and supply chain performance. The approach also includes three major areas of financial risk management in supply chains, as well as possible elements of supply chain agility and performance leveraging big data and business intelligence.

We hope that our suggested research approach will assist scholars and operators broaden their understanding of how to attain SC mobility. It also emphasizes the necessity of successfully managing financial risks in supply chains and successfully enhancing the capacity of business intelligence and big data to minimize these risks, reduce exposure associated with tasks in managing financial risks in supply chains, and eventually enhance nimbleness.

In the conceptual framework, the present study does not account for BI maturity (Cosic et al. 2015) or regulation impacts. The comparative usefulness of applying business intelligence in supply chain administration is outside the scope of this study. This original study's shortcomings might be seen as a potential for further studies. Following that, a scientific case study with multiple individuals from various companies would be done. We will contact ten to twelve directors from each company who are involved in controlling financial risk in their financial chains, as well as examine the capacity of big data and business intelligence within each company to assist in the three key areas we discussed earlier in this research for financial risk management in supply chains and evaluation. Appropriate materials to assess each organization's performance in increasing its speed of progress. We will explore methods for efficient and optimum use of big data and business intelligence to promote operational capability for flexibility and efficiency in controlling financial risks in supply chains via these in-depth research papers.

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