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AI-Driven Optimization of Intelligent Supply Chains and Payment Systems: Enhancing Security, Tax Compliance, and Audit Efficiency in Financial Operations

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Abstract:

The potential of Artificial Intelligence (AI) to impressively improve logistics and supply chains has long been recognised. However, only in recent years have the resources and accomplishments in AI research become available to efficiently engage in the kind of optimisation required by modern and intelligent supply chains and payment systems. In view, with the rise of the Internet of Things (IoT), vehicle routing, Big Data, and blockchain-driven track and trace, effective and ongoing application of a new sub-field, AI-driven optimization, is seen as the next key challenge and productivity improvement for the structure and design of future-risk-averse intelligent logistics. Therefore, as a perspective of multiple interrelated novel standing points of view a broad introduction to this field is given here. The benefits of AI technology will be comprehensive and balanced to successfully fulfill such an optimized concept of future intelligent logistics and accompanying payment systems, particularly if along with the technical aspects its strong social and environmental impacts are closely monitored and controlled. Hence, increasing the transparency, explainability, and resilience of the AI and AI-guided approaches will be relevant competitive advantages. If the upcoming breakthroughs in the field of AI-driven optimization of logistics and supply chains are to be established, significant new forms of collaboration between businesses, authorities, and academia is vital. As a starting point for such comprehensive interaction, highlighted by the missing cross-sector or cross-field interdisciplinary efforts on this topic thus far, an appropriate research agenda, as well as significant spaces for joint R&D projects, are proposed and identified.

Keywords: AI Optimization,Intelligent Supply Chains,Payment Systems Security,Cryptographic Security,Tax Compliance,Audit Efficiency,Machine Learning,Blockchain Technology,Digital Signature,Reinforcement Learning,Supply Chain Cost Minimization,Fraud Detection,Financial Auditing,Taxation Algorithms,Transaction Verification

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1. Introduction

The industry is progressively promoting environment-friendly supply chain networks. The goals are to reduce fuel usage, carbon emission, and traffic congestion. Only in 2017, the global fuel use and carbon dioxide discharge were 544 billion liters and 2.45 billion tons, respectively. The first and foremost, of developed countries, the transportation sector contributes around 15 percent of the total carbon dioxide emission to the environment. Particularly in the case of European Union countries, transportation is the leading source of environmental air and noise pollution, respectively 24 percent and 33 percent. In terms of greenhouse gas production, road transportation contributes more than 70 percent. Conventional production technologies are acknowledged to have largely contributed to the carbon footprint generated in supply chain systems. Thus, contemporary configuration of supply chain and logistics management (SCM and logistics) networks has been aimed to advance and maintain environmental equilibrium. Reduced assigned freight time, improved transportation efficiency, equipped distribution structure, and advanced vehicle technology are some of the primary purposes. The performance improvement goals of such technologies comprise maximum possible usage of resources, decrease of waiting, and the transport time of vehicles, and cheesecloth discharge, augment of on-time and amount deliveries, reduction of deadheading, lowering allocation costs, and minimization of air and noise pollution. Consequently, AI-induced decision support solutions are crucial to enhancing the execution and effectiveness of such technologies. The network-based structure of SCM and logistics were originally investigated to build a conceptual framework in order to deploy AI for the optimized operation of a network-based distribution structure. The framework embodies suppliers that supply valuable merchandise, data input, and currency that transit the network with agreements and acquisitions. Each supplier or output node of commerce scheduling has a specified capacity and specialization that requires the transportation of products at a given cost. For reasons of this present model, the network might be regarded as an undirected degree-one graph, with dispersed sources, a node assigned distribution center, and a node designated output customer. All resources transit the network out of D. Nodes B and C are transporters of goods that should either accumulate or transfer the commodity.

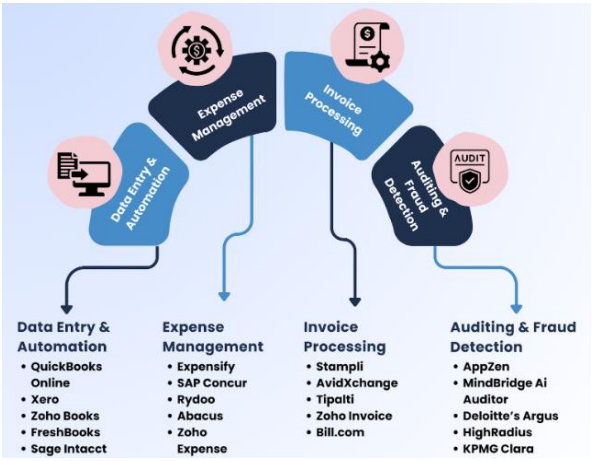

Fig 1: AI-Driven Optimization of Intelligent Supply Chains and Payment Systems

1.1. Background and Significance Present-day supply chain systems based on data sources are evolving at an incredibly quick speed and produce substantial volumes of data. Data-driven AI provides a platform for enabling large-scale and complicated supply chain systems to process data for insightful decision-making and action. AI-driven optimization of adaptive and intelligent supply chains and payment systems is explored.

In light of the above challenges and with an impending concern in the community on systematic and secure network-resource utilization system design with a focus on AI-driven optimization of intelligent supply chains and payment systems, the purpose of this paper is to design methodologies and technologies for AI-driven optimization of adaptive and intelligent supply chains and payment systems, and apply AI-driven solutions to model, solve and optimize the systemic operations, network resources, and reliability decisions towards system-wide performance indices for the end-users in a comprehensive framework.

In nature, the proposed framework looks for a group of AI tools and models to induce intelligence and automation in the operational planning, routing and scheduling, and reliability prediction of the adaptive and intelligent supply chains and payment systems, each with different characteristics and complexities. Specifically, the real-time learning, prediction and optimization features of state-of-the-art AI methodologies help shape a family of effective agents to model and solve relative operational, technical and financial problems respectively, and create a secure and reliable network infrastructure, aiming to improve efficiency, convenience and safety of consumers, providers, and autonomous systems, enhance integration and interoperability of services, and facilitate fairness and sustainability of the marketplace for a wide variety of economic zones.

Equ 1: AI-Driven Optimization of Supply Chains

$$C_{total} = \sum_{i=1}^{N} \sum_{j=1}^{M} (p_i \cdot x_{ij} + t_{ij} \cdot x_{ij})$$

subject to constraints:

- Demand satisfaction: $\sum_{i=1}^{N} x_{ij} = d_j$, for each customer j.
- Supply constraint: $\sum_{j=1}^{M} x_{ij} \leq S_i$, for each supplier i.
- Non-negativity: $x_{ij} \geq 0$.

2. Understanding Intelligent Supply Chains

Artificial intelligence (AI) in its simplest form entails making computers capable of performing tasks that are typically associated with human intelligence, such as recognizing when a product is running out and knowing how to put a shipment together and when it is time to send it. Typically, AI in the supply chain focuses on gaining visibility in areas where it is hard to achieve and then performing tasks that require that visibility. Areas where AI is having a huge influence include predicting consumer behaviour and sales, operational procurement using smart data, assisting with supply chain planning by forecasting supply and

demand, improving logistics of warehouse management to optimize inventory, and analyzing inbound and outbound logistics operations, such as multi-echelon, network design, and routes optimization. Common logistics optimizations include faster shipping speed to reduce delivery time and lower shipping costs, and adaptability regarding economic impacts in trade war situations. One of the ways organizations are utilizing machine learning and AI to improve the industrial supply chain and logistic strategy is through dealing with a large number of variables when examining and making decisions, breaking out effectiveness adjustments for the whole organization into smaller and more detailed units. AI is then used for the refinement of these strategies. For example, catching stock-outs is crucial for 3PLs and e-commerce companies. Companies are currently exploring optimization algorithms for warehouse and inventory management compliant with specific agreements with clients to provide the highest inventory availability. It has been proven that having specific SKU bin configurations and stock layout within a warehouse can help decrease service times when it comes to day-to-day activities, such as inventory replenishment or transportation. The topic of warehouse optimization technique implementation is decentralized across multiple client SMEs, which absorbs some of the complexity of handling vast amounts of participants and variables.

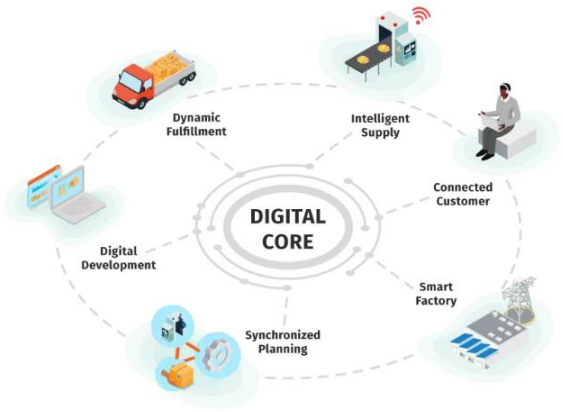

Fig 2: Intelligent Supply Chain Management

2.1. Definition and Characteristics The arrival of artificial intelligence (AI) as a new research paradigm has recently shaped the creation of a variety of applications that manage the intricate interaction of networks, organizations, processes, and IT systems. Social, economic, and natural systems are subjected to the level of complexity that previously required simplified models of linear and deterministic behavior. Moreover, their structure is evolving quickly due to the impact of globalization, rapid innovation, and the institutional shift towards a highly interconnected digital economy. In light of this, AI has been shown to be a strategic tool due to the possibility of providing decision-makers with suitable models and techniques to understand and steer the behavior of complex systems efficiently. In addition to this, recent enhancements in networking and computing promote AI's capability to look deep into the structure of complex systems and increase its potential to manage them efficiently. Major advancements in this area are allowed by the development of big data capable architectures and self-learning technologies.

The supply chain forms a network of suppliers to downstream customers that the ultimate customer gains access to through a series of independent or connected corporations. The network might include factories, warehouses, suppliers, customers, producers, wholesalers, and retailers. The first step in the supply chain is planning, where the strategic objectives of the network are determined. This is followed by sourcing - determining which suppliers to obtain items from, bargaining costs, scheduling the shipment of goods to the factory, and confirming that vendors deliver goods on time. The next step of the supply chain is to build goods at the factory from components purchased by vendors, and by-products die in the process. Then the goods are stored in the stock before they are sold as needed by the distribution system. The next stage was distribution. It is the recipe for product, catalogs, displays where to store, and when an order arrives, specify which box it should be placed in and handle shipping to the customer. The final part of the chain is the customer interface, which is in charge of obtaining returns and orders back from the client and delivering goods to the client. This section concentrates on the modeling of the logistical processes of the supply chain.

2.2. Importance in Modern Business If a user takes a glimpse at the modern industrial scene, one would see a maze of intricate, fiercely connected production systems and supply networks, all of which interact and rely on a supply chain system. In such an environment, it is clear that many complex management decisions must be taken, necessitating a combination of knowledge, experience, and real-time information that is either not accessible or not directly accessible. Consequently, a significant segment of operations, production, marketing, and procurement management applications will profit tremendously from AI-based strategies since they may not only simplify and mitigate the work for a logistics expert who optimizes the network, but they may also lead to superior solutions, particularly when these experts need real-time information for their pursuit. Artificial intelligence is a rapidly growing, multidisciplinary research arena that has the potential to provide logistic examiners with the required tools, knowledge, and techniques to create complicated AI-based systems that may provide decision support in uncertainty concurring supply chain operations. During the past three decades, AI has made major advancements. The expansion of AI systems into logistics organizations may assist in overcoming obstacles and expanding organisations, increasing the pace at which data is examined, enhancing the effectiveness, accuracy, quality, and value of the decisions made, and reducing costs. AI solutions have also been used to solve industrial supply chain management problems by simplification, adaptive scheduling, and fault diagnosis of intricate systems.

3. Role of AI in Supply Chain Management

Supply chain management is an area where we are likely to observe widespread use of intelligent applications. These might take the form of classic knowledge-based systems, software agents or even blockchain technology. Increasing levels of automation are to be expected within logistics. The specialist on intelligent supply chains and payment systems outlines a future scenario in which delivery planning, the retrieval of goods from the warehouse and final delivery are conducted entirely by AI-driven robots. Other potential

applications discussed are intelligent invoices and automated financials. The collection and processing of invoices is an essential yet time-consuming part of financial management, especially for small businesses. Fintech companies have begun developing paper-to-digital invoice systems, which will help automate the processing of invoices. Some players on the EU market are using AI algorithms to process electronic invoices. Evolving such systems will allow intelligent matching between purchase orders and invoices. Furthermore, AI systems using natural language processing might automatically identify illegitimate invoices. Potential use-cases involving chatbot systems for invoice tracking and liquidity status monitoring are also predicted.

Within existing financial systems there is also a possibility to observe an increased demand for automated solutions. Predominantly finance-oriented AI applications will likely focus on fraud detection – a multi-billion-euro annual problem for the industry. The application of AI in processing transactions is also expected to increase, focusing on payment categorization and personal financial advice. With the rise of app-based banking, investment in personalization will be key for fintech firms. Marketing efforts will be heavily based on the analysis and prediction of customer behaviour, allowing for instant-calculating suitable loan interest rates. It is also stated that in the near future, AI-driven smartphones might help clients better understand their spending behaviour, in effect acting as a financial tutor. The partnership of AI and the IoT is anticipated to create innovative business models which link costs to particular lifestyle choices, rewarding healthy living with reduced prices for insurance, gym access or even groceries.

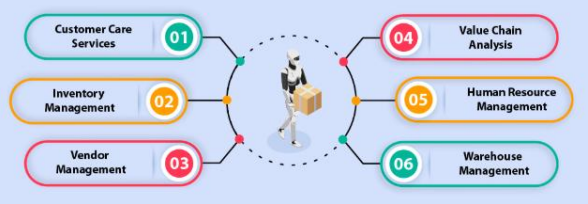

Fig 3: AI In Supply Chain Management

3.1. Predictive Analytics Supply chain and payment in integrated logistics have become vital under the autonomous intelligent systems recent advancement since unprecedented business applications are emergent over complex decision-making issues. In this study, fundamentals are integrated in the art about the AI deployment for two prominent integrative fields with stakeholder relations depicted in conceptual illustration for the algorithm's connection to naked eye installation on related research. It also natally convenes a diverse network of participants to accompany stakeholders with a pivotal prospective strategy for educated deployment. In the stand-out supply chain section, initial is to schematize the integration of the prominent logistics-operation-finance nodes of the intelligent supply chain for insight of AI algorithms' utility. To elaborate over the critical sub-nodes while combining historical predictive analytics observations to educate future optimization and AI prioritization. It exemplifies the initial manufacturing subfield, with the few initial categories of the broad application, to recognize it is an imbalanced view over the supply chain categories concerning to stipulate more representatively balanced future study and correlative research of its own. The Exemplifying algorithm section has a spotlight of its

own deployment research, when broader network cultivation is suggested. In addition to conventional marketing, warehouse, and routing decisions, it covers comparatively less insightful but prominent paddock and forecasting segments. Other potentially promising premises of the supply chain finance subfield education conceive external AI algorithms evaluation and inspections over the exogenous circumstances of the inducted research which would contribute to the introductory strategy accompaniment for integrated stakeholders.

3.2. Automation and Robotics Driven by globalization, mega-trends and emerging technologies such as Artificial Intelligence (AI), Digital Twin, Internet of Things (IoT), Robotic Process Automation (RPA), Augmented Reality, Drones, Blockchain and Additive Manufacturing businesses, governments and consumers are experiencing significant changes regarding how products are created, sold and delivered. AI-driven changes are numerous ranging from the sourcing of raw materials and labor to production, warehouse, and logistics management, customer experience and payment systems. Moreover, there is a multitude of academic processes and publication standards to observe. Machines and computers can accomplish some of these tasks better and faster than a human ever could. Luckily, Automation and Robotic Process Automation technologies are there to help with that. They will take over various routine tasks such as scheduling, rescheduling, data analysis, trend monitoring and charts. Today's overview will focus on some of these important aspects and changes currently happening or likely to happen within the future. The evolution of AI-driven Intelligent Supply Chains (ISC) and payment systems in Germany is being explored using as an example a leading German carmaker company. The need for rapid adjustment of existing processes, methods, logistics, inspection and control systems, as well as employee retraining and creation of new job profiles are being highlighted. Additionally, the possible shifts and future of the industries, employment markets, infrastructure, and consumer habits within the country are being assumed.

Equ 2: Security in Payment Systems

$$H(P,k) = \text{Hash}(P||k)$$

$$\sigma(P,k) = \text{Sign}(H(P,k),k)$$

Let:

- P represent a payment transaction with amount A
- k denote a cryptographic key
- $H(P,k)$ be the cryptographic hash of the payment data P
- $\sigma(P,k)$ be the digital signature of the transaction

4. Payment Systems in Supply Chains

Supply chain efficiency is the primary norm that advocates all industrial production. An integrated approach combines benchmarking, engineering, and procurement based on the objective norm of benchmarking. The benchmark competition is first divided into different classes for attributes creation, then normalized by statistical outliers. Attributes with similar standards are aggregated to create a multi-attribute norm. A multi-demand strategy analysis is adopted for each commodity in a multi-commodity allocation to framework the

benchmarking process. Shared generation sources with neighboring responsibility zones are considered on the North American Western Interconnection. These industrial competition norms can be developed for engineering teams to implement in-depth development strategies. Abstract: This study examines a supplier park with four autonomous vendors and an internal industrial supply chain with a dedicated external rail and truck network. The complex transportation network means that it is difficult to optimize traditional respect multiple-echelon supply chain parameters uniformly. Vendors must determine the collection lot size after production and the delivery lot size when delivery orders are placed. Production facilities must determine the optimal collection size and budget of their vendors. At the same time, the supplier park must determine the facilities that are produced by Autonomous and the modal fragmentation pallet composition of trucks and ships that serve the container terminal ports. This requires the development of a novel decoupling procedure. Several state-of-the-art artificial intelligences (AIs) and very large-scale neighborhood search algorithms (VLNS) are used to solve highly weak complex integer programming models.

The numerical experiment indicates the effectiveness of algorithm synthesis and a significant number of ins-tested products. This is a network usage fee that is calculated. It is an important guideline for supply chain acceleration. The laboratory uses the fee method to develop a control compensation procedure for the objectives of the real supply of industrial parks and the network access fee received by LSP. Performance growth, network time reduction, delivery billing amounts, capacities, and safety inventory sizes were analyzed through various numerical experiments with a qualified sensitive research method. This work provides examples on how to optimize the rail-truck modal split and the vehicle rhythm to minimize total supply chain network costs. On the development of the supplier park, the sustainable supply chain development dilemma is analyzed in the park-linked environment of vendors and industrial parks by using the cross-complaint work, the identified new distributors' development work stream and bad.

Several suggestions were drawn from the received studies. The supplier's easy-to-use supply chain payment fee method is upgraded by the implementation of the plant consignment fee. The consignment fee is calculated from the production payment category of the transported articles in which desired calculation attributes are included and the selectable normalization process. Chain production under collaborative arrangements are applied, compensation algorithm design is reached faster by using computational integration. The supplier's development time includes understanding the setup time of the backer garments and accommodation processes.

4.1. Overview of Payment Systems In the present era of digitalization, the internet has driven people effectively in many aspects, including education, e-commerce, accounting, shopping, payment systems, and banking. People have started to use the internet for e-commerce activities, which play a vital role in the circulation of money. The payment system was brought to the population in the industry because of its considerable attention. A payment system bridges the gap between the trade provider and customer. Effectiveness of the payment system is a significant feature for every enterprise. Success of a payment transaction is based on the routing of the transaction. The term ‘Upward Routing’

corresponds to the point at which a merchant website passes a transaction to the payment gateway, while the 'Downward Routing' corresponds to the journey of the transaction from the gateway through all the associated acquirers and back to the gateway, where the response is sent back to the merchant. This work focuses on the Upward Routing of a transaction. Superior routing of a transaction boosts the success probability of the transaction. That is a transaction is more likely completed if the gateway treats it well. With the setup of a prosperous digital payment system, a payment service supplier (PSP) and a payment service alternative (PSP) will function between a business and its merchants and between a gateway and its banking institutions.

With respect to actual transactions, the PSPs of the business will hire PSPs that expedite transactions through the gateway, which will then use the services of many acquirers. Acquirers are banking companies responsible for dealing with transactions through the card scheme. Each acquirer is associated with a bank. A prospective approach to store the most effective static and dynamic configurations is to use machine learning (ML) and artificial intelligence (AI) techniques. Substantial research has been performed to improve the productivity of the terminals using ML models, which help service providers to store various parameters related to each transaction terminal obtained from the training data. Utilizing these models, a payment transaction can be securely sent to the terminal having the highest effectiveness likelihood. However, the terminal placement is disturbed when a parameter of the training data significantly changes. Thus, there remains a need for an innovative technique that considers the ease of configuring the gateway while still reacting promptly to the alteration in any of the parameters.

Fig 4: Overview of Payment Systems

4.2. Challenges in Payment Processing In the current era of digitization, online payment systems are attracting considerable interest. Every customer who makes a purchase online necessarily undergoes the payment process. Improving the efficiency of a payment system is important as a payment system has a substantial impact on revenues for businesses operating them. A payment system consists of a gateway, a payment processor, and numerous acquirers: these are banks that receive the payment on behalf of the merchants. The gateway is an integral component of a payment system through which every

transaction is routed. All the incoming transactions are uniform, irrespective of payment method or card brand. The gateway relies on the payment processors to process these transactions, each gateway has roughly the same arrangement of acquirer-integrated payment processors. These payment processors integrate with the gateway through various configurations called terminals. Every transaction to be routed to a payment processor must specify one of its terminals. This requirement was implemented to give merchants flexibility in specifying the acquirer and other payment-related attributes of the payment processor. Routing a payment transaction through the best terminal is crucial to increase the probability of a payment transaction being successful. Machine learning (ML) and artificial intelligence (AI) techniques can be employed to accurately predict the best terminals based on their previous performance and various payment-related attributes. The goal is to maximally utilize this modeling to improve the performance of the pay system.

A novel pipeline has been devised consisting of static and dynamic modules to accomplish this modeling. The static module is executed every second and does the initial filtering of the terminals using static rules and a logistic regression model trained to predict gateway downtimes. The dynamic module is executed 15 seconds following the successful execution of the static module. The purpose of this module is to compute novel terminal-wise features in real-time that accurately model the terminal behavior. These features are updated in real-time using a feedback loop from the decision-making gateway and are passed to a random forest classifier at the moment of the transaction. The classifier predicts success probabilities for every terminal and, based on those probabilities, the gateway decides the terminal to which the transaction is routed. This pipeline has been in production for the last 2 years, routing millions of transactions. It improved the success rate across all payment methods by 5%. The system now sends at least 7% more internet transactions, which has made the payment system more resilient to sharp performance drops. This also resulted in an improvement in the success rates of high-denomination transactions because they are typically sent by users with a high success rate. This has made the payment system more resilient to performance changes by acquirers and processing banks. This improvement is notable in user experience because for users the experience of not getting a rejection is more satisfactory than understanding the reason behind the rejection. Better understanding and predicting acquirer downtimes guard merchants from revenue loss which in turn promotes more appeal to merchants' payment systems. As a result, this feature earned a higher success rate for all the merchants. Alternatively, the payment system could gradually build trust in merchants with track-record data by first routing small transactions. The overall improved success rates resulted in more business income. At the end of the day, offline payment processors submit all the transaction attempts that accumulate a penalty not only for late-submitted transactions but also for those that otherwise failed. Hence, a higher success rate also implies less miss-rate on the submit-time, and therefore less expensive. This, in turn, further promotes a better success rate.

5. AI Technologies Enhancing Payment Systems

The evolution of artificial intelligence (AI) is shifting all paradigms within business environments, altering how supply chains and payment systems are managed. AI investments

are projected to exceed the $8 billion mark this year. The main focus is on upgrading procurement processes, sourcing of products and raw materials, combined with a particular focus on B2B payment systems, which are tuned to the functions of supply chains. Efforts are put into creating more customized solutions, which are able to either modify existing supply chains or develop entirely new ones, integrated with payment solutions. All these efforts enable using AI to drive the optimization of intelligent supply chains and the seamless monitoring of transactions. It is estimated that 57 percent (including all B2B payments) will be carried out in real-time by the end of this year, with the use of checking delivery status being one of the predicted triggers.

AI-based commerce has trickled down significantly within supply management right from the onset of the pandemic. A lot of home-bound consumers have embraced e-commerce for their shopping endeavors, even for essential goods. The effect was way beyond the initial foreseeable outcomes, affecting not only e-commerce itself, but the entire supply logistics chain as well. In a rush to satisfy the increasing online demand, a great portion of e-commerce has shifted its reliance to larger online merchants. With the capacity to promptly dispatch orders, the consequence has been an unbearable encumbrance to transport systems, particularly those focused upon so-called "last-yard" delivery. In a bid to surmount these obstructions, diverse AI-supported shopping platforms have been put to use. Underneath these, a versatile chatbot, catering to the complete procurement chain, including merchandise sourcing, payment, and even track status checking, can be singled out. Several markets have seen the implementation of artificial intelligence system applications in the management of all warehousing operations. In instances such as these, goods selection may have been subject to automation, making employees use Smart Glasses. Those are a wearable device, paired with Warehouse Management System (WMS), capable of imparting precise data to the bearer straight to the eyepiece, indicating the items to be picked with the entire process being under AI control.

5.1. Machine Learning Algorithms The research will concentrate on the convergence of AI and ML technologies to foster the optimization and protection of the novel intelligent supply chain payment system. Information and communication technology gives opportunities to upgrade supply chain payment systems in a quicker/ more accurate process. Nonetheless, the rapid evolution of monetary and payment systems brings performance and risks, which old approaches may not manage effectively anymore, while the stake is becoming increasingly important.

Compared to the other primary industry, the emergence and adequate fulfillment through technological/ organizational modifications of counterparty and systemic risks in monetary and payment systems is crucial for BFS and payment platforms. Effort will be made to tackle real-world operational issues savored by a European monetary and payment system supplier and financier when contemplating the refurbishment and optimization of a novel supply chain fund transfer platform. Such platforms enable shifting funds among diverse functions of a multinational group that are usually located in diverse countries, e.g. to settle the inter-organization trade, offshoring, funding, and financial performance consolidation.

A novel AI-ML converged model is fostered to support supply chain fund transfer system goals adapting a blend of various AI-ML methods. Machine Learning (ML) at or on top of working with deep neural networks (DNN) is emphasized, as they are quite extensible and can achieve interaction with participants and data via APIs. Some of the developed AI-ML DNN solutions are unique and haven't been published before, as they adapt a blend of newly-fostered DNN methods of various kinds enumerated recently in the literature. Nice retrospection and comparisons to other simpatico research are provided though. The blend of AI-ML DNN models is devised to warrant that crucial information is considered and is predictive in conditions with little data and for long-term goals. Some emerging barriers and issues are also discussed to aid schooled development of ML technology in monetary and payment systems and beyond.

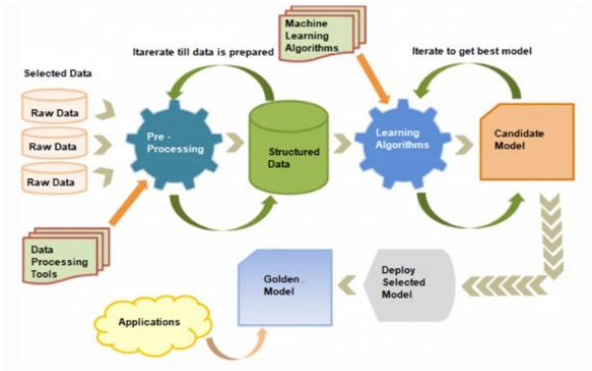

Fig 5: Machine Learning Algorithms

5.2. Blockchain Technology Blockchain Technology refers to digital records and transactions protected by advanced cryptography and distributed across computers in the network. It is used in various applications such as preserving the transaction history and handling financial transactions in cryptocurrencies. Supply Chain Management (SCM) involves all activities from the acquisition of raw materials to the delivery of end products or services, including suppliers, factories, warehouses, transportation, customers, etc. A supply chain (SC) comprises not only operational activities, but also information flows and money transfer across different trading partners. Blockchain technology can trustfully record transactions for the mechanism of cooperation in a supply chain so that all parties have a common, authentic understanding of the SC transactions, thus enhancing trust among trading partners and reducing the necessity for intermediaries. The first of a two-part overview paper on Artificial Intelligence (AI)-Driven Optimization of Intelligent Supply Chains and Payment Systems examines optimization models developed to mitigate operational risks and improve decision-making related to the trade financing of cash-constrained SMEs. It provides a framework to structure data-driven and simulation-aided research in this emerging field; reviews mathematical programming models focused on decisions and transactions along the trade financing lifecycle through scenario-based risk modeling; presents models and techniques used in sourcing, production, payment, hedging, and finance decisions associated with the export of physical goods or the supply of commercial services; and includes a case study on product quality inspection, the provision of financial penalties, and the decision to block payment. Widespread IoT deployments and

increases in the velocity of data exchange and business transactions have set the stage for the newly coined concept of Intelligent Supply Chains (ISCs). To simplify and coordinate routine operations in ISCs, blockchain and distributed ledger technology (DLT) will be increasingly used to create a network of autonomous agents with the ability to act proactively and execute predefined events under specific circumstances and conditions. They are expected to be particularly useful in managing cross-border payments, letters of credit, and related logistics operations.

Equ 3: Tax Compliance and Audit Efficiency

$$\text{Total Tax} = \sum_{j=1}^{N} T_i \cdot P_j \cdot Q_j$$

Let:

- T_i be the tax rate for a specific product or service
- P_j be the price of product j
- Q_j be the quantity of product j sold
- R be the total revenue from transactions

6. Security in AI-Driven Supply Chains

The rapid evolution of artificial intelligence (AI) to support intelligent systems in market requirements represents a new challenge for research in supply chain systems. Organizations that adopt AI technologies are confronted with a wide range of applications in the field of logistics and supply chain automation systems. AI technologies have gained increasing attention and are being utilized by many well-known organizations to optimize their supply chains and logistics systems. Optimized supply chain networks, which include the production process, warehouse management system as well as order management and transportation including delivery, consist of various tasks suitable for the application of AI. Areas of AI operation support include automated UX prototyping, mining of user activity, event-based monitoring and prediction, expertise management, crowd management, forecast, and scheduling of social campaigns. The solutions are compound systems and cover every step, starting from selecting products to deliver production, efficient storage and fast distribution systems, accompanied by artificial intelligence algorithms. In future supply chain systems, the AI will provide outputs for an optimal combination of demand forecasting and planning, routing and scheduling of transportation tasks to implement better use of resources and optimized sales. The products should be delivered at the right time, in the right amount with the right quality and at the lowest possible cost. These systems should also provide passive optimization of the process, e.g. warehouse organization, including the principles of product selection, placement rules, or optimal delivery path calculation.

Covid-19 also generates additional conditions for the operation of manufacturing-warehouse networks because of significant limitations in the movement of goods, both in the distribution from the production level to the warehouse, and during delivery from the warehouse to the recipient. These limitations lead to the stagnation of the distribution process and loss of resources. In addition, sudden behavioral changes in the market, because of fear, the dynamic development of the disease, or due to a sudden spike in demand in response to media notifications, make classic supply chain network optimization systems inadequate, because

they cannot automatically adapt to sudden changes in market behavior. On the other hand, AI systems have greatly increased the capabilities of tracking, interpreting and responding that are difficult to achieve with traditional techniques. However, the involvement of AI systems in the composition of supply chains in traditionally highly conservative industries and at levels that directly affect consumers raises many controversial issues starting from trust and reliability, ending with ethical credibility.

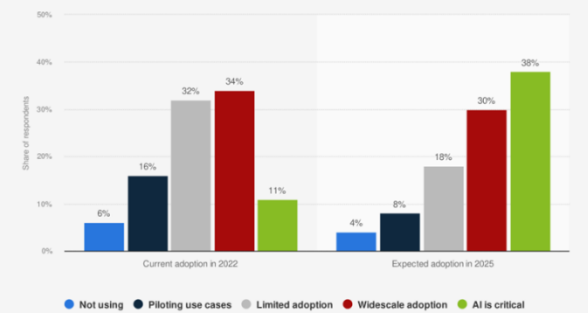

Fig : AI-Driven Supply Chain Optimization

6.1. Cybersecurity Threats According to, cybersecurity threats are on the increase and have the potential to cause significant economic losses. Cybersecurity risks fall within the top 5 risks with High Impact and are rated 4th in terms of the likelihood of occurrence. Applications of AI in comfortable settings, specifically banking and finance, are of remarkable interest in the FinTech/RegTech area. The roots of such interest originate from the heavy load of rules (compliance, reporting, and also supervision) that are mandatory for the proper functioning of the financial systems worldwide. Noteworthy, many of these compliance rules are currently fulfilled manually by financial institutions, representing a high financial cost. The high presence of manual work also increases the potential for oversight and error, which can be critical for the stability and functioning of the financial system at the global level.

The integration of complex AI models in worldwide supply chains and payments can be game changing with respect to detection ability and processing efficiency. Such a profound integration allows for the review and interpretation of data in real-time, as they are generated. It is key when considering processes where coordinated actions have to be planned in response to unforeseen events (like rapidly altering consumer behaviors). Nevertheless, the increase of the monitoring intensity of supply chains and payment systems is not risk-free. Cyber-attacks on the newly established AI-driven networks can significantly reduce trust and confidence in their operation, ultimately hindering their wide acceptance. Concerns about reliability and robustness can prevent the adoption of current and future AI-based applications. Given the critical role that new AI-driven international supply chains and payment chains are foreseen to play in the next future, this poses a series of issues and suggests the need for the establishment of widely accepted guidelines, identification of security vulnerabilities and the development of appropriate protection strategies.

6.2. AI-Enhanced Security Measures Supply chain and any equivalent Mege Forces-based payment system are an essential part of a diversified and dynamic economy as it is commonly associated with the tactical and strategy functions of business

environments. This e-class supports the tasks of transferring goods from suppliers to customers to develop an Intelligent Supply Chain (ISC) and an Intelligent Payment System (IPS) for payment applications. To achieve these, Initial Rotation and Enhancement Factors are employed in ISC and IPS respectively to increase the business price. The ISC and IPS are designed, built, and evaluated by Supporting Information-Based services and infrastructures. The successive results reveal the benefits of e-classes in ensuring that ISC and related value-added services enhance the strategic position of businesses. And thus, enhancing the use of stakeholders about the financial condition of the IPS. To use developed e-classes, businesses are able to improve supply chain perspective and payment network efficiency.

Syncing Goods from the point where light diodes are being manufactured to the point to which light diodes are employed in the consumer machinery, going through various occasions against vendors and through conducting the service providers, i.e. suppliers, manufacturing plants, transport facilities, transactions, warehouse systems, outlets, customers, or vice versa businesses. Here's a few fundamental organizations, requesting the goods purchased, shipped overseas, and supervising the price of goods doing shop, specialties, news stores, etc. The target might float in step with internet technology, resulting, e.g., in online shopping and e-money transactions, and under the prevailing regime, a surge in internet updates with differently sized strategies are required. Substantial technical information of making the internet application, info-design for device, informing procedure, appending content services, legal matters.

7. Conclusion

The objective is to cleverly optimize designing performance and operating a structured supply chain network targeted at a television manufacturing firm's performance metrics utilizing an artificial intelligence (AI) technique. It has been proven that a variety of unique concepts, tactics, and methods may be used in the design of a supply chain network's integrated network architecture to optimize a structured supply chain network. The recognized organizational performance criteria are stakeholder satisfaction, innovation and learning, market performance, customer satisfaction, and financial success.

It was decided to evaluate, design, and model the original SCM network in order to more effectively design the efficient SCM architecture; moreover, it is tested on the SCM network of a television manufacturing organisation. In addition to the network-based design of the SCM architecture, a logistic infrastructure network is also developed; it has a profound influence on the effectiveness of the SCM network. Publicly established techniques for AI-based SCM report on the prospective evolution of SCM and logistics, and the processes of SCM and logistics have only recently begun to be effectively modelled. The total performance metrics of the project are 94.12 percent. Beyond the above, it is hoped that the suggested model may urge those interested in developing SCM and logistics architecture to invest in understanding the importance of a network-based architecture.

7.1. Future Trends

Supply chains are central to the value generation of businesses and economies alike. Supply chains belong to the oldest organizational constructs and have undergone numerous transformations throughout the

years. With the advent of the Internet, supply chains underwent the electronic transformation of business processes. This altered the way companies did business, providing more interaction, but still many human operators were required to enter information. Today, digitized data passes autonomously and with increased accuracy from partner to partner through the Internet, which triggered the fitting of the term intelligent to this last evolved form of interconnected enterprise networks (intelligent supply chains,. Intelligent supply chains are reshaping the landscape of the economy and will lead to the full automation of business relations. The application of artificial intelligence (AI) within intelligent supply chains and the resulting changes to the overall payment system landscape will be discussed. Some recent advances that mark the onset of such transformation are provided and a plausible future development of this landscape is described.

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