Swarm Intelligence Technique for Supply Chain Market in Logistic Analytics Management

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ABSTRACT

Supply chain management has become increasingly important as an academic subject due to globalization developments contributing to massive production-related benefits reallocation. The huge volume of data produced in the global economy means that new tools must be created to manage and evaluate the data and measure organizational performance worldwide. Smart technologies such as swarm intelligence and big data analytics can help get clear data of the location, condition, and environment of products and processes at any time, anywhere to make smart decisions and take corrective schedules that the supply chain can run more effectively. This study proposes the swarm intelligence modeling-based logistic analytics management (SIMLAM) in service supply chain market. A generalized structure for swarm intelligence implementation in supply chain management is suggested, which is advantageous to industry practitioners. Different deterministic methods practically fail due to the intrinsic computational complexity of the problem of higher dimensions.

KEYWORDS

Logistic Analytics Management, Supply Chain Market, Swarm Intelligence Modelling

INTRODUCTION

The supply chain market is a supplier chain on which an organization produces marketing materials to market its products and services (Manogaran et al.2020). The supply chain is a network between the company products and its providers to distribute a product to the greatest buyer. The supply chain often provides the necessary steps for bringing the product or service to the customer from its original condition (Pournader et al.2020). The entire process of manufacture and sale of commercial goods, from the supply of materials through the production of the goods through their distribution and sale, is defined as a supply chain (Manogaran et al.2020). Every company that expects to compete must

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successfully manage supply chains. Supply chain management (SCM) can increase customer service, trimmed operating costs, and improve its financial position (Govindan et al.2019).

Further advantages include reduced inventory costs, a better share of information between partners, better integration of processes, and enhanced quality (Yu et al.2020). The supply chain integrates product innovation techniques, automated logistics, manufacturing processes, and demand forecasts (Kauffmann et al, 2020). An effective and optimized supply chain is essential. It will result in dramatically lower costs and shorter output times if handled properly (Awaysheh et al.2019). SCM deals with production, sourcing, processing, procurement, logistics, and more supply chain operations. Without it, businesses face cutting back their clients and losing competitive advantage in their respective markets (Gholizadeh et al.2020). SCM's challenge is that the various requirements extend to all supply chain stakeholders, resulting in different restrictions and goals (Ramasamy et al.2019). The limits would apply to plant capability, market satisfaction, inventory balance, plant interdependence, transportability, and optimizing benefit by opening up the optimal number of plants, ensuring the optimum supply of material, etc. (Bag et al.2020; Khan et al.2020). This leads to challenges in optimizing a particular member since it will hinder another member's effectiveness in the supply chain adversely (Kamble et al.2020).

Logistics Management is part of the supply chain process. From the source to the consumption point of view, plans, implements, and tracks effective, efficient flow and storage of products, services, and related data to satisfy consumers' needs (Khan et al.2020; Raut et al.2019). The organization and execution of a complex operation are normally detailed in logistics. The control of goods' movement from production to consumption in the general business context is logistics to fulfill clients' or businesses' needs (Gao et al.2020; Raut et al.2019). Tangible objects, such as tools, equipment and services, and food and other consumables, may be included in logistics resources (Jiang et al.2017). Logistics Management forms a part of the SCM and planning, implementing, and monitoring effectual, efficient forward and reverse flow and storage between points of origin and consumption of goods and services to comply with customers' requirements (Chu et al.2020). The modern supply chain must adapt to address emerging demands and problems in the supply chain, and supply chain management must prepare accordingly to ensure it smoothly (Al-Turjman etal.2020). A combination of customer demands, more market paths, global uncertainties, and other considerations produces huge obstacles around the supply chain network (Jolfaei et al.2019). The entire operating flow in a warehouse, product receipt, shipping, order handling, and export distribution requires logistic firms' visibility (Abbasi et al.2020). There are dynamic demand growth, longer and more diverse supply chains, and a shift in consumer preferences concerning delivery times and service quality (Sundhari et al.2020). The collective action of autonomous, self-organized networks, natural or artificial, is swarm intelligence (SI). SI networks normally contain a population of modest agents communicating locally with each other and their environments (Baskar et al.2019).

Decision phases may be defined as the various phases of supply chain management to take steps or decisions relating to such goods or services. Effective management of the supply chain involves decision-making in three decision phases associated with the flow of knowledge, product, and funds. By advancing Big data analytics (BDA), businesses can better understand their consumer expectations, deliver a satisfactory service to meet their demands, boost their revenue and profits and enter new markets. Big data applications in different fields, including financial services, marketing, accounting, shipping, logistics, and manufacturing industries. Big data application implementation gains extract new information and training new sources of meaning in ways that impact supply chain relationships. Swarm intelligence is a science that focuses on natural and artificial systems made up of several persons coordinating by decentralized coordination and individuality.

The main contributions of this paper:

1) Designing SIMLAM to effective decision making for supply chain and corrective action to improve the organization performance.

2) Natural evolutionary algorithm to solving the supply chain and logistics management issues.
3) The mathematical result has been performed and proposed SIMLAM based on decision making, customer satisfaction, customer satisfaction, logistic management, organization performance, efficiency, data transmitting rate, and operating cost compared to other methods.

The rest of the paper is structured as follows: Section1 overview of logistic management in the supply chain market, and Section 2 Describes the Related works. Section 3 deliberates the SIMLAM method to enhance organizational performance and improve supply chain efficiency. Section 4 elaborates on the results and discussion. Section 5 concludes the research paper.

RELATED WORKS

(Julianelli et al.2020) suggested the Critical success factors-based taxonomy and framework for reverse logistics. The patterns of production and consumption following take-up-disposal flow have adversely obstructed the environment over a period. This caused society, where the circular economy arose as an important idea, to examine and seek sustainable development options. This article establishes, from the viewpoint of the CE technological cycle, a taxonomy for CSF of reverse logistics that can generate value for the organization and its SC and offers a basis for the correlation between CSFs and reverse logistics in the sense of the circular SC.

(Kara et al.2020) introduced the data mining-based framework (DMF)for supply chain risk management. In-supply chain risk management entails businesses using data-driven techniques by enhanced risk exposure levels, technology advancement challenges, and a rising knowledge surge in supply chain network (SCRM). Multiple computational approaches in wise and timely decision-making are used by data mining (DM). The research reveals how DM allows uncovering covert and valuable data from unstructured risk data for intelligent risk management decisions.

(Ar et al.2020) initialized the decision framework (DF) for evaluating the feasibility of blockchain in logistics operations. This research's key goal is to study the possible application of quantitative approaches to blockchain solutions in the logistics industry. To this end, a policy paradigm is suggested that integrates AHP as part of VIKOR under Intuitionist Fuzzy theory in a multi-criteria decision system. The decision framework (DF) in this study may allow decision-makers to determine blockchain's feasibility in logistic transactions, one of the key research gaps in blockchain research currently being carried out.

(Yazdani et al.2019) described the Multi-Attribute Decision Support Model with Fuzzy Quality Function Deployment (MADM-FQFD) and grey relational analysis for the supply chain to settle complex decisions. To overcome specific choices, this paper provides the multi-attribute decision support model in a supply chain. This paper is a forum for promoting decision-making by combining QFD and Gray Relational Analysis to display key supply chain drivers in a blurry environment. The expert team recognizes the natural, social & cultural, and economic aspects as the external component of the QFD to achieve the relevance of logistic metrics within the supply chain.

(Mohanty et al.2019) discussed the Fuzzy hierarchical analytical model (FHAM) for integrated logistics performance management. In this article, a Fuzzy holistic hierarchical analytical model for evaluating the success of facilitators in the interconnected logistical structure is presented. Due to the uncertain and complex climate, different enablements and prioritization of fiscal, organizational and environmental requirements would be required to determine and prioritize enabling. A hierarchical model is proposed using these methodologies to reduce the proposed model's low flexibility and inadequacy.

(Doktoralina et al.2019) Deliberated the partial least square and structural equation modelling (PLS-SEM) for supply chain outcomes and logistic firm profitability. The reduction in the output of the logistics sector lowers the gross domestic product (GDP). Therefore, this analysis's key objective was to investigate strategic management accounting's role in growing profitability to resolve this problem. For the study of data obtained, (PLS) and (SEM) is used. The findings show a substantial positive relationship between strategic procurement accounting and supply chain outcomes and the logistics firms' performance. Their results show a significant positive relationship.

A massive and unparalleled transition has taken place in the supply chain and logistical sector. Technological advances lead the path to the success of supply chain management. The supply chain and logistical industry integrate new technologies such as Artificial intelligence, 3D printing, IoT, and drone distribution sustain in the market. There are some issues in the logistic management in the supply chain market in the existing method. In this paper, the SIMLAM has been proposed to reduce the logistic problems. Big data to overcome decision-making for the organization for supply chain operates effectively. In section 3 explores the detailed operation as followed below.

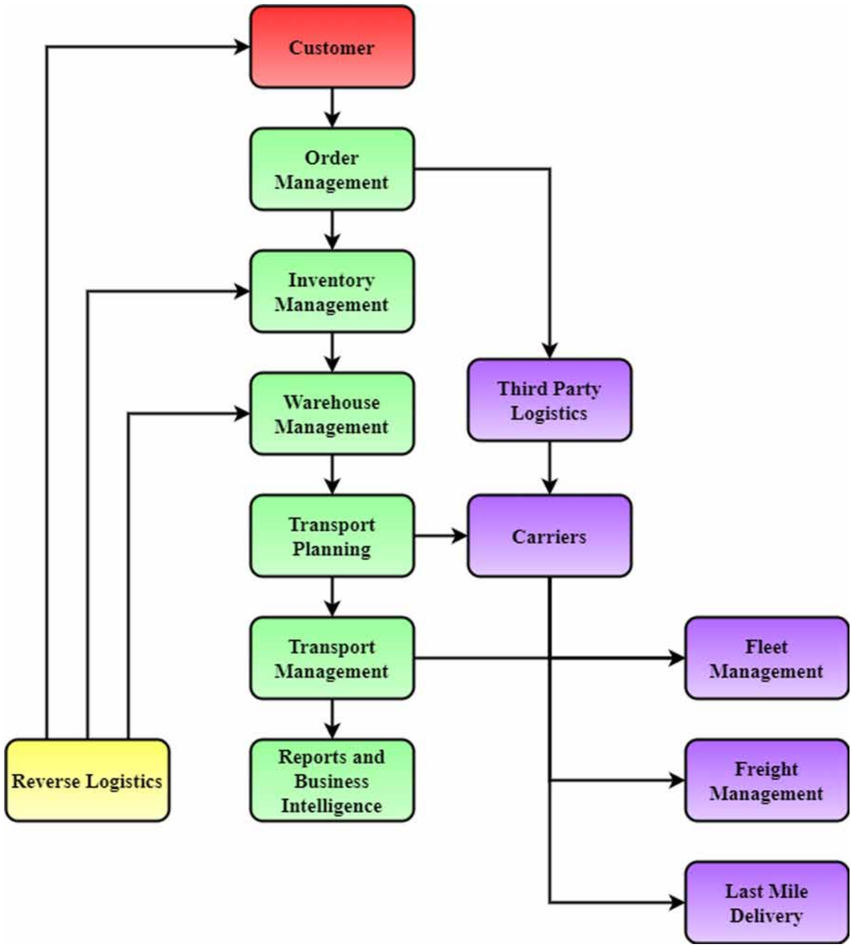
SWARM INTELLIGENCE MODELLING BASED LOGISTIC ANALYTICS MANAGEMENT (SIMLAM)

Internet technology has advanced, and information is very readily usable and accessible. Competition between business organizations (BOs) in the industry is strong nationwide. Companies move from consumer loyalty to customer satisfaction through improved product quality and the introduction of exclusive, customized products. Cost of raw material, work, power, and other production inputs are reasonably free, so BOs focus on enhancing procedures to maximize the use of resources and associated costs. Logistics analytics management is a term used to define analytical processes shown by organizations to examine and organize the logistical functions and supply chain to guarantee the horizontal running of operation in a timely and cost-effective way. The swarm intelligence methods have originated applications in numerous business management fields. Science, transportation, control theory, medical, forecasting, social sciences, tracking of moving objects, etc., swarm intelligence algorithms are categorized by how they imitate the natural systems. Therefore, many real-life settings can be resolved by swarm intelligence algorithms, and applications in the supply chain market and logistics are well observed.

Figure 1 shows the Logistics Analytics Management. Online ordering and processing typically involve operations for inventories development and editing, customer service management, payment acceptance, fraud checks, and paperwork handling among distributors, retailers, storage companies, and transportation companies. Controlling and documenting the amount of product sold is a key aspect of the supply chain. Receiving, maintaining, and monitoring the stock requires highly accurate inventory information processing, thus addressing the frequent and continuous adjustments. Automating from conventional Tablets to inventory management systems (IMS) provides the necessary clarification that centralizes all of the data in a single location via the IMS. The method of tracking the products in their whole process, from manufacturing to delivery, is an IMS. It regulates that the handle information and product flow on business' supply. With all the available tracking information, the IMS act as the centralized controller of the entire process. Warehouse management is a collection of procedures that maintain, control, and automate the activities of warehouses. This involves the receipt, movement, warehouse workers management using KPIs, secure working environment, and software and hardware to identify and monitor products. The human side of warehouse purchases includes the usage of an automated labour relations framework for WMS. First of all, the system assigns assignments with preparation and organizing capability for specific warehouse workers. This helps to track productivity, predict shifts or employees who struggle. The world of task history reveals the whole history of employees' tasks to evaluate their peak labour, maximize workflow and identify solutions when challenges exist. In the long term, production and performance will be improved while labour costs will decline.

LMS connects carriers to offer the best shipping alternative in the world to both parties. Transportation selection tools are to determine the cheapest airline. These tools help configure the proposal request, address queries, approve proposals and evaluate deals. The transport management

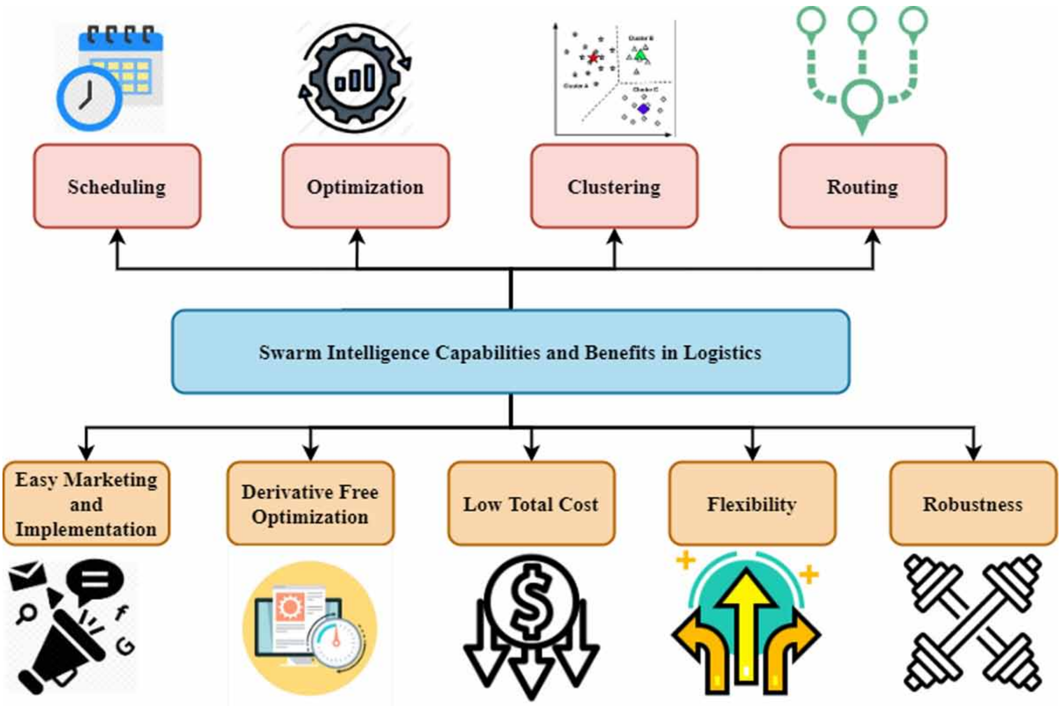
Figure 1. Logistics Analytics Management



system (TMS) helps consumers plan their shipments on a custom, online TMS account. Delivery assessments focus on crucial metrics like vehicle type, population density, power, traffic analytics predictive, etc. The transport management system guarantees on-time delivery via automatic asset monitoring and prompt notifications for both shippers and customers if the shipment is deteriorating. The software will evaluate shipping history and optimize customer operations by leveraging analytics and big data to mitigate logistics costs and reduce shipment delivery time. The software will progress performance metrics and KPI's and make the computer model forecast supply chain challenges by applying business intelligence. Hence, in this paper, the SIMLAM model has been proposed in the service supply chain market.

Figure 2 shows the proposed SIMLAN model. Swarm intelligence is an emergent field of biologically-inspired artificial intelligence that depends on social insects' behavioural models such as ants, bees, wasps, termites, etc. Load Balancing/Scheduling emphasizes the job's relative position rather than its direct successor and direct predecessor in the schedule, and summation assessment rule / global pheromone assessment rule is followed. The process of derivative-free optimization parallelly done with easy marketing reduces the total cost, enhancing the proposed model. A cluster is a collection of similar agents and is dissimilar to the agents in other groups. An optimization issue is finding the Best Solution/Minimal Cost Solution from all the feasible resolutions. Routing is based

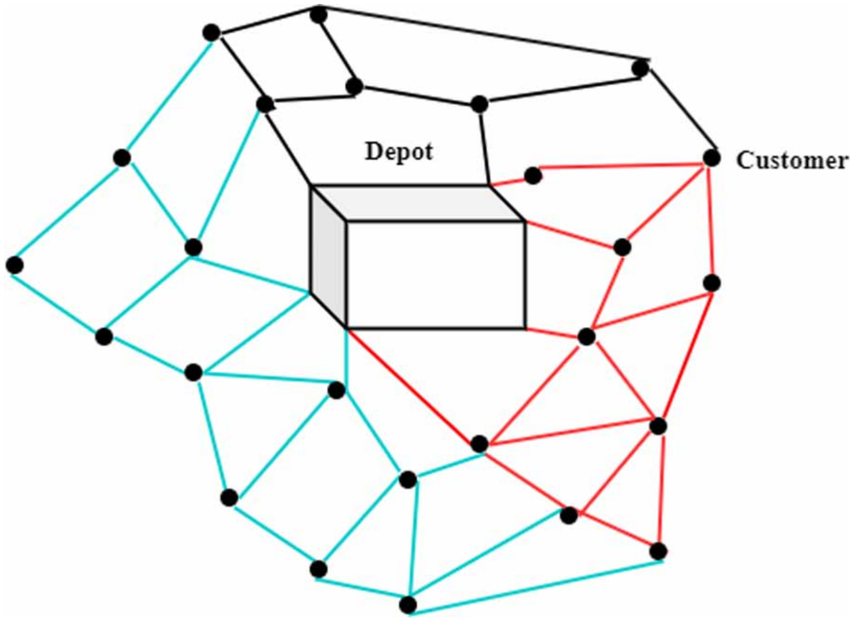
Figure 2. Proposed SIMLAM model



on the principle that backward ants use the forward ants' valuable information on their trip from source to destination. The forward ants adapted their path by acknowledging the perspective of the environment, yet never the backward ants. Instead, few ants stop to look forward and then adjust the way upon its, particularly focusing knowledge. The ants could convert their fore view into an intrinsic compass layer, which can be maintained in every region of their body. A generalized structure for the application of Swarm Intelligence in supply chain management is proposed that will support industry professionals. Due to the underlying dynamic estimation of greater dimensions' problem, different deterministic methods practically be unsuccessful. The suggested work then uses a natural evolutionary algorithm to tackle the issue of particle swarm optimization. The results indicated that the variations in future shipment choices, demand, and optimal delivery policies are addressed simultaneously. The management has purchase requisition along with the option of dynamic supply policies for placing orders. The manufacturer endorses regular deliveries of production lines and goods in smaller quantities to benefit operating performance.

Figure 3 shows the vehicle routing problem. The vehicle routing problem (VRP) is a combinatorial optimization management issue that pursues the optimal routes navigated by a vehicle to deliver the product to consumers. An identified issue in this field is prioritizing consumers in the shortest probable period where consumers with recognized demands are supplied by one or numerous depots. The challenge of identifying less expensive routes through one repository to a collection of remote locations consumers is sometimes defined as the VRP. Satisfying the prioritized consumers who are located remotely within a stipulated period improves the demand and supply chain. The traveling cost among the depot and every consumer and among every pair of consumers is provided. The vehicle routing problem solution should determine routes for every vehicle, initial and finish at depots, such that a set of consumers is assisted by precisely one vehicle, the total cost of the route is reduced, and consumer satisfaction (achieving their demand) is increased while taking into account a set of

Figure 3. Vehicle routing problem



assumed restraints. Usually, the resolution to a vehicle routing problem has to consider numerous other restrictions, like the vehicles' capability, the salespersons' working times, and the importance of the desired consumers. Additional, numerous alternatives to the vehicle routing problem consider diverse factors like the nature of the transported goods, the service quality prerequisite, and the consumers' features and vehicle.

Supply chain management is enhancing profits as supply chain managers help manage and reduce supply chain costs, resulting in significant corporate profit growth. Supply chain managers reduce plants, warehouses, and passengers within the chain to reduce fixed assets. The main sectors contributing to driving profitability in supply chain management are cost reduction, sales increase, higher productivity, and performance increases. The managers may create new business opportunities or services by focusing on the mentioned factors to enhance the profit. Transport is a big logistics factor that is most valued. Both transport modes include road transport, freight trains, transportation of freight, and air transport. Without shipping, goods do not pass through a supply chain from one point to the next. Hence in this paper, SIMLAM has been proposed to improve logistics efficiency. This model can support the business's logistics network to customer business to ensure customers' interest, optimize services, enhance logistics efficiency, and reduce operational cost-effectiveness. By providing the parameters mentioned above, the SIMLAM supports the logistic business network. The Swarm intelligence enables firms to leverage the existing logistics network, cut operational expenses, boost company benefits, increase market productivity, and service a large variety of clients concurrently.

Ant colony algorithm (ACO) simulates a vehicle with an individual artificial ant and roads built to customize any ant before anyone is visited. Any ant begins at the store, and the number of tour customers is zero. In a list of workable sites, the ant chooses the next customer, and the storage space of the vehicle is changed before going to another customer location. If the vehicle's capacity limit is exceeded, the anti is returned to the factory. After all, customers are visited, the ant comes back to the depot, and the total distance L is measured for the entire artificial ant path. With this technique, a predetermined number of ants m is sequentially generated incomplete routes. Each ant must create a vehicle route that any customer visits. The ant includes the following formula to identify the next customer position j in equation (1):

$$i = argmax\left\{\left(\varphi_{jv}\right)\left(\mu_{jv}\right)^{\gamma}\right\} v \notin N_L \tag{1}$$

As shown in equation (1), identity, the next customer location, has been formulated. When the path from current position j to potential locations v is equal to the sum of pheromone φ_{jv}. The value μ_{jv} is the opposite of the distance between the two customers, and γ determines the distance in the sorting algorithm compared to the concentrations of pheromones. The memory of the ants N_L, which tracks places which are no longer to be selected, is already visited. Value P is a random uniform variable $\left[0,1\right]$, and the parameter is the value P_0. When an ant chooses a new spot, the arc with the largest value is chosen, except that P is bigger than P_0. In that case, the ant chooses the following random variable $\left(t\right)$ based on the next location likelihood distribution of the visit Q_{ji}, which prefers high phéromone amounts and short distances in equation (2):

$$Q_{ji=\frac{\left(\varphi_{jv}\right)\left(\mu_{jv}\right)^{\gamma}}{\sum_{v\notin N_L}\left(\varphi_{jv}\right)\left(\mu_{jv}\right)^{\gamma}}} \tag{2}$$

As described in equation (2), the probability of distribution has been calculated. Each ant uses formulas (1) and (2) to follow the most favorable route or randomly choose a route based on the distribution of the likelihood of distance and pheromones' accumulation. The next step offers him the chance to go to each of the four other areas. In this case, the weighted distance from the paths leads the ant to prefer position two as the next visitor location, even though it's shorter than location 3. In general, this alternative has become more effective in the development and pheromone stage of a more straightforward path for other ants. This method of selection continues until any customer is visited and the tour is complete.

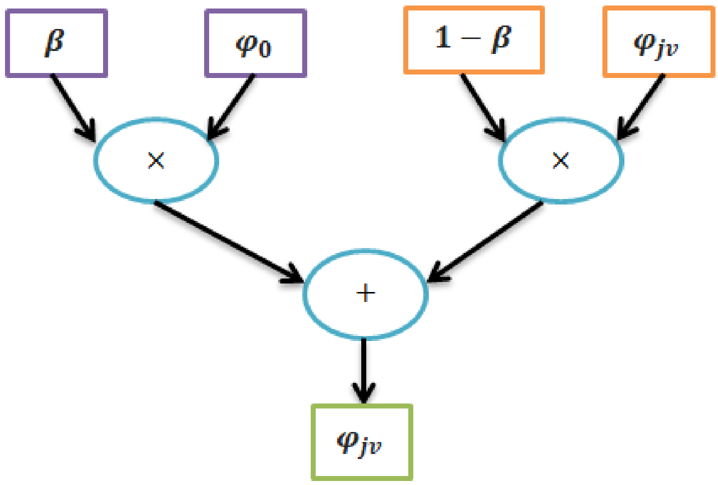
The pheromone tracks of the ants need to be modernized to map the movement of the colony. Trail updating involves local trail changes following the generation of individual solutions and updating the path to the best solution discovered following the generation of a predetermined number of solutions N. Local changes reduce pheromone quantities on both arcs to simulate normal pheromone evaporation. The accumulated pheromone on every curve is approximately equal to the impacts that occur. The pheromone quantities across the curve are negligible compared to the local changes. This is done with the following update to the local trail in equation (3):

$$\varphi_{jv} = \left(1-\beta\right)\varphi_{jv} + \left(\beta\right)\varphi_0 \tag{3}$$

As shown in equation (3) and figure 4 shows the local trail updating has been formulated. Where β is an evaporation speed parameter that is determined by the φ_0 initial pheromone value assigned in the graph H to all arcs. The opposite of each problem's historically best-known distance for this analysis is a strategy used for each situation.

After constructing a predetermined number of full routes, a global update is achieved by inserting pheromones in each of the arcs in the strongest one of N ants. Updating the global trial is performed according to the following in equation (4):

Figure 4. Local trail updating



$$\varphi_{jv} = \left(1 - \beta\right)\varphi_{jv} + \beta\left(K\right)^{-1} \tag{4}$$

As discussed in equation (4), Global trail updating has been evaluated. This equation determines the short routes and increases new routes using the arcs in previous best solutions. This method is replicated for the prescribed number of iterations, and the best overall solution for all iterations is shown as an output of the model performance.

According to the features, B2C electronic trading logistics are limited and high-density and are obtained mostly in the city. This essay points out the logistics operating mode for electronic trading. Items are transported from the retailer to the delivery center. The electronic business portal is the monitoring center for the whole system, is responsible for collecting reports about retail purchases and the merchandise delivery center in a regional distribution center (RDC). According to the city circle, a regional logistics center distributes goods to City Circle Distribution Center (CDC) and then moves them to customer bands. According to electronic commerce logistics' characteristics, this mode determines the logistics center's location to optimize regional fulfillment centers and metropolitan distribution centers. This article sets the decision-making aim to reduce the model complexity and construct a model that considers transport costs, storage, and operation costs based on the B2C Electronic Commerce Network operating model. This article creates an updated, multi-objective model in terms of the transport network's everyday flow, the sorting costs, and the selection of services. Transportation expenses include circle distribution center costs and regional distribution center cost production and price of supply center. Costs of shipping to T and costs for the procurement center in equation (5):

$$\sum_{p=1}^{m} L_{qp} Z_{qp} P_{qp} C_{qp} \tag{5}$$

As described in equation (5), shipping costs have been formulated. In the formula of every variable are follows: L_{qp} defines the distance of supply center transportation, Z_{qp} is the rate of supply center, P_{qp} is the total gross traffic of supply center, C_{qp} Explores the order of the supply center. Centre of supply to regional distribution center cost is formulated in equation (6):

$$\sum_{e=1}^{n}\sum_{p=1}^{m}\delta_{qp}L_{qp}Z_{qp}P_{qp}C_{qp} \tag{6}$$

As shown in equation (6), the center of supply to regional distribution center cost has been calculated. δ_{qp} explores the variable of decision, n is defined as the regional distribution center number of choice, L_{qp} deliberates the transportation distance for supply center, Z_{qp} indicates the rate of supply center logistics, P_{qp} explores the total gross traffic of supply center, C_{qp} Express the orders for the regional distribution center. Regional distribution center and circle distribution center cost is in equation (7):

$$\sum_{h=1}^{l}\sum_{e=1}^{n}\sum_{p=1}^{m}Y_{pd}\,\delta_{pd}L_{pd}Z_{pd}P_{pd}C_{pd} \tag{7}$$

As described in equation (7), Regional distribution center and circle distribution center cost have been evaluated. Y_{pd} Introduced the variable of decision circle distribution center $\left(L\right)$ choice, δ_{pd} elaborates the decision variable regional distribution center n choice, L circle distribution center number, L_{pd} intimates the regional distribution center through circle distribution center logistics distance, Z_{pd} is the rate of logistics for regional distribution center through a circle distribution center, P_{pd} is the total gross of traffic for regional distribution center through a circle distribution center, C_{pd} Express the order for the regional distribution center through the circle distribution center. The logistics operation cost is calculated in equation (8):

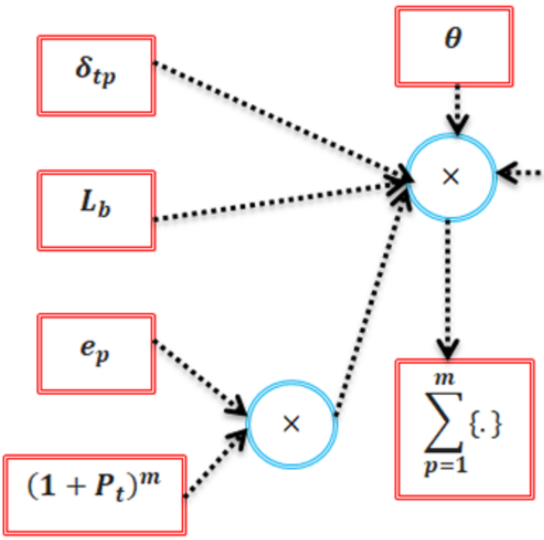
$$S=\sum_{p=1}^{m}L_{qp}Z_{qp}P_{qp}C_{qp+}\sum_{e=1}^{n}\sum_{p=1}^{m}\delta_{qp}L_{qp}Z_{qp}P_{qp}C_{qp}+\sum_{h=1}^{l}\sum_{e=1}^{n}\sum_{p=1}^{m}Y_{pd}\delta_{pd}L_{pd}Z_{pd}P_{pd}C_{pd} \tag{8}$$

As deliberates in equation (8), logistics operation cost has been determined. The warehouse costs include costs for the supply center and regional distribution center construction, day-to-day operating expenses, and sorting costs. The maintenance expenses include the building costs for factories and the purchase of supplies. The warehouse area covers every item of everyday products and the pre-casted regions for goods in equation (9):

$$\sum_{p=1}^{m}\left\{\delta_{tp}*L_{b}*e_{p}\left(1+P_{t}\right)^{m}*\theta*A_{y=1,2}+V_{y=1,2}\right\} \tag{9}$$

As introduced in equation (9) and figure 5, pre-casted areas for goods have been founded. δ_{qp} describes the regional distribution center $\left(n\right)$ choice for decision variable, L_{b} the maximum value of daily warehouse, L_{b} defines every type of goods covers area, P_{t} deliberated the N future prediction

Figure 5. Pre-casted areas for goods



with year commodity, m incremental of commodity prediction, θ is the coefficient of volumetric, A_y express the construction costs, $A_{y=1}$ intimates the single warehouse layer, $A_{y=2}$ indicates the stereoscopic warehouse value, V_y is the equipment capital costs for warehouse, $V_{y=1}$ deliberates the single warehouse layer, $V_{y=2}$ denotes the stereoscopic warehouse value for equipment capital cost. Daily operation cost calculated in equation (10):

$$\sum_{p=1}^{m}\left(e_p * L_b * \theta * X_p + e_p * L_b * \theta * K\right) \tag{10}$$

As explores in equation (10), the daily operating cost has been evaluated. e_p introduced the maximum value of daily warehouse, e_p express the covers every type of goods, θ denotes the coefficient of volumetric value, X_p Explores the per unit area operating costs, K defines the per unit area sorting price. To overall warehouse cost is in equation (11):

$$W = \sum_{p=1}^{m}\left\{\delta_{tp} * L_b * e_p\left(1+P\right)^m * \theta * A_{y=1,2} + V_{y=1,2}\right\} + \sum_{p=1}^{m}\left(e_p * L_b * \theta * X_p + e_p * L_b * \theta * K\right) \tag{11}$$

As deliberated in equation (11), the overall warehouse cost has been calculated. The cost of the automated trading logistics provider business to the customer is a very significant metric. The service cost in equation (12)

$$T = \sum_{p=1}^{m}\delta * \alpha * \left(S_{max} - S_{avg}\right) \tag{12}$$

As initialized in equation (12), service cost has been executed. Where $\delta = 0,1$ describes the decision variable, supply center through regional distribution center for the circle distribution center and a connection between them 0 means the no association and 1 denotes the connection. α Express the standard service S_{max} deliberates the maximum time of delivery, S_{avg} Average time delivery. Logistics network optimization model in equation (13):

$$Min\left(S + Z + T\right) = Min\left(\sum_{p=1}^{m} L_{qp} Z_{qp} P_{qp} C_{qp} + \sum_{c=1}^{m} \sum_{p=1}^{n} \delta_{qp} L_{qp} Z_{qp} P_{qp} C_{qp} + \sum_{h=1}^{l} \sum_{c=1}^{m} \sum_{p=1}^{n} Y_{pd} \delta_{pd} L_{pd} Z_{pd} P_{pd} C_{pd} + \sum_{p=1}^{m} \left\{\delta_{tp} * L_{b} * e_{p} \left(1 + P\right)^{m} * \theta * A_{y=1,2} + V_{y=1,2}\right\} + \sum_{p=1}^{m} \left(e_{p} * L_{b} * \theta * X_{p} + e_{p} * L_{b} * \theta * K\right) + \sum_{p=1}^{m} \delta * \alpha * \left(S_{\max} - S_{avg}\right)\right) \tag{13}$$

As shown in equation (13) logistics network optimization model has been determined. By reducing the daily service cost, the maintenance and warehouse cost is reduced. The SIMLAM has been proposed to minimize logistic issues and encourage new practitioners to achieve high decision making, customer satisfaction, logistics management, organization performance, efficiency, data transmitting, and operating costs.

RESULTS AND ANALYSIS

The SIMLAM has been proposed to improve the logistic performance and increase the customer relationship to achieve based on these parameters achieve high decision making, customer satisfaction, logistics management, organization performance, efficiency, data transmitting, and operating cost.

Decision-Making Ratio (%)

Big data are high volumes, high speeds, and various information assets that need new processing for improved decision-making, insight, and supply chain process optimization. The rate of generation or supply of relevant data can be specified by the speed, reliability, data transmission efficiency, and extraction speed to discover valuable information concerning decision models and natural evolutionary algorithms. This refers to the rate of collection of the data and the data collection. BIG technology can form data in similar designs and guide policymaking directly connected to performance, competitiveness, and efficiency. This will revolutionize decision-making and management strategies. BIG data processing, the exponential evolution of internet and web purchases has drawn interest. Academics and academics have been inspired to pay careful attention to future integrations of Big Data into SCM since various potential gains can be gained by data-driven decision-making. Figure 6 shows the decision-making ratio.

Customer Satisfaction Ratio (%)

The proposed method offers a high customer experience and priority in an environment where communications service providers (CSPs) have more and more identical service offers and devices. CSPs are key differentiators in solutions that can highlight what matters to satisfy customers and provide insights into their wide customers, networks, and service information. This document explores ways to integrate big data insight with automated and helpful progressions related to main customer contact points to enhance the consumer experience. Using a unique practice to choose the correct key quality indicator, CSPs improve their business performance, create a precise key formula for business targets that predict clients' behaviour, and ultimately understand which factors influence most people. Figure 7 shows the customer satisfaction ratio.

Logistic Management Ratio (%)

In manufacturing industries, the maintenance of perishable goods is a key challenge for logistics companies. The integration of big data with technology has a very high potential for enhancing

Figure 6. Decision-Making Ratio (%)

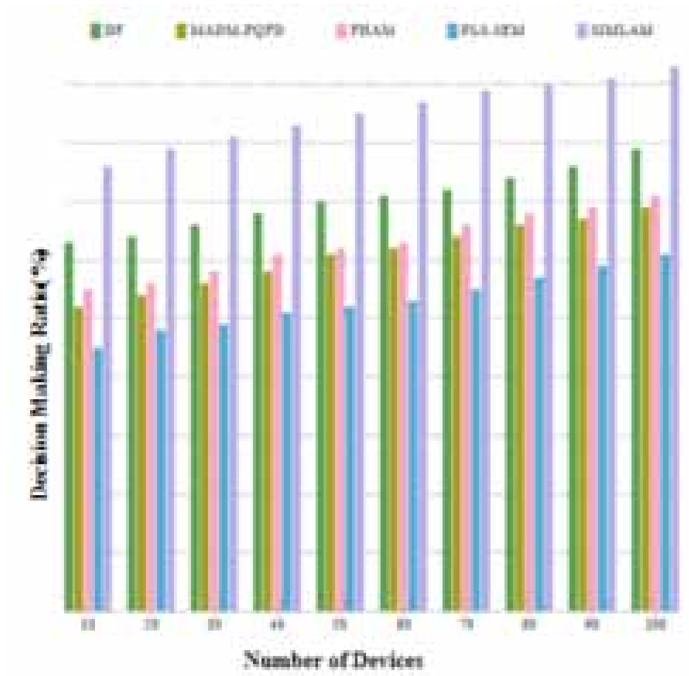
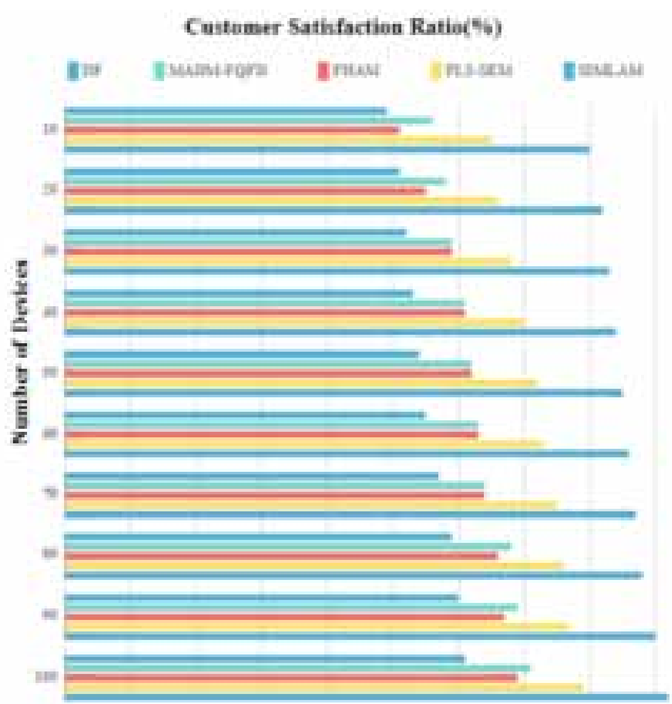


Figure 7. Customer Satisfaction Ratio (%)



logistical efficiency. Big Data helps to keep these goods reliably through different techniques. This results in the automation of the entire supply chain system. Big Data is used to target and differentiate customers to optimize customer interaction accurately. Big Data supports the logistics industry in data-driven policy-making, developing strategies, and implementing innovations. Logistical networks will be a good way for businesses to increase the quality of distribution systems and reduce operational costs to maximize decision-making to protect customer needs and service standards. Figure 8 shows the Logistic Management Ratio.

Organization Performance Ratio (%)

Big data analytics play an important part in optimizing the management of the supply chain. It solves many pain points at strategic, organizational, and tactical stages. Big data impacts the operations of the supply chain. It differs from the improvement of delivery times and how contact differences between producers and vendors can be minimized. Analytics reports enable decision-makers to achieve organizational effectiveness and track productivity results. Supply chain insight increases cost-saving decisions and enhances quality levels by allowing data-driven decisions. Traceability of goods is essential to efficient processes in the supply chain. Supply chain managers can quickly track a package using handheld devices and connect radio frequency identification devices to those goods. Big data analytics enable companies to collect correct product information to keep operators up to date with their distribution cycle. Figure 9 shows the Organization Performance Ratio (%)

Efficiency Ratio (%)

Big Data Analytics (BDA) is an emerging phenomenon that shifts how businesses handle their market output and increases their high valuation. This observational survey employs a qualitative interpretative approach and uses three processing firms with different BDA levels to perform a comparative case. BDA capacity, including organizational preparedness and design considerations BDA policy, management supports, financial support, and employee engagement, allowed the greater

Figure 8. Logistic Management Ratio (%)

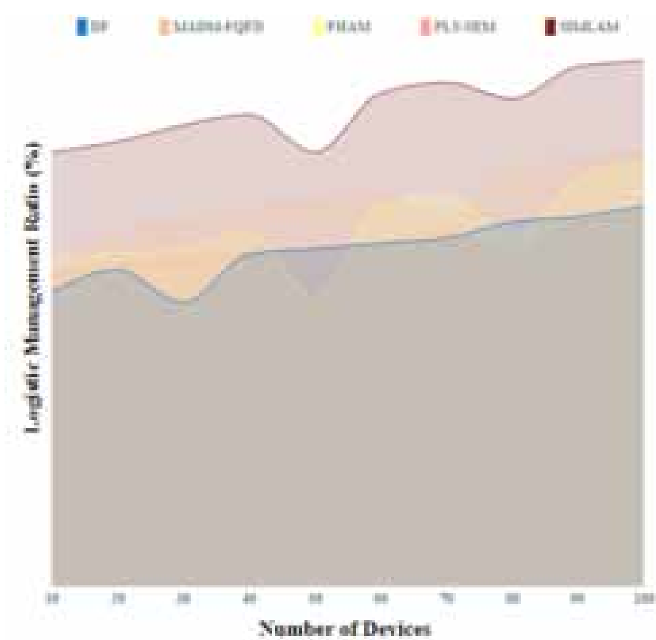
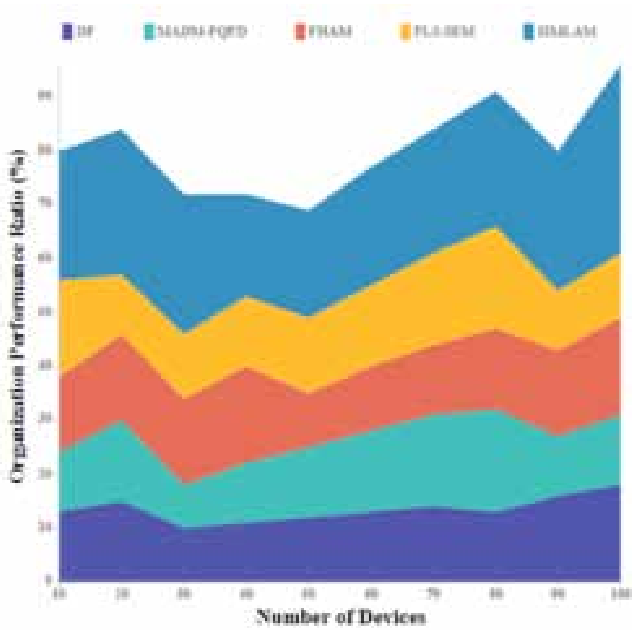


Figure 9. Organization Performance Ratio (%)



use of BDA for decision making and thereby improved business performance in the manufacturing process in terms of data quality, access, centralized management, and implementation, analytical capacity and people expertise. Our findings further illustrate that major management impacts the effect of BDA on employee empowerment and how BDA can be incorporated into organizations to improve management skills rather than replacing them. The real importance of the BDA application in production companies and promoting positive economic improvements in society. Figure 10 shows the Efficiency Ratio.

Data Transmitting Rate (%)

Business efficiency and logistics management performance are due to the ability to handle, access, and analyze large data volumes. The optimization of the routing of goods and services will significantly affect the viability of any business. More complex data is to be managed with more data-driven logistics and transport. The existing knowledge sources include cameras, operating networks, social media, blogs, statistical systems, etc. Data can be consumed faster, processed longer, and evaluated quicker using data-based solutions, meaning that all of these criteria can be fulfilled by logistics firms. The Internet of Things and Big Data-enabled shippers can see the shipping process from the beginning to the end. Big data can be used to boost efficiency to simplify distribution methods. Logistics optimization is the best use of Big Data in logistics. Path optimization aims to reduce costs and prevent disrupted transportation. Table 1 shows the Data Transmitting Rate.

Operating Cost Ratio (%)

Management of logistics includes many sectors, including space for warehouses and storage charges, pick up, shipping, and transport. When executing cost-efficient logistical management strategies, incorporation with schedule information systems will make much difference. The organization may adjust or enhance its affiliate marketing plan by measuring stock accuracy in real-time. Second, first, or first, the E-Commerce plan could come to an end. SIMLAM model will increase the efficiency

Figure 10. Efficiency Ratio (%)

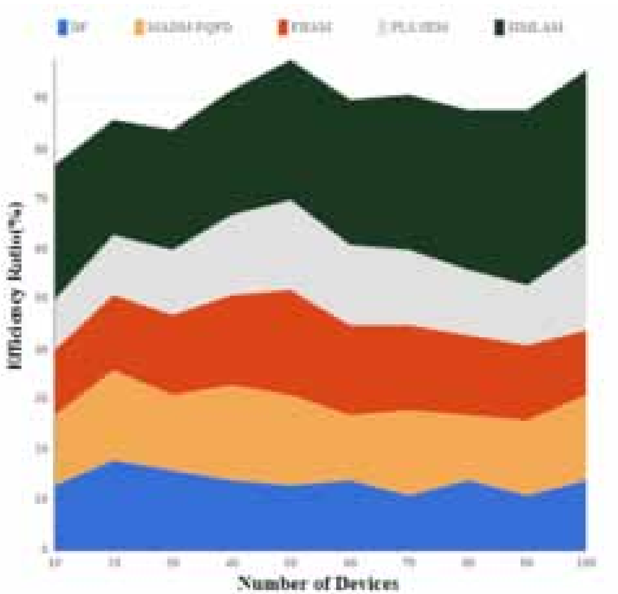


Table 1. Data Transmitting Rate (%)

Number of Devices	DF	MADM-FQFD	FHAM	PLS-SEM	SIMLAM
10	35.1	43.2	62.1	55.1	63.8
20	38.3	44.5	61.3	56.3	68.3
30	39.6	47.8	58.6	57.8	76.1
40	37.9	48.1	57.8	58.9	77.4
50	38.3	52.3	56.9	42.1	83.2
60	39.6	51.6	54.4	46.8	85.1
70	44.7	48.5	53.2	51.3	87.2
80	46.1	51.2	52.1	57.2	88.4
90	48.3	56.7	51.7	54.9	93.6
100	49.5	59.8	57.8	58.4	91.3

of its employees, the morality of its employees, strategic thinking, and exchanging ideas. Affiliate marketing is directly proportional to individual performance. Hence the by increasing personal efficiency, the affiliate marketing plan is increased. Warehouse management programs provide tools for arranging warehouse space, optimize storage, and make selection simpler for workers. It monitors the system's various objects. It helps to achieve and deliver correctly and reduces return rates due to error. Companies will determine the return possibilities through the incorporation of big data analytics. These instruments will classify the most likely returnee goods and help businesses take the steps needed to minimize damages and costs. Table 2 shows the Operating Cost Ratio.

The SIMLAM has been proposed to achieve high decision making, enhance customer satisfaction, improve logistics management, organization performance, efficiency, data transmitting, and operating

Table 2. Operating Cost Ratio (%)

Number of Devices	DF	MADM-FQFD	FHAM	PLS-SEM	SIMLAM
10	52.7	42.9	32.3	44.3	32.1
20	56.1	47.3	33.5	42.7	36.3
30	43.4	42.2	36.6	45.9	34.6
40	46.1	45.5	37.2	47.2	35.8
50	45.2	44.6	46.4	41.4	33.3
60	32.1	41.8	48.9	38.6	31.8
70	36.2	42.3	49.1	33.7	29.3
80	33.5	46.9	45.3	32.9	26.1
90	31.7	43.4	47.2	48.6	24.9
100	36.3	41.5	49.1	44.2	21.6

cost when compared to other Decision Framework (DF), Multi-Attribute Decision Support Model with Fuzzy Quality Function Deployment (MADM-FQFD), Fuzzy Hierarchical Analytical Model (FHAM), Partial Least Square and Structural Equation Modelling (PLS-SEM) methods.

CONCLUSION

Supplier chain management has become more important due to globalization, contributing to massive re-assignment of production benefits. Smart technologies such as swarm intelligence and large data analytics can contribute, at any time and anywhere, to the clear data on the condition, location, and environment of products or processes, the supply chain can be more efficient and intelligent in making intelligent decisions. Hence in this paper proposed the SIMLAM to improve the supply chain market service and logistics performance. A logistical network based on SI can be an effective way for businesses to improve logistics services' efficiency and reduce operating costs to optimize decision-making under the premise of guaranteeing consumer and service levels interest. Thus the experimental results show the Proposed SIMLAM to achieve high decision making (93.2%), enhance customer satisfaction (92.8%), improve logistics management (98.4%), organization performance (96.1%), efficiency (92.1%), data transmitting rate (91.3%), and operating cost (21.6%)when compared to other methods. The future scope of the research has to be focusing on increasing the data transmitting rate and efficiency.

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