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Increasing the Efficiency and Effectiveness of Inventory Management by Optimizing Supply Chain through Enterprise Resource Planning Technology

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Abstract

Good inventory administration is an important task in the management of the supply chain of any business. Effective inventory handling practices aim to reduce the cost of procurement by effectively managing and optimizing inventory, so that supply chain (SC) members are not affected by surplus and deficit. By proper demand management, material requirement planning, sourcing, procurement, receive and issue, we can optimize our inventory and increase the efficiency of supply chain management. To optimize inventory, we have to control and manage running stock, excess stock, old stock, and dead stock. ERP can help us to integrate all the processes (Demand, Material Requirement Planning, Sourcing, Procurement, Receive, Transfer, Issue, Adjustment, ABC Analysis, FIFO Method, Safety Stock, Stock Management) and optimize the inventory. In this paper, we propose an Inventory Optimization and Cost Saving Model and also a method that effectively uses a Genetic Algorithm (GA) for better control of inventory and increase the efficiency of the supply chain. This paper reports on a genetic-based approach to improving inventory management systems in the asset management of the industry. This paper targets specifically the quantification of the maximum level of stock and the level of deficit required for the asset's efficiency in the transaction list so that transaction costs can be reduced. The method is used in a three-phase delivery model that is trained to perform well. I guess that we can remove the bullwhip effect and constraints by optimizing inventory by using ERP.

Key Words: ERP, Genetic Algorithm, Optimisation, Inventory Management, Supply Chain.

Introduction

Optimizing inventory is a technique aimed at matching capital investment limitations with service-level areas across a big number of stock-keeping units (SKUs) through accounting for requirement and supply unpredictability. Inventory handling software (ERP) is available from a variety of firms all over the world. ERP may provide point solutions, such as forecasting, or certain modules that must be purchased individually. In today's marketplaces, a company's capacity to deal with the problems of lowering lead times and expenses, enhancing buyer service stages, and enlightening product quality is critical. By using ERP,

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we may solve all kinds of problems of inventory. Purchase, manufacture, supply, and advertising have traditionally functioned separately. Regrettably, these organizations have different purposes, even though they appear to be working toward the same goal. Marketing aims for a high degree of customer service and a high volume of sales, but both goals are at odds with the goals of manufacturing and distribution. Exploration decisions are frequently made exclusively based on lowering asset costs, while production and distribution decisions are frequently made solely based on maximizing power while lowering production costs (unit), regardless of greater commodity levels or longer lead times. Procurement administration entails the successful coordination and integration of several entities with varying purposes working toward a mutual area. Recently, the significant probable aimed at achieving these goals done good procurement management approaches was realized. (Joines, et al, 2002).

The issue with asset management is a lack of sufficient availability of an item to fulfill the predicted demand pattern while striking an acceptable balance between the expense of retaining inventory and the penalty (lost sales and goodwill) at the end. This could be items sold in the store, components of machinery left in the factory, train cars, or money in the bank to meet client needs. It is very amazing to discover that so many seemingly disparate problems may be solved mathematically as a property management problem. Of course, there are numerous types of innovation programs. There are three categories of associated costs. This has a restricted value that is determined by the specific order. These include the administrative expenses of placing an order, also known as restructuring costs or set costs; and (ii) inventory costs, also known as inventory cost carrying costs, which include storage charges, interest, and insurance, among other things. (iii) loss of interest, goodwill, and other costs associated with a deficit. For good procurement management, all of the above should be prepared. (Narmadha, et al, 2009).

Holland and colleagues created the genetic algorithm in the 1960s and 1970s. The theory of evolution, which explains the origin of species, inspired genetic algorithms. Natural selection will inevitably lead to the extinction of endangered and endangered species in their habitats. Stronger has a high chance of passing on genes to future generations via reproduction. Genes with the correct genetic makeup become stronger in their genes over time. Random genetic alterations can occur while slow-moving evolution is taking place. New species will arise from creation if these mutations provide further benefits to the struggle of existence. Natural selection removes failed alterations.

The human or chromosomal is the GA word for the solution vector x $ X. Microorganisms are the units that makeup chromosomes. Every element is in charge of one or more chromosomes. Genes are supposed to be binary numbers in Holland's actual projection of GA. Various genes have been introduced in recent investigations. In the chromosomal solution space, a particular solution resembles x in general. A method of mapping between loci and chromosomes is required for the solution. Coding is the name for this map. GA, on the other hand, focuses on problem-solving rather than the problem itself. GA works with populations, which are groups of chromosomes. The populace is healthy. It all began at random. As the search progresses, the population will develop more and more suitable solutions until it converges, at which point it will be conquered through a sole answer. Holland also gave evidence of convergence (schema theory) for chromosomal binary vectors' global optimism. To generate new solutions from old ones, GA employs two techniques: crossover and mutation. GA's most essential operator is the crossover operator. Crossover occurs when two chromosomes, commonly referred to as parents, combine to generate new

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chromosomes known as children. Parents are chosen from a population's chromosomes with a preference for fitness so that their offspring inherit good genes compatible with their parents. It is intended that by continually using the crossover operator, genes generated from good chromosomes will become more evident in the population, resulting in a better overall solution. The transformer operator modifies the signals of the chromosomes randomly. At the genetic level, modification is frequently used. The rate of mutation (the potential for genetic mutation) during normal GA activation is relatively low and is dependent happening the distance of the gene. As a result, the new genetic material created by mutations will be similar to the unique. In GA, genetic alterations play a critical role. Crossover, as previously said, brings people together by causing chromosomes in humans to match. Genetic mutations also assist the search engine to escape to local optima by restoring genetic variation in humans. The next generation's chromosomes are chosen during reproduction. In the most common scenario, a person's resilience determines whether the following generation will survive. (Kalathil, 2021).

Literature Review

A network purchasing network is a complex network, with many manufacturers, many suppliers, many vendors, and many customers. This study has created a supply chain model that considers building materials, lead (design) lead periods, requirement and expanses information, and buyer requirements. In exchange, the strategy creates a base-level stock in each store — a partial warehouse or end product — to lower the initial cost of setting up the complete network and ensuring client needs. (Markus et al. 2016; Kushwaha, 2015) Companies may now proactively evaluate master and transactional data in near real-time, using the insights obtained to patch gaps and revenue losses, thanks to rapid improvements in analytics and machine learning (ML). In huge data sets, ML algorithms and the models are based on excel at detecting anomalies, trends, and forecasting insights. Predictive analytics can predict demand spikes or troughs and recommend which items, amount, and location/store should be supplied when.

A machine learning model has been created to estimate sales demand to help optimize inventory and save money owing to high or low inventory due to erroneous demand. The model also considers return order data to optimize returns, resulting in higher customer satisfaction and lower costs. (Archit Bansal, 2021; Kushwaha et al., 2015).

In preparing the study, the main objective was to understand the Inventory Management system at Al Nasr Group who faced difficulties while handling materials and maintaining the workforce. While studying, the problems which caused the delay in inventory management were identified, and also the market potential for the gold ornaments was also valued. A comparison was also made between these 4 shops to find their Inventory Management Efficiency and also their sales accumulation. The final result of the analysis gives a brief idea about the company, their sales, inventory optimization, and problems faced by them. These finding helps to suggest improvements for the Inventory management and also strategies which will help the company to improve their profit for the future. (Talin Tenson Kalathil, 2021; Kushwaha, 2018)

A bi-level programming approach that can simultaneously decide the position of delivery centers and the inventory plan of supply centers and retailers is used to solve the location-inventory dilemma in this research. The findings display that cooperative optimization saves more money than individual optimization,

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that the perfect solution is more stable during demand variations, and that it meets the optimal allocation of key consumers (Kushwaha et al., 2021_b; Wanying Peng, et al, 2021).

Spare parts are kept on hand to help with product maintenance, decreasing downtime, and extending the life of the product. The "right-to-repair" drive, which mandates that manufacturers offer enough spare parts during the lifecycle of their items to diminish leftover and promote sustainability, has given replacement parts inventory management a boost. Between 2010 and 2020, 148 publications on spare parts inventory management were produced, according to this study. This review of the literature is unique in three ways. To begin, we look at the layout of various inventory networks' supply chains to handle spare parts. Second, depending on analytics methodologies, we divide the current study into three categories: descriptive, predictive, and rigid analytics. (Kushwaha et al., 2021_a; Shuai Zhang, et al, 2021)

The plain deliberation of inventory holding costs for the planned architecture of supply networks has not remained extensively lectured in scholarly works. This article describes how to use a Monte Carlo simulation model to analyze an item-by-item inventory control system to include inventory holding costs in a supply chain optimization model. According to the findings, the SRL should only be used if uncommon expectations are correct, and probable roles are a respectable guesstimate for computing inventory costs in supply chain setups. (Liliana Bolaños-Zúñiga, et al, 2021)

Thanks to advances in sensors and communication technology, the company can now achieve global data exchange and complete inventory control. Created a strategy to optimize inventory control using deep learning. In this case, the decision-making process is based on artificial neural networks. Accepts a status vector as input, describing the current inventory and orders in the process chain. The output is a control vector, which manages the instructions of each station individually. In addition, for simulation-based decision-making optimization, the incentive function is performed based on the generated storage and out-of-stock costs. The results show that the tilt speed and scan speed are very sensitive. By significantly reducing the total cost compared with the original state and using optimized hyperparameters to obtain stable control behavior of the process chain of up to ten stations, the potential of the proposed method can be demonstrated. (M. A. Dittrich, et al, 2021)

We provide a method for analyzing the optimal inventory policy while taking into account different risk preferences of decision-makers to reduce inventory risk in supply chain systems that are subject to uncertainty. The proposed technique uses a combination of conditional average risk and response surface models. The proposed method uses robust optimization to solve the inventory control problem in a multi-tier supply chain system. The simulation model is used to verify the effectiveness of the proposed strategy. In addition, in this study, the proposed method was compared with the dual response surface method, and the comparison results confirmed the superiority of the recommended method in improving the robustness of the supply chain system. (Ying Yang, et al, 2021)

The study is considered significant since it is hoped that, if completed, it would provide additional insight into stock control procedures. The study will offer an intriguing contribution to the knowledge of the general and specific effects of store control in other private and public utilities by using a car service facility as a reference point. In addition, the study will support the necessity to improve stock management

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and control to reap the anticipated benefits. Using the assignment technique, this research will provide a mathematical model for optimal inventory policy to minimize overall inventory cost, and it will be applied to a case study. (Mohamed Khalil, et, al, 2021)

Inventory is one of a company's most valuable assets, whether it's a major corporation or a small or medium-sized enterprise. As a result, inventory management decisions have a direct impact on revenue. The purpose of this investigation is to determine the appropriate amount of control for each inventory item and to solve the inventory management problem of small and medium-sized businesses. In this study, we used Ordinal Clustering (ROC) technology to aggregate inventory items from multiple items. A medium-sized gear manufacturing company that produces 40 distinct types of planetary and custom gearboxes puts the suggested framework to the test. According to the findings, using the recommended cluster formation technique with ROC and quantity discounts can save you 47.64 percent on costs. This method aids in the identification of various assemblies, the aggregation of component requirements, and the development of a specialized inventory strategy for each component to reduce inventory carrying costs. (Ganesh B.Narkhede, et, al, 2021)

Inventory classification is a management method used to group items with comparable characteristics and define a set of specific control and monitoring mechanisms for each group of items. In this document, we provide a performance-based inventory classification (PBIC) method to determine a grouping solution for a multi-item hierarchical inventory system managed by continuous review. We believe that it is most effective to group products based on the information contained in the value of your control strategy and the value of performance-related parameters instead of grouping products based on the similarity of unit cost, demand rate or delivery time. Strategy. We describe a new strategy-driven approach to establish ranking criteria. We also use classification methods to manage the multi-dimensionality of multi-level systems to determine one-dimensional scores. In order to improve the Pareto (ABC)-based solution, we provide a search-based partitioning method that uses a unique aggregation method. The PBIC technique outperforms other classification methods by a substantial margin, according to our findings. Furthermore, empirical evidence shows that the PBIC and the optimal grouping method work nearly identically. Finally, we analyze the impact of our findings on management, emphasizing that when managers need to conduct an effective, comprehensive, and credible hypothetical investigation into inventory management, they must classify problem aggregation and downscaling. (Alireza Sheikh-Zadeh, et, al, 2021)

China's big data development history is rather brief, having lasted barely ten years thus far. Even though big data applications in real life are still limited, the supply chain has made some headway. In the actual operation of the supply chain, various types of data will be generated. If these data can be effectively classified and used, the "bullwhip effect" of supply chain operations will be significantly improved. Therefore, this research proposes to use big data to build a collaborative supply chain inventory management model and application architecture. We focus on the supply chain of the beer industry, which is the most well-known consumer industry with a "bullwhip effect". Based on system dynamics, we built a collaborative big data inventory management model for the supply chain of the beer industry. We use the Vensim program for simulation and sensitivity testing. After adopting our model, we noticed that the inventory volatility of participants in the beer industry supply chain was significantly reduced, which proved the efficiency of the model. Our research can also be used to address potential issues with the

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collaborative inventory management approach for massive data supply chains, and it suggests some solutions. (Jinhui Chen, et, al, 2021)

The goal of this study is to examine inventory management at PT XYZ Indonesia by optimizing the forecasting approach. The research method employed was descriptive research, intending to use qualitative and quantitative data to explain and describe the research object. Qualitative data defined a description of a company's actions that were carried out through inventory management. Sales data, inventory data, and quantity data of items arriving in the company are examples of quantitative data. The study took place in the Storage System department over 30 months, from January 2014 to June 2016. A category was taken as many as 1 from the ABC analysis data conducted by the company. On the article level, the least MAD value was for the D product with linear regression forecasting method, according to the findings of research utilizing the three types of forecasting methods. The C product has the smallest MAPE value when using the simple moving average forecasting approach. On the level of aggregate products, exponential smoothing forecasting produced the smallest MAD and MAPE values, implying that the exponential smoothing forecasting approach predicts the smallest and most accurate aggregate for product deviation. (Rosalendro Eddy Nugroho, et, al, 2021)

This study examines the contribution of the literature to the search for safety stock in the procurement process under uncertainty and risk, focusing on the issue of scale (determining the level of safety stock). From 1995 to 2019, we conducted a systematic literature review (SRS) in related journals, including 193 articles. The three main themes involved in these documents are safety stock size, safety stock management, and the location, allocation, or placement of safety stock. SLR analysis reveals gaps in the literature and research opportunities and provides a roadmap for future research on this topic. (Júlio Barros, et, al, 2021)

Ineffective inventory control of finished goods warehouses is a concern for small and medium-sized companies in the agribusiness sector. Therefore, the importance of this project lies in improving the inventory control of olive products. In addition, the purpose of the survey is to reduce inventory costs, since there are currently 319,204 soles overloaded. Perfect delivery, inventory accuracy, inventory disruption, and inventory turnover are designed to improve efficiency and standardization indicators. The FIFO method and the PHVA method (plandoverifyact), also known as the Deming cycle, will be used in agro-industrial organizations to standardize the processes of receiving, placing, preparing and shipping in warehouses of finished products. (Izaguirre Malasquez, et, al, 2021).

The supply chain management strategy that underpins the policymaking progression for the purchase of certain commodities has been taken into consideration (Buffett et al, 2004). RFQs are based on price projections, demands, and estimates that raise the asset's value every day without lowering receivables costs. The Markov Decision Framework (MDP) has been used to model the problem, which permits for the control of the utilization of movements grounded on future region resources. Dynamic programming is used to establish the acceptable pricing demands for each region in the MDP. TacT is a procurement control agent that contains predictive, augmenting, and adaptable materials (Pardoe et al. 2009). TacTex-06's tasks include forecasting the economy's future, such as the pricing that suppliers will offer and the grade of the client request, and directing for forthcoming measures to guarantee extreme profitability.

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(Beamon et al, 1998). obtainable findings from the education of presentation indicators used in procurement models, as well as a methodology for selecting the best chemical supply chain measuring systems. Supply networks are also getting new flexibility systems. It has been hypothesized that the beam-ACO can be achieved in asset management by (Kumar et al. 2012). Beam-ACO has been utilized to boost supply chain shipping and logistic agents. The conventional ACO method has aided in optimizing the dispersed scheme's performance. The adoption of Beam-ACO has improved procurement results both locally and globally. The use of Genetic Algorithms (GA) in a profitable industry example is proposed by (Wang et al. 2000). The GAs was used to justify the full cost of the bulk purchasing scheme in this example. Numerous diagnostic models with stochastic needs are used to demonstrate the program. The mathematical model was developed to illustrate a stochastic invention with many to many demands, travel constraints, and pricing uncertainty aspects. The genetic algorithm gave its blessing by (Lo, 2007) works with the well-known issue of production with backward realities, such as fluctuating demands over time and incomplete production due to product interruption and clear distribution mistakes. In addition to increasing the number of production cycles to produce an innovation policy (R, Q), an integrated production system may be created to minimize the cost of complete collection in a given period by using production intermediate search. [Baras et al. 2015] System Dynamics has created a simulation model for conventional retail transactions. The goal of their simulation work was to come up with new policies that would increase income while lowering costs for the seller. In addition, the study's goal was to look into the consequences of various diversity techniques. A procurement model based on a stock-based system is frequently reviewed to assist HP production managers in managing products in their supply chains (Lee et al., 2018)

(P. Radhakrishnan et. al., 2009) has created a unique and effective method based on Genetic Algorithms to evaluate whether it is possible to minimize the cost of sales of goods by reducing surplus stock and the amount of deficit necessary in the usage of inventory in the supply chain. The majority of known algorithmic performance improvements have been made, however, it turns out that the majority of them have not had the intended influence on design decisions or procurement-related issues. Some efficiency tactics are ineffective because they are not well-suited to solving complicated performance problems in the short time frames required for decision-making, while some problem-based strategies necessitate advanced technology. This complicates the deployment of decision-making systems that offset the urge towards quick adoption in a fast-changing world. IO strategies must define where acceptable assets should be placed around the world, taking into account their cost at each stage of the supply chain, as well as all targeted service levels and lead recovery periods.

SUPPLY CHAIN INVENTORY OPTIMIZATION ANALYSIS

Inventory Optimization and Cost Saving Model

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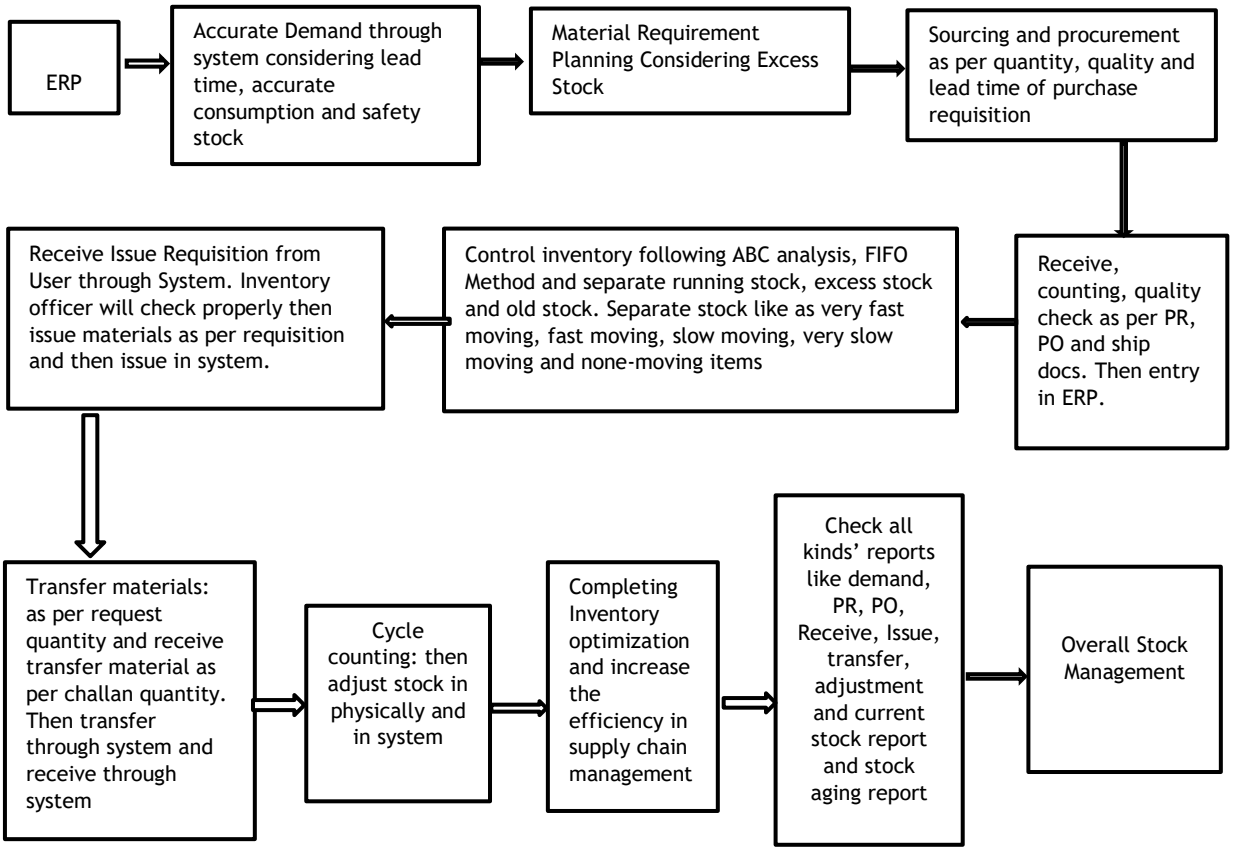

FIGURE 1. Inventory Optimization and Cost Saving Model

The above figure-1 represents the inventory management and cost-saving model. To make an effective supply chain, a company or business will receive the order then make a Bill of Materials then create demand. For made to order supply chain, a company or business will receive an order then make a Bill of Materials then create demand. If the BoM and consumption are wrong, demand will not be accurate. For made to stock supply chain, demand is generated by analyzing the previous history of 3-month, six months and one-year consumption. Making accurate demand needs accurate lead time, consumption, and safety stock. If the consumption report is wrong, demand will not be accurate. Inaccuracy of demand may happen stock out and stock over. For stock out, we can't meet the customer requirement timely. We may lose the customer. For stock over, we have to bear holding cost, wastage cost, and damage cost. We have to make Materials Requirement Planning properly. At the time of MRP, we have to consider existing excess stock. Suppose for an item we need 10000 pcs but we have 3000 pcs as existing stock then we go for purchase 10000-3000=7000 pcs. For inventory optimization, we must utilize and maximum reuse the stock of the materials. Then we have to go for sourcing and procurement. We have to source as per requirement quantity, quality, and lead time. Otherwise, it will impact inventory. At the time of material receiving, we have to count and check the quality as per requirement and documents. Otherwise, it impacts inventory by bad quality, damage, and short quantity. Then we have to issue materials to manufacturing. Users submit issue requisition through the system. The inventory officer checks properly requisition quantity is ok or not. Then

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they will keep ready and issue physically and in the system. We must issue materials as per consumption and requirement of manufacturing. If we issue more than the required quantity, we have to face stock out. If we have to manufacture in another company or subcontract, then the inventory officer will receive transfer requisition through the system and make ready goods physically and in the system, then transfer material to a specific location. For old stock, we have to take steps very quickly. We must reuse or sell to others so that we can reduce our losses. By using ERP, we can integrate all of the processes. We can make time and action plans. All the data and works are visible by ERP. We can get all kinds of the report from ERP. Thus we can Increase the Efficiency and Effectiveness of inventory management by optimizing Supply Chain through Enterprise Resource Planning Technology. For various reasons, inventory optimization is critical to business operations in today's changing economic environment. The first is the cost of carrying, maintaining, and managing inventory. Most prices are rising steadily, real estate and tax rates are rising, and transportation costs are soaring. Inventory optimization can ensure that inventory is balanced to meet expected demand while reducing costs and improving control over subsequent inventory purchases. Planning reduces the need to expedite supplier orders, thereby reducing the need to expedite customer shipments.

Second, the optimization of the inventory improves the financial performance of the inventory by combining the purchase and storage in the demand of the expected customers. If it is not excluded, it will help reduce the surplus stock and the accumulation of inventory in the future. 3,444 third, many known variables that can affect your inventory are much more, and as a result, your customer service level has your customer service level to monitor properly. I have only planned your inventory that I could not achieve both your inventory expectation and consumer expectations. If you try to plan with ERP, it will be even worse, as it will be worse to increase the client's misfortune and lose income.

Essentially, inventory optimization is the process of balancing an inventory's investment with a company's fill-rate (service level) requirements. Some additional financial concerns and limits can be applied to the algorithm creation process. These complicated algorithms operate behind the scenes so that the user is not confused or afraid of utilizing optimization to aid accomplish their inventory.

The major goal of inventory control is to foresee where, why, and how management will be required, and such predictions will be produced here in the process. The proposed Methodology will ensure that adequate stock levels are maintained in the future, lowering the procurement asset's cost. The Supply Chain model is separated into three parts, each of which will be implemented in turn.

FIGURE 2. Three Stage Supply Chain (Studied Model)

In Figure 2, The manufacturer creates a variety of products and decides how they will be delivered to the distribution center and distributed to the agents. The Recommended Approach tries to identify the specific product to be focused on, as well as the number of stock levels of items that different supply chain

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members must maintain, and the approach assesses whether stock quality exists. To discover the proper value, we apply a genetic algorithm in our proposed method. Figure 3, which depicts the processes utilized in the performance analysis, clearly depicts the performance of our method.

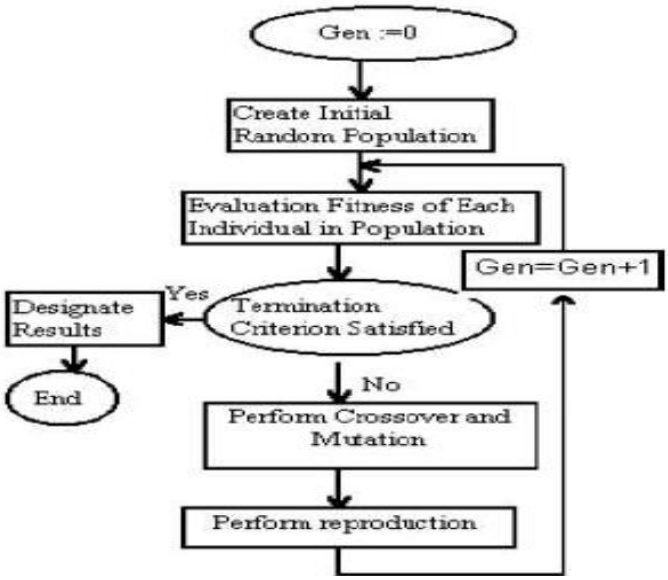

Figure 3. Genetic Algorithm Structure

Figure-3, which depicts the processes utilised in the performance analysis, clearly depicts the performance of our method. The number of excess stock levels and the number of shares necessary for various supply providers were initially represented by zero or non-zero numbers. Asset Control is not required if the provider's data is zero, but it is required if the data is non-zero. Non-zero data denotes both a surplus and a deficit. The surplus is referred to as the fair value, while the deficit is referred to as the negative value.

Human generation: Each gene consists of a series of random numbers. Here, a chromosome of three genes with random numbers in each kind is created, as well as a product representation. Figure-3 depicts a random human created for genetic function. The number of events in the prior record is determined after the manufacturing of such people. This is accomplished by calculating the function () and determining the total number of actions performed by that person in a specific product. This is the number of such instances of the level of product shares applicable to all members for the entire period under consideration.

Chromosome 1

-300	800	-400

Chromosome 2

100	-600	900

FIGURE 4. Chromosome Representation

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Strength performance test: In the genetic algorithm, the solution of a certain chromosome arranged in all the other chromosomes is called an intensity function, which is a transparency function. The correct chromosomes, or at least the closest chromosomes, can multiply and combine their data sets in one of many ways to create a new generation that is better than we think. Fortification work issued by:

$$f(i) = \log\left(1 - \frac{n_{occ}(i)}{n_{not}}\right), \quad i = 1, 2, 3, \ldots\ldots\ldots, n$$

Where:

i= the number of occurrences of the chromosome in the record set.

n= the total number of records that have been collected from the past or the total number of data present in the record set.

The set chromosome's enhanced function is generated at random. Following that, the chromosomes are genetically modified.

Genetic Performance: Following the completion of the strength calculation, genetic functions are carried out. Genetic performance can be seen through selection, crossover, and body modification.

Selection: The challenge of choosing the most powerful chromosome for the continuous genetic function is known as the initial genetic function. This is accomplished by assigning levels to each of the existing chromosomes based on their predicted intensity. The best chromosomes are chosen for the continuation of the procedure based on this requirement.

Crossover: Only one crossover point is used in this study for crossover performance. The mating lake's first two chromosomes are chosen for crossover performance. The crossover function for the model scenario is depicted in the diagram below.

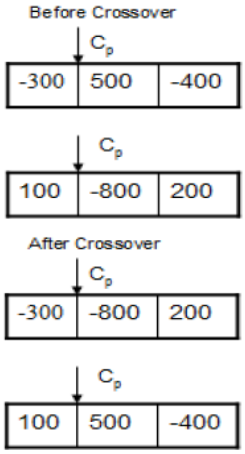

FIGURE 5. Crossover Operation

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The genes in the two chromosomes to the right of the cross-over location are exchanged, and the cross-over procedure is completed. Two new chromosomes are obtained after the crossover procedure. The cross-functional function is done because the correct genes for the crossing site in the two chromosomes are altered. Two new chromosomes are discovered after crossover surgery. Genetic modification: Crossover performance causes newly acquired chromosomes to be pushed to mutation. A new chromosome is produced when a modification is made. This is accomplished by doing a random two-point generation and then switching back and forth between the two genes. Figure-5 shows a diagram of the transformation function.

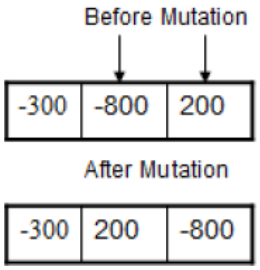

FIGURE 6. Genetic Modification

The mutation process creates new chromosomes that are not identical to the ones that were created. Following the discovery of a new chromosome, a new chromosome will be generated at random. The previous step will be repeated using the new chromosome found in the previous step. In other words, an excellent chromosome will be found at the end of each iteration. This will be mixed with the newly created random chromosomes in the next iteration. Finally, among all of the persons present, the proper person is discovered. This sophisticated chromosome provides detailed information on each supply chain member's stock levels of a specific commodity. Based on the data, it can be inferred that a certain product and its related inventory level play an important role in increasing the cost of a procurement project. By adjusting the inventory level of the specific product in the appropriate members of the supply chain, sales expenses can be reduced in the future.

RESULT AND DISCUSSION

With the help of MATLAB, the inventory management efficiency in procurement management based on genetic algorithms is evaluated. The MATLAB script is used to generate stock levels for three different supply chain members: factory, distribution center, and agent, and this set of data is used to assess the genetic algorithm's performance. Table-1 shows the set of data that was used. Table 1 lists the remaining 17 data sets, which are considered historical records.

TABLE 1. A Sample of Data Sets Having Stock Levels of the Members of Supply Chain

Factory	Distribution Center	Agent
146	118	532

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-491	-239	169
372	573	-345
-491	-239	169
888	-844	208
-491	-239	169
-491	-239	169
792	-456	837
-746	721	-677
172	969	-407
-491	-239	169
611	-295	-445
-491	-239	169
482	-471	761
-992	268	-370
-152	275	-345
-491	-239	169

As mentioned above, the first two chromosomes are produced early in the genetic process. The genetic provider's Crossover and Mutation are responsible for these first chromosomes. After cross-inserting and adjusting our iterative value "100", the corresponding chromosome is obtained. 'After each repetition, the chromosome obtained matches the best chromosome. Therefore, at the 100 ends, the major chromosome "491 329 169" is found. By comparing the results obtained from the genetic algorithm with previous records, it can be determined that the control of the chromosomes of this result is sufficient to minimize losses due to multiple inventory reserves or inventory shortages. Therefore, it is verified that the analysis found an inventory index, which is the best predictor of inventory in asset management.

The results of customers using advanced inventory planning and optimization show that they have achieved (Wikipedia, 2020):

- Reduce inventory by 20% to 40% or more, usually in 6 months or less
- Express and express delivery Reduce transportation by 35% or more
- Increase productivity by reducing planning time by 60% to 80% or more
- Control costs and reduce replenishment by 15% or more

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- By 5% to 15% in customer needs Or more, provide suitable items to improve service level More
- Out of stock reduced by 15% 30% or more
- Sales increased from 15% to 15% or more
- Due to better supplier relations, Commodity costs were reduced by 5% to 10%

We find that manually setting is a time-consuming task and quite impossible to integrate and optimize. In our findings we can see that to optimize inventory, we have to control and manage running stock, excess stock, old stock, and dead stock. We can also see that ERP can help us to integrate all the processes (Demand, Material Requirement Planning, Sourcing, Procurement, Receive, Transfer, Issue, Adjustment, ABC Analysis, FIFO Method, Safety Stock, and Stock Management) and optimize the inventory.

IMPLICATIONS OF THE STUDY

The study will provide an opportunity to gather information regarding inventory optimization. It will also gather all the research findings and available literature in inventory optimization in Bangladesh and South Asia. This study will focus on sustainable inventory security and financial benefits. The study will contribute to Companies that have achieved financial benefits by employing inventory optimization. Companies have reaped financial gains from inventory optimization, according to the research according to a study by IDC Manufacturing Insights, several companies using inventory optimization were able to reduce inventory levels by as much as 25% in just one year and achieve discounted cash flows of more than 50% in less than two years. By employing inventory optimization to achieve improved service levels while lowering inventory, Electro components, the world's largest distributor of electronics and maintenance supplies, raised revenues by £36 million. In two years, Castrol used inventory optimization to cut finished goods inventory by an average of 35% while enhancing service levels (measured as line fill rates) by 9%. Smith's Medical, a Smiths Group company, employed inventory optimization to better meet demand volatility and supply unpredictability, decreasing the risk of understocking and overstocking while smoothing out manufacturing cycles. (Wikipedia, 2020) In every business and company inventory optimization by ERP is applicable and they will be benefited from cost-saving and time savings.

LIMITATIONS

The scope of inventory optimization is very broad and includes many theories on how to evaluate the chain. This article will not go into detail about everything that is included in the term inventory management. The purpose of this article is to describe the methods that can be used to determine whether inventory optimization is effective and to provide a model or index that combines multiple data. Inventory optimization practices vary based on company size, company business, and rules implemented by local governments, and vary from company to company. The second part of the empirical study will be carried out in a single company or a few, and cannot be considered representative of all companies. This means that the results of this research must be taken into account. Due to the need to protect confidential information, the results of this phase of the empirical investigation must be presented without real numbers.

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CONCLUSION

The main reason for choosing the 'Inventory Optimization' as the title is that Inventory Management is a very important factor to every company and a company with inefficient Inventory Management may lead to difficult management and loss of the customers. The findings show that collaborative optimization saves more money than individual optimization, that the perfect solution is more stable during demand variations, and that it meets the optimal allocation of key consumers. On the other hand, inventory costs can have a significant impact on the expansion or contraction of the optimal structure of the supply chain and distribution system. The latent function is a good approximation for calculating inventory costs in a supply chain environment.

The subject of inventory management is fundamental to the performance of any organization and is one of the most important factors for its long-term viability and high productivity. The most effective inventory management is to reduce costs as much as possible while meeting customer expectations for services such as delivery accuracy and lead time.Inventory management is an important part of supply chain management. We discussed cost-saving and inventory optimization models and gene-based algorithms to maximize asset allocation in supply chain management, and focused on how to directly determine the amount of inventory required and the total cost when reducing inventory. Operations in the supply chain. We apply our method to the inventory optimization model and the three-step learning model for improvement. The proposed method was implemented and MATLAB was used to test its effectiveness. Manually setting reorder settings (such as safety stock or minimum/maximum levels) is a time-consuming task. Therefore, it is rarely completed and cannot adapt to changing demand conditions. These activities should not consume the valuable time of the buyer/planner. The re-ordering (replenishment) settings can be optimized to save a lot of money. Because ERP can accomplish it quickly, the results dynamically reflect changes in demand.

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