INVENTORY MANAGEMENT SYSTEM FOR RETAILERS - LITERATURE SURVEY

1. **Research on the optimization of Retailer Inventory Strategy based on System Dynamics Simulation**

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The supply chain inventory management aims at meeting customers' demands, reducing inventory cost and increasing enterprise profit. We need to place an order and replenish productions when the inventory is under safety stock quantity. We can appropriately combine with historical records and product sale reports through a dynamic simulation analysis, and then provide variable parameters which are similar to the reality operation situation. So a simulation model is established and it must meet customers' demands, operate smoothly and use up the inventory in time. Therefore, we can use the method of system dynamic simulation to optimize the variable parameters in a two-stage supply chain inventory system. We simplify the model actually and assume that it primarily consisted of a manufacturer and a retailer. Moreover, it can describe the process of supplying an order directly from a manufacturer to a retailer. The model should meet the customers' demands primarily, and we need to reset the variable parameters of adjustment production time, demand production delay time and demand sale time to get a better retail inventory strategy ultimately. System dynamics (SD) was created during the mid-1950s by Professor Jay Forrester of the Massachusetts Institute of Technology. A system is integrated by multiple elements, such as constraint conditions, inputs, outputs and feedbacks. They are all included in the complex of systems and the environment. The theory foundation of system dynamics consists of classical fluid mechanics and feedback control theory. It is a discipline that focuses on cognizing and solving system problems, connecting with natural science and social science as well. It is widely used within the company, between businesses and businesses, among regions and even in cross border strategy decisions. System dynamics is usually called “strategic decision laboratory” Supply chain inventory management system is an integrated system, and the operation process of the supply chain is much more complex in reality than a simulation model. This paper focused on a two-stage supply chain inventory management system and it was simplified rationally. We used vensim software to establish models and simulate the system and provided some better supply chain inventory operation projects by adjusting the value of Apt, Dpd, Dst and other parameters. And the retailer inventory storage strategy was optimized under an uncertain environment ultimately. We made a conclusion that the method was feasible through analyzing an example. And a better inventory storage strategy was given to the retailer. The simulation model which we researched was a simplified one, so it couldn't react to the whole storage operation process of the supply chain system roundly and objectively. Since the theory of system dynamics is integrated and complex.

2. EFFECTS OF YIELD AND LEAD-TIME UNCERTAINTY ON RETAILER MANAGED AND VENDOR MANAGED INVENTORY MANAGEMENT

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AUTHOR : SOONKYO LEE, YOUNG JOO KIM, TAESU CHEONG AND SEUNG HO YOO [2019]

Generally, there are various elements of uncertainty in a supply chain. In particular, uncertainties in lead time, demand, and yield are very important in the semiconductor industry. Higher uncertainty can lead to bullwhip effects that can undermine the performance of the entire supply chain. This study examines the relationship between uncertainty in the supply chain and the outcome of inventory replenishment policies. Specifically, we analyze the effects of well-known uncertainties on manufacturer production quantity and retailer order quantity decisions in a decentralized supply chain. In addition, we also analyze and compare the effects of these uncertainties for the retailer-managed inventory and the vendor-managed inventory policies. Using numerical experiments, a comparative analysis of the two alternatives is conducted to determine suitable options for improving supply chain performance. In general, the performance of vendor-managed inventory is better than that of retailer-managed inventory, but we observe from the numerical experiments that there exist circumstances under which retailer-managed inventory shows better supply

chain performance. y, we examine models that analyze the impact of supply uncertainty in retailer-managed and vendor-managed decentralized supply chains on supply chain performance. We thus identify optimal production and order quantities for centralized and decentralized supply chains under lead-time,yield, and demand uncertainty. For the RMI model, when yield is low, the retailer always attempts to order more than the optimal quantity, which might lead to the bullwhip effect. Therefore, in order to minimize the impact of the bullwhip effect, the manufacturer wishes to obtain and utilize its yield information so that they can better gauge the exact level of demand. The centralized production quantity is always greater than the production quantity of the VMI, which is quite intu itive. Under the same conditions, it would be more advantageous for the manufacturer under the VMI model to set the wholesale price higher; however, because the retailer's profit decreases rapidly as the wholesale price increases, there needs to be an appropriate agreement to ensure a fair distribution. As we have confirmed in this study, under the decentralized supply chain model, the total profit of the VMI and RMI models increases as the unit cost decreases, the holding cost decreases, the salvage value increases, and as the lead-time and yield uncertainty decrease. Therefore, we confirm through the numerical studies that higher yield or lead-time uncertainty generally leads to lower expected profits for both the manufacturer and retailer no matter which inventory management policy is utilized. Overall, the profit for the RMI model is higher than that for the VMI model. In addition, for certain parameters (unit cost and wholesale price), we observe that, although total profit increases or remains the same, there is a conflict of interest between the retailer and the manufacturer. One of the limitations of this study is that we do not propose appropriate contracts that coordinate a decentralized supply chain under either the RMI or VMI model when both yield and lead-time uncertainty exists. Therefore, we believe that the result of our study can be used as the foundation for in-depth research into supply chain contracts.Another limitation is that we assume that the retailer knows the manufacturer's yield and lead-time information. Thus, our study can be extended to a decentralized supply chain where this information is not fully available to the retailer.
In addition, we consider a supply chain consisting of a single manufacturer and a single retailer. Thus, our study can be extended to more complex supply chains (e.g., multiple retailers or three-echelon supply chains including a distributor) and evaluate the impact of simultaneous yield and lead-time uncertainty.

3)A Study of Inventory Management System Case Study

LINK:
https://www.researchgate.net/publication/327793184_A_Study_of_Inventory_Management_System_Case_Study
AUTHOR: Nazar Sohail,2Tariq Hussain Sheikh, : Received: April 19, 2018, Accepted: May 22, 2018

Inventory management is a challenging problem area in supply chain management. Companies need to have inventories in warehouses in order to fulfil customer demand, meanwhile these inventories have holding costs and this is frozen fund that can be lost. Therefore, the task of inventory management is to find the quantity of inventories that will fulfil the demand, avoiding overstocks. This paper presents a case study for the steel manufacturing industry (Small Scale Industry) on inventory management. The relationship between the inventory management and company performance was determined based on inventory days and return on asset (ROA) analysis. The research found that company X had a few inventory problems such as unorganized inventory arrangement, large amount of inventory days / no cycle counting and no accurate records balance due to unskilled workers. The study also proved that there was a significant relationship between return on asset (ROA) and inventory days. This paper also provides recommendation to the company and for further research.
Inventory management has to do with keeping precise records of finished goods that are ready for shipment. This often means posting the production of newly completed goods to the inventory totals as well as subtracting the most recent shipments of finished goods to buyers. When the company has a return policy in place, there is usually a subcategory contained in the finished goods inventory to account for any returned goods that are reclassified or second grade quality. Accurately maintaining figures on the finished goods inventory makes it possible to quickly convey information to sales personnel as to what is available and ready for shipment at any given time. The ROI of Inventory management will be seen in the forms of increased revenue and profits, positive employee atmosphere, and on overall increase of customer satisfaction. The next step of the present research will be the application of achieved results of demand forecasts, safety stock and reorder points into simulation software in order to achieve more accurate results.

4)Research paper on Inventory management system

LINK : https://www.irjet.net/archives/V5/i4/IRJET-V5I448.pdf
AUTHOR : Punam Khobragade* , Roshni Selokar* , Rina Maraskolhe* Prof.Manjusha Talmale+ 2018

Inventory Management System is software which is helpful for the businesses operate hardware stores, where storeowner keeps the records of sales and purchase. Mismanaged inventory means disappointed customers, too much cash tied up in warehouses and slower sales. This project eliminates the paper work, human faults, manual delay and speed up process. Inventory Management System will have the ability to track sales and available inventory, tells a storeowner when it's time to reorder and how much to purchase.Inventory Management System is a windows application developed for Windows operating systems which focused in the area of Inventory control and generates the various required reports.
This paper presents an alarm about the information section in the bill which in view of desktop application. It's a straightforward desktop application inwhich the network to the immediate distribution center with the goal that information ought to be refreshed in store for the confirmation. It's a secure application in which the no information spillage from the stockroom. And furthermore gives the one table organization look so that after the finish of month we know about what we sold.

5)A Study of Inventory Management System of Linamar India Pvt. Ltd, Pune

LINK : https://amity.edu/userfiles/admaa/da2a0paper%204.pdf
AUTHOR : Anajali Mishra & Harshal Anil Salunkhe ,2018

The aim of the study is to examine the inventory management process. The significance of this research is based on the benefits that can be obtained by identifying the issues of inventory control. The methodology used are unstructured interviews, on-site study, and annual report analysis. Inventory management is an important area of manufacturing industry. If company fails to manage inventory, they will face failure. It is a challenge for the company to maintain fair inventory. There are various inventory management techniques available for maintaining fair inventory level in the company. The basic objective of this paper is to study about inventory management techniques used in Linamar India Pvt. Ltd. and find out some measures for improvement on inventory management process of the concerned company. The present system of inventory management of the company is good. For improvement of the present inventory management system, company should adopt other inventory management techniques.
The Inventory management is significant for any manufacturing organization. It helps the organization in smooth running of its activities and in reducing the cost of managing the inventory. From the above data study, it can be concluded that Linamar India Private Limited is managing its inventory very efficiently. The techniques undertaken by the organization are helping it in continuous flow of its production activities. EOQ, safety stock analysis, ABC analysis are being undertaken efficiently and effectively. Inventory turnover ratio is also showing an increasing trend which indicates that sales of the organization is increasing every year.

6)Development of Inventory Management System

LINK : https://ieeexplore.ieee.org/document/5478077
AUTHOR : Yang Fan ,2010

This paper introduces Agent technology into domestic storage management and uses the autonomy, reactivity and sociality of Agent to realize the seamless connection among enterprises by defining interaction and cooperation mechanisms among different Agents, thereby achieving the aim of reducing and even eliminating inventory, so it is a feasible thought and method for enterprises to realize effective storage management. This paper mainly designs a storage management system model based on multi-Agent and describes main Agent cooperation processes of the system.
In the design of storage management system model based on multi-Agent in this paper, we use a hierarchical federation multi-Agent system organization structure and the cooperation among Agents is based on improved contract net protocol, which enhances system performance on the whole. Next, we will analyze from Agent performance and system processing efficiency. The autonomy of Agent in the model is mainly manifested as follows,It can carry out task allocation independently when accepting tasks. It can distinguish commodity kinds for the tasks submitted by users and look for suitable task undertakers according to the grades and names of these commodities, the process doesn’t need user’s intervention and it can be finished independently. When a task can not be finished in time, the system can reallocate the task independently.

After a task is allocated, the original task needs to be undertaken by another Agent due to some unexpected matters, the system will reallocate the task.After a task is finished, the system can report on its own initiative and doesn't need user's surveillance. Interaction is mainly manifested as follows: Agents can communicate with each other by sending message and Agents cooperate with their own behaviors and finish the execution of tasks through these interactions. It can be seen from the foregoing communication message among Agents that Agents in this model have interaction and strong interactive ability and there is a time constraint when they interact with each other. Reactivity is mainly manifested as follows: MatManagerAgent can place an order according to bidding information of various Agents and StoManagerAgent can also make different responses to the messages sent by MatManagerAgent according to its own conditions, it can accepts the order or refuse the order. When production management Agent doesn't agree with this order, storage management Agent makes a response in time to cancel this order. Using hierarchical federation multi-Agent system organization structure in the model can solve system management well and realize centralized management in domain and it doesn't need that every Agent in domain has rich knowledge and ability, which is convenient for system implementation and the performance of the whole system will not decrease. Adopting distributed processing among federations also conforms to the practical environment of the system and convenient implementation technology, which makes interaction and cooperation among different organization Agents easy. Adopting the model system based on improved contract net protocol can reduce communication traffic and interaction among Agents effectively and make system processing efficiency and stability higher. Increasing constraint conditions of bidding activity will also reduce the bidding activities of some Agents who don't have bidding qualifications, thereby reducing communication and increasing processing efficiency. In the places where tasks need interaction frequently, if these information interactions are not improved, a bottleneck will form and users need to issue new tasks frequently, which may cause system crash. The improved contract net protocol considers many possible cases in bidding, introduces three evaluation indexes and combines the ability information of Agent with historical circumstances of finishing tasks before to provide a forceful foundation for manager Agent to select the optimal successful bidder. The improved contract net protocol is favorable for not only optimizing task allocation scheme but also increasing task allocation success rate and task completion quality.

7)INVENTORY MANAGEMENT INFORMATION SYSTEM DEVELOPMENT AT BPRTIK KEMKOMINFO JAKARTA

LINK : https://ieeexplore.ieee.org/document/8089303
AUTHOR : Elvi Fetrina1 , Eri Rustamaji2 , Tatat Nuraeni3 ,Yusuf Durrachman4 ,2022

The Institute of Training and Research for Information and Communication Technology (BPRTIK) is an institution under the Ministry of Communications and Information Technology (KEMKOMINFO). Since this Institution manages its inventories by using spreadsheet so that the data are not synchronized properly and prone duplication of data. The inventory reports such as maintenance process reports are also done manually and are recorded in papers that have not been organized into a single database, making those reports are vulnerable to a loss or corruption of data. In addition, the process of task's assignment and monitoring are still done manually by using a memo or even verbally which then lead to the undocumented reports. In this study, the data were collected by interview, observation and literature study. Rapid Application Development (RAD) and Object-Oriented Approach using Unified Modeling Language (UML) were used as the system development and design methods respectively. The results of this study is inventory management information system, which can support and manage the inventory's processes such as the process of controlling and monitoring, maintenance, assignment and reporting.
Inventory Management Information System is able to facilitate the performance of the division of state property and asset inventory management process starts from the process control, maintenance, filing, purchasing, external service, reception, assignment to the reporting process.The system was built using Rapid Application Development (RAD) and Unified Modeling Language (UML) With this system, the data is stored directly into the database so it will minimize the possibility of loss or damage data .

8)An IoT Application for Inventory Management with a Self-Adaptive Decision Model

LINK : https://ieeexplore.ieee.org/document/7917105
AUTHOR : Lizong Zhang,Nawaf Alharbe,Anthony S. Atkins ,2022

Safety storage in large warehouse is an urgent issue to be addressed by both the local authorities and businesses, especially after the Tianjin explosions. This paper proposes an inventory management system for a warehousing company. The system integrates RFID technology and a self-Adaptive distributed decision

support model for inbound and outbound actives, inventory location suggestions and incident handling. The model consists of three major components: environment recognition, knowledge merging and the decision making. In addition, a 'selfadaptive' feature is adopted for adjusting the knowledge used in decision making procedure. An experiment is also outlined to validate the utilisations of our model and the proposed system. In this paper, a novel inventory management system designed for storage company is described. It uses the RFID technology for tracking the movement of goods, and a proposed self-adaptive distributed decision support model is introduced to enable the system automatically 'fit' to its deployed environment by adjusting of the nodes' knowledge base. The proposed model provides a more generic approach for decision support in inventory management. It uses a distributed schema and all decision makings are carried out by the nodes individually to avoid any possible delay caused by network communications. The model uses the result of scenario recognition as a benchmark for knowledge selection to create a local knowledge base that used by node individually to carry out the decisions with its own rule-based system. In addition, a selfadaption step is introduced to further modify the local knowledge base for better adaption to the scenario where the node deployed. A simulation experiment is then carried out in this paper, in order to prove the utilization of the proposed inventory management system, as well as the self-adaptive model. This design is also confirmed by another chemical storage company, and they estimated the design could bring 10% work efficiency improvement to their current work procedures.

9)Study On A New System for Inventory Control

LINK : https://ieeexplore.ieee.org/document/4659581
AUTHOR : ZHU Xiaoyu LI Xiaojiu , 2022

As we all know, inventory control is important in a clothing company and Agent Technology has become very popular in the last few years as a new approach to developing software systems. This paper study on a newt system for inventory control using plannin and distributed agents in apparel indursty. Multi Agent Systems (MAS), a term used to describe the incorporation of multiple types of agents into various systems, is a way of designing and implementing a system with the advantages of agent entities. We chose to use agents as a decision support tool for use in a Retail Inventory Management System. Since the management of inventory is crucial to the success of most companies, and since we see a potential major role for agents in the business process management MAS seems a likely choice for a decision support platform. This work stems from our prior work in simulating a MAS inventory system, then implementing the system for production use.
Agents can help design an Inventory Management System that is reliable, more accurate, intelligent, distributed, scalable, faster, and simpler in design. Such a system is very much needed in this time and in the future especially with the growing economy and the growth of the Internet. The future of such systems lies in creating a component that can negotiate online orders for restocking inventory with online suppliers. Our current decision support system is limited to the inventory system (excluding supply chain activities) for a medium sized department store in China. We plan to add to this system a simulation of the store's supply chain (or at least some part of it) to test how the inventory system will behave in a more dynamic scenario (i.e. testing various supply chain situations).

10)Study on Auto enterprise inventory management

LINK : https://ieeexplore.ieee.org/document/6114678
AUTHOR : Zhang Guirong,Mu Yuxin ,2022

This paper aims at solving the following problems: our country autocar business inventory managment, unreasonablesupply chain inventory managment mode of cooperation , unreasonablevibrator type recifier the network, imappropriate new technique information technique and physical distribution, physical distribution system reaction capability scarcity and all the components purchased by the storekeeper according to his mastery of the stock. This paper puts forward a series of measures like a total inventory management, strengthening production management and lowering in products inventory, strengthening the marketing management to reduce inventory, strengthening the whole coordination of enterprise and countermeasures to improve the management inventory level.
To improve the present stock situation of the car enterprises, they should not only strengthen their internal supply chain management, but also strengthen the coordination and cooperation between supply chain enterprises and the whole coordination countermeasures so as to improve the management level of the inventory. A set of supply chain enterprise identity of credit evaluation system and effective performance evaluation system and incentive mechanism should be established as well as supply chain cooperation monitoring and control system in order to vitalize the whole supply chain.