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ANALYSIS OF THE PROCESS OF INVENTORY PLANNING, CONTROL AND MANAGEMENT[23]

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Abstract: *Inventory management is a process of planning, control and administration of stocks of goods and materials in a warehouse or company, aiming at optimization of stocks and satisfaction of customer needs. This includes tracking the quantities, location, movement and value of goods to avoid both shortages and surpluses while maintaining operational efficiency. The main objective is to provide the right amount of products at the right place and at the right time, while reducing costs and losses.*

Inventory management is critical to the functioning of warehouse systems. It covers maintaining an adequate amount of resources in stock while minimizing shipping and storage costs. The choice of suppliers is also a complex issue, as warehouses often have the opportunity to receive goods from different suppliers who offer different prices and terms. Therefore, the choice of supplier can have a significant effect on total costs. Maintaining appropriate resource levels and selecting the right suppliers affect efficiency and financial results. Developed a model was also analysed in which opportunities for improvement were identified. The analysis showed that there is a limitation in supplies from a specific supplier, expressed in the obligation to provide a minimum resource from each supplier. In real practice, it is possible for a certain period of time not to order resources from a certain supplier.

Keywords: *stock availability, planning, control, management, supplier.*

INTRODUCTION

The analysis of the process of planning, control and management of stock is an important aspect for any company engaged in trade or production. This process can help optimize operations and reduce costs. Here are some key points that highlight the importance of analytics:

- Identifying Weaknesses: The analysis can reveal areas where current practices are not effective, such as excess goods or resource shortages.
- Inventory Optimization: Allows managers to determine optimal inventory levels, which is critical for reducing storage and logistics costs.
- Increase customer satisfaction: Better inventory management can ensure fast and reliable delivery of goods to customers, improving their experience.
- Financial results: Effective inventory management can lead to significant savings and improve a company's financial performance.
- Interaction with suppliers: Analysis helps to optimize relationships with suppliers and can reveal opportunities to improve supply conditions.
- Technology integration: Using inventory management software can facilitate analysis and offer real-time updated data.

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- Strategic planning: By analyzing current processes, companies can develop long-term strategies for developing and improving inventory management.

Analysis of this process not only improves operational efficiency, but also affects the overall competitiveness of the company. It is key to the successful management of resources and the achievement of the organization's strategic goals.

The use of mathematical models for inventory management in automotive workshops is an effective approach to optimizing inventory and achieving a balance between supply and cost. Some of the most common mathematical models include:

- Optimal Replenishment (EOQ) Model: This model serves to determine the optimal quantity to order in order to minimize the total cost of holding and ordering. Factors such as parts cost, storage costs and ordering costs are taken into account in the model.
- Just-in-time (JIT) models: The goal of this model is to minimize inventory and storage costs by having parts delivered just as they are needed for service operations. Successful implementation requires excellent coordination with suppliers and precise supply planning.
- Demand forecasting models (demand forecasting): This model uses historical data and statistical methods to predict future inventory needs. It helps determine the optimal amount of stock based on forecasts of the number of cars expected to pass through the workshop.
- Simulation Model: This model uses computer simulations to study and optimize inventory management. It can be used to test different strategies and scenarios to find the most effective inventory management.
- Combining models: These models can be combined, depending on the specific conditions and parameters that affect inventory management. The use of appropriate mathematical methods is essential to obtain optimal solutions.

The analysis finds that the inability to refuse supply of resources imposes constraints on the optimization of inventory costs. This creates pricing constraints that can make the services offered by the repair shop uncompetitive in the market. As a result, it is necessary to improve the model, which is the subject of the current study.

EXHIBITION

After the analysis, a specified and improved mathematical model related to the planning and optimization of the costs for preservation and storage of a specifically purchased resource is proposed. A new mathematical model has been developed for managing the purchasing and stocking of resources. This model is based on factors such as price, minimum and maximum quantities that can be purchased from each supplier in certain months, and the minimum and maximum storage quantities.

The studied warehouse follows its spare parts supply strategy for an annual period (12 months), which ensures trouble-free service and repairs. In the specific case, we will consider a scenario with a medium-sized car repair shop located in Ruse. The planning of purchase quantities refers to a certain auto part, which in this case we call resource 1. This part is among the most frequently used in the workshop's activity. Table 1 shows the prices of resource 1 from three different suppliers for the previous 12 months. Prices vary from month to month as manufacturers update their prices at different times (monthly, quarterly, semi-annually, etc.). At the start of planning, the garage has 2 units of resource 1 in stock.

Table 1. Prices of resource 1 of the three Suppliers

A month	Supplier 1	Supplier 2	Supplier 3
1	120	112	130
2	120	112	130
3	120	112	130
4	120	125	130
5	120	125	130
6	120	125	130
7	142	134	140

8	142	134	140
9	142	134	140
10	142	155	140
11	142	155	140
12	142	155	140

Table 2 gives the estimated quantities that will be used in repair activities, the minimum and maximum storage quantities, and the storage cost of resource 1 for one month.

Table 2. Anticipated quantities to be used in repair activities, the minimum and maximum storage quantities and the storage cost of resource 1 for one month

A month	Quantities to be used	Minimum storage quantities	Maximum storage amounts	The cost of storing resource 1 for one month
1	8	1	16	1.2
2	8	1	16	1.2
3	8	1	16	1.2
4	10	2	19	1.2
5	10	2	19	1.2
6	10	2	19	1.2
7	10	2	19	1.4
8	12	2	19	1.4
9	6	1	16	1.4
10	6	1	16	1.4
11	9	1	16	1.4
12	9	3	16	1.4

After applying software , Table 3 presents the solution for the study period , i.e. quantities to be purchased in each period and storage quantities.

Table 3. Study period decision

A month	Supplier 1	Supplier 2	Supplier 3	Storage quantities
1	4	5	1	4
2	4	5	1	6
3	4	6	1	9
4	4	6	0	9
5	4	6	1	10
6	4	6	1	11
7	2	6	1	10
8	2	6	1	7
9	2	6	1	10
10	2	6	2	14
11	2	6	2	15
12	2	6	2	16

The model allows auto repair shops to effectively plan the purchase and storage of stock by predicting various parameters. Although this model provides successful inventory management, the paper reveals that it can be improved by adding more realistic constraints.

The model includes evaluated conditions related to the fact that the purchase of parts from the supplier must comply with minimum and maximum quantities, or report that it is not possible to make a purchase. This means that the purchased quantity of parts cannot be less than the minimum or greater than the maximum allowable quantity for each supplier , or no auto parts can be purchased.

This added flexibility and accuracy results in a significant reduction in total costs, making the model preferred for inventory management. Despite the complexity of the second model, it offers higher efficiency and utility.

The model enriches the mathematical literature in the field of inventory management, providing a more detailed and detailed representation of the process of purchasing and storing auto parts in auto repair shops. It offers greater flexibility and accuracy in determining the optimal quantities to purchase and store, taking into account fluctuations in auto parts prices over time, which adds extra realism and precision to planning.

The application of this model in a specific context—a car repair shop in Rousse—demonstrates its significant role in inventory management and establishes it as a preferred tool for implementing inventory management strategies. Importantly, this model is particularly suited to business environments where product prices and availability often vary.

CONCLUSION

The optimal strategy for attracting customers is based on the balance between competitive prices and the quality of services provided. The use of mathematical models for the management of stock in car repair shops is an effective method for optimizing stocks and achieving a balance between supplies and costs. The model emphasizes the importance of flexibility and adaptability in inventory management, especially in volatile environments where prices and availability of auto parts can change.

These observations highlight the importance of adaptive inventory management models to increase efficiency and reduce total costs in auto repair shops.

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