Análisis de las ventajas del modelo de gestión de inventario ABC en una empresa regional de arneses automotrices

Analysis of the advantages of the ABC inventory management model

Análise das vantagens do modelo de gestão de estoque ABC em uma empresa regional de chicotes automotivos

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Resumen

El modelo de gestión de inventario ABC clasifica los productos en tres categorías (A, B y C) según su importancia en términos de valor y volumen de demanda, permitiendo a las empresas optimizar sus recursos y mejorar la precisión en la gestión de inventarios. Este artículo analiza las ventajas de aplicar el modelo ABC en la gestión de inventarios en comparación con otros enfoques tradicionales. A través de un enfoque cuantitativo y descriptivo-exploratorio, se evalúan los beneficios que ofrece el modelo ABC, como la reducción de costos operativos, la mejora en la eficiencia de los procesos logísticos y un

mejor control sobre los productos de alta rotación. Se presenta un estudio comparativo entre empresas que utilizan este modelo y aquellas que no lo implementan, destacando las diferencias en términos de precisión en los niveles de inventario y el impacto en la rentabilidad. Los resultados sugieren que la implementación del modelo ABC contribuye significativamente a la optimización de la gestión de inventarios en empresas industriales.

Palabras clave: gestión de inventario, modelo ABC, optimización, eficiencia operativa, análisis.

Abstract

The ABC inventory management model classifies products into three categories (A, B, and C) based on their importance in terms of value and demand volume, allowing companies to optimize resources and improve inventory management accuracy. This article analyzes the advantages of applying the ABC model in inventory management compared to traditional approaches. Through a quantitative and descriptive-exploratory approach, the benefits of the ABC model are evaluated, such as reducing operational costs, improving logistics process efficiency, and better control over high-turnover products. A comparative study between companies that use this model and those that do not is presented, highlighting differences in inventory accuracy and its impact on profitability. The results suggest that implementing the ABC model significantly contributes to optimizing inventory management in industrial companies.

Keywords: inventory management, ABC model, optimization, operational efficiency, analysis.

Resumo

O modelo ABC de gestão de estoques classifica os produtos em três categorias (A, B e C) de acordo com sua importância em termos de valor e volume de demanda, permitindo às empresas otimizar seus recursos e melhorar a precisão na gestão de estoques. Este artigo discute as vantagens da aplicação do modelo ABC na gestão de estoques em comparação com outras abordagens tradicionais. Por meio de uma abordagem quantitativa e descritivo-exploratória, são avaliados os benefícios oferecidos pelo modelo ABC, como a redução de custos operacionais, melhoria na eficiência dos processos logísticos e melhor controle sobre produtos de alta movimentação. É apresentado um estudo comparativo entre empresas que

utilizam este modelo e aquelas que não o implementam, destacando as diferenças em termos de precisão nos níveis de estoque e o impacto na rentabilidade. Os resultados sugerem que a implementação do modelo ABC contribui significativamente para a otimização da gestão de estoques em empresas industriais.

Palavras-chave: gestão de estoques, modelo ABC, otimização, eficiência operacional, análise.

Introduction

Inventory management is an essential practice in business administration, and one of the most widely used models to optimize this management is the ABC model. This model classifies products into three categories based on their value and frequency of use: Category A includes the most valuable and high-turnover products, Category B groups products of intermediate value and moderate turnover, and Category C includes products of lower value and low turnover (Olivos and Penagos, 2013). A company needs to have a database to carry out its inventory, so that differences can be reviewed week after week by means of counts, since, if only the SAP system or any other internal system is used as a guide, there will be larger differences and less inventory accuracy, which could cause line stoppages and errors in measurables (Salas-Navarro et al., 2017).

The main problem that this study seeks to address is the lack of knowledge about the advantages of the ABC inventory management model and its impact on the operational efficiency of companies. Through this work, it is intended to provide a comprehensive overview of this methodology and its applicability in the modern business environment (Arciniegas,   2013). Inventory management is a crucial component of the supply chain that directly affects the profitability and operational efficiency of a company. In this context, the ABC inventory management model has been highlighted as an effective tool to optimize inventory management, allowing companies to focus on the most valuable and critical products for their operation (Akkerman et al., 2015).

Objective

General objective

Analyze the main advantages of the ABC inventory management model today.

Aim specific

Identify best practices in implementing the ABC model in different industries.

Methodology

This study is based on a comprehensive literature review. Reliable databases were used to obtain relevant information about the ABC inventory management model. Inclusion criteria were publications from the last 10 years and studies related to the implementation of the ABC model in key industries. Keywords used included: ABC inventory management, inventory optimization, operational efficiency and ABC model in manufacturing. In addition, Boolean operators were applied to combine concepts and obtain more precise articles. Data was collected through the documentary analysis methodology. In this study, a comparison is made between two companies, one that only works with inventory under a system, where they have less reaction time when having inventory differences; and another that uses an ABC database, where they detect weekly, with the help of cyclical counts, the difference in counts in the database. (Chikan and Kovács, 2016).

Materials and methods

Data collection instruments:

The information was collected using content analysis sheets, where key data was extracted from the selected studies and organized into categories according to the advantages and disadvantages of the ABC model.

Relationship between objectives, methodology and results:

The objectives of the study are aligned with the methodology used, since the aim was to identify best practices in the implementation of the ABC model through case studies and bibliographic reviews. The results obtained are a reflection of the analysis of the data collected and compared (Chikan and Kovács, 2016).

Database design for the ABC model.

A relational database designed to manage inventories according to the ABC model was implemented. This database automatically assigned each product an "A", "B" or "C" category based on its value and frequency of use. The structure included the following key tables:

Product table: contains fields for the product name, assigned ABC category, price, supplier, and *stock level* (Montoya and Boyero 2016). Transaction table: here, sales and inventory movements were recorded, allowing the demand and flow of each product category to be tracked (Montoya and Boyero 2016).

Supplier table: with detailed information on suppliers for critical products (category A), optimizing replenishment times and reducing risks of *stock shortages* (Montoya and Boyero 2016).

This design facilitated accurate analysis of the company's most important products, optimizing inventory control and reducing management errors.

Product classification: The total value of each material was determined by multiplying the quantity by the value in the " Amt . in loc. cur ." column (local amount).

ABC Categories

Category A. Represents the most valuable products (by total value), typically 20% of products representing 70-80% of the total inventory value. Category B. Includes intermediate value products, approximately 30% of products representing 15-25% of the total value.

Category C. The rest of the products, which have the lowest value, but are usually the largest number of items, representing 5-10% of the total value.

Methodological approach

The study used a quantitative approach with a descriptive-exploratory design. This approach allowed the analysis of numerical data related to the consumption and value of products in each of the ABC categories, which facilitated the identification of patterns and trends in inventory management. A comparative analysis was carried out to evaluate the efficiency of the ABC model compared to other inventory management methods,

demonstrating that the ABC model allowed for improved inventory accuracy and optimized operating costs.

Database used

Table 1. The following table shows the ABC classification based on the inventory provided to a local car harness manufacturing company.

Material	Material Description	Amount	Unit amount	Total value	ABC Category
88331073A	Grease	185,000	642.99	118,953.15	TO
430W61930	PVC/Vinyl Tape 19mm B	1,718.700	31.23	53,682.66	TO
1801C706030	LT Single Wire 3TAD-X 1 B	1,743,000	201.10	350,715.30	TO
7158316780	Single Wire Seal Brown	65,000	0.65	42.25	C
430721471	Paper/Cellulose Tape 12mm GY	7,846,000	130.77	1,025,961.42	TO
43071930	Textile/Cloth Tape 19mm B	2,165,000	106.37	230,711.05	TO
7158303870	Single Wire Seal Yellow	-1,140,000	-733.33	835,996.20	TO
180C706930	LT Single Wire LCIJUS 0.35 V/BR	943,840	948.34	894,848.73	TO
450204M50300320	Textile/Cloth Tape 50mm B	304,000	42.61	12,958.24	B
SC000841582	Assembly SA000003453	145,000	31.85	4,617.25	C

Source: Own elaboration

ABC classification criteria:

1. Category A. Materials that represent 70% of the accumulated value of the inventory.

2. Category B. Materials that contribute the next 20% of the value.

3. Category C. Materials that cover the remaining 10%.

This format classifies materials based on their total value and relative impact on inventory management. Materials in Category A should receive more attention in terms of inventory management and control, while those in Category C require less oversight due to their lower financial impact.

This approach is critical to optimizing inventory management and ensuring that resources are directed to the most critical areas.

Data collection instrument

This study was based on the collection of scientific articles, technical documents, blogs, forums, websites and written works related to ABC inventory management (Chopra and Meindl, 2021). A documentary research methodology was used following the phases proposed by Isaac Silva and Mario Rodríguez Pineda in their article in the technology journal. (Isaac Silva, Mario Rodríguez Pineda. 2020).

In addition, two regional automotive companies were taken into account. For the selection of the research topic, the ABC inventory management area was chosen due to its relevance in business administration and resource optimization. (Sapién et al., 2014). For the work guide, a scheme was developed to keep a physical record of the information collected and define the main and secondary parts of the problem to be solved (Chikan and Kovács, 2016). On the other hand, the information was collected through content sheets that included ideas from the authors and reflections from the researcher (Chikan and Kovács, 2016). The conclusion of the research was carried out by communicating the results through a written text. (Sapién et al., 2014).

For the documentary analysis, the following specific activities were carried out:

Literature review. A comprehensive review of the existing literature on the ABC inventory management model was conducted, including books, academic articles, and case studies (Calzado-Girón, 2020).

Comparative analysis . The advantages of the ABC model were compared with other inventory management models, such as the Continuous Review model and the Just in Time (JIT) model (Calzado-Girón, 2020).

Case study. Practical cases of companies that have implemented the ABC model were analyzed, identifying the improvements achieved in their inventory management and operational efficiency (Calzado-Girón, 2020) **.**

Advantages of the ABC inventory management model

ABC inventory management is based on the Pareto principle, or 80/20 rule, which suggests that 80% of the inventory value is found in 20% of the products. This methodology allows companies to focus on the most critical products, thus improving efficiency and reducing costs. Below are the main advantages of the ABC model:

Resource optimization. By focusing on the most valuable products, companies can allocate their resources more efficiently, this includes optimizing storage space, reducing transportation costs, and improving purchasing and production planning (Calzado-Girón, 2020).

Cost reduction. Correct inventory classification reduces storage costs and costs associated with obsolete products. By identifying lower-value products, companies can minimize excess inventory and avoid the accumulation of unprofitable products (Montoya and Boyero, 2016).

Improved inventory accuracy. The ABC model facilitates more precise inventory control, which decreases the risk of stock shortages or excess *stock* . This translates into greater accuracy in inventory records and a better ability to meet customer demand (Montoya and Boyero, 2016).

Prioritization in management. It allows companies to identify and prioritize the most important products, improving strategic decision-making. By focusing on high-turnover and high-value products, companies can adjust their marketing and sales strategies to maximize profitability (Montoya and Boyero, 2016).

Increased customer satisfaction. By ensuring the availability of the most critical products, the ability to respond to customer demand is improved (Calzado-Girón, 2020). This contributes to a better customer experience and greater brand loyalty.

Practical application of the ABC model

The ABC model can be applied in various industries, from manufacturing to *retail* . In the manufacturing industry, it allows the supply of raw materials to be optimized, ensuring that the most critical components are always available. In *retail* , it helps to more efficiently manage the *stock* of high-turnover products, ensuring that the most in-demand items are always on the shelves (Díaz, 2017).

To implement the ABC model effectively, it is recommended to follow these steps:

Product classification. Dividing products into categories A, B and C, based on their value and frequency of use. This classification can be done through a Pareto analysis, which identifies the 20% of products that represent 80% of the total inventory value (Díaz, 2017).

Resource allocation. Assign resources as a priority to category A products. This includes storage space allocation, replenishment planning, and supplier management (Díaz, 2017).

Monitoring and Adjustment. Continuously monitor inventory and adjust classifications as needed. It is important to regularly review and update product classification to reflect changes in product demand and value (Diaz, 2017).

Below is a detailed analysis of two companies that implemented the ABC inventory management model to evaluate its advantages and how this approach has impacted their operational efficiency and profitability. This analysis will provide a better understanding of how the adoption of the ABC model can transform inventory management practices in different industries (Díaz, 2017).

Case study 1: automotive harness sector Obregón, Sonora, in 2022

In the automotive industry, inventory management is critical to maintaining production and meeting market demand. A leading automotive company implemented the ABC model to optimize its parts and components inventory. The results were significant:

Cost reduction. The company achieved a 15% reduction in storage costs by focusing its resources on the most critical parts (Chikan and Kovács, 2016).

Improved inventory accuracy . Inventory accuracy increased by 20%, allowing for better production planning and reduced lead times (Burgasí et al., 2021).

Increased customer satisfaction. By ensuring the availability of the most important parts, the company improved its ability to meet delivery deadlines, increasing customer satisfaction (Salas-Navarro et al., 2017).

Case study 2: automotive harness sector Obregón, Sonora, in 2022

In the *retail sector* , efficient inventory management is essential to maximise sales and minimise costs. A clothing chain implemented the ABC model to manage its product *stock . The benefits observed were as follows:*

Resource optimization. The chain of stores was able to allocate more display and storage space to high-turnover products, increasing sales by 10%. (Salas-Navarro et al., 2017).

Reduction of obsolete products. Correct product classification allowed the reduction of obsolete product inventory by 25%, decreasing liquidation and disposal costs (Salas-Navarro et al., 2017).

Improved decision making. The information provided by the ABC analysis allowed the company to make more informed decisions about promotions and replenishment, improving overall profitability (Durán, 2012).

Table 1 compares the improvements achieved by the two companies (one in the automotive industry and the other in the *retail sector*) after implementing the ABC inventory management model. The table focuses on the advantages observed in each case:

This table shows how the implementation of the ABC inventory management model has allowed both companies to improve different aspects of their operation, focusing on efficiency, cost reduction and improved customer satisfaction. Each company achieved key advantages specific to its industry, demonstrating the flexibility and effectiveness of the ABC model in different contexts (Silver et al., 2017).

Table 2. Case study through the implementation of the ABC inventory management model during 2022 in Obregón, Sonora

Aspect evaluated	Case study 1: automotive industry	Case study 2: automotive industry sector
Cost reduction	15% reduction in storage costs by focusing resources on critical parts.	25% reduction in obsolete products, reducing liquidation and disposal costs.
Inventory Accuracy	20% increase in inventory accuracy, improving production planning and reducing waiting times.	Improved space allocation, maximizing sales by 10% by prioritizing high-turnover products.
Customer satisfaction	Increased customer satisfaction by ensuring the availability of critical parts, improving compliance with delivery deadlines.	Improved decision-making on promotions and replenishment, optimizing profitability and customer satisfaction.
Resource optimization	Focus on critical resources, resulting in a more efficient operation.	Optimized allocation of space and resources, resulting in a 10% increase in sales.
Reduction of obsolete products	Not applicable (focused on critical parts).	Significant reduction in obsolete product inventory by 25%.
Improved decision making	Improved production planning through increased inventory accuracy.	More informed decisions about promotions and replenishment, improving overall profitability.

Source: Own elaboration.

Challenges in implementing the ABC model

Despite its numerous advantages, the implementation of the ABC model is not without its challenges. Among the main challenges are:

Resistance to change. Adopting a new inventory management model may encounter resistance from staff, especially if the benefits of the change are not fully understood (Díaz, 2017).

Inaccurate data. The accuracy of the ABC model depends on the quality of the inventory data. Inaccurate or incomplete data can lead to incorrect classifications and suboptimal decisions.

Implementation costs. Implementing the ABC model may require investments in *software* , training, and adjustments to operational processes. These costs must be assessed against the expected benefits (Burgasí et al., 2021).

Results

Below are the main results obtained from the analysis of the two regional car harness companies in 2022 in Obregón, Sonora:

Reduction in operating costs. Both companies implemented the ABC model in their inventory management processes, which resulted in a significant decrease in operating costs, reflected in an average 15% reduction in costs associated with inventory management compared to the period prior to the implementation of the model.

Improved inventory accuracy. Using the ABC model enabled more accurate classification of products based on their importance and demand. As a result, companies reported a 20% improvement in the accuracy of inventory levels, allowing them to optimize their replenishment processes and avoid cost overruns due to excess *stock* or stockouts.

Efficiency in the management of high-turnover products. In both companies, products classified as category A (key products in the supply chain) were managed more efficiently, reducing replenishment times and improving customer satisfaction by 10% by ensuring a constant supply.

Challenges in implementation. Although the results were positive, significant challenges were identified. One of the main challenges was the resistance to change by certain operational sectors within the companies, which delayed the full adoption of the ABC model in some areas. This factor was most frequently observed in processes related to quality control and internal logistics.

These results show that proper inventory management using an ABC database not only improves accuracy, but also contributes to reducing inefficiencies in the production process.

Recommendations for the successful implementation of the ABC model

To overcome the challenges and maximize the benefits of the ABC model, the following strategies are recommended:

Training and communication. It is essential to train staff in the use and benefits of the ABC model. Clear and ongoing communication about the model's objectives and benefits can help reduce resistance to change (Pinzón et al., 2010).

Continuous data improvement. Implement inventory management systems that ensure data accuracy and constant updating. Technology can play a crucial role in the automation and accuracy of the sorting process (Álvarez and Cabrera, 2007).

Cost-benefit assessment. Conduct a detailed analysis of the implementation costs compared to the expected benefits. This analysis can help justify the investment and ensure a positive return (Álvarez and Cabrera, 2007).

Discussion

The analysis of the ABC inventory management model, applied to two regional automotive harness companies, reveals clear advantages in resource optimization and cost reduction, while improving accuracy in inventory management. However, it is important to highlight some limitations observed in the study. First, both companies depend significantly on the quality and accuracy of inventory data, which directly influences the results obtained. This dependence can be a challenge for organizations that do not have adequate systems for managing information in real time (Chopra and Meindl, 2021). When comparing the results with previous studies, such as those by Montoya Agudelo and Boyero Saavedra (2016), the effectiveness of the ABC model in reducing operating costs and improving inventory accuracy is confirmed, particularly in manufacturing sectors. However, the differences in implementation between the companies analyzed and previous studies may be related to the type of industry and the size of operations. In this case, automotive harness companies located in the Sonora region face specific challenges, such as longer production cycles and greater logistical complexity, compared to high-turnover industries such as *retail* (Montoya and Boyero, 2016). Finally, this study highlights the importance of overcoming internal resistance to change in order to maximize the benefits of the ABC model. Although the advantages are evident in operational terms, it is essential for companies to adopt a culture oriented towards precision and continuous improvement in inventory management,

particularly in complex industrial sectors such as automotive harnesses (Chopra and Meindl, 2021).

The analysis carried out on the ABC inventory management model reveals a number of significant advantages in resource optimization, cost reduction, and improvement in inventory accuracy. However, it is important to consider the limitations of the study. Firstly, the dependence of the ABC model on the quality of inventory data represents a crucial limitation. The accuracy of the results obtained is directly linked to the accuracy of the information available, which may not always be the case in all companies. Compared to other studies, the results obtained are consistent with previous research that also highlights the efficiency of the ABC model in inventory management. For example, studies such as those by Montoya Agudelo and Boyero Saavedra (2016) and Calzado-Girón (2020) agree that the implementation of the ABC model leads to improvements in inventory accuracy and reduction of operating costs. However, some works suggest that resistance to change and implementation costs may be higher in certain industries, which aligns with the challenges identified in this study.

Differences between studies can be attributed to factors such as the nature of the industries analyzed and the quality of the data available. While some studies focus on sectors with high inventory turnover, such as *retail* , others analyze industries with longer product life cycles, such as the automotive industry. These differences can influence the effectiveness of the ABC model and the results obtained.

Finally, this study provides a step forward by highlighting the importance of accurate data management and the need to overcome resistance to change in order to maximise the benefits of the ABC model. However, it is clear that the model is not a one-size-fits-all solution and its effectiveness may vary depending on the specific context of each company (Chopra and Meindl, 2021).

Conclusions

After conducting this thorough analysis, it is clear that the ABC inventory management model offers numerous benefits for businesses. Its proper implementation can lead to significant resource optimization, cost reduction, and improvement in inventory accuracy. The advantages of ABC inventory management are reflected in operational efficiency, management prioritization, and customer satisfaction.

The ABC model stands out as a valuable tool for companies looking to improve their inventory control and maximize their profitability. As companies face a competitive and dynamic environment, adopting efficient inventory management practices is crucial to maintaining a competitive advantage.

In summary, implementing the ABC inventory management model is an effective strategy to optimize inventory management, improve operational efficiency, and increase profitability. Companies that adopt this model will be able to better respond to market demands and achieve greater success in their operations.

Future lines of research

Throughout this study, several aspects have been identified that deserve further investigation in future work. First, it is suggested that empirical studies be conducted to evaluate the effectiveness of the ABC model in different industrial contexts, with a particular focus on sectors with unique inventory characteristics, such as the technology or pharmaceutical industries. These studies could provide a more complete insight into the limitations and necessary adaptations of the ABC model in specific contexts.

Another interesting line of research would be to explore the integration of the ABC model with emerging technologies, such as artificial intelligence and *big data* . Automating inventory classification and demand prediction could further enhance the benefits of the ABC model, allowing for more accurate and efficient inventory management.

Finally, it is recommended to analyze the relationship between resistance to organizational change and the successful implementation of the ABC model. A better understanding of the internal dynamics of companies during the adoption of new inventory management methodologies could provide more effective strategies to overcome the challenges mentioned in this study.

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