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Inventory management for retail companies: A literature review and current trends

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***Abstract*—In recent years, the correct management of inventories has become a fundamental pillar for achieving success in enterprises. Unfortunately, studies suggesting the investment and adoption of advanced inventory management and control systems are not easy to find. In this context, this article aims to analyze and present an extensive literature concerning inventory management, containing multiple definitions and fundamental concepts for the retail sector. A systematic literature review was carried out to determine the main trends and indicators of inventory management in Small and Medium-sized Enterprises (SMEs). This research covers five years, between 2015 and 2019, focusing specifically on the retail sector. The primary outcomes of this study are the leading inventory management systems and models, the Key Performance Indicators (KPIs) for their correct management, and the benefits and challenges for choosing or adopting an efficient inventory control and management system. Findings indicate that SMEs do not invest resources in sophisticated systems; instead, a simple Enterprise Resource Planning (ERP) system or even programs such as Excel or manual inventories are mainly used.**

Keywords—retail, management, inventories, smes, literature review

I. Introduction

Nowadays, organizations, and especially those performing activities in the retail sector, face multiple challenges in the planning and management of their resources. For this sector, having efficient management of human, technological, or material resources refers to the performance that companies characterized by the experience gained in their management could obtain over time. Therefore, the correct inventory management has become essential, especially in organizations dedicated to retail [1-3]. The determination of the optimal inventory level is a fundamental part of the life of organizations due to the high investment that it represents at the time of its acquisition, administration, and maintenance. According to [4], [5], "the role of inventory management is to ensure that stocks of raw material or other supplies, i.e., work-in-progress and finished goods, are kept at levels that provide maximum service levels at minimum costs". This because the realizable asset occupies a significant percentage within the Total Assets. Hence, its correct ordering and administration imply being able to minimize the risk of contracting results that may put the health of the company at risk.

Various technologies have been developed over time for inventory management, going from basic manual reporting to an integrated information system (IS), which can help to "decide how and where orders should be fulfilled to improve service levels while decreasing total costs" [6]. Moreover, these new functionalities can collaborate in the most effective handling of materials and better manage the cycle of purchase - reception - allocation in production [7], [8].

This article aims to present an extensive literature review concerning inventory control and management in the retail sector. First, the paper includes a systematic literature review regarding the Key Performance Indicators (KPIs) of inventory control and management in retail companies. Second, the main systems, methodologies, and tools used for inventory management are described. Finally, the current trends in inventory handling and management in retail companies are outlined. For this, the application of the Fink [9] and the Population, Interventions, Controls, and Outcome (PICO) [10] methodologies were developed, which suggests different steps and stages, to solve the problems and research questions raised. To answer these questions, a great variety of digital databases were used. Thus, conference and journal articles concerning inventory control and management in retail companies were retrieved. The articles selected were analyzed through the Atlas.ti software. Finally, a qualitative and quantitative analysis was performed to answer the research questions raised. The organization of the paper is as follows. Section 2 presents the methodology through which the work was guided. The next section encompasses results together with analysis and discussion. Ultimately, Section 4 shows the conclusion section gathering the main findings as well as proposals for future work.

II. Research Methodology

To accomplish the goals described above, the study follows the Fink methodology [11]. It consists of seven main tasks: (1) choosing research questions, (2) defining bibliographic or article databases, (3) selecting search terms, (4) applying practical screening criteria, (5) applying methodological screening criteria, (6) doing the review, and (7) synthesizing the results. Therefore, the systematic

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literature review starts establishing the particular needs for knowledge or research questions. For this purpose, the PICO methodology was used [12]. In this case, Population refers to retail companies; Intervention relates to inventory control and management; Comparison refers to identifying systems, methodologies, and tools, and Outcomes refers to answer the research questions. Therefore, the research questions addressed in this study are the following: What are the main KPIs of inventory control and management in retail companies? What are the systems, methodologies, and tools aimed at inventory control and management in retail companies? and What are the current trends in inventory control and management in retail companies?

As a second step, a relevant set of digital databases were selected. It was decided to use both specific and general digital databases, namely: Emerald, Science Direct, Scopus, and Taylor & Francis. Based on the research questions, the search terms were defined (Step 3) and the searching string was established as follows: retail AND inventory AND SMEs AND (model OR management OR industry OR technology OR cost OR control OR maintenance OR system OR optimization OR rotation OR turnover OR software OR trend OR tendency OR tool OR tics. This chain searching was examined in the title or abstract document, and the selection was limited to conference and journal articles, in English and the period 2015-2019 (Step 4). It is worth noting that duplicate articles were removed. A numerical summary of the potential articles is presented in Table 1.

TABLE I. SEARCH RESULTS IN BIBLIOGRAPHIC DATABASES

Database	Number of articles	Relative percentage
Emerald Insight	39	13%
Science Direct	167	54%
Scopus	99	32%
Taylor and Francis	7	2%
Total	312	100%

The final sample articles consisted of 312 potentially relevant studies. The full text of each document was retrieved for detailed evaluation to discard those that did not fulfill the selection criteria with the inventory management and control topic in retail companies. To determine the article's contribution, the main sections, such as abstract, results, discussions, and conclusions, were analyzed in-depth (Step 5). As a result, 42 primary studies were subsequently selected for doing the review using the Atlas.ti software (Step 6). In each article, information extracted was the following: (1) demographics information (title, authors, journal name, country and year), and (2) information related to the study (enterprise activity, implementation sector, theoretical foundation). The data were collected thought suitable codes such as technology, inventory type, cost, stock type, order form, control method, reposition, information levels, planning, and policies. This information was used to construct code nets and to establish the main topics of this contribution. Finally, a quantitative (metadata analysis) and qualitative (content) analysis was performed (Step 7).

III. RESULTS AND DISCUSSION

In this section, the results of the systematic literature review and current trends in inventory management for retail companies are reported and discussed. First, the results of the metadata analysis are presented. Finally, the research questions are answered in the second part of this Section.

A. Metadata Analysis

Based on the literature review, several results were obtained with the codes used. Within these codes are demographic data, such as year and country. In the results obtained between the years 2015 and 2019, it can be seen that studies have been increasingly carried out in such a way that in Fig 1, it is observed that 34.21% of the investigations were published during the year 2018 and 15.79% during the years 2015, 2016, and 2019. It is worth mentioning that during 2019 there is a reduction in publications since not all publications are covered due to the period in which this study is carried out. Also, in Fig 2, it is observed that 23.68% of studies were performed in the United States, being the year 2018 in which the majority of publications were made in this country, 18.42% in the United Kingdom, and 15.79% in the Netherlands. Finally, countries with less number of reported studies are China, Hong Kong, India, Poland, Singapore, Switzerland, Taiwan, Vienna, and France, all with a contribution of 2.63%.

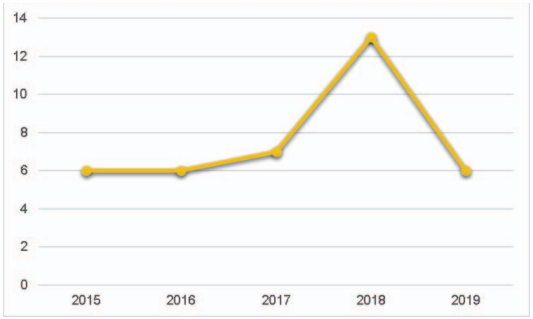

Fig. 1. Analysis of Articles by Year.

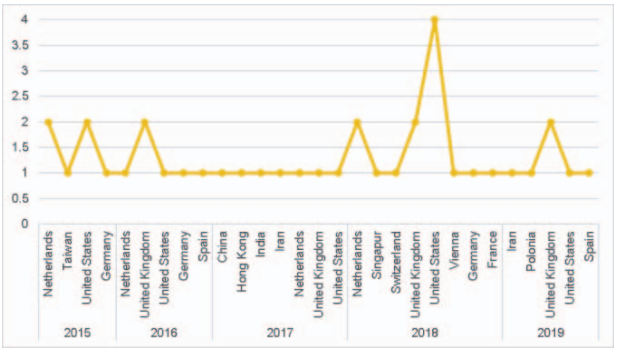

Fig. 2. Analysis of Articles by Year and Country/City

B. Content Analysis

In the succeeding part, the qualitative results of the study based on the research questions posed are presented.

1) What are the main indicators (KPIs) of inventory control and management in Retail companies?

Based on the literature review regarding indicators of inventory control and management within retail companies, 22 key aspects have been identified to consider when performing inventory management, which could play the role of performance indicators or performance within inventory control and management decisions. All the KPIs identified allow knowing the effectiveness of inventory control and management carried out within retail companies. Among

them, the first ten are considered essential due to its higher frequency of employment, while the remaining 12 have a minimum frequency, as shown in Fig. 3. The KPIs identified are: 1) actual inventory and its relationship with the company's information system, 2) inventory level, 3) shortage of scarcity, 4) product reordering, 5) product replenishment, 6) service level, 7) products availability, 8) excessive inventory, 9) items on the shelf, 10) income level – earnings, 11) preference and purchase decision, 12) response level, 13) lost items, 14) returns, 15) complexity and operational performance, 16) proper planning, 17) inventory balance, 18) sales data, 19) verification of the amounts received in stores, 20) incorrect scanning at the time of payment, 21) incorrect deliveries, and, 22) adaptive, flexible inventory.

a) Actual inventory and its relationship with the company's information system.

A retail store must have the same data in all its records, that is, the data that has been recorded in the information system must be the same data that is physically held [13]. This is considered necessary due to continuous inconsistencies that exist between the physical inventory record and the inventory that appears in the system, incurring operational consequences [14]. Furthermore, this inaccuracy of inventory registration causes an increase in the number of shortages [15] and damages the operating performance and the reputation of the retailer with consumers [16], which could be improved by providing inventory information to the customer. In this way, the level of quality of service received by the customer can be projected and, in turn, the existence of the product is ensured [17]. Another benefit of maintaining an inventory information system is to know how much physical inventory the company has and how much stock was diverted from the records [15]. Ultimately, a retail store has monetary losses as a direct result of the difference between the information recorded on actual inventory and the record in the company's information system [13].

b) Inventory level.

When an assortment planning problem arises, it is essential to develop an optimization model that considers the optimal assortment and the inventory level [18]. At the beginning of a season, the inventory level must be lower to avoid that in the end it is sold at a low price, this is a consequence of keeping the product at a fixed level throughout the season [19]. Therefore, maintaining a low inventory level of a product can create pressure among customers causing the immediate purchase of the product [17]. Conversely, as the number of inventory units increases, the difficulty of detecting inventory discrepancies also increases [16]. One reason to maintain an adequate level of inventory is that, in case of requiring to make a transfer, this allows the decision on the ideal quantity [20]. Finally, it would be interesting to consider the effect that the inventory level has on the profit levels [21].

c) Shortage of scarcity.

A lack of products can be caused by various factors, including differences between product costs, which creates the possibility of a shortage of an expensive product and an excess of cheap products [13]. There is an interaction effect between scarcity levels and price leadership; when it is the case that the scarcity increases exceeding a certain limit, the effect is reestablished. When a high level of shortage at the time of sale occurs, there is also an increase in the probability of the sale order being returned [22]. One of the reasons for a shortage is the inefficiency in the inventory replacement process and control, the inaccuracy of inventory records on various products, and the lack of inventory review [23] [15] [24]. Finally, low inventory levels at some point can be leveraged to carry out marketing strategies focused on scarcity [22].

d) Product reordering or replenishment.

In the retail environment, preventing the loss of sales opportunities requires the accurate and timely replacement of products to customers [25]. A periodic replenishment policy is essential, which is based in the variation of the levels of services and costs under the specific policies established [26]. Failing to perform a timely replenishment, the products are considered depleted. It is possible to have inventory in the backroom and still have an empty shelf, thus causing a loss of sale [27]. Finally, it is essential to emphasize that the total cost of a product may increase due to short delays in its replacement [23].

e) Service level.

Poor service level results from having inadequate inventory control parameters [28]. A higher level of service is obtained if there is a decrease in the level of unsatisfied demand and if the levels of the finished product at the beginning of a period increase [19]. The level of inventory service for seasonal products should be kept high for basic clothing fashion retail companies. Conversely, the fashion manufacturer can reap benefits by improving its profit level if the inventory service level target is low. Also, it is best to maintain a low inventory service level on certain products in the luxury fashion market as it projects product exclusivity [29].

f) Availability of products.

The product availability is related to the inventory information provided to the customer, through which the customer verifies the service quality [17]. Besides, this information influences the customer's decision when the purchase is made [22]. Offer sellers assign a fixed amount of inventory to a sale, and the offers page shows in real-time the percentage of products claimed. This reveals the availability of products to the customer. By doing so, the inventory level consumed would generate a desired effect of the product, and thus more sales of popular products would be made. In this way, inventory and sales control are maintained [17].

g) Product replacement.

Among the strategies used by retailers to minimize the effect on operational activities caused by inventory, several different errors can be detected, such as storing additional items or increasing the frequency of restocking of stores with the purpose of maintaining a high level of inventory [15]. More frequent product replenishment results in reduced space needed for each item, warehouse release, and increased shelf space; consequently, it ends up managing a greater variety of products and freeing up capital [26]. Furthermore, a decrease in the replacement rates of products affects the optimal level of inventory, causing its increase [30].

h) Excessive inventory.

One of the strategies retailers use to deal with excess stock is to apply product rebates or pricing. The discounts applied to the products will depend on the deterioration rate and the useful life of the product. The possibility of excess inventory increases if a timely inventory level review is not carried out [24]. Consequently, excess inventory is directly caused by inappropriate inventory control [28].

i) Items on the shelf, Response level, and Income level – earnings.

The importance of a response, relative to inventory, is greatest when it comes to reducing the risk of low profit levels for the fashion retailer and its supply chain (SC). When the inventory service is higher, it is required that the quick response must be also higher [29]. The presence of an item on the shelf allows a quick response and a higher probability of selling the item [13]. Hence, this aspect is essential in a retail store since higher turnover is assured in the inventory level, having an impact on the level of profit or income [21] [31].

j) Lost items, incorrect scanning, and verification of the amounts received, and complexity and operational performance.

Retailers suffer from product misplacement problems; the reason could be that the product is sent to wrong storage shelves [32]. Having lost articles gives the possibility of lost sales because the products are misplaced [25]. The concurrence of lost items is one of the causes of inventory inaccuracy [33]. Other reasons that affect the registration of inventories are the incorrect scanning of products at the time of payment and verification problems of quantities received in the store that frequently occur due to operational failures [15]. Finally, inaccuracy in the inventory record affects the operational performance of a retailer [16].

k) Preference, Purchase Decision - Sales Data, and Inventory Balance.

Customer preferences, opinions, and purchasing decisions can be learned through inventory information [17]. Companies can take advantage of this information because the sales data reflects the customer's feelings and preferences, and based on these data, inventory management can be improved [34]. The performance of an inventory system can be determined when calculating the probability of the inventory equilibrium state [30].

l) Incorrect deliveries and Returns.

One of the causes of inventory inaccuracy is making incorrect deliveries, driving an increase in the return of products [33]. This creates pressure on the operating resources managed by retailers. Another critical aspect is the level of shortage, if this is high it will cause an increase in the probability that the customer will return the order [22].

m)Adaptive, flexible inventory, and proper planning.

Inventory problems imply low adaptability and a lack of functionality in the retailer's SC [35]. These SC processes require adequate preparation due to their complexity [1]. Determining adequate amount of raw materials and finished products contributes to minimizing inventory costs [19].

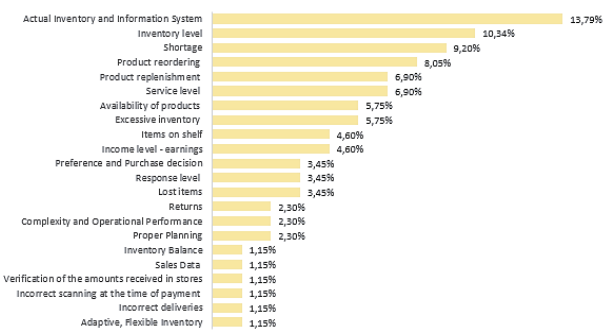

Fig. 3. Frequency of Mention of Indicators in Inventory Management.

2) What are the systems, methodologies, and tools aimed at managing and optimizing inventory in Retail?

Through the literature review, the main systems, methods, and tools used for inventory management were identified. This study considered them as systems allowing better inventory control, management, and supply. Based on their focus areas, three groups were created: inventory records and localization, optimization, and the order quantity determination.

a) Systems, methodologies, and tools focused on inventory records and localization.

In this group, bar code and Radio Frequency Identification (RFID) were identified. Unlike price labels where the checkout employees have a chance to validate the cost with the product, bar codes are not commonly used to control the product-specification created out of the bar code scan with the existent product. To evade ticket switching, it is required the integration of the product weight next to its cost and additional data in the payment method. In addition, the staff is needed at the checkout counter to scan the product's barcode and position the product on the machine in order to measure its weight. If the product weight is considered into the outlet protocol, an alert can be triggered by any relevant deviation in existent and measured weight [13].

Price calculations can be presented in real-time. Additionally, it offers the store the opportunity to know the actual stock count information within fixed readers. RFID stock counts (by stationary or handheld readers) allow inventory levels to be evaluated every day considering each stock line in every area of the store. This item-level tagging tool is able to reduce the technology breach and give the retailers both the accuracy and the ease of use which are needed in order to help their merchandising plan and store display performance. This will provide strategic information which can be used for different decisions, for example 'money mapping' of store sections, which highlight 'hot zones' where the sales of the displayed products are quicker and in a greater amount in comparison to 'cold' zones, which are characterized by slower stock lines [36]. In the retail store, there are four main ideas on which the procedures are based on: improving stock exactness, out of stock management, products localization, and loss recognition. The benefits of this tool include; field of vision is not needed for the item registration, various products are able to be registered with a single can, also tickets can be read from quite a great range. The location of the system is important due to its influence on the coverage it provides, while the front system offers a better coverage facing the products, the upper system improves coverage at the top of the shelves. The top system is found to be more effective in comparison with the front system (where the scanner is in front of the item) as a result of the diverse and random label orientation [37] . It is important to define the intended purposes of meeting the application requirements since the most extended coverage scope given by this technology is not required. Therefore, it is achievable to evade its major disadvantages concerning costs, tasks maintenance, and applying proper protocols [38]. RFID enables the restructure of inner procedures in the store to hold the chance to improve the operations efficiency considering service levels and total costs, relying on ticket costs and information quality [23]. RFID plays a strategic role under competition by focusing on the impact caused by unit tagging cost in the manufacturer-retailer interaction through the processes of

hiring and wholesaling pricing [32]. Another technology that includes an antenna is RAIN RFID, which decreases costs at the same time that upgrades the range of vision, product tracing, exactitude, identify losses, and allowing to find missing items [37]. Besides, the Tree-based protocol organizes the IDs by using the length of a ticket ID as the length of the tree, then it uses '0' and '1' in for the left and right side of the tree respectively. A scanner searches for '0' and all the tickets whose IDs start with '0' reply. If it's a favorable run (i.e., one ticket replies) or an empty run (i.e., no ticket replies), the scanner searches for '1' and all the tickets whose IDs start with '1'reply, this procedure goes on until all the tickets have been recognized giving as a result a binary tree. The Iterative ID-free Protocol (IIP) recognizes the presence of an item as a result of a reply given by a hash function, which pseudo-randomly chooses a space in a time period searching for the ticket ID. Missing tickets can be detected as a result of the comparison between the expected and the observed data. Therefore, if the reader confirms that exists an empty space where it supposed to be a ticket, the scanner determines that the ticket is missing. The Slot Filter-based Missing Tag Identification (SFMTI) resolve the predicted collision spaces into singleton spaces and separates the predicted empty spaces along with the unsolvable collision spaces, improving as a result the expected time efficiency. This protocol shows an efficient collision solving method, which can take collision spaces and turn them into the predicted singleton spaces, in addition the predicted empty spaces and the unsolvable collision spaces are separated and not carried out for the purpose of achieving time efficiency [39]. An application of RFID is called Smart Shelf; it can register and detect the position of the products placed, previously labeled with RFID tags [40].

b) Systems, methodologies, and tools focused on optimization.

The main elements identified in this group were the Bayesian estimation method, the Multi-Channel Distribution Center (MCDC), the Logistic Information Systems (LIS) for Omni-channel, and the Threshold Accepting Algorithm. The Bayesian method estimates the error distribution caused by inspections using finite information out of periodic shelf inspections. Its goal focuses on providing strategic parameters to managers to make empirically informed decisions. Management scientists have used this method in order to deduce demand metrics and stock levels to improve replenishment decisions [41].

MCDC is defined as an inventory system that involves cooperation between workers, Warehouse Management System (WMS) hardware and software, items and their layout, and stock policies implemented. This optimization model needs accurate, available information about daily inventory involving both items and locations to improve them for costumers and retail orders [16].

The continuously evolving omnichannel panorama affects the back-end LIS which helps material handling related to warehouse activities ensuring an efficient and effective process, in addition it also helps with order and inventory management in the network. The progress of LIS with a proper functionality is associated with a well-developed Omni-channel logistics. Essential aspects to contemplate to make Omni-channel logistics are adaptable platforms which support adding nodes and updating software, increased integration, constant synchronization and improved information accuracy [2].

Ultimately, the Threshold Accepting algorithm has been used to resolve a variety of optimization problems due to its robust optimization heuristic. The costs for the manufacturer implicate production costs, whereas the costs for the retailer implicate shortage, stock holding, fixed ordering, and buying costs [42]. It is important for firms to define their decision variables aiming to increase their profit. The manufacturers should define the prices related to large scale sales, and the retailers should be able to define their replenishment cycles and their prices as well. Differential Evolution algorithms are also presented in order to deal with the second level of the bi-level matter, as an alternative to solve the second level of the bi-level problem, where both manufacturers and retailers should determine their correspondent price and also in the retailers case, determine the replenishment cycle [42].

c) Systems, methodologies, and tools focused on determining the order quantity.

In this group, the main elements found are the following: Integrated Information System (IIS), Economic Order Quantity (EOQ), Joint Replenishment Problem (JRP), Vendor Managed Inventory (VMI), the Ordinary Empirical (OE) Distribution, Inventory Record Inaccuracy (IRI), Markov decision process (MDP), All Unit Discount (AUD) policy and Incremental Quantity Discount (IQD) policy, and Fuzzy Inventory Management.

IIS improves services levels and reduce costs by choosing how orders have to be fulfilled as well as where they need to be fulfilled. Additionally, it should be able to increase the inventory visibility across multiple nodes [43]. It also allows reserving the stock, prioritizing and tracking client's orders, and managing return flows. IIS could improve material handling effectiveness and efficiency in each node [2]. The global challenge for IS focus on the support of information sharing as well as fast decision making involving several actors [2].

EOQ is an order policy focused on deteriorating products. It determines the best restocking time as well as the period of time in which the stock will drain completely. The best backlogging and ordering policies can be determined using these values in order to minimize the total stock cost per unit time [44]. A partial delay in the payment is permitted only if the store's order size is bigger than a minimum amount. If the minimum quantity is considerable, the store is going to have preference for a partial payment delay. The advantage for the store consists in having a courtesy period to complete the payments after an initial partial payment for receiving the items. Applying this method, the store total cost is higher considering the ordering cost; more storage cost rises the total cost at the same time that reduces the backorder level and a lower total cost is achievable due to an stretched delay period [44]. An EOQ model gives the retailer the opportunity to analyze the union between order size and expected costs [45].

JRP defines if several items are ordered together or not. In order to reduce the inventory system total cost, it is necessary to consider two elements from the ordering problem considering an inventory with various items: major ordering (fixed, setup) and minor ordering costs. The former arises when the order is made no without considering the number of diverse items in the order. The latter is used considering every singular product in the reposition order [14].

VMI is a SC application where the responsibility of the inventory management at the retail point, belongs to the supplier. A supplier is in charge of choosing the right time and quantity to order on behalf of the retailer [46]. Implementing VMI based models allows Retailer Centers (RCs) to avoid stock decisions and hold stocks, therefore letting the supplier to define on both decisions, stock and routes. In this way, a general SC optimization is achieved, benefiting both the RCs and the supplier [47]. Implementing VMI with a lack of appropriate replenishment policies can make this alliance fail [46].

The OE Distribution method is applied in order to model slow-moving demand operations, as well as working with time series and parameter constellations due to its great performance across these considerations. This distribution model has demonstrated to be capable of working with inventory control considering slow-moving products and including configurations with shorter time series [28].

IRI is aimed to produce financial/operational profit by upgrading in-stock position monitored through technology-based inventory audits, in comparison to recurrent replenishment of stores or holding extra stock. In order for this technology to be profitable, retailers need to know how many items are available in every store. The exactitude of inventory records provided by this technology is critical to fill both online and in-store orders [15].

A MDP increases the predicted total income of a group of products in a finite period. The objective of this model relies on detecting the best markdown policy for every item. In this model, a policy details a discount percentage which is set for every item for all inventory levels each week. The MDP model presents however, an inconvenient when it comes to more than two items, it shows a problem with the interaction among items becoming inconceivable an optimal solution [31].

The AUD policy presents a discount rate available for each item bought. On the other hand, in the IQD policy, the reduce price rate is applied exclusively to extra units above the total amount of items over which the reduce price rate is given. Due to the material cost being normally the bigger spending in the manufacturing process, the policy was stretched in order to work with final products and raw materials in periods of scarcity and the newsvendor answers the clients demands through the period while the finished product is completely sold [19].

Fuzzy Inventory Management is presented as an option for traditional probabilistic methods which work with inventory management incertitude. In order to define an optimal EOQ, the following variables are described as Fuzzy variables; backorder cost, holding cost, order cost, and demand. These variables are simulated between them by applying particle swarm optimization and genetic algorithms. This model not only reduces the total cost, the confidence that it is possible to keep the total cost within the budget is also increased. Fuzzy logic can be applied to other situations beyond determining periodic and continuous inventory policies [48].

3) What are the current trends in inventory handling and management in retail companies?

To define the current trends for inventory management in the retail industry, it is convenient to consider critical aspects that allow knowing the effectiveness of the proposed models employing the 22 KPIs presented above. These aspects are identified as key performance indicators of the inventory models. In the study carried out, 22 relevant indicators are established, 10 of them show a higher mention frequency within various studies analyzed. The importance of these indicators is given as a result of the analysis presented above, in which each indicator is displayed and shows its influence over adequate inventory management. Furthermore, these indicators will allow the organization to know the state of the inventory, as well as the model evaluation, which can be used to make continuous improvements to contribute to the business wellness.

On the other hand, the current tendencies in inventory management are primarily focused on developing tools that enable retailers, product location control, loss detection, stock management, cost reduction, and service level improvement. To accomplish these requirements, many studies have been developed over the past five years, whose findings can be categorized into three different approaches. The first approach refers to the tools, protocols, and systems which allow retailers to keep track of their inventory location as well as inventory loss. Examples of tools are RFID, RAIN RFID, Bar Codes, and systems based on previous devices like a Smart shelf system. The second approach refers to algorithms and systems focused on inventory optimization. Trends aiming to find the optimization in inventory management include the Bayesian Estimation Method, Threshold Accepting and Differential Evolution algorithms, Logistic Information system, and Multi-Channel Distribution Center system. Finally, the third approach focuses on determining the order quantity considering costs and inventory management. The main tendencies applied in retail industries are the IIS, EOQ, JRP, VMI, OE Distribution, Threshold Accepting, and Differential Evolution algorithms, MDP, AUD and IQD policies, and Fuzzy Inventory Management method.

IV. Conclusion

Retail companies have acquired significant importance within several countries due to their high economic contribution. Therefore, the need to analyze their KPIs becomes highly significant, as well as their different systems, methodologies, and tools used within inventory management and optimization. From the aspects mentioned above, the main trends in inventory management within companies were defined.

Regarding KPIs, findings reveal 22 important indicators within inventory management that must be considered when retailers evaluate their stock. Among them, ten primary indicators were founded: inventory level, actual inventory and its relationship to the company's information system, shortage or shortage frequency, frequency of product reordering or replenishment, service level, replacement frequency, product availability, inventory in excess, number of items on the shelf and level of income or profit. These indicators allow the organization to know the state of the stock, to be managed appropriately, and show an excellent service quality and product availability image to the customer. The importance of evaluating an inventory management system using indicators is reflected in the main advantages, i.e., the decrease in monetary loss, higher operating performance, and a higher profit rate.

Overall, the evidence from this study suggests that order quantity, inventory localization, and optimization are the main factors in which the systems, methodologies, and tools are focused. In this context, RFID systems are the most employed

tools in retail industries in terms of solving location issues because they are capable of keeping track of inventory and provide a high confidence level on inventory records. Likewise, in terms of order quantity, systems like the EOQ, JRP, the AUD and IQD policies, and MDP focus on determining the correct order of items to accomplish optimization levels. Indeed, some studies showed that retailers are working with VMI. In this methodology, the supplier controls the inventory according to the retailer behavior, leading a complete optimization of the SC. Furthermore, the current research came up with algorithms focused on the optimization of the inventory like the Bayesian Estimation Method, the LIS for Omni-Chanel, the Threshold and Differential Algorithms, and Multi Chanel Distribution Center. All these optimization algorithms and methodologies mention the importance of having an integrated information system that allows companies to perform their decision process.

It is important to mention that all retailers may not be able to employ these technologies due to their high cost of implementation and maintenance. To all those retailers with limited resources, cheaper software is accessible that could help with the management of their inventory like bar codes or policies as EOQ, AUD, and IQD, which will allow optimizing their stock without making considerable investments.

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