

ABC-FSN Analysis for Inventory Management Policy: A Case Study in Retail Industry

Indesta Aulia Hendra Putri and Djoko Sihono Gabriel

Industrial Engineering Department

Indonesia University

Depok, Indonesia

putriindesta@gmail.com, gabriel@ie.ui.ac.id

Abstract

An increase in overall economic activity and income can lead to an increase in per capita spending. This is related to increasing people's purchasing power. One industry that is experiencing growth and can expand its market share is retail companies. Where children's toy retail companies are one sector that has a big opportunity to reach a large market. Specific inventory controls are required by businesses to continue operating. Stores have difficulty tracking inventory accurately when their inventory systems are deficient. Specific inventory control is required by the business. Therefore, it is vital for businesses to manage their inventory efficiently if they want to avoid excess stock and reduce its negative impact on the operations of the entire organization. The aim of this research is to create an adequate inventory policy for one of the retail toy stores based on its characteristics. Inventory policy is determined by categorizing commodities using integrated ABC and FSN classification methods. By combining these approaches, you can make better decisions in inventory management, focus on products that provide the greatest financial impact and meet customer demand more effectively in order to develop better and more efficient inventory management strategies.

Keywords

ABC-FSN Analysis, Inventory Management, Inventory Policy, Retail Industry

1. Introduction

An increase in economic activity and overall income can lead to an increase in per capita spending. When the economy grows, people's average income also tends to increase. If average per capita spending increases, it indicates that in general, society has more money available to spend. An increase in average per capita spending can be a good indicator of economic health and people's spending tendencies. Jakarta is a dynamic metropolitan city with a growing range of shopping, entertainment and lifestyle options, which can drive consumption and increase per capita spending. The increase in per capita expenditure in DKI Jakarta could be caused by several factors, one of which is an increase in people's purchasing power.

Increasing people's purchasing power can expand market share, one of which is retail companies. The retail marketing mix includes all the goods and services that the store can offer to consumers as well as all the store manager's programmatic efforts for the market environment. Retail mix is a marketing strategy used by retailers with the aim of getting consumers to make purchasing decisions in their stores (Barca et al., 2021). One of the industries in the retail sector that is experiencing quite rapid growth is companies in the children's toys sector. Changes in consumption trends and consumer preferences can also influence demand for children's toys. If there are many children in the population, it can create significant opportunities for the retail industry in the children's toys sector. Children's toy retail companies have a great opportunity to reach this growing market and gain significant market share.

PT. XYZ is one of the main players in the modern toy retail sector in Indonesia, providing a variety of educational toys for children. Each store offers various types of products and services with different characteristics and purposes to meet consumer needs (Bascur & Rusu, 2020). The demand for toys continues to be high because every child has the need to play and explore. Sales at one of the stores of PT. XYZ in Jakarta shows that there is an increase in sales from 2021-2023. Due to large demand trends, inventory management also needs to be considered in meeting customer needs. Spillin et al (2013), observed that retail outlets play a large role in the economy and pointed out that the size of the inventory market has achieved significant growth in many economies. Supply chain management has an important role in influencing increased sales. By optimizing inventory, customer demand can be met properly, avoiding shortages or excess stock that can affect sales.

According to Songa (2016), inventory control is a strategy for the effective performance of a company, such as determining lower inventory storage and transportation costs and the challenges faced show that if corrective action through inventory strategy is taken, these challenges can be immediately overcome. Due to large demand trends, inventory management also needs to be considered in meeting customer needs. By optimizing inventory, toy retailers can best meet customer demand, avoiding stock shortages or overstocks that can impact sales. However, the comparison between inventory and sales of goods in one of the stores of PT. XYZ shows that total inventory exceeds total sales so there is excess inventory. The current situation is that orders are made based on sales history. Where there are no ordering conditions and when is the right time to reorder by paying attention to the characteristics of the goods. If total inventory exceeds sales, this indicates overstocking or unwanted inventory buildup. In an overstock situation, a company has a greater quantity of goods than is necessary to meet customer demand in a given time period. To avoid and reduce inventory buildup, companies can implement various effective inventory management strategies and practices. Based on the conditions described, an analysis of goods classification was carried out for the excess inventory conditions that occurred in one of PT. XYZ stores.

1.1 Objectives

The purpose of this research is to develop inventory management strategies for resource allocation and inventory policies based on the classification obtained by focusing on the most important items, having high turnover, and minimizing the risk of unnecessary inventory in retail sector.

2. Literature Review

2.1 Inventory Management

Inventory is an important thing that can affect all activities in the company. Inventory includes all actions related to organizing and managing inventory levels so that adequate supplies are available to meet anticipated demand. According to NdiranguKung'u (2019) and Ibrahim (2016), inventory can be classified into three types, namely raw materials, work in progress and finished goods. The structure that businesses employ to control their interests in inventory is known as inventory management. This entails keeping track of and monitoring stock levels, projecting demand, and choosing when and how to handle it (Stevenson, 2010). Inventory management is needed as a process of planning and controlling inventory to balance supply and demand in order to meet consumer needs while minimizing total inventory investment (Singh & Verma, 2018). If total inventory exceeds sales, this indicates overstocking or unwanted inventory buildup. This indicates inappropriate inventory planning. Difficulty achieving optimal inventory due to uncertainty in demand and supply resulting in lost sales or excessive inventory holding. According to Potphode & Supriya (2018), an inventory control system where item priorities change according to different inventory analysis techniques.

Inventory management is essential to businesses because it focuses primarily on cutting costs while meeting customer demands by offering a reasonable level of assurance regarding the sustainability and obtainability of balanced stock items at the appropriate quality, quantity, and time. A well-designed and effectively implemented inventory policy can contribute to reduced carrying costs, as inventory is purchased as needed and at the right time (Penny et al., 2021). Maintain sufficient inventory to meet customer demand in a timely manner. Accurate customer demand forecasts are the basis of optimal inventory policies. Various forecasting methods such as historical analysis, trend analysis, and market research can be used to predict demand (Simchi-Levi et al., 2004). This is important to maintain customer satisfaction and avoid stockouts or overstocks that can lead to lost sales and reputational damage (Chopra & Meindl, 2013). According to Ainul Fahmi et al. (2023), inventory policies are needed to balance inventory that is too much or too little. Inventory policies are also very effective in minimizing inventory turnover while promoting products to the

public. Inventory control also plays an important role in maintaining good supply chain relationships, which can often prevent and solve problems by working together with suppliers (Ahmed et al., 2021).

2.2 ABC Analysis

The commonly used inventory categorization analysis, namely ABC, is used to manage stock of goods that must be managed differently. ABC analysis is widely used in industry which is the use of the concept of inventory grouping or classification. This method, which divides objects into three groups A, B, and C according to their level of relevance, is based on the Pareto principle. Based on Pareto's principle (1971), it is common to know that a company's sales and earnings are largely driven by a small portion of its product inventory. These categories or groups are designated A, B and C which are arranged based on the percentage of sales contribution which can be explained as follows (Bahagia, 2006):

1. Category A (80-20)

This is a type of goods that absorbs 80% of the funds from all capital available for inventory with a total of around 20% of the total types of goods managed.

2. Category B (15-30)

This is a type of goods that absorbs 15% of the funds from all capital available for inventory after category A, with a total of around 30% of the total types of goods managed.

3. Category C (5-50)

This is a type of goods that only absorbs 5% of the total capital available for inventory after category A with a total of around 50% of the total types of goods managed.

Items marked "A" have the greatest sales potential and require close management, items marked "B" are important and require moderate control, and items marked "C" are less important than items marked "A" or B and has the smallest sales potential. The main purpose of this classification is to focus attention on a few important items (A items) rather than many unimportant items (C items).

2.3 FSN Analysis

FSN analysis stands for Fast, Slow, and Non-Moving. FSN is a method of grouping goods based on the level of movement or rotation of goods within a certain time period. According to Khembhavi et al (2019), F stands for Fast moving, S for Slow moving and N for Non-moving items. Fast moving (F) are goods that are frequently issued or used. Slow moving (S) is goods that are issued or used less in a certain period of time. Meanwhile, non-moving (N) is goods that are not released or used for more than a certain period of time. Grouping of goods using FSN analysis is based on turnover ratio (TOR), namely inventory turnover for one year. The TOR value can be calculated using the formula:

$$TOR = \frac{\Sigma \text{ Sales Quantity}}{\Sigma \text{ Inventory Quantity}} \quad (1)$$

The FSN criteria according to Devarajan & Jayamohan (2016) are seen from the movement of goods during one year, where the ratio of the level of sales of goods for one year to the average inventory level in the warehouse. The TOR values are sorted from highest to lowest and then the classification is determined as follows:

1. Category F (TOR > 3)

This is a type of item that has high rotation or is frequently sold over a period of time. Such as goods with a high level of need or high popularity.

2. Category S (3 ≤ TOR ≤ 1)

This is a type of item that has low rotation or is rarely sold over a period of time. The level of need for these goods is low or less desirable.

3. Category N (TOR < 1)

This is a type of item that does not have rotation and is not sold within a period of time. These items are in inventory stock for quite a long time without being sold because they are not relevant to market needs.

2.4 Integration of ABC and FSN Analysis

Integration of these two analyzes is carried out by carrying out ABC analysis which is then continued with FSN analysis. ABC analysis provides an overview of which items have the greatest impact on total inventory costs, while FSN analysis provides an overview of which items move the fastest. In this way, companies can make more informed decisions about which items need to be ordered more frequently and which items can be ordered in smaller quantities or even eliminated. The importance of integrating multiple classification schemes, leveraging them to generate

additional inventory categories, and developing appropriate inventory control systems for each scheme. Because each inventory control technique has its own limitations regarding its application and use when used alone. The ABC-FSN matrix table shows that there are 3x3 elements which indicate nine different classes, namely AF, AS, AN, BF, BS, BN, CF, CS, and CN. The nine classes have their own priorities. According to Hlaing et al. (2017) and Kumar and Shukla (2022), based on the matrix element priority matrix, ABC-FSN with the categories AF, AS, AN, BF, and CF which have the most significant inventory groups are categorized into category 1. The moderately important categories of BS, BN, and CS are placed in category 2. In the meantime, category 3 is limited to the least significant CN or those that are not significant at all.

3. Methods

Research procedures are a series of systematic steps carried out to collect the data and information needed for research. This includes planning, data collection, analysis and interpretation of results to answer research objectives. This research was carried out in the retail industry, which is a chain of stores that specializes in selling various types of toys for children. With a shop area of 500 square meters, various product categories are offered, such as educational toys, dolls, board games, interactive toys, construction toys, and many more for 7 departments, namely babies, boys, girls, education, family fun, and outdoor. An analysis was carried out using the ABC method (level of importance of each group of goods) and FSN (stock turnover rate) to classify more specific goods, whereas previously the company had not classified the criticality level of goods specifically.

The ABC analysis stage requires sales data taken from a one-year average based on value. To obtain this value, the average sales value in one year is calculated and then sorted based on sales contribution from largest to smallest. Then the percentages are calculated and sorted using the Pareto principle. Next, FSN analysis is carried out. This analysis requires data on the availability of goods to meet demand for goods. To obtain this value, a calculation is carried out using TOR, namely average sales divided by average inventory. Then, ABC-FSN integration was carried out which enabled the company to better understand the value and volume of goods in inventory, as well as prioritize inventory management based on its characteristics.

4. Data Collection

Data collection is carried out through retail companies. The data required includes the quantity requested and the price per unit of 20 examples of goods. The Table 1 shows the data used in this research.

Table 1. Data Collection

Item Code	Demand per Year (Unit)	Price (Rp/ unit)	Average Sales Quantity (Unit)	Average Inventory Quantity (Unit)
FPIB	48	Rp121.520	4	6
EMGE	48	Rp109.950	4	1
WHTT	50	Rp97.520	5	11
TNFD	83	Rp45.810	7	40
CRCW	33	Rp98.910	3	3
TDFB	16	Rp199.900	2	2
EMSA	36	Rp79.900	3	8
WHPL	25	Rp110.900	3	1
MBBF	77	Rp33.900	7	5
WWMP	26	Rp99.950	3	6
MBCM	57	Rp43.920	5	11
EMDF	71	Rp34.900	6	38
EMFD	109	Rp22.410	10	15
RLSP	36	Rp64.950	3	4
PPMI	15	Rp149.900	2	8
SGWP	23	Rp97.425	2	7
WHID	17	Rp126.100	2	2
MCGR	71	Rp29.900	6	44
CRAC	42	Rp48.930	4	9
EMCW	51	Rp39.900	5	108

Table 1 presents consumption statistics for twenty goods for one year, from February 2023 to January 2024. Then the calculations are carried out. ABC analysis produces a classification of goods based on the proportion of investment invested, while FSN analysis produces a classification based on the stock turnover rate.

5. Results and Discussion

5.1 ABC Analysis

In the ABC analysis for twenty types of goods which can be seen in the Table 2, data on demand and price of goods as well as the sales value of each item in the period observed are used. Sort sales value from largest to smallest. This value is the basis for calculating the proportion of investment consumption in sales volume, namely by calculating the total and percentage of sales which then obtains the cumulative percentage which will then be categorized based on classes A, B and C. Types of goods with a cumulative percentage of 0% - 80% of sales are included in category A, goods with a cumulative percentage of 81% - 95% of sales are included in category B, and for goods with a cumulative percentage of 96% - 100% of sales are included in category C.

Table 2. Result ABC Analysis

Item Code	Demand per Year (Unit)	Price (Rp/unit)	Value Sales per Year (Rp/unit)	% Value Sales per Year	% Cumulative	Group
FPIB	48	Rp121.520	Rp5.832.960	9,77%	9,77%	A
EMGE	48	Rp109.950	Rp5.277.600	8,84%	18,61%	A
WHTT	50	Rp97.520	Rp4.876.000	8,17%	26,77%	A
TNFD	83	Rp45.810	Rp3.802.230	6,37%	33,14%	A
CRCW	33	Rp98.910	Rp3.264.030	5,47%	38,60%	A
TDFB	16	Rp199.900	Rp3.198.400	5,36%	43,96%	A
EMSA	36	Rp79.900	Rp2.876.400	4,82%	48,78%	A
WHPL	25	Rp110.900	Rp2.772.500	4,64%	53,42%	A
MBBF	77	Rp33.900	Rp2.610.300	4,37%	57,79%	A
WWMP	26	Rp99.950	Rp2.598.700	4,35%	62,14%	A
MBCM	57	Rp43.920	Rp2.503.440	4,19%	66,33%	A
EMDF	71	Rp34.900	Rp2.477.900	4,15%	70,48%	A
EMFD	109	Rp22.410	Rp2.442.690	4,09%	74,57%	A
RLSP	36	Rp64.950	Rp2.338.200	3,92%	78,49%	A
PPMI	15	Rp149.900	Rp2.248.500	3,77%	82,25%	B
SGWP	23	Rp97.425	Rp2.240.775	3,75%	86,01%	B
WHID	17	Rp126.100	Rp2.143.700	3,59%	89,60%	B
MCGR	71	Rp29.900	Rp2.122.900	3,55%	93,15%	B
CRAC	42	Rp48.930	Rp2.055.060	3,44%	96,59%	C
EMCW	51	Rp39.900	Rp2.034.900	3,41%	100,00%	C

Based on the accumulated sales value, three product groupings can be identified, where group A consists of fourteen items of raw materials with an accumulated investment value of 78.48 percent; Group B contains four products with an accumulated investment value of 14.66 percent; and Group C contains two products with an accumulated investment value of 6.85 percent. Item categorization is obtained from ABC analysis of the resulting data. By defining and assessing the applicability of the problem under study, these findings provide a basis for allocating priorities in problem solving options that will produce the best inventory management results.

5.2 FSN Analysis

In the FSN analysis for twenty types of goods, goods are grouped based on the level of movement or turnover in the warehouse or supply chain. This approach helps to understand the movement patterns of goods in proper inventory management. The FSN analysis which can be seen in the Table 3 uses demand and supply data for each item in the observation period. Then the turnover ratio is calculated, namely the average sales divided by the average inventory which will then be categorized based on classes F, S, and N. Types of goods with a TOR value > 3 are in category F, goods with a value of $3 \leq \text{TOR} \leq 1$ are in category S, and goods with a TOR value < 1 are in category N.

Table 3. Result of FSN Analysis

Item Code	Turnover Ratio	Group
FPIB	1,50	S
EMGE	0,25	N
WHTT	2,20	S
TNFD	5,71	F
CRCW	1,00	S
TDFB	1,00	S
EMSA	2,67	S
WHPL	0,33	N
MBBF	0,71	N
WWMP	2,00	S
MBCM	2,20	S
EMDF	6,33	F
EMFD	1,50	S
RLSP	1,33	S
PPMI	4,00	F
SGWP	3,50	F
WHID	1,00	S
MCGR	7,33	F
CRAC	2,25	S
EMCW	21,60	F

Based on the results of the FSN analysis of the types of goods shown in Table 3, there are six types of goods that are classified as class F, namely fast-moving goods. There are eleven types of goods that move slowly in group S. Group N has three goods that do not move.

5.3 Integration of ABC and FSN Analysis

A matrix was obtained to classify types of goods based on the results of ABC and FSN analysis. This matrix has 9 groupings based on the integration of ABC and FSN analysis. The ABC-FSN integration analysis produces 9 characteristics, namely AF, AS, AN, BF, BS, BN, CF, CS, and CN which can overcome the limitations of the analysis. Table 4 presents the results of the categorization of ABC/FSN item types.

Table 4. Result of ABC and FSN Analysis Integration

	F	S	N
A	TNFD; EMDF	FPIB; WHTT; CRCW; TDFB; EMSA; WWMP; MBCM; EMFD; RLSP	EMGE; WHPL; MBBF
B	PPMI; SGWP; MCGR	WHID;	
C	EMCW	CRAC	

Based on the table above, it can be seen that each type of goods is included in the categories AF, AS, AN, BF, BS, CF, and CS. BN and CN groups which do not have products in their group. The AS group has the most types of items in its category, namely nine items, which represent inventory items that have high value (category A) and slow turnover (category S).

The characteristics of each type of goods are obtained from the table above based on their relative value and consumption patterns. Once this is determined, the company can decide on the best inventory policy based on the characteristics of each type of item. These features were divided into nine groups with three main categories after combining these two analyses. According to Hlaing et.al (2017) and Kumar and Shukla (2022), based on the matrix element priority matrix, ABC-FSN with the classifications AF, AS, AN, BF and CF which have the most important inventory groups are grouped into category 1. For BS, BN, and CS which have moderate importance grouped into category 2. Meanwhile, only the least important CN or not important at all are grouped into category 3.

6. Conclusion

Integration of ABC-FSN analysis is carried out to make it easier to manage types of goods based on selected criteria. ABC is a classification system that divides inventory items into three categories based on their relative value in the total inventory value. FSN is a classification system that divides inventory items into three categories based on consumption patterns. Activities carried out by combining ABC-FSN analysis enable the identification of types of goods so that companies can have a more holistic understanding of their inventory items and determine priorities in stock management. Companies can use appropriate and optimal strategies to predict inventory problems such as over- and under-stocks, out-of-stocks, or missed sales.

There are twenty different types of items in all. From the research results, it is known that there is a classification that is obtained based on identifying the importance of goods and demand patterns based on their relative value as well as the speed of rotation and frequency of demand. The results showed that in category 1, namely the most important items and requiring attention regarding stock control (AF, AS, AN, BF, CF), there were 18 types of items (TNFD; EMDF; FPIB; WHTT; CRCW; TDFB; EMSA; WWMP; MBCM; EMFD; RLSP; EMGE; WHPL; MBBF; PPMI; SGWP; MCGR; EMCW). Category 2 which has moderate importance (BS, BN, CS) has 2 types of goods (WHID; CRAC), and category 3 which has less importance (CN) has no type of goods. ABC-FSN provides a more comprehensive understanding of items that have a high financial impact (ABC) and different consumption patterns (FSN), so that companies can manage their inventory more effectively according to the priorities and characteristics of each item.

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Biographies

Indesta Aulia Hendra Putri graduated with a Bachelor of Engineering degree from Brawijaya University in 2019 with a major in Agricultural Engineering and interests in Bioprocess Engineering. She is currently pursuing a Master of Engineering degree at the Industrial Engineering University of Indonesia, with interests in Management Industry.

Djoko Sihono Gabriel is a Professor in Industrial Engineering, Universitas Indonesia. He earned a Bachelor of Engineering (B. Eng.) in Industrial Engineering, Bandung Institute of Technology, Bandung, Indonesia in 1980, the engineer (Ir.) in Industrial Engineering, Bandung Institute of Technology, Bandung, Indonesia in 1981, the master of engineering (M. Eng.) in Industrial Management, Universitas Indonesia, Jakarta, Indonesia in 1995, the doctor (Dr.) in mechanical engineering, Universitas Indonesia, Jakarta, Indonesia in 2015. He is a professor in industrial engineering at Faculty of Engineering, Universitas Indonesia with a major in industrial management, especially in material engineering management. His research interest include industrial engineering, manufacturing system, material value conservation, and sustainable manufacturing.