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Redesign the layout of the raw material warehouse from randomized storage to class-based storage

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ABSTRACT

The company has a problem of ineffectiveness in the layout of the raw material warehouse due to the use of storage methods that ignore factors such as the type, dimensions, and condition of the goods. This reduces the optimal function of the warehouse and increases the time to retrieve goods. This research aims to redesign the suitable and practical layout of the raw material warehouse by considering its form and function, as well as filling methodological gaps from previous research. The method used is class-based storage. Based on ABC analysis, the category with the highest value is class C goods, with 73 units. Meanwhile, from the fast, slow, non-moving (FSN) analysis, class F (fast-moving) goods have the highest frequency of movement, with a movement percentage of 63% for 10 units of goods. The warehouse slotting analysis shows an increase in the number of shelves from nine to 15 shelves with five different shelf models and layout changes in raw material warehouses 1 and 2. The class-based storage method results in a more organized layout, efficient movement of goods, and faster picking time to optimize warehouse functions.

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1. INTRODUCTION

A modern company's main challenge is balancing competitive advantage and sustainable operation to meet various stakeholder expectations by preserving reputation, legitimacy, and credibility [1]. Competition in the business world is fiercer, and every company must conduct its business activities effectively and efficiently. A company requires transformations to win the competition; layout design influences one of these successes [2]. Defining suitable facilities is part of the supply chain strategy that will have long-term effects throughout the network. Balakrishnan and Cheng [3] revealed that a practical layout can cut factory operating costs by up to 30%. Therefore, the more structured the warehouse storage, the lower the price and the higher the order picking speed [4].

The layout impacts corporate image, customer relations, warehouse capacity, ongoing processes, costs incurred, warehouse flexibility, and quality of the work environment [5]. The design also influences the overall efficiency and effectiveness of the warehouse and, in turn, the supply chain [6]. One of the findings in Ang and Lim [7] is the importance of optimizing classes depending on the utilization and optimization of storage layouts in unit cargo warehouses so that total travel costs can be minimized, leading to the operational efficiency of unit cargo warehouses. Warehouses have the function of maximizing the utility of various resources to meet customer demand or maximize customer demand under limited resources [8]. In the global supply chain, warehouses play an important role [9]. The reason warehouses are considered significant is their function as a buffer or a balance between supply and demand [10]. Moreover, the role of the warehouse in logistics is to provide the facilities to store all types of inventories, from raw materials to final products, to ease the stages between the upstream and downstream of the supply chain [8]. Balanced supply power and customer demand are symbols of frequency stability in a power system [10].

Warehouse-related issues that are often found in the industry involve layout problems, which incur enormous transport costs. Warehouse layout planning involves determining storage policies, space requirements, and specific locations within the warehouse for each product [11]. The basis of every application of warehouse strategy and design is minimizing costs and the company's efforts to achieve the desired level of customer service [12]. The more structured the warehouse storage, the lower the costs and the higher the speed of order retrieval [13].

Company Y, now referred to as a company, is engaged in manufacturing and producing industrial-scale laundry machines. Currently, the company operates based on orders (make-to-order). Make-to-order production delivers a high level of uncertainty and complexity in production planning. Associated with the application of the layout of the raw material warehouse storage of the company that uses randomized storage, in which the items are positioned randomly or fail to employ a fixed storage location and reference, or frequently, the product area is changed in terms of storage. This leads to the unorganized storage of items and delays product search time. Hence, the warehouse capacity needs to be utilized optimally, resulting in decreased warehouse capacity and indisciplined behavior when inputting goods in or out due to the unplanned layout of raw materials. So, it is necessary to re-layout the storage in the warehouse by implementing a class-based storage policy. This policy divides products into classes and assigns specific areas for each class in the storage area [14]. The class-based storage method is the arrangement of materials based on the similarity of materials in a group. This type of storage fits warehouses with many materials or goods that number in the thousands [5]. This condition is similar to the condition of the raw material warehouse at Company Y.

2. LITERATURE REVIEW

Class-based storage is trendy among practitioners due to its extraordinary capabilities, such as simple implementation, manageable maintenance, and the ability to cope with product mix and demand variations [13]. Class-based storage is a policy widely used based on the classification of product types and grouping [15]. Applying class-based storage methods can reduce retrieval time, improve consumption efficiency, shorten time costs, reduce the occupation capital rate, and promote enterprise development [16]. Thus, the pick-up time is reduced, and all downstream processes will benefit accordingly [17]. Research discussing class-based storage has been extensively studied in previous research, and from this study, the research gaps are revealed in the form of storage type development. The development of the storage refers to the review of the facility layout based on the particular aspects associated with the needs of the company, which is influenced by various factors, including the type of goods grouping, the frequency of goods in and out, and the size as well as shape of the company's warehouse.

In the study conducted by Ekren *et al.* [18], a research gap was demonstrated in the form of implementing different storage policies based on company needs, such as positioning goods at the nearest location based on the frequency of goods movement. Furthermore, in the study of Pan *et al.* [19], the research gap was found in the form of the effect of the item retrieval model, taken from the lowest or top shelf order in the retrieval column, and other aspects of the retrieval mode. The research gap in the research of Rao and Adil [20] is the application of a class-based storage strategy that works in real industrial situations with vertical travel (shelf height) considerations, and the extension of a class-based storage model in the warehouse area by considering different analysis policies. In the journal of Manzini *et al.* [21], the following research gap is the introduction of the problem and layout allocation and slotting to manage futures and nondeterministic scenarios. The novelty of this study is sufficing the methodological research gap, which is the development of storage types in the scope of companies that previously used randomized storage and later developed into class-based storage.

3. RESEARCH METHOD

This study uses a class-based storage policy method, which is supported by several analyses, including ABC classification, fast-moving, slow-moving, and non-moving (FSN) analysis, and warehouse slotting. Based on bibliometric analysis, this method has been proven effective in improving storage efficiency and warehouse management by grouping items based on specific characteristics, allowing for optimized layout and reduced retrieval time [22]. Figure 1 describes the flow of data processing.

3.1. ABC classification

ABC classification is a research method for a group of materials that are classified based on the cost of using the material per period [23]. The cost is calculated by multiplying the price per unit of material by the volume of material used during a certain period, which is generally one year. The period in this research refers to June 2022 up to May 2023. Class grouping in the ABC classification is divided into three categories, as shown in Figure 1.

- Category A if the absorption of funds is counted as around 70-80% of all capital provided by inventory, and the quantity of goods is estimated at around 10-20% of all goods managed, with a cumulative percentage smaller than 75%. Goods in category A are positioned at the front of the warehouse for easy access by warehousing staff.
- Category B if the absorption of funds is around 15-20% of all capital provided by inventory (after category A) and the quantity of goods is around 20-40% of all goods managed, with a cumulative percentage between 75-95%. Goods in this category are set after the border area of category A or are in the middle part of the warehouse.
- Category C if the absorption of funds is around 5% of all capital provided by inventory (excluding A and B), and the quantity of goods is counted as around 50-60% of all goods managed with a cumulative percentage between 95% and 100%. Goods that are classified as category C are positioned at the back of the warehouse.

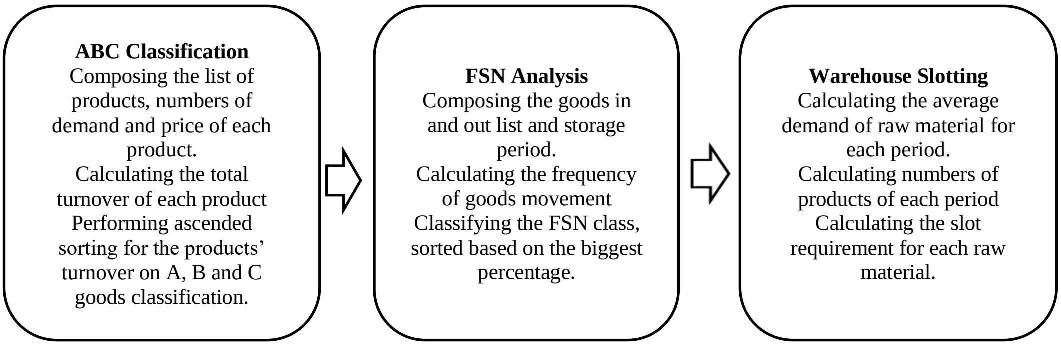

Figure 1. The flow of data processing

3.2. FSN analysis

FSN analysis is a method of goods grouping based on three class characteristics, namely fast-moving (F), slow-moving (S), and non-moving (N). FSN analysis is also identified as the grouping method based on the level of use and average storage. The FSN classification is divided into three parts:

- Class F: fast-moving is an item whose level of demand is valued at more than 3. Usually, the number of items is 10-15% of the total number of items.
- Class S: slow-moving is an item that has a demand ratio between 1 and 3. Usually, the number of items is 30-35% of the total number of items.
- Class N: non-moving is an item with a demand level ratio of less than 1 or 0. Usually, the number of items is 60-65% of the total number of items.

3.3. Warehouse slotting

Slotting design is applied to improve picking operations, such as distances, operating costs, crane movements, use of human resources, and storage strategies based on implementation alternatives [24]. With slotting, the allocation of storage space and appropriate storage locations can be determined based on the criteria of each item in the warehouse. After identifying the priority grouping of each product from the ABC classification and FSN analysis, it is essential to determine the location of each product and information on pallet capacity requirements for each existing product. As for the slotting calculation steps, operate the following formula:

- Calculating the average demand for raw materials for each period:

$$I = \frac{T}{P} \quad (1)$$

Where I is the average number of raw material requests for each period; T is total demand (kg); and P is storage period of raw material, which has been determined.

– Calculating the number of products for each period:

$$Packaging\ quantity\ = \frac{Average\ inventory\ (kg)}{Material\ unit\ weight\ (kg/unit)} \quad (2)$$

– Calculating the slot requirements for each raw material:

$$Slots\ requirement\ = \frac{Packing\ quantity\ (unit)}{Max\ number\ of\ packs\ (unit/slot)} \quad (3)$$

This study needs research data, including the initial conditions of the raw material warehouse layout, the type of storage shelves, and data on the one-period use of goods. Data on the use of goods includes all kinds of goods stored in the warehouse and the number of goods left entered every month. Next is the item specification data, which contains information about items' dimensions and price; later, data about the shelf capacity, which includes information on each material's weight and the maximum number of packages in the storage rack.

4. RESULTS AND DISCUSSION

Data originating from the research methods can later be processed to obtain the results. The results of the analysis are divided into three parts: the first part is the analysis of ABC classification, the second part is the analysis of FSN, and the last part is the analysis of warehouse slotting. These parts will be explained as follows.

4.1. Default layout

The company has a raw material warehouse divided into two parts: the permanent warehouse and the emergency warehouse. Until recently, warehouses have been used as storage for small-sized goods components, with a storage area of up to 51 m^2, located in the company's central area. The division of permanent warehouse locations currently includes one fixed raw material warehouse that covers a central area of 9×3 m, an additional area of 3×3 m, and two permanent raw material warehouses with an area of 5×3 m. The emergency warehouse stores large items, with a storage area of 27 m^2 located along the company's production road. Currently, the company employs a randomized storage method, in which the storage of goods is not based on specific groupings. The initial layout of the warehouse is depicted in two dimensions in Figure 2 and three dimensions in Figure 3.

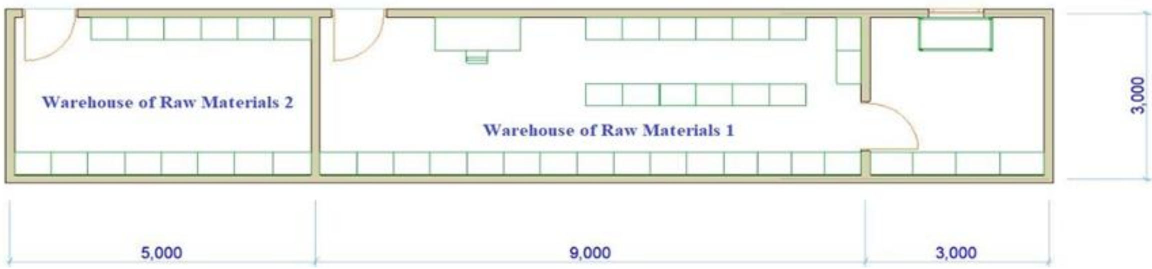

Figure 2. Two-dimensional raw material warehouse initial layout [25]

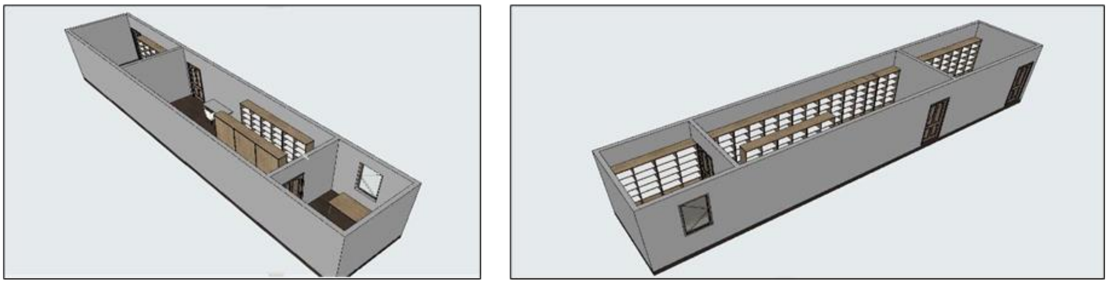

Figure 3. Warehouse three-dimensional initial layout (back view) [25]

In addition to dividing storage space, the company initially still used storage racks of various sizes. The emergency warehouse has plates, pipes, and AS storage shelves. In contrast, storage shelves with open and closed partitions and multiple sizes can be found in the permanent raw material warehouse.

4.2. ABC classification

The ABC classification calculation identifies the material grouping of certain classes based on cost and demand for material usage per period. The period covers one year, from June 2022 to May 2023. Data on goods usage and price are presented in the ABC classification data analysis, and grouping refers to the results of the cost percentage, as generated in Table 1.

Table 1. Cost percentage calculation [25]

No.	Types of goods	Usage amount	Price (IDR)	Total price (IDR)	Cost percentage (%)
1	Bearing 6316-ZZ/C3 SKF	4	1,644,000	6,576,000	0.62
2	UKP 209J FYH bearings	37	292,500	10,822,500	1.02
3	Bearings UKP 213 FYH	4	780,000	3,120,000	0.29
4	Bearing 30206/P6 Reduce Koyo	32	40,000	1,280,000	0.12
5	Plat SS HL 304 4×8×1.2 mm 2 sides	109	1,506,000	164,154,000	15.48
…					
	Amount	1,167	203,342,500	1,060,607,500	100

Furthermore, the cost percentage results are sorted from the highest to the lowest value to be further classified into each class. Under specific consideration, class A is specified as a group with a cumulative percentage of less than 75%, class B with a cumulative percentage between 75% and 95%, and class C with a cumulative percentage between 95% and 100%. The results of the classification are seen in Table 2.

Table 2. The results of the classification [25]

No	Types of goods	Usage amount	Cost percentage (%)	Cumulative fees (%)	Class
1	Plate SS HL 304 4"×8"×1.2 mm 2 sides	109	15.48	15.48	A
2	Motor 10 HP 380V Mitsubishi	12	14.70	30.17	A
…					
11	Perforated Plate SS 304 4"×8"×2 mm Ø 6 mm	5	2.21	77.08	B
12	SS HL Plater 304 4"×8"×2 mm	10	2.08	79.17	B
…					
28	Pipe SS 304 4"×2 mm	1	0.47	95.07	C
29	MS Round Axles (50.8) 2"	1	0.45	95.53	C
…					
	Total	1,167	100.00		

The next step is to determine the cost classification based on predetermined classes. This is done by calculating the number and percentage of types of goods, the amount and rate of goods, and the total price of each class. The percentage and cumulative total costs were calculated from the total price acquired for each class, as seen in Table 3.

Table 3. Results of the ABC classification grouping [25]

Class	Types of goods	Types of goods (%)	Goods quality	Usage quality (%)	Total price (IDR)	Percentage Price (%)	Cumulative Perc. Price (%)
A	10	10	353	30	794,111,000	75	75
B	17	17	170	15	209,234,500	20	95
C	73	73	644	55	57,262,000	5	100
Total	100	100	1,167	100	1,060,607,500	100	

From the data calculation, the results prove that the classification of goods in class A consists of 10 different types of goods in warehouses, with a percentage of 10% of the total number of types, and the total quantity of goods used is 353 units, or equal to 30% of the total usage. With the absorption of 75% of funds or a total price of IDR 794,111,000, the inventory provides all capital. All goods in category A are placed at the front section of the warehouse for staff to easily access and marked with a green area on the raw material warehouse storage rack.

From data processing, it was found that the class B category consisted of 17 types of goods in the warehouse, with a percentage of 17%, and several goods totaling 170 units, with a percentage of quantity obtained by 15%, in accordance with the rules for class B classification. Moreover, the absorption of funds of 20% was obtained from a total price of IDR 209,234,500 out of the total capital provided by inventory after category A. Goods included in the class B classification are positioned in the raw material warehouse, bordered with A category goods, or are in the middle position of the warehouse. It is marked with a yellow area on the raw material warehouse storage rack.

Likewise, the class C category, as generated from the results of previous calculations, showed that class C has 73 units of goods in the raw material warehouse. The total quantity of goods used in raw material warehouses was 644 units, which is 55% of the total goods by 55%. Absorption of funds in class C was determined as 5%, with the total price of IDR 57,262,000 of all capital provided by inventory (excluding A and B). This is in line with the rules of all predetermined class C groupings. Goods included in the class C classification are set at the end of the raw material warehouse, bordered with B Category goods, and marked with a red area on the warehouse storage shelves.

4.3. FSN analysis

FSN analysis is a goods grouping analysis based on the frequency of goods movement generated from the in-and-out data of goods. The data used is the goods frequency per period. The frequency percentage for each item is obtained, as shown in Table 4.

Table 4. Calculation of the frequency of movement of goods [25]

No.	Types of goods	Total number	Period (month)	Frequency	Frequency percentage (%)
1	Bearing 6316-ZZ/C3 SKF	13	12	156	0.33
2	UKP 209J FYH bearings	74	12	888	1.86
3	Bearings UKP 213 FYH	11	12	132	0.28
4	Bearing 30206/P6 Reduce Koyo	72	12	864	1.81
5	SS HL Plate 304 4"×8"×1.2 mm 2 sides	329	12	3,948	8.26
	Amount	3,983		47,796	100

Furthermore, the results of the frequency percentage were sorted from the highest value to the lowest value to be further classified into each class. The provisions determined that class F has 10% of the total number of items, class S has 30% of the total items, and class N has 60% of the total items. The results of the classification are illustrated in Table 5. The final results for each class division on the FSN frequency percentage analysis can be seen in Table 6.

Table 5. FSN analysis clustering results in [25]

No.	Types of goods	Frequency	Frequency percentage (%)	Cumulative frequency (%)	Group
1	Ring Plate ss 12 mm	12,828	26.84	26.84	F
2	Black PlatEser MS 1 mm	6,216	13.01	39.84	F
…					
11	Strip Plate Stainless 3×20 mm SS 304	840	1.76	64.80	S
12	Pipe SS 304 16 mm×1.2 mm (5/8")	828	1.73	66.53	S
…					
41	Round Axle SS 304 12 mm	204	0.43	90.21	N
42	Strip Plate Stainless 5×20 mm SS 304	192	0.40	90.61	N
	Amount	47,796	100		

Table 6. Classification of the frequency of movement of goods by class [25]

Class	Types of goods	Types of goods (%)	Transfer frequency	Frequency displacement (%)	Cumulative displacement frequency press (%)
F	10	10	30,132	63	63
S	30	30	12,780	27	90
N	60	60	4,884	10	100
Total	100	100	47,796	100	

Based on the frequency classification of goods movement, it is obtained from the calculation that class F has as many types of goods as ten units, or with a percentage of 10%, totaling 100 units of goods. Then, the calculation results are in accordance with the rules for the percentage of the goods in the FSN grouping of class F categories. The number of movement frequencies in class F is 30,132, with a percentage value of goods movement of 63%. Goods handling in class F is more stringent than in other classes, and class F goods are placed in the easiest-to-reach areas. Goods categorized in class F are placed in the front shelf area, the same as the placement of goods in class A (ABC analysis), marked with a green storage shelf.

In the class S classification category, goods are notified with movement, which is not too fast and frequent, but not too slow. The calculation of the class S movement frequency classification consists of 30 units of goods, with a percentage of goods of 30% out of 100 units of goods. The rate of types of goods is 30%, which is in line with the rules for the most minor S class classification, between 30% and 35%. The total frequency of class S goods movement is 12,780, with a percentage of movement of 27% and a cumulative rate of 90%. Handling goods in class S is less tight than in class F and less flexible than in class N. The placement of class S goods in the middle or second order area in the raw material warehouse after class F is the same as the goods arrangement in class B (ABC analysis), which is marked with yellow shelf storage.

The final classification in the FSN analysis is class N, which contains goods with slow movement. The previous calculation found that most types of goods were in class N, accounting for 60% of the total number of 100 units of goods. This percentage is included in the smallest class N classification rules, 60-65% of the total number. The total frequency of class N goods movement is 4,884, with the percentage of movement of N goods recorded as 10% and the cumulative percentage as 100%. Class N goods handling is considered the easiest since the object movement is classified as the slowest. Therefore, the goods are placed in the rear area or at the end section of the raw material warehouse. This placement is the same as the placement of goods in class C (ABC analysis), which is marked with a red storage rack.

4.4. Warehouse slotting

After classifying the types of goods based on ABC classification and FSN analysis, the next stage is determining slotting using the warehouse slotting method. The warehouse slotting method is used to determine the allocation of storage space and appropriate storage locations according to the criteria of each item in the warehouse. With the storage rack capacity data and the weight of each item, determine the capacity of each raw material and the maximum number of packages per shelf obtained from the company's raw material data, as seen in Table 7.

Table 7. Calculation of warehouse storage slot needs [25]

No	Types of goods	Material unit weight (kg)	Maximum number of packages (units)	Packaging quantity	Slots requirement
1	Bearing 6316-zz/C3 SKF	4	20	745.25	37,262
2	UKP 209J FYH bearings	3	5	993.66	198,732
3	Bearings UKP 213 FYH	3	10	993.66	99,366
4	Bearing 30206/P6 Reduce Koyo	0.25	20	11,923.94	596,197
5	Plat SS HL 304 4"×8"×1.2 mm 2 sides	28.29	16	105.37	6,586

With warehouse slotting analysis, slot capacity can be determined for each item used in the production of the product. This analysis can optimize warehouse functions so that the layout is more efficient, reduces goods picking errors, and minimizes warehouse operational costs. The application of warehouse slotting analysis within the company can make changes to the arrangement of the need for storage rack slots, which, in the previous case, used randomized storage as the placement method for goods in the raw material warehouse. There is an absence of a particular grouping applied to the raw material warehouse, so the number of existing shelves is unsuitable for the need for storage allocation. However, with the application of warehouse slotting analysis, the company can find out the number of slots needed for each item in the raw material warehouse so that the optimization of its functions can be more finagled.

4.5. Proposed layouts

From the proposed layout, the storage of goods in the raw material warehouse has been grouped by class, both from the frequency of use and the level of investment absorbed in inventory. Figure 3 shows that all the goods in the emergency warehouse occupy the same space as the goods in the permanent raw material warehouse. The placement of class A or F items is situated closest to the I/O point, which is marked in green on the storage rack plan. Class B or S goods are placed on the rack arrangement after class A or in the middle of the warehouse, marked in yellow on the storage rack plan. In contrast, class C or N goods are positioned far away from the I/O point, which is located at the very end of the raw material warehouse, marked in red on the storage rack layout. The two-dimensional layout plan for the proposed raw material warehouse 1 and raw material warehouse 2 is portrayed in Figure 4. In contrast, the three-dimensional plan is illustrated in Figures 5 and 6.

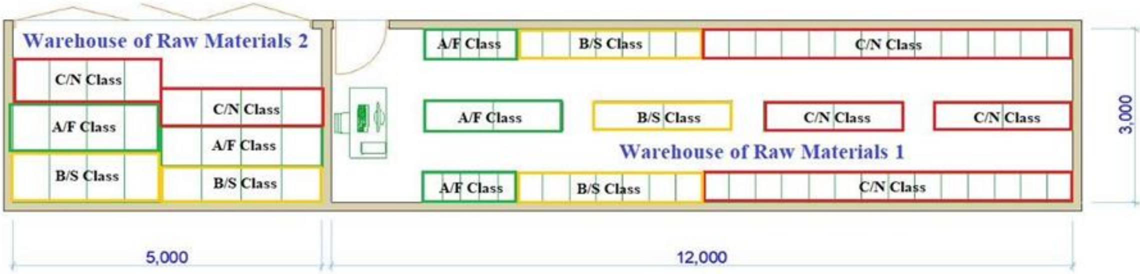

Figure 4. Two-dimensional proposed warehouse layout for raw materials 1 and 2 [25]

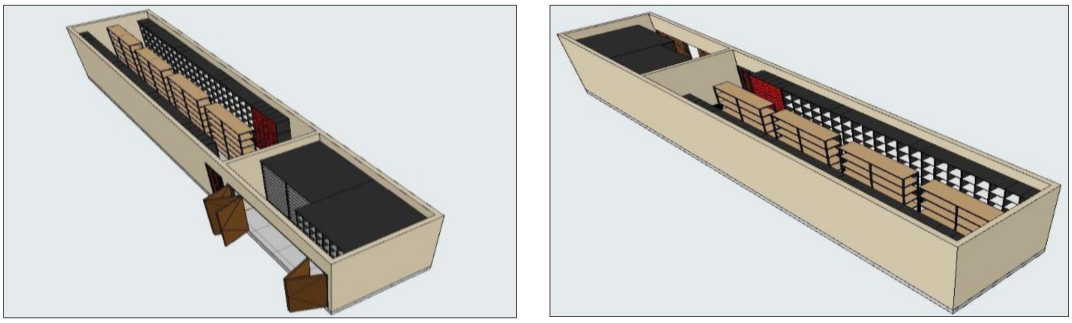

Figure 5. Warehouse three-dimensional proposed layout [25]

Figure 6. A three-dimensional proposed layout for raw materials in the warehouse [25]

The results of the proposed layout have been adjusted based on calculations from several analyses, resulting in two parts of the raw material warehouse space, which are "raw material warehouse 1," which covers an area of 36 m^2 designated for storing small- to medium-sized parts of goods. The second part is the “raw material warehouse 2” set, which has an area of 15 m^2 and is used to keep large parts (plates, pipes, and axles). Raw material warehouse 1 uses three types of storage shelves, while raw material warehouse 2 uses two types of storage shelves.

Differences are found between proposed improvements to the initial layout, encouraging the effectiveness of the goods’ pick-up process, and employee performance in the company. The placement of the administrative desk at the raw material warehouse 1 has changed from initially on the left of the door to recently being positioned straight in the direction of the exit/entrance. This transition is used to facilitate the smooth in-and-out administration process and to control warehouse conditions since all parts of the raw material warehouse 1 can be easily accessed from the administration desk.

The implementation of the proposed layout improvements has had several influences on the warehouse, including the faster process of picking up goods, which leads to saving more time because the placement of goods is based on grouping results. It also optimizes the function of the warehouse area by adding or moving goods to a more strategic location, and provides easy access to the administration section for the in-and-out recording process. Later, this improvement leads to the smooth production of other departments in the warehouse, as shown in Table 8.

The layout improvements proposed in this study, such as changes to the size of the warehouse and the addition of storage racks, are in line with the findings of Alfarokhi *et al*. [5], which showed a 68% reduction in picking distance. The main difference in our study lies in adding extra space and optimizing the layout of the raw material warehouse, which focuses not only on picking distance but also on improving administrative access and grouping of goods. This ensures smooth production flow in other departments that depend on the smooth operation of the warehouse.

Table 8. Comparison of the initial layout and the proposed layout [25]

Difference	Layout prefix	Layout proposal
Improved raw material warehouse 1	9 m×3 m	12 m×3 m
Additional space	3 m×3 m	-
Improved raw material warehouse 2	5 m×3 m	5 m×3 m
Emergency raw material warehouse	27 m×1 m	-
Storage shelf	9 shelves	15 shelves
G.BBT 2-door model	1 door	2 rolling doors

5. CONCLUSION

Based on the results of the analysis using the class-based storage method involving three analyses, namely ABC classification, FSN analysis, and warehouse slotting, this research produces a proposed layout that is different from the initial design, especially in terms of the division of warehouse locations and placement of goods. The placement of goods is based on the classification of goods movement, where class A/F goods are placed in the area closest to the I/O point, class B/S goods are placed in the middle area, and class C/N goods are placed at the end of the warehouse. The main difference in the proposed layout is the change in the placement of infrequently used items, which were previously in the emergency warehouse, to the storage area for plates, axles, and pipes to maximize the function of the warehouse. Thus, the warehouse area consists of raw material warehouse 1 with a size of 12×3 m and raw material warehouse 2 with a size of 5×3 m, allowing for more efficient management of goods and increasing the effectiveness of picking time. However, this research has limitations, such as not further examining the effect of picking distance on the placement of goods and not discussing the costs involved in designing the layout. In addition, this research has not examined the use of technology in recording goods in and out of the warehouse. Therefore, future research can develop this topic by deepening the analysis of the distance of picking goods, analyzing the costs in designing layouts, and applying technology such as radio frequency identification (RFID) to facilitate data collection of goods.

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AUTHOR CONTRIBUTIONS STATEMENT

This journal uses the Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

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C : **C**onceptualization
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R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

The authors state no conflict of interest.

INFORMED CONSENT

We have obtained informed consent from all individuals included in this study.

DATA AVAILABILITY

Data availability does not apply to this paper as no new data were created or analyzed in this study.

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