REDESIGNING OF WAREHOUSE ITEMS LAYOUT AT COMPANY XYZ USING 5S SYSTEM STRATEGY

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ABSTRACT

5S system is designed to create a "work environment that is self-explaining, ordering and improving." The main objective of the study was to redesign warehouse items layout at Company XYZ using 5S system strategy. This study used applied research, which worked by moving from a theory review to a practical problem. The researchers were able to evaluate the awareness, importance, and areas where 5S could be applied in the company. The total warehouse area was 1428.612 sq.m. with a space utilization of 52.57%. From the proposed warehouse items layout, the researchers had saved a total space of 193.01 sq.m which was 13.51% of the total warehouse items space that was converted into receiving area and shipping area.

Keywords: *ABC Analysis, 5S System Strategy, Applied Research*

INTRODUCTION

The foundation of each business organization is the warehouse management, one of the fundamental parts of supply chain management. It begins from order and receives well from supplier up to the following period of supply chain from discharging and conveying merchandise to the client. Today, warehouse management places a very significant role in company's success. It is one of the oldest activities related to production. It increased relevance in the last years, transfiguring it into a science with mathematical and computer models. It is a key factor for different companies to customer service and demand variability. [1]

Moreover, one of the most powerful Lean Manufacturing Tools and a cornerstone of any successful implementation is that of 5S. It is a simple tool for organizing your workplace in a clean, efficient, and safe manner to enhance your productivity, visual management and to ensure the introduction of standardized working. One of the most important factors of 5S is it makes problems immediately obvious.[2] The 5S system is a good starting point for all improvement efforts aiming to drive out waste from the manufacturing process and ultimately improve a company's bottom line by improving products and services, and lowering costs.[3]

The researchers improved the warehouse layout by using a 5s tool that maximized all the space. When the researchers visited the plant, the researchers observed that some boxes were outside their warehouse. Rearranging the products to match changes in demand helped minimize the negative impacts of seasonal demand and arrange the items by placing fast moving products at the front of the picking aisle. Maintain fast moving and high-sell inventory near the picking area of the facility will not consume too much time transferring it to the shipping dock of the warehouse.

The main purpose of this study was to apply the 5's system strategy to improve and maximize the warehouse items layout of Company XYZ.

Conceptual Framework

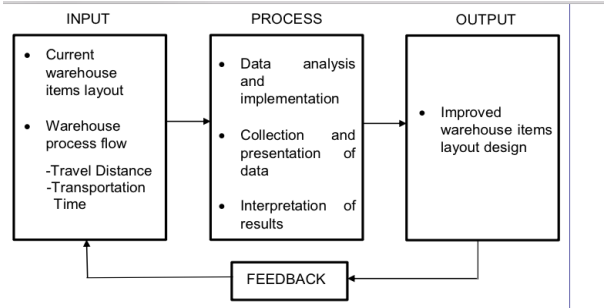

Figure 1. Research Paradigm

Figure 1 shows the input whereas the researchers determined what was wrong in the warehouse layout design and identified the root causes, the process flow in the warehouse, the travel distance, and the transportation time, as well as to perform the process of data analysis and implementation. Furthermore, for the output, the knowledge and data acquired the researchers were able to improve and present new warehouse layout design. Lastly, for continuous improvement, the feedback followed.

Objectives of the Study

The main objective of the study was to redesign warehouse items layout at Company XYZ using 5S system strategy. Specifically, it aimed to:

1. Analyze the existing warehouse items layout;
2. Determine the root cause of unorganized items utilization, using Why-Why Analysis; and
3. Propose solution to improve and maximize the warehouse items layout.

METHODOLOGY

This study used applied research that worked moving from a theory review to a practical problem. It started through interview and company observations to collect information about the questions and problems being study. From each data gathered, the researchers analyzed and interpreted them. Through this, the researchers were able to evaluate the awareness, importance, and areas where 5S can be applied in the company.

The researches divided the analyses of the data into two. First, analyses with the aim of characterized the current warehouse using 5S system strategy, number of orders, transportation time, and also, the travel distance. The second one analyzed with purpose of reaching the goal (ABC Analysis).

RESULTS AND DISCUSSION

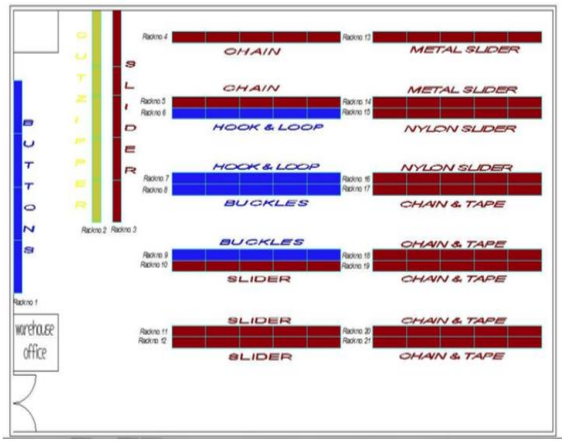

Figure 2. Existing Warehouse Items Layout

Figure 2 shows the existing warehouse items layout of Company XYZ. The researchers grouped each item in category with respect to ABC Analysis: A for fast moving item, B for slow moving items; and C for nonmoving items. Also, the researchers assigned color code to determine in where following items belong: orange for fast moving items, yellow for slow moving items, and green for non-moving

items. Furthermore, fast moving items were consumed within a month, slow moving items were consumed within a year, and non-moving items had no consumption within a year.

Existing Warehouse Items Space Utilization

Table 1. Computation of Areas in Existing Warehouse Items Layout

Description	Length (m)	Width (m)	Units	Total Area (sq.m)
Racks	15	0.8	21	252
Aisles Between Racks	15	3.8	8	456
	15	1	1	15
Total Aisles Area				471
Warehouse Office	4	4		16
Space for Forklift	4	3		12

Total Warehouse Items Area = 47.94 sq.m x 29.8 sq.m

= 1428.612 sq.m

$$\text{Existing Warehouse Items Space Utilization} = \frac{252 \text{ sq.m} + 471 \text{ sq.m} + 16 \text{ sq.m} + 12 \text{ sq.m}}{1428.612 \text{ sq.m}}$$

$$= 0.5257 \times 100\%$$

= 52.57%

Transportation Time and Travel Distance of Existing Warehouse Items Layout

Table 2. Transportation Distance and Travel Time of Existing Warehouse Items Layout

Items Category	Rack Number	Item	Travel Distance (meters)	Transportation Time (minutes)
Fast Moving	3	Slider	29.1	0.36
	4	Chain	44.25	0.55
	5	Chain	44.25	0.55
	10	Slider	28.05	0.35
	11	Slider	28.05	0.35
	12	Slider	21.6	0.27
	13	Metal Slider	62.08	0.78
	14	Metal Slider	62.08	0.78
	15	Nylon Slider	56.68	0.71
	16	Nylon Slider	56.68	0.71
	17	Chain & Tape	51.28	0.64
	18	Chain & Tape	51.28	0.64
	19	Chain & Tape	45.91	0.57
	20	Chain & Tape	45.91	0.57
	21	Chain & Tape	39.44	0.49
Slow Moving	2	Cut Zipper	22.3	0.28
Non-Moving	1	Buttons	25.5	0.32
	6	Hook & Loop	38.85	0.49
	7	Hook & Loop	38.85	0.49
	8	Buckles	33.45	0.42
	9	Buckles	33.45	0.42

Table 2 shows the items category of each item, the rack numbers, the items name, the current travel distance, and the current transportation time. The researchers noticed that even the products were categorized as fast-moving item. It had the farthest travel distance and longest transportation time among all the items inside the warehouse.

Why-Why Analysis

Table 3. Causes of Unorganized Warehouse

Causes	Why 1	Why 2	Why 3	Solution		Occurrence	Percentage
				Short Term	Long Term		
Can't easily view stock level of the materials	Manufacturers don't have full visibility to their inventory	They are manually counting/ checking stocks	They don't use the Barcode/ Square Code Technology	Clean out the inventory that believe to be no longer useful to the productivity of business.	Automate system to offer real-time, accurate information about stock level and composition.	3	27.27%
Improper Product Location	Raw materials or fast-moving materials are not in the most accessible location	Raw materials or fast-moving materials are in the back of the Warehouse Item	-	Separate finish goods (indent material) s to raw materials	Group products by their classification	2	18.18%
Not optimized Picking of Products	Can't easily find the products	Racks/Products don't have enough signage	-	Plan how and what signage to put	Put signage in the racks and assigned color to distinguish what is the classification of products.	2	18.18%
5s method is not practiced at all time	Not all employees are knowledgeable in 5s method	Employees don't have enough training and understanding in 5s method	-	Conduct 5s training for the employees	-	2	18.18%
						11	1

Table 3 shows the causes of unorganized warehouse and its 3 why's. It also showed the solution for each reason both short terms and long term time frame. Company XYZ give percentage for cannot easily view stock level of the materials, improper product location, not optimized picking of products, and 5S method are not practice at all time that cause unorganized warehouse of 27.27%, 18.18%, 18.18% and 18.18%, respectively.

Proposed Warehouse Items Layout

Figure 3. Proposed Warehouse Items Layout

Figure 3 shows the first proposed warehouse items layout. The researchers had saved a total space of 193.01 sq.m which was 13.51% of the total warehouse items space converted into receiving area and shipping area. The first thing the researchers did is to sort all items according to the frequent use or pick up by using the ABC analysis: A being the fast moving which was the raw materials of zipper, B being the slow moving which was the cut zipper, and C being the non-moving which was the non-zipper products. For the propose warehouse items layout, the researchers placed the items in the racks according to its product category and also same products were close to each other

Saved Area = 50.4 sq.m + 142.61 sq.m

= 193.01 sq.m

= 13.51% of the total warehouse area

Receiving Area = 6.3 m x 8 m

= 50.4 sq.m

Shipping Area = 21.94 m x 6.5 m

= 142.61 sq.m

Space Utilization:

Description	Length (m)	Width (m)	Units	Total Area (sq.m)
Racks	15	0.8	21	252
Aisles Between Racks	15	3	7	315
	15	4.1	3	184.5
Total Aisles Area				532.5
Warehouse Office	4	4		16
Space for Forklift	4	3		12
Receiving Area	6.3	8		50.4
Shipping Area	21.94	6.5		142.61

Total Warehouse Items Area = 47.94 m x 29.8 m

= 1428.612 sq.m

$$\text{Propose 1 Warehouse Items Space Utilization} = \frac{252\ \text{sq.m} + 532.5\ \text{sq.m} + 16\ \text{sq.m} + 12\ \text{sq.m} + 50.4\ \text{sq.m} + 142.61\ \text{sq.m}}{1428.612\ \text{sq.m}}$$

$$= 0.7038 \times 100\%$$

= 70.38%

Space Utilization Percent increased versus Existing = 17.81%

Comparison of Travel Distance and Transportation Time of Existing and Proposed Warehouse Items Layout

Table 4. Comparison of Travel Distance and Transportation Time of Existing and Proposed Warehouse Items Layout

Material Category	Rack Number	Item	Current Travel Distance (meters)	Proposed 1 Travel Distance (meters)	Cut Travel Distance in Proposed 1 (meters)
Fast Moving	3	Slider	29.1	19.44	9.66
	4	Chain	44.25	41.94	2.31
	5	Chain	44.25	37.44	6.81
	10	Slider	28.05	19.44	8.61
	11	Slider	28.05	23.94	4.11
	12	Slider	21.6	23.94	-2.34
	13	Metal Slider	62.08	24.04	38.04
	14	Metal Slider	62.08	24.04	38.04
	15	Nylon Slider	56.68	28.61	28.07
	16	Nylon Slider	56.68	41.94	14.74
	17	Chain & Tape	51.28	46.61	4.67
	18	Chain & Tape	51.28	46.61	4.67
	19	Chain & Tape	45.91	42.04	3.87
	20	Chain & Tape	45.91	42.04	3.87
	21	Chain & Tape	39.44	37.44	2.00

Table 4 shows the comparison of the existing travel distance and the proposed 1 travel distance. The travel distance of all the racks in the fast-moving category was the most priority of the researchers to minimize travel distance of the personal. From the table above, metal slider and nylon slider had the most cut distance, with the percentage of almost 50% of the current travel distance.

CONCLUSION

1. This study assessed the existing warehouse of Company XYZ in terms of total warehouse area, space utilization, the travel distance, transportation time, and equipment that the company were using in the warehouse. The total warehouse area was 1428.612 sq.m with a space utilization of 52.57%. The farthest rack travel by the warehouse personnel was about 62.08 meters, and the longest transportation time was 0.78 when

heading into that rack. The warehouse used 2 forklifts with a dimension of 2.43m x 0.94m x 2.09.

2. Why-Why Analysis was performed with the company cannot easily view stock level of the materials, 27.27%; improper product location, 18.18%; not optimized picking of products, 18.18%; and 5s method was not practiced at all time, 18.18% causing the unorganized warehouse.

3. The researchers proposed a warehouse items layout which considered the travel of forklift when making turns between the racks, with a space capacity of 70.38%. First thing the researchers did is to sort all items according to its frequent use or pick up by using ABC analysis; A being the fast moving, B being the slow moving, and C being the non-moving. Next, the researchers placed same items in racks according to its category and also same products were placed close to each other. Cleaning the racks for the non-moving products to be written off by following the advice of the top management. To standardize the warehouse items label for the racks down to the product must be place. Sustainability was very important because 5s should not be seen as a one-time event, but must always accomplished with discipline. Regular checking and reassessment were needed to practice continuous improvement. The researchers recommend this proposal to the company; because it increased the space capacity by 17.81%.

RECOMMENDATIONS

1. To the Company XYZ, for them to improve accurate information about stock level and composition to reduce labor costs, to have signage in racks, and to assign color to distinguish what was the classification of products, to have bar coding scanning and printing into boxes, and for them to apply all the improvements that the researchers have thought based on observations that could make their warehouse a better one.

2. To the current company owners, for them to conduct 5S training for the workers to be able to recognize the methods for

eliminating or at least minimizing the occurrence of such accidents.

3. To the future researchers, for them to serve this as basis in making another study about warehousing. This study may help them to conduct their study easily.

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