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DRAFT LAYOUT OF A DISTRIBUTION WAREHOUSE ON THE RESULTS OF CLUSTER ANALYSIS

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Keywords: layout, cluster analysis distribution warehouse
Abstract: In the article, we focused on the proposal of a layout solution for the distribution warehouse of the manufacturing company using the cluster analysis. In the dendrogram we selected the optimal number of clusters, which are groups of stocks according to share in the expedition. Cluster analysis belongs to multivariate statistical methods. Cluster analysis is defined as general logical technique, procedure, which allows to cluster variate objects into groups – clusters on the basis of *similarity* or *dissimilarity*. Cluster analysis involves computational procedures, which purpose is to reduced a set of data on several relatively homogenic groups – clusters, while the condition of reduction is - maximal and simultaneously minimal similarity of clusters.

1 Charakteristic of cluster analysis

Cluster analysis belongs to multivariate statistical methods. Cluster analysis is defined as general logical technique, procedure, which allows to cluster variate objects into groups – clusters on the basis of *similarity* or *dissimilarity*. Cluster analysis involves computational procedures, which purpose is to reduced a set of data on several relatively homogenic groups – clusters, while the condition of reduction is - maximal and simultaneously minimal similarity of clusters.

Similarity of objects is studied by the degree of similarity(correlation coefficient and association coeficient) or the degree of dissimalarity – degree of distance (distance coefficient). Methods of cluster analysis are on the basis of clustering clasified as hierarchical or non-hierarchical methods.

2 Description of the supply in the enterprise

For the analysis, we have customer demand data for one calendar year, which corresponds to the production plan and plan the expedition. This information represents inputs for an cluster analysis of stock of the products of the selected manufacturing enterprise. The production line of the enterprise is divided into 5 basic groups: Nara, J77, J104, J108, J110. The evolution of the expedition of products during the individual months of the selected calendar year is shown in Figure1.

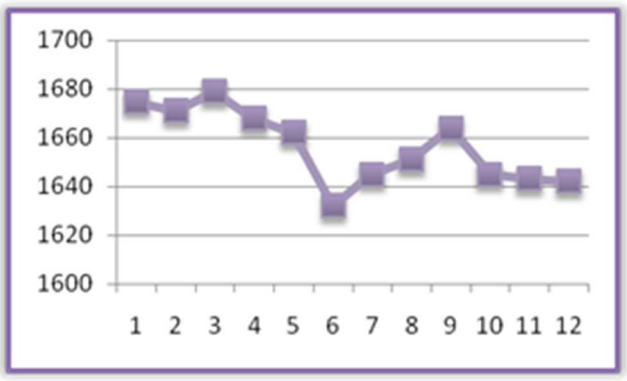

Figure 1 Development of product expedition

Product development expedition has fluctuating course, the average company produces and dispatches the goods 1656 pieces of products per month, the largest export was registered in March of that year and the lowest in June of that year. Since it is a custom form of production, in some months of the year a one-time customer demand for the selected product has arisen.

Percentage of basic types of products in the total expedition is shown in Figure 2.

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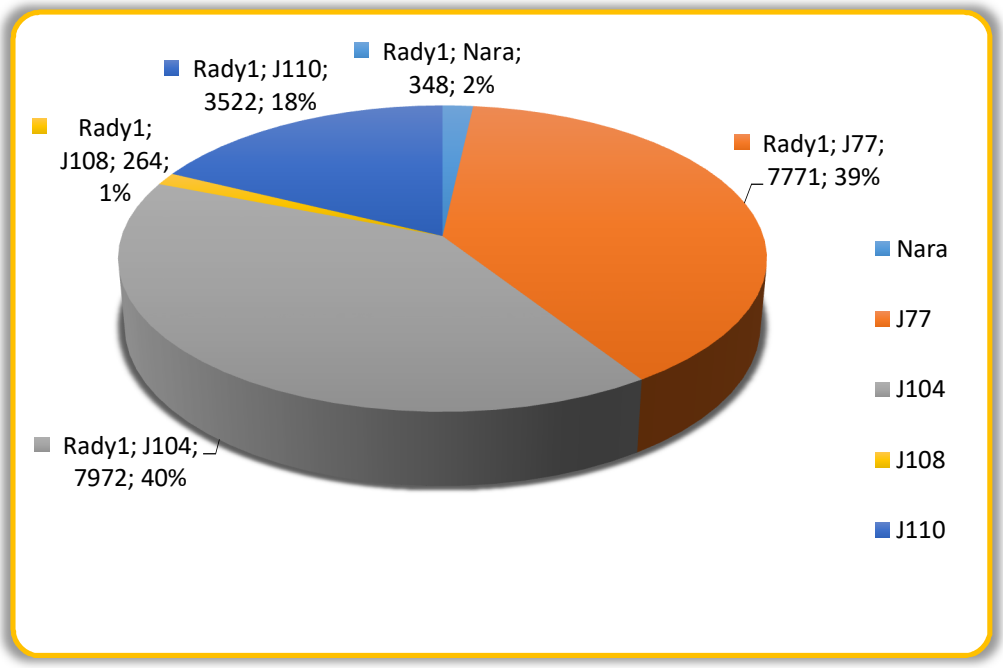

Figure 2 The share of types of products on an expedition

The largest share of the expedition has J10 chairs with 40% share and J77 chairs with 39% share.

3 Cluster analysis in distribution warehouse

Data on monthly expedition individual products have been entering for performing cluster analysis. The Ward method, which belongs to the hierarchical methods, was used, and the square Euclidean distance was used to express the distance. The result of cluster analysis is a dendrogram showing the various clusters depending on the distance connections. The dendrogram is a section for selecting the optimal number of clusters.

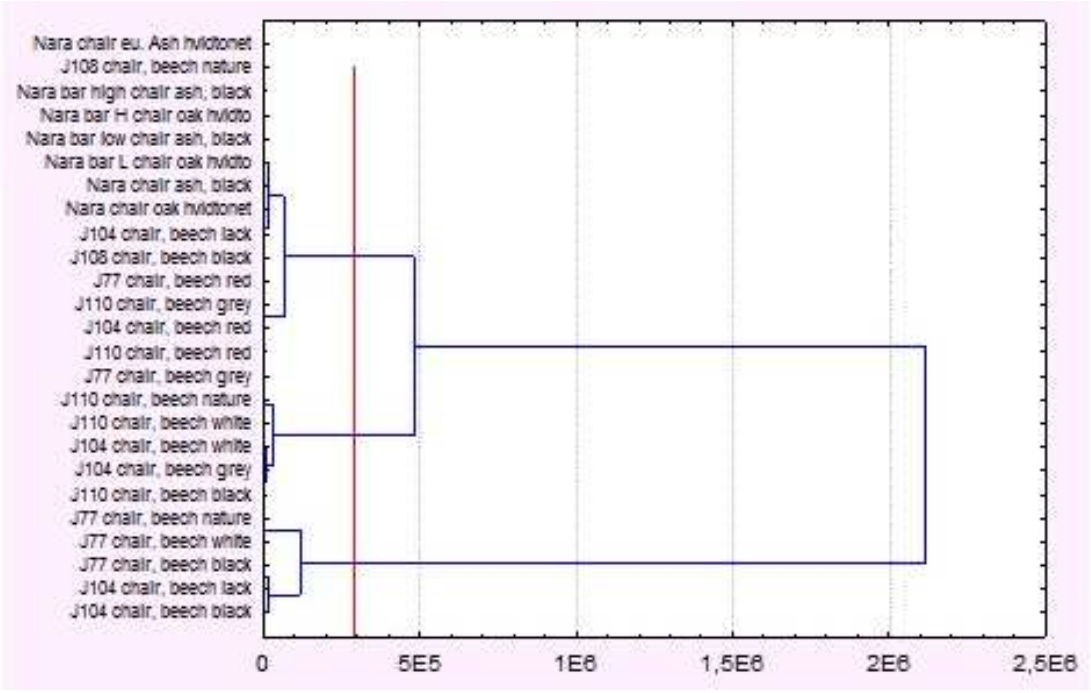

Figure 3 Dendrogram

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From the dendrogram results follow optimal clusters describsed in the Table 1.

Table 1 Clusters

Clusters	Products	Σ
1.cluster	Nara chair eu. Ash hvidtonet	**2657**
	J108 chair, beech nature	
	Nara bar high chair ash, black	
	Nara bar H chair oak hvidto	
	Nara bar low chair ash, black	
	Nara bar L chair oak hvidto	
	Nara chair ash, black	
	Nara chair oak hvidtonet	
	J104 chair, beech lack	
	J108 chair, beech black	
	J77 chair, beech red	
	J110 chair, beech grey	
	J104 chair, beech red	
	J110 chair, beech red	
2. cluster	J77 chair, beech grey	**6111**
	J110 chair, beech nature	
	J110 chair, beech white	
	J104 chair, beech white	
	J104 chair, beech grey	
	J110 chair, beech black	
3. cluster	J77 chair, beech nature	**11109**
	J77 chair, beech white	
	J77 chair, beech black	
	J104 chair, beech lack	
	J104 chair, beech black	

The result of cluster analysis of the finished goods manufacturing companies is to identify three clusters of products. These clusters can be taken into account when solving individual warehouse items in the enterprise.

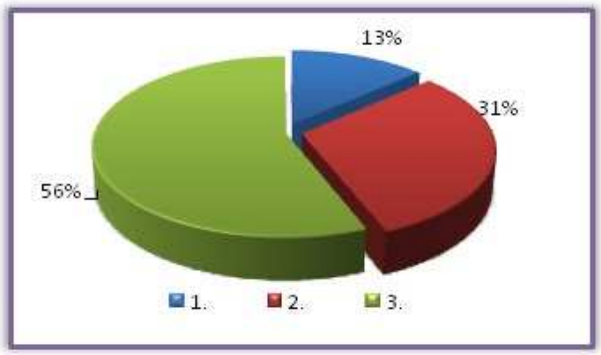

Figure 4 Share of clusters of products on expedition

From the graphical representation in Figure 4 shows that the largest share of the expedition has products 3.cluster, then 2.cluster and the smallest share has 1.cluster. It is therefore appropriate to place products 3. cluster within the warehouse closer towards to loading finished products. 3.cluster contains the products of the main groups J77 and J104.

Conclusions

From the results of the cluster analysis follow three clusters of final products which are shown in Figure 2D (Figure 5) and the 3D sketch (Figure 6) of the layout of warehouse of final products.

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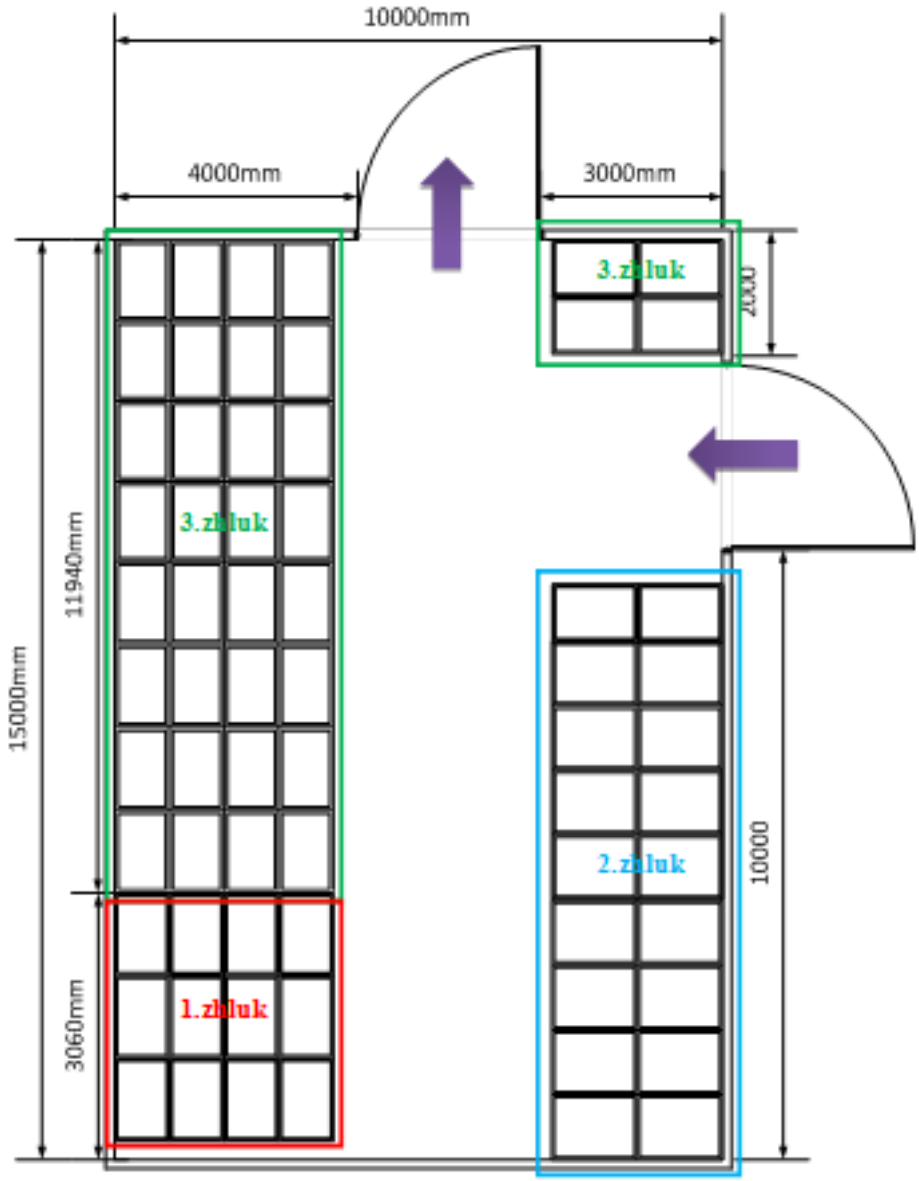

Figure 5 2D layout warehouse of finished products

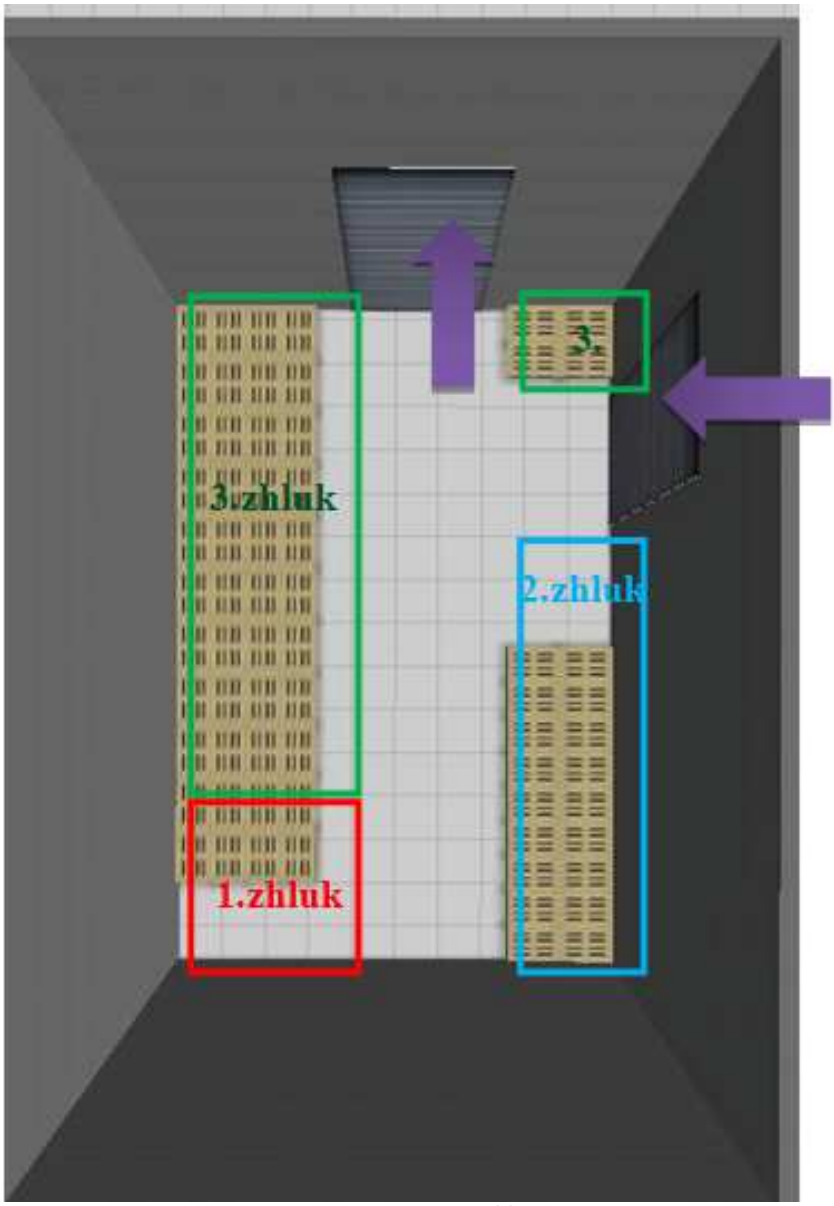

Figure 6 3D layout warehouse of finished products

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