CLASSIFICATION OF SUPPLIED COMPONENTS

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ABSTRACT

Classification is a common way to allocate available resources and handle the increased complexity in the supplier network, which is a result of the increased globalization in the manufacturing sector. To classify supplied components, a model with specified criteria, method and establishment of classes has to be used. A new model, based on a Swedish manufacturing company, suggests the Ng-method with three ranked criteria. The parameters used are, in order, predicted volume value, historical supplier lead time standard deviation and unit cost, to cover three dimensions of the component's characteristics. The number of classes depends mainly on what is possible in a management perspective, and can be created by the 80-20 rule, or from experience within the organization. Which parameters to use as criteria have to be chosen with respect to the purpose of the classification model, and what fits with the method.

INTRODUCTION

With increasing globalization in the manufacturing sector to meet customer needs, the supplier network has increased in complexity. The increased number of suppliers has meant that it has become even more important for companies to manage their suppliers in an efficient way, by developing effective inventory control policies. Generally, a small fraction of a manufacturing company's purchased items represent a large fraction of expeditors (Hopp & Spearman, 2011). To spend the same amount of purchasing activities in procurement of all items is obviously irrational.

For manufacturing companies that works with thousands of articles, it is common to classify the components, or the component suppliers, in order to streamline the organization and the management of inventories (Martin & Stanford, 2007).

One reason for classifying components is to manage safety stock, to hedge against unpredictable fluctuations in supply or demand, so that shortages preferably will not occur. The use of safety stock involves tied up capital and inventory costs. Therefore, classification is an effective approach for differentiating service levels so that articles, for which shortages have a significant impact, are allowed a greater proportion of the capital invested in safety stock than articles for which the impact is not as significant.

An electronic manufacturing company in Sweden is using classification with this purpose, to manage safety stock. The model they use today has been used for a couple of years and now they want to challenge this model from a theoretical perspective. This paper presents a new model for

classification of supplied components at the company.

The next section in this paper regards classification in general and which methods that can be used at the case company. It also includes a discussion about what parameters to use and how the classes should be divided. Thereafter the results from the study, including the new model, and finally the conclusions are presented.

CLASSIFICATION

Classification allows a company to have better control over all components and divide them into various groups, assigned to different strategies. The methodology implies grouping and classifying articles by various industry specific parameters, which are important for the allocation of resources in the company e.g. capital and capacity utilization.

PARAMETERS

The number of criteria used to manage inventory varies depending on the type of business/industry (Flores, et al., 1992). To obtain strong results in the classification of suppliers or components, it is important to choose the classification criteria with care and not only work with the volume value (Flores, et al., 1992).

In creation of the new model, more than twenty different parameters have been identified that affect the classification and the appropriate safety stock levels at the company. These could be grouped into four different factors, related to suppliers, components, customers and internal operations.

One aspect to consider when choosing which parameters to use as criteria is whether historical or forecasted data should be used. Historical data are often already available within the organization, while predicted data will give a better view of what lies ahead.

Depending on which parameters have been chosen, the way to measure them can differ. For some parameters might value be the most appropriate way, while others could be more reasonably to measure in percent, deviation or average.

METHODS

One of the most widely used models is the ABC classification (Martin & Stanford, 2007). During the past 20 years this method has been developed to include more than one criterion. The method divides the inventory items into three classes according to the parameter volume value.

Generally, there are two types of classification; single criterion and multiple criteria methods. The multiple criteria classification uses more than one criterion for classification, and has led to the development of several methods.

Seven different classification methods that use more than one criterion have been reviewed in order to find which is most suitable for the company.

- Multi criteria matrix – an extended version of the classical ABC classification
- Analytical Hierarchy Process – based on pairwise comparisons of all criteria and components
- Fuzzy rule – based on the assumption of no clear membership in a class
- Artificial neural network – is trained by a dataset to imitate a manager´s decision
- Weighted liner optimization – a mathematic optimization method with a maximization objective function
- Ng-method – based on weighted liner optimization but simplified to be more user friendly

- Cluster analysis – a statistical method that maximizes differences between the classes

ESTABLISHMENT OF CLASSES

Depending on the method used, the division of classes can be made in different ways. Some methods, like cluster analysis, creates the division itself, while others require specified boundaries. For example the multi criteria matrix requires boundaries for each criterion. Some methods provide a final score, and therefore only require one boundary per class.

Since the purpose of a classification is to allocate a company's resources, the number of components in the higher classes usually is lower than the number of components in the lower classes. There are no clear guidelines of how to create the classes, but experience within the organization or the 80-20 rule are mentioned as possible ways (Guvenir & Erel, 1998).

RESULT

To create the new model, both a classification method and parameters for the model, have to be selected. Also a way to establish the classes has to be defined.

Since a variety of methods facilitates the use of multiple criteria, it was desired to consider different perspectives of the components characteristics in the classification model. The economic impact, the supplier performance and the degree of standardization where considered the most important ones. Therefore, the parameters used in the new model are 1) predicted volume value, 2) historical supplier lead time standard deviation and 3) unit cost. Instead of unit cost can a standardization scale parameter be used, but this has not been possible in this project.

The method considered as the most suitable to use in the new model was the Ng-method (Ng, 2007). It was chosen since it is relatively easy to use and it provides the user with reliable and predictable classification results. The method requires the criteria to be ranked and assigns each component a final score that is used for the classification. The criteria are ranked in the same order as presented above, i.e. predicted volume value is seen as the most important.

The result of the new model is illustrated in an example, see Table 1, where 2949 components where classified. The model is compared to the classical ABC classification with volume value as the criterion, which is similar to the currently used model at the company. The division of components is 70 % of the volume value in the A class, 20 % in the B class and the remaining 10 % in the C class. To facilitate the comparison, the boundaries for the Ng-method are set so that the number of components in each class is consistent.

Table 1 Portion of components that stayed respectively changed class

	Components	**%**
Stays in class	2540	86,1
Moves one step	365	12,4
Moves two steps	44	1,5
Total	2949	

The new suggested model provides a slightly different output than the model currently used, even if a majority of the components stay in their class. The reason that some components move one or even two classes is that additional criteria are considered, even if these do not have as big impact as the first criterion. This is reasonable since both the supplier performance and the degree of

standardization are factors that affect the required safety stock.

CONCLUSION

This paper briefly presents a new model for classification of supplied components. The following conclusions can be drawn from the project.

When choosing input parameters to use as classification criteria, both qualitative and quantitative parameters can be used, where the former often requires more work by the user in order to be useful in the model. The parameters have to be chosen with respect to the purpose of the classification, and how complex the model should be.

Which method to use when classifying components is affected by the number of criteria that is desired and in which form the input data are.

The number of classes depends mainly on what is possible in a management perspective. To justify the use of several classes there has to be a clear difference in how the classes are managed, otherwise they can be merged. The division of components between the classes can be done with the 80-20 rule or by experience.

To utilize the result of the classification model in a good way, it is important for the company to assign the right service level for each class and use an appropriate formula for calculating safety stock. The model should be used frequently to avoid dramatic changes when the output from the model is imported to the ERP-system.

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