Abstract

Title: Order management for indirect materials

Authors:

1. Balasubramanyam Pisupati
2. Desika Selvaraj
3. Sheela Siddappa
4. Shanu Agrawal

Email Id: shanu.agrawal@in.bosch.com

Purpose of Research:

In the present study, an approach for managing purchase orders (PO) with a supplier has been proposed. As we all know that, it becomes difficult to manage purchase orders when a supplier supplies more than one material. This is due to the prevalent ordering procedure i.e. whenever the material quantity reaches below safety level or whenever a request comes from any department, a PO is raised. This causes the creation of more than one PO in a short time span. Subsequently, it increases the processing cost and also the logistic cost of purchase orders as they are directly proportional to the number of POs raised. A method for bundling the purchase orders of different material with a supplier has to be investigated to reduce the POs raised. In this paper, we have discussed an efficient way to handle this kind of scenario using conditional probability, forecasting technique and supplier evaluation technique.

Methodology and Major Results:

We can resolve the problem of raising of multiple purchase orders in a short span with the same supplier by giving the probable list of materials that can be bundled together with the currently required material. Now a common PO can be raised for this bundled list. This probable list of materials can be found by predicting the demand of other materials supplied by the supplier.

But it is too theoretical, practically it is not possible to raise purchase order of other materials at buyer level. Even though the buyer is able to predict the demand of other materials supplied by the supplier, he may not have the correct estimate about the actual requirement. Actual requirement of materials are correctly assessed by the request raising department and not the buyer. Due to this, a more effective way to deal this problem will be at the purchase requisition level and not at the purchase order level. So, we have to find an alternate way to predict the demand of other materials while raising PR for required material. There are two ways to predict this demand.

So, there is a need for predicting the demand of other materials at a department level. This can be done by using either the forecasting techniques when PR data is available or inventory management techniques when actual consumption data is available. We had PR data and hence for this paper forecasting techniques such as simple exponential forecasting, ARIMA, GARCH

and SVM models were tried out for each material. The model which resulted in lesser error was considered for predicting the demand of each material. From the predicted list of materials one will be able to know the necessity of other materials and a purchase request can be raised of all materials together. This way multiple PRs raised for various materials required for the same department can be avoided.

In scenarios where there is insufficient data for forecasting the demand for other materials, one can use simple conditional probability to identify the list of items generally ordered together. For example: If a person is raising purchase request for monitor (A), he may also need CPU (B) and keyboard in coming days. Using conditional probability, one can identify the probability of material B being ordered in next 15 days provided an order for material A is placed. One has to be very careful while finding the conditional probability because if both materials are bought only once and together then conditional probability will be one but it will not be correct. One can decide whether to raise purchase request for the second material or not by looking at the total number of instances when a request for material A and B occurred within the relevant time limits considered. Due to insufficient data, it is left to the purchaser's discretion to decide the quantity of material to be ordered.

After receiving all the purchase requests from various departments, buyer will combine the purchase requests for the same materials being requested by different departments. We will now find the best supplier for each material by using a supplier evaluation technique. There are two prominent techniques for supplier evaluation. One is Analytical Hierarchical Process (AHP) which is used when the relative importance of each variable compared to the others is available and another one is Data Envelopment Analysis (DEA) which is used when the importance described earlier is unavailable. In this paper we have discussed both the techniques. Most common variables used for supplier evaluation are price, lead time, price variance, quality of material, order fulfillment, number of purchase orders, delay in payment days and the number of materials supplier by the supplier.

In analytical hierarchical process (AHP), variables used are price, lead time, quality of material and number of materials supplied by the supplier. Same material might have been ordered with same supplier many times and hence each material will have more than one price, lead time and quality of material associated with it. But for evaluating suppliers using AHP process we need only one price, lead time and quality of material since one supplier will act as one Decision Making Unit (DMU). For calculating the single price, lead time etc we have taken the average of the two recent values of these variables. Quality of material is calculated after taking average of ratio of number of non rejected material by total materials. The procedure of obtaining a single value for each variable can be changed according to need.

In DEA, input variables used are price, lead time and output variable are quality of material and order fulfillment. Here, we evaluate suppliers on the basis of following criteria. If a supplier supplies a better quality batch of the material and fulfills all orders on time at lesser price and lesser lead time compared to the other suppliers, he is more efficient than others. After finding the best supplier for each material, buyer will combine the purchase orders of materials. This combination of materials is raised as one PO with a single supplier if the supplier comes out as an acceptable supplier for all those combined materials.

Implications:

Using the above explained process, details of predicted demand for other materials can be provided to a user raising a purchase request for a material. This will reduce multiple PRs being raised in a short span of time. Reduction in PRs leads to reduction of purchase orders. Further reduction in POs is done by identifying the best supplier for a set of materials and bundling POs of those materials. This in turn results in improvement of overall efficiency of purchasing department. Subsequently this will reduce the processing cost and transportation cost.