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Designing and implementing a supplier evaluation tool for a contract manufacturing industry

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Conceição, S.V *.; svieira@dep.ufmg.br. - Corresponding author
Renno, R. R. *; renno@uai.com.br
Epaminondas, L.A.R. *; luizre@uai.com.br

* Federal University of Minas Gerais
Industrial Engineering Department
Av. Antonio Carlos, 6627 – Pampulha
PCA – Sala 261
CEP – 30161-970 – Belo Horizonte - BRAZIL
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Abstract
The contract manufacturing scenario is characterized by high demand fluctuation, short product life cycle, pressure for cost reduction and high products and components obsolescence. Management Tools to guide enterprises in this competitive scenario are required and evidenced when worldwide suppliers are part of the chain. This article presents the development of a Supplier Performance Evaluation Tool for Contract manufacturing industries, or Electronic Manufacturer Services (EMS). The tool was developed in Brazil and implemented in the ERP system of one of the largest EMS companies. Action-Research methodology was used on the process of developing the tool. The tool is allowing the company to improve the overall results on its supply chain, reducing inventory costs, lead times and achieving many other benefits. The system is also allowing the supply chain participants to move into world class logistics.

1. Introduction
In the mid 80’s, in response to the growth of Asian electronic enterprises that started producing high volumes of high tech products and components, large American companies such as Apple, ATT, IBM and HP decided to outsource it’s internal manufacturing operations to contract manufacturing companies (Sturgeon, 2000). Since then, those companies went through an enormous growth and nowadays have revenues of more than 100 billions.

The contract manufacturing business is organized through an international production network with two main participants, the trademark companies known as OEM (Original Equipment Manufacturer) and the Electronic Manufacturing Services provider (EMS), who supply the OEM with the manufacture of products.
In this scenario, the OEM performs the most value added activity to the supply chain: the design of products, marketing and sales, while the EMS is responsible for the assembly, procurement and logistics operations and in some cases final product fulfillment (Sherman, 1988; Sterling, 1997; Sturgeon, 1997).

Besides the OEM and EMS, the component suppliers represent important roles in this international network, acting as direct suppliers for EMS to the assembly of Printed Circuit Boards (PCBs) and as technology developers for new products, working with the OEM in the design of new components.

The OEM has a role of both Customer and Supplier of the EMS. Customer when they contract the EMS to execute the manufacture and logistics of products and supplier when it delivers some of the strategic and main components of the final product, in order to maintain confidentiality of the product design. The Figure 1 represents the roles in this network.

![Figure 1. Outsourcing Supply Chain](image)

Turnkey is the type of contract most widely used in the outsourcing of manufacturing. (Sturgeon 1997). From a materials management perspective, the EMS performs in a segment with adverse characteristics to production planning and control and logistics operations. In this segment, the demand is highly volatile and the lifecycle of products is excessively short, yet demanding low product costs, high quality and short lead times,
besides the flexible change in forecast required by OEMs. When the materials management is performed well, it allows expressive financial results for the company.

Kaplan and Norton describe 3 perspectives that can be used to measure supplier performance: Time, Quality and Price.

Time has become a major competitive weapon in today’s competition. Being able to respond rapidly to a customer request is often the critical skill for obtaining and retaining valuable customers’ business (Kaplan 1996). Modern enterprises act upon inventory trying to increase inventory turns and, any fail in fulfill the delivery of the product at the agreed time can generate inventory excess (early delivery) or manufacturing downtime (late delivery), increasing operational costs.

Quality was a critical competitive dimension during the 1980s and remains important to this day. However, quality has shifted from a strategic advantage to a competitive necessity (Kaplan, 1996). The customers expect that suppliers will deliver products according to the specs due to the high confidence, however, the measurement of quality is still necessary.

Low Price is another competitive advantage that companies require from its suppliers. Supply products at a low cost is fundamental for the business and for a competitive price of the final product. Price is compared among suppliers becoming a critical issue in competitiveness.

The large amount of suppliers and their physical disposition contributes to a low efficiency of materials management of the supply chain. The purchasing strategic decision, the relationship between supplier-buyers, the performance measurement and the financial performance of the enterprise are connected and influence the overall performance of the company (Carr e Person, 1999)

Gordon (1994) describes the advantages of a performance measurement system: (1) a professional way to approach supply management; (2) statistical data of supplier performance can be compiled and used to support decision; (3) establish acceptable levels of supply and guarantee that they are achieved; (4) acknowledge the strong and weak points of each supplier.
Many components are essential in a supplier performance evaluation. According to Cusumano and Takeish (1991), the strategic management of the suppliers is critical when the components determine the quality of the final product sold by the company. The supplier performance evaluation is recognized to be more than purchasing products at a low cost. The transaction cost, communication, problem solving and change of suppliers impact in the product final cost.

Metrics and measures in the supply chain are divided in four levels: (1) planning; (2) Supply; (3) Production/Assembly; (4) Delivery/client. Under the planning level is orders entry, lead time and the way orders are placed. In the supply level is the supplier evaluation and partnership with then. The supplier evaluation involves important measures in the strategic, operational and tactic levels (Gunasekaran, 2003). The strategic level includes lead time, quality and cost. The tactic level includes efficiency of the purchase order cycle time, quality assurance and capacity flexibility. The operational level includes technical skill, schedule attendance and quality level desired.

In the production level is the capacity utilization, effectiveness of the schedule techniques and the range of products and services. The delivery/customer level is the delivery performance evaluation, number of receipts with error, delivery flexibility, distribution total cost, flexibility among others described by Gunasekaran (2003).

The sourcing strategy is the mechanism throughout the relationship between purchase and supply are managed (Bozarth, 1998). Four practices of supply strategic are recognized and describe the relationship between customer and supplier:

1. Information Exchange between Buyers and Suppliers;
2. Multiple Sources of Supply;
3. Formal Contract Relationships;
4. Informal Partnership Relations.

One of the strategies that lost usage is the multiple source of supply among a class of commodities. Many firms are reducing the number of sources used and allocating most of its purchases in one
single source (Speckman, 1988). These actions have many objectives: (1) few suppliers make the re-schedule activities easier because you have few supplier to contact, (2) volumes can be consolidated and discounts negotiated, (3) the chosen suppliers can dedicate capacity and reduce lead time, (4) the logistic cost and the complexity of routes can be minimized. Those benefits generally exceed those acquired by multiple sources.

Another strategy commonly used is the formal contract that specifies the nature of the relationship, including prices to be paid, quality and delivery expectations. The formal contract is commonly used by international firms that are starting a business process and use this resource to reduce the uncertainly of overseas negotiation (TurnBull, 1992)

The formal contract can be the door to the negotiation customer-supplier that, through the time, conducts to a cooperation partnership agreement. Such agreements are characterized by mutual compromise in problem solving and cost reduction (Ring de Van de Ven, 1994). To mutually find solution to the problems, buyers and suppliers must be willing to share a great amount of information, including those related to the design of the product.

Enterprises that buy components of high technology must explore partnership frameworks and involve suppliers in the development of new products acquire competitive advantage in the future (Bozarth, 1993). Long term partnerships allows higher components price, in order to attain gains in the inventory reduction, product quality and shorter lead times (Fawcett and Birou, 1992)

According to Linden (1998) and Ernest (1997), the transfer of the manufacturing operations to developing countries such as Brazil is one of the ways the Contract Manufacturing firms are working to reduce costs. The low expend in labor and the already developed industrial park contributes to this movement.

The sourcing strategy is critical to enterprises that operate the principles of supply chain management. It works with the management of the supply base in an intensive manner, identifying and selecting suppliers to long-term partnerships (Talluri and Narasimhan, 2003). Bowersox (2001) and Gunasekaran (2003) summarize the logistics parameters that are important to evaluate.
• Delivery Performance – lead time reduction and On-time Delivery;

• Distribution Total Cost – Effective distribution systems optimize the cost and efficiency of the process;

• Customer satisfaction and Service – The supply chain is not effective without satisfied customers. Flexibility is the most important issue for satisfaction;

• Quality – Complete attendance of ordered items, documentation and product without failures or damages.

2. Methodology

The methodology used in the development of the supplier performance evaluation tool is Action-Research (Coghlan, 2002). Some steps were established with structured interviews in the materials, Purchasing, Quality and Information Technology departments. Those areas are directly involved in the planning, purchasing and receiving process inside the company.

In the Action-research, the search for facts and experimentation of practical problems that require solution involving the collaboration and cooperation of researchers, as well as the members of the organization (Coughlan, 2002)

The developing process of the performance evaluation tool was characterized by the following steps:

• Criteria definition and parameters to evaluate the performance of suppliers;

• Data gathering and definition of the evaluation process;

• Statistical analysis to definition of suppliers to be evaluated and scoring level to be performed inside each parameter;

• Outlining the evaluation model;

• Methodology to data gathering;

• Analysis and validation of the model;

• Development of the software, which module incorporates the ERP system of the enterprise;
• Implementation and system follow-up;
• Tests and users training;
• First results and continuous improvement;

3. Development
The company studied in this process will be here denominated as EMSBrazil. It is a multinational that performs its operations in many markets assembling high tech electronic products. The company has over 40 manufacturing operations and repair around the world and approximately 35,000 employees. It is positioned among the 5 largest companies on the segment and has revenues of approximately 5 billion dollars.

The core competency of the company is the assembly of PCBs at a low cost, where the financial gains are in the management of the supply base, components and logistics cost reduction and production excellence.

The development process of the evaluation performance system was motivated by the difficult that the enterprise had to manage the supply base.

The urgency sense to the development of a tool capable of monitor and act over many suppliers of low efficiency had its summit when many information of various buyers could not be compiled in such a way that the managers could act in the problem solving. Each group of suppliers is dedicated to a product line (work cell) and they have different points of view about the efficiency of the same suppliers, but could not quantify and obtain a holistic vision of the business.

The majority of suppliers of electronic components are situated out of the country (around 90%) and this complicates the management of the supply base from language issues (the majority of suppliers are Asian) and time zone to transport, logistic costs and lead time. There are some distributors established in Brazil that facilitates the purchase of components, however, at a higher price than those directly purchased with suppliers, reducing the marginal profit of the company
A tool efficient to evaluate the suppliers and capable to guide the EMSBrazil in its sourcing decisions can help the company to attain the factors mentioned above and allow the company to have competitive advantage.

3.2. The Evaluation model

As the Supplier performance evaluation constitutes of an intensive data gathering activity where many areas or departments are involved to generate information, the data needs to be stored at one single location, in this case, a data bank or ERP of the company.

The definition of the parameters used in the performance evaluation was based in the world-class logistics concept (delivery date flexibility, cost, fast response to forecast changes, confiabilidade de entrega, proximity to customer) and tried to include the requirements of the EMSBrazil. The main parameters being evaluated were divided in two groups, denominated as Quantitative and Qualitative one. The first one received 80% of the total score distributed, the qualitative group received the remaining 20%.

Some of the quantitative parameters are Late Delivery, Early Delivery, Payment Conditions, Quality, Corrective Action Response Time and Quantity Discrepancy. Qualitative parameters are Backup Inventory Availability, Capacity to EDI or electronic systems for communication, escalation among others.

The classification of suppliers was based in the sum of the points received for each parameter following the table bellow:

- 90 – 100 World Class
- 80 - 89 Preferential
- 70 - 79 Good
- 60 - 69 Acceptable
- 0 - 59 Reproved
4. Results

A recent priority of the company is the increase of inventory turns and one of the goals established by the corporation is the reduction of the metric Early Delivery that could not be measured before the implementation of the tool. Today, with the tool available, this metric can be measured and results can be presented to each supplier.

One of the largest benefits brought to the company is the guidance proportioned to buyers in the sourcing of materials. Through the results obtained in the tool, the buyers can guide the purchase and orient the business to certain suppliers who offer best benefits.

The tool responds at the main objective of identifying suppliers and reducing its number. Besides that, the EMSBrazil can compare the results with other business units. The EMSBrazil used to guide the purchase materials by the corporate evaluation of suppliers, which not represented the performance well since performance is different to many companies’ sites.

The EMS also conquered new business because some customers require that the EMS have a performance evaluation system to guarantee that the product is delivered with high quality.

The software, due to the simplicity in data collecting and generation does not overload the employers in the task of fulfilling data. The quantitative data is generated automatically and the qualitative one is generated only every quarter, minimizing the work that the employers would have.

The results of the first 6 months are described below. They were obtained through the measure of 78 suppliers (Table 4.1):
We can conclude by the information above that the number of suppliers contained in the Class “Good”, “Preferential” and “Acceptable” remains almost constant, with low variations through this six month period, while the number of “World Class” and “Reproved” Suppliers are reducing. During this six month period the suppliers are concentrating in the Class “Good” and “Preferential”, occurring a variation in the number of suppliers “acceptable”. The numbers of suppliers reproved are constantly showing drops, since suppliers’ acknowledge the fact that they are being measured and seek for improvement in procedures and process.

5. Conclusion

The tool developed guide the buyers in the sourcing decision in a simple and efficiency manner and orient the head managers to act over the quality problems and cost reduction with valuable data, allowing the company to make a strategic planning of long term.

The tool also collaborates in the selection and reduction of the supply base, acting deeply on the management of the supply chain. Besides that, the tool can approximate suppliers in partnerships and business increase, reducing the costs of order management.
The main contribution of the tool was the unification and centralization of data into the ERP of the company, facilitating the data gathering and report release through the company, optimizing the daily activities.

The tool is today fundamental to manage the company supply base, helping the purchase and quality departments on taking decisions. It is being widely used inside the company and the continuous improvement will allow the tool to obtain better results.

7. References


