Chapter 3
Maximization of Delivery-Based Customer Satisfaction Considering Customer–Job Relationships in a Cellular Manufacturing Environment

Gürsel A. Süer
Ohio University, USA

Aslıcan Arınsoy
Ohio University, USA

ABSTRACT

In this chapter, the authors propose a mathematical model to maximize overall customer satisfaction subject to minimum satisfaction levels for selected customers. The mathematical model performs cell loading (i.e., assigns jobs to cells). The customer satisfaction is measured in terms of ratio of jobs completed to the total number of jobs from a customer. The proposed model connects jobs to customers. An experimentation was performed with this model in a multi-period rolling environment that tested four different fuzzy rules. Fuzzy rules were used to modify the minimum satisfaction levels for customers in a dynamic fashion in a rolling horizon. Fuzzy rules identify customers with low satisfaction in recent periods and attempt to increase their satisfaction in the following period. The performance of fuzzy rules is compared.

INTRODUCTION

Customer satisfaction is the key measurement of how a product or service of a company meets a certain customer's expectation. Since it is a subjective measure, there are various definitions in the literature on customer satisfaction. An important indicator of customer satisfaction in business is the number of repeat customers (WebFinance, n.d.). Increasing number of repeat customers shows an increase in the overall customer satisfaction. From a marketing perspective, customer satisfaction is

DOI: 10.4018/978-1-4666-5039-8.ch003

"the number of customers or percentage of total customers, whose reported experience with a firm, its products, or its services (ratings) exceeds specified satisfaction goals" (Farris, Bendle, Pfeifer, & Reibstein, 2010).

In today's highly competitive business world, it is not enough to satisfy customers to some extent, but it is important to achieve the highest customer satisfaction possible. In the Harvard Business Review, it is stated that the difference between a satisfied and a completely satisfied customer may "swallow a business" (Jones & Sasser, 1995). For this reason, companies need to pay close attention to customer satisfaction in a multi-period context and seek continuous improvement methods to increase customer satisfaction because customer satisfaction creates loyal customers in the long term. In addition, satisfied customers generally put positive word of mouth about the companies and it will increase the number or potential customers in the following periods.

Customer satisfaction depends on various factors. The quality of the product, meeting due dates, price, volume and mix flexibility in manufacturing are some examples of these factors that influence customer satisfaction (Zhang, Vonderembse, & Lim, 2003). In addition, operational performance has a direct and significant impact on customer satisfaction; higher operational performance increases the market share and profit of the company (Stank, Goldsby, & Vickery, 1999). Moreover, expected and unexpected values of the product have a direct impact on customer satisfaction (Sadeghi & Farokhian, 2011). Depending on the business sector, some other factors, such as customer expectation, perceived service quality, price promotions, complaint management, and service provider's attitude may affect customer satisfaction.

In this chapter, we are considering customer satisfaction issues in a cellular manufacturing company and customer satisfaction is measured as the percentage of jobs completed by their due dates in a given period. A mathematical model is developed to assign jobs to cells such that overall customer satisfaction is maximized. Furthermore, several fuzzy rules are developed to allocate minimum satisfaction restrictions for customers and their performance is evaluated in a multi-period rolling environment.

BACKGROUND

Demand management is the crucial linkage between marketplace and manufacturing. Some basic demand management operations are forecasting demand, specifying product requirements, setting due dates, updating customer order status and defining the requirements for manufacturing (Vollmann et al., 2005). Well-defined demand management utilizes the resources of the company, increases a company's profit and strengthens the relationship between the company and the marketplace. In order to obtain efficient demand management, a company's strategy, customers' expectation and manufacturing capabilities should support each other (Vollmann et al., 2005). In this study, we consider a cellular manufacturing company that follows Make-to-Order strategy and therefore meeting customer due dates is critical to maximize customer satisfaction. Make-to-Order strategy is also critical in reducing the finished goods inventory levels as the company does not have to produce based on the forecast. Any forecast errors may lead to increased and in some cases obsolete inventory. Inventory reduction is one of desirable outcomes that can be obtained in Lean Manufacturing systems.

Cellular Manufacturing System (CMS) is an application of Group Technology (GT) and the main objective of CMS is to balance product flexibility and cell utilization (Süer, Kamat, Mese, & Huang, 2013) . Some of the advantages of CMS are reduced lead time, work-in-process inventory, setup times, simplified scheduling, improved quality and visibility (Süer, Arikan, & Babayiğit, 2008; Wemmerlov & Hyer, 1989). There are two types