The Extend Customer Requirement Factors Based Service Level Evaluation for Manufacturing Enterprises:
Service Level Evaluation for Manufacturing Enterprise

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ABSTRACT

This study proposes a novel way to evaluate the enterprise customer service level (ECSL) for OEMs (Original Equipment Manufacturers). First, a set of service level evaluating metrics is established based on the extended customer requirement factors (ECRFs), which covers the whole service product delivery process to fully reflect enterprise customers’ service requirement. Then, the hybrid fuzzy multiple-criteria decision-making approach combining the analytic hierarchy process (AHP) and the technique for order of preference by similarity to ideal solution (TOPSIS) are adopted. In the evaluating model, a fuzzy method is used to reflect the ambiguity in human thinking and decision making. The weight of each decision maker is determined by a two-layer way to make it more objective. The individual preferences are aggregated by AIP (aggregating individual priorities) way in the group decision-making process of the AHP to respect each decision makers’ separate opinion. With the presented approach, ECSL can be evaluated and adjusted conveniently.

KEYWORDS
Fuzzy TOPSIS, Group AHP, Multiple Criteria Decision Making, OEM, Service Level Evaluation

INTRODUCTION

Currently, enterprises are connected by the business network or industrial supply chain, and almost no enterprises can finish all business process of a product independently, they need all kinds of services from suppliers or business partners. In the manufacturing industry, OEMs outsource and provide manufacturing service to other countries. Thus, manufacturing service is “product”, and the enterprises which would buy the manufacturing service are “customers” (Mihailescu, 2005) in the OEM manufacturing system.
The OEMs need to fully satisfy customers’ requirement and response to customers’ requirement efficiently and quickly to gain more customer orders. However, there is usually the wide gap between service providers and their customers. Customers’ possible response of service activities cannot be put into the service system efficiently. Service level evaluation can function as feedback from service suppliers to customers, help to make clear the relevant customer requirement metrics from the customer point of view, and determine the target value of these requirement metrics. It is essential for the service system operating so as to make the system integrated.

Besides the traditional important customer requirement of punctuality, enterprises customers concern more about the manufacturing process of the products currently, their attention extends to cover supplier selection, volume flexibility, flexible delivery, environmental friendship (Niu et al., 2015; Wang et al., 2016), and the preferences of different kinds of enterprise customers also vary on these factors. These extended factors are referred to as the enterprise customer requirement factors (ECRFs) in this study. The ECRFs reveal enterprise customers’ concerns about manufacturing service supplied by OEMs. Satisfy the extend requirements of enterprise customers and improve enterprise customer service level (ECSL) is essential for OEMs being competitiveness compared with their peers so as to attract more orders.

Among the ECRFs, order completion time is the primary basis of the ECSL. The order completion time sets the up limit of the ECSL. Besides, the other nonmanufacturing ECRFs also play different roles in affecting the ECSL degree. The CSL evaluation for OEMs needs to consider all ECRFs and describe their contribution to ECSL appropriately.

However, only a few studies on suitable ECSL evaluation methods, including manufacturing and nonmanufacturing factors are available. The effective method needs to be established to evaluate the ECRFs based enterprise customer service level. Thus, this study attempts to propose the ECRFs-based ECSL evaluation method for OEMs. A hybrid fuzzy multiple criteria decision making (MCDM) approach combining the analytic hierarchy process (AHP) and the technique in order of preference by similarity to ideal solution (TOPSIS) is adopted. With the presented approach, CSL can be evaluated and adjusted conveniently.

The rest of this paper is arranged as follows: Section 2 presents a brief literature review of the customer service level evaluation of manufacturing enterprises. Section 3 describes the proposed evaluation method. Numerical example is provided in Section 4. Finally, Section 5 provides the conclusion of the study and further research areas.

2. LITERATURE REVIEW

Research on manufacturing-enterprise-related customer service mainly concentrates on production and inventory control and product development. These operation processes can affect customer satisfaction directly so as to change the enterprise performance rapidly. With the popularity and the generalization of the service concept, service also has been used in manufacturing system configuration, such as SOM (service-oriented manufacturing) and PSS (product service system) (Geng et al, 2012). The definition of service varies with the various research targets.

When connected with the production line and inventory management, customer service is usually used as an evaluating parameter in optimizing constraints. Among them, Lei Yang et al. (2010) presented a new Kanban system operating in a multistage, mixed-model assembly line to help an enterprise improve its customer service level through timely delivery. Jin Cao et al. (2016) proposed a novel customer demand prediction (CDP) approach for service-oriented manufacturing (SOM) incorporating customer satisfaction to cope with the issue that the customer satisfaction would significantly influence the customer demand of the following purchasing periods.

Customized product development or product configuration is considered an effective way to meet the needs of individual customers. Wang (2013) considered customer service level in product configuration, wherein the importance of product attributes was derived from its satisfactory
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