An ERP model for supplier selection in electronics industry

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ABSTRACT

Asus Tech. is the largest motherboard manufacturer in Taiwan. Hundreds of suppliers cooperate with the company in business. So that supplier selection is the most important function of a purchasing department in the enterprise. An enterprise resource planning (ERP) system in the process of supplier selection may result in the great savings in both costs and man hours. In the concept of push and pull, an ERP system acts as an efficient tool in the resource integration and profit creation for a company. Through ERP, a decision manager can clearly realize the strength and weakness of the purchasing operation. To establish a real-time purchasing environment, a methodology of analytic network process (ANP), technique for order preference by similarity to ideal solution (TOPSIS) and linear programming (LP) are effectively applied in the supplier selection process. ANP and TOPSIS are used to calculate the weight and give suppliers a ranking; LP effectively allocates order quantity to each vendor. As to the result, four PC board suppliers are given orders for 1200, 727, 1000 and 73 pieces.

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1. Introduction

ERP is an information system to plan and integrate all of an enterprise's subsystems including finance, purchase, production, human resources and sales. The primary function of ERP is to integrate the interdepartmental operation procedures and management information systems (Yang, Wu, & Tsai, 2007). ERP effectively reduces supply chain cost, shortens production time, improves products' quality, provides better service to the customer, and balances the forecasted supply and demand. Fig. 1 is an ERP integration system which includes the main divisions of the enterprise that need to link and integrate. Effectively implementing an ERP system from buyer to supplier may reduce significant cost and substantial amounts of time (Tarantilis, Kiranoudis, & Theodorakopoulos, 2008).

Supplier selection and order allocation are the most significant issues in the purchasing division of enterprises, and these two issues can be effectively integrated into an ERP system to optimize the purchase environment. Selecting the right suppliers not only brings substantial benefits for companies but also increases customer satisfaction. Chen, Lin, and Huang (2006) concluded that the supplier selection problem is a group-decision problem made under numerous criteria, as well as uncertain and imprecise data. Manufacturers must cooperate or have interactions with suppliers to maximize productivity and minimize the total cost (Chou & Chang, 2008). In the past, price was the key reason to choose a supplier because cost reduction is the main consideration for a decision maker. Thus, in the traditional scenario, a vendor provided the lowest price without more concern for other prerequisites, in order to earn more orders from customers. However, in today's competitive global business environment, if an enterprise strives to maintain its competitiveness, its decision maker needs to simultaneously consider suppliers' price, quality, service, etc. Hence, supplier selection is a multiple criteria decision-making (MCDM) problem that requires consideration of both tangible and intangible factors.

Ghodsypour and O'Brien (1998) provided a model combining analytic hierarchy process (AHP) and linear programming to take into account tangible as well as intangible criteria for vendor selection, and to effectively solve order allocation problems among suppliers. This study combines two kinds of MCDM methods, ANP and TOPSIS and a multi-objective programming method. ANP is used to compute the weight of criteria and sub-criteria. After determining each criteria by ANP, TOPSIS is performed to calculate the final score of each alternative, giving each alternative a ranking. At the final step, bundled with the constraints of quality, capacity, delivery, etc., LP is used to compute the optimal order quantity of each supplier after assessing the weight of each alternative. The procedure of supplier selection can be shown in Fig. 2.

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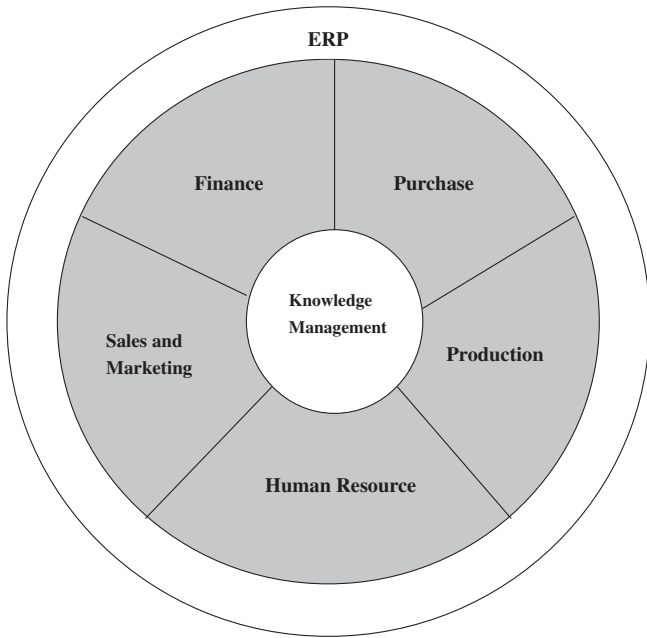URL: http://web.ypu.edu.tw/prince/html/reports_01.htm (C.-T. Lin).

Fig. 1. Main divisions improvement through ERP system.

1.1. Push and pull

Adopting an ERP system in a purchasing department has two incentives, push and pull. In today's fast-paced, quickly changing environment, enterprises confront more pressure and more challenges from internal forces within the company, as well as from factors external to the company. Hence, enterprises expect to phase in an efficient tool, ERP, to optimize the company operation.

The substantial benefits of phasing in ERP are integration, flexibility and real-time responses. The two incentives of push and pull are the main reasons that enterprises adopt an ERP system to
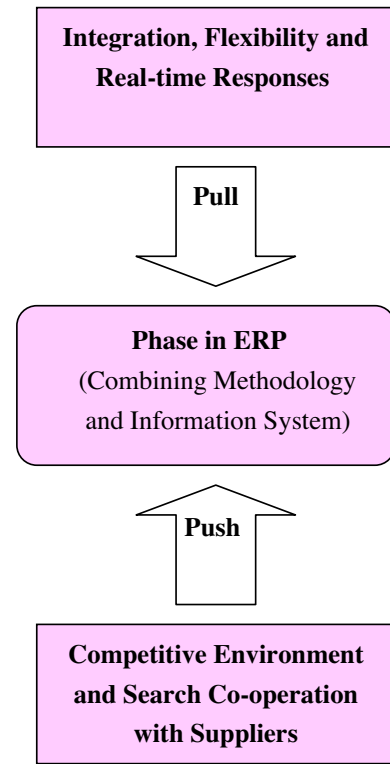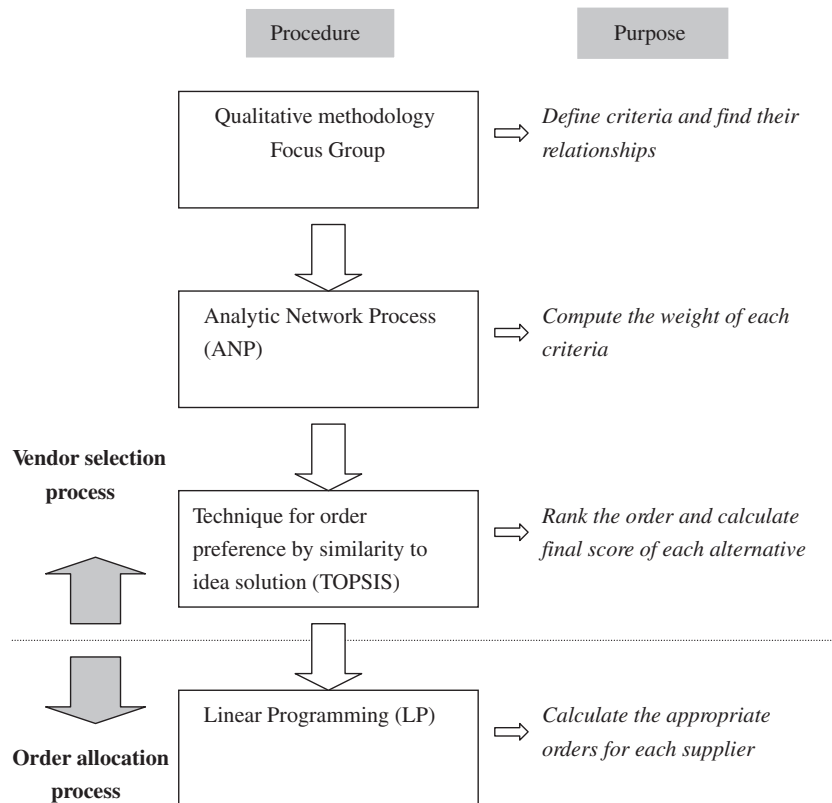

Fig. 3. Push and pull concept in an ERP system.

Fig. 2. Procedure of supplier selection system.