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The role of ERP tools in supply chain information sharing, cooperation, and cost optimization

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Abstract

The transaction based integrated Enterprise Resource Planning (ERP) software provides different tools that can support supply chain integration but at the same time it has several features that obstructs the integration with business partners. We concentrate on the inventory management aspects of supply chain coordination reviewing the recent quantitative modeling and organizational results available in literature. We summarize the results of a detailed numerical and sensitivity analysis based on our previously published models for supply chain cooperation and joint optimal ordering and shipment policies for the buyer and supplier. These results can be used in enterprise software to measure the potential monetary value of policy coordination, to promote cooperation, and minimize the total supply chain system cost. Our further goal is to combine quantitative tools with organizational and management factors, and to integrate them in a multi-level framework of policy coordination.

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1. Introduction

Enterprise Resource Planning (ERP) software systems have focused on internal process integration of traditional functions, such as sales, production, and inventory management. The transaction based integrated processing provides different tools that can support supply chain

integration but at the same time it has several aspects that obstruct the integration with business partners. By gaining access to the suppliers' production and delivery schedules, buyers can improve their own production plans and delivery schedules. Correspondingly, suppliers can use the buyer's real time store level data to plan their inventory levels, and production schedules. Sharing order status information among the supply chain partners improves customer service quality, speeds up the payment cycle and provides cost savings. Sharing data regarding to performance

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metrics such as lead times, quality specifications, return status, etc., helps supply chain partners to identify and overcome the bottlenecks in the supply chain.

In this paper first we summarize the most important tools and concepts of ERP systems that help in supply chain information sharing, cooperation, and cost optimization. On the other hand the obstacles of cooperation are characterized and suggestions for improvement are listed. In the third section, we provide the quantitative analysis and support for the three different development phases: first we discuss the traditional, adversary relationship between buyer and supplier, and then the case of partnership and the joint optimal policies are discussed, followed by the consideration of the effects of supply chain network. In the fourth section we deal with the organizational analysis and summarize the barriers, bridges of inter-organizational cooperation. Next, we outline a multi-level framework of cooperation for supply chain partners. In the last section conclusions and further research plans are summarized.

2. ERP tools: Opportunities and obstacles for supply chain integration

The implementation of ERP enables the companies to move towards an extended enterprise business model that enhances value across the total supply chain. In order to gain supply chain efficiencies, companies need to exchange large amount of planning and operational data, ranging from information for annual contracts and periodic progress reporting to real-time delivery and invoicing data. The advantages and obstacles of ERP tools have been discussed in several research papers. Next we quote some relevant statements from the recent articles that underline our research problems and approaches:

Although ERP packages strive to integrate all the major processes of a firm, customers discover that some essential functionality is lacking—[Scott and Kaindl \(2000\)](#).

Traditional ERP infrastructures failed to support an extended business model across the supply chain—[Edwards et al. \(2001\)](#).

The challenge is to figure out what, how, where, who, when, and why manufacturing operations can feed the ERP beast—[Harrold \(2001\)](#).

Since ERP philosophy is process based, rather than function based, it necessitates disruptive organizational changes—[Hong and Kim \(2002\)](#).

ERP systems mostly adopt a myopic view of planning, based on pure deterministic planning methods—[Landeghem and Vanmaele \(2002\)](#).

ERP provides several tools; the two most important for supply chain integration are the real-time transaction tracking and the internal process integration. Next we outline the four main opportunities offered and the obstacles of using them. In [Table 1](#) we formulate four research questions and indicate the directions how we try to answer these questions in the subsequent sections using quantitative and organizational analysis.

The traditional vertically integrated business model requires re-evaluation. The ERP software vendors saw the above problems and started providing advanced decision support tools that are the new ERP software extensions. Among them the most important directions are: the Advanced Planning and Scheduling (APS), Demand Planning and Revenue Management (DPRM), Customer Relationship Management (CRM), Sales Force Automation (SFA), and Supply Chain Management (SCM).

In this paper, we concentrate on the inventory management aspects of supply chain coordination. With our quantitative analysis we try to present results in information systems area by

- providing guidelines for transaction tracking,
- promoting visibility of information for the supply chain, and by
- supporting coordination among business partners.

In the decision support area we try to

- improve the quality of ordering and transportation decisions (for SCM and DPRM),

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