Chapter 8
Collaborative Demand and Supply Planning Networks

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ABSTRACT

The focus of manufacturing planning and control has gradually expanded from (in-house) production activities towards all manufacturing and logistic activities in the supply chain. Planning of in-house operations is still very important, but the trends towards increased use of outsourcing and mass customisation require that customers and suppliers are able to exchange information frequently to cut down costs and lead time while quickly adapting their manufacturing and logistics operations to market/customer requirements. Many vendors offer systems to plan and control in-house operations, whereas only a few large vendors (such as Oracle, SAP and I2) offer supply chain planning systems. This limits the ability for SMEs to exploit the supply chain planning options. This chapter discuss current supply chain planning solutions and presents a more simple and adaptive concept to be used in both SMEs and larger enterprises. The research presented in this chapter is funded by the EU Union via the EmpoSME, ValuePole projects, and by the Research Council of Norway via the SFI Norman project.

INTRODUCTION

Most manufacturing companies face strong competition and continuous changes in market and customer requirements. Planning are frequently affected by the actions of suppliers and customers in their supply networks such as changes to orders that are already in production or re-planning caused by lack of materials or resources. Often, decisions have to be made without having a complete, real time overview of possible options and associated consequences. The result is typically excess inventories, too long lead times, too low customer satisfaction and poor resource utilisation.

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Supply networks are dynamic and hard to define, and a single company is often part of several different supply networks simultaneously. An increasing level of customisation combined with demands for high quality, low costs, short and precise delivery times, and high flexibility represents a significant challenge to managing operations in networks.

Although these challenges will apply to companies of all sizes, they are particularly true for SMEs due to the following characteristics:

- The network are typically non-hierarchical
- They have limited staff available for specialist roles in planning and decision making
- They have limited resources available to invest in Advanced Planning Systems
- They require flexible tools which let them exploit the advantage of typically being flexible and easier to manage than larger enterprises

Observation shows that information exchange is often limited to order placements without any kind of information visibility or other communication between network partners. Thus network effects of individual decisions are often not possible to neither intercept nor predict. This implies that planning and control at any network partner is currently executed with incomplete information about status among the other network partners and without the possibility to see the full consequences of decisions being made. Additionally, the planning and control task will vary with regards to scope and complexity challenging the traditional planning and control approaches, and existing methodologies, tools and knowledge.

The paper briefly discusses three major areas for manufacturing in non-hierarchical networks. After this a more simple and adaptive alternative approach to existing APS solutions is presented, and finally the approach is positioned in a broader perspective titled "Work Bench Concept" to be used in both SMEs and larger enterprises.

COLLABORATION IN NON-HIERARCHICAL NETWORKS

Typical for SMEs is that they operate in non-hierarchical networks, characterised by power being distributed among members, and the absence of one or several dominant actors that dictate plans or impose a centralised planning perspective (Harland et al., 2001). In such networks each member participates in multiple supply chains and all members are more or less equal in status and therefore no member has the power to dictate the others (Jagdev and Thoben, 2001). The core part of each network might form what could be titled as a Virtual Enterprise to share skills or core competencies and resources in order to better respond to business opportunities.

Coordination and collaboration between the companies is vital in such networks. Collaboration refers to the activities and environment related to the "joint planning and execution of supply chain activities" (Ayers, 2006), and is therefore an essential element in planning activities in a network perspective. Collaboration is using cooperative efforts in order to meet mutual goals, exchanging information, developing improvement in partnership (Ayers, 2006). A manufacturing network is fully coordinated when all decisions are aligned to accomplish global system objectives (Sahin and Robinson 2002); of course when this occurs decisions have already crossed the company's boundaries, meeting articulated and complex contexts (Danese et al., 2004). Several collaborative models for coordination networks activities have been developed. The aim of models such as collaborative planning, forecasting and replenishment (CPFR), vendor managed inventory (VMI) and automated replenishment programs (ARP) is to achieve seamless inter-organisational interfaces by specifying control principles and operations