

A combined financial and physical flows evaluation for logistic process and tactical production planning: Application in a company supply chain

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Abstract

This paper proposes an approach to evaluate tactical production planning in supply chains. The production planning evaluation is usually based on physical parameters (stock level, demand satisfaction, etc.). Adding financial evaluation to classical evaluation could be relevant. This paper proposes to implement Activity Based Costing (ABC), cost drivers, and payment terms in order to estimate cash flow created by supply chain tactical production planning. Links between financial and physical flow are done by the evaluation of production planning impact on indirect cost. This evaluation is made using logistic process activities. This kind of cost model could be integrated in supply chain software like advanced planning and scheduling (APS) tools. An application of this type of evaluation is done on a real industrial case study.

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1. Introduction

A company's supply chain is "comprised of geographically distributed facilities such as plants, distributions centres, and supplier's warehouse" and "transportation links carrying products between facilities" (Lee et al., 1997). This chain (Beamon, 1998) is traditionally characterized by three types of flows:

- The forward physical flow (purchase of materials, transformations of the raw materials into products, delivery of the products). The physical flow optimization aims to satisfy the final customers.
- The backward financial flow that circulates in a discontinuous way. The financial flow optimization is made in a local way, in each supply chain link, but seldom in a global way. The financial flow optimization (Badell et al., 2005) will make possible the shareholders satisfaction and the supply chain working improvement.
- The backward information flow that allows the coordination of financial and physical flow between each node, and the global supply chain coordination.

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The flows integration is usually made by enterprise information system based on software tools like Enterprise Resource Planning (ERP) and/or Advanced Planning and Scheduling (APS). The information flows are out of the scope of paper.

The paper objective is to propose an approach to evaluate logistic process performance in supply chain by discussing connections among the physical and the financial flows across the chain. Judging from the literature, these flows do not always overlap in supply chain management. If there are some works which propose to analyze the impact of physical flow in financial flow in strategic planning (Vidal and Goetschlackx, 2001), very few works show relationships between cash position and planning in tactical or operational dimension. A study of supply chain manager interest for integration of financial impact in operational and tactical planning is done by Vickery et al., (2003). These authors show that managers are really interested by tools, which integrate financial and customer aspects in optimization. Despite their real interest, this kind of tools do not yet exist.

Hence, the challenging problem consists in formalizing relationships between physical and financial flow by their integration in tactical planning for an internal supply chain (a company supply chain). Our aim (Fig. 1) is to propose an approach that allows the use of budgeting in production planning with APS tools for company supply chain. Indeed, in actual APS, operational and tactical plans do not integrate financial resources synchronisation. This paper proposes to integrate financial metrics in computer model for APS. Regarding to tactical

level, we assume that budgeting and planning financial and physical flows could be synchronized. This kind of synchronization can be seen as a performance driver for supply chain management. By integrating financial parameters such as payments terms in Activity Based Costing (ABC) models and by coupling these kind of models with planning models, each production plan will be associated with a budget and with financial metrics.

The paper is organized as follows. Section 2 discusses previous work about cash management and tactical planning evaluation with ABC. Section 3 presents a modelling framework for supply chain evaluation called PREVA for PROcess EVALUation. Section 4 presents computational results based on PREVA approach on a case study. Finally, some conclusions are given in Section 5.

2. Literature review

First paragraph deals with tactical planning in supply chain. Second paragraph of this section studies links between physical flow and financial flows in supply chain management

2.1. Tactical planning generic variables in supply chain management

Supply chain tactical planning consists in determining quantity of items manufactured or transported across supply chain on a given horizon. Most of the papers about supply chain planning propose mathematical models in order to achieve this goal. All these models rise from a lot-sizing model called

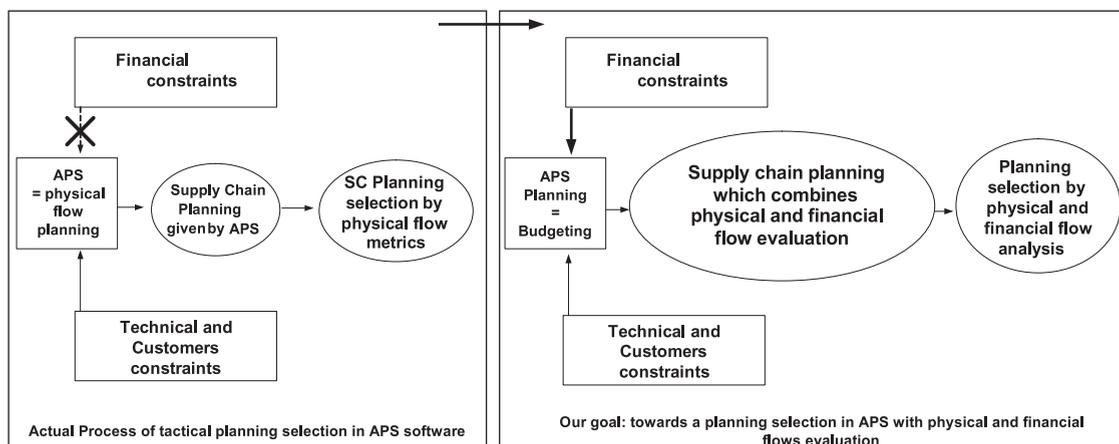


Fig. 1. Towards a planning selection in APS by applying physical and financial flow evaluation.

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