

# Stochastic Models for Cash-Flow Management in SME

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## INTRODUCTION

Financial management is one of the top concerns of many small and medium enterprises (SMEs). Especially, when the enterprise progresses through various life-cycle stages, they face more problematic situations in managing their financial assets (McMahon, 2001). Furthermore, SMEs usually incur high interest rate for any types of financial services due to their higher credit risk, and resource constraints they face when they use financial services (Baas & Schrooten, 2006). The need for more careful and effective financial management is of critical importance to researchers and managers of SME's. Accurate cash-flow forecasting models that are easy to use are becoming important for businesses to manage their finances efficiently. Such models will be especially critical for SMEs when liquidity and credit decrease in the economy. In this chapter, first, we model a business process of a furniture manufacturer SME in a flow chart to visualize the product flow, information flow, and cash flow in order to identify the relationship among them and potential re-engineering opportunities. Additionally, we apply a Markov Chain based cash-flow forecasting technique from management literature proposed by Corcoran who extended the work of Cyert et al. (1962) to predict cash collection of a real furniture manufacturing SME in Pennsylvania (Corcoran, 1978; Cyert, Davidson, & Thompson, 1962). We aim to compare the accuracy of the

stochastic model with those of other common practices in industries. This forecasting technique uses exponential smoothing to accounts receivable aging to forecast annual cash-flow within about 2% error, a considerable improvement compared to the industries' prevailing practice which is about 15%-18% error. The cash flow forecasting model is implemented in Excel to ensure ease of use and data integration. Lastly, we present "what-if" analysis discussing impacts of profit margin, high versus low, on the cash flow.

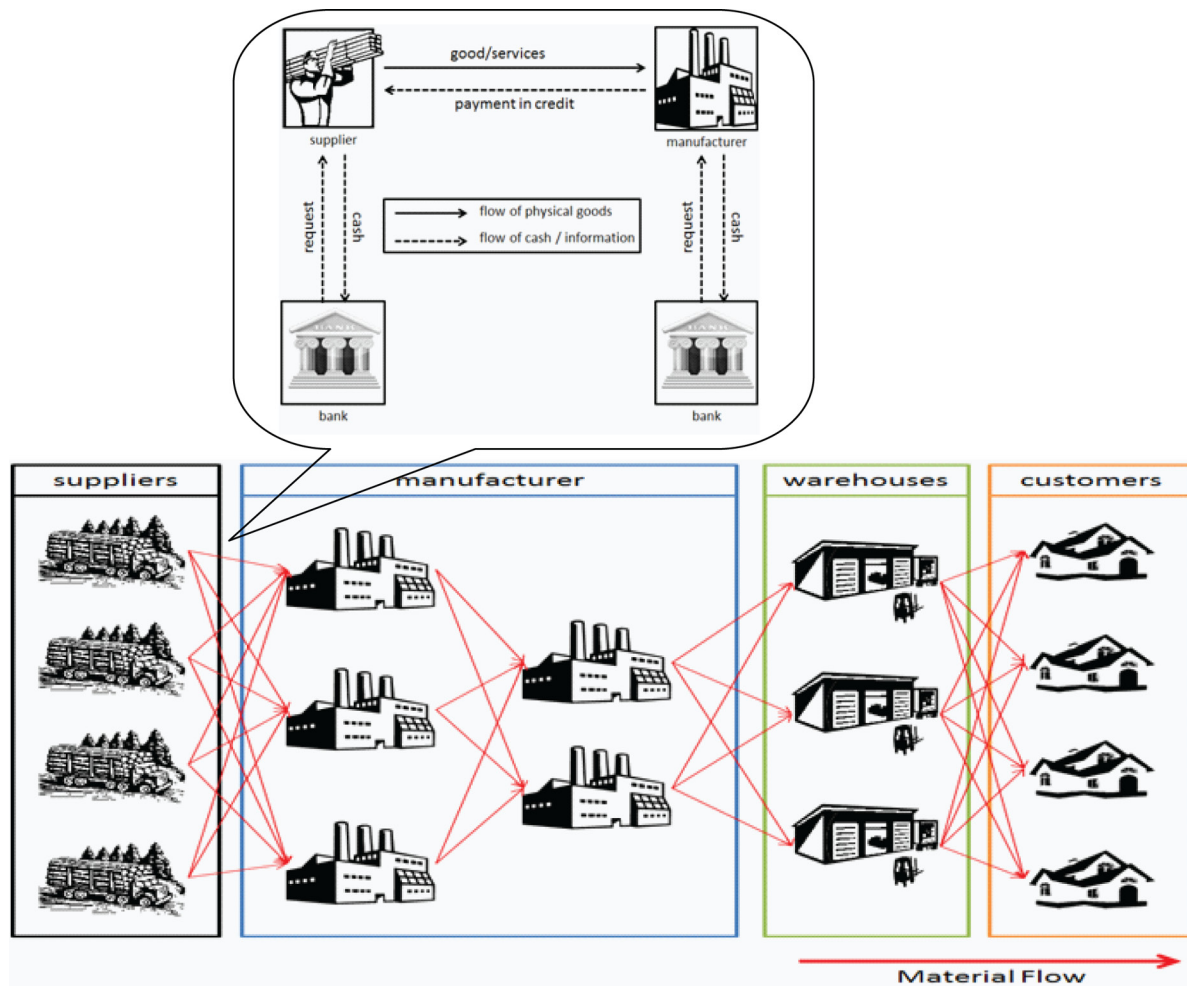
## BACKGROUND

### Flows in Supply Chain

Supply chain management is currently a fast growing area in most businesses and is considered as key to the success of most leading companies. Typically, a supply chain involves coordination of three major flows which are product flow, information flow, and cash flow (Chopra & Meindl, 2007). Figure 1 shows these three flows between a supplier and a manufacturer at one stage of a multi-stage supply chain. These flows continue in all stages across the supply chain. In this chapter, we focus on the relationship between the cash flow and the product flow of fundamental entities in a supply chain, a small and medium enterprise (SME) manufacturer and its supplier.

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Figure 1. Flows in supply chain



The business process of an SME, a furniture manufacturer in Pennsylvania called Acme, is detailed from the beginning of the customer order process to the end of the payment collection process. One of the main purposes of the business process model is to enable a common understanding and analysis of a business process. For that reason, many researchers and practitioners attempted to measure the complexity of a business process using various diagrams such as UML and BPMN (Aguilar-Saven & Sara, 2004). The summary of the processes is listed below. Details may vary by industries.

1. **Order placement:** By the nature of this industry, Acme applies a pull production system. In other words, the business process begins upon a customer order request which can be done by phone, email, and online through a Website. Then, the sales department processes the quotation. Once the quotation is accepted, the customer places an order via a purchasing order (PO). All activities in this step show the flow of information exchanges between the two parties.
2. **Manufacturing process:** Once the PO is received, the manufacturing process begins by determining the design of the product and

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