

**Electronic Supply Chain Collaboration  
for Small Job Shop Manufacturers:  
An Exploratory Triangulation Study**

by

**Thomas Magnuson Coe**

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ELECTRONIC SUPPLY CHAIN COLLABORATION FOR  
SMALL JOB SHOP MANUFACTURERS:  
AN EXPLORATORY TRIANGULATION STUDY

A Dissertation

Presented to the  
Faculty of the Argosy University–Orange County

In Partial Fulfillment of  
The Requirements for the Degree of

Doctor of Business Administration  
in  
Information Systems

by

Thomas Magnuson Coe

July 2004

Abstract of Dissertation Presented to the  
Graduate School of Argosy University–Orange County  
in Partial Fulfillment of the Requirements for the  
Degree of Doctor of Business Administration

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2004

Chairperson: Dr. Judith L. Forbes

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Dr. Paul Bramhall

Department: School of Business

Driven to improve their competitive advantages, manufacturers are looking to electronic supply chain collaboration (ESCC). The benefits of ESCC have long been described in the literature, but only recently, after considerable advances in the capability of information technology, have these benefits been verified by empirical studies. The high cost of ESCC has limited its early application to larger companies. Although interest in ESCC is high in business and information systems circles, the large group of small manufacturers has received meager attention. Theory suggests, however, that ESCC benefits are maximized as more supply chain partners integrate their information systems into a supply chain network. This exploratory triangulation study considered the current

state and future implications of ESCC for the small job shop manufacturer. Three lines of research addressed the problem in terms of the SJSM business environment, ESCC technology, and success cases studies.

The study found that ESCC integration is proceeding slowly, impeded primarily by a lack of standards for data integration. Advances in the Internet and related technology have, however, eliminated all but the last few barriers to ESCC. The remaining barriers are likely to fall pending acceptance of new ESCC standards such as RosettaNet. ESCC is already well established in select industries and will accelerate into other industries as standards develop. Currently, most ESCC activity is between top- and mid-tier manufacturers, but this activity will eventually spread down to third-tier small manufacturers. The study found no evidence that true integration, or the exchange of data between trading partners without retyping, is currently practical for most SJSMs. The study did find that low-integration ESCC is currently practical for SJSMs. In low-integration ESCC, manufacturers use Web portals to remotely access their trading partners' information systems. Low-integration ESCC can be implemented at low cost and offers advantages such as positive return on investment, competitive advantage, and a head start toward advanced ESCC. At the time of the study, only a few SJSMs had attempted even low-integration ESCC. SJSMs have, however, widely adopted the Internet for static Web sites, for email, and for exchanging electronic documents, including CAD drawings. Although neither haste nor large investment are called for, the study recommends that SJSMs take measured steps toward truly integrated ESCC and concludes that skills in ESCC will be necessary for SJSMs to protect their competitive advantages within the next four to eight years.

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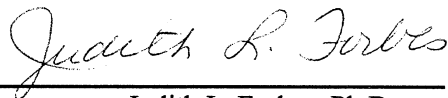
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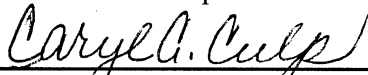
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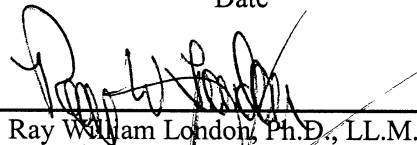
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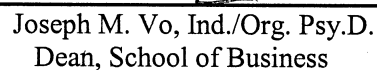
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## DEDICATION

To Tammy, my wife and dance partner.

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## CHAPTER ONE: THE PROBLEM

The great Internet revolution seems to have fizzled with the collapse of the dot-com bubble. But the major productivity gains from the Internet are still to come. New Internet technology promises to improve productivity by closing the information gap between buyers and sellers. This improvement comes under the umbrella of supply chain management (SCM). Manufacturers in particular are told that they must embrace electronic collaboration and SCM to remain competitive. Wal-Mart's years of steady growth with ever-lower prices are attributed to its SCM skills; Kmart's bankruptcy is blamed on inadequate SCM.

The market for SCM software and services is expected to grow from \$3.8 billion in 1999 to more than \$20 billion by 2004 (Maynard, 2000; Rutner, Gibson, & Vitasek, 2002). SCM has become an important topic at business schools. Manufacturing professionals are barraged with reports of the benefits of SCM-related projects. SCM is said to improve market share, quality, and time to market while reducing costs and inventory (AMR Research, 2002; Chandra, 2002; Hays, 2002; Karpinski, 2002; MacKrell, 2001; Oracle Corporation, 2002; PRTM Management Consultants, 2002; QAD Incorporated & University of Michigan Business School, 2002). A Deloitte research study found that companies effectively using supply chain applications were 81 percent more profitable than those who did not; the study also found that despite the benefits, just 13 percent of responding companies fully used the technology (T. Smith, 2002a).

Although much energy and excitement surround SCM, software suppliers have neglected an important segment of the manufacturing economy—the small manufacturer.

Professionals who work closely with small manufacturers such as machine shops see abundant opportunities for improvement through electronic collaboration. These opportunities, however, are largely ignored by software solution suppliers, the trade press, and academic researchers. This dissertation investigates this neglected area of electronic collaboration and supply chain management with the small manufacturer. This work will also introduce a related topic not previously studied: the possibility of applying SCM with a much lower investment in information technology than that required for conventional approaches.

This chapter introduces the study. The first section discusses the problem background and defines the key terms. The second section reviews underlying theory and literature. Remaining sections discuss the need, purpose, hypotheses, and method for the study.

### Problem Background and Definitions

This section introduces, defines, and combines the ideas of supply chain, integration, and collaboration, resulting in the key definition for the study. The differences between small- and large-investment versions of the technology are explained, and the nature of the subject for the study, the small manufacturer, are described.

#### *Supply Chain Concept: A Tool for Business Improvement*

Businesses do not exist within four walls. To improve a business, attention must be paid to what customers want and what is available from suppliers. Supply chain analysis is a tool for improving business by considering the big picture, such as the

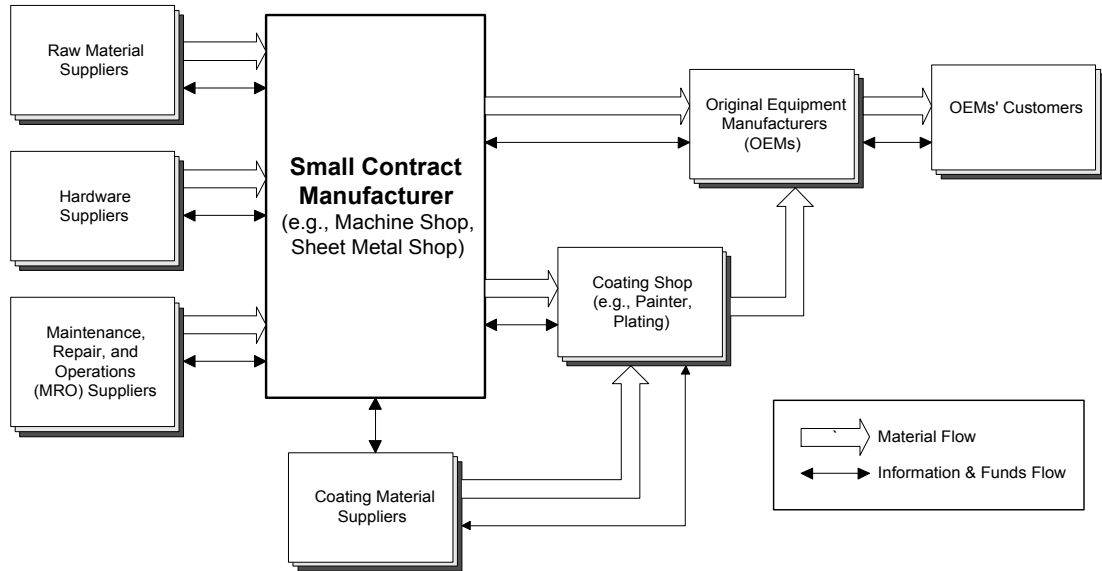


Figure 1.1. Simplified Supply Chain for the Typical Small Job Shop Manufacturer.

supply chain for a typical job shop shown in Figure 1.1.<sup>1</sup> The idea is to consider the entire supply chain as a system, thus improving the performance of the shop as a whole.

Manufacturers have applied supply chain tools to reduce common problems such as shortages, excess inventory, excess cost, and poor quality. By working closely with supply chain partners, companies are able to bring new products to market faster and gain strategic competitive advantages (Lambert, 2001; MacKrell, 2001).

---

<sup>1</sup> The terms *supply chain* and *value chain* were popularized by business author Porter (1985). Porter used the term *value chain* to describe processes internal to the company and *supply chain* for outside suppliers. Some authorities follow Porter’s internal/external value chain/supply chain convention (Cox & Blackstone, 1998; Housel & Skopec, 2001), while others use the terms interchangeably to refer to all the processes between raw material and the customer (Intel Press, 2002; Najarian, n.d.; Sussman, 2002). The term *supply chain* has gained wide acceptance and is used in corporate titles, names of university departments, and business publications and as a category of application software. For this dissertation, the broad process-oriented definition supplied by Ayers (1999) is preferred: “The supply chain includes all the processes that put the product in the hands of end users. This includes numerous transactions involving physical movement, exchange of information, and the flow of money” (p. 1).

Conceptually making customers part of the system, instead of excluding them, helps the entire system deliver what customers want (Stank, Keller, & Daugherty, 2001). Once the complete supply chain is understood, it is possible to improve the way it works. By improving the flow of information along the supply chain, the system adapts more rapidly to meet the needs of the customer.

### *Integration*

Improving the use and flow of information in a supply chain is known as integration. With improved integration, supply chains can save money by acting quickly. A typical example comes from the automotive industry, where the popularity of colors changes rapidly and influences sales. A few years ago, it could take weeks for a change in color demand at the dealer to reach the paint manufacturer. Now, with a well-integrated supply chain information system, the paint manufacturer and the auto assembler can adjust their product mix on a daily basis. Cars that are available with popular colors and options sell better, and discounting of unpopular styles is reduced. Rapidly communicating demand information is only one of the many benefits of integrating information flow along the supply chain. Among the most important benefits of integration is ease of collaboration.

### *Collaboration and Synergy*

Collaboration occurs when two or more people or organizations work together. Under good circumstances, working together results in synergy. Synergy occurs when two or more people or organizations working together achieve results that are better than they could have achieved working separately. Manufacturing requires human and other resources far beyond those available to all but the largest organizations. Collaboration is



always present in supply chains to some degree (i.e., placing an order), but collaboration is enhanced when supported by long-term relationships and specific tools for exchanging and managing information. Information technology and the Internet have provided tools for collaboration such as email, online conferencing, shared documents, and automated exchange of data. These electronic tools enable implementations of the supply chain and collaboration concepts. Although the combination of these concepts is often studied under terms such as supply chain management, this study introduces a more specific term, *electronic supply chain collaboration (ESCC)*.

#### *Electronic Supply Chain Collaboration Defined*

ESCC is a systems approach to integrating a supply chain, whereby multiple businesses work as a team, aided by information technology, to optimize the entire supply chain, thus reducing total systems costs and improving customer responsiveness. Customer responsiveness involves aligning the product design, price, time frame, and delivery method to the customers needs.

ESCC allows the exchange of data among supply chain partners, preferably in real time. The data exchange covers routine functions among the parties in a format that is integrated with each party's internal information systems. ESCC encompasses not only business transactions and operations but also product design, life-cycle management, support services, and quality functions. ESCC aids, automates, and enhances the individual and group relationships among organizations. Ideally, ESCC is characterized by cooperation among businesses using multidisciplinary teams for the benefit of the entire chain, including the customer and each member business.