

The frontiers of eBusiness technology and supply chains

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Abstract

This article is an Introduction to this Special Issue on “eBusiness and Supply Chain Management.” It also provides a vision for eBusiness and supply chain for the future.

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1. Introduction

Henry David Thoreau, arguably one of the greatest thinkers of his time said of Samuel Morse’s invention of the telegraph:

“We are in great haste to construct a magnetic telegraph from Maine to Texas; but Maine and Texas, it may be, have nothing important to communicate.¹”

Just like the telegraph and the railroads in the mid-nineteenth century, the Internet, and indeed, digitally enabled technologies, has fundamentally changed how businesses manage their supply chains. When Samuel Morse sent his first telegraphic message “What has God Wrought?” in 1844 (from the Book of Numbers) little did he imagine the magnitude and scope of change created by information technology (compare Morse’s message to Wal-Mart’s data warehouse which exceeds half a *petabyte*!²)

The times they are changing!

For the purposes of this Special Issue, we define eBusiness technologies as the use of the Internet or any digitally enabled inter- or intra-organizational information technology to accomplish business processes. Over the last decade, such technologies, specifically the Web, have revolutionized supply chain design, management, and control. They have enabled a paradigm shift from inventory to information; from competition to collaboration; and from cost to value.

eBusiness technologies have permeated every supply chain process. Products are collaboratively designed on the Web; procurement software and exchanges have streamlined purchasing and reduced transaction costs; ERP systems have codified, standardized, and automated data storage and retrieval; collaborative technology has enhanced supply chain visibility and has made the distribution of products and services efficient; and communication technologies have improved customer relationships and marketing strategies.

While eBusiness technologies bring with them the promise of lean and efficient supply chains, companies that use them need to address several issues before its potential is fully realized. They need to decide, among others, which technologies to use and how; the scope of collaboration with trading partners; the quantity and

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¹ Walden, 1952.

² <http://www.eweek.com/article/2/0,1895,1675960,00.asp>.

type of information to share; which products to collaboratively design; which distribution channels to use; and how to measure performance. The issues are multifaceted and resolving them is a complex and enduring process.

The intent of this Special Issue is to address some of these issues. Our call was to “publish papers that address the cutting-edge of this nexus between eBusiness and supply chain management.” While there have been several Special Issues on eBusiness and Supply Chain,³ papers in this Issue, in addition to updating the state-of-art research, showcase the primary methodological focus of this journal—Empirical and Case Study Based Methods. The response to our call was enthusiastic. We had 45 submissions for the Special Issue. After an initial editorial review, we put 36 papers into the review process. The papers in this Special Issue were chosen from these 36 papers. All papers went through at least two rounds of revisions, with some requiring more revisions prior to acceptance.

2. Supply Chains & Digital Technologies: a vision

We see eBusiness technologies impacting supply chains significantly in four areas. These areas are more “process-oriented”—a single technology (like RFID, for example) can impact processes in all these areas.⁴

2.1. *The Product Design Cycle*

eBusiness technologies have impacted product design processes in three ways. First, to manage shrinking product life cycles, suppliers, and manufacturers are sharing design and engineering information over the Internet in the early stages of product development. The premise of such web-based collaboration is faster time-to-market, quicker upgrades, efficient life cycle management, and the elimination of unnecessary inventory. Companies in a wide variety of industries—Lucent, Adaptec and Cisco in the hi-tech industry; GAP and Land’s End in the fashion industry; and Dana Corporation in the automotive parts are already embracing principles of web-based design collaboration to accelerate product development cycles.

³ See for example *Production and Operations Management Journal*, 2002, 11, 4; *Decision Sciences Journal*, 2002, 33, 4; *Interfaces*, 2001, 31, 2.

⁴ See also Ganeshan (2000) “Plugging in the Supply Chain” at *Markets Magazine*, 19–22.

Second, many companies are finding ways to reconfigure products quickly to better match supply and demand. Some, like the Spanish retailer Zara, are pre-positioning assets (such as manufacturing capacity, semi-finished goods) across the supply chain and when demand is realized, they marshal these assets to make and deliver the product or service. Still others, like Dell and Hewlett-Packard, are postponing the final customization of the product until demand is known.

Third, sustainability is quickly becoming an important aspect of product design. Internet-based technologies are helping supply chains reorganize to manage the “reverse loop”—from maintenance and after-sales service, eventually to recovery after end-of-use.

2.2. *Collaborative Planning & Logistics*

Firms have long realized that collaborating on procurement and replenishment increases product velocity while improving efficiency. Examples include vendor-managed inventory (VMI) agreements in the consumer products industry; Efficient Customer Response (ECR) initiatives in the grocery industry; and Quick Response in the Apparel industry. The latest Internet-enabled initiative is Collaborative Planning, Forecasting, and Replenishment (CPFR) whose central premise is that short- and long-term information regarding POS data, forecasts, shipping, and production plans; and order generation, is shared by supply chain partners over the Internet, who in turn use the information for joint planning.

Over the last 10 years, electronic marketplaces have brought with them the ability to bring multiple buyers and sellers to an Internet site to transact. In addition to providing new channels of procurement, marketplaces have reduced the cost of identifying, certifying, transacting with and evaluating suppliers. The next wave of supply chain processes hope to combine the depth of CPFR-like initiatives with the scope of electronic markets, bringing a multitude of players – suppliers, manufacturers, retailers, 3PLs, etc. – sharing information and transacting in real-time.

2.3. *Streamlining the order management cycle*

The order management cycle (OMC) is the management of a customer order from the time it is placed to the time the product is delivered to the customer. This includes order preparation, transmittal, order picking, and packing, and eventually transporting it to the customer. Often the cycle extends beyond delivery to include after-sales service and product end-of-use

Table 1

Paper	Area of inquiry	Key question	Research methods
Zhou and Benton	Collaborative Planning & Logistics	How does information integration impact supply chain practice?	Empirical methods
Sanders	Collaborative Planning & Logistics; Supply Chain Metrics	What is the relationship between organizational use of eBusiness technologies, organizational collaboration, and performance?	Empirical methods
Rosenzweig and Roth	Collaborative Planning & Logistics; Supply Chain Metrics	How do you operationalize a set of new, multi-item measures that tap into infrastructural competencies required for leveraging B2B commerce?	Empirical methods
Persona, Regattieri, Pham, and Battini	Product Design Cycle	What is the impact of eBusiness technologies on maintenance management and supply chain operations?	Case study
Barratt and Oke	Collaborative Planning & Logistics	What are the antecedents of high levels of supply chain visibility from a resource-based theory perspective across external supply chain linkages?	Case study
Klein	Product Design Cycle	Do client and vendor derive benefits from: (a) client's customization of and (b) client's real time information access from the vendors' eBusiness solutions?	Case study
Johnson, Klassen, Leenders, and Awaysheh	Supply Chain Metrics	How do industry context, firm characteristics, and firm-level strategic resources, such as purchasing teams, influence: (a) the exploitation of eBusiness technologies and (b) the relationship between eBusiness technology use and firm performance?	Empirical methods
Harland, Caldwell, Powell, and Zheng	Collaborative Planning & Logistics	What are the barriers to the adoption of eBusiness technologies and therefore to achievement of integrated information in supply chains in SME's?	Case study
Devraj, Krajewski, and Wei	Collaborative Planning & Logistics; Supply Chain Metrics	Do eBusiness technologies support customer integration and supplier integration on performance? And how does this in turn impact operating performance?	Empirical methods
Power and Singh	Collaborative Planning & Logistics	What is the nature of the relationship between application of internet technologies for integration of supply chain activities, trading partner relationships, and the need for structural change?	Empirical methods

recovery. The OMC has received renewed scrutiny with the realization that any delay in the OMC translates directly into delays for the customer.

The latest technology-enabled trend in managing the OMC is two-pronged: first, Customer Management Tools (like CRM & Demand management software) are making it possible to understand, market to, and serve the customer better. Second, an evolving trend in managing the OMC is the concept of “fulfillment at web-speed.” The concept involves being connected, via open standards such as the Internet or even wireless devices, in real-time to suppliers, 3PLs, carriers, and customers. This enables every player in the fulfillment process to access dynamic information that can be used to speed the product to the customer.

2.4. Supply Chain Metrics

Performance measurement in the supply chain is evolving from traditional product-based functional financial measures internal to the firm to a “dashboard” of financial, time, logistical, and service measures that span every link in the supply process. Since the supply chain usually involves more than one firm, it is important for managers to evaluate what every firm brings in terms of costs and benefits to the supply chain; and eventually how such benefits can be shared between supply chain partners. This often necessitates a different organizational structure—cross-functional and inter-firm teams that analyze, monitor, and improve supply

chain processes. Such a process or activity-based performance evaluation requires the use of several sophisticated real-time data warehouses and complex costing techniques that span multiple companies (often shared in real-time). In addition to process-based measures, shared data warehouses also aid in the computation of overall Supply Chain Metrics such as service levels and “life-time profitability” by customer segment, time through the OMC (or supply chain velocity), Economic Value Added, and Return on Investment.

3. Papers in this issue

These four areas provide a general framework for supply chain transformation. Many salient issues – and consequently the papers in this Special Issue—span multiple areas. [Table 1](#) classifies the papers in this Special Issue based on the four broad areas discussed above. We also indicate the key research question and the research method used to answer the question.

The papers in [Table 1](#) are the result of 2 years of revisions and reviews and we thank all the authors and reviewers for making this a success! As many of the papers in this Issue suggest, there still are a multitude of issues that need to be addressed and we hope that this Special Issue spurs further interest in the eBusiness/Supply chain area.

Thoreau would be glad: Maine and Texas have a lot to say to each other after all!