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Chapter III

Principles of Digitally Mediated Replenishment of Goods: Electronic Commerce and Supply Chain Reform

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INTRODUCTION

Many authors (Cunningham and Tynan, 1993; Dearing, 1990; Johnston, 1998; Rochester, 1989; Skagen, 1989; Swatman, 1993) now recognize that the significance of business-to-business electronic commerce in the supply chain is not just its ability to reduce direct operational costs (Colberg, 1990; Dearing, 1990), but also as an enabling technology for business process simplification, particularly as part of the over-arching simplification philosophy that goes variously by the names Just-In-Time (Abraham, Holt and Kathawala, 1990; Groenevelt, 1993), Quick Response (Fiorito, May and Straughn, 1995) and Efficient Consumer Response (Kurt Salmon Associates, 1993). There is also increasing recognition that supplier / customer interactions and supply chain performance as a whole are the correct units of analysis of supply chain reforms and their benefits (Buxmann and Gabauer, 1999; Johnston, 1998). Yet few accounts have attempted to define the precise principles by which the various technologies that make up supply chain electronic commerce are able to provide this simplification of business processes and supply chain performance improvement.

This chapter takes up that challenge by describing an increasingly sophisticated series of supply chain reform initiatives with the aim of extracting the underlying principles of digitally mediated replenishment. It is hoped that such an approach will provide a richer, more unified, and more principled account of various EC-enabled supply chain reforms which are often discussed in isolation, but also, by drawing out from diverse supply chain reforms a small set of underlying principles, that it will be possible to more easily generalize from these cases to create other process simplifications appropriate to novel circumstances and business requirements. The chapter begins with fairly well known supply chain reforms analyzed in a new way, but leads on to quite novel issues such as the role of EC in pull as well as push JIT replenishment systems, the use of two dimensional bar code as a medium for EDI, and the use of the new Internet-based business document exchange and presentation products and services. This work is empirically grounded upon a series of case studies

conducted in the past four years with some of the largest manufacturing and retail enterprises in Australia, but the reforms described are very much typical of world best practice in supply chain management. The case descriptions are kept brief: greater detail can be found in the references provided.

The chapter concentrates on replenishment of retail goods, component parts, and raw materials along the supply chain of large retail and manufacturing enterprises. It focuses on the interaction between a "customer" enterprise which wishes to replenish goods from a "supplier" that distributes or manufacturers them. For simplicity, certain potential intermediaries to this process, such as third-party transport companies, are ignored. In the next two sections, the pertinent technologies involved are described, and a small number of principles that explain their use and their effectiveness in creating supply chain reform through electronic commerce are stated.

SUPPLY CHAIN ELECTRONIC COMMERCE TECHNOLOGIES

There are a number of technologies which must be used together to achieve digital mediation of the replenishment/remittance cycle (Clarke, 1992; Cunningham and Tynan, 1993; Kalakota and Whinston, 1996; Kimberley, 1991). They are:

1. *Universal product numbering.* For effective digital mediation of the exchange of goods for money, trading partners must use a common system of identifying products. This has led to the requirement for a world-wide, unique product numbering system for individual retail packs, distribution packs of items such as cartons, and shipments of multiple items (Johnston, 1998). Building on the initiative of the Uniform Code Council in the U.S. who developed the 12-digit Universal Product Code, the United Nations-based International Article Numbering Association (EAN International) has provided systems for such unique numbering through the EAN-13 retail item number, the Trade Unit Number (TUN), and the Serial Shipping Container Code (SSCC), respectively (EAN, 1997). They have also produced standards for other product and shipment descriptive data such as batch number, production data, maximum durability date, and so forth.
2. *Automatic Identification.* The ability to mark items, cartons, and shipping containers with a machine readable form of their EAN identification codes is a vital requirement for digitally mediated replenishment. Simple linear bar code is by far the most widespread automatic identification technology (Harmon and Adams, 1990), but there has been recent interest in radio frequency tags and smart cards as additional possibilities for specialized applications. These are more expensive technologies but they have the potential to move beyond mere identification and allow data to be updated in the course of transactions.
3. *Electronic Data Interchange (EDI).* EDI is "the Interorganizational exchange of business documentation in structured, machine-processable form" (Emmelhainz, 1990, p4). In addition, traditionally it is required for the transmission to qualify as true EDI, that the message be structured according to widely disseminated, preferably international *de jure* standards, and that the transfer be from one trading partner's business application to the other's application via independently sourced translation software. The most common approach to distribution has been via store-and-forward