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The Impact of Electronic Integration on Time-based Performance

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The proliferation of information systems integrators, such as EDS and Anderson Consulting, attests to the perceived benefits of computerized integration. Integrated systems offer an opportunity to optimize organizational decisions at an enterprise level and save time and effort from unnecessary rekeying of data (Porter and Millar 1985). With electronic integration, organizations ".. use information technology to create joint, interpenetrating processes at the interface between value-added stages.." (Malone et al. 1987), and gain business value from tighter integration along the firm's value chain (Porter and Millar 1985). In the context of advanced manufacturing technology (AMT), Meredith and Hill (1987) posit four levels of integration: (1) stand-alone, (2) cells, (3) linked islands and (4) full integration, and show how increasing levels of integration enable more systemwide scope and more extensive organizational impacts, although at substantial risk. Similarly, Malone et al. (1987) propose an evolution from stand-alone databases to shared databases, and Dean, Yoon and Susman (1992) use integration sophistication as a dimension to conceptualize proximity to state-of-the-art technology.

The theoretical foundation for this paper is based on organizational economics (Williamson 1975, Malone et al. 1987, Gurbaxani and Whang 1991, Milgrom and Roberts 1992, Bakos and Kemerer 1992, Bakos and Brynjolfsson 1993). The basic premise is that IT can reduce internal and external coordination costs and affect organizational governance of markets and hierarchies. Electronic integration has enabled faster decisions by reducing internal coordination costs such as decision information costs resulting in both horizontal and vertical growth of firms (Gurbaxani and Whang 1991). In addition, IT can lower market transaction costs, by reducing external coordination costs, and so encourage market and hybrid relationships between firms (Bakos and Brynjolfsson 1993), such as value-added partnerships (Johnston and Lawrence 1988) and vertical quasi-integration (Zaheer and Venkatraman 1994).

Electronic integration permeates the boundaries of functions and the organization itself to cut out unnecessary administrative steps resulting in faster communications and time savings (Malone et al. 1987, Milgrom and Roberts 1992). Furthermore, IT enabled cross-functional teams, concurrent engineering and other parallel processes are faster than sequential transactions (Bower and Hout 1988). Shared information leads to tighter integration and improved coordination between departments and firms. For example, inter-departmental and inter-firm communication with email is likely to accelerate new product development (Gupta and Wilemon 1990). Similarly, a shared database from CAD/CAM integration of design engineering and manufacturing is likely to result in faster, better designs (Malone et al. 1987). In fact, coordinating interdependencies between design and manufacturing during new product development has been studied as an integration or coordination problem by many researchers (Imai, Nonaka and Takeuchi

1985, Malone et al. 1987, Malone and Crowston 1990, Milgrom and Roberts 1992, Adler 1995).

IT monitors and controls production processes with automatic alerts and faster processing, and integrates materials, equipment, personnel, work instructions, and facilities. Although, electronic links between functional groups in an organization and between the organization and its customers and suppliers are assumed to facilitate faster transactions, there has not been much empirical support. An exception is a recent study of EDI impacts on JIT (Srinivasan et al. 1994). We hypothesize that tighter electronic integration results in better time-based performance. For example, we expect that electronic integration impacts new product time to market.

In this research we examine empirical data collected from 17 firms in the disk drive industry. The respondents provided data on time-based performance over the last two years, and completed a 55 element matrix based on Dean, Yoon and Susman's (1992) validated measuring instrument, that indicated the link between pairs of functional areas (accounting/finance, marketing/sales, purchasing/receiving, product design, process engineering, production scheduling, production, quality control, distribution/shipping) and customers and suppliers. On a scale of 1 to 6, the sophistication of the link ranged from: 1="not linked at all", 2="not linked by computer", 3="linked by email only", 4= "physical data transfer", 5="electronic data transfer", to 6="shared database". Preliminary analysis reveals that time-based performance has improved considerably over the two year period. Integration varies considerably by functional area and internal integration is much greater than external integration. Integration with customers and suppliers are primarily email links, but a few organizations are using EDI and shared databases.

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