ENTERPRISE RESOURCE PLANNING SYSTEMS AND ENTERPRISE APPLICATION INTEGRATION IN SUPPLY CHAIN MANAGEMENT
Adriano O. Solís, Ph.D.
Academic Advisor, NAPM El Paso

An enterprise resource planning (ERP) system is an enterprise-wide information system that facilitates the flow of transactional data relating to manufacturing, logistics, finance and accounting, marketing and sales, and human resources in the firm. The integration, which allows the firm to achieve “end-to-end connectivity,” is accomplished through a database residing on a common platform and shared by the various application programs. Manufacturing is made immediately aware of any new customer order as soon as it is entered by sales. Likewise, purchasing is made aware of material requirements associated with the new customer order. Accounting records are automatically updated as transactions occur. The status of every customer order—whether being planned for assembly, in process, just completed, being prepared for shipment, in transit, or received by the customer—is available to the sales personnel. The shared database not only allows the various functional departments access to up-to-date information, but also allows the firm to avoid unnecessary duplication and the attendant potential for error associated with posting the same information all over.

General Mills, one of the largest food companies in the United States, reported record financial results during the fiscal year ended May 28, 2000 arising from total sales of $6.7 billion and net earnings of $614 million. It marked the third consecutive year of double-digit earnings per share growth. In an interview with the Journal of Supply Chain Management (Reese, 2000), the vice president of purchasing for General Mills, declared:

“We have a fully integrated ERP system, so we have been able to significantly reduce the amount of our transactional activities, as well as the associated costs. We have a low-cost supply chain relative to our competitors, which has been a direct benefit.”

Case studies have shown (e.g., Palaniswamy and Tyler, 2000) that firms that have implemented ERP systems have made improvements in inter-functional coordination and business performance at various levels, helping them reduce cycle times, reduce inventories, and share information readily across the organization. Because flexibility, speed of delivery, and responsiveness to preferences of individual customers have become order winners in today’s marketplace and traditionally “make-to-stock” manufacturing operations have switched to “make-to-order” mode, ERP systems have proven very useful for, among others, incorporating new sales orders and order changes into production scheduling, materials management, and logistics planning.

It is worth noting, however, that many companies have experienced difficulties in implementing ERP systems. Hershey Foods Corporation began its 1999 Annual Report citing problems in implementing its ERP system:

“There is no doubt that 1999 was a most difficult and disappointing year for Hershey Foods Corporation. While the year got off to a slow start due to excessive retail inventories, we fully expected a strong finish in the second half of the year. Instead, the
implementation of the final phase of the Corporation’s enterprise-wide information system created problems in the areas of customer service, warehousing and order fulfillment. These difficulties were exacerbated by our growth in recent years which had resulted in shipping capacity constraints. As a result, Hershey’s sales and earnings fell well short of expectations for the year.”

Hershey’s consolidated net sales of $3.94 billion in 1999 represented a 2.8% decline from 1998, while earnings before interest and taxes (excluding gains from the divestiture of its pasta business) declined 8.7%.

In some cases, implementation projects may be poorly managed, with the company having inadequately trained personnel to install and customize the system.

Often, an ERP system is unable to provide all of the functionality provided by custom applications that have been written over the past 30 years. As a result, such “legacy” applications must be kept in operation alongside the ERP system. For example, Whirlpool Corporation, one of the world’s largest manufacturers of household appliances, while utilizing SAP’s R/3 system as its ERP platform, has continued to use its “best-of-breed” pricing and promotion system from Trilogy Software (Tiazkun, 1999). MMS, a Utah-based maker of vitamins and minerals, also selected the SAP R/3 ERP system, but decided to keep its warehouse management system (WMS) from Catalyst International (Michel, 1999). Similarly, Fujitsu PC, which chose Oracle Applications as its ERP system (Michel, 1999), implemented a separate application package for product configuration and a custom-built manufacturing execution system (MES).

However, the ERP system acquired from the primary vendor may not be capable of communicating directly with the legacy system. This has prompted the emergence of Enterprise Application Integration (EAI) as a framework for tying an ERP system with other applications needed for supply chain management (SCM), by way of providing the messaging and data transformation tools that link the applications together. For instance, Whirlpool selected CrossWorlds Software to create an interface between its SAP R/3 ERP system and its Trilogy pricing and promotion system (Tiazkun, 1999). MMS, the vitamins and minerals manufacturer, turned to Oberon Software’s Prospero to integrate the Catalyst WMS to SAP R/3 (Michel, 1999). Fujitsu PC chose Vitria Technology’s BusinessWare for integration of its Oracle ERP system with the product configuration and MES applications (Michel, 1999). Diebold, the automated teller machine manufacturer, uses IBM’s MQSeries to integrate its Baan ERP system with legacy mainframe applications (Gilbert, 1999).

Moreover, mergers and acquisitions lead not only to various legacy applications, but also multiple ERP packages within the same enterprise. In such cases, EAI needs to address links between the multiple ERP packages, in addition to those between ERP systems and legacy systems. Until recently, the worldwide manufacturing operations of Ingersoll-Rand Co. were organized as eight autonomous companies with about 100 manufacturing facilities around the globe—resulting from acquisitions over the years. In 1999, top management of Ingersoll-Rand decided to restructure the eight autonomous companies into a single company with 13 business units. This required tying together a mix of information systems, in many cases aging legacy
systems inherited from the many acquisitions that contributed to the company’s growth over the years and unable to communicate with one another. The company installed an Oracle ERP system and selected CrossWorlds Software to integrate the former with the various legacy systems worldwide (Konicki, 2000).

Furthermore, EAI does not just address inter-functional coordination—i.e., the need to integrate systems internally. EAI also addresses the inter-organizational dimension of supply chain integration and coordination. For example, Extricity’s Alliance EAI framework has allowed Taiwan Semiconductor Manufacturing Co. (TSMC), a company that provides outsourced semiconductor foundry services to hundreds of customers worldwide, to integrate a custom, mainframe-based order management system with the disparate ERP and legacy systems of its customers (Michel, 1999).

References

Note:
This is the fifth in a series of short, expository articles on supply chain management. These have been incorporated as sections in an article—forthcoming in the *Encyclopedia of Information Systems*—on supply chain management and information technology prepared by Professors Mo Adam Mahmood, Leopoldo A. Gemoets, and Adriano O. Solis, all of the Department of Information and Decision Sciences, The University of Texas at El Paso.