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Bucking the Trends: What the Future May Hold for ERP Packages

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Introduction

One of the more significant IT developments in recent years has been the widespread implementation of ERP packages by large and medium-sized companies that formerly developed their own custom applications software. Adopting packaged software allowed many companies to replace their aging legacy systems in time to avoid Y2K problems and brought a variety of other benefits, including strategic business advantages, improved system architectures, and outsourced software maintenance. With so much going for them, ERP packages seem likely to remain popular for some time to come. In this context, it makes sense to try to anticipate how ERP packages will evolve in the future.

One view of the future can be constructed from an assessment of the issues faced by today's ERP package adopters and the responses under development by ERP package vendors. In this view, the functionality of ERP packages will expand, and the architecture of ERP packages will evolve, in ways that address many of today's business opportunities and technical challenges. This view of the future assumes a high degree of continuity with today's in-house IT management regime; in particular, it involves a continuation of the current division of labor between ERP package adopting organizations and ERP package vendors (Brehm and Markus, 2000). A clear articulation of this continuity view of the future is offered by Davenport (2000a this issue).

But experts in strategic planning contend that it is often not wise to rely solely on views of the future that are extensions of the past (Markus, 1996; Schwartz, 1991). Instead, they argue, there is value in visualizing alternative future scenarios that incorporate discontinuities. Doing so can enable planners to identify and invest in options that preserve one's flexibility if unexpected situations unfold.

In the scenario planning tradition, this paper offers a plausible discontinuity view of the future of ERP packages. Our claim is not that our scenario *will* transpire, but only that it *could*. However, if our scenario were to occur, it would have major implications for both ERP package adopters and ERP package vendors. Companies that have developed the knowledge, capabilities and skills suited to this alternative future would prosper relative to those that had not. Therefore, companies are well advised to assess their ERP strategies in light of the discontinuity view.

In the next section, we summarize the continuity view of ERP packages' future. Then, we lay out our alternative—discontinuity—view. Finally, we discuss the implications of our analysis for ERP package adopters and vendors.

The Continuity View

Technologies evolve, in part, through responses to the problems people experience in using them (Rosenberg, 1982; Stinchcombe, 1990). This empirical generalization suggests a strategy for forecasting the direction of technology change. While many companies have achieved considerable benefits from their investments in ERP packages, they have not always had an easy time doing so. In the face of problems using ERP packages, some organizations devise their own solutions; others rely on vendors or services providers. As users' difficulties become known to vendors—sometimes through the efforts of user groups, the media, consultants, and market research firms—vendors attempt to address them, often pre-announcing their intentions in order to forestall further criticism and to prevent customer defections to competing products. Thus, it is often possible to sense the direction of package evolution long before users experience relief.

Some common problems ERP package users face

Among the most serious problems associated with ERP packages reported in trade and academic literature are the following: limited functionality, lack of decision support, lack of extended enterprise support, implementation and upgrade difficulties, and high total cost of ownership.

Limited functionality. ERP packages differ from traditional software packages most obviously in that they provide a wide range of functionality within a common architecture. Thus, they subsume many of the transaction processing applications that a typical company would have in its applications portfolio—accounting applications, sales order entry programs, inventory management and production scheduling applications, distribution programs, etc.[1] These packages are said to be integrated, because the applications share a common database, and transaction data can flow seamlessly from one ''module'' to the next, without rekeying or software interfaces (Davenport, 1998), thereby eliminating problems that plague companies with unintegrated, legacy applications systems.

Because their functionality is so broad, ERP package vendors have tended to sell them as ''complete'' solutions to a company's information processing needs. However, the experience of many ERP package adopters has been otherwise. First, although vendors are increasingly delivering ''industry specific'' versions of their systems, many organizations have found both that unusual business processes are not well supported by the software and that it is not always possible to change business processes to conform to package features (Brehm et al., 2000; Markus and Tanis, 2000; Soh et al., 2000).

Companies have used a wide variety of approaches for dealing with the lack of appropriate functionality in ERP packages, including:

- Leaving some processes unautomated.
- Adopting manual workarounds.
- Adopting specialized ''bolt-on'' packages designed by independent software vendors to work with a particular ERP system.
- Integrating multiple enterprise packages in a best-of-breed solution.
- Integrating the ERP package with the organization's legacy systems.
- Building new custom modules to work with the ERP system.
- Modifying ERP package code.

The various ''integration'' strategies listed above have spawned a whole new industry of enterprise application integration software (EAI) tool vendors and services providers.

Two particular non-industry-specific areas in which many companies found early ERP packages deficient were decision support and support for relationships with customers and suppliers. These areas are discussed next.

Lack of decision support. In fairness to ERP package vendors, ERP packages were not originally intended to fulfill companies' needs for business reporting; they originated as integrated collections of transaction processing systems. Technologically, decision support and transaction processing are quite

different things: a system optimized to do one well does not do the other well, and vice versa.

The companies that adopt ERP packages often have extensive needs for business reporting. Since the late 1960s, a high proportion of business information processing activity has been directed at decision support vs. routine transaction processing. And one of the prime motivations for companies to adopt integrated packages was to acquire the integration of data they need for sophisticated decision support. It is small wonder, then, that one of the biggest and loudest complaints about ERP packages was the lack of adequate decision support (Bashein and Markus, 2000).

Some companies quickly solved this problem on their own. For instance, Microsoft loaded data from its SAP R/3 financials software into a database, developed a custom reporting system and some preformatted reports and made the software, the reports, and data for ad hoc analyses available via the company intranet (Bashein et al., 1997). Other companies struggled with the vendors' facilities for creating operational reports or simply rekeyed the data into Excel spreadsheets (Koh et al., 2000).

Lack of extended enterprise support. Today, the enthusiasm for e-commerce has led many companies to demand functionality to support their purchasing and marketing transactions and decisions. Early ERP packages did not support such supply chain management functions as advanced planning and optimizing (APO), collaborative planning, forecasting, and replenishment (CPFR), or vendor managed inventory (VMI). Nor did they support such marketing activities as call center operations, customer relationship management (CRM), or e-commerce storefronts.

Some companies made do for these needs with their (older) legacy systems or new custom software, which had to be custom integrated with ERP packages. Others turned to independent software vendors (and later to their ERP vendors, see below) for programs that they hoped could be quickly integrated with their ERP systems. In some cases, the vendors of these extended enterprise packages offered to host the packages (as application service providers or ASPs) and to do the integration themselves. This solution often gets companies up and running on the new capabilities faster than with in-house implementation and integration.

Implementation and upgrade difficulties. Because ERP packages encompass so much functionality (though not so much as adopters may want), they are very complex, which makes it difficult to configure them to the organization's structures and processes. Although they are presented to ERP adopting organizations in ''modules'' of functionality, the modules are not entirely independent. The way the sales and distribution module is configured, for example, has implications for the functioning of the accounting module. Because of tight internal integration, ERP packages are often referred to pejoratively as ''monolithic'' (Sprott, 2000).

Many organizations rely on experienced implementation consultants to guide them through the difficulties of configuration. Those who go it alone often learn by trial and error: Revel Asia, for example, had to reconfigure its financial module, when it later implemented an operations module (Koh et al., 2000).

Problems such as those at Revel Asia translate into lengthy and expensive implementations. Adding to implementation difficulties is the need, discussed above, to integrate the ERP systems with bolt-ons, legacy systems, other ERP systems or new custom software. And the integrations themselves can cause problems downstream when companies want to avail themselves of new versions and releases of the vendors' ERP software (Brehm et al, 2000). In some cases, the integrations do not work with the new package versions and releases, forcing the company to reprogram the integrations or do without with the additional functionality (Markus and Tanis, 2000).

High total cost of ownership. Difficulty in upgrading to later releases or versions is one reason that companies have experienced higher than hoped for total cost of ERP package ownership (Kremers and Dissel, 2000; Ohlson, 2000). But there are other important reasons as well. With the client-server

nearly impossible task to optimize an interface for each job type. Instead, screens were designed according to program logic; consequently, even a simple task might involve the need to click through multiple screens. With even modest delays in response time, this situation could result in slow responses to customer inquiries or the need to add more staff; some companies found the delays such that they could not do online order entry. Further, the large number of screens involved in some jobs, coupled with the integrations that could propagate data entry errors throughout the business, resulted in substantially increased training costs.

This litany of problems hardly exhausts the difficulties adopting organizations have encountered while implementing and living with ERP packages. But it covers the main ones, and it provides sufficient background to explain a large part of ERP package vendors' development agendas.

Vendor solutions to users' problems with ERP packages

Among the major items on the close-in[2] development agendas of most ERP package vendors[3] are providing data warehouses and decision support, developing or acquiring new industry-specific and extended enterprise functionality, componentizing software, web-enabling software and providing portals, and externally hosting software.

Data warehouses and decision support. ERP vendors' first response to customers' reporting needs was to claim that the operational report writing facilities in ERP packages were all that was required. In the face of continuing complaints, however, they rapidly developed data warehousing and decision support capabilities (King, 2000).

New industry-specific and extended enterprise functionality. As customers' attention shifted from core ERP package functionality to industry-specific applications and extended enterprise capabilities, ERP package vendors began scrambling to provide this capability themselves. In some cases, they developed their own new software modules. In other cases, they acquired independent software vendors and integrated their packages into their product lines or developed marketing alliances with independent software vendors. Today, ERP package vendors can claim to offer a range of extended enterprise capabilities as well as a variety of versions tailored to particular industry segments.

ERP package vendors further claim that ERP systems are the necessary foundation for e-commerce success, because they provide for internal systems integration, which is assumed to be a precondition of external integration. For example, e-commerce gurus Kalakota and Robinson (1999) outline a ''Roadmap to Market Leadership'' that involves a progression from internal enterprise integration to integration in the supply chain and the larger business community.

> The business world's steady embrace of enterprise apps may be the most important development in the corporate use of information in the 1990's. As companies race toward the information economy, their structures are increasingly made up of interlocking business apps. Isolated, stand-alone apps are history. E-business is about how to integrate an intricate set of apps so they work together like a well-oiled machine to manage, organize, route, and transform information (Kalakota and Robinson, 1999, p. 82).

Kalakota and Robinson further point out that achieving the business goal of creating a richer customer experience requires integrating e-commerce Web sites with back-office systems like the ERP packages that provide the capabilities to fulfill the customers' order (1999, p. 85).

Componentization. ERP package vendors could not mistake their customers' calls for breaking up the ''monolithic'' ERP package software (without, of course, destroying integration capabilities!). The vendors' response has been componentization of the packages—that is, the re-development of the packages using object development methods, component interface protocols such as COM and CORBA, integration standards such as XML, and semantic agreements such as those provided by CommerceOne (Sprott, 2000).

ERP package adopters hope that the vendors' componentization efforts will allow them to upgrade one ERP package module without upgrading all others at the same time and to effortlessly combine modules from various sources include different ERP vendors, independent software vendors, and their own legacy systems. As Davenport (2000a, this issue) points out, it is not clear that it is in ERP package

vendors' financial interests to provide easy access to other vendors' software. Most likely, then, componentization will result in only modest relief for companies' integration needs and upgrading difficulties.

Web-enablement and portals. The widespread adoption of Internet standards has enabled ERP package vendors to promise substantial improvements in adopting companies' total cost of ownership. Web-enablement means that individual users almost anywhere in the world can access ERP processes and data without requiring a local ERP client or the technical support this entails. Because of web-enablement, one company reported to us that implementing ERP in seven countries was ''no big deal.'' Enterprise information portals (e.g., mySAP.com[4]) further provide a customized interface to various classes of users at relatively low cost (compared to the cost of custom tailoring screen masks). Of course, acquiring the capabilities of web-enablement and portals requires ERP adopters to upgrade to the most recent versions of ERP software.

Application hosting. Perhaps the ultimate solution to implementation and upgrading difficulties and the costs of technical support is application hosting, enabled by the Internet, in which the ERP vendor (or another service provider) runs the software for an adopter, pricing this service on a per transaction basis. While application hosting has found considerable acceptance in the area of CRM, it has yet to become established in the ERP environment. Part of the reason may be that many ERP adopters have already developed in-house operation and support capability (whereas they had not yet done so for CRM), and so are reluctant to outsource it without demonstrated benefits. Another reason is the immaturity the application hosting business models and pricing schemes. For instance, the hosters would prefer to offer the same functionality to all adopters (since it lowers their support costs), whereas customers prefer tailored solutions. Finally, ERP software is often seen as ''mission critical''[5] software, whereas CRM, at least initially, is not.

In short, a review of the major problems experienced by ERP package adopters explains the key items on the ERP package vendors' development agendas. Taken together, these converging trends suggest a future for ERP packages that is a modest extension of the situation today: many companies will continue to use ERP packages, finding them greater in functionality, somewhat easier to integrate with other capabilities (especially those provided by the ERP vendor), generally easier to upgrade, and less costly to support. Their ERP systems will be the foundation for companies' extended enterprise (e-commerce) initiatives. Often, companies will continue to do the operating, integrating, and upgrading of ERP systems themselves, though others may begin to make greater use of applications hosting.

This is the continuity view of the future. It is highly plausible, because it is almost here. In the next section, we present another vision of the future—one that is also plausible, but is sharply discontinuous with the present, because it is predicated on somewhat different current trends.

The Discontinuity View

One thing that gets lost in the continuity view is the nature of the connections between a company and its ''extended enterprise partners.'' Today, many companies have electronic links with some of their suppliers and customers via a technology known as electronic data interchange (EDI). At its most basic, EDI is a unique, dyadic electronic connection (involving custom software and telecommunications linkages) between two firms. It requires that both firms agree on the types of communications between them (e.g., purchase orders, shipment notices, etc.), the format of the communications (i.e., the syntax and semantics of messages, so that the communication can be understood), and the technology of the communications (e.g., telecommunications protocols). Many developments have occurred to facilitate the bi-lateral agreements involved in EDI. Industry and cross-industry standards have been developed for different types of transactions (e.g., purchase orders) in different industries; value added networks have been formed to reduce the burden of telecommunicating with different business partners.

By and large, however, EDI has remained a technology of dyads rather than of supply chains or business communities. Powerful companies like retail chains (Bouchard and Markus, 1996) and shipping lines (Damsgaard and Truex, 1999) set their own rules of interaction that their smaller or weaker partners are

forced to follow, meaning that they may have to create *multiple* custom integrations to perform the same type of transaction with their different business partners. Since small companies may lack IT resources, it is often the case that they do not integrate their ''electronic'' connections to business partners with their own internal systems. They may receive the communications via email or fax, which they print out and manually enter into their own systems (if any). Naturally, this process obviates for the small companies many of the benefits claimed for electronic integration. And, naturally, too, EDI has never been as widely nor as enthusiastically adopted as its proponents expected.

Even the largest organizations that depend heavily on EDI may suffer from its dyadic nature. Large companies may have many different EDI connections with the same business partner—and each one of these integrations needs to be maintained. In the terms used earlier, EDI has a high total cost of ownership.

Internet technology promises some relief for the costs of EDI. Using the public Internet or a virtual private network based on Internet protocols substantially cuts telecommunications costs over dial-up lines and value added networks. But it doesn't, by itself, make any difference to EDI's dyadic nature. A supplier to several manufacturers, for example, must access (ideally electronically interface with) each manufacturer's extranet to accumulate orders.

What *can* make a difference in the dyadic nature of electronic data interchange, however, is the emergence of third parties that mediate the exchanges between buyers and suppliers. In some industries, wholesalers or distributors have long performed this function. A buyer may need to connect to only one wholesaler to ''communicate'' with multiple suppliers. But in large areas of business, intermediaries have been relatively uncommon—at least until the recent explosion of new ''business-to-business'' e-commerce ventures.

Enter the vortals

In the last few years, and increasingly in recent months, firms have sprung up to aggregate supply, aggregate demand, or match buyers and sellers, often in areas where intermediaries did not exist before (Kaplan and Sawhney, 2000). These ventures have been called by various names—hubs, marketplaces, exchanges, vortals (a contraction of ''vertical portal'') to name but a few. Originally, many of the vortals were technology companies or new ''dot-com'' ventures, but increasingly they are consortia of established industry participants (Chircu and Kauffman, 2000). Examples include cooperative buying or selling exchanges in PC parts, airline tickets, automobile inputs, and pharmaceuticals and hospital supplies. For example, in March, 2000, a group of organizations including Kraft Foods, Procter & Gamble, General Mills, Nestle, Unilever, Best Foods and the Grocery Manufacturers of America announced eCPG.NET (http://www.ecpg.net/), a new vortal for the consumer products industry. At the time of the announcement, there were over 20 other electronic marketplaces in the food and beverage industry.

The future of these exchanges is definitely uncertain. The airline tickets exchange and the automobile parts exchange have already attracted antitrust attention (Copeland, 2000; Meehan and Sullivan, 2000). And some companies decline to participate in vortals (Ansberry, 2000), fearing lower switching costs, greater price competition, or loss of perceived competitive advantage. Vortals may level the playing field in any industry, allowing small or inefficient competitors to gain at the expense of larger or better performing companies. Consequently, the strongest companies may not be willing to join.

> Wal-Mart Stores Inc., for instance, decided not to join fellow retailers on the WorldWide Retail Exchange, because it didn't see any reason to link up and help its competitors. Jay Allen, a Wal-Mart spokesman, says the retailer put its own system in place in 1991 and has more than 9,000 vendors participating. ''We've put a lot of effort and time and resources to develop that,'' he says. ''Why share all that?'' (Ansberry, 2000).

But other strong companies disagree:

> . . . Chevron launched the Petrocosm Marketplace in March. Developed with Mountain View, Calif.-based ecommerce developer Ariba, Petrocosm is an industry-owned online marketplace where companies can buy and sell just about anything having to do with oil and gas—from drilling pipe to engineering designs.
>
> Interestingly, Petrocosm is not meant to be a Chevron-only marketplace; the company owns a

> founding shareholders' stake of 20% in the venture, but the site overall will be divided between several ''anchor tenants'' from all parts of the industry. It may seem odd to launch a venture that can benefit competitors. Texaco has joined Petrocosm as a partner.
>
> But Chevron's Paul thinks it makes sense. ''The real economic benefits are going to come when you bring lots of suppliers and lots of customers to the marketplace,'' he says. Moreover, Chevron hopes to benefit like any investor, should Petrocosm's business boom.'' (Gantenbeim, 2000).

Despite uncertainty about their futures, the sheer momentum of vortal formations suggests that they must be reckoned a significant trend.

As ''hubs'' in networks of buyers and sellers, vortals can reduce the number of pair-wise connections between buyers and sellers. Instead of one (or more) unique electronic connections between each actual pair of transacting firms, each firm now needs only one standard connection to the vortal[6] to be able to reach, not only one's current partners, but potential future partners as well. Consider this example:

> To get purchase orders to our suppliers, we [Schlumberger's Oilfield Services Division] use MarketSite, Commerce One's Internet marketplace for business-to-business transactions. MarketSite lets us connect with hundreds of suppliers using a single, open system. It replaces the proprietary electronic data interchange systems we used to have to maintain. Unlike EDI, which required a series of expensive, one-to-one connections with individual suppliers, a Web marketplace is a low-cost, many-to-many system, (''E-Procurement at Schlumberger,'' 2000 p. 22).

A further, though unstated advantage, is that the same MarketSite system would allow Schlumberger easily to connect with suppliers with which it does not currently do business, thus potentially expanding the market for Schlumberger in a relatively low-cost way.

Enter the collaboration facilitators

Naturally, the picture portrayed above is an over-simplification. Damsgaard and Truex (1999) make it clear that standards represent the least common denominator of communications between firms; they must be reinterpreted by each interacting pair. Thus, many people argue that vortals are only appropriate for the most commodity-like products or services. But this is where another interesting development comes in—the emergence of third-party firms that ease complex coordinations among firms, where these coordinations were formerly done on a direct, firm-to-firm (pair-wise) way. Consider FreeMarkets OnLine. This company is often admired as a vortal that provides an electronic medium for reverse auctions: companies post their requirements for goods or services and suppliers bid to fulfill them. But FreeMarkets OnLine is not a java applet. It is an organization of people who work hard with companies that may never have done business together before:

> The search for circuit boards for the United Technologies Corp., a big electronics manufacturer, begins the way most supplier searches begin: by scouring lists of more than 2,500 factories in printed catalogs and electronic registries, and calling dozens of knowledgeable sources. At Pittsburgh-based FreeMarkets OnLine Inc., men and women with the primitive-sounding titles of ''market maker'' and ''market making engineer'' cull that list down to 1,000 factories, based on considerations like the plant location, and then whittle that number down by about two-thirds after reading reports on production capability and listening to feedback from customers. After an extensive written survey, another cut takes the number down to 100, and these are examined with an eye toward their long-term business performance, processes and the capability of their management teams. The 50 most promising suppliers are invited to play a brand-new game that could win them a major new customer, and coincidentally, forever change the way they do business, (Jahnke, 1998).

In other words, FreeMarkets OnLine makes a bigger market for customers like United Technologies not (just) by providing an electronic marketplace but also by the human tasks of finding and grooming potential suppliers. They also work hard with the buyer to craft an appropriate request for quotation. For example, owing to a lack of integrated internal systems, a buyer may define its needs for a particular type of goods differently in various locations, creating

problems when it needs to aggregate these needs into a common order.

Another area in which third-party facilitation is catching on is that of supply chain management. For some time now, companies have begun outsourcing to logistics firms the management of their warehouses and transportation needs (Rao et al., 1998). But things have gone one step farther with CPFR (collaborative planning, forecasting, and replenishment). It has become quite clear that companies can achieve better supply chain performance (e.g., reduced stock-outs, shorter delivery times, etc.) if they share information about sales, production, inventory, lead-times, etc. with customers, suppliers and logistics partners (Wouters et al., 1999).

But obstacles to information sharing and coordination exist (Wouters et al., 1999). First, in many industries, companies distrust each other and are reluctant to share information. Furthermore, for effective supply chain performance, it is not possible to do collaborative planning on a pair-wise basis: one needs to know the demands of the customers and the constraints imposed by suppliers' suppliers, and some of this information is a function of their business with your competitors. In such an environment, the only hope for collaborative planning (and it may be slim[7]) is for a trusted third[8] party, to whom all others would confide their confidential needs and production details, to optimize the production and shipment requirements for the entire supply chain. Given their existing role as intermediaries in transportation and logistics planning, companies like UPS and FedEx are aggressively developing services in collaborative planning, often in partnership with leading ERP package vendors.

It is much too soon to speculate on the future of such ventures. As with vortals, there are many barriers to their success. At the same time, however, the energy behind the new collaboration initiatives and the examples of facilitators like FreeMarkets OnLine suggest that collaboration facilitation is a significant trend. The market research firm Gartner Group, recently put it like this:

> C-commerce is a form of e-business—the most advanced form. E-business has become synonymous with conducting business over the Internet. It includes a broad set of sales, marketing and service activities that, until now, have focused on connecting an enterprise with suppliers and customers. The c-commerce vision includes inter-enterprise Internet connection but goes a step further by enabling *multiple enterprises* to work interactively online to find ways to save money, make money and solve business problems—often by dynamically restructuring their relationships. ... C-commerce applications will replace static, Web-enabled supply chain and value chain applications as the dominant application model by 2004, (''Collaborative Commerce,'' 2000, emphasis added).

Both vortals and collaboration facilitators offer participants at least two major benefits. First, they provide business integration benefits such as market expansion or supply chain optimization that cannot be achieved solely by electronic integration between pairs of companies. Second, they reduce technology integration costs by reducing the number of electronic connections that need to be set up and maintained: single connections with the hub or facilitator take the place of multiple unique connections with different trading partners. Together, these two advantages suggest that the obstacles to the adoption of significantly different business practices may eventually be overcome, at least in some instances.

Implications for the Future of ERP Packages

Let's assume then that the future may hold many more intermediated business interactions than does the present. What might this mean for the future of ERP packages? There are at least two distinct possibilities. The first is that ERP will remain essential for all parties involved in collaborative commerce. The second is that only the ''hub'' organizations will retain what we now call ERP functionality.

ERP—essential functionality for all participants

The first possibility is entirely consistent with the continuity view described above. Indeed, since the ERP vendors have thrown themselves wholeheartedly into collaboration ventures, this is the future they are banking on. Their preferred future looks like this: hubs or facilitators act as switches, passing electronic transactions between the interacting parties. Each party to the transaction would have its own ERP

systems, but instead of direct connections as with EDI, the transactions would travel via the intermediary (who would also, of course, add various kinds of value such as facilitation or market making).

Since the ERP package vendors are determined to be major players in collaboration facilitation, and since, as mentioned earlier under the continuity view, it is not necessarily in their best interest to provide connectivity to other ERP systems, one imagines (Davenport, 2000a, this issue) that the whole thing would be designed to work best (or only) at least initially for companies that all used the same ERP system. Naturally, this view of the future is highly favorable to the interests of ERP vendors and it does not portend much change for in-house IT departments: they would continue to do pretty much what they are doing now.

ERP—only needed at the hub of collaborative commerce

But there is a plausible alternative: intermediaries might become the information processors for the participants, or in today's jargon, the ''hosters'' of ERP functionality for a trading community or supply chain. As discussed below, the intermediaries may outsource information processing capabilities to other providers. Note that this scenario is different from typical ASP arrangements, discussed under the continuity view. There, a service provider hosted either a company's unique configuration of an ERP package or a company's unique database running on a shared, standard ERP configuration. In the discontinuity scenario, not only is the ERP package shared, but the database is, too.

There are two main arguments in support of this radical view of the future. First, ERP packages, even with extended enterprise capabilities, do not have the business functionality needed for collaborative commerce and cannot provide it. Second, for all parties to maintain ERP capability involves unnecessary costs in redundancy and the possibility of errors.

There is growing recognition that ERP systems currently lack the functionality required for collaborative multi-party commerce. For example, a Delphi study of supply chain executives in European multinationals found that only three or four of twelve key trends in supply chain management were supported by ERP (Akkermans et al., 1999). Among the key trends believed not to be supported by ERP packages are further integration of activities between suppliers and customers across the entire supply chain, changes in who drives supply chain coordination, supply chains consisting of several enterprises, full exchange of information with all the players in the chain, and further outsourcing of activities such as physical distribution, finance and administration.

According to Akkermans et al., (1999), the major reasons for ERP packages' failure to support these emerging needs are that ERP packages are monolithic—a factor likely to be addressed by componentization—and that ERP systems have developed along a different trajectory than did supply chain management concepts—a factor that bodes less well for the ability of ERP packages to adapt. Wouters et al. (1999) suggest that the problem lies in the fundamental logic of ERP packages, which is much harder to address with the items currently on the ERP package development agenda. In traditional supply chain relationships, *pairs* of companies undertake all different phases of the sales and fulfillment cycle. In collaborative commerce, by contrast, the different activities are functionally decomposed and allocated to the party in a multi-party supply chain that is best able to do them, for example, at lowest total cost or with best total delivery time. (See Fig. 1, from Wouters et al., 1999.)

ERP packages and their extended enterprise modules have been designed for traditional relationships between pairs of companies. They have not been designed to support three-way and *n*-way interactions[9]. New ERP modules and ERP package componentization, by themselves, will not address this fundamental difference in business logic between traditional supply chain relationships and multi-party collaborative commerce. Further, it is difficult to envision successful coordination of complex collaborative arrangements with multiple decentralized ERP systems.

The second argument in favor of the alternative view of ERP package future—that collaborative information processing capability need be done only at the hub—concerns ''systems integration'' costs—the costs of redundancy and the potential for errors. When two companies ''trade,'' they execute a complex transaction involving flows of goods, money and information. From an abstract perspective, the transaction belongs to neither party alone; it belongs to both. (The only part of the transaction truly unique to each party is its tax implications.) Today with ERP systems and EDI, both parties process and

store information about this transaction separately, incurring redundant costs for systems integration and data processing and risking the possibility of errors. A shared information processing system and database would decrease the total cost of information processing for the interacting firms.[10]

In essence, the alternative future sketched out here is one in which organizations will devolve information processing activities to collaboration intermediaries. The technology market research firm, Forrester, describes a similar vision of the future under the provocative title ''the Death of IT,'' meaning the decline of in-house IT operations, not of information technology itself (Cameron, et al. 2000). Their argument is summarized as follows:

> To support complex, fast changing business processes that span multiple companies, firms will disperse technology management across an exT (external technology) environment. (Cameron, et al. 2000).

Forrester's argument is predicated on three business trends—the emergence of vortals, the disaggregation of companies (cf. Davenport, 2000a, this volume), and the dynamic reconfiguration of business processes (cf. Wouters et al., 1999). Together, these trends mean that companies will require the ability to integrate and disintegrate their business processes and related systems capabilities frequently and rapidly (cf. Davenport, 2000a, this volume; Werbach, 2000). In-house IT organizations, Forrester argues, will not be able to meet these needs with traditional IT processing tools (e.g., ERP packages, integration technologies, etc.). Consequently, the ownership and operation of most information processing assets will shift outside the boundaries of the individual e-commerce participants to ''exT'' external technology service providers.

Our enhancement to Forrester's argument is that the external technology services providers will probably not operate as today's outsourcers do: today, individual companies contract with one or more technology service providers to address their own individual needs. Rather, we expect that individual companies will contract with collaboration facilitators who will coordinate information processing services for the community of collaborating members. The collaboration facilitator may do the information processing in house or it may contract information processing out to an ASP or to a consortium of ASPs, each providing a specializing information processing function (e.g., application hosting, data management, telecommunications, etc.). As an example of how such an arrangement might work, consider the example of Biztro:

> Designed specifically for small businesses, the Biztro system allows a manager or owner to log on to one Website to take care of payroll, benefits, human resources, and procurement. Biztro licenses those services and its technology to bigger service providers—such as phone companies, ISPs, and banks—which in turn offer it to their small-business customers. With its far-reaching plan to gain critical mass by scooping up small businesses from the customer lists of established companies, Biztro ambitiously hopes its Web-based backbone will become the standard ''operating system'' for a new generation of business applications, all running on the Web and connected to hundreds of other suppliers and service providers (Donahue, 2000).

Objections and answers

At least two objections to this model of future information processing are likely: First, how will organizations gain access to the data they need to make management decisions? And, second, how will organizations accommodate the need to integrate across multiple business processes and/or trading communities? Both questions make it clear that collaborative commerce would not eliminate ''systems integration'' issues. However, their locus would likely shift from in-house IT operations to external service providers.

Even today, companies cannot satisfy their needs for decision support entirely with their own enterprise data, no matter how well integrated via ERP or other means (Gray and Watson, 1998). Effective decision support requires external data, as well as internal. Companies frequently purchase external data from information providers and custom integrate external data with their own internal data. However, a new type of ''exT'' providers is springing up to manage data integration for companies on an outsourced basis. One can imagine such companies providing the ''glue'' across multiple collaborations and external data sources.

Interestingly, a major hurdle in e-commerce today is the lack of standardization in product data across trading partners (Wouters et al., 1999). An additional hurdle concerns lack of commonality of business processes. While standards are particularly important in a network of trading relationships, they are often resisted and they can be difficult to implement in the absence of central hierarchical control (Akkermans and Horst, 2000). In the case of EDI, powerful firms have often imposed multiple standards on their weaker partners (Damsgaard and Truex, 1999). Vortals, however, may be the catalysts of more mutually beneficial standards within industry groups.[11]

In short, the emergence of vortals and collaboration facilitators on the e-commerce scene suggests the possibility of a future for ERP packages that is radically different from the continuity view. In the discontinuity future, the capability we now know as ERP, much revamped and optimized for collaborative, rather than dyadic, commerce, is provided on a centralized basis to a community of trading partners. The hub either performs information processing and integration itself along with other value-added services or outsources information processing and integration to applications service providers. The individual trading partners rely for their decision support needs on specialized data integrators who work with various hubs and external data providers to supply an integrated decision support environment.

Conclusion

In this paper, we have presented two alternative futures for ERP packages. The continuity view represents an extension of existing trends visible in the difficulties companies have had in using ERP systems and in the major steps ERP vendors are taking to reduce those problems. The discontinuity view extrapolates from the business trends of trading exchanges and supply community facilitators. Both views are possible. Both may simultaneously occur—in different industries or in different types of firms.

It seems quite clear that ERP vendors already consider the trends underlying the discontinuity future to be very important. To our knowledge, major vendors such as SAP, Oracle, and Peoplesoft are investing in technology to support collaboration (Fox, 2000).[12] Clearly, they are hoping that their core ERP systems will retain a large market. They may even hope that collaboration technologies will draw more ERP package adopters into their folds. But whether or not these hopes are founded, ERP vendors are planning to play an important role in the exchanges between companies.

The two futures have very different implications for in-house IT management. The continuity future implies business as usual. The skills most useful in today's in-house IT environment—skills at integrating systems and data—remain most useful in the future. The discontinuity future implies a radical change in in-house IT management. The key skills for the future involve contracting and coordinating with external service providers and understanding needs for new types of services.

Scenario planners (Schwartz, 1991) argue that envisioning alternative futures, however unlikely they may appear in a statistical sense, helps firms develop the strategies they need to do well, no matter what occurs. In the spirit of scenario planning, we suggest that many in-house IT departments should consider how they would approach a discontinuous future. What skills are needed? What projects would provide the flexibility for several different courses of action? What indicators should be tracked to monitor the emerging future? Asking and answering such questions will go a long way toward making the future a better place to be.

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Notes

1. ERP systems originated in the manufacturing sector. Today, ERP systems are being developed for retail, financial services, distribution, education and other non-manufacturing industries.
2. Recent past, current, or short-term future.
3. Another major challenge, of course, is just staying in business in face of intense competition and industry consolidation; Baan, for instance, is currently seeking a buyer.
4. mySap.com is a complex product offering that involves

electronic marketplace capabilities in addition to web-enablement and portal software.

5. This is the title of Davenport's new book on ERP systems (Davenport, 2000b).
6. Or possibly one connection to each of several vortals.
7. Several recent attempts at collaborative supply chain optimization have not been as successful as hoped. A more successful effort, called the SLIM project, was discussed by (Wouters et al., 1999).
8. Since the transportation-logistics company is usually referred to as the third party between buyers and sellers (as in ''third party logistics'' or 3PL), multi-party collaboration with a trusted intermediary is often called 4PL.
9. A major difficulty has to do with differences in the way product data are represented in the information systems of different parties in an extended supply chain (Wouters et al., 1999).
10. This argument assumes that telecommunications costs are not a significant factor. Most analysts expect dramatic declines in telecommunications costs in the foreseeable future.
11. Integration is, however, likely to remain a problem across industry groups.
12. For instance, ''SAP has also been building Internet marketplaces-most notably for chemical companies BASF, Henkel, Degussa-Huls, and Metallgesellschaft, and for food giants Nestle and Danone'' (Fox, 2000).

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