E-PROCUREMENT: BUSINESS AND TECHNICAL ISSUES

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E-procurement is changing the way businesses purchase goods. This article reviews the technologies for E-procurement, discusses business issues in implementing E-procurement, presents life cycle for implementing E-procurement, and outlines the steps needed for implementing MRO goods E-procurement.

There has been a large shift over the years in how companies view purchasing, and the Internet with the advent of electronic commerce is one element that has helped cause the shift. The purchasing profession has undergone a transformation from merely a necessary function to one that has become more strategic and focused on generating competitive business advantage. Information technology has been a key enabler in purchasing’s evolution into a more strategic business function, by reducing the time taken to complete mundane tasks and allowing purchasing agents to focus on more value-added activities.

The Internet and electronic commerce especially have much to offer in the way of increasing the efficiencies and competitive advantage of purchasing. Many companies are developing plans to integrate some form of Internet-based electronic commerce into their supply chain management practices that will enable them to develop and maintain a competitive advantage. These advantages are typically in the form of reduced costs, increased efficiencies, a greater degree of accuracy, and speedier processing and delivery.

Most E-procurement activities of companies are currently centered on nonproduction — mostly maintenance, repair, and operating supplies (MRO) goods. MRO goods spending accounts for as much as 60 percent of total expenditures for some companies. The Aberdeen group identifies transaction cost savings of up to $70 and reduction of cycle times to two days from seven days when MRO goods are procured via the Internet. Croom identifies both operational and strategic benefits to using electronic commerce for purchasing MRO items. The operational benefits include reduction of administrative costs in the procurement process and improved audit trails of each transaction throughout the process. Strategic benefits include having greater influence and control over expenditures, raising the profile of the purchasing function, and having a greater opportunity to manage the supply base. Many purchasing executives believe that the long-term benefit of E-procurement will be the freeing of purchasing resources from transaction processing to refocus them on strategic sourcing activities.

Historically, a significant portion of supply chain and business-to-business (B2B)
E-PROCUREMENT TECHNOLOGIES

B2B Overview

Exhibit 1 shows an example of a B2B purchasing system. A customer with Company A uses the purchasing software and places an order on company B’s system. The order is received by an E-commerce server, which is integrated with the back-end ERP/DBMS systems. Similarly, Company A’s system is also integrated with its ERP system to enter its data into the accounting and planning systems. The communication between the two systems takes place via the Internet. For this system to work, both company A and B must integrate their back-end systems with the Web. Many smaller suppliers are less inclined to integrate their ERP system with their E-commerce Web servers, preferring instead to reenter the data manually into the ERP system. In such cases the benefits of using E-procurement technologies are not fully realized.

There are various purchasing software technologies. The following are the most important: E-procurement (buyer software), E-catalog, auctions, and marketplaces — also known as net markets/exchanges software. However, companies’ solutions many times straddle more than one of these options. A brief description of each of these technologies follows.

E-Procurement

Buyer software enables users to automate transactions and focus on the buying organization’s activities, such as order placement, catalog management, payment, reporting, and so on. Most of these systems currently handle MRO products. Users typically access the client software on their desktop, providing access to E-catalogs that are customized for their organization. Users typically source from preferred suppliers listed on their catalogs, within limits enforced by purchasing management. If a person purchasing an item does not have the authority to buy it, these systems route the document to appropriate channels and manage the workflow. The purchasing limits and approval routings are stored as profiles for users within the system. Systems such as Ariba and Commerce One typically fall in this category. Such systems can be integrated
Virtual catalogs dynamically retrieve information from multiple catalogs and present the data in a unified manner with its own look and feel — not that of the source catalog.

E-Catalog

The E-catalog is the most widely used of the purchasing technologies. At its simplest, it automates customized, printed supplier catalogs. E-catalogs provide a better audit trail and may actually be tied to legacy systems for data capture from transactions, or linked to workflow systems for approval routing. Use of individual supplier electronic catalogs does, however, have its practical limitations.

In environments where end-users are free to choose from among many suppliers, accessing multiple, disparate electronic catalogs and choosing among them can be problematic. Users must not only know which suppliers can provide the needed goods or services, but also be familiar with a wide variety of catalog formats and data access mechanisms. In addition, product specification and cost comparisons may not be easy. A drawback from the purchasing organization standpoint is that multiple linkages must be established to capture the transactional data from different supplier catalogs.

The most common deployed solution for such environments is catalog aggregation; that is, combining the offerings from all approved suppliers into a centrally maintained catalog.

This solution overcomes the data access and integration problems and allows a more product-centric search. It is costly, however, due to the high set-up and maintenance costs. Since it costs a lot to aggregate suppliers, the frequency of orders must be high enough to cost justify the inclusion of some supplier data. These aggregation technologies assume that suppliers will provide information to the purchasing organization in a particular format.

The data that suppliers provide must not only be readable, it must be machine understood so that search engines can find the product and comparisons of specifications and prices can be done. Unfortunately, most supplier-provided catalogs do not meet both these criteria. The solution is in using virtual catalogs, wherein individual online supplier catalogs are not aggregated or duplicated. Virtual catalogs dynamically retrieve information from multiple catalogs and present the data in a unified manner with its own look and feel — not that of the source catalog. Virtual catalogs do not actually contain any product information on their own. Rather, they contain information pertaining to the contents of online supplier catalogs and linkages to the actual product information contained therein. Once this communication protocol has been established, it is possible to answer user inquiries with responses combined, in a consistent manner, from separate online sources.

An organization using a virtual catalog will configure the system to allow users access only to approved products from established suppliers, while allowing the purchasing professionals to access any Internet-based catalog. Legacy systems and workflow linkages are established only once. The virtual catalog eliminates the effort and expense associated with catalog aggregation, offers the flexibility of allowing access to product information from a diverse array of sources and data formats, and provides only the most current product-centric information directly from its source.

Auctions

E-procurement technologies come with the ability to hold auctions. Both forward and reverse auctions are feasible. In a forward auction, sellers post the goods or services they want to sell, and buyers then bid for the services or goods. Excess capital equipment or inventory is typically sold via forward auctions. In a reverse auction, buyers post a request for quotes for items they want to buy,
Marketplaces  
manage the participants’ information and business process (both buy side and sell side), as well as the transaction.

and allow sellers to bid. In general, when purchasing agents want to buy direct material through auction techniques, they use a reverse auction. The agents prepare by doing basic sourcing and narrowing down their sources to four or five suppliers. The agents then request quotes for auction from these five suppliers. There are also exchanges where auctions can take place that are neutral to both buyers and sellers. The software is pretty flexible, allowing different types of auction rules (Yankee, Dutch, etc.), in terms of open or closed bids, what details can be seen, reserve prices, etc., which are all specifiable by the organization.

Marketplaces
Organizations find that it is costly to maintain E-catalogs inside their organization, and any transactional costs that may be saved are wiped out. Marketplaces (also known as net markets) have emerged to meet this need. These organizations specialize in aggregating the data of different suppliers and provide overlaying filters so that customized views of prices, terms, and so on are obtained for each purchasing organization. However, even these specialized companies have problems of their own. There are so many of these marketplaces — each with its own format needs — that suppliers have trouble meeting individual marketplace requirements. Also, different companies call the same item by different names, so that comparisons are not easily made. This is complicated by the fact that different industries might use the same term with different meanings. Finally, these problems are compounded for direct materials, which might need blueprints and other detailed technical descriptions to go with the system. A number of intermediary firms are arising to meet these needs.

Marketplaces may be independent trading exchanges, vertical markets, or portals. Primarily these marketplaces allow collaboration and data sharing within or across industries. The nature of services can go beyond cataloging to transaction management. Sites such as Ariba.net, VerticalNet, and so on fall under this category. They are attractive to both buy- and sell-side organizations for different reasons. On the buy side they provide demand aggregation, enable quick and easy supplier comparisons, and allow activity reporting, strategic sourcing, and so on. On the sell side, they provide low-cost introduction to customers, better capacity management and efficient inventory, production management via demand aggregation, and analytics that help suppliers position their product better in the market.

Marketplaces were started by neutral firms that control the supply chain and industry consortia. For example, General Motors uses Commerce One software and created its own catalog. GM has two Web sites: MarketSite is intended for its own internal use, and SupplyPower provides a range of parts, products, and services for GM’s suppliers. GM also posts the excess steel that it buys, passing on its savings to its suppliers. In contrast, Boeing provides an intermediary site for customers to buy replacement parts that are directly shipped by its suppliers. Industry consortia are also players in this field. For example, GM, Ford, and Chrysler have an initiative (Covisint) by which purchasing for these companies worth over $240 billion per year is expected to be consolidated at one site.

Feldman describes a few requirements for marketplaces. Marketplaces manage the participants’ information and business process (both buy side and sell side), as well as the transaction. It is also necessary that marketplaces support security, liquidity, transparency, efficiency, and anonymity. At times, users may want to be anonymous, or have their details hidden, or ensure that their histories and trading activities are not revealed to other parties. This must be balanced with the need for reliable information, so every participant trusts them. Because marketplaces are basically services, the services may have to evolve. For example, services that are not common such as yield management (a service that airlines use for assigning seats) might have to be supported for everyone.

Marketplace exchanges such as freemarkets.com also support auctions. Most organizations are currently focusing on exchanges with fixed auction rules applied to simple goods and services.

Integrated Frameworks
Exhibit 2 shows an integrated framework, depicting how the various technologies described are interrelated and used by companies. On the buy side, a customer uses buyer software to search the companies’ internal catalogs (which contain an aggregated list from all suppliers that is a virtual catalog), or to search an intermediary marketplace site and place an order. The order will go through the marketplace only if the customer searches for the latter and places an order there. Otherwise, the
order will be placed directly with the supplier. The supplier’s E-commerce server confirms the order and updates its own back-end systems. When the buyer software receives a confirmation from the supplier/marketplace, it updates its back-end systems.

When the marketplace is used, it contains aggregated content from all suppliers that can be searched. It also provides customized views for specific buyers. Auctions are generally conducted using marketplace software.

**Business Issues**

Significant planning is needed to achieve the savings promised by E-procurement. Enterprises must focus on certain key critical success factors.

**Critical Success Factors**

**Define an E-Procurement Strategy**

For an organization to become an E-enterprise and compete in E-commerce, it is not sufficient for its information technology and business strategies to be aligned; they must merge. The E-procurement strategy must include a combined technology and business strategy. The vision and leadership must come from the purchasing department and identify the areas in which procurement technologies are most likely to benefit the company and provide it competitive advantage. The company must identify its core competencies and how procurement processes can support the core competencies. The technology strategy must be developed around supporting these core competencies. The technology group must also identify directions in which the technology is heading, such as back-end integration, and move the company to the technology forefront in support of the procurement processes.

**Reengineer the Procurement Processes**

The benefits of E-procurement technology will not be apparent if there is simply an automation of existing methods of working. To gain the benefits of reduced costs, better sourcing, and so on, it is essential that a reengineering of the procurement process be undertaken. As a result of implementing Internet-enabled procurement technologies, organizations have found that their supplier relationships are redefined, and that, in general, the number of suppliers is reduced. Hence, supplier consolidation, etc. must be planned for prior to the implementation of the E-procurement technology. Companies should gather input from stakeholders throughout the organization, since they are likely to be affected by the reengineering of the procurement process.
Companies should also communicate to the stakeholders that this might be a difficult process for everyone.

**Involve Key Stakeholders**

Procurement affects every facet of the organization; therefore key stakeholders from every affected department must be brought into the new system's planning process. Management must confer with these various groups, taking their inputs into consideration, as it carefully assesses those problems the company wants to address and the system's goals. It is also essential to bring key stakeholders on board early in the process, involving them from the very beginning. If the stakeholders are not behind the effort, users might not use the system, continuing to use existing legacy methods for procurement instead.

**Focus on Segments**

Currently there is no single vendor offering solutions in the entire procurement arena (from E-procurement to exchanges). Solutions from many vendors currently concentrate on MRO and indirect goods such as office supplies, IT equipment, and professional services. Many offerings do not provide support for direct goods, or for integrating suppliers across the supply chain. Enterprises might have multiple procurement strategies: one for direct material and one for MRO items. No single E-procurement tool from a vendor will meet an enterprise's strategy correctly. It is necessary to segment and choose the vendor for each procurement strategy separately. For example, an organization must choose one vendor for MRO items and another to support direct goods.

**Identify Useful Measures**

Organizations should identify useful measures in terms such as cost per transaction for MRO items, cycle time from requisition to fulfillment, etc. They should use measures that can be measured and are useful in predicting the success or failure of the system.

**Manage Expectations**

Organizations should manage the expectations of the users and stakeholders by telling them the truth. The technology is still in a developmental stage and the functionalities may be incomplete. Everything that was possible with legacy systems might not be immediately feasible with the new environment. For example, in many instances changes to orders are harder to process with new technologies. In addition, the goods ordered with this technology might be limited to noncoded and MRO items and may be limited to a small percentage (as low as 10 percent) of MRO items in the initial pilot implementation. As acceptance of the technology within the organization increases, the percentage of MRO items available will also increase.

**Cost/Benefits**

Organizations should be aware that the costs to implement the solutions are significant, and the benefits from the investment may not be apparent for a two- to three-year period — until the entire system is implemented. Many companies have a difficult time estimating the costs. Vendors are moving away from traditional licensing and maintenance fees as they try to establish market share and are moving to a transaction-based fee structure. In addition, there are many less visible costs (that make up as much as five to ten times the cost of software) that are not included (for example, the cost of consultants, integration, catalogs and search engines, transaction costs, and user training). Similarly, the benefits are not easy to measure. Benefits come from three areas: compliance, leverage, and process efficiency.

**Integration with Back-End Systems**

The system will have to integrate with back-end office systems such as ERP and database systems. Applications that run at the back end must also be integrated.

**Impact on Suppliers**

The organization should assess the impact of the system on suppliers and their technological readiness to implement the system at their end, and should provide the services necessary for the system to succeed. For example, suppliers must be able to provide the catalog information for their products into any system that is designed. It is necessary to put together a supplier adoption team, train the suppliers, and get them ready concurrent with the organization’s implementation.

**E-Procurement Project Life Cycle**

Once the business issues have been sorted out and a decision has been made to implement E-procurement technology, a standard life cycle (Exhibit 3) must be followed.

1. **Plan/Analyze:** Gather the detailed requirements for the system. The input should be gathered from key stakeholders and users alike. Generate a request for proposals and
perform a market search. Analyze various tools available on the market and research their suitability for the organization. Establish criteria for suitability and fitness of the product for your organization. Evaluate the tools against the criteria and have the main vendors or possible candidates demonstrate their product in your company.

- **Define/Design**: Once you have picked a product, conduct a gap analysis to identify the gaps between requirements and the tool’s standard functionality. Have the vendor demonstrate all the key functionality that will be required, so that you know clearly what is not within the tool’s realm. The gaps identify the customization necessary to implement the product in your organization. Prioritize the gaps and develop a cost estimate for the customizations, so that you can decide on which customizations will be taken up first. Develop functional specifications on the customizations necessary for the tool that has been chosen.

- **Develop/Construct**: The technical architecture of the procurement system must be designed and set up. Workflow rules that are necessary for authorization, procurement rules, etc., must be enunciated for the product to be configured. Programs must be written to add/modify the functionality that exists within the standard tool that has been chosen. Each of the programs must undergo unit and system tests, following which user acceptance testing on the product is conducted.

- **Implement/Deployment**: Once the customizations have been developed and tested, the system is ready for pilot deployment. Train the users on the usage of the system, and test the pilot implementation. Modify the system based on the pilot, test it, and then deploy the system at all locations.

**Implementation of E-Procurement for MRO Items**

It is first necessary to have a clear understanding of the business process that needs to be automated and the exact areas that are being automated. This should be laid out clearly. For example, the federal government in a pilot for electronic catalogs developed a diagram (Exhibit 4) identifying the procurement
This six-step process identified and had a goal of automating all portions of the process, from accessing and searching the catalog to evaluating the result, placing the order, receiving the items, and processing the payment. A clear depiction enables everyone to understand what business processes need to be accomplished by the system. From this, the requirements and specifications for the system can be identified.

Not only must the system requirements in terms of functionality be specified; the integration that is required with back-end systems must be specified. How is the order integrated with existing ERP or database systems? How is the processing of payment integrated with the existing ERP system? What is the integration with the applications running on these ERP systems, etc.? All these must be specified.

Once the specifications and integration requirements are written out, a request for proposals is sent. The proposals that are returned must be evaluated on the following criteria:

- **Functionality**: Does the proposed system have the functionality that is required? For example, in the above case, the system must be able to aggregate and integrate the catalogs of multiple suppliers. Does it support payment processing via procurement or credit cards, etc.? These factors must be evaluated. An evaluation of the functionality must be made from different buy perspectives: buying of an MRO item to buying of services; buying with a procurement card to buying with a credit card, etc.

- **Technical Architecture**: What is the architecture of the product? Is it a solution from a single vendor or is it built from components of different vendors? Can the system be extended, and is it flexible? How intuitive is the user interface, and how easy is it to use? Is the performance of the system adequate? Will the system scale from a few transactions to a large number of transactions?

- **Cost**: What is the total cost of ownership of the product. It must be recognized that the acquisition cost is small compared to the overall cost of implementing many of these systems.

**Service and Support**: An evaluation must be made of the support provided by the vendor. Does the company and the solution offered have long-term viability? Will the product be enhanced as new standards and developments come in the area?

Once a system is picked, the system is implemented following the E-procurement life cycle discussed in the previous section. The rules for procurement for different users and items are developed. Any workflow that is necessary is identified, and the system is configured with the business rules of the organization. Customization requirements are identified, prioritized, and the system customized for your needs and tested thoroughly. The users are trained on the system and the system is deployed. The analytic tools available with the system are used to measure the benefits of using the system versus the traditional way of procurement. A comparison of the actual benefits to estimated benefits should be made and surveys of various stakeholders done to ensure that the system is a success.

**Issues with E-Procurement Systems**

Experience by companies implementing E-procurement suggests that it is not without problems. Current E-procurement products have less functionality than traditional purchasing products or purchasing modules of ERP systems. Some users are turned off by this and are hesitant to use the E-procurement products. This is because E-procurement products are still in the early stage of their evolution and the functionality will continue to improve.

Current E-procurement products mainly support non-coded/nonstock MRO materials only. Although stock MRO material purchasing is possible through extensive back-end integration, most companies are sticking to non-coded/nonstock items such as supplies (paper, pencil, furniture, etc.). The main issues are integration back to the ERP, inventory management system, and the lack of access to information stored in item master files or database systems for coded items. For companies...
that have visual inventory management systems such as KANBAN, current E-procurement products might be a better fit.

Direct material procurement requires a lot more back-end integration than indirect materials and is very much more complex. There are some direct material products available, but companies are hesitant to try them, as the functionality does not cover all the requirements. In addition, the standards are continuing to evolve. Unlike indirect, direct material process has linkages to planning, engineering, and sales systems, making it problematic.

Catalog content development remains a major problem. Several suppliers think they need to invest a lot of time and money to convert the information from their internal format to meet different customer and marketplace catalog formatting requirements. Suppliers do not believe they reap the benefits for their investments and view the benefits as being primarily on the customer or buy side for which they have to bear the costs. Hence, suppliers are reluctant to satisfy all except their biggest customers.

CONCLUSION

Companies both big and small can now reap the benefits of E-procurement technologies by automating the purchasing operations such as catalog search, supplier selection, and purchase order processing. These activities can be done by end-users, while ensuring that corporate purchasing policies are being enforced.

The implementation of E-procurement systems is not without problems. Current systems do not include all the functionality required by users. For example, the level of integration with back-end systems provided varies. In addition, catalog and content management issues faced by organizations are still large. However, vendors are developing more of the required functionality in their products. Outsourcers and marketplaces that host the catalog contents and consultants have arisen to help organizations with their E-procurement implementations.

A strategy that many organizations follow in their E-procurement process is to use a consulting company to help them start out with a pilot implementation on about 5 to 10 percent of their MRO items, within a single business unit. As lessons from the pilot implementation are absorbed and experience is gained, the E-procurement technology is rolled out gradually to other business units and expanded into other MRO items.

Companies wishing to integrate and implement E-procurement systems must follow the E-procurement system life cycle depicted in Exhibit 3. Specifically, the objectives of the project such as the details shown in Exhibit 4 must be determined. This must include the products and services as well as the processes that are affected. This is followed by a request for proposals and a careful selection of the vendor providing the solution. The solution proposed must be evaluated for its technical issues such as the model for catalog content, as well as integration with ERP and other back-end systems. In addition, issues such as the total cost of ownership and the service and support provided by the vendor must be considered during the implementation. Once a vendor is picked, the procurement rules and workflow rules must be implemented and tested.

Internet-based procurement technologies are fundamentally changing the way purchasing buys both its MRO goods and direct goods. Automated exchanging of data between suppliers and buyers is accomplished with these technologies, resulting in tighter relationships between suppliers and buyers. Fewer errors and higher data quality are filled into back-end ERP systems as procurement technologies get integrated with ERP and other back-end systems.

References