

E-COMMERCE AND E-PROCUREMENT/PURCHASING

John B. Wyatt III
LeRoy H. Graw

California State Polytechnic University, Pomona
California State Polytechnic University, Pomona

This article defines E-Commerce and E-Procurement/Purchasing as well as some related terms, provides statistics on their use, explains key roadblocks to implementation of E-Procurement/Purchasing systems, and provides recommendations for the Procurement/Purchasing Manager who wishes to initiate E-Procurement.

INTRODUCTION

What is electronic commerce? First, it is as “a merchant transaction involving goods and/or services using the Internet or private intranet as the vehicle for effecting the transaction”. More narrowly, it should include specific technologies such as electronic data interchange (EDI), electronic funds transfer (EFT), fax, and e-mail.

What is E-Procurement/Purchasing? Although it is intuitive that it is “50% of E-Commerce”, it may not be obvious how procurement/purchasing professionals view it. We define it simply as the “acquisition of goods and/or services using purchase as the method of acquisition effected using electronic media.” The ultimate goal of E-Procurement/Purchasing is “paperless purchasing”, which contemplates elimination of paperwork for all the important documents used in procurement/purchasing, including the specification/statement of work, requisition, solicitation, purchase order/contract, delivery/task order, invoice, and payment.

PERVASIVENESS OF USE

How pervasive will electronic procurement/purchasing be in the coming years? A study conducted by the Boston Consulting Group (BCG) indicated that, by 2003, a quarter of all business-to-business purchasing in the US will be conducted online. (Global E-Commerce, 1999). Such purchasing is expected to increase by 33% per year until 2003 and reach \$2.8 trillion in transaction value. The BCG estimates that by 2003, the following six sectors will have more than 65% of all E-Commerce purchases: retail, motor vehicles, shipping, industrial, equipment, high tech, and Government. BCG did not provide any breakdown among these six sectors.

According to BCG, most of the E-Commerce “market share” is in North American, with approximately 70% of the total E-Commerce transactions taking place in the US, Canada, and Mexico. BCG anticipates most of the growth will take place in

Asia, Europe, and Latin American as more and more businesses go “on-line” in those parts of the world.

VOCABULARY

With electronic commerce comes a whole new vocabulary. The terms and definitions below have been provided by the Electronic Commerce Resource Center (Fairfax, Virginia), the Louisiana Electronic Assistance Program, the Department of Defense, and the U.S. Small Business Administration. (Karoway, 1996, at p. 18.)

1. **Architecture:** The hardware, software, telecommunications networks, and personnel capable of supporting electronic commerce.
2. **Authentication:** A mechanism which allows the receiver of an electronic transmission to verify the sender and the integrity of the transmission through the use of an electronic key (code) or algorithm which is shared by the sender and the receiver. This algorithm may also be referred to as an electronic signature.
3. **Electronic Data Interchange (EDI):** The computer-to-computer exchange of business data in a standardized format. EDI is a tool for electronic commerce, as is electronic funds transfer. However, while EDI is limited to automated payment, electronic commerce incorporates a much wider scope of features such as graphical/descriptive catalogs of goods and services and automation of the entire ordering and payment process. All this occurs in a paperless online environment with instant transactions.
4. **Electronic Funds Transfer (EFT):** The electronic transfer of cash between accounts at different financial institutions.
5. **Encryption:** There are two types of encryption -- symmetric and public key. Symmetric encryption uses only one key, or code, known by both sender and receiver, that is vulnerable while in electronic transit. Public key encryption uses both a public and private key. The public key, or code, is given to all users receiving messages. A message encrypted with a public key can only be decrypted using the corresponding private key, and a message encrypted with the private key can likewise only be decrypted with the public key. Encrypted messages are "scrambled" while in transit. When the appropriate key is entered into the computer, the message is decrypted or "unscrambled."
6. **Trading partner:** An organization that has agreed to do business electronically with another organization.
7. **Value-added network (VAN):** A third-party entity, which electronically exchanges information between subscribers and trading partners. With today's technology, even more can be done with VAN, including

authentication of electronic signatures, and development of the needed interfaces for automated payment processes in an online environment.

The following additional definitions were provided by the Electronic Commerce Association, Electronic Commerce 97, Internet Literacy Consultants, Oakland Electronic Commerce Resource Center. (*Id.*)

1. **Application-level firewalls:** A firewall security system where internal computers never converse with the Internet, but rather hand information to routers which move between the firewall and cyberspace.
2. **Archiving:** The storage of records for purposes of security, back up, or auditing.
3. **Automated Clearing House (ACH):** A network of financial institutions providing electronic funds transfer service.
4. **Backbone:** Typically refers to both the physical medium connecting computers, such as fiber optic cable, and to the specific network which addresses and routes usage protocol.
5. **Commerce server:** Sophisticated software enabling high-performance workstations to become Web sites capable of handling secure online transactions and maintaining databases for inventory management.
6. **Continuous replenishment:** A business process wherein the supplier manages inventory levels for the buying organization using resale or consumption information transmitted electronically from the customer on a frequent basis. Some retail stores such as Wal-Mart are now able to submit information directly from point-of-sale.
7. **Cookie:** A piece of information sent by a Web server to a Web browser that the browser software is expected to save and send back to the server when the browser makes additional requests from the server. Cookies may contain information such as login or registration information, online shopping cart information, or user preferences. Browsing on a supplier's Web site may result in some information about the purchasing organization being transmitted via cookies back to the supplier, such as their path around the Web site, or identity information provided via the browser.
8. **Electronic coins:** Also called tokens, they're an electronic payment system developed to handle "micropayments" or small, Internet-

based transactions between 25 cents and \$10. This payment system, as well as electronic purses may allow purchasers to obtain product off the Internet without using a procurement card.

9. **Electronic envelope:** The header and trailer (or beginning and ending) information that precedes and follows the business information in an EDI transmission. Providing the same function as a paper envelope, it controls the routing from the sender to receiver and provides security with a clear audit trail.
10. **Electronic purse:** Using smart card technology, an electronic purse is created with cash stored electronically on a micro-chip, creating a pre-payment card which can then be used to purchase goods and services.
11. **Hub:** Usually a large organization, very active in EDI, who strongly encourages its paper-based business partners to become involved in EDI trade; also called a sponsor.
12. **Hybrid EDI:** Introduced by service providers to accommodate situations in which only one trading partner is capable of using EDI, while the other continues to trade using traditional methods involving paper or fax. An example would be a purchaser sending an electronic purchase order, which is then faxed by a service provider to the supplier lacking EDI capabilities.
13. **Interactive EDI:** The online exchange and processing of single electronic documents or line item details in real time between trading partners. Modifying electronic contracts between a purchaser and a supplier, and approving those changes, would use this technology.
14. **Internet cash:** Purchased from an issuer (bank or credit institution) and then exchanged freely over the Internet. It's aimed at low-value payments, both internationally and domestically.
15. **Legacy Data Management (LDM):** The process of identifying and evaluating historical information and defining potential solutions and requirements for long-term usage of that data in a cost effective manner. For example, legacy data currently on existing mainframes may be put on the Internet.
16. **Network:** Any time two or more computers are connected together to share resources, a network is created. A network can be internal or external.

17. **Online catalog:** A Web site that allows products to be viewed and ordered online. To shop online, users click on items they want to order, thus placing them in their "shopping cart" for "checkout."
18. **Reverse Mode Authentication:** Allows "on-demand" authentication of the host, thereby enabling users to establish a host's identity before releasing sensitive information. Applying this technology to a supplier's online catalog could ensure its authenticity.
19. **Security certificate:** A chunk of information (often stored as a text file) that is used by the secure sockets layer (SSL) protocol to establish a secure connection. This protocol encrypts information for privacy, authentication, and message integrity. The certificates contain information about who it belongs to, who it was issued by, a unique serial number or other unique identification, valid dates, and an encrypted "fingerprint" that can be used to verify contents of a certificate.
20. **Smart card:** A small, plastic card resembling a credit card, but containing a microchip that stores cash in encrypted form on the card itself. The card could be used at telephones, gas stations, PCs, vending machines, or any other built-in card-reading device.
21. **TCP/IP:** Transmission Control Protocol/Internet Protocol. This is a suite of protocols that defines the Internet. TCP/IP software is available for every major kind of computer operating system and is necessary to be on the Internet.

The last set of definitions is for those who are not clear about some of the very basic definitions:

1. **Internet:** A huge network of computers spanning the globe.
2. **Web site:** Any computer on the Internet running a World Wide Web server.
3. **Intranet:** A network of computers running a World Wide Web server for internal consumption that is not necessarily connected to the Internet.
4. **Extranet:** An intranet connected to the Internet, but with access limited to specific computers and/or individuals. If access were not limited, it would be a Web site.

Eveleth (1998) focuses on the differences between/among information technology, E-commerce, and E-Business. Her explanations are:

Information Technology

Information technology covers the entire spectrum of hardware, software, and network services. The most important concepts surround the use of the general platforms that systems run on. A legacy system refers to hardware and software solutions that are mainframe-based and were developed in the 1970s and 1980s. Many organizations run their general ledger and core systems (human resources, payroll) on mainframe computers. These systems link servers to desktop systems via physical links or networks, hence the name client/server.

The two other important terms are "batch" and "interactive." Large systems with millions of pieces of data and many records used to only be updated once a day. In this mode, if the price of a product or material changed, the system would continue to show the old price until the next day. In an interactive mode, the pricing change would take affect right away. Today's technology has enabled many batch applications to be performed in an interactive mode. This fundamental change has led the way into the future with the advent of electronic commerce and electronic business.

E-Commerce

E-commerce is the means of doing financial business electronically. E-commerce has become important to purchasing and supply professionals, as it completely changes the way we do business. If you can set up pricing and terms and conditions with a supplier and have that supplier provide their catalog electronically then you can drive the point of purchase down to the user. In the meantime, the purchasing professional can turn his or her efforts to the strategic relationship between his or her organization and the supplier.

E-Business

The speed and efficiency of electronic business has been one of the big reasons for the great shift in how businesses, individuals, and co-workers communicate with each other. On a commercial level, we are starting to see the digital mall; this is the electronic version of a shopping mall. The mall owner, or Internet service provider (ISP) will host your site, and provide the equipment, maintenance, and security needed for your site. For purchasing and supply professionals this is a convenient way to get to an industry-specific site and be able to choose from a number of catalogs and put them into their shopping basket. Another benefit of e-business is the virtual store. This is similar to the digital mall, except that these are businesses that exist exclusively on the Internet."

Eveleth suggests that “the advantages for companies to participate in e-commerce over the ‘Net are numerous. These include the opportunity to reach a worldwide audience, 24-hour-a-day service, opening new channels for distribution, customer convenience, and the ability to beat competitors to new markets. These technologies are truly changing the way purchasers and suppliers do business.”

E-PROCUREMENT/PURCHASING APPLICATIONS

One of the earliest manifestations of E-Commerce was “Electronic Data Interchange”, commonly referred to as “EDI”. Karoway, *supra* at pp. 18-21 suggests that “Though EDI will probably not disappear, many purchasers believe it, along with e-mail and other forms of electronic commerce, will eventually fall under the Internet umbrella. In fact, large corporations that currently use EDI to transmit purchase orders, file invoices, and pay bills stand to reap the greatest rewards. While EDI transactions over private or value-added networks (VANs) cost users an estimated \$150 per hour, the same transactions over the Internet cost about \$1 per hour. VANs currently provide organizations with the technical capability to transmit their data to other connected parties. In the future, many believe the Internet will serve this function.”

Mike Gordon, manager of electronic commerce for contract manufacturer Avex Electronics Inc. in Huntsville, Alabama, was quoted by Purchasing Today as saying that “Since VANs charge per character sent, it's cost-prohibitive to transmit electronic drawings. On the Internet, transmission charges remain constant, regardless of size.” Purchasing Today noted that Avex and its 80 trading partners currently use VAN EDI to exchange purchase orders (POs) and PO acknowledgments, PO changes and change acknowledgments, invoices, bills of material, and remittance advice. Gordon was quoted as saying that “he expects the Internet to become Avex's primary communication vehicle for electronic commerce.”

Avex was a pioneer in EDI on the Internet. It began piloting EDI on the Internet in 1994. It and Santa Clara, California-based National Semiconductor currently exchanges invoices and acknowledgments over the Internet, and Avex conducts Internet experiments with two additional trading partners. In addition, the company participates in a CommerceNet pilot program to securely transmit requests for quotation via the Internet from the original equipment manufacturer to the subcontracted partner, component supplier, and distributor. CommerceNet, a Menlo Park, California-based consortium of high-technology companies, promotes business use of the Internet. “The infrastructure and security software are there,” Gordon says, “and our trading partners are in agreement. It's just a matter of time.”

Gordon indicated that Avex plans to move its entire EDI program, including payment transactions, to the Internet. Its Internet EDI format features message encryption and user authentication; MIME (multipurpose Internet messaging extensions) capability, which allows bundling of e-mail and data files; increased flexibility because the system is translator-independent (*i.e.*, companies using different translator software

are still compatible); and reduced transaction costs due to the Internet's flat-fee cost structure.

Unisys' purchasing division would like to take the electronic-commerce concept one step further. Instead of simply conducting its own procurement activities online *via* its fledgling Global Procurement Network (GPN), the Blue Bell, Pennsylvania-based computer manufacturer would like to see the entire purchasing profession connected via the Internet.

"The GPN is a micronetwork for Unisys' internal use," says Ed Coyle, C.P.M., former vice president of corporate procurement. "What is needed is a consortium-type macronetwork for all purchasers and their suppliers."

Coyle created Unisys' worldwide integrated GPN in 1994 to establish an electronic link among approximately 400 Unisys purchasing personnel in the United States and abroad, and to dramatically reduce or entirely eliminate all departmental paperwork. Unisys purchasers dial up to the private network via the World Wide Web on the Internet.

"We're trying to get synergy going, so maybe if we get other organizations involved, we can get the whole procurement world connected," says Coyle, adding that 20 or so companies have already expressed interest in accessing or developing similar systems. "People have come in to see the GPN, and we've helped them to develop their own procurement application on the Internet. If we get other people invested in a macronetwork, we can expand the use of the Internet for common benefit."

Currently, the GPN provides internal-network links to procurement policies and procedures, contract models, licensing documents, and tools and methodologies for conducting pricing agreements, as well as external-network links to industry associations and publications. The GPN is simply using the Internet's public bandwidth - which is cheaper - to make both internal- and external-network links.

"Say you want to place an order for hand-held telephones with a supplier," Coyle says. "You can access GPN to see what deals are already in place, and if there is a buying history with that company, possibly negotiate a discount, or, at the very least, determine the previous price so you don't keep reinventing the wheel."

"Purchasers can then pull down existing contract models, customize them, and route them electronically to the relevant parties, Coyle adds. "In the near future," he predicts, "I see a more interactive role between the supplier and the purchaser, extending to actual transactions taking place online." Since this article Coyle transferred to IBM and plans to incorporate a similar system there.

THE LEGISLATIVE FRAMEWORK FOR PUBLIC E-PROCUREMENT

The federal procurement process has undergone a massive transformation during the last decade. The rise of ecommerce and virtual business that led to an explosive growth in the private sector of the national economy threatened to leave behind the bloated procurement bureaucracy with dire consequences for the national defense. Thus, the federal procurement program has undergone a massive restructuring to operate according to the Internet Age standards. The legislative framework supporting the restructuring is based upon the *Federal Streamlining Acquisitions Act*, passed by the Congress in 1994, that mandates that the Federal Government will use Ecommerce to conduct its business. To implement the requirements of this act, the Clinton administration has issued in July, 1997 *The Framework for Global Electronic Commerce*. The paper outlines the administration strategy for the implementation of the act and provides detailed steps for the application of ecommerce tools throughout the federal procurement process.

The Department of Defense formed the Joint Electronic Commerce Project as the overall umbrella organization for the department wide implementation of FASA according to the strategy outlined in the Framework.” The JECPO serves as the Department of Defense Executive Agent for accelerating the application of eBusiness practices and associated information technologies to improve DoD acquisition processes, life-cycle sustainment and other department business operations.” (JECPO website mission statement)

ECOMMERCE PROJECTS

JECPO has developed and continues to maintain the following operational projects to support the implementation of ecommerce tools and applications within the defense procurement process:

- Central Contractor Registration is the centralized electronic database serving as the single entry point for any potential contractor bidding for defense contracts. The database was created as the only repository of defense contractor information for the whole Department of Defense in order to avoid redundant paperwork and reduce administrative costs.
- Department of Defense Business Opportunities is the Internet portal for any defense contractor looking for Defense business opportunities. The website allows comprehensive searches by various criteria and, upon the identification of the desired solicitation, directs the user to the Service website where the solicitation is maintained. The purpose of this project is to “accelerate the life cycle practices of acquisition and procurement using the latest in electronic commerce techniques.”(Website mission statement)
- Department of Defense Electronic Mall is a series of electronic catalogs spliced together to reduce transactions costs and allow the government buyers to browse items, compare items and post orders.

- The Electronic Document Access Web (EDA Web) “combines Internet and World Wide Web technologies with electronic document management to eliminate paper files and facilitates information sharing among DoD communities to provide access to single-source DoD official documents. The information is maintained and available for access to authorized users in Portable Document Format (PDF).”(Website mission statement). The project maintains common forms needed to transact business between the defense agencies and the business contractors in order to eliminate paperwork, reduce the order cycle time and improve productivity.
- Past Performance Automated Information System provide information about contractors and their past performance for the contracting officer. The project allows the user access to all the data collected throughout the department.
- Wide Area Work Flow project mission is to develop a series of metrics to measure the progress of the transition to paperless contracting, develop a business plan to attain paperless contracting and develop ecommerce software prototype as a substitute for paper forms.
- Defense Electronic Business Exchange is the Electronic Data Interchange hub for all the department activities. It provides storing, routing and translating services for Trade Parties and other authorized users.

THE ULTIMATE?

Perhaps the ultimate in E-Procurement/Purchasing is transmitting your requirements to a third party (via the Internet) so that the third party can effect your purchases for you (typically over the internet). The authors are aware of a firm called the Interactive Buyers Network (IBNL), which provides that very service. Although the service cannot be used for complex procurements, it seems to work for standard commercial, off-the-shelf items for which a detailed specification is not needed. The service, which hopes to expand nation-wide, even guarantees a certain level of cost savings based upon prices paid for IBNL purchases compared to your previous prices paid before implementation of IBNL. The name of their software package is “VirtualSource” and they can be found at <http://www.vsource.net/>

ROADBLOCKS TO E-PROCUREMENT/PURCHASING

Purchasers can logically ask themselves: “What is standing in the way of E-Procurement/Purchasing, if it has so many obvious benefits?” Charlie Channel, a lawyer and procurement analyst in the purchasing department at California-based

Stanford University, (which instituted EDI on a value-added network and boasts a nearly paperless procurement system), coordinates CommerceNet's Internet-based purchasing project, a joint experiment with NAPM-Silicon Valley, Inc. This project suggests that "For Internet-based purchasing to get off the ground the following must take place:

- ☞ More suppliers need to get online. They need to come up with servers with useful functionality to send quotations, and receive orders.
- ☞ Industry needs to develop standardized tools and a unified approach for encrypting data that will work for everybody so we can move forward.
- ☞ A great deal of education needs to take place on the purchasing side of the electronic equation.
- ☞ In regards to security issues, purchasers need to understand technology and the real risks of being ripped off. Security ought not be that big of an impediment.
- ☞ They need to understand the real potential for increasing productivity by using EDI, via the Internet or not. They need to condone the deployment and control of purchasing cards to end users.
- ☞ They need to recognize the merits of Web-browser software. When they realize that the cost of using a browser is less expensive than a telephone call and more convenient, they will use the browser.
- ☞ Management must deftly voice support for the use of electronic commerce, and at the same time put controls on Internet access or promote and honor system, because you can't let employees go surfing without limits.

CAVEAT

The application of e-commerce tools in the procurement and purchasing process, with the establishment of B2B exchanges and even B2C exchanges, has profound economic implications. The economic viability of a business in the long run is by no means established by the successful implementation of e-commerce tools and applications. The implementation of e-commerce tools and programs has as a direct effect the elimination of the middleman and the elimination of transaction and information costs. This will lower the costs of production, and implicitly the costs of goods sold. The enormous cost savings will be past to the consumer in the form of lower prices and the suppliers will be forced to achieve the same cost savings within their value chain.

The widespread application of e-commerce through the whole of the private sector will generalize this trend and should result in a sharp and long deflation. The

survival of any business in such an environment may well depend of the fact that the consumer prices will fall slower than the business prices. In a nutshell, this is important food for thought.

RECOMMENDATIONS

E-Procurement/Purchasing has a better chance of success when the following recommendations are considered:

1. Procurement/Purchasing Managers must recognize that E-Procurement/Purchasing is not just a “Procurement thing”, but a process that involves most elements of the organization. Successful implementation requires not only the active support of top management, but also the participation of virtually all the managers in the organization. And by all means, use participative management in doing so. Remember that “when we share, we care”!!

2. Procurement/Purchasing Managers must carefully plan their E-Procurement/Purchasing implementation. To say that the goal is complete and immediate implementation of a system of “paperless purchasing” is totally unrealistic and downright silly to boot. “Paperless purchasing” is a goal that few organizations have met completely. It is questionable whether a total paperless system is realistic for many firms.

3. Procurement/Purchasing Managers need to carefully consider the cost advantages of each aspect of their E-Procurement/Purchasing program. Some processes may be cheaper and more efficient to do “the old way”. Doing them electronically “for its own sake” should be carefully avoided.

4. Procurement/Purchasing Managers need to take a “project management approach” to their implementations. Cost, Schedule, Performance, and Customer Satisfaction must be carefully considered and managed in order to achieve overall project success.

5. Procurement/Purchasing Managers must consider their implementation a “major change effort”. The resistance to change among those wedded to the “old way” must not be underestimated. A manager who fails to plan for resistance and have strategies planned for overcoming this resistance will not find success in his/her implementation.

SUMMARY

In conclusion, the E-Procurement bandwagon is rolling. The question that all businesses must ask is should I jump on now or be mowed under by its wheels. It is the hope of these authors that they have given some guidance for businesses to make a learned decision regarding entrance/implementation of the exciting realm of E-Procurement.

REFERENCES

<http://www.iti.org/cec/index.htm> -- The Center for Electronic Commerce.

<http://ecommerce.internet.com/ec-news/> -- The site for E-Commerce News.

<http://www.vsource.net/> -- The software website for the Interactive Buyers Network (Limited).

<http://www.acq.osd.mil/ec> -- Defense Electronic Commerce Home Page.

<http://leap.nlu.edu/ECEDI/ECEDI.htm> -- The Louisiana Electronic Assistance Program.

http://www.commerce.net/research/facts-figures-forecasts/2000/00_01.html---
CommerceNet, 10050 N. Wolfe Road, SW2-255, Cupertino, California.

<http://www.arraydev.com/commerce/jip> - *The Journal of Internet Purchasing*.

<http://www.hitechsurplus.com> - High-Tech Surplus.

Eveleth, K. (1998). Do You Know Your IT from Your E-C? , *Purchasing Today*. July, p. 4.

Karoway, C. (1996). E - Commerce Explodes, *Purchasing Today*, April, pp. 18-21.

Wright, B. (1997). Sign (Electronically) on the Dotted Line, *Purchasing Today*. August.

Global E-Commerce. (1999). Taken from the 1999 National Education Seminar on "Innovative Contracting: Practical Approaches" National Contract Management Association.