Building Internet Applications Through Technology

Michael Litvak & Jeremy Clare

Since businesses "discovered" the Internet in the mid-1990s, much press has been generated about electronic commerce (EC). However, little has been published that provides an overview of how business functions are being transformed by EC applications and the specific technologies that are driving these applications, such as intelligent agents, cookies, plug-ins, etc. In this article, we will describe these key technologies and their relationship to critical applications, as well as their business impact. We will also highlight significant trends in this area.

Internet-based electronic commerce is still in its infancy. For the adventurous, this flexible market opens up tremendous opportunities to try new ideas and new business models. For traditional players, this dynamic framework increases risk and uncertainty. Regardless of your current position, it is imperative that you understand the implications of doing business via on-line channels and begin to reposition your company to avoid losses and maximize gains.

In general, Internet-enabled applications provide the following external benefits to businesses:

- Enhancing your relationship with existing customers.
- Finding new customers.
- Improving customer service.
- Establishing new businesses that were not possible without an on-line method of distribution.
- Gaining additional revenues through Website advertising, subscriptions,

transactions, and undiscovered on-line business models.

Internal benefits include:

- Rapid application deployment.
- Development of knowledge-management systems via Intranets.
- Reduced time to market.
- Significant cost savings.

Whether you wish to experiment in Internet-based electronic commerce or plunge right in, there is a treasure chest full of tools, processes, and pathways to follow. We've tried to highlight here some of the many technologies and applications that are revolutionizing electronic business efforts. This list is by no means exhaustive, but is meant to illustrate some of the ways in which companies are using this new open platform to change the way they do business.

Applications that Enable Electronic Commerce

The Internet opens up tremendous potential, allowing innovative companies to develop new business models never before attempted. Listed below are just some of the creative methods already in use by pioneering companies such as General Electric, Dell Computer, and Cisco Systems. In each case, we have attempted to describe an application, explain its potential benefits, and provide an example. Early adopter organizations are already conducting hundreds of millions of dollars' worth of commerce on-line by using a combination of the applications described below to transform their
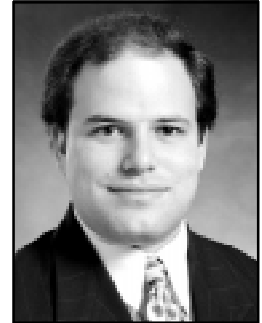
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Web sites from mere public relations locations into electronic marketplaces.

In each case, we have attempted to describe an application, explain its potential benefits, and provide an example. Are you currently implementing such an application? How do you compare with the examples?

Customized/Personalized Web Pages

A popular application for the Web these days is customized or personalized Web pages. A number of sites, such as MyYahoo [http://my.yahoo.com], allow you to develop customized filters so that the information you want to see is the only information you are going to get. It's information tailored to your needs—your information, your way. Other sites using customized Web page applications include Reuters News Explorer [http://www.muscat.co.uk/newsexplorer], Individual's NewsPage service [http://www.newspage.com], and MSNBC's personal page [http://www.msnbc.com].

By enhancing the usefulness of your site's information to the users, you are more likely to keep them coming back for more. With the number of Web sites growing at an exponential rate, repeat visits are invaluable. If you are implementing a service based on an advertising or subscription model, the user filtering choices provide you with a greatly improved understanding of user needs and wants. This increases the value of the site to advertisers, generating more revenue.

Notifications/Messaging

Notifications/messaging provides another way to stimulate demand for your product or service. Imagine you're in the airline business. On a fairly regular basis, you notice that you have empty seats on particular flights. What if you could offer discounts to people just a few days before the flight to fill those empty seats? Well, a number of programs, such as USAirways' Esaver [http://www.usair.com/travel/fares/esavers.html], allow airlines to send e-mail messages to registered users who have indicated they are particularly interested in travel between selected destinations. Notifi-

cations also provide a cost-effective means for offering "limited-time" offers, even when that limited time is under 48 hours.

Webmasters are also using messaging applications to inform people when their Web sites are updated, hoping to increase the amount of traffic on their sites. Tools such as URL-Minder from NetMind [http://www.netmind.com] allow you to register the addresses of frequently-visited Web sites, and the agent will inform you when these pages are updated.

Product Customization/Customer Self-Service

The computer industry has been quick to catch on to the product customization capabilities of the Internet. Product customization applications allow users to tailor products to fit their needs. If you're in the market for a new computer, you might want to stop by the Dell [http://www.dell.com] or Gateway 2000 [http://www.gateway.com] home page. Both allow you to configure the specific model and options you want, obtain a price quote, and, if you want, order the configured computer directly on-line.

Dell's success demonstrates the benefits of building customer-specific machines. Beyond increased customer satisfaction, the generation of tailored orders, when combined with Dell's manufacturing processes, improves inventory control and cash-flow management, and allows Dell to track/identify popular features. This is a company that grew by changing the economics of the computer industry, and, with the Web, they're at it again.

Shopping Carts

Another way that Web sites provide customer self-service is through the use of shopping carts. The cart allows consumers to aggregate their on-line purchases into one unit, which can be reviewed for accuracy prior to placing an order. For example, the on-line bookseller Amazon.com [http://www.amazon.com] allows customers to aggregate purchases from a number of

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virtual "shelves" by clicking on the shopping cart option at the Amazon home page.

Comparison Shopping

One way in which you might attract new customers is through a site providing a product finder or some other form of comparison shopping. For example, if you are looking to do some traveling, Microsoft's Expedia [http://www.expedia.com] site or Travelocity [http://www.travelocity.com] are among the many sites that will find the best airfare, hotel, or car rental to help you plan your trip.

Sites such as CompareNet [http://www.compare.net] allow customers to enter the features they desire for a given type of product. The software will then search its database to provide potential products that meet customers' criteria. Two of them can then be selected for a direct comparison. Similarly, The Gap [http://www.gap.com] site allows users to compare the features of different lines of jeans.

However, these sites may be just as likely to *lose* you customers. You should understand the comparison criteria used and contact the site manager to learn their ratings methodology. The site should also address the trends they are seeing between price, features, or other aspects of your product/service offering, as well as your competitors'.

On-Line and Off-Line Product Demonstrations

Product demonstrations, both on-line and off-line, allow you to demonstrate your company's product or service right to your customers in the comfort of their own homes without the cost of additional sales staff. Applications of on-line product demonstration include retrieving baseball scores while a game is in process or developing a stock ticker. At Arthur D. Little, our Cambridge Consultants Ltd. division is using Java to create virtual product demonstrations that allow potential users to see how a technology might work [http://www.camcon.co.uk/communicator/applet.html]. This generates user feedback to help bring successful

products to market. It's like having a focus group, but open to an unlimited number of people, and available 24 hours a day, seven days a week.

Firestone's Building Product Company [http://www.firestonebpco.com/video/quicktime.htm] is demonstrating their products off-line. The site allows users to download QuickTime videos to watch how Firestone's products are used. The ability to view the products in action is the reason behind the success of the infomercial industry. This application allows that model to be applied to the Web—in a more customized fashion and at a significantly lower cost of distribution.

Internet Telephony

Perhaps the most exciting application emerging over the last year has been Internet telephony. There are a growing number of applications that enable the use of the Internet as an alternative to traditional telephone calling over the public switched telephone network. These applications add telecommunications capability for telephone switches such as PBXs and ACDs to interact with the Internet. Some of the examples include:

Phone Calls—Using the Internet, you can get big savings on international and long-distance calls. Internet telephony is achieved either by using a piece of software on your computer (such as Vocaltec's NetPhone) or just using the telephone. Either of these terminal devices can call up a computer known as a gateway (also provided by Vocaltec). The gateway uses the Internet to establish a connection to another gateway near the person you are calling. The gateway at the other end calls the person's phone or connects to their computer, and you can then begin your phone conversation—all at the cost of a local phone call. Jeff Pulver's Web site [http://www.pulver.com] has the latest information on Internet telephony.

Conferencing/Whiteboard/Shared Applications (Groupware)—The Internet also allows you to hold group meetings, connecting users from continents away. Not only

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can you hear and see them, but you can collaborate on documents as well. Intel's Video Phone, Microsoft's NetMeeting, Netscape's Collaborator, and White Pine's CU-SeeMe are all examples of programs with this capability.

Web-Based Call Centers—Imagine letting your call center representatives interact with customers at your Web site. You can. Lucent [http://www.lucent.com] and Rockwell Switching Systems [http://www.switch. rockwell.com], in conjunction with NetSpeak [http://www.netspeak.com], are among the companies developing call center solutions using the Internet.

Internet telephony offers significant cost savings over the public switched network. It also enhances the level of interactivity of the Internet, where customers can speak directly to other customers or with customer repre-sentatives at their discretion, increasing traffic and improving customer service. Finally, these applications allow for truly global meetings to take place across an organization. All you need is an Internet connection and the right software.

Internet Chat/Bulletin Boards

The Internet has chat rooms similar to a "party" telephone line. The chat rooms enable users to converse about a wide range of topics, or one very specific topic, depend-ing on the nature of the chat room. The customer logs on, typically using an anony-mous user name, and, once he or she is comfortable, can begin participating in the conversation, provided they have the necessary software. An alternative to the chat room is the bulletin board, where messages are kept for ongoing discussion and do not take place in real time. Many sites use these applications as a way of allowing users to interact with one another and provide product reviews and feedback to the site about the company's product or about the site itself.

Perhaps the most frequent users of chat rooms and bulletin boards over the Internet have been on-line booksellers such as Barnes & Noble [http://barnesandnoble. com]. Go there and check out their book

forums (you may even find something you like), or participate in an on-line chat with an author (look for the date and time).

Internet Radio

Internet radio is another popular application. By using software such as RealAudio, you can receive live radio broadcasts over the Internet. AudioNet [http://www.audionet.com] has links to a number of Internet radio stations. Radio increases the level of interactivity of your site, increasing traffic and enabling radio advertising to be used through the on-line channel.

Targeted Advertising

Finally, the current panacea of Internet commerce is targeted advertising. As you may be aware, a rule of thumb in advertis-ing is that half of the expenditure is wasted—except no one knows which half. The theory is that by aggregating individual customer profiles, Webmasters and site-providers can provide a much more specific description of their target audience than traditional media (e.g., television and radio), greatly enhancing the effectiveness of a company's advertising dollar.

Servers such as those offered by NetGravity [http://www.netgravity.com] allow a Webmaster to tailor the advertise-ments appearing on a Web site to a specific audience, based on the demographics of visitors to that site and user profiles. Excite [http://www.excite.com] uses audio-enabled advertisements to target their audience.

Technologies That Enable Electronic Commerce

By now, we hope that you have identi-fied at least some ways in which the Internet can improve, or even revolutionize, the way you conduct business. If so, the next logical step is learning about how you can imple-ment these solutions. Before you do that, however, it helps to have an overview of some of the key technologies. In each case, we have provided some example Web sites that you can visit to get a better feel for how these technologies are being used.

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Figure 1
Tools that Enable Internet Applications

Technologies

The tools that enable Internet applications grow daily. This matrix highlights examples of specific implementations of applications and their underlying technologies.

Applications	Active Agents	Passive Agents	Push	Streamlining Video	Streamlining Audio	Payment Methods	Cookies	Web-Tracking Tools	Plug-Ins	Java	Security	Firewalls
Transactions						U					U	X
Security											U	
Search Engine	U	U										X
Targeted Advertising			U		U	U	U					
Customized Pages		U					U					
On-Line Demos				X	X					U		
Off-Line Demos									U			
Product Customization		U	X					X				
Product Finder/Comparison Shopping	X	U	X									
Modifications/Messaging	U		X					X				
Internet Telephony					X							
Desktop Video Conferencing				U								
Web-Based Call Centers				X	U	X				X		
Internet Radio					U							

U = Application uses the referenced technology.
X = Indicates an important relationship between a technology and an application.

Source: Arthur D. Little, Inc.

Agent Technology

A critical technology for Internet commerce is agent technology. Agents act on your behalf, helping you get things done. In the physical world, for example, a researcher can help you quickly find information you need, a travel agent can identify possible vacation spots based on your particular requirements, and a personal shopper can help you find items you wish to purchase.

The Internet has no international governing body to organize it, nor a glossary to direct you. It is a wealth of information for those who know how to find it. Thankfully, there are "virtual agents" who can help you do just that.

The most basic agent is the search engine. Search engines comb the Internet for information that meets parameters you have defined. There are a number of search engines, such as Yahoo [http://www.yahoo.com], Lycos [http://www.lycos.com], Excite [http://www.excite.com], and Altavista [http://altavista.digital.com] which, after the user enters in key words, will search the Internet for sites that contain references to the information requested. Other search engines use preset user specifications to continually retrieve relevant information. Imagine logging on to the Internet and immediately seeing the current stock prices of your investment portfolio as well as today's

weather. Engines such as MyYahoo do just that.

An important aspect of agents is that they can learn. The technology is based on algorithms that train the agent to better mimic your decision-making process. Passive agents will search the Internet for a particular type of information upon request. For example, using firefly technology [http://www.firefly.com], you can locate musicians and artists that have a sound you might appreciate based on previous musical selections. Or the agent can find CDs you have yet to purchase for artists it knows you enjoy. Active agents, such as The Informant [http://informant.dartmouth.edu], will search for this type of information without prompting by the user. The goal is to achieve the level of an information butler that will free you from having to search the Internet to find the information you want. Just relax and let your electronic bits do the work.

Cookies

Cookies are another technology that allows the user to customize their on-line experience. According to Netscape's specification [http://home.netscape.com/newsref/std/cookie_spec.html], "cookies are a general mechanism which server side connections [versus your PC connection] can use to both store and retrieve information from the client side of the connection."

Cookies are hypertext protocol (HTTP) objects that are sent along with the content of the Web site you are visiting. Cookies then reside on your hard drive, resending information about your last visit when you revisit a Web site. This information might include the site-specific user ID and password, enabling customer page settings or other interactive capabilities. The point is to make the site more interactive and responsive for users.

Cookies are very important to the advertising industry because they enable the people running Web sites to develop profiles of the visitors to their site. It is an enabling technology for narrowcasting, which increases the effectiveness of an advertiser's marketing campaign. However,

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concerns over the privacy of the end user has led to the development of the Open Profiling Standard. This standard gives the end user greater control over how their personal information is used. The standard has been endorsed by a number of leading software developers, including Netscape, Firefly, and Microsoft. For more information about cookies, visit CookieCentral at [http://www.cookiecentral.com].

Security

A key concern for many on the Internet is security. Most security measures used today are based on public key cryptography methodology developed by RSA Data Security, Inc. [http://www.rsa.com], including the Secure Electronic Transaction specification developed by Visa [http://www.visa.com] and MasterCard [http:/www.mastercard.com] and endorsed by American Express [http://www.americanexpress.com].

The first step in RSA's methodology is to provide the user with two keys—a public key and a private key. The private key encrypts data at the sender's computer, while the public key decrypts that information at the receiver's computer. This encryption/decryption is based on an algorithm such as Data Encryption Standard (DES), thereby placing the information or data in what is referred to as a secure digital envelope. Public keys are shared among users, while the private key is known only to the user.

The second step is for the sender to authenticate that they are who they say they are. This is done through a digital signature, certificate, or watermark issued by RSA, Verisign [http://www.verisign.com], or the U.S. Postal Service [http://www.usps.com]. The digital signature comes from the individual, while the certification or watermark comes from these third parties who verify that the signature is, in fact, from the user.

Most corporations using the Internet provide security through a suite of software applications known as firewalls. Firewalls are devices placed between the network and the Internet to prevent the entry of un-

wanted parties. Firewalls essentially perform two functions:

- They block incoming traffic you don't want.
- They permit other traffic to leave the network.

They do this by screening and filtering digital packets of information. Firewall vendors include CheckPoint Software Technologies [http://www.checkpoint.com] and Secure Computing [http://www. securecomputing.com].

Streamlining and Off-Line Audio/Video

The interactive nature of cyberspace is made possible in part by streamlining and off-line audio/video. Streamlining results in real-time audio and video transmissions over the Internet. Progressive Network's Real Audio [http://www.realaudio.com] and Real Video are examples of plug-ins that add these capabilities to your browser.

Rather than viewing on-line demos or video or audio clips in real-time, people often prefer to download the file and view it or listen to it at their own convenience. The same plug-ins that enable streamlining audio and video can also be used when you are not connected to the Internet, provided the file resides on your hard drive. Technologies that enable these demonstrations include Macromedia's Shockwave [http://www. macromedia.com/shockwave] and Apple's Quicktime [http://quicktime.apple.com].

Payment Mechanisms

Payment mechanisms are going to be required for Internet transactions. You can't take your wallet with you into cyberspace...unless you convert it into electronic money. Not only do most payment mechanisms eliminate the need for physical money, but they also enable micropayments for transactions that are too small to justify the cost of ordinary processing fees. Leading proponents of digital money are CyberCash [http://www. cybercash.com] supported by First Union Bank [http://www.firstunion.com], and

DigiCash [http://www.digicash.com], which is organizing merchants around its eCash mechanism with the help of Mark Twain Bank [http://www.marktwain.com/ shopcats.html]. CyberCash's site also offers an on-line presentation using the Shockwave plug-in.

The most common way that people interact with the Internet is through their browser software, such as Netscape's Navigator or Microsoft's Internet Explorer. Before the development of the World Wide Web, the Internet was really hard to navigate. Hypertext Mark-up Language (HTML) was the initial mark-up language used to create Web sites, ensuring that each page could be viewed properly by a browser like Mosaic. An inherent problem with HTML, however, is that it does not lend itself easily to the dynamic needs of electronic commerce. In order to enable the interactive capabilities of the Internet, your browser needs help through the form of application-specific programs called helpers, plug-ins, components, or applets. These mini-programs allow you to do things like listen to the radio, watch video clips, and calculate loan payments over the Internet.

Plug-Ins/Languages

Plug-ins and languages are the means through which the browser is enhanced to provide additional functionality, most of which is seamless (hopefully) to the user. Plug-in programs are usually created using one of the following languages: Java, JavaScript, or Active X, although other languages such as C and C++ are also used. Java is a platform-independent, object-oriented language that was developed by Sun Microsystems. The importance of Java is that it enables you to "write once, distribute everywhere," so that your application will run on Windows, Macintosh, or any other operating system. Java programs are called applets, and are compiled using a tool known as the "virtual machine" which resides on your computer. Because it's a full development language, Java can be used to also write non-browser-specific programs.

JavaScript, developed by Netscape, is a scripting language that does not offer a full

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set of development capabilities. As a result, it is easier to learn than Java. Active X is a scripting language from Microsoft, and currently only works with the Windows 95 and NT operating systems.

Wouldn't it be easier if many of the capabilities of plug-ins and applets were already built into your browser? Well, yes and no. On the one hand, there are benefits for browsers with plug-in functions already built in, such as all-in-one functionality and seamless integration of functionality. On the other hand, if browsers came complete with numerous plug-in capabilities, there is a cost in the form of increased complexity and bloatware that takes up large amounts of hard disk space. Both Microsoft and Netscape are adding additional capabilities to their browsers, many of which were licensed from or inspired by a large group of third-party software developers such as Progressive Network's Real Audio and Macromedia's Shockwave (for multimedia presentations) plug-ins.

The development of these tools and the growing number of third-party developers again speaks to the growing maturity of electronic commerce. Arthur D. Little expects the rapid rate of product development known as "Internet time" to continue, and foresees more robust electronic commerce applications.

More information about Java can be found via Sun's JavaSoft unit [http://www.javasoft.com]. Information on plug-ins can be found on Netscape's Web site or at dedicated sites like Browserwatch [http://www.browserwatch.com] and Cliff Stroud's Internet Applications page [http://www.stroud.com]. Information on Java applets can be found at Gamelan [http://www.gamelan.com], while information on Active X components can be found through Cnet's Active X site [http://www.activex.com].

Push Technology

Push technology has the potential to revolutionize the way we receive information on a daily basis. When CNN began broadcasting, many people didn't think a 24-hour news channel would work. Ted Turner

proved them wrong. Turner believed that people wanted a channel that offered real-time information on current events. Some people wondered if you could take that capability and port it over to the Internet. The result is push technology.

Similar to agents in function, push technology uses a predefined filtering mechanism to allow users to receive only the data they are interested in. This information might be news or stock quotes or updates of frequently-used software. Push technology differs from agents in that it does not allow the user the same degree of flexibility in specifying the exact nature of the data they want to receive. If agents are information butlers, push technologies are like pizza delivery boys who provide you with food from a fixed menu. However, both benefit the user by retrieving information from the Internet rather than forcing the user to go out and find it.

Push technologies are based on a broadcasting model for the Internet. Servers at the developer's site aggregate content (news, music, software, etc.) like the TV networks, and then broadcast that information to all of the clients who subscribe to their network. A program sits on your hard drive and acts like a set-top box, enabling you to change the channel to view only that information at any given time.

The Point Cast Network [http://www.pointcast.com] was the first use of push technology to capture people's attention. Marimba [http://www.marimba.com] has also received considerable attention, and its products are more flexible. They can be used not only to send news, but also to broadcast other information. For example, using push technology, network managers can upgrade PC-based software by broadcasting upgrades and fixes over the network. Another popular push vendor is BackWeb [http://www.backweb.com].

Web-Analyzing Tools

The customer-profiling capabilities of the Internet would not happen without Web-analyzing tools. Once you've collected all the information from the cookies, you

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need to make sense of it. This is where tools such as log-file analyzers come in. Using the Web-tracking capabilities of the cookie or your Web server, an analyzer can tell who is visiting your site and which areas of the site are receiving the most interest. This will allow you to better tailor the site to the developing needs of your visitors, as well as suggest new areas for development to keep visitors coming back. Log-file analyzers include Software's WebTrends [http://www. webtrends.com], Bazaar's Analyzer Pro 1.0 [http://www.aquas.com], and Microsoft's Market Focus 3 [http://www.interse.com].

Trends to Watch For

As we have mentioned, the Internet marketplace is developing faster than most of us can keep up with. In fact, it's entirely possible that, by the time you read this, some of the companies we have highlighted here will have entirely changed their business model, merged with another company, or gone out of business. However, we have found a few sites that we think are useful for that purpose (see box). Also, it's very easy to lose sight of the landscape when you're on a fast-moving train. Therefore, we'd like to step back for a minute and share with you some of our thoughts on events we are likely to see over the coming months.

Perhaps the most important near-term trend is the significant rollout of Internet-telephony-based solutions. The cost savings can easily justify the implementation of these systems, and the technology continues to improve. Equally important, Intel, Microsoft, Netscape, VocalTec, and others have agreed to comply with the H.323 standard, which means that you can use any Internet telephony client software to communicate with any other client software. The removal of this barrier will greatly enhance the utility and ubiquity of Internet telephony.

As the phone companies are arguing over the long-distance and local markets, this new platform may pull the rug out from under them. New telecommunications providers are using Internet telephony to create global telecommunications networks, thereby marginalizing the importance of

distance-based fees. This is driving Deutsche Telecom to run Internet telephony trials, and is also driving AT&T into a joint venture with VocalTec. UUNet, an ISP, is already moving up the value chain by developing an Internet-based fax business. Look for other telcos to jump into the fray.

Another area is agent technology. We believe the algorithms will improve, moving us ever closer to the emergence of the "information butler." Search engines will get better, allowing us to find information more readily, and improving the quality of that information. This will provide additional grease for "friction-free" commerce, as more transactions are likely to take place.

Finally, perhaps the most important impact of Internet commerce is the explosion of products and services that will be enabled by rapid application development. As time to market continues to come down, barriers to entry will be reduced while, at the same time, providing established players with an opportunity to build additional switching costs. The open-standards-based Internet, combined with languages like Java that use a "write once, distribute anywhere" paradigm, are rewriting software development economics to the benefit of both businesses and their customers. We expect that pace to only get faster with the deployment of cable modems, ADSL, and other broadband technologies that will force us to completely rewrite, rather than simply revise, this article in three to five years.

Conclusion

Given the pace of development in the Internet marketplace, known as "Internet time," it is likely that even since this journal went to press, other groundbreaking technologies have been making waves. Despite this rate of change, it is our belief that you should now be comfortable in understanding the fundamental opportunities that Internet-enabled commerce provides for your business. We encourage you to begin taking advantage of these opportunities, because your competitors may have already gotten started. NTQ

As the phone companies are arguing over the long-distance and local markets, this new platform may pull the rug out from under them.

Keeping Up

The Internet is a web of sometimes-confusing information. Standards just don't exist. Anything goes, and everything can connect to anything. There's no map or index to guide you. Change is an every-minute occurrence. Well, here's some help. Listed below are some Web sites for the neophyte or the user who just wants to keep up with what's going on in electronic commerce.

A Business Researcher's Guide to Internet Electronic Commerce Page [http://www.brint.com/Elecomm.htm]—A Business Researcher's Guide is a searchable knowledge map of contemporary business, management, and information technology issues. It provides access to hundreds of full-text articles and papers, magazines and journals, case studies, tools, and thousands of other resources on some of the hottest issues of interest to business, technology, and information professionals.

Resource Center Menu [http://www.ecworld.org/Resource_Center/menu.html]—The EC World Institute's Resource Center provides information on EDI, electronic commerce, and the U.S. Department of Defense's Continuous Acquisition and Life-cycle Support (CALS) initiative.

A Framework for Electronic Commerce [http://www.iitf.nist.gov/electronic_commerce.htm]—The White House's Information Infrastructure Task Force (IITF) developed this site to outline a proposed EC strategy. The site establishes a set of principles to guide policy development, outlines administration positions on a number of key issues related to electronic commerce, and provides a road map for international negotiations where appropriate. It also identifies which government agencies will take the lead in implementing this work.

The Electronic Commerce Resource Center [http://www.cio.com/forums/ec.html]—This site is maintained by *CIO* magazine. It includes case studies and links to *CIO* and WebMaster articles, white papers, on-line forums, and vendor information. The site also links to other industry groups.

Emmerce, Computerworld's On-Line Magazine on Electronic Commerce [http://www.computerworld.com/emmerce/]—This site is the self-proclaimed Webzine for electronic commerce strategists. It contains departments, features, and forums for professionals involved in developing and implementing strategies for electronic commerce. It also has references to raw data regarding the development of electronic commerce.

Secure Electronic Transactions [http://www.visa.com]—This site contains a technical specification for securing credit card payments over open networks such as the Internet. Secure Electronic Transactions (SET) specifications were jointly developed by Visa and MasterCard with participation from several other companies, including Microsoft, GTE, IBM, and Verisign.

U.C. Berkeley School of Information Management and Systems Electronic Commerce Page [http://www.sims.berkeley.edu/resources/infoecon/commerce.html]—This site is frequently updated with a rich set of current information. You can also register to receive an e-mail notification when the page is updated, saving you from having to go there when there isn't a critical mass of new information.